

TRIGONOMETRY

(Previous Year Questions)

(CPO – 2020)

1. If $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ - y \tan^2 66^\circ \tan^2$

$$24 = \frac{y}{2} \text{ the value of } y \text{ is:}$$

यदि $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ - y \tan^2 66^\circ \tan^2$

$$24 = \frac{y}{2} \text{ हैं, तो } y \text{ का मान ज्ञात करें।}$$

(CPO 23-10-2020 Shift I)

- (A) $\frac{3}{8}$ (B) 8 (C) $\frac{1}{3}$ (D) $\frac{8}{3}$

2. A ladder leaning against a wall makes an angle θ with the horizontal ground such that $\cos \theta = \frac{5}{13}$. If the height of the top of the ladder from the wall is 18m, then what is the distance (in m) of the foot of the ladder from the wall?

एक सीढ़ी दीवार के सहारे झुकी है और वह क्षेत्रज भूमि के साथ θ कोण इस प्रकार बनाती है कि $\cos \theta = \frac{5}{13}$ है यदि दीवार से सीढ़ी के शीर्ष की ऊँचाई 18 मी. है, तो दीवार से सीढ़ी के आधार की दूरी (मी. में) ज्ञात करें।

(CPO 23-10-2020 Shift I)

- (A) 19.5 (B) 13 (C) 7.5 (D) 18

3. If $4 - 2 \sin^2 \theta - 5 \cos \theta = 0, 0^\circ < \theta < 90^\circ$, then the value of $\cos \theta + \tan \theta$ is :

यदि $4 - 2 \sin^2 \theta - 5 \cos \theta = 0, 0^\circ < \theta < 90^\circ$ है, तो $\cos \theta + \tan \theta$ का मान ज्ञात करें।

(CPO 23-10-2020 Shift I)

- (A) $\frac{2+\sqrt{3}}{2}$ (B) $\frac{2-\sqrt{3}}{2}$
 (C) $\frac{1+2\sqrt{3}}{2}$ (D) $\frac{1-2\sqrt{3}}{2}$

4. A person was standing on a road near a mall. He was 1425 m away from the mall and able to see the top of the mall from the road in such a way that the top of a tree, which is in between him and the mall, was exactly in line of sight with the top of the mall. The tree height is 10 m and it is 30 m away from him. How tall (in m) is the mall?

एक व्यक्ति मॉल के निकट सड़क पर खड़ा है। वह मॉल से 1425 मी. की दूरी पर हैं और सड़क से मॉल के शीर्ष की इस प्रकार देखने में सक्षम हैं कि उसके और मॉल के बीच स्थित पेड़ का शीर्ष मॉल के शीर्ष के साथ दृष्टि रखा भैं हैं। पेड़ की ऊँचाई 10 मी. हैं और यह उस व्यक्ति से 30 मी. की दूरी पर स्थित हैं। मॉल की ऊँचाई (मी. में) ज्ञात करें।

(CPO 23-10-2020 Shift I)

- (A) 475 (B) 300
 (C) 425 (D) 525

5. If $\sec 3x = \operatorname{cosec} (3x - 45^\circ)$, where $3x$ is an acute angle, then x is equal to;

यदि $\sec 3x = \operatorname{cosec} (3x - 45^\circ)$ है, जहाँ $3x$, न्यून कोण हैं, तो x का मान ज्ञात करें-

(CPO 23-10-2020 Shift II)

- (A) 27.5° (B) 45°
 (C) 35° (D) 22.5°

6. The value of

$$\frac{\sin^2 30^\circ + \cos^2 60^\circ - \sec 35^\circ \cdot \sin 55^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$$
 is equal to:

$$\frac{\sin^2 30^\circ + \cos^2 60^\circ - \sec 35^\circ \cdot \sin 55^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$$
 का मान ज्ञात करें।

(CPO 23-10-2020 Shift II)

- (A) $-\frac{1}{4}$ (B) $\frac{1}{4}$
 (C) $-\frac{1}{8}$ (D) $\frac{1}{8}$

7. The length of the shadow of a vertical pole on the ground is 18 m. If the angle of elevation of the sun at that time is θ . Such that $\cos \theta = \frac{12}{13}$,

then what is the height (in m) of the pole? भू-तल पर किसी अधोलंब खंभे की परछाई की लंबाई 18m है। यदि उस समय सूर्य का उन्नयन कोण θ इस प्रकार है कि $\cos \theta = \frac{12}{13}$ है तो

खंभे की ऊँचाई (m में) ज्ञात करें—(CPO 23-10-2020 Shift II)

- (A) 7.5 (B) 9
 (C) 18 (D) 12

8. Asha and Suman's mud forts have heights 9 cm and 16 cm. They are 24 cm apart. How far (in cm) are the fort tops from each other?
 आशा और सुमन द्वारा बनाए गए मिट्टी के किलों की ऊँचाई 9 cm और 16 cm है। वे एक-दूसरे से 24 cm की दूरी पर हैं। उनके शीर्षों के बीच की दूरी (cm में) ज्ञात करें। **(CPO 23-10-2020 Shift II)**
 (A) 16 (B) 7
 (C) 25 (D) 24
9. The length of the shadow of a vertical pole on the ground is 36m. If the angle of elevation of the sun at the time is θ . Such that $\sec\theta = \frac{13}{12}$, then what is the height (in cm) of the pole?
 किसी अधोलंब स्तंभ की भूमि पर पड़ने वाली परछाई की लंबाई 36 है।
 यदि उस समय सूर्य का उन्नयन कोण θ इस प्रकार है कि $\sec\theta = \frac{13}{12}$ है, तो स्तंभ की ऊँचाई (cm में) ज्ञात करें।
(CPO 24-10-2020 Shift I)
 (A) 12 (B) 9
 (C) 18 (D) 15
10. If $\sin 3x = \cos(3x - 45^\circ)$, $0^\circ < 3x < 90^\circ$, then x is equal to :
 यदि $\sin 3x = \cos(3x - 45^\circ)$, $0^\circ < 3x < 90^\circ$ है, तो x का मान ज्ञात करें ?
(CPO 24-10-2020 Shift I)
 (A) 35° (B) 45°
 (C) 22.5° (D) 27.5°
11. The value of $\frac{\sin^2 30^\circ + \cos^2 60^\circ + \sec 45^\circ \cdot \sin 45^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$ is :

$$\frac{\sin^2 30^\circ + \cos^2 60^\circ + \sec 45^\circ \cdot \sin 45^\circ}{\sec 60^\circ + \operatorname{cosec} 30^\circ}$$
 का मान ज्ञात करें ?
(CPO 24-10-2020 Shift I)
 (A) $-\frac{1}{4}$ (B) $\frac{3}{8}$
 (C) $-\frac{3}{8}$ (D) $\frac{1}{4}$
12. Asha and Suman's mud forts have heights 9 cm and 16 cm. If the fort tops are at 25 cm apart from each other, then the distance (in cm) between two forts is :
(CPO 24-10-2020 Shift I)
 आशा और सुमन के मिट्टी के बराँदों की ऊँचाई 9 cm और 16 cm है। यदि घराँदों के शीर्ष एक दूसरे से 25 cm दूर हैं, तो दोनों घराँदों के बीच की दूरी (cm में) ज्ञात करें।
 (A) 24 (B) 16
 (C) 7 (D) 25

13. The value of $\frac{\sin^2 52^\circ + 2 + \sin^2 38^\circ}{4\cos^2 43^\circ - 5 + 4\cos^2 47^\circ}$ is :

$$\frac{\sin^2 52^\circ + 2 + \sin^2 38^\circ}{4\cos^2 43^\circ - 5 + 4\cos^2 47^\circ}$$
 का मान ज्ञात करें।
(CPO 24-10-2020 Shift II)
 (A) 3 (B) $\frac{1}{3}$ (C) $-\frac{1}{3}$ (D) -3
14. A ladder is resting against a wall. The angle between the foot of the ladder and wall is 60° and the foot of the ladder is 3.6 m away from the wall. The length of the ladder (in m) is :
 दीवार की तरफ झुकी हुई सीढ़ी का उन्नयन कोण 60° है और सीढ़ी का आधार दीवार से 3.6 m दूर है। सीढ़ी की लंबाई (m में) ज्ञात करें।
(CPO 24-10-2020 Shift II)
 (A) 5.4 (B) 3.6
 (C) 14.4 (D) 7.2
15. If 4θ is an acute angle and $\cot 4\theta = \tan(\theta - 5^\circ)$, then what is the value of θ ?
 यदि 4θ चूर्चा कोण है और $\cot 4\theta = \tan(\theta - 5^\circ)$ है, तो θ का मान ज्ञात करें।
(CPO 24-10-2020 Shift II)
 (A) 19° (B) 45°
 (C) 21° (D) 24°
16. Let A and B be two towers with same base. From the midpoint of the line joining their feet, the angles of elevation of the tops of A and B are 30° and 60° , respectively. The ratio of the heights of B and A is :
 माना A और B समान आधार वाली दो सीनारों के आधारों को जोड़ने वाली रेखा के मध्यबिंदु से, A और B के शीर्ष का उन्नयन कोण क्रमशः 30° और 60° है। B और A की ऊँचाई का अनुपात ज्ञात करें।
(CPO 24-10-2020 Shift II)
 (A) 1 : 3 (B) 3 : 1
 (C) 1 : 2 (D) $1 : \sqrt{3}$
17. If $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \times \tan^2 66^\circ \times \tan^2 24^\circ = \frac{y}{2}$, then the value of y is:
 यदि $4(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \times \tan^2 66^\circ \times \tan^2 24^\circ = \frac{y}{2}$ है, तो y का मान ज्ञात करें।
(CPO 25-10-2020 Shift I)
 (A) -4 (B) 8
 (C) 4 (D) -8

- 18.** A ladder leaning against a wall makes an angle θ with the horizontal ground such that $\tan\theta = \frac{12}{5}$. If the height of the top of the ladder from the wall is 24m, then what is the distance (in m) of the foot of the ladder from the wall?
एक सीढ़ी दीवार के सहारे झुकी हैं और वह क्षेत्रिज भूमि के साथ θ कोण इस प्रकार बनाती हैं कि $\tan\theta = \frac{12}{5}$ यदि दीवार से सीढ़ी के शीर्ष की ऊँचाई 24 मी. हैं, तो दीवार से सीढ़ी के आधार की दूरी (मी.में) ज्ञात करें। **(CPO 25-10-2020 Shift I)**

(A) 18 (B) 19.5
(C) 10 (D) 7.5

19. A person was standing on a road near a mall. He was 1215 m away from the mall and able to see the top of the mall from the road in such a way that the top of a tree which is in between him and the mall, was exactly in line of sight with the top of the mall. The tree height is 20 m and it is 60 m away from him. How tall (in m) is the mall ?
एक व्यक्ति मॉल के निकट सड़क पर खड़ा हैं। वह मॉल से 1215 मी. की दूरी पर हैं और सड़क से मॉल के शीर्ष को इस प्रकार देखने में सक्षम हैं, कि उसके और मॉल के बीच स्थित एक पेड़ का शीर्ष मॉल के शीर्ष के साथ दृष्टि रेखा में हैं। पेड़ की ऊँचाई 20 मी. हैं और यह उस व्यक्ति 60 मी. की दूरी पर स्थित हैं। मॉल की ऊँचाई (मी. में) ज्ञात करें। **(CPO 25-10-2020 Shift I)**

(A) 375 (B) 300 (C) 405 (D) 250

20. If $4 - 2 \sin^2\theta - 5\cos\theta = 0, 0^\circ < \theta < 90^\circ$, then the value of $\cos\theta - \tan\theta$ is :
यदि $4 - 2 \sin^2\theta - 5\cos\theta = 0, 0^\circ < \theta < 90^\circ$ है, तो $\cos\theta - \tan\theta$ का मान ज्ञात करें। **(CPO 25-10-2020 Shift I)**

(A) $\frac{1+2\sqrt{3}}{2}$ (B) $\frac{2+\sqrt{3}}{2}$
(C) $\frac{2-\sqrt{3}}{2}$ (D) $\frac{1-2\sqrt{3}}{2}$

21. Solve for θ : $\cos^2\theta - \sin^2\theta = \frac{1}{2}, 0 < \theta < 90^\circ$.
 θ का मान ज्ञात करें $\cos^2\theta - \sin^2\theta = \frac{1}{2}$ जहाँ $0 < \theta < 90^\circ$ है। **(CPO 25-10-2020 Shift II)**

(A) 45° (B) 60°
(C) 40° (D) 30°

22. If $\cot\theta = \frac{1}{\sqrt{3}}, 0^\circ < \theta < 90^\circ$, then the value of $\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\cosec^2\theta - \sec\theta)$ is:
यदि $\cot\theta = \frac{1}{\sqrt{3}}, 0^\circ < \theta < 90^\circ$, तब $\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\cosec^2\theta - \sec\theta)$ का मान ज्ञात करो-
(CPO 25-10-2020 Shift II)

(A) 5 (B) 0
(C) 1 (D) 2

23. Let A and B be two towers with the same base. From the mid point of the line joining their feet, the angles of elevation of the tops of A and B are 30° and 45° , respectively. The ratio of the heights of A and B is:
माना कि A और B समान आधार बाली दो मीनार हैं। और दोनों मीनारों के आधार के बीच ठीक मध्य से, A और B के शीर्ष के उन्नयन कोण क्रमशः 30° और 45° हैं। A और B की ऊँचाई का अनुपात ज्ञात करें। **(CPO 25-10-2020 Shift II)**

(A) $\sqrt{3} : 1$ (B) $1 : \sqrt{3}$
(C) $3 : 1$ (D) $1 : 3$

24. A ladder is resting against a wall. The angle between the foot of the ladder and the wall is 45° and the foot of the ladder is 6.6 m away from the wall. The length of the (in m) is:
दीवार के सहारे रखी हुई एक सीढ़ी के पाद और दीवार के मध्य कोण 45° हैं, और सीढ़ी का पाद दीवार से 6.6 मी. दूर है। सीढ़ी की लम्बाई (मी. में) ज्ञात करें। **(CPO 25-10-2020 Shift II)**

(A) $6.6 \times \sqrt{2}$ (B) $2.2 \times \sqrt{2}$
(C) $3.3 \times \sqrt{2}$ (D) $3.6 \times \sqrt{2}$

Solution

1. (D) $4(\cosec^2 57^\circ - \tan^2 33^\circ) - \cos 90^\circ - y \tan^2 +$

$$66^\circ \tan^2 24 = \frac{y}{2}$$

$$4(\cosec^2 57^\circ - \tan^2(90^\circ - 57^\circ)) - y \tan^2 66^\circ$$

$$\tan^2(90^\circ - 66^\circ) = \frac{y}{2}$$

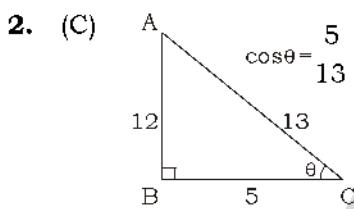
$$4(\cosec^2 51^\circ - \cot^2 57^\circ) - y \tan^2 66^\circ \cot^2 66^\circ$$

$$= \frac{y}{2}$$

$$4(1) - y = \frac{y}{2}$$

$$4 = \frac{3y}{2}$$

$$y = \frac{8}{3}$$



$$(AB) 12 \rightarrow 18$$

$$(C) 1 \rightarrow \frac{18}{12}$$

$$(BC) 5 \rightarrow \frac{18}{12} \times 5 = \frac{3}{2} \times 5 = 7.5 \text{ cm}$$

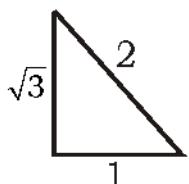
3. (C) $4 - 2 \sin^2 \theta - 5 \cos \theta = 0$
 $4 - 2(1 - \cos^2 \theta) - 5 \cos \theta = 0$
 $4 - 2 + 2 \cos^2 \theta - 5 \cos \theta = 0$
 $2 \cos^2 \theta - 5 \cos \theta + 2 = 0$
 $2 \cos^4 \theta - 4 \cos \theta - \cos \theta + 2 = 0$
 $2 \cos \theta (\cos \theta - 2) - 1 (\cos \theta - 2) = 0$
 $(\cos \theta - 2)(2 \cos \theta - 1) = 0$

$$\cos \theta = \frac{1}{2}, 2$$

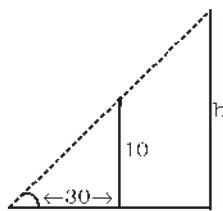
$$\cos \theta + \tan \theta$$

$$\frac{1}{2} + \sqrt{3}$$

$$\frac{2\sqrt{3} + 1}{2}$$



4. (A)



$$\tan \theta = \frac{10}{30} = \frac{1}{3}$$

$$\tan \theta = \frac{h}{1425}$$

$$\frac{1}{3} = \frac{h}{1425}$$

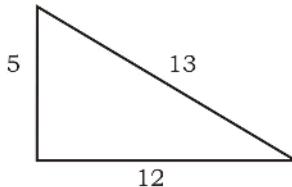
$$h = 475 \text{ m}$$

5. (D) $3x + 3x - 45^\circ = 90^\circ$
 $6x = 135^\circ$
 $x = 22.5$

6. (C) $\frac{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2 - \cosec 55^\circ, \sin 55^\circ}{2+2}$

$$= \frac{\frac{1}{4} + \frac{1}{4} - 1}{4} = -\frac{1}{2} \times \frac{1}{4} = -\frac{1}{8}$$

7. (A)

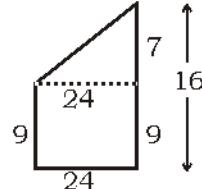


$$12 \rightarrow 18$$

$$1 \rightarrow \frac{18}{12}$$

$$5 \rightarrow \frac{18}{12} \times 5 = 7.5$$

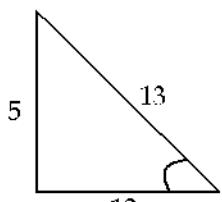
8. (C)



distance farts tops from each other

$$= \sqrt{(7)^2 + (24)^2} = \sqrt{625} = 25$$

9. (D)



$$\sec \theta = \frac{13}{12}$$

$$12 \xrightarrow{\times 3} 36$$

$$\therefore 5 \xrightarrow{\times 3} \boxed{15}$$

 10. (C) $3x + 3x - 45^\circ = 90$

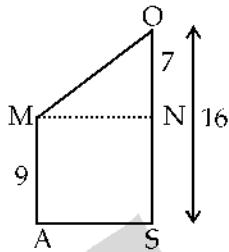
$$6x = 135^\circ$$

$$x = 22.5^\circ$$

 11. (B) $\frac{\sin^2 30^\circ + \cos^2 60^\circ + \sec 45^\circ \cos 45^\circ}{\sec 60^\circ + \csc 30^\circ}$

$$= \frac{\frac{1}{4} + \frac{1}{4} + 1}{\frac{1}{2} + 2} = \frac{6}{16} = \frac{3}{8}$$

12. (A)



$$\therefore (25)^2 = (7)^2 + (MN)^2$$

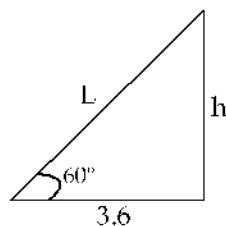
$$\Rightarrow MN = 24$$

13. (D)

$$\frac{\sin^2 52^\circ + 2 + \sin^2 38^\circ}{4 \cos^2 43^\circ - 5 + 4 \cos^2 47^\circ}$$

$$= \frac{\sin^2 52 + \cos^2 52 + 2}{4(\cos^2 43 + \sin^2 43) - 5} = \frac{1+2}{4-5} = -3$$

14. (D)



$$\cos 60^\circ = \frac{3.6}{L}$$

$$L = 3.6 \times 2$$

$$h = 7.2 \text{ cm}$$

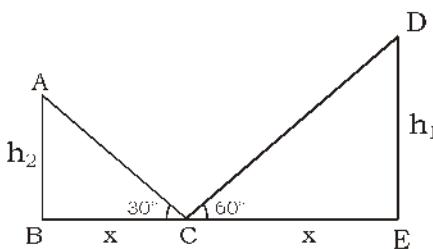
 15. (A) $\cot 4\theta = \tan(60^\circ - 5^\circ)$

$$40 + \theta - 5 = 90$$

$$5\theta = 95$$

$$\theta = 19^\circ$$

16. (B)


 $\Delta ABC \sim \Delta DCE$

$$\tan 30^\circ = \frac{h_2}{x}, \tan 60^\circ = \frac{h_1}{x}$$

$$h_2 = \frac{x}{\sqrt{3}}, h_1 = \sqrt{3}x$$

$$h_1 : h_2$$

$$\sqrt{3}x : \frac{x}{\sqrt{3}}$$

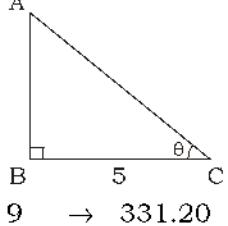
 17. (D) $4(\sec^2 33^\circ - \tan^2 33^\circ) - \cos 90^\circ + y \tan^2 66^\circ$

$$\cot^2 66^\circ = \frac{y}{2}$$

$$\Rightarrow 4 \times 1 - 0 + y = \frac{y}{2}$$

$$\Rightarrow y - \frac{y}{2} = 4 \quad \Rightarrow y = -8$$

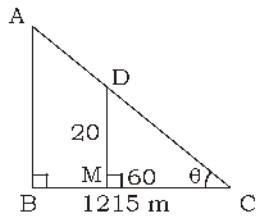
18. (C)



$$9 \rightarrow 331.20$$

$$\therefore BC = \frac{24}{12} \times 5 = 10 \text{ m}$$

19. (C)


 $\Delta ABC \sim \Delta DMC$

$$\frac{BC}{CM} = \frac{AB}{DM} \Rightarrow \frac{1215}{60} = \frac{20}{DM}$$

$$\therefore AB = 405$$

20. (D) $4 - 2\sin^2\theta - 5\cos\theta = 0$

Put $\theta = 60^\circ$

$$4 - 2 \times \frac{3}{4} - \frac{5}{2} = 0$$

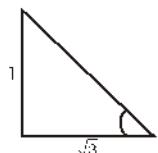
$$\therefore \cos 60^\circ - \tan 60^\circ = 0$$

$$\Rightarrow \frac{1}{2} - \sqrt{3} \Rightarrow \frac{1-2\sqrt{3}}{2}$$

21. (D) $\cos^2\theta - \sin^2\theta = \frac{1}{2}$

$$\cos 2\theta = \cos 60^\circ \\ \theta = 30^\circ$$

22. (C)



$$\cot\theta = \frac{1}{\sqrt{3}}$$

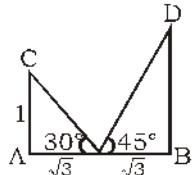
Put $\theta = 60^\circ$

$$\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\cosec^2\theta - \sec\theta)$$

$$\Rightarrow \frac{2 - \frac{3}{4}}{1 - \frac{1}{4}} + \left(\frac{4}{3} - 2\right) \Rightarrow \frac{5}{3} - \frac{2}{3}$$

$$\Rightarrow 1$$

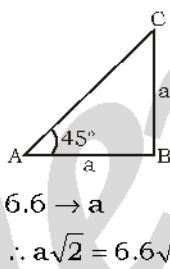
23. (B)



$$OB = BD$$

$$\frac{AC}{BD} = \frac{1}{\sqrt{3}}$$

24. (A)



$$6.6 \rightarrow a$$

$$\therefore a\sqrt{2} = 6.6\sqrt{2}$$

$$\text{Length of ladder} = 6.6 \times \sqrt{2}$$

(CPO - 2019)

1. A clock tower stands at the crossing of two roads which point in the north-south and the east-west directions. P, Q, R and S are points on the roads due north, east, south and west respectively, where the angles of elevation of the top of the tower are respectively, α , β , γ and δ . Then

$$\left(\frac{PQ}{RS}\right)^2 \text{ is equal to:}$$

एक घंटा-घर दो ऐसी सड़कों के चौराहे पर स्थित है जो उत्तर-दक्षिण और पूर्व-पश्चिम दिशाओं की ओर जाती है। P, Q, R और S सड़क की क्रमशः उत्तर, पूर्व, दक्षिण और पश्चिम दिशाओं में स्थित ऐसे बिंदु हैं, जहाँ से घंटा-घर के शीर्ष के उन्नयन कोण क्रमशः α, β, γ और δ हैं।

तो $\left(\frac{PQ}{RS}\right)^2$ का मान ज्ञात कीजिए।

(A) $\frac{\tan^2 \alpha + \tan^2 \delta}{\tan^2 \beta + \tan^2 \gamma}$ (B) $\frac{\tan^2 \alpha + \tan^2 \beta}{\tan^2 \gamma + \tan^2 \delta}$

(C) $\frac{\cot^2 \alpha + \cot^2 \beta}{\cot^2 \gamma + \cot^2 \delta}$ (D) $\frac{\cot^2 \alpha + \cot^2 \delta}{\cot^2 \beta + \cot^2 \gamma}$

2. If $0 \leq \theta \leq 90^\circ$, and $\sin(2\theta + 50^\circ) = \cos(4\theta + 16^\circ)$, then what is the value of θ (in degrees)?

यदि $0 \leq \theta \leq 90^\circ$ और $\sin(2\theta + 50^\circ) = \cos(4\theta + 16^\circ)$ है, तो θ का मान (अंश में) ज्ञात कीजिए।

- (A) 8° (B) 10°
 (C) 12° (D) 4°

3. If $0 \leq \theta \leq 90^\circ$, and $\sec^{107} \theta + \cos^{107} \theta = 2$, then $(\sec \theta + \cos \theta)$ is equal to :

यदि $0 \leq \theta \leq 90^\circ$, और $\sec^{107} \theta + \cos^{107} \theta = 2$ है, तो $(\sec \theta + \cos \theta)$ का मान ज्ञात कीजिए।

(A) 2^{-107} (B) 1 (C) 2 (D) $\frac{1}{2}$

4. A pole stands vertically on a road, which goes in the north-south direction. P, Q are two points towards the north of the pole, such that $PQ = b$, and the angles of elevation of the top of the pole at P, Q, are α , β respectively. Then the height of the pole is :

एक खंभा उस सड़क पर उर्ध्वाकार रूप से खड़ा हुआ है, जो उत्तर दक्षिण दिशा में जाती है। P, Q खंभे के उत्तर में स्थित दो ऐसे बिंदु हैं, कि $PQ = b$ और P, Q से खंभे के शीर्ष के उन्नयन कोण क्रमशः α , β हैं। खंभे की ऊँचाई ज्ञात कीजिए।

(A) $\frac{b}{\tan \beta + \tan \alpha}$ (B) $\frac{b}{\cot \alpha - \cot \beta}$

(C) $\frac{b}{\tan \beta - \tan \alpha}$ (D) $\frac{b \tan \alpha}{\tan \beta}$

5. If $\frac{1}{\cosec \theta + 1} + \frac{1}{\cosec \theta - 1} = 2 \sec \theta$, $0^\circ < \theta < 90^\circ$,

then the value of $\frac{\tan \theta + 2 \sec \theta}{\cosec \theta}$ is :

यदि $\frac{1}{\cosec \theta + 1} + \frac{1}{\cosec \theta - 1} = 2 \sec \theta$, $0^\circ < \theta < 90^\circ$ है,

तो $\frac{\tan \theta + 2 \sec \theta}{\cosec \theta}$ का मान है :

(A) $\frac{2+\sqrt{3}}{2}$ (B) $\frac{4+\sqrt{2}}{2}$ (C) $\frac{2+\sqrt{2}}{2}$ (D) $\frac{4+\sqrt{3}}{2}$

6. If $(\cos \theta + \sin \theta) : (\cos \theta - \sin \theta) = (\sqrt{3} + 1) : (\sqrt{3} - 1)$, $0^\circ < \theta < 90^\circ$, then what is the value of $\sec \theta$?

यदि $(\cos \theta + \sin \theta) : (\cos \theta - \sin \theta) = (\sqrt{3} + 1) : (\sqrt{3} - 1)$, $0^\circ < \theta < 90^\circ$ है, तो $\sec \theta$ का मान क्या होगा ?

(A) 1 (B) 2 (C) $\sqrt{2}$ (D) $\frac{2\sqrt{3}}{3}$

7. From the top of a house A in a street, the angles of elevation and depression of the top and foot of another house B on the opposite side of the street are 60° and 45° , respectively. If the height of house A is 36 m, then what is the height of house B ? (Your answer should be nearest to an integer.)

एक गली में स्थित मकान A के शीर्ष से, सड़क के दूसरी ओर स्थित एक अन्य मकान B के शीर्ष और पाद के उन्नयन और अवनमन कोण क्रमशः 60° और 45° हैं। यदि मकान A की ऊँचाई 36 m है, तो मकान B की ऊँचाई कितनी है ? (आपका उत्तर पूर्णांक के सबसे निकट होना चाहिए)

(A) 91 m (B) 93 m
 (C) 94 m (D) 98 m

8. The angles of elevation of the top of a tower from two points on the ground at distance 32 m and 18 m from its base and in the same straight line with it are complementary. The height (in m) of the tower is :

- 14.** If $\text{cosec } \theta = 1.25$, then $\frac{4 \tan \theta - 5 \cos \theta + 1}{\sec \theta + 4 \cot \theta - 1} = ?$

यदि $\text{cosec } \theta = 1.25$ है, तो $\frac{4 \tan \theta - 5 \cos \theta + 1}{\sec \theta + 4 \cot \theta - 1} = ?$

(A) 2 (B) $\frac{10}{11}$ (C) $\frac{9}{10}$ (D) $\frac{1}{2}$

15. From the top of a lamp post of height x metres, two objects on the ground on the same side of it (and in line with the foot of the lamp post) are observed at angles of depression of 30° and 60° , respectively. The distance between the objects is $32\sqrt{3}$ m. The value of x is:

x मीटर ऊंचे एक प्रकाश स्तंभ के शीर्ष से, इसके एक ही तरफ भूमि पर स्थित दो वस्तुओं (प्रकाश स्तंभ के पाद की सीधी रेखा में) के अवलोकित किये गए अवनमण कोण क्रमशः 30° और 60° हैं। वस्तुओं के बीच की दूरी $32\sqrt{3}$ मी. है। x का मान ज्ञात कीजिए।

(A) 36 (B) 48
(C) 54 (D) 45

16. If $\sqrt{2} \sin(60^\circ - \alpha) = 1$ where $0^\circ < \alpha < 90^\circ$, then the value of α will be?

यदि $\sqrt{2} \sin(60^\circ - \alpha) = 1$, $0^\circ < \alpha < 90^\circ$ है, तो α का मान क्या होगा?

(A) 15° (B) 30°
(C) 45° (D) 60°

17. If $\sin \theta - \cos \theta = 0$ where $0^\circ < \theta < 90^\circ$, then what will be the value of $\sin^4 \theta + \cos^4 \theta$?

यदि $\sin \theta - \cos \theta = 0$, $0^\circ < \theta < 90^\circ$ है, तो $\sin^4 \theta + \cos^4 \theta$ का मान क्या होगा?

(A) $\frac{1}{3}$ (B) 1 (C) $\frac{1}{2}$ (D) $\frac{1}{4}$

18. The angle of elevation of top of a tree from a point on the ground which is 300 m away from the base of the tree is 30° . When the height of the tree increases, the angle of elevation changes to 60° . Find out the increase in the height of the tree.

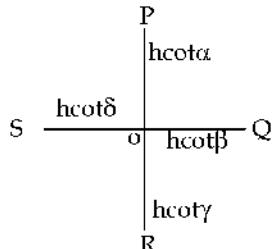
एक पेड़ के शीर्ष का भूमि पर स्थित उस बिंदु से उन्न्यन कोण 30° है, जो पेड़ के तल से 300 मी. की दूरी पर है। जब पेड़ की ऊँचाई बढ़ जाती है, तो उसी बिंदु से उसके शीर्ष का उन्न्यन कोण 60° हो जाता है। पेड़ की ऊँचाई में कितनी वृद्धि हुई है? (पूर्णांक के निकटतम)

(A) 346 m/मी. (B) 364 m/मी.
(C) 342 m/मी. (D) 384 m/मी.

- 19.** A ladder leaning against a window of a house makes an angle of 60° with the ground. If the distance of the foot of the ladder from the wall is 4.2 m, then the height of the point, where the ladder touches the window from the ground is closest to:
- एक घर की खिड़की पर खड़ी हुई एक सीढ़ी भूमि के साथ 60° का कोण बनाती है। यदि दीवार से सीढ़ी के पाद की दूरी 4.2 मी. है, तो उस बिंदु की ऊँचाई क्या होगी, जहां सीढ़ी भूमि से खिड़की को स्पर्श करती है?
- (A) 7.3 m/ मी. (B) 6.8 m/ मी.
 (C) 7.8 m/ मी. (D) 7 m/ मी.
- 20.** A pole of length 7 m is fixed vertically on the top of a tower. The angle of elevation of the top of the pole observed from a point on the ground is 60° and the angle of depression of the same point on the ground from the top of the tower is 45° . The height (in m) of the tower is:
- एक टॉवर के शीर्ष पर 7 मी. लंबी एक छड़ उर्ध्वाधर रूप से स्थापित की गई है। भूमि पर एक बिंदु से छड़ के शीर्ष का अवलोकित किया गया उन्नयन कोण 60° है और टॉवर के शीर्ष से भूमि पर उसी बिंदु का अवनमन कोण 45° है। टॉवर की ऊँचाई (मी. में) कितनी है?
- (A) $7(2\sqrt{3} - 1)$ (B) $\frac{7}{2}(2\sqrt{3} - 1)$
 (C) $7\sqrt{3}$ (D) $\frac{7}{2}(\sqrt{3} + 1)$
- 21.** If $3(\cot^2 \theta - \cos^2 \theta) = 1 - \sin^2 \theta$, $0^\circ < \theta < 90^\circ$, then θ is equal to:
- यदि $3(\cot^2 \theta - \cos^2 \theta) = 1 - \sin^2 \theta$, $0^\circ < \theta < 90^\circ$ हो, तो θ का मान बताइए?
- (A) 30° (B) 60°
 (C) 45° (D) 15°
- 22.** The value of $\tan^2 48^\circ - \operatorname{cosec}^2 42^\circ + \operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta)$ is
 $\tan^2 48^\circ - \operatorname{cosec}^2 42^\circ + \operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta)$ का मान ज्ञात कीजिए।
- (A) -1 (B) 0
 (C) 1 (D) -2
- 23.** If $\cos^2 \theta - \sin^2 \theta = \tan^2 \phi$, then which of the following is true?
- यदि $\cos^2 \theta - \sin^2 \theta = \tan^2 \phi$ है, तो निम्नलिखित में से कौन-सा विकल्प सही है?
- (A) $\cos \theta \cos \phi = 1$
 (B) $\cos^2 \phi - \sin^2 \phi = \tan^2 \theta$
 (C) $\cos^2 \phi - \sin^2 \phi = \cot^2 \theta$
 (D) $\cos \theta \cos \phi = \sqrt{2}$
- 24.** If $\frac{\cos \theta}{1 - \sin \theta} + \frac{\cos \theta}{1 + \sin \theta} = 4$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\sec \theta + \operatorname{cosec} \theta + \cot \theta)$?
- यदि $\frac{\cos \theta}{1 - \sin \theta} + \frac{\cos \theta}{1 + \sin \theta} = 4$, $0^\circ < \theta < 90^\circ$ है, तो $(\sec \theta + \operatorname{cosec} \theta + \cot \theta)$ का मान ज्ञात कीजिए।
- (A) $1 + 2\sqrt{3}$ (B) $\frac{1 + 2\sqrt{3}}{3}$
 (C) $\frac{2 + \sqrt{3}}{3}$ (D) $2 + \sqrt{3}$
- 25.** Two points A and B are on the ground and on opposite sides of a tower. A is closer to the foot of tower by 42 m than B. If the angles of elevation of the top of the tower, as observed from A and B are 60° and 45° , respectively then the height of the tower is closest to:
- भूमि पर दो बिंदु A और B स्थित हैं, जो एक टॉवर के दोनों ओर एक-दूसरे की विपरीत दिशाओं में हैं। A, B की तुलना में टॉवर के पाद के 42 मी. अधिक निकट है। यदि A और B से अवलोकित किए गए टॉवर के शीर्ष का उन्नयन कोण क्रमशः 60° और 45° हैं, तो टॉवर की ऊँचाई लगभग कितनी है?
- (A) 87.6 m (B) 98.6 m
 (C) 88.2 m (D) 99.4 m

Solution

1. (C) ATQ,



From the figure

$$PQ^2 = h^2 \cot^2 \alpha + h^2 \cot^2 \beta$$

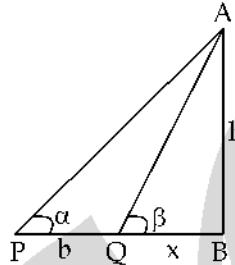
$$RS^2 = h^2 \cot^2 \gamma + h^2 \cot^2 \delta$$

$$\left(\frac{PQ}{RS}\right)^2 = \frac{\cot^2 \alpha + \cot^2 \beta}{\cot^2 \gamma + \cot^2 \delta}$$

2. (D) $\sin(2\theta + 50^\circ) = \cos(4\theta + 16^\circ)$
 $\Rightarrow (2\theta + 50^\circ) + (4\theta + 16^\circ) = 90^\circ$
 $\Rightarrow 6\theta + 66^\circ = 90^\circ$
 $\Rightarrow 6\theta = 24^\circ$
 $\Rightarrow \theta = 4^\circ$

3. (C)

4. (B)



$$\tan \alpha = \frac{h}{b+x}$$

$$x = h \cot \alpha - b$$

$$h = x \tan \beta$$

$$h = (h \cot \alpha - b) \tan \beta$$

$$h (\cot \beta - \cot \alpha) = -b$$

$$h = \frac{b}{\cot \alpha - \cot \beta}$$

5. (B) $\frac{1}{\cosec \theta + 1} + \frac{1}{\cosec \theta - 1} = 2 \sec \theta$

$$\frac{\cosec \theta - 1 + \cosec \theta + 1}{\cosec^2 \theta - 1} = 2 \sec \theta$$

$$\frac{2 \cosec \theta}{\cot^2 \theta} = 2 \sec \theta$$

$$2 \times \left[\frac{\sin^2 \theta}{\cos^2 \theta \times \sin \theta} \right] = \frac{2}{\cos \theta}$$

$$\frac{\sin \theta}{\cos \theta} = 1 \Rightarrow \tan \theta = 1$$

$$\Rightarrow \theta = 45^\circ$$

$$\text{Value of } \frac{\tan \theta + 2 \sec \theta}{\cosec \theta} = \frac{\tan 45^\circ + 2 \sec 45^\circ}{\cosec 45^\circ}$$

$$= \frac{1+2\sqrt{2}}{\sqrt{2}} \text{ or } \frac{\sqrt{2}+4}{2} = \frac{4+\sqrt{2}}{2}$$

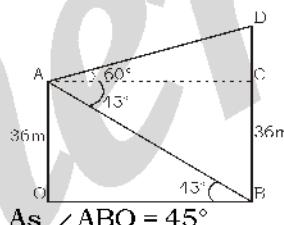
6. (D) $\frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} = \frac{\sqrt{3} + 1}{\sqrt{3} - 1}$

Using C & D

$$\frac{\cos \theta}{\sin \theta} = \frac{\sqrt{3}}{1} \Rightarrow \cot \theta = \sqrt{3} \Rightarrow \theta = 30^\circ$$

$$\Rightarrow \sec \theta = \sec 30^\circ = \frac{2}{\sqrt{3}} \text{ or } \frac{2\sqrt{3}}{3}$$

7. (D)



As $\angle ABO = 45^\circ$

$\Rightarrow AO = OB = 36 = BC = AC$ in $\triangle ACD$

$$\tan 60^\circ = \frac{DC}{AC}$$

$$\sqrt{3} = \frac{DC}{36}$$

$$\Rightarrow DC = 36\sqrt{3} \text{ m}$$

Height of House B

$$= BC + CD = 36 + 36\sqrt{3}$$

$$= 98 \text{ m}$$

8. (A) As we know in the given case height

$$= \sqrt{32 \times 18} = 24 \text{ m}$$

9. (C) $3 + \cos^2 \theta = 3(\cot^2 \theta + \sin^2 \theta)$

Put $\theta = 60^\circ$ which satisfies the equation

$$\Rightarrow \cos \theta + 2 \sin \theta = \cos 60 + 2 \sin 60$$

$$= \frac{1}{2} + \frac{2\sqrt{3}}{2} = \frac{2\sqrt{3} + 1}{2}$$

10. (D) $\tan(11\theta) = \cot(7\theta)$

$$\Rightarrow 11\theta + 7\theta = 90^\circ$$

$$\Rightarrow 18\theta = 90^\circ$$

$$\Rightarrow \theta = 5^\circ$$

$$\begin{aligned}
 & \Rightarrow \sin^2(60^\circ) + \sec^2(90^\circ) + \operatorname{cosec}^2(120^\circ) \\
 & = \sin^2 30^\circ + \sec^2 45^\circ + \operatorname{cosec}^2 60^\circ \\
 & = \left(\frac{1}{2}\right)^2 + (\sqrt{2})^2 + \left(\frac{2}{\sqrt{3}}\right)^2 \\
 & = \frac{1}{4} + 2 + \frac{4}{3} = \frac{3+24+16}{12} = \frac{43}{12}
 \end{aligned}$$

11. (C) $7\sin^2\theta + 3\cos^2\theta = 4$
 $7\sin^2\theta + 3(1 - \sin^2\theta) = 4$
 $4\sin^2\theta = 1$
 $\theta = 30^\circ$

$$\tan^2 60^\circ + \operatorname{cosec}^2 60^\circ = 3 + \frac{4}{3} = \frac{13}{3}$$

12. (C) $\tan\theta = \frac{20}{21}, \frac{1+\sin\theta+\cos\theta}{1-\sin\theta+\cos\theta}$, divided by $\cos\theta$

$$\sec\theta = \sqrt{1 + \left(\frac{20}{21}\right)^2}, \frac{\sec\theta + \tan\theta + 1}{\sec\theta - \tan\theta + 1}$$

$$\sec\theta = \frac{29}{21}, \frac{\frac{29}{21} + \frac{20}{21} + 1}{\frac{29}{21} - \frac{20}{21} + 1} = \frac{7}{3}$$

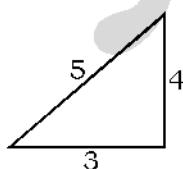
13. (B) $2\sin\theta + 15\cos^2\theta = 7$
 $\Rightarrow 2\sin\theta + 15 - 15\sin^2\theta = 7$
 $\Rightarrow 15\sin^2\theta - 2\sin\theta - 8 = 0$

$$\Rightarrow \sin\theta = \frac{4}{5} \Rightarrow \tan\theta = \frac{4}{3}$$

Putting value of $\tan\theta$ in required equation

$$\frac{3 - \tan\theta}{2 + \tan\theta} = \frac{3 - \frac{4}{3}}{2 + \frac{4}{3}} = \frac{\left(\frac{5}{3}\right)}{\left(\frac{10}{3}\right)} = \frac{1}{2}$$

14. (B)



$$\operatorname{cosec}\theta = \frac{125}{100} = \frac{5}{4}$$

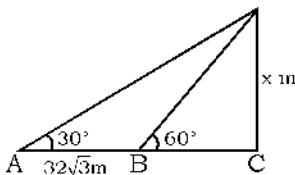
$$\Rightarrow \tan\theta = \frac{4}{3} \Rightarrow \cos\theta = \frac{3}{5}$$

$$\Rightarrow \sec\theta = \frac{5}{3} \Rightarrow \cot\theta = \frac{3}{4}$$

Putting respective values at required equation

$$\begin{aligned}
 & \Rightarrow \frac{4\left(\frac{4}{3}\right) - 5\left(\frac{3}{5}\right) + 1}{\frac{5}{3} + 4 \times \frac{3}{4} - 1} = \frac{\frac{16}{3} - 3 + 1}{\frac{5}{3} + 2} = \frac{\frac{16}{3} - 2}{\frac{5}{3} + 2} \\
 & = \frac{10}{11}
 \end{aligned}$$

15. (B)



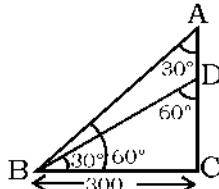
As we know
 $x(\cot 30^\circ - \cot 60^\circ) = AB$

$$\begin{aligned}
 & \Rightarrow x \times \frac{2}{\sqrt{3}} = 32\sqrt{3} \Rightarrow x = 48 \text{ m} \\
 16. \text{ (A)} \quad & \sqrt{2} \sin(60^\circ - \alpha) = 1
 \end{aligned}$$

$$\begin{aligned}
 \sin(60^\circ - \alpha) &= \frac{1}{\sqrt{2}} \\
 \sin(60^\circ - \alpha) &= \sin 45^\circ \\
 60^\circ - \alpha &= 45^\circ \\
 \alpha &= 15^\circ \\
 \sin\theta - \cos\theta &= 0 \\
 \sin\theta &= \cos\theta \\
 \theta &= 45^\circ
 \end{aligned}$$

$$\begin{aligned}
 (\sin 45^\circ)^4 + (\cos 45^\circ)^4 &= \left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^4 \\
 &= \frac{1}{2}
 \end{aligned}$$

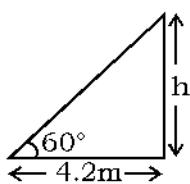
17. (C)



$$\begin{aligned}
 DC &= 100\sqrt{3} \text{ m} \\
 AC &= 300\sqrt{3} \text{ m}
 \end{aligned}$$

Increase in height

$$\begin{aligned}
 &= 300\sqrt{3} - 100\sqrt{3} \\
 &= 200 \times \sqrt{3} \\
 &= 200 \times 1.73 \\
 &= 346 \text{ m}
 \end{aligned}$$

19. (A)


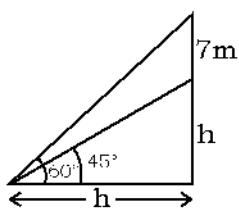
$$\tan 60^\circ = \frac{h}{4.2}$$

$$\sqrt{3} = \frac{h}{4.2}$$

$$h = 4.2 \times \sqrt{3}$$

$$h = 4.2 \times 1.72$$

$$h = 7.3\text{m}$$

20. (D)


$$\tan 60^\circ = \frac{h+7}{h}$$

$$h\sqrt{3} = h + 7$$

$$h(\sqrt{3}-1) = 7$$

$$h = \frac{7}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$$

$$h = \frac{7}{2} (\sqrt{3}+1)\text{m}$$

21. (B) $3(\cot^2\theta - \cos^2\theta) = 1 - \sin^2\theta$

$$3(\cos^2\theta \cdot \cosec^2\theta - \cos^2\theta) = \cos^2\theta$$

$$3 \cot^2\theta = 1 \quad (\cosec^2\theta - 1 = \cot^2\theta)$$

$$\cot\theta = \frac{1}{\sqrt{3}}$$

$$\theta = 60^\circ$$

22. (A) We know that

$$\cosec(90^\circ - \theta) = \sec\theta$$

$$\tan^2 48^\circ - \cosec^2 42^\circ + 0$$

$$\tan^2(90^\circ - 42^\circ) - \cosec^2 42^\circ$$

$$\cot^2 42^\circ - \cosec^2 42^\circ = -1$$

$$[\cosec^2\theta - \cot^2\theta = 1]$$

23. (B) $\cos^2\theta - \sin^2\theta = \tan^2\phi$

 Let the value of $\theta = 0$ and $\phi = 45^\circ$

 So, LHS $\cos^2 0^\circ - \sin^2 0^\circ = 1 - 0 = 1$

 RHS $\tan^2 45^\circ = 1$ (LHS = RHS)

Now, put these value in option

$$\text{And } \cos^2\phi - \sin^2\phi = \tan^2\theta$$

$$\text{LHS, } \frac{1}{2} - \frac{1}{2} = 0$$

$$\text{RHS} = \tan^2 0^\circ = 0$$

So, answer is (B)

$$\text{24. (D)} \quad \cos\theta \left[\frac{1}{1-\sin\theta} + \frac{1}{1+\sin\theta} \right] = 4$$

$$\Rightarrow \cos\theta \left[\frac{1+\sin\theta+1-\sin\theta}{1-\sin^2\theta} \right] = 4$$

$$[(1-\sin\theta)(1+\sin\theta) = 1-\sin^2\theta]$$

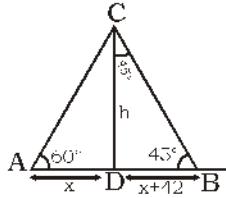
$$\Rightarrow \cos\theta \times \frac{2}{\cos^2\theta} = 4 \Rightarrow \cos\theta = \frac{1}{2}$$

$$\cos\theta = \cos 60^\circ$$

Now,

$$\Rightarrow \sec 60^\circ + \cosec 60^\circ + \cot 60^\circ$$

$$\Rightarrow 2 + \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} \Rightarrow 2 + \sqrt{3}$$

25. (D)


$$\text{By triangle BCD, } h = x + 42$$

$$\text{By triangle ADC, } h = x\sqrt{3}$$

$$x\sqrt{3} = x + 42$$

$$x\sqrt{3} - x = 42$$

$$x(\sqrt{3}-1) = 42 \Rightarrow x = \frac{42(\sqrt{3}+1)}{2}$$

$$= 21(\sqrt{3}+1) \sim 57.372$$

$$\text{So, length of tower} = 57.372 + 42 = 99.37$$

$$= 99.37 \sim 99.40$$

(CPO – 2018)

- 11.** If $\sin(A + B) = \frac{\sqrt{3}}{2}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$, then
 $(2A + 3B)$ is equal to:

यदि $\sin(A + B) = \frac{\sqrt{3}}{2}$ और $\tan(A - B) = \frac{1}{\sqrt{3}}$ तो $(2A +$

3B) बराबर है —

- (A) 120° (B) 135°
(C) 130° (D) 125°

- 12.** The angle of elevation of top of a tower from a point P, on the ground is θ such that $\tan \theta = \frac{12}{5}$. If distance of the point P, from the base of the tower is 75 m, what is the height of the tower?

भूमि पर स्थित किसी बिन्दु P से एक टावर के शीर्ष का उन्नयन कोण θ है, जिसमें $\tan \theta = \frac{12}{5}$ है। टावर के पांव से बिन्दु P की दूरी 75 मीटर है, तो टावर की ऊँचाई कितनी होगी ?

(A) 160 m./मी. (B) 200 m./मी.
 (C) 190 m./मी. (D) 180 m./मी.

- 13.** From the top of a 120 m high tower, the angle of depression of the top of a pole is 45° and the angle of depression of the foot of the pole is θ , such that $\tan \theta = 3/2$. What is the height of the pole?

120 मीटर ऊंचे टॉवर के शीर्ष से, एक खंभे के शीर्ष का अवनयन कोण 45° तथा खंभे के आधार का अवनयन कोण θ इस प्रकार है कि $\tan\theta = 3/2$ है, खंभे की ऊंचाई कितनी है ?

- (A) 60 m./मी.
 (B) 75 m./मी.
 (C) 80 m./मी.
 (D) 40 m./मी.

- 14.** If $\sec 2x = \operatorname{cosec} (3x - 45^\circ)$, then x is equal to:

यदि $\sec 2x = \operatorname{cosec} (3x - 45^\circ)$ है, तो x बराबर है:

- (A) 40° (B) 45°
 (C) 27° (D) 35°

- 15.** The length of shadow of a vertical pole on the ground is 24 m. If the angle of elevation of the sun at that time is θ , such that $\sin \theta = 5/13$, then what is the height of the pole?

भूमि पर गढ़े एक ऊर्ध्वाकार खंभे की छाया 24 मीटर लंबी है। यदि उस समय सूर्य का उन्नयन कोण θ इस प्रकार है कि $\sin \theta = 5/13$, तो खंभे की ऊँचाई क्या होगी?

- **16.** The value of

$\frac{\sin^2 60^\circ + \cos^2 30^\circ - \sec 35^\circ \cdot \sin 55^\circ}{\sec 60^\circ + \cos \operatorname{ec} 30^\circ}$ is equal to /
का मान निम्नलिखित में से किसके बराबर है ?

- (A) $\frac{1}{8}$ (B) $\frac{1}{3}$
 (C) $\frac{1}{2}$ (D) $\frac{1}{4}$

- 17.** If $\cos \theta = \frac{1}{\sqrt{10}}$, then $\tan \theta$ is equal to:

यदि $\cos \theta = \frac{1}{\sqrt{10}}$ हो, तो $\tan \theta$ का मान ज्ञात कीजिये ?

- (A) $\frac{1}{\sqrt{3}}$ (B) $\frac{1}{3}$ (C) $\sqrt{3}$ (D) 3

- 18.** From the top of 120 m high lighthouse, the angle of depression of two ships on opposite side of the base of the lighthouse is 30° and 60° . What is the distance between the ships? (rounded off)

120 मीटर ऊंचे प्रकाश स्तंभ के शीर्ष से प्रकाशस्तंभ के दोनों ओर विपरीत दिशाओं में दो जहाजों का अवनमन कोण 30° और 60° है। जहाजों के बीच की दूरी क्या है? (लगभग)

- 19.** The string of a kite is 30 m long and it makes an angle 60° with the horizontal. The height of the kite above the ground is:

पतंग की डोर 30 मीटर लम्बी है और वह क्षेत्रिज से 60° का कोण बनाती है, तो धरती से पतंग की ऊँचाई ज्ञात कीजिये ?

- (A) $10\sqrt{3}$ m (B) 15 m
 (C) 7.5 m (D) $15\sqrt{2}$ m

- 20.** The top of a broken tree touches the ground at an angle of 60° and at a distance of 45 m from the base of the tree. The total height of the tree is: (Use $\sqrt{3} = 1.73$ and $\sqrt{2} = 1.41$)

दूटे हुए एक पेड़ का शीर्ष पेड़ की जड़ से 45 मीटर दूर 60° के कोण पर भूमि को स्पर्श करता है। पेड़ की कल लम्बाई क्या होगी?

($\sqrt{3} \approx 1.73$ और $\sqrt{2} \approx 1.41$ का उपयोग कीजिए?)

- (A) 141.3 m (B) 153.45 m
 (C) 167.94 m (D) 137.24 m

- 21.** A ladder leaning against a wall make an angle of 60° with the horizontal. If the foot of the ladder is 10 m away from the wall, what is the length of the ladder?

33. If $5\cos\theta - 12\sin\theta = 0$, the value of $\frac{2\sin\theta + \cos\theta}{\cos\theta - \sin\theta}$ is:

यदि $5\cos\theta - 12\sin\theta = 0$ है, तो $\frac{2\sin\theta + \cos\theta}{\cos\theta - \sin\theta}$ का मान है:

- (A) $1\frac{75}{119}$ (B) $2\frac{34}{35}$
 (C) $3\frac{2}{3}$ (D) $3\frac{1}{7}$

34. The shadow of tower, when the angle of elevation of the sun is 60° is found to be 15 m shorter than when it is 45° . The height of the tower is:

एक मीनार की छाया, सूर्य का उन्नयन कोण 60° होने पर, सूर्य के उन्नयन कोण 45° होने पर प्राप्त होने वाली मीनार की छाया से 15m छोटी पाई जाती है। मीनार की ऊँचाई :

- (A) 41.5 m (B) 26.5 m
 (C) 20.5 m (D) 35.5 m

35. $\sin 18^\circ - \cos 72^\circ$ is equal to:

$\sin 18^\circ - \cos 72^\circ$ बराबर है :

(A) 1 (B) 2
 (C) 0 (D) $\frac{1}{2}$

36. The angle of elevation of a flying drone from a point on the ground is 60° . After flying for 5 seconds the angle of elevation drops to 30° . If the drone is flying horizontally at a constant height of $1000\sqrt{3}$ m, the distance travelled by the drone is :

जमीन पर एक बिंदु से एक उड़ान ड्रोन का उन्नयन कोण 60° है। 5 सेकंड उड़ान भरने के बाद उन्नयन कोण 30 डिग्री तक कम हो जाता है।

यदि ड्रोन क्षेत्रिक रूप से $1000\sqrt{3}$ मी. की निरंतर ऊँचाई पर उड़ रहा है, तो ड्रोन द्वारा 5 सेकंड में तय की गई दूरी ज्ञात कीजिए :

- (A) 2000 m/मी. (B) 1000 m/मी.
 (C) 3000 m/मी. (D) 4000 m/मी.

37. The value of $\cos^2 45^\circ + \sin^2 30^\circ - \sin^2 60^\circ$ is equal to :

$\cos^2 45^\circ + \sin^2 30^\circ - \sin^2 60^\circ$ का मान ज्ञात करें :

- (A) $\frac{3}{2}$ (B) $\frac{1}{2}$
 (C) 0 (D) 1

38. The value of $\cot^2 A - \frac{1}{\sin^2 A}$ is equal to :

$\cot^2 A - \frac{1}{\sin^2 A}$ का मान ज्ञात करें :

- (A) 0 (B) -1
 (C) -2 (D) 1

39. A girl 1.2 m tall can just see the sun over a 3.62 m tall wall which is 2.42 m away from her. The angle of elevation of the sun is :

1.2 मीटर लंबी एक लड़की 3.62 मीटर लंबी दीवार के ऊपर सिर्फ सूर्य को देख सकती है यदि दीवार उससे 2.42 मीटर दूर है तो सूर्य का उन्नयन कोण है :

- (A) 60° (B) 30°
 (C) 90° (D) 45°

40. $\frac{4}{3} \tan^2 60^\circ + 3\cos^2 30^\circ - 2\sec^2 30^\circ - \frac{3}{4} \cot^2 60^\circ$

बराबर है :

- (A) $\frac{8}{3}$ (B) $\frac{7}{3}$
 (C) $\frac{10}{3}$ (D) $\frac{5}{4}$

41. When the sun's angle of depression on change from 30° to 60° , the length of the shadow of a tower decreased by 70 m. What is the height of the tower ?

जब सूर्य का अवनमन कोण 30° से 60° हो, जाए तो परछाई 70 मी. घट जाती है, तो टावर की ऊँचाई ज्ञात कीजिए ?

- (A) 36.55 m (B) 65.55 m
 (C) 45.65 m (D) 60.55 m

42. From a point P on a level ground, the angle of elevation of the top of a tower is 30° . If the tower is 270 m high, the distance of point P from the foot of the tower is :

जमीन पर किसी बिन्दू P से किसी टावर की उन्नयन कोण 30° हो तथा टावर की ऊँचाई 270 मीटर हो, तो बिन्दू P की टावर के तल से दूरी ज्ञात करें ?

- (A) 467.65 m (B) 476.65 m
 (C) 376.65 m (D) 367.65 m

43. $(\operatorname{cosec} A - \sin A)^2 + (\sec A - \cos A)^2 - (\cot A - \tan A)^2$

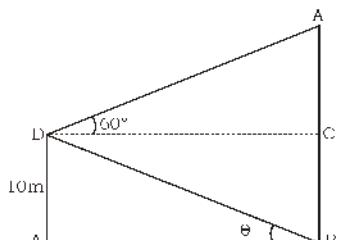
बराबर है :

- (A) 2 (B) 1
 (C) 0 (D) -1

Solution

1. (B) $x + 45 + 2x = 90$
 $3x = 45$
 $x = 15^\circ$

2. (C)



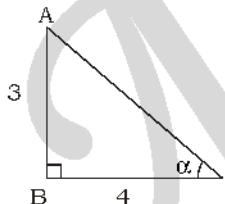
$$\tan \theta = \frac{2}{3}$$

$$\begin{aligned} \Rightarrow AB &= 15 \\ \Rightarrow CD &= 15 \\ \Rightarrow AC &= 15 \tan 60^\circ \\ &= 15\sqrt{3} \end{aligned}$$

$$\Rightarrow \text{height of tower} = AC + CB = 15\sqrt{3} + 10 = 36 \text{ m}$$

3. (A) $\frac{\sin^2 24 + \cos^2 24}{\sin^2 66 + \cos^2 66} + \sin^2 61 + \cos^2 61$
 $\Rightarrow \frac{1}{1} + 1 = 2$

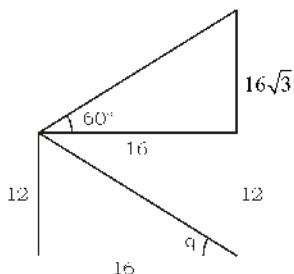
4. (C)



$$\begin{aligned} BC &= 3 \rightarrow 5 \\ 1 &\rightarrow \frac{5}{4} \\ AC &= 5 \\ \Rightarrow \frac{5 \times 5}{4} &= 6.25 \text{ m.} \end{aligned}$$

5. (A) $\frac{\frac{1}{2} - \frac{1}{2} + 1}{\frac{\sqrt{3}}{2} - 1 + 1} = \frac{1}{\left(\frac{\sqrt{3}}{2}\right)} = \frac{2}{\sqrt{3}}$
 or $= \frac{2\sqrt{3}}{3}$

6. (D)



$$\tan 60^\circ = \frac{x}{16}$$

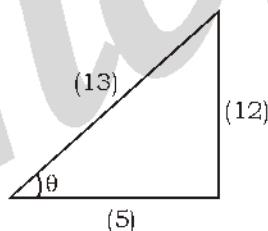
$$\tan \phi = \frac{3}{4}$$

From the figure

$$\begin{aligned} \text{height of tower} &= \frac{12}{3} \times (3 + 4\sqrt{3}) \\ &= 4(3 + 4\sqrt{3}) = 39.68 \text{ m} \end{aligned}$$

7. (B) $3x + (30 + 2x) = 90^\circ$
 $5x = 60^\circ \Rightarrow x = 12^\circ$

8. (C)

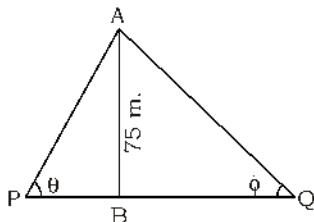


$$\sin \theta = \frac{12}{13}$$

$$\Rightarrow \frac{7.5}{5} \times 12 = 1.5 \times 12 = 18 \text{ m}$$

9. (B) $\sin^2 30^\circ \cdot \cos^2 45^\circ + 2 \tan^2 30^\circ - \sec^2 60^\circ$
 $= \left(\frac{1}{2}\right)^2 \times \left(\frac{1}{2}\right) + 2 \times \frac{1}{3} - (2)^2$
 $= \frac{1}{8} + \frac{2}{3} - 4 = \frac{3 + 16 - 96}{24} = -\frac{77}{24}$

10. (D)



$$\tan \theta = \frac{3}{4} \quad \tan \phi = \frac{5}{8}$$

In $\triangle ABP$,

$$\frac{AB}{PB} = \tan\theta$$

$$\frac{75}{PB} = \frac{3}{4}$$

$$\Rightarrow PB = 25 \times 4 \\ = 100\text{m}$$

In $\triangle ABQ$,

$$\frac{AB}{BQ} = \tan\phi$$

$$\frac{75}{BQ} = \frac{5}{8}$$

$$\Rightarrow BQ = 15 \times 8 \\ = 120\text{m}$$

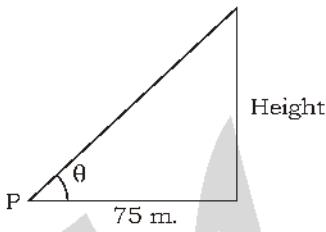
$$\Rightarrow PQ = 100 + 120 = 220\text{m}$$

$$11. (\text{B}) \quad A + B = 60^\circ \quad A - B = 30^\circ$$

$$\Rightarrow A = 45^\circ \quad B = 15^\circ$$

$$\Rightarrow 2A + 3B = 2(45^\circ) + 3(15^\circ) \\ = 90^\circ + 45^\circ = 135^\circ$$

12. (D)



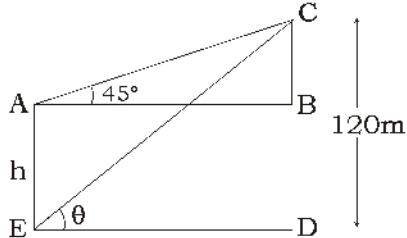
$$\tan\theta = \frac{12}{5} \text{ (Given)}$$

$$\tan\theta = \frac{\text{Perpendicular}}{\text{Base}}$$

$$\Rightarrow \frac{12}{5} = \frac{\text{height}}{75}$$

$$\Rightarrow \text{height} = 15 \times 12 = 180 \text{ meter}$$

13. (D)



$$\text{Given, } \tan\theta = \frac{3}{2}$$

In $\triangle CDE$,

$$\tan\theta = \frac{3}{2}$$

$$\Rightarrow \frac{CD}{DE} = \frac{3}{2}$$

$$\Rightarrow \frac{120}{DE} = \frac{3}{2} \Rightarrow DE = 80 \text{ m}$$

$$\text{As } DE = AB = 80 \text{ m}$$

In $\triangle ABC$

$$\tan 45^\circ = 1$$

$$\Rightarrow BC = AB = 80 \text{ m}$$

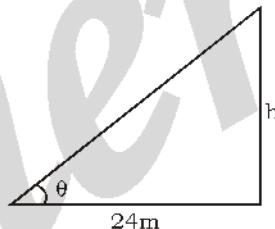
From the figure,

$$AE = CD - BC$$

$$= 120 - 80 = 40 \text{ m}$$

$$14. (\text{C}) \quad \sec 2x = \operatorname{cosec}(3x - 45^\circ) \\ \Rightarrow 2x + (3x - 45^\circ) = 90^\circ \\ \Rightarrow 5x = 135^\circ \\ \Rightarrow x = 27^\circ$$

15. (B)



$$\text{Given, } \sin\theta = \frac{5}{13}$$

$$\text{If } h = 5, \text{ hypotenuse} = 13 \\ \Rightarrow \text{base} = 12$$

$$\Rightarrow \frac{24}{12} \times 5 = \text{height}$$

$$\Rightarrow h = 10 \text{ m}$$

$$16. (\text{A}) \quad = \frac{\sin^2 60 + \cos^2 30 - \sec 35 \cdot \sin 55}{\sec 60 + \operatorname{cosec} 30} \text{ As,} \\ \sec 35 = \operatorname{cosec} 55$$

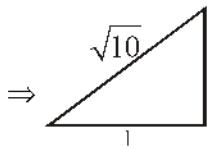
$$\text{So, } = \frac{\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 - \operatorname{cosec} 55 \cdot \sin 55}{2+2}$$

$$= \frac{\frac{3}{4} + \frac{3}{4} - 1}{4}$$

$$\Rightarrow \frac{\left(\frac{3}{2} - 1\right)}{4} \Rightarrow \left(\frac{1}{2}\right) \times \frac{1}{4} \Rightarrow \frac{1}{8}$$

17. (D) $\cos\theta = \frac{1}{\sqrt{10}}$

$$\text{As } \cos\theta = \frac{B}{H} = \frac{1}{\sqrt{10}}$$

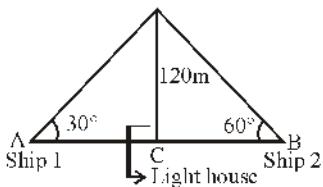


$$\Rightarrow \text{height} = \sqrt{(\sqrt{10})^2 - 1^2} = \sqrt{9} = 3$$

$$\Rightarrow \tan\theta = \frac{\text{height}}{\text{base}}$$

$$\tan\theta = \frac{3}{1} = 3$$

18. (C)



here, AB is distance between both ships

$$AC = 120 \cot 30^\circ$$

$$BC = 120 \cot 60^\circ$$

$$\Rightarrow AB = AC + BC$$

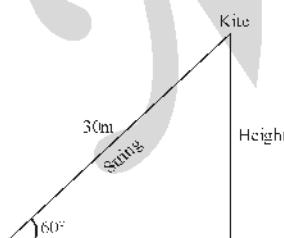
$$= 120 \cot 30^\circ + 120 \cot 60^\circ$$

$$= 120 [\cot 30^\circ + \cot 60^\circ]$$

$$= 120 \left[\sqrt{3} + \frac{1}{\sqrt{3}} \right]$$

$$= 120 \times \frac{4}{\sqrt{3}} = \frac{480\sqrt{3}}{3} = 160\sqrt{3} = 277 \text{ m}$$

19. (D)



As we know

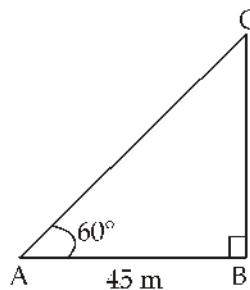
$$\sin\theta = \frac{\text{height}}{\text{hypotenuse}}$$

$$\Rightarrow \sin 60^\circ = \frac{\text{height}}{30}$$

$$\Rightarrow \frac{\sqrt{3}}{2} = \frac{\text{height}}{30}$$

$$\Rightarrow \text{height} = \frac{30 \times \sqrt{3}}{2} \Rightarrow 15\sqrt{3} \text{ m.}$$

20. (C)



$$\text{Length of tree} = AC + CB$$

$$AC = 45 \sec 60^\circ$$

$$= 45 \times 2 = 90 \text{ m}$$

$$BC = 45 \tan 60^\circ$$

$$= 45\sqrt{3}$$

$$= 77.94 \text{ m}$$

$$\text{Total Length} = 90 + 77.94$$

$$= 167.94 \text{ m}$$

21. (C) As we know,

$$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$$

$$\Rightarrow \cos 60^\circ = \frac{10}{\text{ladder}}$$

$$\Rightarrow \frac{1}{2} = \frac{10}{\text{ladder}}$$

$$\Rightarrow \text{ladder} = 20 \text{ m}$$

22. (D) $4\tan\theta = 3; \quad \tan\theta = \frac{3}{4} \text{ (Given)}$

$$\frac{5\sin\theta - 3\cos\theta}{5\sin\theta + 3\cos\theta} = ?$$

Divide numerator and denominator by $\cos\theta$

$$\frac{5\left(\frac{\sin\theta}{\cos\theta}\right) - 3\left(\frac{\cos\theta}{\cos\theta}\right)}{5\left(\frac{\sin\theta}{\cos\theta}\right) + 3\left(\frac{\cos\theta}{\cos\theta}\right)} = \frac{5\tan\theta - 3}{5\tan\theta + 3}$$

Putting value of $\tan\theta$ which is $3/4$ in above equation

$$= \frac{5 \times \frac{3}{4} - 3}{5 \times \frac{3}{4} + 3} = \frac{15 - 12}{15 + 12} = \frac{3}{27} = \frac{1}{9}$$

23. (C) From trigonometric identities

We know,

$$\operatorname{cosec}^2\theta = 1 + \cot^2\theta$$

$$\sin^2\theta = 1 - \cos^2\theta$$

Putting there values in original equation
 $\Rightarrow \operatorname{cosec}^2\theta \cdot \sin^2\theta$

$$\Rightarrow \frac{1}{\sin^2\theta} \times \sin^2\theta = 1$$

24. (C) $x = a\cos\theta + b\sin\theta$ [Given]

$$y = a\sin\theta - b\cos\theta$$

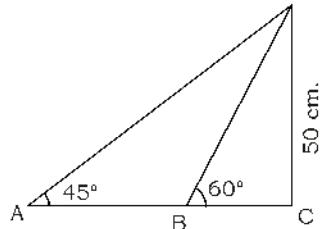
$$\Rightarrow x^2 + y^2 = (a\cos\theta + b\sin\theta)^2 + (a\sin\theta - b\cos\theta)^2$$

$$\Rightarrow a^2\cos^2\theta + b^2\sin^2\theta + 2ab\sin\theta\cos\theta + a^2\sin^2\theta + b^2\cos^2\theta - 2abc\cos\theta\sin\theta$$

$$\Rightarrow a^2(\sin^2\theta + \cos^2\theta) + b^2(\cos^2\theta + \sin^2\theta)$$

$$\Rightarrow a^2 + b^2$$

25. (B)



$$\text{Here, } BC = 50 \cot 60^\circ$$

$$AC = 50 \cot 45^\circ$$

Distance between A and B

$$= AC - BC$$

$$= 50 \cot 45^\circ - 50 \cot 60^\circ$$

$$= 50(\cot 45^\circ - \cot 60^\circ)$$

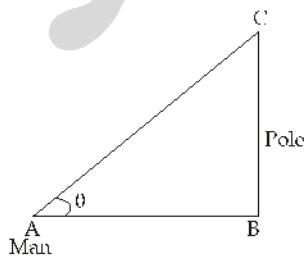
$$= 50 \left(1 - \frac{1}{\sqrt{3}}\right) = \frac{50(\sqrt{3}-1)}{\sqrt{3}}$$

$$= \frac{50(3-\sqrt{3})}{3} = 21.10 \text{ m}$$

26. (C) $4\sin^2 30^\circ + 3\cot^2 60^\circ$

$$\Rightarrow 4\left(\frac{1}{2}\right)^2 + 3\left(\frac{1}{\sqrt{3}}\right)^2 = \frac{4}{4} + \frac{3}{3} \Rightarrow 1 + 1 = 2$$

27. (D)



Given (AB = BC)

$$\Rightarrow \tan\theta = \frac{BC}{AB} = \frac{AB}{AB} = 1$$

$$\Rightarrow \theta = 45^\circ$$

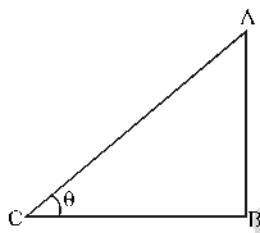
28. (C) $1 + \frac{\tan^2 A}{1 + \sec A} = \frac{1 + \sec A + \tan^2 A}{1 + \sec A}$

As we know,

$$1 + \tan^2 A = \sec^2 A$$

$$= \frac{\sec^2 A + \sec A}{1 + \sec A} = \frac{\sec A(1 + \sec A)}{(1 + \sec A)} = \sec A$$

29. (C)



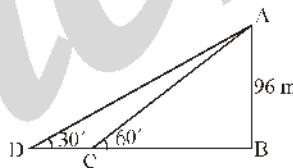
Given, AB = CB

$$\Rightarrow \tan\theta = \frac{AB}{CB} = \frac{AB}{AB} = 1$$

$$\Rightarrow \theta = 45^\circ$$

30. (C) $\frac{\operatorname{cosec} 31^\circ}{\sec 59^\circ} = \frac{\operatorname{cosec}(90^\circ - 59^\circ)}{\sec 59^\circ} = \frac{\sec 59^\circ}{\sec 59^\circ} = 1$

31. (C)



$$BC = 96 \operatorname{Cot} 60^\circ$$

$$BD = 96 \operatorname{Cot} 30^\circ$$

$$\Rightarrow CD = BD - BC$$

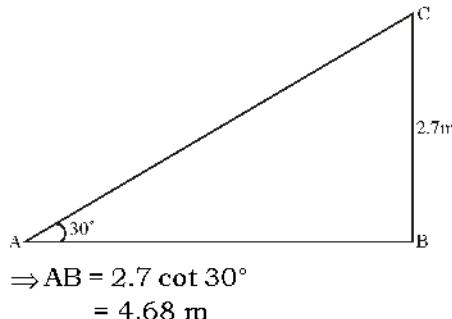
$$= 96 \operatorname{Cot} 30^\circ - 96 \operatorname{Cot} 60^\circ$$

$$= 96 (\operatorname{Cot} 30^\circ - \operatorname{Cot} 60^\circ)$$

$$\Rightarrow CD = 96 \left(\sqrt{3} - \frac{1}{\sqrt{3}}\right) = 96 \times \frac{2}{\sqrt{3}}$$

$$= \frac{96 \times 2 \times \sqrt{3}}{3} = 32 \times 2 \times \sqrt{3} = 64\sqrt{3} \approx 111 \text{ m}$$

32. (A)



$$\Rightarrow AB = 2.7 \operatorname{cot} 30^\circ$$

$$= 4.68 \text{ m}$$

33. (D) $5 \cos \theta = 12 \sin \theta$

$$\Rightarrow \frac{\sin \theta}{\cos \theta} = \frac{5}{12}$$

$$\Rightarrow \tan \theta = \frac{5}{12}$$

$$\frac{2 \sin \theta + \cos \theta}{\cos \theta - \sin \theta} = ?$$

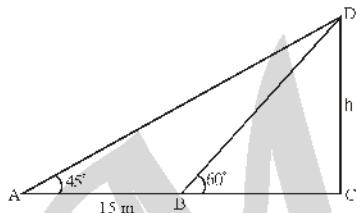
Divide numerator and denominator by $\cos \theta$

$$\Rightarrow \frac{\left(2 \frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\cos \theta}\right)}{\left(\frac{\cos \theta}{\cos \theta} - \frac{\sin \theta}{\cos \theta}\right)} = \frac{2 \tan \theta + 1}{1 - \tan \theta}$$

$$\Rightarrow \frac{2 \times \frac{5}{12} + 1}{1 - \frac{5}{12}} = \frac{\left(\frac{5}{6} + 1\right)}{\left(1 - \frac{5}{12}\right)} = \frac{\left(\frac{11}{6}\right)}{\left(\frac{7}{12}\right)} = \frac{11}{6} \times \frac{12}{7}$$

$$\Rightarrow \frac{22}{7} \Rightarrow 3 \frac{1}{7}$$

34. (D)



As, $BC = hcot 60^\circ$ $AC = hcot 45^\circ$

$$\Rightarrow AB = AC - BC \\ = hcot 45^\circ - hcot 60^\circ \\ \Rightarrow 15 = h(cot 45^\circ - cot 60^\circ)$$

$$\Rightarrow 15 = h \left(1 - \frac{1}{\sqrt{3}}\right)$$

$$\Rightarrow 15 = h \left(\frac{\sqrt{3} - 1}{\sqrt{3}}\right)$$

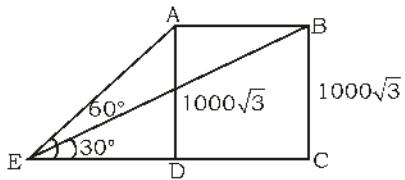
$$\Rightarrow h = \frac{15\sqrt{3}}{\sqrt{3} - 1}$$

$$\approx 35.5 \text{ m}$$

35. (C) $\sin 18^\circ - \cos 72^\circ$

$$= \sin 18^\circ - \cos (90^\circ - 18^\circ) \\ = \sin 18^\circ - \sin 18^\circ = 0$$

36. (A)



$$DE = 1000\sqrt{3} \cot 60^\circ$$

$$EC = 1000\sqrt{3} \cot 30^\circ$$

$$\text{Distance travelled by drone} \\ = CE - DE = DC$$

$$\Rightarrow 1000\sqrt{3} [\cot 30^\circ - \cot 60^\circ]$$

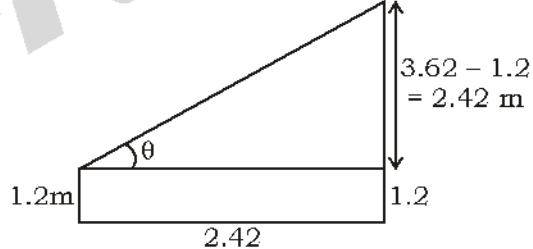
$$\Rightarrow 1000\sqrt{3} \times \frac{2}{\sqrt{3}} = 2000 \text{ m}$$

37. (C) $\frac{1}{2} + \frac{1}{4} - \frac{3}{4} = \frac{3}{4} - \frac{3}{4} = 0$

38. (B) Put $A = 45^\circ$

$$1 - \frac{1}{\left(\frac{1}{2}\right)} = 1 - 2 = -1$$

39. (D)



From the figure

$$\tan \theta = \frac{2.42}{2.42} = 1$$

$$\Rightarrow \theta = 45^\circ$$

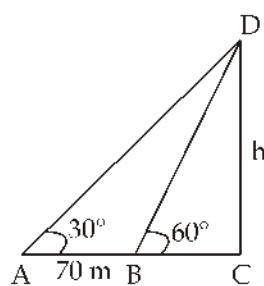
40. (C) $\frac{4}{3} \tan^2 60^\circ + 3 \cos^2 30^\circ - 2 \sec^2 30^\circ - \frac{3}{4} \cot^2 60^\circ$

$$= \frac{4}{3} (\sqrt{3})^2 + 3 \left(\frac{\sqrt{3}}{2}\right)^2 - 2 \left(\frac{2}{\sqrt{3}}\right)^2 - \frac{3}{4} \times \left(\frac{1}{\sqrt{3}}\right)^2$$

$$= 4 + \frac{9}{4} - \frac{8}{3} + -\frac{1}{4} = \frac{48+27-32-3}{12}$$

$$= \frac{75-35}{12} \Rightarrow \frac{40}{12} = \frac{10}{3}$$

41. (A)



Let Height of tower = h m

As we know,

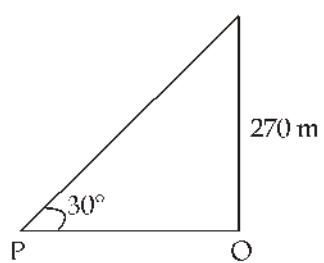
$$AB = h (\cot 30^\circ - \cot 60^\circ)$$

$$\Rightarrow 70 = h \left(\sqrt{3} - \frac{1}{\sqrt{3}} \right)$$

$$\Rightarrow h = \frac{70}{\left(2/\sqrt{3} \right)} = 35\sqrt{3}$$

$$\approx 60.55 \text{ m}$$

42. (A)



$$OP = 270 \cot 30^\circ$$

$$= 270 \times \sqrt{3} = 467.65 \text{ m}$$

43. (B) Put $A = 45^\circ$

$$= \left(\sqrt{2} - \frac{1}{\sqrt{2}} \right)^2 + \left(\sqrt{2} - \frac{1}{\sqrt{2}} \right)^2 - (1-1)^2$$

$$= 2 \left(\sqrt{2} - \frac{1}{\sqrt{2}} \right)^2 = 2 \left(\frac{1}{\sqrt{2}} \right)^2 = \frac{2}{2} = 1$$

(CPO – 2017)

- | | |
|---|---|
| <p>1. What is the simplified value of $\left(\frac{\cot\theta + \tan\theta}{\sec\theta}\right)$?</p> <p>$\left(\frac{\cot\theta + \tan\theta}{\sec\theta}\right)$ का सरलीकृत मान क्या है ?</p> <p>(A) $1 - \cos^2\theta$ (B) $2 \sin\theta$
 (C) $\cosec\theta$ (D) $\sec^2\theta$</p> <p>2. If x and y are positive acute angles such that $\sin(4x - y) = 1$ and $\cos(2x + y) = 1/2$, then what is the value of $\cot(x + 2y)$?
 यदि x तथा y धनात्मक न्यूनकोण हैं, $\sin(4x - y) = 1$ तथा $\cos(2x + y) = 1/2$ है, तो $\cot(x + 2y)$ का मान क्या होगा ?</p> <p>(A) $\sqrt{3}$ (B) $\frac{1}{\sqrt{3}}$
 (C) 1
 (D) Cannot be determined/ज्ञात नहीं किया जा सकता</p> <p>3. 80 m away from the foot of the tower, the angle of elevation of the top of the tower is 60°. What is the height (in metres) of the tower?
 एक मीनार के पाद से 80 मीटर दूर किसी बिंदु से मीनार के शीर्ष का उन्नयन कोण 60° है। मीनार की ऊँचाई (मीटर में) क्या है ?</p> <p>(A) 40 (B) $60\sqrt{3}$
 (C) $80\sqrt{3}$ (D) $\frac{40}{\sqrt{3}}$</p> <p>4. The respective ratio between the height of tower and the point at some distance from its foot is $57 : 19\sqrt{3}$. What is the angle (in degrees) of elevation of the top of the tower?
 एक मीनार की ऊँचाई तथा उसके पाद से कुछ दूरी पर स्थित एक बिंदु की दूरी का अनुपात $57 : 19\sqrt{3}$ है। मीनार के शीर्ष का उन्नयन कोण (डिग्री में) क्या है ?</p> <p>(A) 30 (B) 45
 (C) 60 (D) 75</p> <p>5. If the $\cos\theta + \sin\theta = m$ and $\sec\theta + \cosec\theta = n$, then what is the value of $\frac{n}{2}(m^2 - 1)$?
 यदि $\cos\theta + \sin\theta = m$ तथा $\sec\theta + \cosec\theta = n$ है, तो $\frac{n}{2}(m^2 - 1)$ का मान क्या है ?</p> <p>(A) m (B) 2m
 (C) mn (D) 2n</p> | <p>6. If $\sec\theta + \cosec\theta = \sqrt{2} \sec(90 - \theta)$ then what is the value of $\cot\theta$?
 यदि $\sec\theta + \cosec\theta = \sqrt{2} \sec(90 - \theta)$ है, तो $\cot\theta$ का मान क्या है ?</p> <p>(A) $\sqrt{2}$ (B) 2
 (C) $\sqrt{2} - 1$ (D) $\sqrt{2} + 1$</p> <p>7. What is the simplified value of $\left(\frac{1}{\cosec\theta + \cot\theta}\right)^2$?
 $\left(\frac{1}{\cosec\theta + \cot\theta}\right)^2$ का सरलीकृत मान क्या है ?</p> <p>(A) $\cosec\theta + \tan\theta$
 (B) $\sin\theta + \cos\theta$
 (C) $(1 - \cos\theta) / (1 + \cos\theta)$
 (D) $(1 - \sin\theta) / (1 + \sin\theta)$</p> <p>8. If $\sin(\theta + 23^\circ) = \cos 58^\circ$, then what is the value of $\cos 5\theta$?
 यदि $\sin(\theta + 23^\circ) = \cos 58^\circ$ है, तो $\cos 5\theta$ का मान क्या है ?</p> <p>(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{\sqrt{3}}{2}$ (D) 0</p> <p>9. If $x \sin\theta = \frac{5\sqrt{3}}{2}$ and $x \cos\theta = \frac{5}{2}$ then what is the value of x?
 यदि $x \sin\theta = \frac{5\sqrt{3}}{2}$ तथा $x \cos\theta = \frac{5}{2}$ है, तो x का मान क्या है ?</p> <p>(A) $\sqrt{3}$ (B) $1/2$ (C) $\frac{\sqrt{3}}{2}$ (D) 5</p> <p>10. If $\theta + \varphi = \frac{2}{3}\pi$ and $\cos\theta = \frac{\sqrt{3}}{2}$, then what is the value of $\sin\varphi$?
 यदि $\theta + \varphi = \frac{2}{3}\pi$ तथा $\cos\theta = \frac{\sqrt{3}}{2}$ है, तो $\sin\varphi$ का मान क्या है ?</p> <p>(A) 0 (B) $\frac{1}{2}$ (C) $\frac{1}{\sqrt{2}}$ (D) 1</p> |
|---|---|

22. If $\tan A = \frac{1}{3}$ and $\tan B = \frac{2}{5}$, then what is the value of $\tan(2A+B)$?

यदि $\tan A = \frac{1}{3}$ तथा $\tan B = \frac{2}{5}$ है, तो $\tan(2A+B)$ का मान क्या है?

- (A) $\frac{8}{15}$ (B) $\frac{6}{13}$ (C) $\frac{37}{115}$ (D) $\frac{23}{14}$

23. What is the simplified value of $[(1+\sec^2\theta)\tan^2\theta] + 1$?

$[(1+\sec^2\theta)\tan^2\theta] + 1$ का सरलीकृत मान क्या है?

- (A) $\cos^2\theta$ (B) 1
(C) $\sec^2\theta$ (D) $\cosec\theta$

24. What is the simplified value of $[(1 - \cos^2\theta)\cosec^4\theta] - \cot^2\theta$?

$[(1 - \cos^2\theta)\cosec^4\theta] - \cot^2\theta$ का सरलीकृत मान क्या है?

- (A) -1 (B) 0
(C) 1 (D) 3

25. If $\cos(\theta + 31^\circ) = \sin 47^\circ$, then what is the value of $\sin 5\theta$?

यदि $\cos(\theta + 31^\circ) = \sin 47^\circ$ है, तो $\sin 5\theta$ का मान क्या है?

- (A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$
(C) $\frac{\sqrt{3}}{2}$ (D) 0

26. If $2\cos^2\theta - 1 = 0$ and θ is acute, then what is the value of $(\cot^2\theta - \tan^2\theta)$?

यदि $2\cos^2\theta - 1 = 0$ तथा θ न्यूनकोण है, तो $(\cot^2\theta - \tan^2\theta)$ का मान क्या होगा?

- (A) 0 (B) 2
(C) $10/3$ (D) 1

27. If $\frac{1}{\cos\theta + \sec\theta} = \frac{1}{2}$, then what is the value of $\cos^{100}\theta + \sec^{100}\theta$?

यदि $\frac{1}{\cos\theta + \sec\theta} = \frac{1}{2}$ है, तो $\cos^{100}\theta + \sec^{100}\theta$ का मान क्या है?

- (A) 0 (B) 1 (C) 2 (D) 4

28. What is the simplified value of $1 + \cot A \operatorname{Cot}\left(\frac{A}{2}\right)$?

$1 + \cot A \operatorname{Cot}\left(\frac{A}{2}\right)$ का सरलीकृत मान क्या है?

- (A) $\cos\left(\frac{A}{2}\right)$ (B) $\sin^2\left(\frac{A}{2}\right)$

- (C) $\frac{1}{2}\cosec^2\left(\frac{A}{2}\right)$ (D) $\cos A$

29. If $\tan\left(\frac{\theta}{2}\right)\tan\left(\frac{2\theta}{5}\right) = 1$, then what is the value (in degrees) of θ ?

यदि $\tan\left(\frac{\theta}{2}\right)\tan\left(\frac{2\theta}{5}\right) = 1$ है, तो θ का मान डिग्री में क्या है?

- (A) 45° (B) 90°
(C) 100° (D) 120°

30. What is the simplified value of $\frac{3}{\cosec^2\theta} + \frac{5}{1 + \tan^2\theta} - 2\cos^2\theta$?

$\frac{3}{\cosec^2\theta} + \frac{5}{1 + \tan^2\theta} - 2\cos^2\theta$ का सरलीकृत मान क्या है?

- (A) 3 (B) 4 (C) 5 (D) 7

31. What is the simplified value of $\frac{\sqrt{\sec^2\theta + \cosec^2\theta}}{2}$?

का सरलीकृत मान क्या है?

- (A) $\cosec 2\theta$ (B) $\sec^2\theta$
(C) $\cosec\theta \sec\theta$ (D) $\tan\theta$

32. If $\frac{x - x\tan^2 15^\circ}{1 + \tan^2 15^\circ} = \sin 60^\circ + \cos 30^\circ$, then what is the value of x ?

यदि $\frac{x - x\tan^2 15^\circ}{1 + \tan^2 15^\circ} = \sin 60^\circ + \cos 30^\circ$ है, तो x का मान क्या है?

- (A) 2 (B) -1 (C) -2 (D) 1

33. What is the simplified value of

$$\frac{2\sin^3\theta - \sin\theta}{\cos\theta - 2\cos^3\theta}$$

$\frac{2\sin^3\theta - \sin\theta}{\cos\theta - 2\cos^3\theta}$ का सरलीकृत मान क्या है?

- (A) $\tan\theta$ (B) $\sin\theta$
(C) $\cos\theta$ (D) $\cot\theta$

34. If $\tan \theta \tan 5\theta = 1$, then what is the value of $\sin 2\theta$?

यदि $\tan \theta \tan 5\theta = 1$ है, तो $\sin 2\theta$ का मान क्या है?

(A) 0 (B) $\frac{1}{2}$ (C) $1\sqrt{2}$ (D) $\frac{\sqrt{3}}{2}$

35. The angles of elevation of the top of a building from the top and bottom of a tree are 30° and 60° respectively. If the height of the tree is 50 m, then what is the height of the building?

एक पेड़ के शीर्ष तथा आधार से किसी इमारत के शीर्ष का उन्नयन कोण क्रमशः 30° तथा 60° है। यदि पेड़ की ऊँचाई 50 मीटर है, तो इमारत की ऊँचाई कितनी है?

(A) $50\sqrt{3}$ (B) 75
(C) $50 + (\sqrt{3} + 1)$ (D) $75\sqrt{3}$

36. If $\tan \theta = \frac{2}{3}$ then what is the value of

$$\frac{15 \sin^2 \theta - 3 \cos^2 \theta}{5 \sin^2 \theta + 3 \cos^2 \theta}?$$

यदि $\tan \theta = \frac{2}{3}$ है, तो $\frac{15 \sin^2 \theta - 3 \cos^2 \theta}{5 \sin^2 \theta + 3 \cos^2 \theta}$ का मान क्या है?

(A) $\frac{33}{32}$ (B) $\frac{11}{29}$
(C) $\frac{33}{47}$ (D) $\frac{11}{32}$

37. If $\sqrt{5} \tan \theta = 5 \sin \theta$ then what is the value of $(\sin^2 \theta - \cos^2 \theta)$?

यदि $\sqrt{5} \tan \theta = 5 \sin \theta$ है, तो $(\sin^2 \theta - \cos^2 \theta)$ का मान क्या है?

(A) $\frac{3}{5}$ (B) $\frac{1}{5}$
(C) $\frac{4}{5}$ (D) $\frac{2}{5}$

38. What is the simplified value of

$$\frac{7}{\sec^2 \theta} + \frac{3}{1 + \cot^2 \theta} + 4 \sin^2 \theta?$$

$\frac{7}{\sec^2 \theta} + \frac{3}{1 + \cot^2 \theta} + 4 \sin^2 \theta$ का सरलीकृत मान क्या है?

(A) 3 (B) 4
(C) 5 (D) 7

39. Two posts are 4 m apart. Both posts are on same side of a tree. If the angles of depressions of these posts when observed from the top of the tree are 45° and 60° respectively, then what is the height of the tree?

दो खंभे 4 मीटर की दूरी पर हैं। दोनों खंभे पेड़ की एक ओर हैं। यदि पेड़ की ऊँचाई से देखा जाए तो इन खंभों का अवगमन कोण क्रमशः 45° तथा 60° है, तो पेड़ की ऊँचाई कितनी है?

(A) $\sqrt{3} + 1$ (B) $\sqrt{3}(\sqrt{3} + 1)$
(C) $2\sqrt{3}(\sqrt{3} + 1)$ (D) $4\sqrt{3}(\sqrt{3} + 1)$

40. If $\operatorname{cosec} \theta + 3 \sec \theta = 5 \operatorname{cosec} \theta$ then what is the value of $\cot \theta$?

यदि $\operatorname{cosec} \theta + 3 \sec \theta = 5 \operatorname{cosec} \theta$ है, तो $\cot \theta$ का मान क्या है?

(A) $\frac{4}{3}$ (B) $\frac{3}{4}$
(C) $\frac{1}{\sqrt{3}}$ (D) $\sqrt{3}$

41. If $\operatorname{cosec}^2 \theta = \frac{25}{16}$ and θ is acute, then what is the value of $(\sqrt{\cot \theta + \tan \theta})$?

यदि $\operatorname{cosec}^2 \theta = \frac{25}{16}$ तथा θ न्यूनकोण है, तो $(\sqrt{\cot \theta + \tan \theta})$ का मान क्या है?

(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{5}{2\sqrt{3}}$
(C) $\frac{12}{\sqrt{3}}$ (D) $\frac{2\sqrt{3}}{3}$

42. If $(\operatorname{cosec}^2 \theta - 1) = \frac{144}{25}$ and θ is acute, then what is the values of $(\sqrt{\cot \theta + \tan \theta})$?

यदि $(\operatorname{cosec}^2 \theta - 1) = \frac{144}{25}$ तथा θ न्यूनकोण है, तो $(\sqrt{\cot \theta + \tan \theta})$ का मान क्या है?

(A) $\frac{13}{5}$ (B) $\frac{60}{13}$
(C) $\frac{2\sqrt{15}}{13}$ (D) $\frac{13}{2\sqrt{15}}$

43. If $\tan \theta = \sqrt{\frac{1}{13}}$ and θ is acute, then what is the value of $\frac{\csc^2 \theta - \sec^2 \theta}{\csc^2 \theta + \sec^2 \theta}$?

यदि $\tan \theta = \sqrt{\frac{1}{13}}$ तथा θ न्यूनकोण है, तो $\frac{\csc^2 \theta - \sec^2 \theta}{\csc^2 \theta + \sec^2 \theta}$ का मान क्या है?

- (A) $\frac{2}{3}$ (B) $\frac{3}{4}$ (C) $\frac{5}{6}$ (D) $\frac{6}{7}$

44. If $\frac{\sin^2 \theta}{1 + \cos^2 \theta} + \frac{\sin^2 \theta}{1 - \cos^2 \theta} = \frac{8}{5}$ and θ is acute, then what is the value (in degrees) of θ ?

यदि $\frac{\sin^2 \theta}{1 + \cos^2 \theta} + \frac{\sin^2 \theta}{1 - \cos^2 \theta} = \frac{8}{5}$ तथा θ न्यूनकोण है, तो θ का मान (डिग्री में) क्या है?

- (A) 0 (B) 30 (C) 45 (D) 60

45. If $\sec^2 \theta - \sec \theta = 1$, then what is the value of $(\tan^{12} \theta - 3 \tan^{10} \theta + 3 \tan^8 \theta - \tan^6 \theta)$?

यदि $\sec^2 \theta - \sec \theta = 1$ है, तो $(\tan^{12} \theta - 3 \tan^{10} \theta + 3 \tan^8 \theta - \tan^6 \theta)$ का मान क्या है?

- (A) -1 (B) 0 (C) 1 (D) 2

46. If $\theta + \varphi = \frac{\pi}{2}$ and $\tan \theta = \sqrt{3}$, then what is the value of $\cos(\theta - \varphi)$?

यदि $\theta + \varphi = \frac{\pi}{2}$ तथा $\tan \theta = \sqrt{3}$ है, तो $\cos(\theta - \varphi)$ का मान क्या है?

- (A) $1/2$ (B) $\sqrt{3}/2$ (C) 1 (D) $1/\sqrt{2}$

47. If x and y are positive acute angles such that

$\sin(2x + 3y) = \frac{\sqrt{3}}{2}$ and $\cos(4x - 3y) = \frac{\sqrt{3}}{2}$, then what is the value of $\tan(6x - 3y)$?

यदि x तथा y धनात्मक न्यूनकोण हैं, $\sin(2x + 3y) = \frac{\sqrt{3}}{2}$ तथा $\cos(4x - 3y) = \frac{\sqrt{3}}{2}$ है, तो $\tan(6x - 3y)$ का मान क्या है?

- (A) 0 (B) 1 (C) $1/\sqrt{3}$ (D) $\sqrt{3}$

48. If $3 \cot \theta = 4 \cos \theta$, then what is the value of $\cos 2\theta$?

यदि $3 \cot \theta = 4 \cos \theta$ है, तो $\cos 2\theta$ का मान क्या होगा?
 (A) $2/16$ (B) $-1/8$
 (C) $7/16$ (D) $9/16$

49. A person observes that the angle of elevation of the top of a pole of height 15 m is 30° . What is the distance (in metres) of the person from the pole?

एक व्यक्ति पाता है कि 15 मीटर ऊँचाई वाले एक खंभे के शीर्ष का उन्नयन कोण 30° है। इस खंभे से व्यक्ति की दूरी (मीटर में) कितनी है?

- (A) 15 (B) $15\sqrt{3}$
 (C) $15/\sqrt{3}$ (D) 30

50. If $\cosec^2 \theta + \cot^2 \theta = 7$, then what is the value (in degrees) of θ ?

यदि $\cosec^2 \theta + \cot^2 \theta = 7$ है, तो θ का मान (डिग्री में) क्या होगा?

- (A) 15 (B) 30
 (C) 45 (D) 60

51. What is the value of $\frac{\sec \theta}{\tan \theta + \cot \theta}$?

$\frac{\sec \theta}{\tan \theta + \cot \theta}$ का मान क्या है?

- (A) $\cos \theta$ (B) $\tan \theta$
 (C) $\sin \theta$ (D) $\cot \theta$

52. What is the value of $\sin 8\theta + \sin 6\theta$?

$\sin 8\theta + \sin 6\theta$ का मान क्या है?
 (A) $2 \sin 7\theta \cos 7\theta$ (B) $2 \sin 7\theta \cos \theta$
 (C) $2 \sin \theta \cos 7\theta$ (D) $2 \sin 4\theta \cos 3\theta$

53. What is the value of $\frac{\cot x}{1 - \tan x} + \frac{\tan x}{1 - \cot x}$?

$\frac{\cot x}{1 - \tan x} + \frac{\tan x}{1 - \cot x}$ का मान क्या है?
 (A) $\sin x \cos x + 1$ (B) $\sec x \cosec x + 1$
 (C) $\tan x \cot x + 1$ (D) $\sec^2 x \cosec^2 x + 1$

54. Find the value of $\frac{\sqrt{\cosec^2 A - 1}}{\cot A + \tan A}$?

$\frac{\sqrt{\cosec^2 A - 1}}{\cot A + \tan A}$ का मान क्या है?
 (A) $\sin^2 A$ (B) $\cos A \sin A$
 (C) $\cos^2 A$ (D) $\sec A \cosec A$

55. If $5\sin x = 4$, then the numerical value of

$$\left(\frac{\tan x - \cot x}{\sec x - \tan x} \right) \left(\frac{\cos^4 x - \sin^4 x}{2\cos^2 x - 1} \right) ?$$

यदि $5\sin x = 4$ है, तो $\left(\frac{\tan x - \cot x}{\sec x - \tan x} \right)$

$$\left(\frac{\cos^4 x - \sin^4 x}{2\cos^2 x - 1} \right)$$
 का संख्यात्मक मान क्या है?

- (A) $\frac{3}{5}$ (B) $\frac{5}{4}$ (C) $\frac{7}{4}$ (D) $\frac{9}{5}$

56. What is the value of $\frac{(\tan^2 x - \sin^2 x)}{\sec^2 x}$?

$$\frac{(\tan^2 x - \sin^2 x)}{\sec^2 x}$$
 का मान क्या है?

- (A) $\sin^4 x$ (B) $\cos^2 x$
(C) $\sin^2 x$ (D) $\cos^4 x$

57. If $\sin x = \frac{1}{3}$ and $\cos y = \frac{1}{3}$, then what is the values of $\sin(x+y)$?

यदि $\sin x = \frac{1}{3}$ तथा $\cos y = \frac{1}{3}$ है, तो $\sin(x+y)$ का मान क्या है?
(A) $2/3$ (B) $4/9$
(C) $5/9$ (D) 1

58. What is the value of $\frac{\cos x + \cos y}{\sin x + \sin y}$?

$$\frac{\cos x + \cos y}{\sin x + \sin y}$$
 का मान क्या है?

- (A) $\tan\left(\frac{x+y}{2}\right)$ (B) $\tan\left(\frac{x-y}{2}\right)$
(C) $\cot\left(\frac{x-y}{2}\right)$ (D) $\cot\left(\frac{x+y}{2}\right)$

59. What is the value of $\sec 12^\circ \sin 12^\circ \tan 38^\circ \tan 78^\circ \tan 52^\circ$?

$$\sec 12^\circ \sin 12^\circ \tan 38^\circ \tan 78^\circ \tan 52^\circ$$
 का मान क्या है?
(A) 1 (B) 3
(C) $1/2$ (D) $3/2$

60. Find the value of

$$\left(\frac{(\cot \theta - \cosec \theta + 1)(\tan \theta + \sec \theta + 1)}{\cos \theta \cosec \theta} \right) ?$$

$$\left(\frac{(\cot \theta - \cosec \theta + 1)(\tan \theta + \sec \theta + 1)}{\cos \theta \cosec \theta} \right)$$
 का मान क्या है?

- (A) $2 \cos \theta$ (B) 2
(C) $2 \cot \theta$ (D) $2 \tan \theta$

61. What is the value of $\frac{\sin 30^\circ + \cos 30^\circ}{\cos 30^\circ - \sin 30^\circ}$?

$$\frac{\sin 30^\circ + \cos 30^\circ}{\cos 30^\circ - \sin 30^\circ}$$
 का मान क्या है?
(A) $2 - \sqrt{3}$ (B) $2 + \sqrt{3}$
(C) 1 (D) $-(2 - \sqrt{3})$

62. What is the value of $\frac{\sin \theta}{1 - \cot \theta} - \frac{\cos \theta}{1 - \tan \theta}$?

$$\frac{\sin \theta}{1 - \cot \theta} - \frac{\cos \theta}{1 - \tan \theta}$$
 का मान क्या है?
(A) $\sin \theta + \cos \theta$ (B) $\sin \theta - \cos \theta$
(C) $\frac{1}{\sin \theta + \cos \theta}$ (D) $\frac{1}{\sin \theta - \cos \theta}$

63. If $\sin A = x - \cos A$ and $\sec A = y - \cosec A$, then the value of $y(x^2 - 1)$ is equal to:

यदि $\sin A = x - \cos A$ and $\sec A = y - \cosec A$ है, तो $y(x^2 - 1)$ का मान बराबर है;
(A) $3x$ (B) $2x$
(C) $2xy$ (D) 0

64. What is the value of $\sqrt{\sec^2 A + \cosec^2 A}$?

$$\sqrt{\sec^2 A + \cosec^2 A}$$
 का मान क्या है?

- (A) $\sec A + \cosec A$ (B) $\cos A + \sin A$
(C) $\tan A + \cot A$ (D) $\sec A + \cot A$

65. If $\frac{\cot^2 x}{(1 + \sqrt{3})} + \frac{1}{2}(3 - \sqrt{3}) = \cot x$, then what is the value of x?

यदि $\frac{\cot^2 x}{(1 + \sqrt{3})} + \frac{1}{2}(3 - \sqrt{3}) = \cot x$ है, तो x का मान क्या है?

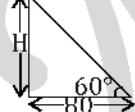
- (A) $\frac{\pi}{2}, \frac{\pi}{4}$ (B) $\frac{\pi}{6}, \frac{\pi}{2}$
(C) $\frac{\pi}{6}, \frac{\pi}{4}$ (D) $\pi, \frac{\pi}{4}$

Solution

1. (C) $\left(\frac{\cot\theta + \tan\theta}{\sec\theta} \right)$
 $\left(\frac{\cos\theta + \sin\theta}{\frac{\sin\theta + \cos\theta}{\sec\theta}} \right)$
 $\left(\frac{\cos^2\theta + \sin^2\theta}{\sin\theta \cos\theta \sec\theta} \right)$
 $\frac{1}{\frac{\sin\theta \cos\theta}{\cos\theta}}$
 $\frac{1}{\sin\theta}$
 $\operatorname{cosec}\theta$

2. (C) $\sin(4x - 4) = 1$
 $\cos(2x + 4) = \frac{1}{2}$
 $\sin(4x - y) = \sin 90^\circ$
 $4x - y = 90^\circ$
 $\cos(2x + y) = \cos 60^\circ$
 $2x + y = 60^\circ$
 $4x - y = 90^\circ$
 $6x = 150^\circ$
 $x = 25^\circ$
 $y = 10^\circ$
 $\cot(x + 2y) = \cot 45^\circ = 1$

3. (C)

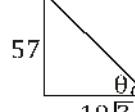


$$\frac{H}{80} = \tan 60^\circ$$

$$\frac{H}{80} = \sqrt{3}$$

$$H = 80\sqrt{3}$$

4. (C)



$$\tan\theta = \frac{57}{19\sqrt{3}}$$

5. (A) $\tan\theta = \sqrt{3}$
 $\theta = 60^\circ$

6. (D) $\cos\theta + \sin\theta = m$
 $\sec\theta + \operatorname{cosec}\theta = n$
 $\frac{n}{2}(m^2 - 1)$
 $\frac{\sec\theta + \operatorname{cosec}\theta}{2}((\cos\theta + \sin\theta)^2 - 1)$
 $\frac{1}{\cos\theta} + \frac{1}{\sin\theta}(\cos^2\theta + \sin^2\theta + 2\sin\theta\cos\theta - 1)$
 $\frac{\sin\theta + \cos\theta}{2\sin\theta\cos\theta}(1 + 2\sin\theta\cos\theta - 1)$
 $\frac{\sin\theta + \cos\theta}{2\sin\theta\cos\theta} \times 2\sin\theta\cos\theta$
 $\sin\theta + \cos\theta = m$
 $\sec\theta + \operatorname{cosec}\theta = \sqrt{2} \sec\theta(90^\circ - \theta)$
 $\cot\theta = ?$
 $\sec\theta + \operatorname{cosec}\theta = \sqrt{2} \operatorname{cosec}\theta$
 $\sec\theta = \operatorname{cosec}\theta (\sqrt{2} - 1)$
 $\frac{\sec\theta}{\operatorname{cosec}\theta} = \sqrt{2} - 1$
 $\cot\theta = \frac{1}{\sqrt{2} - 1} \times \frac{\sqrt{2} + 1}{\sqrt{2} + 1}$
 $\cot\theta = \sqrt{2} + 1$

7. (C) $\left(\frac{1}{\operatorname{cosec}\theta + \cot\theta} \right)^2 = ?$
 $\sin\theta = \frac{1}{\operatorname{cosec}\theta}, \cot\theta = \frac{\cos\theta}{\sin\theta}$

$$\left(\frac{1}{\frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}} \right)^2$$

$$\left(\frac{\sin\theta}{1 + \cos\theta} \right)^2$$

$$\frac{\sin^2 \theta}{(1 + \cos \theta)^2}$$

$$\frac{1 - \cos^2 \theta}{(1 + \cos \theta)^2}$$

$$\frac{(1 + \cos \theta)(1 - \cos \theta)}{(1 + \cos \theta)^2}$$

$$= \frac{1 - \cos \theta}{1 + \cos \theta}$$

8. (B) $\sin(\theta + 23^\circ) = \cos 58^\circ$

$$\cos 58^\circ = ?$$

$$\sin(\theta + 23^\circ) = \cos(90^\circ - 58^\circ)$$

$$\sin(\theta + 23^\circ) = \sin 32^\circ$$

$$\theta = 9^\circ$$

$$\cos 45^\circ = \frac{1}{\sqrt{2}}$$

9. (D) $x \sin \theta = \frac{5\sqrt{3}}{2}, x \cos \theta = \frac{5}{2}$

$$x = ?$$

$$x^2 \sin^2 \theta = \frac{75}{4} \text{ and } x^2 \cos^2 \theta = \frac{25}{4}$$

$$x^2 (\sin^2 \theta + \cos^2 \theta) = \frac{75}{4} + \frac{25}{4}$$

$$x^2 = 25$$

$$x = 5$$

10. (D) $\theta + \phi = \frac{2}{3}\pi$ and $\cos \theta = \frac{\sqrt{3}}{2}$

$$\sin \phi = ?$$

$$\cos \theta = \frac{\sqrt{3}}{2} \Rightarrow \theta = 30^\circ$$

$$\theta + \phi = \frac{2}{3} \times 180$$

$$30^\circ + \phi = 120$$

$$\phi = 90^\circ$$

$$\sin 90^\circ = 1$$

11. (C) $4 \sin^2 \theta - 3 = 0$

$$\sin \theta = \frac{\sqrt{3}}{2}$$

$$\cot^2 \theta + \tan^2 \theta = \left(\frac{1}{\sqrt{3}}\right)^2 + (\sqrt{3})^2 = \frac{10}{3}$$

12. (C) $\frac{\cos \theta}{1 + \sin \theta} + \frac{\cos \theta}{1 - \sin \theta} = 4$

$$\frac{\cos \theta - \cos \theta \sin \theta + \cos \theta + \cos \theta \sin \theta}{\cos^2 \theta} = 4$$

$$\cos \theta = \frac{1}{2}$$

$$\theta = 60^\circ$$

13. (D) $\frac{1}{\sin \theta + \csc \theta} = \frac{1}{2}$

$$\sin \theta + \frac{1}{\sin \theta} = 2$$

$$\sin^{100} \theta + \cosec^{100} \theta = \sin^{100} \theta + \frac{1}{\sin^{100} \theta} = 2$$

14. (C) $\frac{\tan^2 25}{\cosec^2 65^\circ} + \frac{\cot^2 25}{\sec^2 65^\circ} + 2 \tan 20^\circ \tan 45^\circ \tan 70^\circ$

$$\frac{\tan^2 25}{\sec^2 25^\circ} + \frac{\tan^2 65}{\sec^2 65^\circ} + 2$$

$$\frac{\sin^2 25}{\cos^2 25} + \frac{\sin^2 65}{\cos^2 65} + 2$$

$$\cos^2 25^\circ \cos^2 65^\circ$$

$$\sin^2 25^\circ + \cos^2 25^\circ + 2 = 3$$

15. (D) $\cosec \theta + \cosec^2 \theta = 1$
 $\cosec \theta + 1 + \cot^2 \theta = 1$
 $\cot^2 \theta = -\cosec \theta$
 $(\cot^{12} \theta - 3 \cot^{10} \theta + 3 \cot^8 \theta - \cot^6 \theta)$
 $(\cosec^2 \theta + \cosec \theta)^3 = (1)^3 = 1$

16. (A) $\sec \theta = \frac{13}{12}$

$$\cos \theta = \frac{12}{13} = \frac{A}{K}$$

$$L = \sqrt{(13)^2 - (12)^2}$$

$$L = 5, A = 12, K = 13$$

$$\sqrt{\cot \theta + \tan \theta} = \sqrt{\frac{A}{L} + \frac{L}{A}}$$

$$= \sqrt{\frac{12}{5} + \frac{5}{12}} = \sqrt{\frac{144 + 25}{60}} = \frac{13}{2\sqrt{15}}$$

17. (C) $(1 + \tan^2 \theta) = \frac{625}{49}$

$$\tan^2 \theta = \frac{576}{49}$$

$$\tan \theta = \frac{24}{7} = \frac{L}{A}$$

$$L = 24, A = 7, K = \sqrt{(24)^2 + (7)^2}$$

$$k = 25$$

$$\sqrt{\sin \theta + \cos \theta}$$

$$\sqrt{\frac{24}{25} + \frac{7}{25}} = \frac{\sqrt{31}}{5}$$

18. (B) $\sin \theta + \sin^2 \theta = 1$

$$\sin \theta = 1 - \sin^2 \theta$$

$$\sin \theta = \cos^2 \theta \quad \dots \dots (1)$$

$$(\cos^{12} \theta + 3\cos^{10} \theta + 3\cos^8 \theta + \cos^6 \theta - 1) = ?$$

Put value $\cos^2 \theta = \sin \theta$

$$\sin^6 \theta + 3\sin^5 \theta + 3\sin^4 \theta + \sin^3 \theta - 1$$

$$(\sin^2 \theta + \sin \theta)^3 - 1$$

Eqn. (1)

$$(\sin^2 \theta + \cos^2 \theta)^3 - 1$$

$$1 - 1 = 0$$

19. (B) $\cot \theta = \sqrt{11}$

$$\frac{(\cosec^2 \theta + \sec^2 \theta)}{(\cosec^2 \theta - \sec^2 \theta)} = ?$$

$$\begin{bmatrix} 1 + \tan^2 \theta = \sec^2 \theta \\ 1 + \cot^2 \theta = \cosec^2 \theta \end{bmatrix}$$

$$\cot^2 \theta = 11 \text{ or } \tan^2 \theta = \frac{1}{11}$$

$$= \frac{1 + \cot^2 \theta + 1 + \tan^2 \theta}{1 + \cot^2 \theta - 1 - \tan^2 \theta}$$

$$= \frac{2 + \cot^2 \theta + \tan^2 \theta}{\cot^2 \theta - \tan^2 \theta}$$

Put the value

$$= \frac{2 + 11 + \frac{1}{11}}{11 - \frac{1}{11}}$$

$$= \frac{144}{120} = \frac{6}{5}$$

20. (B) $\frac{\cos \theta}{1 + \sin \theta} + \frac{\cos \theta}{1 - \sin \theta} = 2\sqrt{2}$

$$\frac{\cos \theta - \cos \theta \sin \theta + \cos \theta + \cos \theta \sin \theta}{(1 + \sin \theta)(1 - \sin \theta)} = 2\sqrt{2}$$

$$\cos \theta = \frac{1}{\sqrt{2}}$$

$$\theta = 45^\circ$$

21. (C) $\sin \theta + \cos \theta = \sqrt{3} \cos(90^\circ - \theta)$

$$\sin \theta + \cos \theta = \sqrt{3} \sin \theta$$

$$\cos \theta = \sin \theta (\sqrt{3} - 1)$$

$$\tan \theta = \frac{1}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1}$$

$$\tan \theta = \frac{\sqrt{3} + 1}{2}$$

22. (D) $\tan A = \frac{1}{3}$ and $\tan B = \frac{2}{5}$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A} = \frac{2 \times \frac{1}{3}}{1 - \frac{1}{9}}$$

$$\tan 2A = \frac{3}{4}$$

$$\tan(2A+B) = \frac{\tan 2A + \tan B}{1 - \tan 2A \cdot \tan B}$$

$$= \frac{\frac{3}{4} + \frac{2}{5}}{1 - \frac{3}{4} \times \frac{2}{5}}$$

$$= \frac{23}{20} \times \frac{10}{7} = \frac{23}{14}$$

23. (C) $[(1 + \sec 2\theta) \tan^2 \theta]$

$$\left[\left(1 + \frac{1}{\cos 2\theta} \right) \tan^2 \theta \right] + 1$$

$$\left[\left(\frac{\cos 2\theta + 1}{\cos 2\theta} \right) \tan^2 \theta + 1 \right]$$

$$\left[\left(\frac{2 \cos^2 \theta}{\cos^2 \theta - \sin^2 \theta} \right) \tan^2 \theta \right] + 1$$

$$= \frac{2 \sin^2 \theta}{\cos^2 \theta - \sin^2 \theta} + 1$$

$$\frac{\sin^2 \theta + \cos^2 \theta}{\cos^2 \theta - \sin^2 \theta}$$

$$= \frac{1}{\cos^2 \theta}$$

$$= \sec^2 \theta$$

24. (C) $[(1 - \cos^2 \theta) \operatorname{cosec}^2 \theta] - \cot^2 \theta$
 $[(1 - 1 + \sin^2 \theta) \operatorname{cosec}^2 \theta] - \cot^2 \theta$

$$\frac{\sin^2 \theta - \cos^2 \theta}{\sin^2 \theta - \sin^2 \theta}$$

$$= \frac{1 - \cos^2 \theta}{\sin^2 \theta}$$

$$= \frac{\sin^2 \theta}{\sin^2 \theta}$$

$$= 1$$

25. (C) $\cos(\theta + 31^\circ) = \sin 47^\circ$
 $\cos(\theta + 31^\circ) = \sin(90^\circ - 47^\circ)$
 $\cos(\theta + 31^\circ) = \cos 43^\circ$
 $\theta = 12^\circ$

Find out $\sin 5\theta = ?$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

26. (A) $2 \cos^2 \theta = 1$
 $\theta = 45^\circ$
 $\cot^2 \theta - \tan^2 \theta = (1-1) = 0$

27. (C) $\frac{1}{\cos \theta + \sec \theta} = \frac{1}{2}$
 $\cos \theta + \sec \theta = 2$
 $\cos \theta + \frac{1}{\cos \theta} = 2$
 $\cos^2 \theta - 2 \cos \theta + 1 = 0$
 $\cos^2 \theta - \cos \theta - \cos \theta + 1 = 0$
 $\cos \theta (\cos \theta - 1) - (\cos \theta - 1) = 0$
 $\cos \theta = 1$
 $\theta = 0^\circ$
 $\cos \theta^{100} + \sec \theta^{100}$
Put $\theta = 0^\circ$
 $= 1 + 1 = 2$

28. (C) $1 + \cot A \cot \left(\frac{A}{2} \right)$
 $1 + \frac{\cot^2 \left(\frac{A}{2} \right) - 1}{2 \cot \left(\frac{A}{2} \right)} \times \cot \left(\frac{A}{2} \right)$

$$\therefore \left[\cot 2\theta = \frac{2 \cot^2 \theta - 1}{2 \cot \theta} \right]$$

$$\frac{1 + \cot^2 \left(\frac{A}{2} \right)}{2} = \frac{\operatorname{cosec}^2 \left(\frac{A}{2} \right)}{2}$$

29. (C) $\tan \left(\frac{\theta}{2} \right) \tan \left(\frac{2\theta}{5} \right) = 1$

$$\tan \left(\frac{\theta}{2} \right) = \cot \left(\frac{2\theta}{5} \right)$$

$$\left(\frac{\theta}{2} \right) + \left(\frac{2\theta}{5} \right) = 90^\circ$$

$$\frac{5\theta + 4\theta}{10} = 90^\circ \quad \begin{bmatrix} \text{If } \tan x = \cot y \\ \text{then } x + y = 90^\circ \end{bmatrix}$$

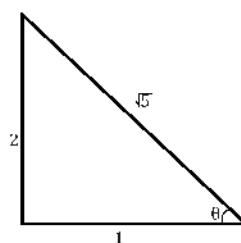
$$\theta = 100^\circ$$

30. (A) $\frac{3}{\operatorname{cosec}^2 \theta} + \frac{5}{1 + \tan^2 \theta} - 2 \cos^2 \theta$
 $3 \sin^2 \theta + \frac{5}{\sec^2 \theta} - 2 \cos^2 \theta$
 $3 \sin^2 \theta + 5 \cos^2 \theta - 2 \cos^2 \theta = 3$

31. (A) 32. (A) 33. (A) 34. (B) 35. (B)

36. (C) $\tan \theta = \frac{2}{3}$
 $= \frac{15 \sin^2 \theta - 3 \cos^2 \theta}{5 \sin^2 \theta + 3 \cos^2 \theta} \quad (\text{Take common } \cos^2 \theta)$
 $= \frac{15 \tan^2 \theta - 3}{5 \tan^2 \theta + 3}$
 $= \frac{15 \left(\frac{2}{3} \right)^2 - 3}{5 \left(\frac{2}{3} \right)^2 + 3} = \frac{15 \times \frac{4}{9} - 3}{5 \times \frac{4}{9} + 3} = \frac{33}{47}$

37. (A)



$$\sqrt{5} \tan \theta = 5 \sin \theta$$

$$\cos \theta = \frac{1}{\sqrt{5}}$$

$$\sin \theta = \frac{2}{\sqrt{5}}$$

$$\sin^2 \theta - \cos^2 \theta$$

$$\left(\frac{2}{\sqrt{5}}\right)^2 - \left(\frac{1}{\sqrt{5}}\right)^2$$

$$\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$$

38. (D) $\frac{7}{\sec^2 \theta} + \frac{3}{1 + \cot^2 \theta} + 4 \sin^2 \theta$

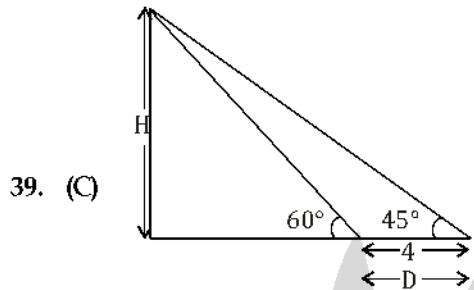
$$7 \cos^2 \theta + \frac{3}{\cosec^2 \theta} + 4 \sin^2 \theta$$

$$1 + \cot^2 \theta = \cosec^2 \theta$$

$$7 \cos^2 \theta + 3 \sin^2 \theta + 4 \sin^2 \theta$$

$$7(\cos^2 \theta + \sin^2 \theta)$$

$$= 7$$



39. (C)

$$D = 4(\cot \theta_1 - \cot \theta_2)$$

$$4 = 4(\cot 45^\circ - \cot 60^\circ)$$

$$4 = 4 \left(1 - \frac{1}{\sqrt{3}}\right)$$

$$4\sqrt{3} = 4(\sqrt{3} - 1)$$

$$H = \frac{4\sqrt{3}}{\sqrt{3}-1} \cdot \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{4\sqrt{3}}{2} (\sqrt{3}+1)$$

$$= 2\sqrt{3}(\sqrt{3}+1)$$

40. (A) $\cosec \theta + 3 \sec \theta = 5 \cosec \theta$

$$1 + 3 \frac{\sec \theta}{\cosec \theta} = 5$$

$$1 + 3 \tan \theta = 4$$

$$\tan \theta = \frac{4}{3}$$

$$\cot \theta = \frac{3}{4}$$

41. (B) $\cosec^2 \theta = \frac{25}{16}$

$$\cosec^2 \theta = \frac{5}{4} = \frac{K}{L}$$

$$A^2 = 5^2 - 4^2$$

$$A = 3, K = 5, L = 4$$

$$\sqrt{\cot \theta + \tan \theta} = \sqrt{\frac{A}{L} + \frac{L}{A}}$$

$$= \sqrt{\frac{3}{4} + \frac{4}{3}} = \sqrt{\frac{25}{12}}$$

$$= \frac{5}{2\sqrt{3}}$$

42. (D) $\cosec^2 \theta - 1 = \frac{144}{25}$

then

$$\cosec \theta = \frac{13}{5} = \frac{K}{L}$$

$$K = 13, L = 5, A = 12$$

$$\sqrt{\cot \theta + \tan \theta} = \sqrt{\frac{12}{5} + \frac{5}{12}} = \sqrt{\frac{169}{60}}$$

$$= \frac{13}{2\sqrt{15}}$$

43. (D) $\tan \theta = \sqrt{\frac{1}{13}}$

$$\tan^2 \theta = \frac{1}{13}$$

$$\text{and } \cot^2 \theta = \frac{13}{1}$$

$$\frac{\cosec^2 \theta - \sec^2 \theta}{\cosec^2 \theta + \sec^2 \theta} = ?$$

$$\begin{aligned} [1 + \tan^2 \theta &= \sec^2 \theta] \\ [1 + \cot^2 \theta &= \cosec^2 \theta] \end{aligned}$$

$$\frac{1 + \cot^2 \theta - 1 - \tan^2 \theta}{1 + \cot^2 \theta + 1 + \tan^2 \theta}$$

$$\frac{\cot^2 \theta - \tan^2 \theta}{2 + \cot^2 \theta + \tan^2 \theta} \quad \text{Put the value}$$

$$\Rightarrow \frac{13 - \frac{1}{13}}{2 + 13 + \frac{1}{13}} = \frac{168}{196} = \frac{6}{7}$$

44. (D) $\frac{\sin^2 \theta}{1 + \cos^2 \theta} + \frac{\sin^2 \theta}{1 - \cos^2 \theta} = \frac{8}{5}$
 $(\sin^2 \theta = 1 - \cos^2 \theta)$

$$\frac{1 - \cos^2 \theta}{1 + \cos^2 \theta} = \frac{3}{5}$$

$$5 - 5 \cos^2 \theta = 3 + 3 \cos^2 \theta$$

$$\cos^2 \theta = \frac{1}{4} \Rightarrow \cos \theta = \frac{1}{2}$$

$$\theta = 60^\circ$$

45. (C) $\sec^2 \theta - \sec \theta = 1$
 $[\sec^2 \theta = 1 + \tan^2 \theta]$
 $1 + \tan^2 \theta - \sec \theta = 1$
 $\tan^2 \theta = \sec \theta$
 $\sec^6 \theta - 3 \sec^5 \theta + 3 \sec^4 \theta - \sec^3 \theta$
 $(\sec^2 \theta - \sec \theta)^3$
 $(1)^3 = 1$

46. (B) $\theta + Q = \frac{\pi}{2}$

$$\tan \theta = \sqrt{3}$$

$$\tan \theta = 60^\circ$$

$$\theta = 60^\circ$$

$$\theta + \Phi = 90^\circ$$

$$\Phi = 30^\circ$$

$$\cos(60^\circ - 30^\circ)$$

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

47. (D) $\sin(2x + 3y) = \frac{\sqrt{3}}{2} \quad \left(\because \sin 60^\circ = \frac{\sqrt{3}}{2}\right)$

$$2x + 3y = 60^\circ$$

$$\cos(4x - 3y) = \frac{\sqrt{3}}{2} \quad \left(\because \cos 30^\circ = \frac{\sqrt{3}}{2}\right)$$

$$4x - 3y = 30^\circ$$

$$\begin{aligned} 2x + 3y &= 60^\circ \\ 4x - 3y &= 30^\circ \\ 6x &= 90^\circ \end{aligned}$$

$$x = 15$$

$$y = 10$$

$$\tan(6x - 3y) = ?$$

$$\tan 60^\circ = \sqrt{3}$$

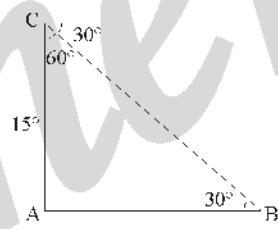
48. (B) $\frac{3 \cos \theta}{\sin \theta} = 4 \cos \theta$

$$\sin \theta = \frac{3}{4}$$

$$\cos 2\theta = 1 - 2 \sin^2 \theta$$

$$\cos 2\theta = 1 - 2 \times \frac{9}{16} = -\frac{1}{8}$$

49. (B)



$$\text{Distance of AB} = \frac{AC}{AB}$$

$$= \frac{15}{AB} = \tan 30^\circ$$

$$AB = 15\sqrt{3} \text{ meter}$$

50. (B) $\csc^2 \theta + \cot^2 \theta = 7$

$$\frac{1}{\sin^2 \theta} + \frac{1}{\cos^2 \theta} = 7$$

$$\frac{1 + \cos^2 \theta}{\sin^2 \theta} = 7$$

$$= 1 + \cos^2 \theta = 7 \sin^2 \theta \quad (\cos^2 \theta = 1 - \sin^2 \theta)$$

$$= 1 + 1 - \sin^2 \theta = 7 \sin^2 \theta$$

$$= 2 = 8 \sin^2 \theta$$

$$= \sin \theta = \frac{1}{2}$$

$$\theta = 30^\circ$$

51. (C) $\frac{\sec \theta}{\tan \theta + \cot \theta} \Rightarrow \frac{\frac{1}{\cos \theta}}{\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta}}$

$$= \frac{\frac{1}{\cos \theta}}{\frac{\sin^2 \theta + \cos^2}{\cos \theta \sin \theta}}$$

$$\frac{\sin \theta \cos \theta}{\cos \theta} = \sin \theta (\because \sin^2 + \cos^2 = 1)$$

52. (B)

$$53. (B) \frac{\cot x}{1 - \tan x} + \frac{\tan x}{1 - \cot x}$$

$$= \frac{\cos x}{1 - \frac{\sin x}{\cos}} + \frac{\sin x}{1 - \frac{\cos x}{\sin}}$$

$$= \frac{\cos^2 x}{\sin x(\cos x - \sin x)} + \frac{\sin^2 x}{\cos x(\cos x - \sin x)}$$

$$= \frac{\cos^2 x}{\sin x(\cos x - \sin x)} - \frac{\sin^2 x}{\cos x(\cos x - \sin x)}$$

$$= \frac{\cos^3 x - \sin^3 x}{\sin x \cos x (\cos x - \sin x)}$$

$$\frac{(\cos x - \sin x) \sin 2x + \cos^2 x + \cos x \sin x}{\sin x \cos x (\cos x - \sin x)}$$

$$= \frac{1 + \cos x \sin x}{\sin x \cos x^2}$$

$$= \sec x \cosec x + 1$$

54. (C) $\frac{\cos \operatorname{ec}^2 A - 1}{\cot A + \tan A}$

$$= \frac{\cot A}{\cot A + \tan A}$$

$$\frac{\cos A}{\sin A}$$

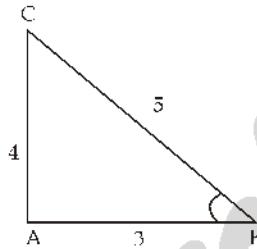
$$= \frac{\cos A}{\sin A} + \frac{\sin A}{\cos A}$$

$$= \frac{\cos A}{\sin A}$$

$$= \frac{\cos^2 A + \sin^2 A}{\sin A \cos A}$$

$$= \frac{\cos A}{\sin A} \times \frac{\sin A \cos A}{1} = \cos^2 A$$

55. (C) $\sin x = \frac{4}{5} \quad \therefore \cos^2 A + \sin^2 A = 1$



$$\left(\frac{\tan x - \cot x}{\sec x - \tan x} \right) \left(\frac{\cos^4 x - \sin^4 x}{2 \cos^2 x - 1} \right)$$

$$= \left(\frac{4}{3} - \frac{3}{4} \right) \cdot \frac{(\cos^2 x + \sin^2 x)(\cos^2 x - \sin^2 x)}{2 \cos^2 x - 1}$$

$$\therefore \cos^2 A + \sin^2 A = 1$$

$$= \left(\frac{7}{4} \right) \left(\frac{\frac{9}{16} - \frac{16}{25}}{\frac{25}{18} - \frac{25}{-1}} \right) = \left(\frac{7}{4} \times \frac{\frac{7}{25}}{\frac{-7}{25}} \right) = \frac{7}{4}$$

56. (A) $\frac{\tan^2 x - \sin^2 x}{\sec^2 x}$

$$\frac{\sin^2 x}{\cos^2 x} - \frac{\sin^2 x}{\sec^2 x}$$

$$\frac{\sin^2 x [1 - \cos^2 x]}{\cos^2 x \times \frac{1}{\cos^2 x}} = \sin^4 x$$

57. (D) $\sin(x+y) = \sin x \cos y + \cos x \sin y$

$$\begin{aligned}\sin x &= \frac{1}{3}, \cos y = \frac{1}{3} \\ &= \frac{1}{3} \times \frac{1}{3} + \frac{2\sqrt{2}}{3} \times \frac{2\sqrt{2}}{3} \\ &= \frac{1}{9} + \frac{4 \times 2}{9} \\ &= 1\end{aligned}$$

58. (D) $\frac{\cos x + \cos y}{\sin x + \sin y}$

$$\frac{2 \cos \frac{x+y}{2} \cos \frac{x-y}{2}}{2 \sin \frac{x+y}{2} \cos \frac{x-y}{2}} = \cot \frac{x+y}{2}$$

59. (A)
 $\sec 12 \sin 12 \tan 38 \tan 78 \tan 52$

$$\frac{\sin 12}{\cos 12} \tan(90-38) \tan 78 \tan 52$$

$$\tan 12 \cot 52 \tan 78 \tan 52$$

$$\tan(90-12) \cot 52 \tan 78 \tan 52$$

$$\cot 78 \cot 52 \tan 78 \tan 52 = 1$$

60. (D) $\frac{(\cot \theta - \csc \theta + 1)(\tan \theta + \sec \theta + 1)}{\cos \theta \csc \theta}$

$$\frac{\left(\frac{\cos \theta}{\sin \theta} - \frac{1}{\sin \theta} + 1\right)\left(\frac{\sin \theta}{\cos \theta} + \frac{1}{\cos \theta} + 1\right)}{\cos \theta \csc \theta}$$

$$\frac{(\cos \theta - 1 + \sin \theta)(\sin \theta + 1 - \cos \theta)}{\sin \theta \cos \theta \cos \theta \csc \theta}$$

$$\frac{(\cos \theta + \sin \theta)^2 - 1}{\cos^2 \theta}$$

$$\frac{1 + 2 \cos \theta \sin \theta - 1}{\cos^2 \theta}$$

$$= 2 \tan \theta$$

61. (B) $\frac{\sin 30^\circ + \cos 30^\circ}{\cos 30^\circ - \sin 30^\circ}$

$$= \frac{\frac{1}{2} + \frac{\sqrt{3}}{2}}{\frac{\sqrt{3}}{2} - \frac{1}{2}} = \frac{1 + \sqrt{3}}{\sqrt{3} - 1} \times \frac{\sqrt{3} - 1}{\sqrt{3} - 1}$$

$$= \frac{1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = 2 + \sqrt{3}$$

62. (D) $\frac{\sin \theta}{1 - \cot \theta} - \frac{\cos \theta}{1 - \tan \theta}$

$$= \frac{\sin^2 \theta}{\sin \theta - \cos \theta} - \frac{\cos^2 \theta}{\cos \theta - \sin \theta}$$

$$= \frac{\sin^2 \theta}{\sin \theta - \cos \theta} + \frac{\cos^2 \theta}{\cos \theta - \sin \theta}$$

$$= \frac{\sin^2 \theta + \cos^2 \theta}{\sin \theta - \cos \theta} = \frac{1}{\sin \theta - \cos \theta}$$

63. (B) $x = \sin A + \cos A$

$$y = \sec A + \cosec A$$

$$y(x^2 - 1)$$

$$\text{Sec } A + \text{Cosec } A [(\sin A + \cos A)^2 - 1]$$

$$\frac{1}{\cos A} + \frac{1}{\sin A} (\sin^2 A + \cos^2 A + 2 \sin A \cos A - 1)$$

$$\frac{\sin A + \cos A}{\sin A \cos A} \times 2 \sin A \cos A$$

$$2(\sin A + \cos A) \quad \therefore \sin A + \cos A = x \\ 2x$$

64. (C) $\sqrt{\sec^2 A + \cosec^2 A}$

$$\sqrt{1 + \tan^2 A + 1 + \cot^2 A}$$

$$= \sqrt{(\tan A + \cot A)^2}$$

$$= \tan A + \cot A$$

65. (C) $\frac{\cot^2 x}{1 + \sqrt{3}} + \frac{1}{2}(3 - \sqrt{3}) = \cot x$

$$\frac{(\sqrt{3}-1)\cot^2 x}{2} + \frac{3-\sqrt{3}}{2} = \cot x$$

$$= (\sqrt{3}-1)\cot^2 x - 2\cot x + 3 - \sqrt{3}$$

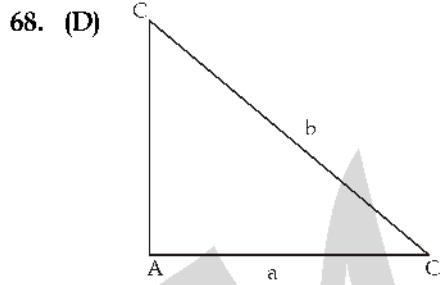
$$\cot x = \frac{2 \pm \sqrt{4 - 4(4\sqrt{3} - 6)}}{2(\sqrt{3}-1)}$$

66. (C) $\sin(30+x) - \cos(60-x)$
 $\sin(A+B) - \cos(A-B) = \sin A \cos B + \cos A \sin B$
 $- \cos A \cos B - \sin A \sin B$
 $= \sin 30 \cos x + \cos 30 \sin x - \cos 60 \cos x - \sin 60 \sin x$

$$= \frac{1}{2} \cos x + \frac{\sqrt{3}}{2} \sin x - \frac{1}{2} \cos x - \frac{\sqrt{3}}{2} \sin x$$

$$= 0$$

67. (B) $15\cos^2\theta + 17\sin^2\theta = ?$
 Least value = 15
 \therefore Put $\theta = 0$ value



$$\cos 37^\circ = \frac{a}{b}$$

$$AC^2 = BC^2 - AB^2$$

$$AC^2 = b^2 - a^2$$

$$AC = \sqrt{b^2 - a^2}$$

A.T.Q.

$$= \operatorname{cosec} 37^\circ - \cos 53^\circ$$

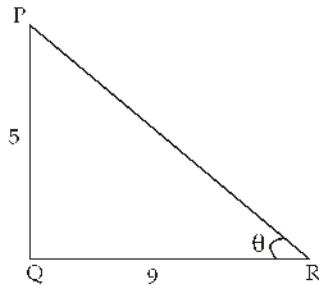
$$\cos(90 - \theta) = \sin \theta$$

$$= \operatorname{cosec} 37^\circ - \sin 37^\circ$$

$$= \frac{b}{\sqrt{b^2 - a^2}} - \frac{\sqrt{b^2 - a^2}}{b}$$

$$= \frac{b^2 - b^2 + a^2}{b\sqrt{b^2 - a^2}} = \frac{a^2}{b\sqrt{b^2 - a^2}}$$

69. (B)



$$\tan \theta = \frac{5}{9}$$

$$PR^2 = PQ^2 + QR^2$$

$$PR^2 = 5^2 + 9^2$$

$$PR^2 = 25 + 81$$

$$PR^2 = 106$$

$$PR = \sqrt{106}$$

$$= \frac{5 \sin \theta + 9 \cos \theta}{5 \sin \theta - 9 \cos \theta}$$

$$= \frac{\frac{5 \times 5}{\sqrt{106}} + \frac{9 \times 9}{\sqrt{106}}}{\frac{5 \times 5}{\sqrt{106}} - \frac{9 \times 9}{\sqrt{106}}}$$

$$= \frac{106}{\sqrt{106}} \times \frac{\sqrt{106}}{-56} = \frac{-53}{28}$$

70. (D)

$$\frac{\sin y + \cos y}{\sin y - \cos y} = 3$$

$$\sin y + \cos y = 3 \sin y - 3 \cos y$$

$$4 \cos y = 2 \sin y$$

$$\frac{\sin y}{\cos y} = \frac{4}{2}$$

$$\tan y = 2$$

$$= \frac{2 \pm 2\sqrt{7 - 4\sqrt{3}}}{2(\sqrt{3} - 1)} = \frac{1 \pm 2 - \sqrt{3}}{\sqrt{3} - 1}$$

$$= \frac{3 - \sqrt{3}}{\sqrt{3} - 1}, \frac{-1 + \sqrt{3}}{\sqrt{3} - 1}$$

$$= \frac{3 - \sqrt{3}}{\sqrt{3} - 1} \times \frac{\sqrt{3} + 1}{\sqrt{3} + 1}, 1$$

$$\sqrt{3}, 1, x = 30^\circ, 45^\circ$$

$$\text{then } \frac{\pi}{6}, \frac{\pi}{4}$$

10. The value of

$$\frac{4 \tan^2 30^\circ + \sin^2 30^\circ \cos^2 45^\circ + \sec^2 48^\circ - \cot^2 42^\circ}{\cos 37^\circ \sin 53^\circ + \sin 37^\circ \cos 53^\circ + \tan 18^\circ \tan 72^\circ}$$
 is:

$$\frac{4 \tan^2 30^\circ + \sin^2 30^\circ \cos^2 45^\circ + \sec^2 48^\circ - \cot^2 42^\circ}{\cos 37^\circ \sin 53^\circ + \sin 37^\circ \cos 53^\circ + \tan 18^\circ \tan 72^\circ}$$
 का मान ज्ञात कीजिए?

- (A) $\frac{35}{48}$ (B) $\frac{59}{48}$ (C) $\frac{49}{24}$ (D) $\frac{35}{24}$

11. The value of

$$\frac{3(\cosec^2 26^\circ - \tan^2 61^\circ) + (\cot^2 12^\circ - \sec^2 18^\circ)}{\cot(22^\circ - \theta) - \cosec^2(62^\circ + \theta) - \tan(\theta + 68^\circ) + \tan^2(28^\circ - \theta)}$$
 is:

- का मान बताइए?
- (A) 3 (B) 4
(C) -1 (D) -2

12. If $\cos \theta = \frac{12}{13}$, then the value of $\frac{\sin \theta (1 - \tan \theta)}{\tan \theta (1 + \cosec \theta)}$ is:

यदि $\cos \theta = \frac{12}{13}$ है, तो $\frac{\sin \theta (1 - \tan \theta)}{\tan \theta (1 + \cosec \theta)}$ का मान बताइए।

- (A) $\frac{25}{78}$ (B) $\frac{35}{234}$ (C) $\frac{35}{108}$ (D) $\frac{25}{156}$

13. If $\frac{\sec \theta - \tan \theta}{\sec \theta + \tan \theta} = \frac{1}{7}$, θ lies in first quadrant, then

the value of $\frac{\cosec \theta + \cot^2 \theta}{\cosec \theta - \cot^2 \theta}$ is:

यदि $\frac{\sec \theta - \tan \theta}{\sec \theta + \tan \theta} = \frac{1}{7}$, θ प्रथम चतुर्थांश में स्थित है, तो

$\frac{\cosec \theta + \cot^2 \theta}{\cosec \theta - \cot^2 \theta}$ का मान बताइए।

- (A) $\frac{19}{5}$ (B) $\frac{22}{3}$ (C) $\frac{37}{12}$ (D) $\frac{37}{19}$

14. The expression $\frac{\tan^6 \theta - \sec^6 \theta + 3 \sec^2 \theta \tan^2 \theta}{\tan^2 \theta + \cot^2 \theta + 2}$, $0^\circ < \theta < 90^\circ$, is equal to :

व्यंजक $\frac{\tan^6 \theta - \sec^6 \theta + 3 \sec^2 \theta \tan^2 \theta}{\tan^2 \theta + \cot^2 \theta + 2}$ का मान बताइए

जहाँ $0^\circ < \theta < 90^\circ$ है।

- (A) $\sec^2 \theta \cosec^3 \theta$ (B) $-\sec^2 \theta \cosec^2 \theta$
(C) $\cos^2 \theta \sin^2 \theta$ (D) $-\cos^2 \theta \sin^2 \theta$

15. The expression

$$\frac{\cos^4 \theta - \sin^4 \theta + 2 \sin^2 \theta + 3}{(\cosec \theta + \cot \theta + 1)(\sec \theta - \cot \theta + 1) - 2},$$

$0^\circ < \theta < 90^\circ$, is equal to:

$$\text{व्यंजक } \frac{\cos^4 \theta - \sin^4 \theta + 2 \sin^2 \theta + 3}{(\cosec \theta + \cot \theta + 1)(\sec \theta - \cot \theta + 1) - 2},$$

का मान बताइए, जहाँ $0^\circ < \theta < 90^\circ$ है।

- (A) $\frac{1}{2} \sin \theta$ (B) $2 \sin \theta$

- (C) $\sec \theta$ (D) $2 \cosec \theta$

16. The expression

$$\frac{(1 - \sin \theta + \cos \theta)^2 (1 - \cos \theta) \sec^3 \theta \cosec^2 \theta}{(\sec \theta - \tan \theta)(\tan \theta + \cot \theta)},$$

$0^\circ < \theta < 90^\circ$, is equal to:

$$\text{व्यंजक } \frac{(1 - \sin \theta + \cos \theta)^2 (1 - \cos \theta) \sec^3 \theta \cosec^2 \theta}{(\sec \theta - \tan \theta)(\tan \theta + \cot \theta)},$$

का मान बताइए, जहाँ $0^\circ < \theta < 90^\circ$ है।

- (A) $\sin \theta$ (B) $2 \cos \theta$
(C) $\cot \theta$ (D) $2 \tan \theta$

17. The value of

$$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \cosec 81^\circ)}{\cosec^2 71^\circ + \cos^2 15^\circ - \tan^2 19^\circ + \cos^2 75^\circ}$$
 is:

$$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \cosec 81^\circ)}{\cosec^2 71^\circ + \cos^2 15^\circ - \tan^2 19^\circ + \cos^2 75^\circ} \text{ का मान बताइए।}$$

- (A) 1 (B) 4
(C) -3 (D) 2

18. If $\frac{\sin^2 \theta}{\cos^2 \theta - 3 \cos \theta + 2} = 1$, θ lies in the first quadrant,

then the value of $\frac{\tan^2 \theta + \sin^2 \theta}{\tan \theta + \sin \theta}$ is:

यदि $\frac{\sin^2 \theta}{\cos^2 \theta - 3 \cos \theta + 2} = 1$, θ प्रथम चतुर्थांश में स्थित है,

तो $\frac{\tan^2 \theta + \sin^2 \theta}{\tan \theta + \sin \theta}$ का मान बताइए ?

- (A) $\frac{2\sqrt{3}}{27}$ (B) $\frac{5\sqrt{3}}{27}$ (C) $\frac{2\sqrt{3}}{9}$ (D) $\frac{7\sqrt{3}}{54}$

- 19.** Two pillars A and B of the same height are on opposite sides of a road which is 40 m wide. The angles of elevation of the tops of the pillars A and B are 30° and 45° , respectively, at a point on the road between the pillars. What is the distance (in m) of the point from the foot of pillar A?

समान ऊँचाई वाले दो स्तम्भ A और B, एक ऐसी सड़क के दोनों ओर स्थित हैं जिसकी चौड़ाई 40 मीटर है। दोनों स्तम्भों के बीच सड़क पर स्थित एक बिंदु से स्तम्भों A और B के शीर्षों के उन्नयन कोण क्रमशः 30° और 45° हैं। स्तम्भ A के पाद से उस बिंदु की दूरी (मी. में) कितनी है?

- (A) $40(\sqrt{3} - 1)$ (B) $20(2 - \sqrt{3})$
 (C) $20(3 - \sqrt{3})$ (D) $39\sqrt{3}$

- 20.** The expression

$$\frac{(1 - 2\sin^2 \theta \cos^2 \theta)(\cot \theta + 1)\cos \theta}{(\sin^4 + \cos^4 \theta)(1 + \tan \theta) \cosec \theta} - 1, \quad 0^\circ < \theta <$$

90° , equals:

$$\text{व्यंजक } \frac{(1 - 2\sin^2 \theta \cos^2 \theta)(\cot \theta + 1)\cos \theta}{(\sin^4 + \cos^4 \theta)(1 + \tan \theta) \cosec \theta} - 1 \text{ का मान}$$

बताइए, जहाँ $0^\circ < \theta < 90^\circ$ है।

- (A) $\cos^2 \theta$
 (B) $-\sin^2 \theta$
 (C) $\sec^2 \theta$
 (D) $-\sec^2 \theta$

Solution

1. (B) $3\tan \theta = 2\sqrt{3} \sin \theta$

$$\frac{3\sin \theta}{\cos \theta} = 2\sqrt{3} \sin \theta$$

$$\cos \theta = \frac{\sqrt{3}}{2} \quad \theta = 30^\circ$$

$$\text{ATQ, } \frac{\cosec^2 60 + \cot^2 60}{\sin^2 30 + \tan^2 60}$$

$$= \frac{\frac{4}{3} + \frac{1}{3}}{\frac{1}{1} + 3} = \frac{\frac{5}{3}}{\frac{13}{3}} = \frac{20}{39}$$

2. (A) $\frac{3(\cot^2 47 - \sec^2 43) - 2(\tan^2 23 - \cosec^2 67)}{\cosec^2(68 + \theta) - \tan(\theta + 61) - \tan^2(22 - \theta) + \cot(29 - \theta)}$

$$= \frac{3(-1) - 2(-1)}{1+0} = \frac{-3+2}{1} = -1$$

3. (C) $1 + 2\tan^2 \theta + 2\sin \theta \cdot \sec^2 \theta = \frac{a}{b}$

Put $\theta = 30^\circ$

$$= 1 + 2\left(\frac{1}{3}\right) + 2 \times \frac{1}{2} \times \frac{4}{3} = \frac{a}{b}$$

$$= 1 + \frac{2}{3} + \frac{4}{3} = \frac{a}{b}$$

$$\Rightarrow \frac{a}{b} = 3$$

$$\text{ATQ, } \frac{a+b}{a-b} = \frac{3+1}{3-1} = \frac{4}{2} = 2$$

Option C is correct

4. (C) $\frac{\left[\frac{\tan^3 \theta}{\sec^2 \theta} + \frac{\cot^3}{\cosec^2 \theta} + 2\sin \theta \cos \theta\right]}{(1 + \cosec^2 \theta + \tan^2 \theta)}$

$$= \left[\frac{\frac{\sin^3 \theta}{\cos^3 \theta}}{\frac{\cos^3 \theta}{\sin^3 \theta}} + \frac{2\sin \theta \cos \theta}{1} \right] \div [\cosec^2 \theta + \sec^2 \theta]$$

$$= \left[\frac{\sin^3 \theta + \cos^3 \theta}{\cos \theta \sin \theta} + 2\sin \theta \cos \theta \right] \div \left[\frac{1}{\sin^2 \theta \cos^2 \theta} \right]$$

$$= \left[\frac{\sin^4 \theta + \cos^4 \theta + 2\sin^2 \theta \cos^2 \theta}{\cos \theta} \right] \times \sin^2 \theta \cos^2 \theta$$

$$= \left[\frac{(\sin^2 \theta + \cos^2 \theta)^2}{(\sin \theta \cos \theta)} \right] \cdot (\sin \theta \cos \theta)^2$$

$$= \sin \theta \cos \theta$$

5. (A) $7\sin^2 \theta + 4\cos^2 \theta = 5$
 $4\sin^2 \theta + 3\sin^2 \theta + 4\cos^2 \theta = 5$
 $3\sin^2 \theta = 1$

$$\sin \theta = \frac{1}{\sqrt{3}}$$

$$\text{ATQ, } \frac{\sqrt{3} \sec \theta + \tan \theta}{\sqrt{2} \cot \theta - \sqrt{3} \cos \theta}$$

$$= \frac{\sqrt{3} \times \frac{\sqrt{3}}{\sqrt{2}} \times \frac{1}{\sqrt{2}}}{\sqrt{2} \times \sqrt{2} - \sqrt{3} \times \frac{\sqrt{2}}{\sqrt{3}}}$$

$$= \frac{\frac{3+1}{\sqrt{2}}}{2 - \sqrt{2}} = \frac{2\sqrt{2}}{\sqrt{2}(\sqrt{2}-1)} = 2(\sqrt{2}+1)$$

6. (C) $(1 + \cot^2\theta)(1 + \tan^2\theta) \times (\sin\theta - \cosec\theta)(\cos\theta - \sec\theta)$

$$\cosec^2\theta \sec^2\theta \left(\frac{-\cos^2\theta}{\sin\theta} \right) \left(\frac{-\sin^2\theta}{\cos\theta} \right)$$

$$= \frac{1}{\sin\theta \cos\theta} = \sec\theta \cosec\theta$$

7. (B) $\frac{(1 + \sec\theta \cdot \cosec\theta)^2 (\sec\theta - \tan\theta)^2 (1 + \sin\theta)}{(\sin\theta + \sec\theta)^2 + (\cos\theta + \cosec\theta)^2}$

$$= \frac{\left(1 + \frac{1}{\sin\theta \cos\theta}\right)^2 \cdot \left(\frac{1 - \sin\theta}{\cos\theta}\right)^2 (1 + \sin\theta)}{\left(\frac{\sin\theta \cos\theta + 1}{\cos\theta}\right)^2 + \left(\frac{\sin\theta \cdot \cos\theta + 1}{\sin\theta}\right)^2}$$

$$= \frac{\left(\frac{(\sin\theta \cos\theta + 1)^2}{(\sin\theta \cos\theta)^2}\right) \cdot \frac{(1 - \sin\theta)^2}{\cos^2\theta} (1 + \sin\theta)}{(\sin\theta \cdot \cos\theta + 1)^2 \left[\frac{1}{\cos^2\theta} + \frac{1}{\sin^2\theta} \right]}$$

$$= \frac{(1 - \sin\theta)(1 - \sin^2\theta)}{\cos^2\theta \cdot (\sin\theta \cos\theta)^2}$$

$$= \frac{\sin^2\theta + \cos^2\theta}{(\sin\theta \cdot \cos\theta)^2}$$

$$= \frac{(1 - \sin\theta) \cdot \cos^2\theta}{\cos^2\theta}$$

$$= 1 - \sin\theta$$

8. (D) $\frac{1 + \cos\theta - \sin\theta}{\sin\theta(1 + \cos\theta)} \times \frac{\sqrt{\sec^2\theta + \cosec^2\theta}}{\tan\theta + \cos\theta}$

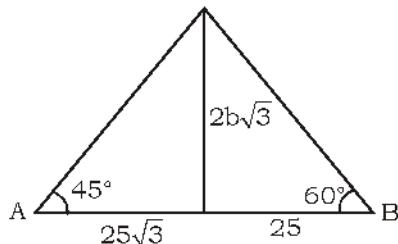
$$\frac{\cos^2\theta + \cos\theta}{\sin\theta(1 + \cos\theta)} \times \frac{\sqrt{\frac{1}{\sin^2\theta \cos^2\theta}}}{\frac{\sec^2\theta}{\tan\theta}}$$

$$\frac{\cos\theta(1 + \cos\theta)}{\sin\theta(1 + \cos\theta)} \times \frac{\tan\theta}{\sin\theta \cos\theta \cdot \sec^2\theta}$$

$$\cot\theta \times \frac{\cot\theta}{\cot\theta}$$

$$= \cot\theta$$

9. (C)



Distance b/w A and B $\rightarrow 25\sqrt{3} + 25$

$$= 25(\sqrt{3} + 1) = 25 \times 2.732 = 68.3$$

10. (B) $\frac{4\tan^2 30 + \sin^2 30 \cos^2 45 + \sec^2 48 - \cot^2 42}{\cos 37 \sin 53 + \sin 37 \cos 53 + \tan 18 \tan 72}$

$$= \frac{4 \times \frac{1}{3} + \frac{1}{4} \times \frac{1}{2} + 1}{1+1+0} = \frac{59}{48}$$

11. (D) $\frac{3(\cosec^2 26^\circ - \tan^2 64^\circ)}{\cot(22^\circ - \theta) - \cosec^2(62^\circ + \theta)}$
 $- \tan(\theta + 68^\circ) + \tan^2(28^\circ - \theta)}$

$$= \frac{3(\sec^2 64^\circ - \tan^2 64^\circ) + (\tan^2 48^\circ - \sec^2 48^\circ)}{\cot(22^\circ - \theta) - \sec^2(28^\circ - \theta)}$$

$$= \frac{3-1}{-1} = -2$$

12. (B) $\cos\theta = \frac{12}{13}, \sin\theta = \frac{5}{13}, \tan\theta = \frac{5}{12}$

$$\frac{\sin\theta(1 - \tan\theta)}{\tan\theta(1 + \cosec\theta)} = \frac{\frac{5}{13}\left(1 - \frac{5}{12}\right)}{\frac{5}{12}\left(1 + \frac{13}{5}\right)}$$

$$= \frac{\frac{5}{13} \times \frac{7}{12}}{\frac{5}{12} \times \frac{18}{5}} = \frac{35 \times 12}{12 \times 13 \times 18} = \frac{35}{234}$$

13. (A) $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{1}{7} \Rightarrow \frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{7}{1}$
 applying c & d rule

$$\Rightarrow \frac{\sec\theta}{\tan\theta} = \frac{8}{6} = \frac{4}{3}$$

$$\Rightarrow \frac{1 \times \cos\theta}{\cos\theta \times \sin\theta} = \frac{4}{3}$$

$$\Rightarrow \sin\theta = \frac{3}{4} \quad \tan\theta = \frac{3}{\sqrt{7}}$$

$$\frac{\cosec\theta + \cot^2\theta}{\cosec\theta - \cot^2\theta} = \frac{\frac{4}{3} + \frac{9}{4}}{\frac{4}{3} - \frac{9}{7}} = \frac{12 + 7}{12 - 7} = \frac{19}{5}$$

14. (D) $\frac{\tan^6\theta - \sec^6\theta + 3 \sec^2\theta \tan^2\theta}{\tan^2\theta + \cot^2\theta + 2}$

Put $\theta = 45^\circ$

$$= \frac{1 - (\sqrt{2})^6 + 3(\sqrt{2})^2 \times 1}{1+1+2}$$

$$= \frac{1-8+6}{4} = \frac{-1}{4}$$

Checking by options at $\theta = 45^\circ$
 $= -\cos^2 45^\circ \cdot \sin^2 45^\circ$

$$= -\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{-1}{4}$$

$$\begin{aligned} 15. (B) & \frac{\cos^4 \theta - \sin^4 \theta + 2 \sin^2 \theta + 3}{(\cosec \theta + \cot \theta + 1)(\cosec \theta - \cot \theta + 1) - 2} \\ &= \frac{(\cos^2 \theta - \sin^2 \theta)(\cos^2 \theta + \sin^2 \theta) + 2 \sin^2 \theta + 3}{(\cosec \theta + 1)^2 - \cot^2 \theta - 2} \\ &= \frac{\cos^2 \theta - \sin^2 \theta + 2 \sin^2 \theta + 3}{\cosec^2 \theta + 1 + 2 \cosec \theta - \cot^2 \theta - 2} \\ &= \frac{\cos^2 \theta + \sin^2 \theta + 3}{1 + \cot^2 \theta + 1 + 2 \cosec \theta - \cot^2 \theta - 2} \\ &= \frac{4}{2 \cosec \theta} = 2 \sin \theta \end{aligned}$$

$$16. (D) \frac{(1 - \sin \theta + \cos \theta)^2 (1 - \cos \theta) \sec^3 \theta \cosec^2 \theta}{(\sec \theta - \tan \theta)(\tan \theta + \cot \theta)}$$

Put $\theta = 45^\circ$

$$= \frac{(1)\left(1 - \frac{1}{\sqrt{2}}\right) \times 2\sqrt{2} \times 2}{(\sqrt{2}-1)(1+1)} = \frac{4\sqrt{2}}{\sqrt{2} \times 2} = 2$$

by options at $\theta = 45^\circ$, $2\tan \theta = 2$

$$17. (D) \frac{(\cos 9^\circ + \cos 9^\circ)(\sec 9^\circ + \sec 9^\circ)}{(\sec^2 19^\circ - \tan^2 19^\circ) + (\cos^2 15^\circ + \sin^2 15^\circ)}$$

$$= \frac{2\cos 9^\circ \sec 9^\circ}{1+1} = 2$$

$$18. (D) \frac{\sin^2 \theta}{\cos^2 \theta - 3 \cos \theta + 2} = 1$$

$$\Rightarrow \sin^2 \theta = \cos^2 \theta - 3 \cos \theta + 2$$

$$1 - \cos^2 \theta = \cos^2 \theta - 3 \cos \theta + 2$$

$$\Rightarrow 2\cos^2 \theta - 3 \cos \theta + 1 = 0$$

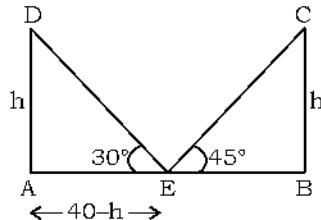
$$\Rightarrow 2\cos^2 \theta - 2 \cos \theta - \cos \theta + 1 = 0$$

$$\Rightarrow 2\cos \theta(\cos \theta - 1) - 1(\cos \theta - 1) = 0$$

$$\Rightarrow (\cos \theta - 1)(2\cos \theta - 1) = 0$$

$$\Rightarrow \cos \theta = \frac{1}{2} \Rightarrow \cos \theta = 60^\circ$$

19. (C)



$$BC = BE$$

$$\text{then } AE = 40 - h$$

In $\triangle DAE$

$$\frac{AD}{AE} = \tan \theta$$

$$\frac{h}{40-h} = \tan 30^\circ$$

$$\frac{h}{40-h} = \frac{1}{\sqrt{3}}$$

$$\sqrt{3}h = 40 - h$$

$$\sqrt{3}h + h = 40$$

$$h = \frac{40}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$$

$$AE = 20(3 - \sqrt{3})$$

$$20. (B) \frac{(1 - 2\sin^2 \cos^2 \theta)(\cot \theta + 1) \cos \theta}{(\sin^2 \theta + \cos^2 \theta)(1 + \tan \theta) \cosec \theta} - 1$$

$$\because \sin^2 \theta + \cos^2 \theta = (\sin^2 \theta)^2 + (\cos^2 \theta)^2 + 2\sin^2 \theta \cos^2 \theta - 2\sin^2 \theta \cos^2 \theta$$

[Adding and subtracting $2 \sin^2 \theta \cos^2 \theta$]

$$(\sin^2 \theta + \cos^2 \theta)^2 - 2\sin^2 \theta \cos^2 \theta = 1 - 2 \sin^2 \theta \cos^2 \theta$$

$$\frac{(1 - 2\sin^2 \theta \cos^2 \theta)\left(\frac{\cos \theta}{\sin \theta} + 1\right) \cos \theta}{(1 - 2\sin^2 \theta \cos^2 \theta)\left(1 + \frac{\sin \theta}{\cos \theta}\right) \cosec \theta} - 1$$

$$\left(\frac{\cos^2 \theta}{\sin \theta \times \frac{1}{\sin \theta}} \right) - 1 = \cos^2 \theta - 1$$

$$= -\sin^2 \theta$$

(SSC CGL MAINS – 2019)

23. If $\sin\theta + \sin^2\theta = 1$, then the value of $\cos^2\theta + \cos^4\theta$ is equal to :
यदि $\sin\theta + \sin^2\theta = 1$ है, तो $\cos^2\theta + \cos^4\theta$ का मान ज्ञात कीजिए।
(A) 0 (B) $\frac{1}{2}$ (C) 5 (D) 1
24. If $\sin(x+y) = \cos(x-y)$, then the value of \cos^2x is :
यदि $\sin(x+y) = \cos(x-y)$ है, तो \cos^2x का मान ज्ञात कीजिए।
(A) 5 (B) 3 (C) $\frac{1}{2}$ (D) $\frac{1}{4}$
25. If $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$, where $0^\circ < \theta < 90^\circ$ then the value of θ is :
यदि $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$, जहाँ $0^\circ < \theta < 90^\circ$ है, तो θ का मान ज्ञात कीजिए।
(A) 50° (B) 60°
(C) 30° (D) 45°
26. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 2 \frac{51}{79}$, then the value of $\sin\theta$ is equal to :
यदि $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 2 \frac{51}{79}$ है, $\sin\theta$ का मान ज्ञात कीजिए।
(A) $\frac{65}{144}$ (B) $\frac{35}{72}$ (C) $\frac{91}{144}$ (D) $\frac{39}{72}$
27. If $\sec\theta + \tan\theta = 3$, then the value of $\sec\theta$ is :
यदि $\sec\theta + \tan\theta = 3$ है, तो $\sec\theta$ का मान ज्ञात कीजिए।
(A) $\frac{5}{3}$ (B) $\frac{4}{3}$ (C) $\frac{3}{5}$ (D) $\frac{3}{4}$
28. If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then the value of $3\cos^2\alpha - 2\sin^2\beta$ is equal to :
यदि $\alpha + \beta = 90^\circ$ और $\alpha = 2\beta$ है, तो $3\cos^2\alpha - 2\sin^2\beta$ का मान ज्ञात कीजिए।
(A) $\frac{1}{4}$ (B) $\frac{3}{2}$ (C) $\frac{4}{3}$ (D) $\frac{3}{4}$
29. If $\operatorname{cosec}39^\circ = x$, then the value of $\frac{1}{\operatorname{cosec}^2 51^\circ} + \sin^2 39^\circ + \tan^2 51^\circ - \frac{1}{\sin^2 51^\circ \operatorname{sec}^2 39^\circ}$ is :
यदि $\operatorname{cosec}39^\circ = x$ है, तो $\frac{1}{\operatorname{cosec}^2 51^\circ} + \sin^2 39^\circ + \tan^2 51^\circ - \frac{1}{\sin^2 51^\circ \operatorname{sec}^2 39^\circ}$ का मान ज्ञात कीजिए।
(A) $\sqrt{x^2 - 1}$ (B) $\sqrt{1 - x^2}$
(C) $1 - x^2$ (D) $x^2 - 1$
30. If $3\sin x + 4\cos x = 2$, then the value of $3\cos x - 4\sin x$ is equal to :
यदि $3\sin x + 4\cos x = 2$ है, तो $3\cos x - 4\sin x$ का मान ज्ञात कीजिए।
(A) $\sqrt{21}$ (B) $\sqrt{23}$
(C) 21 (D) $\sqrt{29}$

Solution

1.(A) Put $\theta = 45^\circ$

$$\frac{\sec^2 45(2 + \tan^2 45 + \cot^2 45) + (\sin^2 45 + \tan^2 45)}{(\operatorname{cosec}^2 45 + \sec^2 45)(1 + \cot^2 45)^2}$$

$$= \frac{2 \times 4(-2)}{4 \times 4} = -1$$

2.(D) $\sin 3A = \cos(A + 10^\circ)$
 $\cos(90^\circ - 3A) = \cos(A + 10^\circ)$
 $90^\circ - 3A = A + 10^\circ$
 $A = 20^\circ$

$$2\operatorname{cosec}30^\circ + 6\sin^2 60^\circ - \frac{3}{2} \tan^2 60^\circ$$

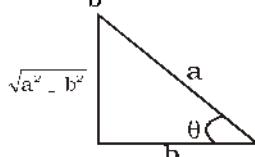
$$2 \times 2 + 6 \times \left(\frac{\sqrt{3}}{2}\right)^2 - \frac{3}{2}(\sqrt{3})^2$$

$$4 + 6 \times \frac{3}{4} - \frac{3 \times 3}{2} = 4$$

3.(D) $\cos A \left(\frac{1 - \cos^2 A}{\cos A} \right) \times \left(\frac{\cos A}{\sin A} + \frac{\sin A}{\cos A} \right)$
 $\sin^2 A \times \left(\frac{\cos^2 A + \sin^2 A}{\sin A \cos A} \right)$

4.(C) $\frac{\sin A}{\cos A} = \tan A$

$\sec \theta = \frac{a}{b}$



$$\tan \theta = \frac{\sqrt{a^2 - b^2}}{b} \quad \sin \theta = \frac{\sqrt{a^2 - b^2}}{a}$$

$$\frac{1 - \tan^2 \theta}{2 - \sin^2 \theta} = \frac{1 - \frac{a^2 - b^2}{b^2}}{2 - \frac{a^2 - b^2}{a^2}} = \frac{(b^2 - a^2 + b^2)a^2}{(2a^2 - a^2 + b^2)b^2}$$

$$= \frac{(2b^2 - a^2)a^2}{(a^2 + b^2)b^2}$$

5.(B) $\frac{\sin \theta [\tan \theta - \tan^2 \theta + \sec^2 \theta]}{(1 - \sin \theta) \sin \theta (1 + \tan \theta) \left(\frac{1 + \sin \theta}{\cos \theta}\right)}$

$$\frac{\sin \theta (\tan \theta + 1) \cos^2 \theta}{(1 - \sin \theta) \sin \theta (1 + \sin \theta) (1 + \tan \theta)}$$

$$= \frac{\cos^2 \theta}{1 - \sin^2 \theta} = \frac{\cos^2 \theta}{\cos^2 \theta} = 1$$

$$\frac{(\cos^2 \theta)^3 + (\sin^2 \theta)^3 + 3 \sin^2 \theta \cos^2 \theta}{\frac{1}{\sin \theta \cos \theta} [(\sin \theta + \cos \theta)^2 - 1]}$$

$$\frac{(\cos^2 \theta + \sin^2 \theta)[(\cos^2 \theta + \sin^2 \theta - \cos^2 \theta \sin^2 \theta) + 3 \sin^2 \theta \cos^2 \theta]}{\sin^2 \theta + \cos^2 \theta + 2 \sin \theta \cos \theta - 1}$$

$$\frac{\cos^4 \theta + \sin^4 \theta + 2 \sin^2 \theta \cos^2 \theta}{1 + 2 \sin \theta \cos \theta - 1}$$

$$= \frac{(\cos^2 \theta + \sin^2 \theta)^2}{2} = \frac{1}{2}$$

7.(D)

$$\text{Put } \theta = 45^\circ$$

$$\left(\frac{1}{\cos 45^\circ} - \frac{1}{\sin 45^\circ}\right) + \frac{1}{\cosec 45^\circ - \cot 45^\circ}$$

$$- \frac{1}{\sec 45^\circ + \tan 45^\circ}$$

$$(\sqrt{2} - \sqrt{2}) + \frac{1}{\sqrt{2} - 1} - \frac{1}{\sqrt{2} + 1}$$

$$= \frac{\sqrt{2} + 1 - \sqrt{2} + 1}{(\sqrt{2})^2 - (1)^2} = 2$$

$$\sec \theta \cosec \theta \Rightarrow \sec 45 \cosec 45 = \sqrt{2} \cdot \sqrt{2} = 2$$

8.(D) $\frac{\cosec^2 30 \sin^2 45 + \sec^2 60}{\tan 60 \cosec^2 45 - \sec^2 60 \tan 45}$

$$\frac{(2)^2 \left(\frac{1}{\sqrt{2}}\right)^2 + (2)^2}{\sqrt{3}(\sqrt{2})^2 - (2)^2(1)}$$

$$= \frac{4 \times \frac{1}{2} + 4}{\sqrt{3} \times 2 - 4} = \frac{6}{2\sqrt{3} - 4} = \frac{3}{\sqrt{3} - 2} \times \frac{\sqrt{3} + 2}{\sqrt{3} + 2}$$

$$= \frac{3(\sqrt{3} + 2)}{3 - 4} = -3(2 + \sqrt{3})$$

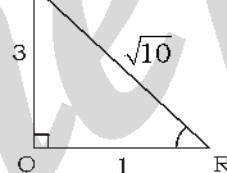
9.(D) $\frac{2 \sin^2 38 \sec^2 52 + \cos 64 \sin 26 + \sin^2 64}{\tan^2 23 + \cot^2 23 - \sec^2 67 - \cosec^2 67}$

$$\frac{2 \sin^2 38 \cosec^2 38 + \cos^2 64 + \sin^2 64}{\tan^2 23 + \cot^2 23 - \cosec^2 23 - \sec^2 23}$$

$$= - \frac{2+1}{[(\sec^2 23 - \tan^2 23)] + [(\cosec^2 23 - \cot^2 23)]}$$

$$= - \frac{3}{[1+1]} = \frac{-3}{2}$$

10.(B)



$$\cos R = \frac{1}{\sqrt{10}} \quad \sin R = \frac{3}{\sqrt{10}}$$

$$\cosec R = \frac{\sqrt{10}}{3} \quad \sec P = \frac{\sqrt{10}}{3}$$

$$\sin P = \frac{1}{\sqrt{10}} \quad \cosec P = \frac{\sqrt{10}}{1}$$

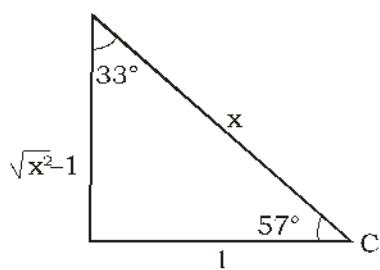
$$\frac{\sec P (\cos R + \sin P)}{\cosec R (\sin R - \cosec P)}$$

$$= \frac{\sqrt{10} \left(\frac{1}{\sqrt{10}} + \frac{1}{\sqrt{10}} \right)}{\sqrt{10} \left(\frac{3}{\sqrt{10}} - \frac{\sqrt{10}}{1} \right)} = \frac{\sqrt{10} \left(\frac{2}{\sqrt{10}} \right)}{\sqrt{10} \left(\frac{3-10}{\sqrt{10}} \right)}$$

$$= \frac{2}{3-10} = \frac{2}{-7}$$

 11.(A) $x = \sec 57^\circ$

$$\cot^2 33^\circ + \sin^2 57^\circ + \sin^2 33^\circ + \cosec^2 57^\circ \cos^2 33^\circ + \sec^2 33^\circ \sin^2 57^\circ$$



$$\begin{aligned} & x^2 + 1 + \frac{x^2 - 1}{x^2} + \frac{1}{x^2} + \frac{x^2}{x^2 - 1} \times \frac{x^2 - 1}{x^2} + \frac{x^2}{x^2 - 1} \times \frac{x^2 - 1}{x^2} \\ & = x^2 + 2 \end{aligned}$$

12.(A) $(\tan^2 A + \cot^2 A - 2) - \frac{1}{\cos^2 A} \times \frac{1}{\sin^2 A}$
Let $A = 45^\circ$

$$(1+1-2) - \frac{1}{\left(\frac{1}{2}\right)} \times \frac{1}{\left(\frac{1}{2}\right)}$$

$$0 - 4 = -4$$

13.(B) $\frac{5 \times \frac{1}{4} + 4 \times \frac{4}{3} - 1}{3 - \frac{1}{4} - \frac{1}{2}} = \frac{15 + 64 - 12}{9} = \frac{67}{27}$

14.(D) $\cos(2\theta + 54^\circ) = \sin\theta = \cos(90^\circ - \theta)$

$$2\theta + 54^\circ = 90^\circ - \theta$$

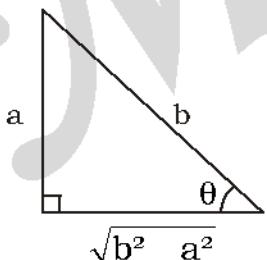
$$3\theta = 36^\circ$$

$$\theta = 12^\circ$$

$$= \frac{1}{\tan 60^\circ + \csc 30^\circ} = \frac{1}{\sqrt{3} + 2}$$

$$= \frac{2 - \sqrt{3}}{(\sqrt{3} + 2)(2 - \sqrt{3})} = 2 - \sqrt{3}$$

15.(A)



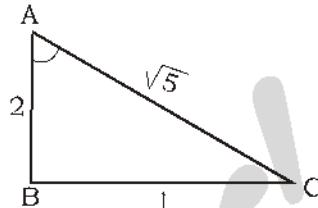
$$\begin{aligned} & \frac{\sqrt{3}\sqrt{b^2 - a^2}}{a} + 1 \\ & \frac{a}{a} + \frac{\sqrt{3}}{\sqrt{b^2 - a^2}} = \frac{\sqrt{3}\sqrt{b^2 - a^2} + a}{a(a + \sqrt{3}\sqrt{b^2 - a^2})} \\ & = \frac{\sqrt{b^2 - a^2}}{a} \end{aligned}$$

16. (C) $\theta = 45^\circ$

$$\frac{\frac{1}{2}}{\frac{1}{\sqrt{2}}\left(1+\frac{1}{\sqrt{2}}\right)} + \frac{1+\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}} = \frac{\frac{1}{2}}{\frac{1}{\sqrt{2}}\left(1+\frac{1}{\sqrt{2}}\right)} + \frac{1+\frac{1}{\sqrt{2}}}{\frac{1}{\sqrt{2}}} = \frac{\sqrt{2}-1}{1} + \sqrt{2} + 1 = 2\sqrt{2}$$

Put in options only C $2 \cdot \sec 45^\circ = 2\sqrt{2}$

17.(B)



$$\frac{\frac{1}{\sqrt{5}}\left(\frac{1}{\sqrt{5}} + \frac{2}{\sqrt{5}}\right)}{\frac{1}{\sqrt{5}}\left(\frac{2}{\sqrt{5}} - \frac{1}{\sqrt{5}}\right)} = \frac{3}{5} = 3$$

18. (A)

$$\begin{aligned} & \frac{\sin \theta + \cos \theta - 1}{\sin \theta - \cos \theta + 1} \times \sqrt{\frac{(1 + \sin \theta)(1 + \sin \theta)}{(1 - \sin \theta)(1 + \sin \theta)}} \\ & = \frac{\sin \theta + \cos \theta - 1}{\sin \theta - \cos \theta + 1} \times \frac{1 + \sin \theta}{\cos \theta} \\ & \theta = 45^\circ \\ & = \frac{\sqrt{2} - 1}{1} \times \frac{\sqrt{2} + 1}{1} \\ & = 2 - 1 = 1 \end{aligned}$$

19.(A)

$$\frac{\left(1 + \frac{\sin \theta}{\cos \theta} + \frac{1}{\cos \theta}\right)\left(1 + \frac{\cos \theta}{\sin \theta} - \frac{1}{\sin \theta}\right)}{\left(\frac{1}{\cos \theta} + \frac{\sin \theta}{\cos \theta}\right)(1 - \sin \theta)}$$

$$\frac{(\cos \theta + \sin \theta + 1)(\sin \theta + \cos \theta - 1)}{\cos \theta \sin \theta \frac{(1 + \sin \theta)}{\cos \theta} (1 - \sin \theta)}$$

$$\frac{\cos^2 \theta + \sin^2 \theta + 2 \sin \theta \cos \theta - 1}{\sin \theta (1 - \sin^2 \theta)}$$

$$\frac{2 \sin \theta \cos \theta}{\sin \theta \cos^2 \theta} = 2 \sec \theta$$

20.(A) Put $\theta = 45^\circ$

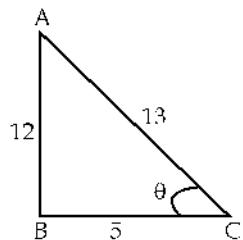
$$\frac{\sec 45^\circ(\sec 45^\circ + \tan 45^\circ)(1 - \sin 45^\circ)}{(\csc 45^\circ - 1)\sin^2 45^\circ}$$

$$\frac{\sqrt{2}(\sqrt{2} + 1) \left(1 - \frac{1}{\sqrt{2}}\right)}{(2 - 1)\frac{1}{2}} = 2$$

$$\sec^2 45^\circ = 2$$

21.(A) $\sin^2 \theta + \csc^2 \theta + 2 + \cos^2 \theta + \sec^2 \theta + 2 = k + \tan^2 \theta + \cot^2 \theta$
 $5 + 1 + \tan^2 \theta + 1 + \cot^2 \theta = k + \tan^2 \theta + \cot^2 \theta$
 $k = 7$

22.(B)



$$\tan^2 \theta + \sec^2 \theta = \frac{144}{25} + \frac{169}{25}$$

$$= \frac{313}{25}$$

23.(D) $\sin \theta = 1 - \sin^2 \theta$
 $\sin \theta = \cos^2 \theta$

$$\sin^2 \theta = \cos^4 \theta$$

$$\sin^2 \theta + \sin^4 \theta = 1$$

24.(C) $\sin(x + y) = \cos(x - y)$
 $x + y = 90^\circ - x + y$
 $2x = 90^\circ$
 $x = 45^\circ$

$$\cos^2 45^\circ = \frac{1}{2}$$

25.(B) $\frac{\cos^2 \theta}{\cos^2 \theta - \sin^2 \theta} = 3$

$$\frac{\sin^2 \theta}{1 - \sin^2 \theta} = 3$$

$$\frac{\sin^2 \theta}{\cos^2 \theta} = 3$$

$$\tan^2 \theta = 3$$

$$\tan \theta = \sqrt{3}$$

$$\theta = 60^\circ$$

26.(A) $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} = \frac{209}{79}$

$$= \frac{2 \sec \theta}{2 \tan \theta} = \frac{288}{130}$$

$$= \frac{1}{\sin \theta} = \frac{144}{65}$$

$$\sin \theta = \frac{65}{144}$$

27.(A) $\sec \theta + \tan \theta = 3$

$$\sec \theta - \tan \theta = \frac{1}{3}$$

$$2 \sec \theta = 3 + \frac{1}{3} = \frac{10}{3}$$

$$\sec \theta = \frac{5}{3}$$

28.(A) $\alpha + \beta = 90^\circ$

$$\alpha = 2\beta$$

$$3\beta = 90^\circ$$

$$\beta = 30^\circ$$

$$\alpha = 60^\circ$$

$$3 \cos^2 60^\circ - 2 \sin^2 30^\circ$$

$$3 \times \frac{1}{4} - 2 \times \frac{1}{4}$$

$$= \frac{1}{4}$$

29.(D) $\frac{1}{\csc^2 51^\circ} + \sin^2 39^\circ + \tan^2 51^\circ -$

$$\frac{1}{\sin^2 51^\circ \cdot \sec^2 39^\circ}$$

$$= \sin^2 51^\circ + \cos^2 51^\circ + \tan^2 51^\circ -$$

$$\frac{1}{\sin^2 51^\circ \cdot \csc^2 51^\circ}$$

$$1 + \tan^2 51^\circ - 1$$

$$= \tan^2 51^\circ$$

$$= \csc^2 39^\circ = x$$

$$\tan 51^\circ = \sqrt{x^2 - 1}$$

$$\tan^2 51^\circ = (\sqrt{x^2 - 1})^2 = (x^2 - 1)$$

30.(A) $3 \cos x - 4 \sin x = \sqrt{9 + 16 - 4}$

$$= \sqrt{21}$$

(SSC CGL MAINS – 2018)

1. If $\sin\theta = \sqrt{3} \cos\theta$, $0^\circ < \theta < 90^\circ$, then the value of $2\sin^2\theta + \sec^2\theta + \sin\theta \sec\theta + \operatorname{cosec}\theta$ is :

यदि $\sin\theta = \sqrt{3} \cos\theta$, $0^\circ < \theta < 90^\circ$ है, तो $2\sin^2\theta + \sec^2\theta + \sin\theta \sec\theta + \operatorname{cosec}\theta$ का मान है ?

(A) $\frac{33+10\sqrt{3}}{6}$ (B) $\frac{19+10\sqrt{3}}{6}$

(C) $\frac{33+10\sqrt{3}}{3}$ (D) $\frac{19+10\sqrt{3}}{3}$

2. The value of the expression $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2)$ is :

व्यंजक $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2)$ निम्न में से किसके बराबर है ?

(A) 0 (B) -1
(C) -3 (D) 1

3. $\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$ is equal to :

$\frac{(2\sin A)(1+\sin A)}{1+\sin A+\cos A}$ का मान निम्न में से किसके बराबर है ?

(A) $1 + \sin A - \cos A$ (B) $1 - \sin A \cos A$
(C) $1 + \cos A - \sin A$ (D) $1 + \sin A \cos A$

4. The value of $\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ \operatorname{cosec} 65^\circ}$ is :

$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ \operatorname{cosec} 65^\circ}$ का मान है :

(A) 4 (B) $\frac{1}{2}$ (C) 2 (D) $\frac{1}{4}$

5. If θ lies in the first quadrant and $\cos^2\theta - \sin^2\theta = \frac{1}{2}$, then the value of $\tan^2 2\theta + \sin^2 3\theta$ is :

यदि θ प्रथम चतुर्थांश में है तथा $\cos^2\theta - \sin^2\theta = \frac{1}{2}$ है, तो $\tan^2 2\theta + \sin^2 3\theta$ का मान है :

(A) $\frac{7}{2}$ (B) 3 (C) 4 (D) $\frac{4}{3}$

6. What is the value of $\operatorname{cosec}(65^\circ + \theta) - \sec(25^\circ - \theta) + \tan^2 20^\circ - \operatorname{cosec}^2 70^\circ$?

$\operatorname{cosec}(65^\circ + \theta) - \sec(25^\circ - \theta) + \tan^2 20^\circ - \operatorname{cosec}^2 70^\circ$ का मान है :

(A) 0 (B) 1
(C) 2 (D) -1

7. $\frac{(1+\cos\theta)^2 + \sin^2\theta}{(\operatorname{cosec}^2\theta - 1)\sin^2\theta}$ is equal to:-

$\frac{(1+\cos\theta)^2 + \sin^2\theta}{(\operatorname{cosec}^2\theta - 1)\sin^2\theta}$ का मान है

(A) $\cos\theta(1 + \sin\theta)$ (B) $2\cos\theta(1 + \sec\theta)$
(C) $\sec\theta(1 + \sin\theta)$ (D) $2\sec\theta(1 + \sec\theta)$

8. $\left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2 + 1$ is equals to—

$\left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2 + 1$ निम्न में से किसके बराबर है ?

(A) $\operatorname{cosec}^2\theta$ (B) $\sec^2\theta$
(C) $\sin^2\theta$ (D) $\cos^2\theta$

9. $\sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}}$ is equal to :

$\sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}}$ निम्न में से किसके बराबर है ?

(A) $\sec\theta + \tan\theta$ (B) $1 + \sec\theta + \tan\theta$
(C) $1 - \sec\theta + \tan\theta$ (D) $\sec\theta - \tan\theta$

10. If $5\sin\theta - 4\cos\theta = 0$, $0^\circ < \theta < 90^\circ$, then the value

of $\frac{5\sin\theta - 2\cos\theta}{5\sin\theta + 3\cos\theta}$ is :

यदि $5\sin\theta - 4\cos\theta = 0$, $0^\circ < \theta < 90^\circ$ है, तो

$\frac{5\sin\theta - 2\cos\theta}{5\sin\theta + 3\cos\theta}$ का मान है :

(A) $\frac{3}{8}$ (B) $\frac{3}{7}$ (C) $\frac{2}{7}$ (D) $\frac{5}{8}$

11. From the top of a tower, the angles of depression of two objects on the ground on the same side of it, are observed to be 60° and 30° respectively and the distance between the objects

is $400\sqrt{3}$ m. The height (in m) of the tower is :

एक मीनार के शीर्ष से दो वस्तुओं का अवनमन कोण, भूमि पर उसके समान किनारे पर क्रमशः 60° और 30° पाए जाते हैं और दोनों वस्तुओं के बीच की दूरी $400\sqrt{3}$ m मापी जाती है। मीनार की ऊँचाई (मीटर में) है :

(A) 800 (B) $800\sqrt{3}$
(C) 600 (D) $600\sqrt{3}$

- 12.** The value of $\left(\frac{\sin A}{1-\cos A} + \frac{1-\cos A}{\sin A} \right) \div \left(\frac{\cot^2 A}{1+\operatorname{cosec} A} + 1 \right)$ is :
- $$\left(\frac{\sin A}{1-\cos A} + \frac{1-\cos A}{\sin A} \right) \div \left(\frac{\cot^2 A}{1+\operatorname{cosec} A} + 1 \right)$$
- (A) $\frac{3}{2}$ (B) $\frac{1}{2}$ (C) 1 (D) 2
- 13.** If $\frac{1+\sin \phi}{1-\sin \phi} = \frac{p^2}{q^2}$ then $\sec \phi$ is equal to :
- यदि $\frac{1+\sin \phi}{1-\sin \phi} = \frac{p^2}{q^2}$ है, तो $\sec \phi$ निम्नलिखित में से किसके बराबर है :
- (A) $\frac{2p^2 q^2}{p^2 + q^2}$ (B) $\frac{1}{2} \left(\frac{q}{p} + \frac{p}{q} \right)$
 (C) $\frac{1}{p^2} + \frac{1}{q^2}$ (D) $\frac{p^2 q^2}{p^2 + q^2}$
- 14.** The value of $\frac{\sec \phi (1-\sin \phi)(\sin \phi + \cos \phi)(\sec \phi + \tan \phi)}{\sin \phi (1+\tan \phi) + \cos \phi (1+\cot \phi)}$ is equal to :
- $$\frac{\sec \phi (1-\sin \phi)(\sin \phi + \cos \phi)(\sec \phi + \tan \phi)}{\sin \phi (1+\tan \phi) + \cos \phi (1+\cot \phi)}$$
- का मान निम्नलिखित में से किसके बराबर है ?
- (A) $2\cos \phi$ (B) $\operatorname{cosec} \phi \sec \phi$
 (C) $2\sin \phi$ (D) $\sin \phi \cos \phi$
- 15.** If $3(\cot^2 \phi - \cos^2 \phi) = \cos^2 \phi$, $0^\circ < \phi < 90^\circ$, then the value of $(\tan^2 \phi + \operatorname{cosec}^2 \phi + \sin^2 \phi)$ is :
- यदि $3(\cot^2 \phi - \cos^2 \phi) = \cos^2 \phi$, $0^\circ < \phi < 90^\circ$ है, तो $(\tan^2 \phi + \operatorname{cosec}^2 \phi + \sin^2 \phi)$ का मान है :
- (A) $\frac{13}{3}$ (B) $\frac{61}{12}$ (C) $\frac{25}{12}$ (D) $\frac{15}{4}$
- 16.** If $\frac{\sin^2 \phi - 3\sin \phi + 2}{\cos^2 \phi} = 1$, where $0^\circ < \phi < 90^\circ$, then what is the value of $(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$?
- यदि $\frac{\sin^2 \phi - 3\sin \phi + 2}{\cos^2 \phi} = 1$ है, जिसमें $0^\circ < \phi < 90^\circ$ है, तो $(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$ का मान क्या है ?
- (A) $\frac{2+2\sqrt{3}}{3}$ (B) $\frac{3+4\sqrt{3}}{6}$
 (C) $\frac{9+4\sqrt{3}}{6}$ (D) $\frac{3+2\sqrt{3}}{3}$
- 17.** The value of $\frac{\sin(78^\circ + \phi) - \cos(12^\circ - \phi) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$ is :
- $$\frac{\sin(78^\circ + \phi) - \cos(12^\circ - \phi) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$$
- (A) 2 (B) -1
 (C) -2 (D) 0
- 18.** The value of $\sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi}$ is equal to :
- $$\sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi}$$
- का मान निम्नलिखित में से किसके बराबर है ?
- (A) $\operatorname{cosec} \phi$ (B) $\frac{1}{2}$ (C) $\sec \phi$ (D) 1
- 19.** From a point exactly midway between the foot of two towers P and Q, the angles of elevation of their tops are 30° and 60° , respectively. The ratio of the height of P to that of Q is :
- दो मीनार P और Q के आधार के बिल्कुल मध्य में, उनके शीर्ष की ऊंचाई के कोण क्रमशः 30° और 60° हैं। तो P और Q की ऊंचाईयों का अनुपात है :
- (A) 1 : 3 (B) 1 : 2
 (C) 1 : $2\sqrt{3}$ (D) 2 : $3\sqrt{3}$
- 20.** The value of $(\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$ is :
- $$(\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$$
- का मान है :
- (A) $20\frac{1}{2}$ (B) 21
 (C) $22\frac{1}{2}$ (D) 22
- 21.** If $\sec \theta + \tan \theta = p$, ($p > 1$) then $\frac{\operatorname{cosec} \theta + 1}{\operatorname{cosec} \theta - 1} = ?$
- यदि $\sec \theta + \tan \theta = p$, ($p > 1$) है, तो $\frac{\operatorname{cosec} \theta + 1}{\operatorname{cosec} \theta - 1} =$
- (A) $\frac{p+1}{p-1}$ (B) p^2
 (C) $\frac{p-1}{p+1}$ (D) $2p^2$

22. The value $\operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta) + \cos 15^\circ \cos 35^\circ \operatorname{cosec} 55^\circ \cos 60^\circ \operatorname{cosec} 75^\circ$ is :
 $\operatorname{cosec}(67^\circ + \theta) - \sec(23^\circ - \theta) + \cos 15^\circ \cos 35^\circ \operatorname{cosec} 55^\circ \cos 60^\circ \operatorname{cosec} 75^\circ$ का मान क्या है ?
 (A) 2 (B) 0 (C) 1 (D) $\frac{1}{2}$
23. If $2\cos^2\theta + 3\sin\theta = 3$, where $0^\circ < \theta < 90^\circ$, then what is the value of $\sin^2 2\theta + \cos^2 \theta + \tan^2 2\theta + \operatorname{cosec}^2 2\theta$?
 यदि $2\cos^2\theta + 3\sin\theta = 3$ जहाँ $0^\circ < \theta < 90^\circ$ है, तो $\sin^2 2\theta + \cos^2 \theta + \tan^2 2\theta + \operatorname{cosec}^2 2\theta$ का मान क्या होगा ?
 (A) $\frac{35}{12}$ (B) $\frac{29}{3}$ (C) $\frac{35}{6}$ (D) $\frac{29}{6}$
24. The value of $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \cos\theta + \sin\theta) \sec\theta$ = ?
 $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \cos\theta + \sin\theta) \sec\theta$ का मान क्या है ?
 (A) -2 (B) 2
 (C) $\sec\theta \operatorname{cosec}\theta$ (D) $\sin\theta \cos\theta$
25. The value of $\frac{\sec^2\theta}{\operatorname{cosec}^2\theta} + \frac{\operatorname{cosec}^2\theta}{\sec^2\theta} - (\sec^2\theta + \operatorname{cosec}^2\theta)$ is :
 $\frac{\sec^2\theta}{\operatorname{cosec}^2\theta} + \frac{\operatorname{cosec}^2\theta}{\sec^2\theta} - (\sec^2\theta + \operatorname{cosec}^2\theta)$ का मान क्या है ?
 (A) 0 (B) -2 (C) 2 (D) 1
26. The value of $\frac{2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)}{\cos^4\theta - \sin^4\theta - 2\cos^2\theta}$ is :
 $\frac{2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)}{\cos^4\theta - \sin^4\theta - 2\cos^2\theta}$ का मान क्या है ?
 (A) -1 (B) -2 (C) 2 (D) 1
27. The value of $\sin^2 64^\circ + \cos 64^\circ \sin 26^\circ + 2\cos 43^\circ \operatorname{cosec} 47^\circ$ is :
 $\sin^2 64^\circ + \cos 64^\circ \sin 26^\circ + 2\cos 43^\circ \operatorname{cosec} 47^\circ$ का मान क्या है ?
 (A) 4 (B) 1 (C) 2 (D) 3
28. The value of $\frac{(\sin\theta - \cos\theta)(1 + \tan\theta + \cot\theta)}{1 + \sin\theta \cos\theta}$ = ?
 $\frac{(\sin\theta - \cos\theta)(1 + \tan\theta + \cot\theta)}{1 + \sin\theta \cos\theta}$ का मान क्या है ?
 (A) $\sec\theta - \operatorname{cosec}\theta$ (B) $\operatorname{cosec}\theta - \sec\theta$
 (C) $\sin\theta + \cos\theta$ (D) $\tan\theta - \cot\theta$

29. The value of $\frac{\sin\theta + \cos\theta - 1}{\sin\theta - \cos\theta + 1} \times \frac{\tan^2\theta(\operatorname{cosec}^2\theta - 1)}{\sec\theta - \tan\theta}$ is :
 $\frac{\sin\theta + \cos\theta - 1}{\sin\theta - \cos\theta + 1} \times \frac{\tan^2\theta(\operatorname{cosec}^2\theta - 1)}{\sec\theta - \tan\theta}$ का मान क्या है ?
 (A) 0 (B) -1
 (C) 1 (D) $\frac{1}{2}$
30. P and Q are two points on the ground on either side of a pole. The angles of elevation of the top of the pole as observed from P and Q are 60° and 30° , respectively and the distance between them is $84\sqrt{3}$ m. What is the height (in m) of the pole ?
 एक खंभे के दोनों ओर आधार पर P और Q दो बिंदु हैं। P और Q के हिसाब से खंभे के शीर्ष के उन्नयन कोण क्रमशः 60° और 30° हैं तथा उनके बीच की दूरी $84\sqrt{3}$ मीटर है। खंभे की ऊँचाई (मीटर में) क्या है ?
 (A) 63 (B) 73.5 (C) 52.5 (D) 60
31. If $\frac{\sin\theta}{1 + \cos\theta} + \frac{1 + \cos\theta}{\sin\theta} = \frac{4}{\sqrt{3}}$, $0^\circ < \theta < 90^\circ$, then the value of $(\tan\theta + \sec\theta)^{-1}$ is :
 यदि $\frac{\sin\theta}{1 + \cos\theta} + \frac{1 + \cos\theta}{\sin\theta} = \frac{4}{\sqrt{3}}$, $0^\circ < \theta < 90^\circ$ है, तो $(\tan\theta + \sec\theta)^{-1}$ का मान क्या होगा ?
 (A) $2 - \sqrt{3}$ (B) $3 - \sqrt{2}$
 (C) $2 + \sqrt{3}$ (D) $3 + \sqrt{2}$

Solution

1. (A) $\tan\theta = \sqrt{3}$

$$\begin{aligned} \Rightarrow \theta &= 60^\circ \\ \Rightarrow 2\sin^2\theta + \sec^2\theta + \sin\theta \sec\theta + \cosec\theta \\ &= 2 \times \frac{3}{4} + 4 + \sqrt{3} + \frac{2}{\sqrt{3}} \\ &= \frac{9+24+6\sqrt{3}+4\sqrt{3}}{6} = \frac{33+10\sqrt{3}}{6} \end{aligned}$$

2. (C) $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2)$

$$\begin{aligned} &= ((\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta \cos^2\theta - 1) \left(\frac{1}{\sin\theta \cos\theta} \right)^2 \\ &= -3 \end{aligned}$$

3. (A) $\frac{(2\sin A)(1+\sin A)}{(1+\sin A+\cos A)} \times \frac{(1+\sin A-\cos A)}{(1+\sin A-\cos A)}$

$$\begin{aligned} &= \frac{(2\sin A)(1+\sin A)(1+\sin A-\cos A)}{1+\sin^2 A + 2\sin A - \cos^2 A} \\ &= \frac{(2\sin A)(1+\sin A)(1+\sin A-\cos A)}{(2\sin A)(1+\sin A)} \\ &= 1 + \sin A - \cos A \end{aligned}$$

4. (C) $\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \cosec 81^\circ)}{(\sin 56^\circ \sec 34^\circ + \cos 25^\circ \cosec 65^\circ)}$

$$= \frac{2\cos 9^\circ \times 2\sec 9^\circ}{\left(\frac{\sin 56^\circ}{\sin 56^\circ}\right) + \left(\frac{\cos 25^\circ}{\cos 25^\circ}\right)} = \frac{4}{2} = 2$$

5. (C) $\cos^2\theta - \sin^2\theta = \frac{1}{2}$

$$\begin{aligned} \Rightarrow 2\cos^2\theta &= \frac{3}{2} \\ \Rightarrow \cos\theta &= \frac{\sqrt{3}}{2} = \cos 30^\circ \\ \Rightarrow \theta &= 30^\circ \end{aligned}$$

So, $\tan^2 2\theta + \sin^2 30^\circ = 3 + 1 = 4$

6. (D) $\cosec(65 + \theta) - \sec(25 - \theta) + \tan^2 20^\circ - \cosec^2 70^\circ$
 $= \cosec(65 + \theta) - \cosec(65 + \theta) + \cos^2 70^\circ - \cosec^2 70^\circ$
 $= 0 - 1 = -1$

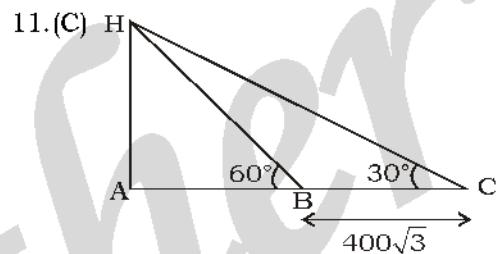
7. (D) $\frac{(1+\cos\theta)^2 + \sin^2\theta}{(\cosec^2\theta - 1)\sin^2\theta} = \frac{2(1+\cos\theta)}{\cos^2\theta}$
 $= 2\sec\theta(1 + \sec\theta)$

8. (B) $\frac{(1-\tan\theta)^2}{1-\cot\theta} + 1 = (-\tan\theta)^2 + 1 = \sec^2\theta$

9. (A) $\sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}} = \sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$
 $= \frac{1+\sin}{\cos\theta} = (\sec\theta + \tan\theta)$

10. (C) $5\sin\theta - 4\cos\theta = 0 \quad \tan\theta = \frac{4}{5}$

$$\text{So, } \frac{5\sin\theta - 2\cos\theta}{5\sin\theta + 3\cos\theta} = \frac{4-2}{4+3} = \frac{2}{7}$$



$BC = 400\sqrt{3}$

So, $AB = 200\sqrt{3}$

then $H = 200\sqrt{3} \times \sqrt{3} = 600 \text{ m}$

12. (D) Put $A = 90^\circ$
 $(1+1) \div (0+1)$

$$\frac{2}{1} = 2$$

13. (B) $\frac{2\sin\phi}{2} = \frac{P^2 - q^2}{P^2 + q^2}$

$$\sin\phi = \frac{P^2 - q^2}{P^2 + q^2}$$

$$\Rightarrow \sec\phi = \frac{p^2 + q^2}{2Pq} \Rightarrow \frac{1}{2} \left[\frac{q}{p} + \frac{p}{q} \right]$$

14. (D) Put $\phi = 45^\circ$

$$\frac{\frac{(\sqrt{2})(\sqrt{2}-1)}{\sqrt{2}}(\sqrt{2})(\sqrt{2}+1)}{\frac{1}{\sqrt{2}} \times 2 + \frac{1}{\sqrt{2}} \times 2} \Rightarrow \frac{\sqrt{2}}{2\sqrt{2}} = \frac{1}{2}$$

15. (B) $\cot^2\phi - \cos^2\phi = \frac{\cos^2\phi}{3}$ $\cot^2\phi = \frac{4\cos^2\phi}{3}$ $\sin^2\phi = \frac{3}{4}$ $\Rightarrow \phi = 60^\circ$ $\Rightarrow \tan^2 60^\circ + \cosec^2 60^\circ + \sin^2 60^\circ$ $3 + \frac{4}{3} + \frac{3}{4} \Rightarrow 3 + \frac{25}{12} \Rightarrow \frac{61}{12}$	22.(D) $\cosec(67 + \theta) - \sec(23 + \theta) + \cos 15 \cos 35$ $\cosec 55 \cos 60 \cosec 75^\circ$ $\Rightarrow 0 + \cos 15 \cos 35 \cosec 55 \cos 60 \cosec 75$ $0 + \cos 60 = \frac{1}{2}$
16. (C) $\sin^2\phi - 3\sin\phi + 2 = 1 - \sin^2\phi$ $2\sin^2\phi - 3\sin\phi + 1 = 0$ $\Rightarrow \phi = 30^\circ$ $\Rightarrow \cos 60^\circ + \sin 90^\circ + \cosec 60^\circ$ $\frac{1}{2} + 1 + \frac{2}{\sqrt{3}}$ $\frac{\sqrt{3} + 2\sqrt{3} + 4}{2\sqrt{3}} \Rightarrow \frac{4 + 3\sqrt{3}}{2\sqrt{3}} = \frac{9 + 4\sqrt{3}}{6}$	23.(C) $2\cos^2\theta + 3\sin\theta = 3 \quad 0 < \theta < 90$ $2 - 2\sin^2\theta + 3\sin\theta = 3$ $\Rightarrow 2\sin^2\theta - 3\sin\theta + 1 = 0$ $\Rightarrow \theta = 30^\circ$ $\Rightarrow \sin^2 60 + \cos^2 30 + \tan^2 60 + \cosec^2 60$ $\frac{3}{4} + \frac{3}{4} + 3 + \frac{4}{3} = \frac{3}{2} + 3 + \frac{4}{3} = \frac{9+18+8}{6} = \frac{35}{6}$
17. (B) $\frac{\sin(78^\circ + \phi) - \sin(78^\circ + \phi) + \tan^2 70^\circ - \sec^2 70^\circ}{\sin^2 25^\circ + \cos^2 25^\circ}$ $= \frac{-1}{1} = -1$	24.(B) $(1 + \cot\theta - \cosec\theta)(1 + \cos\theta + \sin\theta) \sec\theta$ $\text{Put } \theta = 45^\circ \quad (2 - \sqrt{2})(2 + \sqrt{2}) = 2$
18. (D) $\cosec\phi - \cot\phi + \left(\frac{1 - \cos\phi}{\sin\phi}\right)$ $= \frac{\cosec\phi - \cot\phi}{\cosec\phi - \cot\phi} = 1$	25.(B) $\text{Put } \theta = 30^\circ \quad 2$ $\text{Put } \theta = 45^\circ \quad 2$ $1 + 1 - 4 = -2$
19. (A) $x \tan 30 : x \tan 60$ $\frac{1}{\sqrt{3}} : \sqrt{3}$ $\Rightarrow 1 : 3$	26. (D) $\frac{2-3}{1-0-2} = \frac{-1}{-1} = 1$
20. (A) $(\tan^2 29 - \cosec^2 61) + \cot^2 54 - \sec^2 36 + 22 \frac{1}{2}$ $\Rightarrow (\cot^2 61 - \cosec^2 61) + \tan^2 36 - \sec^2 36 + 22 \frac{1}{2}$ $\Rightarrow -1 - 1 + 22 \frac{1}{2} \Rightarrow 20 \frac{1}{2}$	27. (D) $\sin^2 64 + \cos^2 64 + 2$ $\Rightarrow 1 + 2 = 3$
21. (B) $\sec\theta + \tan\theta = P$ $\Rightarrow \sec\theta - \tan\theta = \frac{1}{P} \Rightarrow 2\sec\theta = \frac{P^2 + 1}{P}$ $\Rightarrow \cos\theta = \frac{2P}{P^2 + 1} \Rightarrow \sin\theta = \frac{P^2 - 1}{P^2 + 1}$ $\Rightarrow \frac{\cosec\theta + 1}{\cosec\theta - 1} = \frac{\left(\frac{P^2 + 1}{P^2 - 1} + 1\right)}{\left(\frac{P^2 + 1}{P^2 - 1} - 1\right)} \Rightarrow \frac{2P^2}{2} = P^2$	28. (A) $\frac{(\sin\theta - \cos\theta)(1 + \tan\theta + \cot\theta)}{1 + \sin\theta \cos\theta}$ $\frac{(\sin\theta - \cos\theta)(\sin\theta \cos\theta + 1)}{\sin\theta \cos\theta(1 + \sin\theta \cos\theta)}$ $= \frac{\sin\theta - \cos\theta}{\sin\theta \cos\theta} = \sec\theta - \cosec\theta$
	29. (C) $\text{Put } \theta = 45^\circ$ $\left[\frac{(\sqrt{2}-1)}{1} \right] \times \frac{(1)}{(\sqrt{2}-1)} = 1$
	30. (A) Let height = h $\Rightarrow h(\cot 60 + \cot 30) = 84\sqrt{3}$ $h \times \frac{4}{\sqrt{3}} = 84\sqrt{3}$ $\Rightarrow h = 21 \times 3 = 63$
	31. (A) $\frac{\sin\theta(1-\cos\theta)+\sin\theta(1+\cos\theta)}{\sin^2\theta}$ $\frac{\sin\theta(1-\cos\theta)+\sin\theta(1+\cos\theta)}{\sin^2\theta} = \frac{4}{\sqrt{3}}$ $\frac{2}{\sin\theta} = \frac{4}{\sqrt{3}} = \theta = 60^\circ$ $(\tan 60 + \sec 60)^{-1}$ $= (\sqrt{3} + 2)^{-1} = 2 - \sqrt{3}$

(SSC CGL MAINS - 2017)

1. What is the value of $\frac{2(1 - \sin^2 \theta) \operatorname{cosec}^2 \theta}{\cot^2 \theta (1 + \tan^2 \theta)} - 1$?

$$\frac{2(1 - \sin^2 \theta) \operatorname{cosec}^2 \theta}{\cot^2 \theta (1 + \tan^2 \theta)} - 1 \text{ का मान क्या है?}$$

- (A) $\sin 2\theta$ (B) $\sin^2 \theta$
 (C) $\cos^2 \theta$ (D) $\cos 2\theta$

2. What is the value of $\cos 15^\circ - \cos 165^\circ$?
 $\cos 15^\circ - \cos 165^\circ$ का मान क्या है?

- (A) $\sqrt{3}\sqrt{2}$ (B) $2(\sqrt{3} - 1)$
 (C) $(\sqrt{3} + 1)\sqrt{2}$ (D) $\frac{(\sqrt{3} + 1)}{2}$

3. What is the value of

$$\frac{[1 + 2 \cot^2(90 - x) - 2 \operatorname{cosec}(90 - x) \cot(90 - x)]}{[\operatorname{cosec}(90 - x) - \cot(90 - x)]} ?$$

$$\frac{[1 + 2 \cot^2(90 - x) - 2 \operatorname{cosec}(90 - x) \cot(90 - x)]}{[\operatorname{cosec}(90 - x) - \cot(90 - x)]} \text{ का}$$

- मान क्या है?
 (A) $\cos x + \sin x$ (B) $\sin x - \cos x$
 (C) $\sec x + \tan x$ (D) $\sec x - \tan x$

4. What is the value of $\sin(180 - \theta) \sin(90 - \theta) - \left[\frac{\cot(90 - \theta)}{1 + \tan^2 \theta} \right]$

$$\sin(180 - \theta) \sin(90 - \theta) - \left[\frac{\cot(90 - \theta)}{1 + \tan^2 \theta} \right] \text{ का मान क्या है?}$$

- (A) $\cos^2 \theta \sin^2 \theta$ (B) $\frac{\cot \theta}{(1 + \cot^2 \theta)^2}$

- (C) $\frac{\tan \theta}{(1 + \tan^2 \theta)^2}$ (D) 0

5. A pole is standing on the top of a house. Height of house is 25 metres. The angle of elevation of the top of house from point P is 45° and the angle of elevation of the top of pole from P is 60° . Point P is on the ground level. What is the height (in metres) of pole?

एक घर की चोटी पर एक खम्भा खड़ा है। घर की ऊँचाई 25 मीटर है। बिन्दु P से घर की चोटी का उन्नयन कोण 45° है तथा P से खम्भे की चोटी का उन्नयन कोण 60° है। बिन्दु P भूमि की सतह पर है। खम्भे की ऊँचाई (मीटर में) क्या है?

- (A) $10(\sqrt{3} + 1)$ (B) $15(\sqrt{3} + 1)$
 (C) $25(\sqrt{3} - 1)$ (D) $20(\sqrt{3} - 1)$

6. A ladder is placed against a wall such that it just reaches the top of the wall. The foot of the ladder is at a distance of 5 metres from the wall. The angle of elevation of the top of the wall from the base of the ladder is 15° . What is the length (in metres) of the ladder?

एक सीढ़ी दीवार के सहरे इस प्रकार खड़ी है कि वह दीवार की चोटी तक पहुँचती है। सीढ़ी का आधार दीवार से 5 मीटर की दूरी है। सीढ़ी के आधार से दीवार की चोटी का उन्नयन कोण 15° है। सीढ़ी की लम्बाई (मीटर में) क्या है?

- (A) $5\sqrt{6} - 5\sqrt{3}$ (B) $5\sqrt{6} - 5\sqrt{2}$
 (C) $5\sqrt{2} - 1$ (D) $5\sqrt{3} - 5\sqrt{2}$

7. An aeroplane is flying horizontally at a height of 1.8 km above the ground. The angle of elevation of plane from point X is 60° and after 20 seconds, its angle of elevation from X is become 30° . If point X is on ground, then what is the speed (in km/hr) of aeroplane?

एक हवाई जहाज भूमि से 1.8 कि.मी. की ऊँचाई पर उड़ रहा है। बिन्दु X से जहाज का उन्नयन कोण 60° है तथा 20 सेकण्ड पश्चात् X से उन्नयन कोण 30° हो जाता है। यदि बिन्दु X भूमि पर है, तो हवाई जहाज की गति (कि.मी./घंटा में) क्या है?

- (A) $216\sqrt{3}$ (B) $105\sqrt{3}$
 (C) $201\sqrt{3}$ (D) $305\sqrt{3}$

8. What is the value of / का मान क्या है?

$$\frac{[(\sin x + \sin y)(\sin x - \sin y)]}{[(\cos x + \cos y)(\cos y - \cos x)]}$$

- (A) 0 (B) 1 (C) -1 (D) 2

9. What is the value of / का मान क्या है?

$$\frac{(\tan 5\theta + \tan 3\theta)}{4 \cos 4\theta (\tan 5\theta - \tan 3\theta)}$$

- (A) $\sin 2\theta$ (B) $\cos 2\theta$
 (C) $\tan 4\theta$ (D) $\cot 2\theta$

10. What is the value of $\left(\frac{4}{3}\right)\cot^2\left(\frac{\pi}{6}\right) + 3\cos^2(150^\circ) - 4\cosec^2 45^\circ + 8 \sin\left(\frac{\pi}{2}\right)$?

$\left(\frac{1}{3}\right)\cot^2\left(\frac{\pi}{6}\right) + 3\cos^2(150^\circ) - 4\cosec^2 45^\circ + 8 \sin\left(\frac{\pi}{2}\right)$ का मान क्या है?

- (A) $\frac{25}{4}$ (B) 1 (C) $\frac{-7}{2}$ (D) $\frac{13}{2}$

11. What is the value of $\sin(B-C)\cos(A-D) + \sin(A-B)\cos(C-D) + \sin(C-A)\cos(B-D)$? $\sin(B-C)\cos(A-D) + \sin(A-B)\cos(C-D) + \sin(C-A)\cos(B-D)$ का मान क्या है?

- (A) $\frac{3}{2}$ (B) -3 (C) 1 (D) 0

12. What is the value of / का मान क्या है?

$$\frac{[4\cos(90-A)\sin^3(90+A)] - [4\sin(90+A)\cos^3(90-A)]}{\cos\left(\frac{180+8A}{2}\right)}$$

- (A) 1 (B) -1 (C) 0 (D) 2

13. What is the value of / का मान क्या है?

$$\cos\left[\frac{(180-\theta)}{2}\right]\cos\left[\frac{(180-90)}{2}\right] + \sin\left[\frac{(180-30)}{2}\right]\sin\left[\frac{(180-130)}{2}\right]$$

- (A) $\sin 2\theta \sin 4\theta$ (B) $\cos 2\theta \cos 6\theta$
(C) $\sin 2\theta \sin 6\theta$ (D) $\cos 2\theta \cos 4\theta$

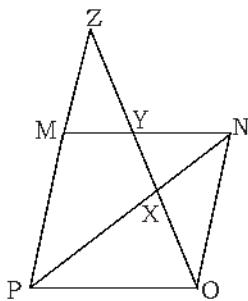
14. What is the value of $[\tan^2(90-\theta) - \sin^2(90-\theta)]\cosec^2(90-\theta)\cot^2(90-\theta)$?

$[\tan^2(90-\theta) - \sin^2(90-\theta)]\cosec^2(90-\theta)\cot^2(90-\theta)$ का मान क्या है?

- (A) 0 (B) 1
(C) -1 (D) 2

15. Two points P and Q are at the distance of x and y (where $y > x$) respectively from the base of a building and on a straight line. If the angles of elevation of the top of the building from points P and Q are complementary, then what is the height of the building?

P तथा Q दो बिन्दु एक इमारत के आधार से क्रमशः x तथा y (जहाँ $y > x$ हैं) की दूरी पर हैं तथा एक सीधी रेखा पर हैं। यदि बिन्दु P तथा Q से इमारत की चोटी के उन्नयन कोण पूरक हैं, तो इमारत की ऊँचाई क्या है?



- (A) xy (B) $\sqrt{\left(\frac{y}{x}\right)}$

- (C) $\sqrt{\left(\frac{x}{y}\right)}$ (D) $\sqrt{(xy)}$

16. The tops of two poles of height 60 metres and 35 metres are connected by a rope. If the rope makes an angle with the horizontal whose tangent is $5/9$ metres, then what is the distance (in metres) between the two poles?

दो खंभे जिनकी ऊँचाई 60 मीटर तथा 35 मीटर हैं, की चोटियों को रस्सी से जोड़ा गया है। यदि रस्सी क्षेत्रिज के साथ कोण बनाती है जिसकी स्पर्श रेखा $5/9$ मीटर है, तो दोनों खंभों के बीच की दूरी (मीटर में) क्या है?

- (A) 63 (B) 30
(C) 25 (D) 45

17. A Navy captain going away from a lighthouse at the speed of $4[(\sqrt{3})-1]$ m/s. He observes that it takes him 1 minute to change the angle of elevation of the top of the lighthouse from 60° to 45° . What is the height (in metres) of the lighthouse?

एक नौसेना कप्तान $4[(\sqrt{3})-1]$ मी./से. की गति से लाइट हाउस से दूर जा रहा है। वह निरीक्षण करता है कि लाइट हाउस की चोटी का उन्नयन कोण 60° से 45° बदलने के लिए उसे एक मिनट लगता है। लाइट हाउस की ऊँचाई (मीटर में) क्या है?

- (A) $240\sqrt{3}$ (B) $480[(\sqrt{3})-1]$
(C) $360\sqrt{3}$ (D) $280\sqrt{2}$

18. What is the value of $[(\sin 7x - \sin 5x) / (\cos 7x + \cos 5x)] - [(\cos 6x - \cos 4x) / (\sin 6x + \sin 4x)]$? $[(\sin 7x - \sin 5x) / (\cos 7x + \cos 5x)] - [(\cos 6x - \cos 4x) / (\sin 6x + \sin 4x)]$ का मान क्या है?

- (A) 1 (B) $2 \tan x$
(C) $\tan 2x$ (D) $\tan\left(\frac{3x}{2}\right)$

19. What is the value of $[(\cos^3 2\theta + 3 \cos 2\theta) / (\cos^6 \theta - \sin^6 \theta)]$?

$[(\cos^3 2\theta + 3 \cos 2\theta) / (\cos^6 \theta - \sin^6 \theta)]$ का मान क्या है?

- (A) 0 (B) 1
(C) 4 (D) 2

- | | | | |
|---|---|--|--------------------------|
| 30. What is the value of $\sin 75^\circ + \sin 15^\circ$?
$\sin 75^\circ + \sin 15^\circ$ का मान क्या है? | (A) $\sqrt{3}$
(C) $\frac{\sqrt{3}}{2}$ | (B) $2\sqrt{3}$
(D) $\sqrt{\frac{3}{2}}$ | |
| 31. What is the value of $[(\cos 3\theta + 2\cos 5\theta + \cos 7\theta) \div (\cos \theta + 2\cos 3\theta + \cos 5\theta)] + \sin 2\theta \tan 3\theta$?
[[$\cos 3\theta + 2\cos 5\theta + \cos 7\theta$] ÷ ($\cos \theta + 2\cos 3\theta + \cos 5\theta$)] + $\sin 2\theta \tan 3\theta$ का मान क्या है? | (A) $\cos 2\theta$
(C) $\tan 2\theta$ | (B) $\sin 2\theta$
(D) $\cot \theta \sin 2\theta$ | |
| 32. What is the value of $\frac{[2 \sin(45 + \theta) \sin(45 - \theta)]}{\cos 2\theta}$?
$\frac{[2 \sin(45 + \theta) \sin(45 - \theta)]}{\cos 2\theta}$ का मान क्या है? | (A) 0
(C) $\cot 2\theta$ | (B) $\tan 2\theta$
(D) 1 | |
| 33. What is the value of $\sin(90^\circ + 2A)[4 - \cos^2(90^\circ - 2A)]$?
$(90^\circ + 2A)[4 - \cos^2(90^\circ - 2A)]$ का मान क्या है? | (A) $2(\cos^3 A - \sin^3 A)$
(C) $4(\cos^6 A + \sin^6 A)$ | (B) $2(\cos^3 A + \sin^3 A)$
(D) $4(\cos^6 A - \sin^6 A)$ | |
| 34. What is the value of $[\cos(90 + A) \div \sec(270 - A)] + [\sin(270 + A) \div \operatorname{cosec}(630 - A)]$?
[$\cos(90 + A) \div \sec(270 - A)$] + [$\sin(270 + A) \div \operatorname{cosec}(630 - A)$] का मान क्या है? | (A) $3 \sec A$
(C) 0 | (B) $\tan A \sec A$
(D) 1 | |
| 35. On walking 100 metres towards a building in a horizontal line, the angle of elevation of its top changes from 45° to 60° . What will be the height (in metres) of the building?
एक इमारत की ओर दैतिज रेखा में 100 मीटर चलने से उसकी चोटी का उन्नयन कोण 45° से 60° हो जाता है। इमारत की ऊँचाई (मीटर में) क्या होगी? | (A) $50(3 + \sqrt{3})$
(C) 150 | (B) $100(\sqrt{3} + 1)$
(D) $100\sqrt{3}$ | |
| 36. The upper part of a tree broken over by the wind make an angle of 60° with the ground. The distance between the root and the point where top of the tree touches the ground is 25 metres. What was the height (in metres) of the tree? | | | |
| एक वृक्ष का ऊपरी भाग आँधी के कारण टूटकर भूमि की सतह से 60° का कोण बनाता है। जड़ और जिस बिन्दु पर वृक्ष का शीर्ष भूमि को छूता है के मध्य की दूरी 25 मीटर है। वृक्ष की ऊँचाई (मीटर में) क्या थी? | (A) 84.14
(C) 98.25 | (B) 93.3
(D) 120.24 | |
| 37. The height of a tower is 300 meters. When its top is seen from top of another tower, then the angle of depression is 60° . The horizontal distance between the bases of the two towers is 120 metres. What is the height (in metres) of the small tower? | एक मीनार की ऊँचाई 300 मीटर है। जब उसकी चोटी को दूसरे मीनार की चोटी से देखा जाता है, तो उन्नयन कोण 60° का होता है। दोनों मीनारों के आधारों के मध्य की दूरी 120 मीटर है। छोटे मीनार की ऊँचाई (मीटर में) क्या है? | (A) 88.24
(C) 92.15 | (B) 106.71
(D) 112.64 |
| 38. What is the value of $\frac{[\sin(y-z) + \sin(y+z) + 2\sin y]}{[\sin(x-z) + \sin(x+z) + 2\sin x]}$?
का मान क्या है? | (A) $\cos x \sin y$ | (B) $\frac{(\sin y)}{(\sin x)}$ | |
| (C) $\sin z$ | (D) $\sin x \tan y$ | | |
| 39. What is the value of / का मान क्या है? | (A) 0
(C) 1 | (B) $\tan^2 x$
(D) $2 \tan x$ | |
| 40. What is the value of / का मान क्या है? | | | |

42. What is the value of

$$\frac{1}{\sin^4(90-\theta)} + \frac{1}{[\cos^2(90-\theta)]-1}?$$

का मान क्या है ?

- (A) $\tan^2 \theta \sec^2 \theta$ (B) $\sec^4 \theta$
 (C) $\tan^4 \theta$ (D) $\tan^2 \theta \sin^2 \theta$

43. What is the value of / का मान क्या है ?

$$\frac{[\tan(90-A) + \cot(90-A)]^2}{[2\sec^2(90-2A)]}$$

- (A) 0 (B) 1 (C) 2 (D) -1
 44. What is the value of $\{\sin(90-x)\cos[\pi-(x-y)]\} + \{\cos(90-x)\sin[\pi-(y-x)]\}$?
 $\{\sin(90-x)\cos[\pi-(x-y)]\} + \{\cos(90-x)\sin[\pi-(y-x)]\}$ का मान क्या है ?
 (A) $-\cos y$ (B) $-\sin y$
 (C) $\cos x$ (D) $\tan y$

45. The angle of elevation of an aeroplane from a point on the ground is 60° . After flying for 30 seconds, the angle of elevation changes to 30° . If the aeroplane is flying at a height of 4500 m, then what is the speed (in m/s) of aeroplane?

मैदान पर एक बिन्दु से एक जवाई जहाज का उन्नयन कोण 60° है। 30 सेकण्ड उड़ने के पश्चात्, उन्नयन कोण 30° में परिवर्तित हो जाता है। यदि हवाई जहाज 4500 मी. की ऊँचाई पर उड़ रहा है, तो हवाई जहाज की गति (मी./सै. में) क्या है ?

- (A) $50\sqrt{3}$ (B) $100\sqrt{3}$
 (C) $200\sqrt{3}$ (D) $300\sqrt{3}$

46. A kite is flying in the sky. The length of string between a point on the ground and kite is 420 m. The angle of elevation of string with the ground is 30° . Assuming that there is no slack in the string, then what is the height (in metres) of the kite?

एक पतंग आकाश में उड़ रही है। मैदान पर एक बिन्दु से पतंग तक धागे की लम्बाई 420 मी. है। मैदान से धागे का उन्नयन कोण 30° है। मान लीजिए कि धागे में कोई ढीलापन नहीं है, तो पतंग की ऊँचाई (मीटर में) क्या है ?

- (A) 210 (B) $140\sqrt{3}$
 (C) $210\sqrt{3}$ (D) 150

47. A balloon leaves from a point P rises at a uniform speed. After 6 minutes, an observer situated at a distance of $450\sqrt{3}$ metres from point P observes that angle of elevation of the bal-

loon is 60° . Assume that point of observation and point P are on the same level. What is the speed (in m/s) of the balloon?

एक गुब्बारा एक समान गति से बिन्दु P से छोड़ा जाता है। 6 मिनट पश्चात्, बिन्दु P से $450\sqrt{3}$ मीटर दूरी पर एक समीक्षक है जो देखता है कि गुब्बारे का उन्नयन कोण 60° है। मान लीजिए कि समीक्षा बिन्दु तथा बिन्दु P एक ही स्तर पर हैं। गुब्बारे की गति (मी./सै. में) क्या है ?

- (A) 4.25 (B) 3.75
 (C) 4.5 (D) 3.45

48. What is the value of / का मान क्या है ?

$$\frac{[(\sin 4x + \sin 4y)(\tan(2x-2y))]}{(\sin 4x - \sin 4y)}$$

- (A) $\tan 2(2x+2y)$ (B) $\tan 2$
 (C) $\cot(x-y)$ (D) $\tan(2x+2y)$

49. What is the value of / का मान क्या है ?

$$[(32\cos^6 x - 48\cos^4 x + 18\cos^2 x - 1)]$$

$$[4\sin x \cos x \sin(60-x) \cos(60-x) \sin(60+x) \cos(60+x)]$$

- (A) $4 \tan 6x$ (B) $4 \cot 6x$
 (C) $8 \cot 6x$ (D) $8 \tan 6x$

50. What is the value of / का मान क्या है ?

$$\left[\frac{2 \cot \frac{(\pi-a)}{2}}{1 + \tan^2 \frac{(2\pi-a)}{2}} \right]$$

- (A) $\frac{2\sin^2 A}{2}$ (B) $\cos A$

- (C) $\sin A$ (D) $\frac{2\cos^2 A}{2}$

51. If $\tan \theta + \sec \theta = \frac{(x-2)}{(x+2)}$ then what is the value of $\cos \theta$?

यदि $\tan \theta + \sec \theta = \frac{(x-2)}{(x+2)}$ है, तो $\cos \theta$ का मान क्या है ?

- (A) $\frac{(x^2-1)}{(x^2+1)}$ (B) $\frac{(2x^2-4)}{(2x^2+4)}$

- (C) $\frac{(x^2-4)}{(x^2+4)}$ (D) $\frac{(x^2-2)}{(x^2+2)}$

52. What is the value of $\frac{(\cos 40^\circ - \cos 140^\circ)}{(\sin 80^\circ + \sin 20^\circ)}$?

$\frac{(\cos 40^\circ - \cos 140^\circ)}{(\sin 80^\circ + \sin 20^\circ)}$ का मान क्या है?

- (A) $2\sqrt{3}$ (B) $\frac{2}{\sqrt{3}}$ (C) $\frac{1}{\sqrt{3}}$ (D) $\sqrt{3}$

53. What is the value of / का मान क्या है?

$$\frac{[1 - \tan(90 - \theta) + \sec(90 - \theta)]}{[\tan(90 - \theta) + \sec(90 - \theta) + 1]}$$

- (A) $\cot\left(\frac{\theta}{2}\right)$ (B) $\tan\left(\frac{\theta}{2}\right)$
 (C) $\sin \theta$ (D) $\cos \theta$

54. What is the value of / का मान क्या है?

$$\frac{[\sin(90 - A) + \cos(180 - 2A)]}{[\cos(90 - 2A) + \sin(180 - A)]}$$

- (A) $\sin\left(\frac{A}{2}\right)$ (B) $\cot\left(\frac{A}{2}\right)$
 (C) $\tan\left(\frac{A}{2}\right)$ (D) $\cos\left(\frac{A}{2}\right)$

55. The distance between the tops of two buildings 38 metres and 58 metres high is 52 metres. What will be the distance (in metres) between two buildings?

दो इमारत 38 मीटर तथा 58 मीटर ऊँची हैं, के शीर्षों के मध्य दूरी 52 मीटर है। दोनों इमारों के मध्य की दूरी (मीटर में) क्या होगी?

- (A) 46 (B) 42
 (C) 44 (D) 48

56. The angles of elevation of the top of a tree 220 meters high from two points lie on the same plane are 30° and 45° . What is the distance (in metres) between the two points?

220 मीटर ऊँचे एक वृक्ष के दो बिन्दुओं का समान तल पर उन्नयन कोण 30° तथा 45° हैं। दो बिन्दुओं के मध्य दूरी (मीटर में) क्या है?

- (A) 193.22 (B) 144.04
 (C) 176.12 (D) 161.05

57. The angles of elevation of the top of a tower 72 metre high from the top and bottom of a building are 30° and 60° respectively. What is the height (in metres) of building?

72 मीटर ऊँचे एक मीनार के शीर्ष का इमारत के ऊपर तथा नीचे से उन्नयन कोण क्रमशः 30° तथा 60° हैं। इमारत की ऊँचाई (मीटर में) में क्या है?

- (A) 42 (B) $20\sqrt{3}$
 (C) $24\sqrt{3}$ (D) 48

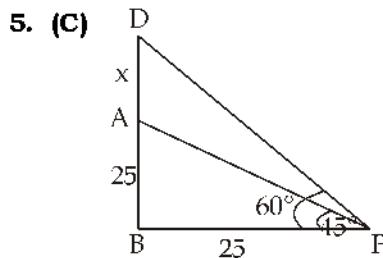
Solution

1. (D) $\frac{2 \cos^2 \theta}{\sin^2 \theta \times \cot^2 \theta (1 + \tan^2 \theta)} - 1$
 $= \frac{2}{1 + \tan^2 \theta} - 1 = \frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} = \cos 2\theta$

2. (D) $\cos 15^\circ - \cos 165^\circ$
 $\Rightarrow \cos 15^\circ + \cos 15^\circ$
 $= 2 \cos 15^\circ = 2 \times \frac{\sqrt{3} + 1}{2\sqrt{2}} = \frac{\sqrt{3} + 1}{\sqrt{2}}$

3. (D) $\frac{1 + 2 \tan^2 x - 2 \sec x \tan x}{\sec x - \tan x}$
 $= \frac{\sec^2 x + \tan^2 x - 2 \sec x \tan x}{\sec x - \tan x}$
 $= \frac{(\sec x - \tan x)^2}{\sec x - \tan x} = \sec x - \tan x$

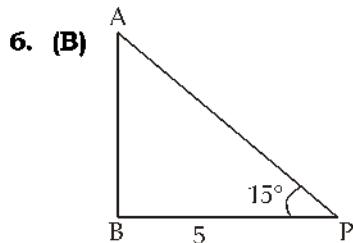
4. (D) $\sin(180 - \theta) \sin(90 - \theta) - \left[\frac{\cot(90 - \theta)}{1 + \tan^2 \theta} \right]$
 $= \sin \theta \cos \theta - \left[\frac{\tan \theta}{\sec^2 \theta} \right] = 0$



Here x = height of pole
 $AB = BP = 25 \rightarrow$ in $\triangle ABD$

$$25\sqrt{3} = 25 + x \rightarrow$$
 in $\triangle DBP$

$$x = 25(\sqrt{3} - 1)$$

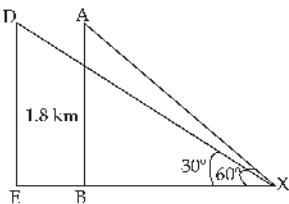


$$AP = \text{length of ladder} \mid \cos 15^\circ = \frac{BP}{AP} = \frac{5}{AP}$$

$$AP = \frac{5}{\cos 15^\circ} = \frac{5}{(\sqrt{3}+1)} \times 2\sqrt{2} \times \frac{\sqrt{3}-1}{(\sqrt{3}-1)}$$

$$AP = 5\sqrt{2}(\sqrt{3}-1) \Rightarrow 5\sqrt{6}-5\sqrt{2}$$

7. (A)



$$BX = \frac{1.8}{\sqrt{3}} = 0.6\sqrt{3}$$

$$ED = 1.8\sqrt{3}$$

$$EB = AD = 1.2\sqrt{3}$$

$$S = \frac{1.2\sqrt{3}}{20} \times 60 \times 60 = 216\sqrt{3} \text{ km/hr}$$

$$8. (B) \frac{(\sin x + \sin y)(\sin x - \sin y)}{(\cos x + \cos y)(\cos y - \cos x)}$$

by putting

$$x = 90^\circ; y = 0^\circ$$

$$\frac{(\sin 90^\circ + \sin 0^\circ)(\sin 90^\circ - \sin 0^\circ)}{(\cos 90^\circ + \cos 0^\circ)(\cos 0^\circ - \cos 90^\circ)} = \frac{1}{1} = 1$$

$$9. (B) \frac{(\tan 5\theta + \tan 3\theta)}{4 \times \cos 4\theta (\tan 5\theta - \tan 3\theta)}$$

$$\frac{\sin 5\theta + \sin 3\theta}{\cos 5\theta + \cos 3\theta} \\ \frac{4 \cos 4\theta (\sin 5\theta - \sin 3\theta)}{4 \cos 4\theta (\cos 5\theta - \cos 3\theta)}$$

$$= \frac{\sin 5\theta \cos 3\theta + \cos 5\theta \sin 3\theta}{4 \cos 4\theta (\sin 5\theta \cos 3\theta - \cos 5\theta \sin 3\theta)}$$

$$= \frac{\sin 8\theta}{4 \cos 4\theta \times \sin 2\theta} = \frac{2 \sin 4\theta \cos 4\theta}{4 \cos 4\theta \sin 2\theta}$$

$$= \frac{2 \times 2 \sin 2\theta \cos 2\theta}{4 \sin 2\theta} = \cos 2\theta$$

$$10. (A) \frac{4}{3} \cot^2 \left(\frac{\pi}{6} \right) + 3 \cos^2 (150^\circ) - 4 \cos ec^2 45^\circ + 8 \sin \left(\frac{\pi}{2} \right)$$

$$\frac{4}{3} \times \cot^2 30^\circ + 3 \cos^2 150^\circ - 4 \cos ec^2 45^\circ + 8 \sin 90^\circ$$

$$\frac{4}{3} \times (\sqrt{3})^2 + 3 \times \left(\frac{-\sqrt{3}}{2} \right)^2 - 4 \times (\sqrt{2})^2 + 8$$

$$\frac{12}{3} + \frac{9}{4} - 8 + 8 \Rightarrow 4 + \frac{9}{4} = \frac{25}{4}$$

$$11. (D) \sin(B-C) \cos(A-D) + \sin(A-B) \cos(C-D) + \sin(C-A) \cos(B-D)$$

$$\text{Let } A = B = C = D$$

$$\sin 0^\circ \cos 0^\circ + \sin 0^\circ \cos 0^\circ + \sin 0^\circ \cos 0^\circ \\ 0 + 0 + 0 = 0$$

$$12. (B) [4 \cos(90 - A) \sin^3(90 + A)] -$$

$$\frac{[4 \sin(90 + A) \cos^3(90 - A)]}{\cos \left(\frac{180 + 8A}{2} \right)}$$

$$= \frac{4 \sin A \cos^3 A - 4 \cos A \sin^3 A}{\cos(90 + 4A)}$$

$$= \frac{4 \sin A \cos A (\cos^2 A - \sin^2 A)}{-\sin 4A}$$

$$= \frac{4 \sin A \cos A \cos 2A}{-2 \sin 2A \cos 2A}$$

$$= \frac{4 \sin A \cos A}{-4 \sin A \cos A} = -1$$

$$13. (B) \cos \left(\frac{180 - \theta}{2} \right) \cos \left(\frac{180 - 9\theta}{2} \right) + \sin$$

$$\left(\frac{180 - 3\theta}{2} \right) \sin \left(\frac{180 - 13\theta}{2} \right)$$

$$= \left[\sin \frac{\theta}{2} \sin \frac{9\theta}{2} + \cos \frac{3\theta}{2} \cos \frac{13\theta}{2} \right]$$

$$= \frac{1}{2} \left[2 \times \sin \frac{\theta}{2} \sin \frac{9\theta}{2} + 2 \cos \frac{3\theta}{2} \cos \frac{13\theta}{2} \right]$$

$$\frac{1}{2} [-\cos 5\theta + \cos 4\theta + \cos 5\theta + \cos 8\theta]$$

$$\frac{1}{2} \times 2 \cos 6\theta \cos 2\theta = \cos 6\theta \cos 2\theta$$

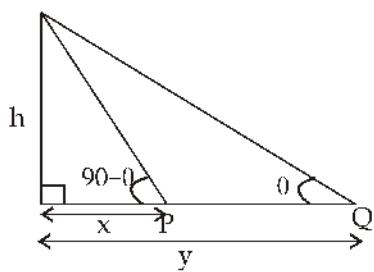
$$14. (B) [(tan^2(90-\theta) - \sin^2(90-\theta)) \cosec^2(90-\theta)]$$

$$\cot^2(90-\theta)$$

$$= (\cot^2 \theta - \cos^2 \theta) \sec^2 \theta \tan^2 \theta$$

$$= \cos^2 \theta \left(\frac{1}{\sin^2 \theta} - 1 \right) \sec^2 \theta \tan^2 \theta$$

$$= \cos^4 \theta \times \frac{1}{\sin^2 \theta} \times \sec^4 \theta \times \sin^2 \theta = 1$$

15.(D)


$$(1) \tan \theta = \frac{h}{y}$$

$$(2) \tan(90 - \theta) = \frac{h}{x}$$

$$\cot \theta = \frac{h}{x}$$

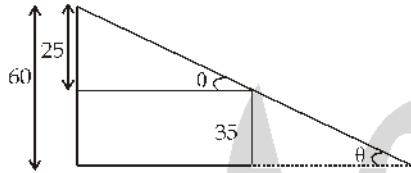
$$\tan \theta = \frac{x}{h}$$

$$\tan \theta = \tan \theta$$

$$\frac{h}{y} = \frac{x}{h}$$

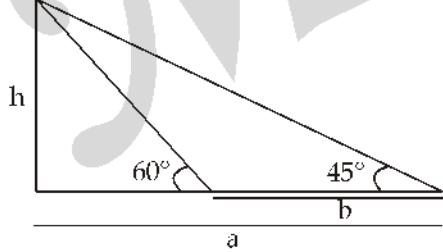
$$= h^2 = xy$$

$$h = \sqrt{xy}$$

16.(D)


$$\tan \theta = \frac{5}{9} \Rightarrow \tan \theta = \frac{5}{9}$$

$$\frac{25}{b} = \frac{5}{9} \Rightarrow b = 45$$

17.(A)


$$\text{Total distance} = 4(\sqrt{3} - 1) \times 60$$

$$b = 240(\sqrt{3} - 1)$$

$$(i) \tan 45^\circ = \frac{h}{a}, 1 = \frac{h}{a}, h = a$$

$$(ii) \tan 60^\circ = \frac{h}{a-b}, \sqrt{3} = \frac{h}{a-240(\sqrt{3}-1)}$$

$$h = \sqrt{3}a - 240(3 - \sqrt{3}) \quad a = \sqrt{3}a - 240(3 - \sqrt{3})$$

$$240(3 - \sqrt{3}) = \sqrt{3}a - a$$

$$240\sqrt{3}(\sqrt{3} - 1) = a(\sqrt{3} - 1)$$

$$a = 240\sqrt{3} \quad h = 240\sqrt{3}$$

18.(B)
$$\frac{\sin 7x - \sin 5x}{\cos 7x + \cos 5x} - \frac{\cos 6x - \cos 4x}{\sin 6x + \sin 4x}$$

 Try putting $x = 30^\circ$

$$\frac{\sin 210^\circ - \sin 150^\circ}{\cos 210^\circ + \cos 150^\circ} - \frac{\cos 180^\circ - \cos 120^\circ}{\sin 180^\circ + \sin 120^\circ}$$

$$\frac{-\sin 30^\circ - \sin 30^\circ}{-\cos 30^\circ - \cos 30^\circ} - \frac{(-1) + \cos 60^\circ}{0 + \sin 60^\circ}$$

$$\frac{-\frac{1}{2} - \frac{1}{2}}{-\frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2}} - \frac{\frac{(-1)+1}{2}}{\frac{\sqrt{3}}{2}} \Rightarrow \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$$

In option 2 $\tan x$ at $30^\circ = \frac{2}{\sqrt{3}}$

19.(C)
$$\left[\frac{(\cos^3 2\theta + 3 \cos 2\theta)}{\cos^6 \theta - \sin^6 \theta} \right]$$

 Try put $\theta = 0^\circ$

$$\frac{1+3}{1-0} = \frac{4}{1}$$

20.(D)
$$\tan\left(\frac{\pi}{4} + A\right) \tan\left(\frac{3\pi}{4} + A\right)$$

$$\tan\left(\frac{\pi}{4} + A\right) \tan\left(\frac{\pi}{2} + \frac{\pi}{4} + A\right)$$

$$- \tan\left(\frac{\pi}{4} + A\right) \cot\left(\frac{\pi}{4} + A\right)$$

$$-1$$

21.(B)
$$\left[(\sec^2 \theta + 1) \sqrt{\sec^2 \theta - 1} \right] \times \frac{1}{2} [\cot \theta - \tan \theta]$$

$$\left[\frac{\cos^2 \theta + 1}{\cos^2 \theta} \right] \left[\frac{\sin \theta}{\cos \theta} \right] \times \frac{1}{2} \left[\frac{\cos^2 \theta - \sin^2 \theta}{\cos \theta \sin \theta} \right]$$

$$= \frac{\cos^2 \theta - \sin^2 \theta + \sin^2 \theta + \cos^2 \theta}{2 \cos^2 \theta} = \frac{2 \cos^2 \theta}{2 \cos^2 \theta} = 1$$

22.(C) $\sin(630 + A) + \cos A$
 $= \sin(720 - 90 + A) + \cos A$
 $- \cos A + \cos A = 0$

23.(D) $(\sin 59 \cos 31 + \cos 59 \sin 31) + (\cos 20 \cos 25 - \sin 20 \sin 25)$

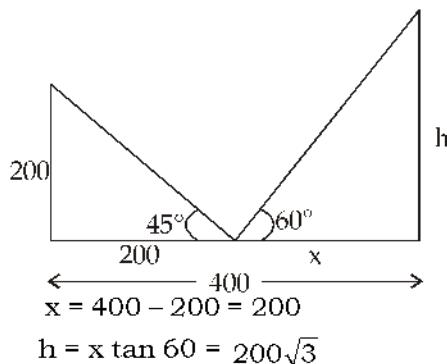
$$\frac{\sin(59 + 31)}{\cos(20 + 25)} = \frac{\sin 90}{\cos 45} = \frac{1}{\frac{1}{\sqrt{2}}} = \sqrt{2}$$

24.(D) $\cos(90 - B) \sin(C - A) + \sin(90 + A) \cos(B + C) - \sin(90 - C) \cos(A + B) = ?$

Put $A = B = C = 0$

$$\cos 90 \sin 0 + \sin 90 \cos 0 - \sin 90 \cos 0 \\ 0 + 1 - 1 = 0$$

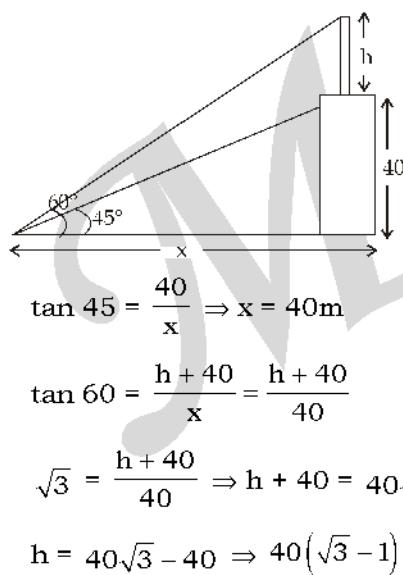
25.(B)



$$x = 400 - 200 = 200$$

$$h = x \tan 60 = 200\sqrt{3}$$

26.(C)



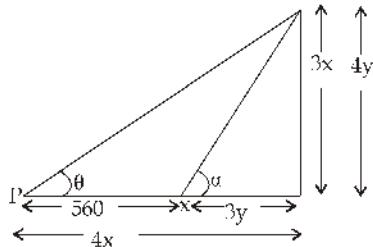
$$\tan 45 = \frac{40}{x} \Rightarrow x = 40 \text{ m}$$

$$\tan 60 = \frac{h + 40}{x} = \frac{h + 40}{40}$$

$$\sqrt{3} = \frac{h + 40}{40} \Rightarrow h + 40 = 40\sqrt{3}$$

$$h = 40\sqrt{3} - 40 \Rightarrow 40(\sqrt{3} - 1)$$

27.(B)



$$\tan \theta = \frac{3x}{4x}; \quad \tan \alpha = \frac{4y}{3y}$$

Height is equal = $3x = 4y$

$$\frac{x}{y} = \frac{4}{3}$$

$$4x = 560 + 3y \quad 3y = \frac{ax}{4}$$

$$4x = 560 + \frac{ax}{4}$$

$$4x - \frac{ax}{4} = 560$$

$$\frac{7x}{4} = 560$$

$$\Rightarrow x = 320$$

$$\text{Height of tower} = 3x \\ = 3 \times 320 = 960 \text{ m}$$

28.(D)

$$\frac{\cos 7A + \cos 5A}{\sin 7A - \sin 5A} = \frac{2 \cos \frac{7A+5A}{2} \cos \frac{7A-5A}{2}}{2 \cos \frac{7A+5A}{2} \sin \left(\frac{7A-5A}{2} \right)}$$

$$= \cot A$$

29.(C)

$$\frac{1 - \sin(90 - 2A)}{1 + \sin(90 - 2A)} = \frac{1 - \cos 2A}{1 + \cos 2A}$$

$$= \frac{1 - (1 - 2\sin^2 A)}{1 + (2\cos^2 A - 1)} = \frac{2\sin^2 A}{2\cos^2 A} = \tan^2 A$$

30.(D)

$$\sin 75 + \sin 15$$

$$\sin 75 + \sin(90 - 75)$$

$$= \sin 75 + \cos 75$$

$$= \sqrt{(\sin 75 + \cos 75)^2}$$

$$= \sqrt{\sin^2 75 + \cos^2 75 + 2 \sin 75 \cos 75} = \sqrt{1 + \sin 150}$$

$$= \sqrt{1 + \frac{1}{2}} = \sqrt{\frac{3}{2}}$$

31.(A)

$$\frac{\cos 3\theta + 2 \cos 5\theta + \cos 7\theta}{\cos \theta + 2 \cos 3\theta + \cos 5\theta} + \frac{\sin 2\theta \times \sin 3\theta}{\cos 3\theta}$$

$$= \frac{\cos 3\theta + \cos 5\theta + \cos 5\theta + \cos 7\theta}{\cos \theta + \cos 3\theta + \cos 3\theta + \cos 5\theta} + \frac{\sin 2\theta \sin 3\theta}{\cos 3\theta}$$

$$= \frac{2 \cos 4\theta \cos \theta + 2 \cos 6\theta \cos \theta}{2 \cos 2\theta \cos \theta + 2 \cos 4\theta \cos \theta} + \frac{\sin 2\theta \sin 3\theta}{\cos 3\theta}$$

$$= \frac{\cos 4\theta + \cos 6\theta}{\cos 2\theta + \cos 4\theta} + \frac{\sin 2\theta \sin 3\theta}{\cos 3\theta}$$

$$\begin{aligned}
 &= \frac{2 \cos 5\theta \cos \theta}{2 \cos 3\theta \cos \theta} + \frac{\sin 2\theta \sin 3\theta}{\cos 3\theta} \\
 &= \frac{\cos(2\theta + 3\theta)}{\cos 3\theta} + \frac{\sin 2\theta \sin 3\theta}{\cos 3\theta} \\
 &= \frac{\cos 2\theta \cos 3\theta - \sin 2\theta \sin 3\theta}{\cos 3\theta} + \frac{\sin 2\theta \sin 3\theta}{\cos 3\theta} \\
 &= \frac{\cos 2\theta \cos 3\theta}{\cos 3\theta} = \cos 2\theta
 \end{aligned}$$

32.(D)

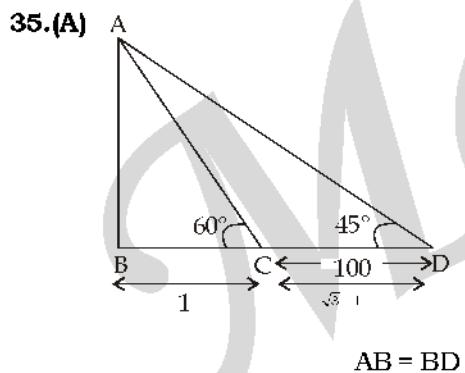
$$\begin{aligned}
 &\frac{2 \sin(45 + \theta) \sin(45 - \theta)}{\cos 2\theta} \\
 &= \frac{\cos(45 + \theta - 45 + \theta) - \cos(45 + \theta + 45 - \theta)}{\cos 2\theta}
 \end{aligned}$$

$$= \frac{\cos 2\theta - \cos 90}{\cos 2\theta} = \frac{\cos 2\theta}{\cos 2\theta} = 1$$

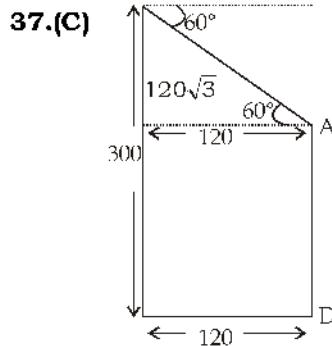
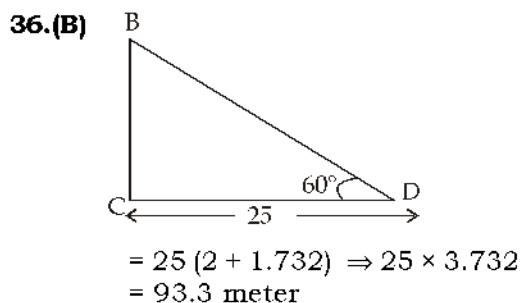
33.(D) $\sin(90 + 2A)[4 - \cos^2(90 - 2A)]$
 $4(\cos^6 A - \sin^6 A)$

34.(D)

$$\begin{aligned}
 &\frac{\cos(90 + A)}{\sec(270 - A)} + \frac{\sin(270 + A)}{\cosec(630 - A)} \\
 &= \frac{-\sin A}{-\cosec A} + \frac{-\cos A}{-\sec A} \Rightarrow \sin^2 A + \cos^2 A = 1
 \end{aligned}$$



$$AB = BD = \frac{100}{\sqrt{3}-1} \times \sqrt{3} \Rightarrow AB = 50(3 + \sqrt{3})$$



$$AD = 300 - 120\sqrt{3} = 92.15 \text{ meter}$$

38.(B)

$$\frac{(\sin(y-z) + \sin(y+z) + 2 \sin y)}{(\sin(x-z) + \sin(x+z) + 2 \sin x)}$$

Putting z = 0 and x = y = 90°

$$\frac{\sin 90 + \sin 90 + 2 \sin 90}{\sin 90 + \sin 90 + \sin 90} = \frac{4}{4} = 1$$

From options $\frac{\sin y}{\sin x} = \frac{\sin 90}{\sin 90} = 1$ (satisfy the question)

2nd Method:

Apply formula $(\sin C + \sin D)$ in denominator and numerator

We have $\frac{\sin y}{\sin x}$

39.(B)

$$\frac{[\sin(x+y) - 2 \sin x + \sin(x-y)]}{[\cos(x-y) + \cos(x+y) - 2 \cos x]} \times \frac{(\sin 10x - \sin 8x)}{(\cos 10x + \cos 8x)}$$

$$\begin{aligned}
 &= \frac{2 \sin x \cos y - 2 \sin x}{2 \cos x \cos y - 2 \cos x} \times \frac{2 \cos 9x \sin x}{2 \cos 9x \cos x} \\
 &= \frac{2 \sin x (\cos y - 1)}{2 \cos x (\cos y - 1)} \times \tan x \\
 &= \tan x \times \tan x = \tan^2 x
 \end{aligned}$$

40.(B)

$$\frac{\sin(90 - 10\theta) - \cos(\pi - 6\theta)}{\cos\left(\frac{\pi}{2} - 10\theta\right) - \sin(\pi - 6\theta)}$$

$$= \frac{\cos 10\theta + \cos 6\theta}{\sin 10\theta - \sin 6\theta} = \frac{2 \cos 8\theta \cdot \cos 2\theta}{2 \cos 8\theta \cdot \sin 2\theta} = \cot 2\theta$$

41.(D) $\sec \theta (\cos \theta + \sin \theta) = \sqrt{2}$

$$\begin{aligned}
 &\Rightarrow \left(\frac{\cos \theta + \sin \theta}{\cos \theta} \right) = \sqrt{2} \Rightarrow 1 + \tan \theta = \sqrt{2} \\
 &\Rightarrow \tan \theta = \sqrt{2} - 1 \quad \Rightarrow \cot \theta = \sqrt{2} + 1
 \end{aligned}$$

$$\text{Now, } \frac{2 \sin \theta}{(\cos \theta - \sin \theta)} = \frac{2}{(\cot \theta - 1)} = \frac{2}{\sqrt{2} + 1 - 1} \\ = \frac{2}{\sqrt{2}} = \sqrt{2}$$

42.(A) $\frac{1}{\sin^4(90-\theta)} + \frac{1}{\cos^2(90-\theta)-1} = ?$

$$= \frac{1}{\cos^4 \theta} + \frac{1}{\sin^2 \theta - 1} \\ = \frac{1}{\cos^4 \theta} - \frac{1}{\cos^2 \theta} = \frac{1 - \cos^2 \theta}{\cos^4 \theta} \\ = \frac{\sin^2 \theta}{\cos^4 \theta} = \tan^2 \theta \sec^2 \theta$$

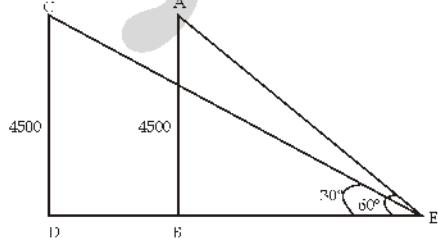
43.(C) $\frac{[\tan(90-A) + \cot(90-A)]^2}{2 \sec^2(90-2A)}$

Put $A = 30^\circ$

$$= \frac{(\tan 60 + \cot 60)^2}{2 \sec^2 30} = \frac{\left(\frac{1}{\sqrt{3}} + \sqrt{3}\right)^2}{2 \times \left(\frac{2}{\sqrt{3}}\right)^2} \\ = \frac{(3+1)^2}{3 \times 2 \times \frac{4}{3}} = \frac{4^2}{8} \Rightarrow \frac{16}{8} = 2$$

44.(A) $\{\sin(90-x) \cos(\pi-(x-y))\} + \{\cos(90-x) \sin(\pi-(y-x))\}$
 $= \cos x \cdot \cos(y-x) + \sin x \sin(y-x)$
 $= -(\cos(y-x) \cos x - \sin(y-x) \sin x)$
 $= -(\cos y) = -\cos y$

45.(B)



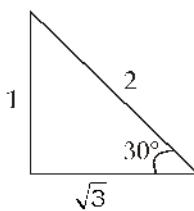
$\text{In } \triangle ABE \quad BE = 1500\sqrt{3}$

$\text{In } \triangle ACD \quad DE = 4500\sqrt{3}$

$BD = DE - BE = 3000\sqrt{3}$

$\text{So, Speed} = \frac{3000\sqrt{3}}{30} = 100\sqrt{3} \text{ (M/Sec)}$

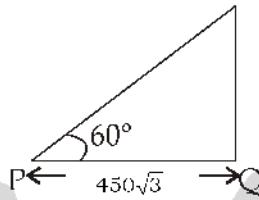
46.(A)



$2 \rightarrow 420$

$1 \rightarrow \frac{420}{2} \times 1 = 210 \text{ m}$

47.(B)



$1 \rightarrow 450\sqrt{3}$

$\sqrt{3} \rightarrow 450 \times 3 = 1350$

$\text{Speed} = \frac{1350}{60 \times 6} = 3.75 \text{ / sec}$

48.(D) $\frac{[(\sin 4x + \sin 4y)(\tan(2x-2y))]}{\sin 4x - \sin 4y}$

$$= \frac{2 \sin 2(x+y) \cos 2(x-y) \times \sin 2(x-y)}{2 \cos 2(x+y) \sin 2(x-y) \cos 2(x-y)} \\ = \tan(2x+2y)$$

49.(C)

$$(32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1) \\ 4 \sin x \cos x \sin(60-x) \cos(60-x) \sin(60+x) \cos(60+x) \\ = \frac{32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1}{4 \cdot \frac{\cos 3x}{4} \cdot \frac{\sin 3x}{4}}$$

We know $\cos 6x$

$= 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

$= \frac{4 \cos 6x}{\cos 3x \cdot \sin 3x} = 8 \cot 6x$

50.(C)

$$\frac{2 \cot\left(\frac{\pi-a}{2}\right)}{\sec^2\left(\frac{2\pi-a}{2}\right)} = \frac{2 \cdot \tan\frac{a}{2}}{\sec^2\left(\pi-\frac{a}{2}\right)}$$

$$\frac{2 \tan\frac{a}{2}}{\sec^2\frac{a}{2}} \Rightarrow 2 \tan\frac{a}{2} \cos^2\frac{a}{2} \Rightarrow \sin a$$

51.(C) $\tan\theta + \sec\theta = \frac{x-2}{x+2}$

We know,

$$\sec\theta - \tan\theta = \frac{x+2}{x-2}$$

$$\text{Add } 2\sec\theta = \frac{x-2}{x+2} + \frac{x+2}{x-2}$$

$$= \frac{(x-2)^2 + (x+2)^2}{x^2 - 4} = \cos\theta = \frac{x^2 - 4}{x^2 + 4}$$

52.(B) $\frac{(\cos 40^\circ - \cos 140^\circ)}{(\sin 80^\circ + \sin 20^\circ)}$

$$\begin{aligned} & 2 \sin \frac{40+140}{2} \cdot \sin \frac{140-40}{2} \\ & 2 \sin \frac{80+20}{2} \cdot \cos \frac{80-20}{2} \\ & = \frac{2 \sin 90^\circ \cdot \sin 50^\circ}{2 \sin 50^\circ \cdot \cos 30^\circ} = \frac{\sin 90^\circ}{\cos 30^\circ} = \frac{1}{\cos 30^\circ} \\ & = \sec 30^\circ = \frac{2}{\sqrt{3}} \end{aligned}$$

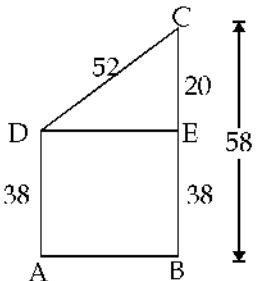
53.(B) $\frac{1 - \cot\theta + \cosec\theta}{\cot\theta + \cosec\theta + 1}$ {1 = $\cosec^2\theta - \cot^2\theta$ }

$$\begin{aligned} & = \frac{\cosec^2\theta - \cot^2\theta - \cot\theta + \cosec\theta}{(\cot\theta + \cosec\theta) + 1} \\ & = \cosec\theta - \cot\theta = \tan\left(\frac{\theta}{2}\right) \end{aligned}$$

54.(C) $\frac{\sin(90^\circ - A) + \cos(180^\circ - 2A)}{\cos(90^\circ - 2A) + \sin(180^\circ - A)} = \frac{\cos A - \cos 2A}{\sin 2A + \sin A}$

$$\begin{aligned} & = \frac{2 \sin \frac{3A}{2} \sin \frac{A}{2}}{2 \sin \frac{3A}{2} \cdot \cos \frac{A}{2}} = \tan \frac{A}{2} \end{aligned}$$

55.(D)

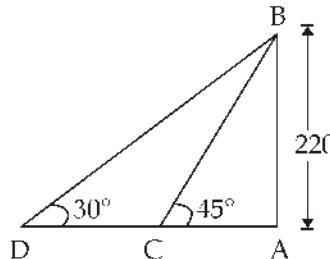


Distance between two buildings
In $\triangle DEC$ $DE^2 = CD^2 - CE^2$

$$\begin{aligned} & = 52^2 - 20^2 \\ & = 2704 - 400 \\ & = \sqrt{2304} \end{aligned}$$

DE = 48 m.

56.(D)



$$\tan 45^\circ = \frac{AB}{AC} = \frac{220}{AC} \Rightarrow AC = 220$$

$$\tan 30^\circ = \frac{AB}{AD}$$

$$\frac{1}{\sqrt{3}} = \frac{220}{AD}$$

$\therefore AD = AC + DC$

$$DC = AD - AC$$

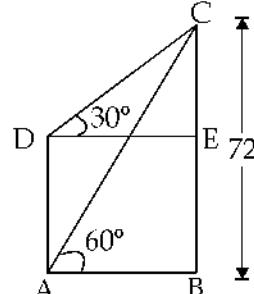
$$= 220\sqrt{3} - 220$$

$$= 220(\sqrt{3} - 1)$$

$$= 220(1.732 - 1)$$

$$= 161.05$$

57.(D)



BC = Tower, AD = Building

$$\text{In } \triangle ABC \quad \tan 60^\circ = \frac{BC}{AB}$$

$$\sqrt{3} = \frac{72}{AB}, AB = 24\sqrt{3}$$

$$AB = DE = 24\sqrt{3}$$

$$\text{In } \triangle DEC \quad \tan 30^\circ = \frac{CE}{DE}$$

$$\frac{1}{\sqrt{3}} = \frac{CE}{24\sqrt{3}} = CE = 24 \text{ m.}$$

$$\begin{aligned} BE & = DA = \text{Height of Building} \\ & = 72 - 24 = 48 \text{ m} \end{aligned}$$

(SSC CHSL - 2020)

1. If $(\sin A - \cos A) = 0$, then find the value of $\cot A$.
यदि $(\sin A - \cos A) = 0$ है, तो $\cot A$ का मान ज्ञात करें।

(A) 0 (B) $\frac{\pi}{6}$ (C) 1 (D) $\frac{\pi}{4}$

2. If $\cos \theta = \frac{4x}{1+4x^2}$, then find the value of $\sin \theta$.

यदि $\cos \theta = \frac{4x}{1+4x^2}$ है, तो $\sin \theta$ का मान क्या होगा?

(A) $\frac{1+4x^2}{4x^2}$ (B) $\frac{1-4x^2}{1+4x^2}$
(C) $\frac{1+4x^2}{1-4x^2}$ (D) $\frac{1-4x^2}{4x^2}$

3. If $\operatorname{cosec} \theta = \frac{41}{9}$, find the value of $5 \tan \theta$

यदि $\operatorname{cosec} \theta = \frac{41}{9}$, तो $5 \tan \theta$ का मान ज्ञात करें।

(A) $\frac{7}{8}$ (B) $\frac{9}{8}$ (C) $\frac{13}{4}$ (D) $\frac{11}{8}$

4. Find the value of θ in the following equation.

$$3 \cot \theta + \tan \theta - 2\sqrt{3} = 0, 0^\circ < \theta < 90^\circ.$$

निम्न समीकरण में θ का मान ज्ञात करें।

$$3 \cot \theta + \tan \theta - 2\sqrt{3} = 0, 0^\circ < \theta < 90^\circ.$$

(A) 30° (B) 45°
(C) 15° (D) 60°

5. In $\triangle ABC$, $\angle A = 90^\circ$, $AB = 20$ cm and $BC = 29$ cm. Find the value of $(\sin B - \cot C)$.

$\triangle ABC$ में, $\angle A = 90^\circ$, $AB = 20$ सेमी. और $BC = 29$ सेमी. है। $(\sin B - \cot C)$ का मान ज्ञात करें।

(A) $-\frac{189}{580}$ (B) $\frac{9}{29}$ (C) $-\frac{9}{29}$ (D) $\frac{189}{580}$

6. If $2\cos^2 \theta = 3(1 - \sin \theta)$, $0^\circ < \theta < 90^\circ$, then find the value of $(\tan 2\theta + \operatorname{cosec} 3\theta - \sec 2\theta)$.

यदि $2\cos^2 \theta = 3(1 - \sin \theta)$, $0^\circ < \theta < 90^\circ$ है, तो $(\tan 2\theta + \operatorname{cosec} 3\theta - \sec 2\theta)$ का मान ज्ञात करें।

(A) $\sqrt{3} + 1$ (B) $\frac{\sqrt{3} + 1}{\sqrt{3}}$
(C) $\sqrt{3} - 1$ (D) $\frac{1 - \sqrt{3}}{\sqrt{3}}$

7. Find the value of $\frac{\tan 50^\circ + \sec 50^\circ}{\cot 40^\circ + \operatorname{cosec} 40^\circ} + \cos^2 65^\circ + \sin 65^\circ \cos 25^\circ + \tan 30^\circ$.
 $\frac{\tan 50^\circ + \sec 50^\circ}{\cot 40^\circ + \operatorname{cosec} 40^\circ} + \cos^2 65^\circ + \sin 65^\circ \cos 25^\circ + \tan 30^\circ$ का मान ज्ञात करें।

(A) $2 + \sqrt{3}$ (B) $\frac{6 + \sqrt{3}}{3}$
(C) $\frac{\sqrt{3}(\sqrt{3} + 1)}{3}$ (D) $1 + \sqrt{3}$

8. If $\cos \theta = \frac{\sqrt{3}}{2}$, then find the value of $\frac{2 - \sin^2 \theta}{1 - \cot^2 \theta} + (\sec^2 \theta + \operatorname{cosec} \theta)$.

यदि $\cos \theta = \frac{\sqrt{3}}{2}$ हो, तो $\frac{2 - \sin^2 \theta}{1 - \cot^2 \theta} + (\sec^2 \theta + \operatorname{cosec} \theta)$ का मान ज्ञात करें।

(A) $\frac{59}{24}$ (B) $\frac{25}{12}$ (C) $-\frac{59}{24}$ (D) $-\frac{25}{12}$

9. If $\tan x = \cot(48^\circ + 2x)$, and $0^\circ < x < 90^\circ$ then find the value of x .

यदि $\tan x = \cot(48^\circ + 2x)$, and $0^\circ < x < 90^\circ$, तो x का मान ज्ञात करें।

(A) 12° (B) 21°
(C) 14° (D) 16°

10. Find the value of / का मान ज्ञात करें।

$$\frac{3 \tan^2 60^\circ \sec^2 30^\circ - \sin^2 45^\circ}{(\cos 15^\circ + \sin 75^\circ)(\sec 15^\circ + \operatorname{cosec} 75^\circ)}$$

(A) $\frac{59}{24}$ (B) $\frac{13}{12}$ (C) $\frac{65}{24}$ (D) $\frac{5}{12}$

11. If $7\sin^2 \theta + 3\cos^2 \theta = 4$, $0^\circ < \theta < 90^\circ$, then find the value of θ .

यदि $7\sin^2 \theta + 3\cos^2 \theta = 4$, $0^\circ < \theta < 90^\circ$ है, तो θ का मान ज्ञात करें।

(A) 45° (B) 30°
(C) 60° (D) 75°

12. If $\cos = \frac{p^2 - 1}{p^2 + 1}$, $0^\circ < \theta < 90^\circ$, then the value of $\operatorname{cosec} \theta$.

- यदि $\cos = \frac{p^2 - 1}{p^2 + 1}$, $0^\circ < \theta < 90^\circ$ है, तो $\operatorname{cosec}\theta$ का मान ज्ञात करो।
- (A) $\frac{1+p^2}{2p}$ (B) $\frac{1-p^2}{2p}$
 (C) $\frac{2p}{1-p^2}$ (D) $\frac{2p}{1+p^2}$
13. If $\sec^2\theta + (1 - \sqrt{3}) \tan\theta - (1 + \sqrt{3}) = 0$, where θ is an acute angle then find the value of θ .
 यदि $\sec^2\theta + (1 - \sqrt{3}) \tan\theta - (1 + \sqrt{3}) = 0$ जहाँ θ न्यून कोण है तो θ का मान ज्ञात करो।
 (A) 30° (B) 60°
 (C) 45° (D) 15°
14. If $A = 30^\circ$, then / यदि $A = 30^\circ$ है, तो
- $$\frac{-3\sin^2 2A + 2\sec^2 A - \tan \frac{3A}{2}}{\frac{1}{3} \sin 3A} \text{ find the value of}$$
- / का मान ज्ञात करो।
 (A) $\frac{-7}{36}$ (B) $\frac{-7}{4}$ (C) $\frac{11}{4}$ (D) $\frac{57}{4}$
15. If $\cos\theta = \frac{7}{3\sqrt{6}}$, where θ is an acute angle then
 find the value of $27\sin^2\theta - \frac{3}{2}$.
 यदि $\cos\theta = \frac{7}{3\sqrt{6}}$, जहाँ θ न्यून कोण है तो $27\sin^2\theta - \frac{3}{2}$ का मान ज्ञात करें।
 (A) 15 (B) 9
 (C) 12 (D) 1
16. In $\triangle ABC$, $\angle C = 90^\circ$ and $\sec A = \frac{13}{5}$, Find the value of $\frac{1 + \sin A}{\cos B}$.
 $\triangle ABC$ में, $\angle C = 90^\circ$ और $\sec A = \frac{13}{5}$ है। $\frac{1 + \sin A}{\cos B}$ का मान ज्ञात करो।
 (A) $\frac{18}{5}$ (B) 5 (C) $\frac{3}{2}$ (D) $\frac{25}{12}$
17. Find the value of following equation. / दिए गए संजक का मान ज्ञात करो।
- $$\tan^2 60^\circ + \operatorname{cosec} 30^\circ \sin 90^\circ + 3 \sec^2 30^\circ$$
- $$4 \cos^2 45^\circ + \sec^2 60^\circ - \cot^2 30^\circ - \cos^2 90^\circ$$
- (A) 3 (B) $\frac{7}{3}$ (C) $\frac{19}{17}$ (D) -12
18. If $\operatorname{cosec}^2\theta (\cos\theta - 1)(1 + \cos\theta) = k$, then find the value of k ?
 यदि $\operatorname{cosec}^2\theta (\cos\theta - 1)(1 + \cos\theta) = k$ है, तो k का मान ज्ञात करो।
 (A) 1 (B) 0
 (C) 1/2 (D) -1
19. If $\sin\theta + \operatorname{cosec}\theta = 7$, then find the value of $\sin^3\theta + \operatorname{cosec}^3\theta$.
 यदि $\sin\theta + \operatorname{cosec}\theta = 7$ है, तो $\sin^3\theta + \operatorname{cosec}^3\theta$ का मान ज्ञात करो।
 (A) 322 (B) 382
 (C) 367 (D) 350
20. If $3\cot A = 4\tan A$, where θ is an acute angle then find the value of $\sec A$.
 यदि $3\cot A = 4\tan A$, जहाँ θ न्यून कोण है, तो $\sec A$ का मान ज्ञात करो।
 (A) $\frac{\sqrt{7}}{2}$ (B) $\frac{1}{\sqrt{3}}$ (C) $\frac{1}{2}$ (D) $\frac{\sqrt{21}}{2}$
21. Find the value of $\frac{\cos^2 20^\circ + \cos^2 70^\circ}{\sin^2 90^\circ} - \tan^2 45^\circ$
 $\frac{\cos^2 20^\circ + \cos^2 70^\circ}{\sin^2 90^\circ} - \tan^2 45^\circ$ का मान ज्ञात करो।
 (A) -1 (B) 0
 (C) -2 (D) 1
22. If / यदि $\frac{\sin^2\theta}{\tan^2\theta - \sin^2\theta} = 5$, then / है, तो find the value of/ का मान ज्ञात करो $\frac{24\cos^2\theta - 15\sec^2\theta}{6\operatorname{cosec}^2\theta - 7\cot^2\theta}$?
 (A) 1 (B) 2
 (C) 6 (D) 4
23. If $\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta} = \frac{k+1}{1-k}$, and $k \neq 1$, then the value of k is equal to?

- यदि $\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta} = \frac{k+1}{1-k}$, और $k \neq 1$ है, तो k का मान ज्ञात करें।
- (A) $\cos\theta$ (B) $\sec\theta$
 (C) $\sin\theta$ (D) $\operatorname{cosec}\theta$
24. If $\sqrt{13} \sin\theta = 2$, then what is the value of expression $\frac{3\tan\theta + \sqrt{13}\sin\theta}{\sqrt{13}\cos\theta - 3\tan\theta}$
- यदि $\sqrt{13} \sin\theta = 2$, तो $\frac{3\tan\theta + \sqrt{13}\sin\theta}{\sqrt{13}\cos\theta - 3\tan\theta}$ का मान ज्ञात करें।
- (A) 4 (B) 3 (C) 5 (D) $\frac{1}{2}$
25. If $\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$. Then find the value of $\sec\theta - \cos\theta$?
- यदि $\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$ तो $\sec\theta - \cos\theta$ का मान ज्ञात करें।
- (A) $\frac{1}{2}$ (B) $\frac{3}{2}$ (C) $\frac{4}{3}$ (D) $\frac{2}{3}$
26. If ΔABC , $\angle C = 90^\circ$ and $\sin A = \sin B$. Find the value of $\cos A$?
- ΔABC में $\angle C = 90^\circ$ और $\sin A = \sin B$ है। $\cos A$ का मान ज्ञात करें।
- (A) $\frac{1}{\sqrt{2}}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) 1
27. If $\frac{\operatorname{cosec}^2\theta}{\operatorname{cosec}^2\theta - \cot^2\theta} = \frac{13}{4}$ and $0^\circ < \theta < 90^\circ$, then find the value of $\frac{52\cos^2\theta - 9\tan^2\theta}{18\sec^2\theta + 8\cot^2\theta}$
- यदि $\frac{\operatorname{cosec}^2\theta}{\operatorname{cosec}^2\theta - \cot^2\theta} = \frac{13}{4}$ और $0^\circ < \theta < 90^\circ$ है, तो $\frac{52\cos^2\theta - 9\tan^2\theta}{18\sec^2\theta + 8\cot^2\theta}$ का मान ज्ञात करें।
- (A) $\frac{4}{11}$ (B) $\frac{8}{13}$ (C) $\frac{8}{11}$ (D) $\frac{5}{11}$
28. If $5\cos\theta = 4\sin\theta$ and $0^\circ < \theta < 90^\circ$, then find the value of $\sec\theta$.
- यदि $5\cos\theta = 4\sin\theta$ और $0^\circ < \theta < 90^\circ$ है, तो $\sec\theta$ का मान ज्ञात करें।
- (A) $\frac{\sqrt{41}}{16}$ (B) $\frac{\sqrt{41}}{5}$ (C) $\frac{\sqrt{41}}{4}$ (D) $\frac{3}{5}$
29. What is the correct value of θ (in degree) in the following equation?
 $\sin 3\theta \cos\theta - \cos 3\theta \sin\theta = \frac{1}{2}$, $0 < \theta < \frac{\pi}{2}$.
 निन्ह समीकरण में θ (डिग्री में) का सही मान क्या है ?
- $\sin 3\theta \cos\theta - \cos 3\theta \sin\theta = \frac{1}{2}$, $0 < \theta < \frac{\pi}{2}$
- (A) 15 (B) 30
 (C) 45 (D) 60
30. If $\sin B = \frac{9}{41}$, then what is the value of $\cot B$ where $0^\circ < B < 90^\circ$?
- यदि $\sin B = \frac{9}{41}$ और $0^\circ < B < 90^\circ$ तो $\cot B$ का मान ज्ञात करें।
- (A) $\frac{9}{41}$ (B) $\frac{40}{9}$ (C) $\frac{41}{9}$ (D) $\frac{9}{40}$
31. What is the value of =
 $\cos 8^\circ \cos 24^\circ \cos 60^\circ \cos 66^\circ \cos 82^\circ$
 $\sin 82^\circ \sin 66^\circ \sin 60^\circ \sin 8^\circ \sin 24^\circ$
 $\cos 8^\circ \cos 24^\circ \cos 60^\circ \cos 66^\circ \cos 82^\circ$
 $\sin 82^\circ \sin 66^\circ \sin 60^\circ \sin 8^\circ \sin 24^\circ$ का मान ज्ञात करें।
- (A) 1 (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{1}{\sqrt{3}}$ (D) 0
32. For θ : $0^\circ < \theta < 90^\circ$ and $3\sec\theta + 4\cos\theta = 4\sqrt{3}$ then calculate $(1 - \sin\theta + \cos\theta)$
 θ के लिए : $0^\circ < \theta < 90^\circ$ है और $3\sec\theta + 4\cos\theta = 4\sqrt{3}$ है तो $(1 - \sin\theta + \cos\theta)$ का मान ज्ञात करें।
- (A) $\frac{1+\sqrt{3}}{2}$ (B) $\frac{1-2\sqrt{3}}{2}$
 (C) $\frac{1-\sqrt{3}}{2}$ (D) $\frac{1+2\sqrt{3}}{2}$
33. Calculate the value of following expression.

$$\frac{3(\cot^2 46^\circ - \sec^2 44^\circ)}{2(\sin^2 28^\circ + \sin^2 62^\circ)} + \frac{2\cos^2 60^\circ \tan^2 33^\circ \tan^2 57^\circ}{\sec^2(90^\circ - \theta) - \cot^2 \theta}$$

$$\frac{3(\cot^2 46^\circ - \sec^2 44^\circ)}{2(\sin^2 28^\circ + \sin^2 62^\circ)} + \frac{2\cos^2 60^\circ \tan^2 33^\circ \tan^2 57^\circ}{\sec^2(90^\circ - \theta) - \cot^2 \theta}$$
 का मान ज्ञात करें।
- (A) 2 (B) 1
 (C) -1 (D) -2

- 34.** If $\tan\theta = \frac{4}{3}$; then calculate $\frac{9\sin\theta + 12\cos\theta}{27\cos\theta - 20\sin\theta}$.
 यदि $\tan\theta = \frac{4}{3}$; तो $\frac{9\sin\theta + 12\cos\theta}{27\cos\theta - 20\sin\theta}$ का मान ज्ञात करो।
 (A) 36 (B) 72
 (C) 18 (D) 100
- 35.** If $\sin^2x - 3\cos^2x = 0$, then find the value of x ? ($0^\circ < x < 90^\circ$)
 यदि $\sin^2x - 3\cos^2x = 0$, तो x का मान ज्ञात करें। ($0^\circ < x < 90^\circ$)
 (A) 60° (B) 45°
 (C) 15° (D) 30°
- 36.** If $\frac{5\cot\theta + \sqrt{3}\cosec\theta}{2\sqrt{3}\cosec\theta + 3\cot\theta} = 1$ and $0^\circ < \theta < 90^\circ$ then
 find $\frac{\frac{7}{2}\cot^2\theta - \frac{3}{4}\cosec^2\theta}{4\sin^2\theta + \frac{3}{2}\tan^2\theta}$.
 यदि $\frac{5\cot\theta + \sqrt{3}\cosec\theta}{2\sqrt{3}\cosec\theta + 3\cot\theta} = 1$ और $0^\circ < \theta < 90^\circ$ तो
 $\frac{7}{2}\cot^2\theta - \frac{3}{4}\cosec^2\theta$
 $4\sin^2\theta + \frac{3}{2}\tan^2\theta$ का मान ज्ञात करें।
 (A) 7 (B) 2
 (C) 3 (D) 5
- 37.** What is the value of $\sqrt{(\cos 60^\circ)\cos 30^\circ - \sin 60^\circ \sin 30^\circ}$.
 $\sqrt{(\cos 60^\circ)\cos 30^\circ - \sin 60^\circ \sin 30^\circ}$ का मान ज्ञात करो।
 (A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) 0 (D) 1
- 38.** If $3\cos\theta = 2\sin^2\theta$, then find the value of $(\tan^2\theta + \sec^2\theta - \cosec^2\theta)$? ($0^\circ < \theta < 90^\circ$)
 यदि $3\cos\theta = 2\sin^2\theta$ तो $\tan^2\theta + \sec^2\theta - \cosec^2\theta$ का मान ज्ञात करें। ($0^\circ < \theta < 90^\circ$)
 (A) $\frac{-7}{3}$ (B) $\frac{-17}{3}$ (C) $\frac{7}{3}$ (D) $\frac{17}{3}$
- 39.** What is the value of $\cot^2 46^\circ - \sec^2 44^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$?
 $\cot^2 46^\circ - \sec^2 44^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$ का मान ज्ञात करो।
 (A) 20.5 (B) 21.5
 (C) 22.5 (D) 26.5

- 40.** If $(1 + \cot^2\theta) + (1 + (\cot^2\theta)^{-1})$ is equal to k . Then find \sqrt{k} .
 यदि $(1 + \cot^2\theta) + (1 + (\cot^2\theta)^{-1}) = k$, तो \sqrt{k} का मान ज्ञात करो।
 (A) $\sin\theta\cos\theta$ (B) $\cosec\theta\cos\theta$
 (C) $\cosec\theta\sec\theta$ (D) $\sin\theta\sec\theta$
- 41.** Calculate the value of $\frac{(\sin^2 27^\circ + \sin^2 63^\circ)}{(\cos^2 24^\circ + \cos^2 66^\circ)} - \sin^2 69^\circ - \cos 69^\circ \sin 21^\circ$.
 $\frac{(\sin^2 27^\circ + \sin^2 63^\circ)}{(\cos^2 24^\circ + \cos^2 66^\circ)} - \sin^2 69^\circ - \cos 69^\circ \sin 21^\circ$ का मान ज्ञात करो।
 (A) 2 (B) 3
 (C) 1 (D) 0
- 42.** Find the value of $\frac{\sec\theta \cdot \cosec\theta}{2 + \tan^2\theta + \cot^2\theta}$.
 $\frac{\sec\theta \cdot \cosec\theta}{2 + \tan^2\theta + \cot^2\theta}$ का मान ज्ञात करो।
 (A) $\cosec\theta\cos\theta$ (B) $\sin\theta\cos\theta$
 (C) $\cosec\theta\sec\theta$ (D) $\sin\theta\sec\theta$
- 43.** If $3\sin^2 A + 4\cos^2 A - 3 = 0$, then what is the value of $\cot A$? (Where $0^\circ \leq A \leq 90^\circ$)
 यदि $3\sin^2 A + 4\cos^2 A - 3 = 0$, तो $\cot A$ का मान ज्ञात करें। ($0^\circ \leq A \leq 90^\circ$)
 (A) can not be determined/ निर्धारित नहीं कर सकते।
 (B) ∞
 (C) 0 (D) 1
- 44.** If $3\cosec\theta + 4\sin\theta - 4\sqrt{3} = 0$ where θ is an acute angle then find the value of θ .
 यदि $3\cosec\theta + 4\sin\theta - 4\sqrt{3} = 0$, जहां θ न्यून कोण है तो θ का मान ज्ञात करो।
 (A) 30° (B) 60°
 (C) 45° (D) 15°
- 45.** If $\cot^2\theta + \cosec^2\theta = 2$, then find the value of $2\sin^4\theta + \sin^2\theta$.
 यदि $\cot^2\theta + \cosec^2\theta = 2$, तो $2\sin^4\theta + \sin^2\theta$ का मान ज्ञात करो।
 (A) 5 (B) 3
 (C) 1 (D) 2

- 46.** If $\cot A + \operatorname{cosec} A = 2$ and A is an acute angle then find the value of $\frac{9 \tan A + 16 \operatorname{cosec} A}{5 \sin A + 3 \tan A}$
 यदि $\cot A + \operatorname{cosec} A = 2$, जहाँ A न्यून कोण है तो $\frac{9 \tan A + 16 \operatorname{cosec} A}{5 \sin A + 3 \tan A}$ का मान ज्ञात करो।
 (A) 3 (B) 6
 (C) 8 (D) 4
- 47.** What is the value of

$$\frac{\cos^2 89^\circ + \cos^2 1^\circ}{\cos 30^\circ \sin 90^\circ - \sin 30^\circ \cos 90^\circ}$$

$$\frac{\cos^2 89^\circ + \cos^2 1^\circ}{\cos 30^\circ \sin 90^\circ - \sin 30^\circ \cos 90^\circ}$$
 का मान ज्ञात करो।
 (A) $\frac{1}{\sqrt{3}}$ (B) $\frac{2}{\sqrt{3}}$ (C) $\frac{1}{1-\sqrt{3}}$ (D) $2\sqrt{3}$
- 48.** If $6\tan^2 \alpha - 2 = 0$ and $0^\circ < \alpha < 90^\circ$ then calculate the value of α .
 यदि $6\tan^2 \alpha - 2 = 0$, $0^\circ < \alpha < 90^\circ$ और तो α का मान ज्ञात करो।
 (A) 45° (B) 30°
 (C) 75° (D) 15°
- 49.** If $\sin \alpha + \operatorname{cosec} \alpha = \tan \frac{\pi}{3}$, then find the value of $\sin^3 \alpha + \operatorname{cosec}^3 \alpha$.
 यदि $\sin \alpha + \operatorname{cosec} \alpha = \tan \frac{\pi}{3}$ है, तो $\sin^3 \alpha + \operatorname{cosec}^3 \alpha$ का मान ज्ञात करें।
 (A) $\frac{1}{2}$ (B) 1
 (C) $\frac{3}{2}$ (D) 0
- 50.** If $8\sin^2 \theta + 2\cos \theta = 5$, then find the value of $(\tan^2 \theta + \sec^2 \theta - \sin^2 \theta)$? ($0^\circ < \theta < 90^\circ$)
 यदि $8\sin^2 \theta + 2\cos \theta = 5$ तो $(\tan^2 \theta + \sec^2 \theta - \sin^2 \theta)$ का मान ज्ञात करें। ($0^\circ < \theta < 90^\circ$)
 (A) $\frac{305}{144}$ (B) $\frac{153}{72}$ (C) $\frac{431}{144}$ (D) $\frac{23}{9}$
- 51.** If $\operatorname{cosec} \theta = \frac{\sqrt{5}}{2}$, then find the value of $(\sec \theta + \tan \theta - \cot \theta \sin \theta)$?
 यदि $\operatorname{cosec} \theta = \frac{\sqrt{5}}{2}$ तो $(\sec \theta + \tan \theta - \cot \theta \sin \theta)$ का मान ज्ञात करें।
 (A) $2 + \frac{\sqrt{5}}{2}$ (B) $2 + \frac{4\sqrt{5}}{2}$
 (C) $2 + \frac{\sqrt{5}}{2}$ (D) $2 + \frac{2\sqrt{5}}{2}$
- 52.** If $3\cot^2 x - 7\operatorname{cosec}^2 x + 7 = 0$ then calculate x ($0^\circ \leq x \leq 90^\circ$)
 यदि $3\cot^2 x - 7\operatorname{cosec}^2 x + 7 = 0$ तो x ($0^\circ \leq x \leq 90^\circ$) का मान ज्ञात करो।
 (A) 60° (B) 0°
 (C) 90° (D) 30°
- 53.** Find the value of $\sin^2 60^\circ + \tan^2 45^\circ + \sec^2 45^\circ - \operatorname{cosec}^2 30^\circ$.
 $\sin^2 60^\circ + \tan^2 45^\circ + \sec^2 45^\circ - \operatorname{cosec}^2 30^\circ$ का मान ज्ञात करो।
 (A) -4 (B) $-\frac{1}{4}$ (C) $\frac{1}{4}$ (D) 4
- 54.** If $2\tan x + 3\cot x = 5$, then find the value of $4\tan^2 x + 9\cot^2 x$.
 यदि $2\tan x + 3\cot x = 5$ तो $4\tan^2 x + 9\cot^2 x$ का मान ज्ञात करो।
 (A) 11 (B) 15
 (C) 13 (D) 17
- 55.** If $\sec \theta = \frac{65}{63}$ and A is an acute angle then find the value of $8(\operatorname{cosec} \theta - \cot \theta)$.
 यदि $\sec \theta = \frac{65}{63}$, जहाँ A न्यून कोण है तो $8(\operatorname{cosec} \theta - \cot \theta)$ का मान ज्ञात करो।
 (A) 2 (B) 4
 (C) 1 (D) 8
- 56.** If $2\cos \theta + \sec \theta - 2\sqrt{2} = 0$; where A is an acute angle then find the value of θ .
 यदि $2\cos \theta + \sec \theta - 2\sqrt{2} = 0$, जहाँ A न्यून कोण है तो θ का मान ज्ञात करो।
 (A) 15° (B) 60°
 (C) 45° (D) 30°
- 57.** In $\triangle ABC$, if angle B is 90° , $AB = 21$ cm and $BC = 20$ cm, then find $\frac{1 + \sin A - \cos A}{1 + \sin A + \cos A}$.
 $\triangle ABC$ में $\angle B = 90^\circ$, $AB = 21$ सेमी. और $BC = 20$ सेमी. तो $\frac{1 + \sin A - \cos A}{1 + \sin A + \cos A}$ का मान ज्ञात करो।
 (A) $\frac{3}{5}$ (B) $-\frac{2}{5}$ (C) $-\frac{3}{5}$ (D) $\frac{2}{5}$

- 58.** Calculate the value of : $\text{cosec}(58^\circ + \theta) - \sec(32^\circ - \theta) + \sin 15^\circ \sin 35^\circ \sec 55^\circ \sin 30^\circ \sec 75^\circ$
 $\text{cosec}(58^\circ + \theta) - \sec(32^\circ - \theta) + \sin 15^\circ \sin 35^\circ \sec 55^\circ \sin 30^\circ \sec 75^\circ$ का मान ज्ञात करें।
- (A) 2 (B) 1 (C) 0 (D) $\frac{1}{2}$
- 59.** If $\tan 3\theta = \sin 45^\circ \cdot \cos 45^\circ + \cos 60^\circ$, and θ is an acute angle then find the value of $\sin 4\theta$.
यदि $\tan 3\theta = \sin 45^\circ \cdot \cos 45^\circ + \cos 60^\circ$, जहाँ θ न्यून कोण है तो $\sin 4\theta$ का मान ज्ञात करें।
- (A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{\sqrt{3}}{2}$ (D) 1
- 60.** If $\tan \theta + \cot \theta = 3$, then what is the value of $\tan^2 \theta + \cot^2 \theta$?
यदि $\tan \theta + \cot \theta = 3$ है तो $\tan^2 \theta + \cot^2 \theta$ का मान ज्ञात करें।
- (A) -1 (B) 7 (C) 1 (D) 11
- 61.** If $5 \tan A = 12$, then what is the value of $\frac{13 \sin A + 20 \tan A}{15 \tan A - 13 \cos A}$? Where A is an acute angle.
यदि $5 \tan A = 12$ जहाँ A न्यून कोण है तो
- $\frac{13 \sin A + 20 \tan A}{15 \tan A - 13 \cos A}$ का मान ज्ञात करें।
- (A) $\frac{31}{41}$ (B) $1\frac{19}{41}$ (C) $1\frac{29}{31}$ (D) $\frac{41}{50}$
- 62.** If $\text{cosec } A = 10$, then what is the value of $20 \sin A + 9\sqrt{11} \sec A$? Where A is an acute angle.
यदि $\text{cosec } A = 10$, जहाँ A न्यून कोण है तो $20 \sin A + 9\sqrt{11} \sec A$ का मान ज्ञात करें।
- (A) 23 (B) 32 (C) 30 (D) 34
- 63.** If $\sin^2 x = 3 \cos^2 x$ and $0^\circ \leq x \leq 90^\circ$ then find the value of $\frac{x}{2}$.
यदि $\sin^2 x = 3 \cos^2 x$, $0^\circ \leq x \leq 90^\circ$ तो $\frac{x}{2}$ का मान ज्ञात करें।
- (A) 15° (B) 30° (C) 22.5° (D) 45°
- 64.** If $\sec \theta - \text{cosec } \theta = 0$, then what is the value of $\sec^2 \theta + \text{cosec}^2 \theta$? Where A is an acute angle.
यदि $\sec \theta - \text{cosec } \theta = 0$, जहाँ A न्यून कोण है तो $\sec^2 \theta + \text{cosec}^2 \theta$ का मान ज्ञात करें।
- (A) 2 (B) 4 (C) 0 (D) 1
- 65.** In ΔABC , $\angle A = 90^\circ$, then $\sin \frac{B+C}{2} \cos \frac{B+C}{2} = ?$
 ΔABC , $\angle A = 90^\circ$ तो $\sin \frac{B+C}{2} \cos \frac{B+C}{2} = ?$
- (A) $\sqrt{2}$ (B) $\frac{1}{2}$ (C) $\frac{1}{4}$ (D) $\frac{\sqrt{3}}{4}$
- 66.** If $\tan A + \sec A = \frac{3}{2}$ and A is an acute angle, then what is the value of $\frac{10 \cot A + 13 \cos A}{12 \tan A + 5 \text{cosec } A}$?
यदि $\tan A + \sec A = \frac{3}{2}$, जहाँ A न्यून कोण है तो
- $\frac{10 \cot A + 13 \cos A}{12 \tan A + 5 \text{cosec } A}$ का मान ज्ञात करें।
- (A) 2 (B) 5 (C) 4 (D) 1
- 67.** If $\frac{\text{cosec } \theta + \cot \theta}{\text{cosec } \theta - \cot \theta} = 7$, then find the value of $\frac{4 \sin^2 \theta + 5}{4 \sin^2 \theta - 1}$.
यदि $\frac{\text{cosec } \theta + \cot \theta}{\text{cosec } \theta - \cot \theta} = 7$ है, तो $\frac{4 \sin^2 \theta + 5}{4 \sin^2 \theta - 1}$ का मान ज्ञात करें।
- (A) 9 (B) 12 (C) 15 (D) 3
- 68.** If $5 \sin^2 \theta = 3(1 + \cos \theta)$ and $0^\circ < \theta < 90^\circ$ then find the value of $\text{cosec } \theta + \cot \theta$.
यदि $5 \sin^2 \theta = 3(1 + \cos \theta)$ और $0^\circ < \theta < 90^\circ$ है, तो $\text{cosec } \theta + \cot \theta$ का मान क्या होगा ?
- (A) $\sqrt{\left(\frac{7}{3}\right)}$ (B) $\sqrt{\left(\frac{3}{7}\right)}$ (C) $\frac{5}{\sqrt{21}}$ (D) $\frac{4}{\sqrt{21}}$
- 69.** If $\cot \theta = \sqrt{2} + 1$ then find the value of $\text{cosec } \theta \text{ sec } \theta$.
यदि $\cot \theta = \sqrt{2} + 1$, तो $\text{cosec } \theta \text{ sec } \theta$ का मान ज्ञात करें।
- (A) $4\sqrt{2}$ (B) $2\sqrt{2}$ (C) $\frac{\sqrt{2}}{4}$ (D) $\frac{\sqrt{2}}{2}$
- 70.** If $\tan A = \frac{11}{60}$ then what is the value of $(4 \cos A - 7 \sin A)$. Given that A is an acute angle.
यदि $\tan A = \frac{11}{60}$ जहाँ A न्यून कोण है तो $(4 \cos A - 7 \sin A)$ का मान ज्ञात करें।
- (A) $2\frac{14}{61}$ (B) $2\frac{41}{61}$ (C) $2\frac{14}{71}$ (D) $2\frac{41}{71}$

71. If $0^\circ < \theta < 90^\circ$ then find the value of

$$\frac{(1 - \sin \theta)(\sec \theta + \tan \theta) \tan \theta}{(\tan \theta + \sec \theta + 1)(\cot \theta - \cosec \theta + 1)}$$

यदि $0^\circ < \theta < 90^\circ$, तो

$$\frac{(1 - \sin \theta)(\sec \theta + \tan \theta) \tan \theta}{(\tan \theta + \sec \theta + 1)(\cot \theta - \cosec \theta + 1)} \text{ का मान ज्ञात करो।}$$

- (A) $\cos \theta$ (B) $\frac{\sin \theta}{2}$ (C) $\frac{\cos \theta}{2}$ (D) $\sin \theta$

72. Solve the following equation:

$$2\cos^2 \theta + (4 + \sqrt{3})\sin \theta - 2(1 + \sqrt{3}) = 0, \text{ where } \theta \text{ is an acute angle.}$$

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$$2\cos^2 \theta + (4 + \sqrt{3})\sin \theta - 2(1 + \sqrt{3}) = 0 \text{ जहाँ } \theta \text{ न्यून कोण है।}$$

- (A) 60° (B) 15°
 (C) 45° (D) 30°

73. If $\frac{3\sqrt{3}\sec \theta + 4\tan \theta}{3\tan \theta + \sqrt{3}\sec \theta} = 2$ & $0^\circ < \theta < 90^\circ$ then find the value of $\cos \theta$?

$$\text{यदि } \frac{3\sqrt{3}\sec \theta + 4\tan \theta}{3\tan \theta + \sqrt{3}\sec \theta} = 2 \text{ और } 0^\circ < \theta < 90^\circ \text{ तो } \cos \theta \text{ का मान ज्ञात करो।}$$

- (A) $\frac{1}{4}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{1}{2}$

74. What number should be subtracted to get 2 by $4(\sin^4 60^\circ + \cos^4 30^\circ) - (\tan^2 45^\circ - \cot^2 30^\circ) + \cos^2 45^\circ - \cosec^2 45^\circ + \sec^2 60^\circ$.

2 प्राप्त करने के लिए किस संख्या को $4(\sin^4 60^\circ + \cos^4 30^\circ) - (\tan^2 45^\circ - \cot^2 30^\circ) + \cos^2 45^\circ - \cosec^2 45^\circ + \sec^2 60^\circ$ से घटाना चाहिए।

- (A) 3 (B) 5
 (C) 4 (D) 7

75. If $\cos \theta = \frac{2}{3}$, then find the value of $2\sec^2 \theta + 2\tan^2 \theta - 6$.

यदि $\cos \theta = \frac{2}{3}$, तो $2\sec^2 \theta + 2\tan^2 \theta - 6$ का मान ज्ञात करें।

- (A) 1 (B) 0
 (C) 4 (D) 2

76. If θ is an acute angle and $\sin \theta = \cos \theta$. Then find the value of $2\tan^2 \theta + \sin^2 \theta - 1$

यदि, $\sin \theta = \cos \theta$ जहाँ θ न्यून कोण है तो $(2\tan^2 \theta + \sin^2 \theta - 1)$ का मान ज्ञात करें।

- (A) 3 (B) 1
 (C) $3/2$ (D) -7

77. The value A is between 45° to 540° and $\sin A = 0.5$, then find the value of $A/3$.

यदि A का मान 45° से 540° के मध्य है। $\sin A = 0.5$ तब A/3 का मान अंश में कितना होगा?

- (A) 170° (B) 160°
 (C) 165° (D) 175°

78. Find the value of

$$\frac{\tan^2 60^\circ - 2\sin^2 45^\circ}{\cos 24^\circ \cos 37^\circ \cosec 53^\circ \cos 60^\circ \cosec 66^\circ + \sin^2 60^\circ}$$

$$\frac{\tan^2 60^\circ - 2\sin^2 45^\circ}{\cos 24^\circ \cos 37^\circ \cosec 53^\circ \cos 60^\circ \cosec 66^\circ + \sin^2 60^\circ}$$

का मान ज्ञात करो।

- (A) $1\frac{3}{5}$ (B) 1 (C) $1\frac{4}{5}$ (D) 2

79. Calculate the value of $\sin^2 x - 4\sin x + 3 = 0$, $0 \leq x \leq \frac{\pi}{2}$.

$\sin^2 x - 4\sin x + 3 = 0$, $0 \leq x \leq \frac{\pi}{2}$ का मान ज्ञात करो।

- (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

80. If $\tan \theta = 15$, then find the value of $\sec \theta$

यदि $\tan \theta = 15$ है, तो $\sec \theta$ का मान ज्ञात करो।

- (A) $\frac{1}{\sqrt{224}}$ (B) $\sqrt{226}$

- (C) $\sqrt{224}$ (D) $\frac{1}{\sqrt{226}}$

81. If $\tan \theta + \cot \theta = 4$, then find the ratio of $3(\tan^2 \theta + \cot^2 \theta)$ to $(2\cosec^2 \theta \sec^2 \theta - 4)$.

यदि $\tan \theta + \cot \theta = 4$, तो $3(\tan^2 \theta + \cot^2 \theta)$ का $(2\cosec^2 \theta \sec^2 \theta - 4)$ से अनुपात ज्ञात करें।

- (A) 5 : 4 (B) 4 : 3
 (C) 3 : 4 (D) 3 : 2

- 82.** If $Y = \tan 35^\circ$ then what is value of $(2\tan 55^\circ + \cot 55^\circ)$?
 यदि $Y = \tan 35^\circ$, तो $(2\tan 55^\circ + \cot 55^\circ)$ का मान ज्ञात करो।
- (A) $\frac{2}{Y^2}$ (B) $\frac{2-Y^2}{Y}$ (C) $\frac{2+Y^2}{Y}$ (D) $\frac{2+Y}{Y^2}$
- 83.** If $\tan^2 x - 3\tan x + 2 = 0$ and $0^\circ < x < 90^\circ$. then find the value of x.
 यदि $\tan^2 x - 3\tan x + 2 = 0$ और $0^\circ < x < 90^\circ$ तो x का मान ज्ञात करो।
- (A) 30° (B) 60°
 (C) 90° (D) 45°
- 84.** Find the value of

$$\frac{\sin 33^\circ \cos 57^\circ + \sec 62^\circ \sin 28^\circ + \cos 33^\circ \sin 57^\circ + \cosec 62^\circ \cos 28^\circ}{\tan 15^\circ \tan 35^\circ \tan 60^\circ \tan 55^\circ \tan 75^\circ}$$

$$\frac{\sin 33^\circ \cos 57^\circ + \sec 62^\circ \sin 28^\circ + \cos 33^\circ \sin 57^\circ + \cosec 62^\circ \cos 28^\circ}{\tan 15^\circ \tan 35^\circ \tan 60^\circ \tan 55^\circ \tan 75^\circ}$$
- का मान ज्ञात करो।
- (A) $\frac{\sqrt{3}}{3}$ (B) $2\sqrt{3}$ (C) $\sqrt{3}$ (D) 2
- 85.** If $A = 60^\circ$ then What is value of $(4\cos^3 A - 3\cos A)$?
 यदि $A = 60^\circ$ है, तो $(4\cos^3 A - 3\cos A)$ का मान ज्ञात करो।
- (A) 1 (B) -1 (C) $-\frac{\sqrt{3}}{2}$ (D) $\frac{\sqrt{3}}{2}$
- 86.** If $\sin \theta = \frac{12}{13}$, then $\frac{\sin^2 \theta - \cos^2 \theta}{2 \cos \theta \sin \theta} \times \cot^2 \theta = ?$
 यदि $\sin \theta = \frac{12}{13}$ है, तो $\frac{\sin^2 \theta - \cos^2 \theta}{2 \cos \theta \sin \theta} \times \cot^2 \theta$ का मान ज्ञात करो।
- (A) $\frac{595}{1152}$ (B) $\frac{118}{144}$ (C) $\frac{595}{3456}$ (D) $\frac{119}{864}$
- 87.** If $(\cos^2 \theta - 1)(2\sec^2 \theta) + \sec^2 \theta + 2\tan^2 \theta = 2$, $0^\circ < \theta < 90^\circ$, then find the value of $\frac{\sec \theta + \sin \theta}{\cosec \theta - \cos \theta}$.
 यदि $(\cos^2 \theta - 1)(2\sec^2 \theta) + \sec^2 \theta + 2\tan^2 \theta = 2$, $0^\circ < \theta < 90^\circ$ तो $\frac{\sec \theta + \sin \theta}{\cosec \theta - \cos \theta}$ का मान ज्ञात करो।
- (A) 2 (B) -3
 (C) -1 (D) 3
- 88.** If $3(\sec^2 \theta + \tan^2 \theta) = 5$, $0^\circ < \theta < 90^\circ$, then find the value of $\cosec \theta$.
 यदि $3(\sec^2 \theta + \tan^2 \theta) = 5$, $0^\circ < \theta < 90^\circ$ तो $\cosec \theta$ का मान ज्ञात करो।
- (A) 2 (B) $\frac{1}{2}$ (C) $2\frac{\sqrt{3}}{3}$ (D) $\frac{1}{\sqrt{3}}$
- 89.** If $21\tan \theta = 20$, then what is value of $(1 + \sin \theta - \cos \theta) : (1 - \sin \theta + \cos \theta)$.
 यदि $21\tan \theta = 20$ है, तो $(1 + \sin \theta - \cos \theta) : (1 - \sin \theta + \cos \theta)$ का मान ज्ञात करो।
- (A) 14 : 15 (B) 13 : 15
 (C) 12 : 11 (D) 11 : 13
- 90.** Calculate the value of $\cos^2 30^\circ + \cos^2 40^\circ + \cos^2 50^\circ + \cos^2 60^\circ$.
 $\cos^2 30^\circ + \cos^2 40^\circ + \cos^2 50^\circ + \cos^2 60^\circ$ का मान ज्ञात करो।
- (A) $\frac{5}{2}$ (B) $\frac{3}{2}$ (C) 2 (D) 1
- 91.** If $5k = \tan \theta$ and $\frac{5}{k} = \sec \theta$, then what is the value of $10\left(k^2 - \frac{1}{k^2}\right)$?
 यदि $5k = \tan \theta$ और $\frac{5}{k} = \sec \theta$, $10\left(k^2 - \frac{1}{k^2}\right)$ का मान ज्ञात करें।
- (A) $-\frac{2}{5}$ (B) 2 (C) $\frac{2}{5}$ (D) -2
- 92.** If $\sin \theta = \frac{11}{15}$, then what is the value of $(\sec \theta - \tan \theta)$?
 यदि $\sin \theta = \frac{11}{15}$ हो, तो $(\sec \theta - \tan \theta)$ का मान ज्ञात करो।
- (A) $\frac{1}{\sqrt{26}}$ (B) $\frac{2\sqrt{26}}{13}$ (C) $\frac{4}{\sqrt{26}}$ (D) $\frac{\sqrt{26}}{13}$
- 93.** If $\sin \theta(2\sin \theta + 3) = 2$, $0^\circ < \theta < 90^\circ$, then the value of $(\sec^2 \theta + \cot^2 \theta - \cos^2 \theta)$.
 यदि $\sin \theta(2\sin \theta + 3) = 2$, $0^\circ < \theta < 90^\circ$ है, तो $(\sec^2 \theta + \cot^2 \theta - \cos^2 \theta)$ का मान ज्ञात करो।
- (A) $\frac{7}{2}$ (B) $\frac{43}{12}$ (C) $\frac{31}{12}$ (D) $\frac{13}{3}$

94. What is the value of $\frac{(1+\cos\theta)(\cosec\theta-\cot\theta)\sec\theta}{\sin\theta(1-\sin\theta)(\sec\theta+\tan\theta)}$

$\frac{(1+\cos\theta)(\cosec\theta-\cot\theta)\sec\theta}{\sin\theta(1-\sin\theta)(\sec\theta+\tan\theta)}$ का मान ज्ञात करो।

(A) $\cos^2\theta$ (B) $\sin^2\theta$
 (C) $\sec^2\theta$ (D) $\cosec^2\theta$

95. Find the value of $\frac{3\cos^227^\circ - 5 + 3\cos^263^\circ}{\tan^232^\circ + 4 - \cosec^258^\circ} + \sin 35^\circ \cos 55^\circ + \cos 35^\circ \sin 55^\circ$.

$\frac{3\cos^227^\circ - 5 + 3\cos^263^\circ}{\tan^232^\circ + 4 - \cosec^258^\circ} + \sin 35^\circ \cos 55^\circ + \cos 35^\circ \sin 55^\circ$ का मान ज्ञात करो।

(A) $\frac{1}{3}$ (B) $1\frac{2}{3}$ (C) $-\frac{1}{3}$ (D) $-\frac{1}{4}$

96. If $\sin\theta = \frac{2\sqrt{ab}}{a+b}$, $a > b > 0$, then find the value of $\frac{\cos\theta+1}{\cos\theta-1}$.

यदि $\sin\theta = \frac{2\sqrt{ab}}{a+b}$, $a > b > 0$, $\frac{\cos\theta+1}{\cos\theta-1}$ का मान ज्ञात करें।

(A) $\frac{a}{b}$ (B) $-\frac{b}{a}$ (C) $\frac{b}{a}$ (D) $-\frac{a}{b}$

97. If $3\cos^2\theta - 4\sin\theta + 1 = 0$, $0^\circ < \theta < 90^\circ$, then find the value of $3\cos^2\theta + 5\tan^2\theta$.
 यदि $3\cos^2\theta - 4\sin\theta + 1 = 0$, $0^\circ < \theta < 90^\circ$, तो $3\cos^2\theta + 5\tan^2\theta$ का मान ज्ञात करें।

(A) $5\frac{2}{3}$ (B) $6\frac{2}{3}$ (C) $5\frac{1}{5}$ (D) $5\frac{4}{3}$

98. Solve the following equation
 $\theta : 2\sqrt{3}\sin^2\theta + \cos\theta - \sqrt{3} = 0$ where θ is an acute angle.
 निम्न समीकरण को हल कीजिए-

$\theta : 2\sqrt{3}\sin^2\theta + \cos\theta - \sqrt{3} = 0$ जहाँ θ न्यून कोण है।

(A) 30° (B) 45°
 (C) 60° (D) 15°

99. If $\sec\theta\left(90^\circ - \frac{3\theta}{2}\right) = \sqrt{2}$, $0^\circ < \theta < 90^\circ$ then the value of $(2\sin\theta + 4\cos\theta)$

यदि $\sec\theta\left(90^\circ - \frac{3\theta}{2}\right) = \sqrt{2}$, $0^\circ < \theta < 90^\circ$ तो $(2\sin\theta + 4\cos\theta)$ का मान ज्ञात करो।

(A) 4 (B) 2
 (C) 6 (D) 3

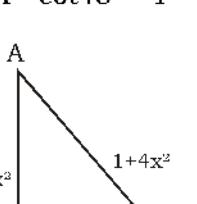
100. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$, then calculate $\sin^4\theta - \cos^4\theta$.
 यदि $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$ तो $\sin^4\theta - \cos^4\theta$ का मान ज्ञात करें।

(A) $\frac{3}{5}$ (B) $\frac{4}{5}$ (C) $\frac{2}{5}$ (D) $\frac{1}{5}$

Solution

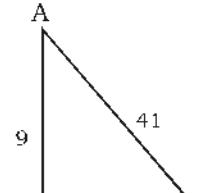
- 1.** (C) $\sin A = \cos A$
 $\Rightarrow \frac{\cos A}{\sin A} = 1$
 $\Rightarrow \cot A = \cot 45^\circ = 1$

2. (B)



$$\sin \theta = \frac{1 - 4x^2}{1 + 4x^2}$$

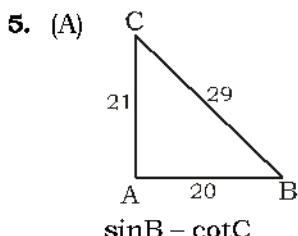
3. (B)



$$\cosec \theta = \frac{41}{9}$$

$$5 \tan \theta = 5 \times \frac{9}{40} = \frac{9}{8}$$

4. (D) Put $\theta = 60^\circ$ (By option)
 $\Rightarrow 3 \times \frac{1}{\sqrt{3}} + \sqrt{3} - 2\sqrt{3} = 0$



$$\sin B - \cot C$$

$$\frac{21}{29} - \frac{21}{20}$$

$$\frac{420 - 619}{580} = \frac{-189}{580}$$

6. (C) $\theta = 30^\circ$ satisfied

$$\begin{aligned} \tan 2\theta + \cosec 3\theta - \sec 2\theta \\ = \tan 60^\circ + \cosec 90^\circ - \sec 60^\circ \\ = \sqrt{3} + 1 - 2 \\ = \sqrt{3} - 1 \end{aligned}$$

7. (B) $\frac{\tan 50^\circ + \sec 50^\circ}{\tan 50^\circ + \sec 50^\circ} + \cos^2 65^\circ + \sin^2 65^\circ + \tan 30^\circ$

$$= 1 + 1 \cdot \frac{1}{\sqrt{3}} = \frac{2\sqrt{3} + 1}{\sqrt{3}} = \frac{6 + \sqrt{3}}{3}$$

8. (A) $\cos \theta = \cos 30^\circ$
 $\theta = 30^\circ$

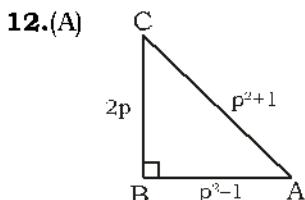
$$\begin{aligned} &\Rightarrow \frac{2 - \frac{1}{4}}{1 - 3} + \left(\frac{4}{3} + 2 \right) \\ &\Rightarrow \frac{7}{-2} + \left(\frac{10}{3} \right) = \frac{-7}{8} + \left(\frac{10}{3} \right) = \frac{59}{24} \end{aligned}$$

9. (C) $3x = 90^\circ - 48^\circ$
 $x = 14^\circ$

10. (A) $\frac{3 \times 3 + \frac{4}{3} - \frac{1}{2}}{2 \cos 15^\circ \times 2 \sec 15^\circ} = \frac{9 + \frac{4}{3} - \frac{1}{2}}{4}$

$$= \frac{31 - 1}{4} = \frac{59}{24}$$

11. (B) $7\sin^2 \theta + 3\cos^2 \theta - 4 = 0$
 $\Rightarrow 7\sin^2 \theta + 3 - 3\sin^2 \theta - 4 = 0$
 $\Rightarrow 4\sin^2 \theta = 1$
 $\Rightarrow \sin \theta = \frac{1}{2}, \theta = 30^\circ$



$$\cosec \theta = \frac{p^2 + 1}{2p}$$

13. (B) $1 + \tan^2 \theta + (1 - \sqrt{3})\tan \theta - (1 + \sqrt{3}) = 0$

$$\Rightarrow \tan^2 \theta + (1 - \sqrt{3})\tan \theta - \sqrt{3} = 0$$

$$\Rightarrow \tan^2 \theta + \tan \theta - \sqrt{3}\tan \theta - \sqrt{3} = 0$$

$$\Rightarrow \tan \theta = \sqrt{3}, -1 \text{ (x)}$$

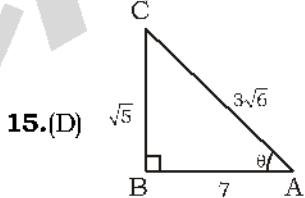
$$\Rightarrow \theta = 60^\circ$$

14. (B) $\frac{-3 \sin^2 60^\circ + 2 \sec^2 30^\circ - \tan 45^\circ}{\frac{1}{3} \sin 90^\circ}$

$$\frac{-3 \times \frac{3}{4} + 2 \times \frac{4}{3} - 1}{\frac{1}{3}} = \frac{\frac{-9}{4} + \frac{8}{3} - 1}{\frac{1}{3}}$$

$$-27 + 32 - 12$$

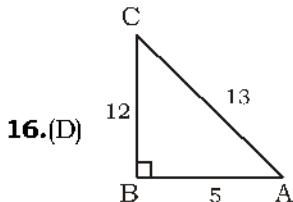
$$\frac{12}{\frac{1}{3}} = \frac{-7 \times 3}{12} = \frac{-7}{4}$$



$$\cos \theta = \frac{7}{3\sqrt{6}}$$

$$27 \sin^2 \theta - \frac{3}{2}$$

$$27 \times \frac{5}{54} - \frac{3}{2} \Rightarrow \frac{5}{2} - \frac{3}{2} = 1$$



$$\sec A = \frac{13}{5}$$

$$\frac{1 + \sin A}{\cos B} = \frac{1 + \frac{12}{13}}{12/13} = \frac{12 + 13}{12} = \frac{25}{12}$$

$$17.(A) \frac{3 + 2 \times 1 + 3 \times \frac{4}{3}}{4 \times \frac{1}{2} + 4 - 3 - 0} = \frac{9}{6 - 3} = 3$$

$$18.(D) \cosec^2 \theta \times (\cos^2 \theta - 1) = k$$

$$\Rightarrow -\frac{1}{\sin^2 \theta} \times \sin^2 \theta = k$$

$$\Rightarrow k = -1$$

$$19.(A) \sin \theta + \frac{1}{\sin \theta} = 7$$

$$\Rightarrow \sin^2 \theta + \frac{1}{\sin^2 \theta} = 7^2 - 7 \times 2$$

$$= 343 - 21 = 322$$

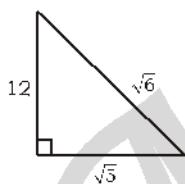
$$20.(A) \tan^2 \theta = \frac{3}{4}$$

$$\therefore \sec^2 \theta = 1 + \tan^2 \theta = 1 + \frac{3}{4}$$

$$\sec \theta = \frac{\sqrt{7}}{2}$$

$$21.(B) \frac{\cos^2 20^\circ + \sin^2 20^\circ}{1} - 1 = 1 - 1 = 0$$

$$22.(B) \frac{\sin^2 \theta}{\sin^2 \theta \tan^2 \theta} = 5$$



$$\tan \theta = \frac{1}{\sqrt{5}}$$

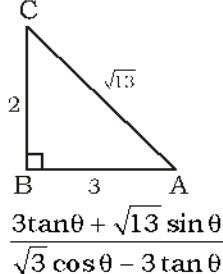
$$\frac{24 \cos^2 \theta - 15 \sec^2 \theta}{6 \csc^2 \theta - 7 \cot^2 \theta} = \frac{24 \times \frac{5}{6} - 15 \times \frac{6}{5}}{6 \times \frac{6}{1} - 7 \times \frac{5}{1}} = 2$$

23.(C) By C & D

$$\frac{\cot \theta}{\cos \theta} = \frac{1}{k}$$

$$k = \sin \theta$$

$$24.(A) \sin \theta = \frac{2}{\sqrt{13}}$$



$$\frac{3 \times \frac{2}{3} + \sqrt{13} \times \frac{2}{\sqrt{13}}}{\sqrt{13} \times \frac{3}{\sqrt{13}} - 3 \times \frac{2}{3}} = \frac{4}{1} = 4$$

$$25.(B) \cos^2 \theta - 1 + \cos^2 \theta - 3 \cos \theta + 2 = 0$$

$$2 \cos^2 \theta - 3 \cos \theta + 1 = 0$$

$$\Rightarrow \cos \theta = \frac{1}{2}, 1(x)$$

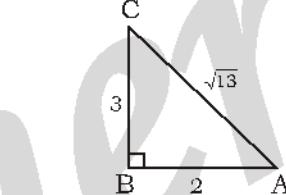
$$\Rightarrow \sec 60^\circ - \cos 60^\circ = 2 - \frac{1}{2} = \frac{3}{2}$$

$$26.(A) \sin A = \cos B$$

$$\Rightarrow A, B = 45^\circ$$

$$\therefore \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$27.(C) 9 \sec^2 \theta = 13 \cot^2 \theta$$



$$\cos \theta = \frac{3}{\sqrt{13}}$$

$$\frac{52 \times \frac{9}{13} - 9 \times \frac{4}{9}}{18 \times \frac{9}{13} - 8 \times \frac{4}{4}} = \frac{36 - 4}{26 + 18} = \frac{32}{44} = \frac{8}{11}$$

$$28.(C) \frac{\sin \theta}{\cos \theta} = \frac{5}{4} \quad \tan^2 \theta = \frac{25}{16}$$

$$\sec \theta = \sqrt{1 + \frac{25}{16}} = \frac{\sqrt{41}}{4}$$

$$29.(A) \sin 3\theta \cos \theta - \cos 3\theta \sin \theta = \frac{1}{2}$$

$$[\because \sin(A - B) = \sin A \cos B - \cos A \sin B]$$

$$\sin(3\theta - \theta) = \sin 30^\circ$$

$$\theta = 15^\circ$$

$$30.(B) \sin B = \frac{9}{41} \quad \cot B = \frac{40}{9}$$

$$31.(C) \frac{\cos 8^\circ \times \sin 8^\circ \times \sin 30^\circ \times \sin 24^\circ}{\cos 8^\circ \times \sin 8^\circ \times \sin 60^\circ \times \sin 24^\circ}$$

$$= \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$$

32.(A) Put $\theta = 30^\circ$

$$= \left(1 - \frac{1}{2} + \frac{\sqrt{3}}{2}\right) = \frac{1 + \sqrt{3}}{2}$$

$$\text{33.(C)} \quad = \frac{3(-1)}{2(1)} + \frac{2\left(\frac{1}{4}\right)}{1} = \frac{-3}{2} + \frac{1}{2} = -1$$

$$\text{34.(B)} \quad \tan\theta = \frac{4}{3}$$

$$\frac{9\tan\theta + 12}{27 - 20\tan\theta} = \frac{9 \times \frac{4}{3} + 12}{27 - 20 \times \frac{4}{3}} = \frac{24 \times 3}{81 - 80} = 72$$

$$\text{35.(A)} \quad 1 - \cos^2\theta - 3\cos^2\theta$$

$$\cos\theta = \frac{1}{2}$$

$$\theta = 60^\circ$$

$$\text{36.(D)} \quad 2\cot\theta = \sqrt{3} \operatorname{cosec}\theta$$

$$\cos\theta = \frac{\sqrt{3}}{2}$$

$$\theta = 30^\circ$$

$$\therefore \frac{\frac{7}{2}\cot^2\theta - \frac{3}{4}\operatorname{cosec}^2\theta}{4\sin^2\theta + \frac{3}{2}\tan^2\theta}$$

$$\frac{\frac{7}{2} \times 3 - \frac{3}{4} \times 4}{4 \times \frac{1}{4} + \frac{3}{2} \times \frac{1}{3}} = \frac{\frac{15}{2}}{\frac{3}{3}} = 5$$

$$\text{37.(C)} \quad \sqrt{\frac{1}{2} \times \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \times \frac{1}{2}} = 0$$

$$\text{38.(D)} \quad 3\cos\theta = 2 - 2\cos^2\theta$$

$$2\cos^2\theta + 3\cos\theta - 2 = 0$$

$$\cos\theta = \frac{1}{2}, \theta = 60^\circ$$

$$\therefore \tan^2 60^\circ + \sec^2 60^\circ - \operatorname{cosec}^2 60^\circ$$

$$\Rightarrow 3 + 4 - \frac{4}{3} = \frac{17}{3}$$

$$\text{39.(B)} \quad \cot^2 46^\circ - \operatorname{cosec}^2 46^\circ + \left(22\frac{1}{2}\right)$$

$$= -1 + 22\frac{1}{2} = 21.5$$

$$\text{40.(C)} \quad (1 + \cot^2\theta)(1 + \tan^2\theta) = K$$

$$\operatorname{cosec}^2\theta \times \sec^2\theta = K$$

$$\sqrt{K} = \operatorname{cosec}\theta \sec\theta$$

$$\text{41.(D)} \quad \frac{(\sin^2 27^\circ + \cos^2 27^\circ)}{(\cos^2 24^\circ + \sin^2 24^\circ)} - (\sin^2 69^\circ + \cos^2 69^\circ) \\ = 1 - 1 = 0$$

$$\text{42.(B)} \quad \frac{\sec\theta \operatorname{cosec}\theta}{\sec^2\theta \operatorname{cosec}^2\theta} = \sin\theta \cos\theta$$

$$\text{43.(C)} \quad 3 - 3\cos^2\theta + 4\cos^2\theta - 3 = 0 \\ \cos\theta = 0 \\ \theta = 90^\circ \\ \Rightarrow \cot 90^\circ = 0$$

$$\text{44.(B)} \quad 3\operatorname{cosec}\theta + 4\sin\theta - 4\sqrt{3} = 0$$

$$\Rightarrow 3 + 4\sin^2\theta - 4\sqrt{3}\sin\theta = 0$$

$$\Rightarrow 4\sin^2\theta - 4\sqrt{3}\sin\theta + 3 = 0$$

$$\Rightarrow \sin\theta = \frac{\sqrt{3}}{2}, \theta = 60^\circ$$

$$\text{45.(C)} \quad \text{Put } \theta = 45^\circ$$

$$2\sin^4 45^\circ + \sin^2 45^\circ$$

$$= 2 \times \left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^2$$

$$= \frac{1}{2} + \frac{1}{2} = 1$$

$$\text{46.(D)} \quad \operatorname{cosec} A + \cot A = 2$$

$$\operatorname{cosec} A - \cot A = \frac{1}{2}$$

$$2\operatorname{cosec} A = \frac{5}{2}$$

$$\sin A = \frac{4}{5}$$

$$\Rightarrow \frac{9\tan A + 16\operatorname{cosec} A}{5\sin A + 3\tan A} = \frac{\frac{9}{3} \times \frac{4}{5} + 16 \times \frac{5}{4}}{\frac{5}{5} \times \frac{4}{5} + 3 \times \frac{4}{3}}$$

$$\Rightarrow \frac{12 + 20}{4 + 4} = 4$$

$$\text{47.(B)} \quad \frac{\cos^2 89^\circ + \sin^2 89^\circ}{\sin(90^\circ - 30^\circ)} = \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$$

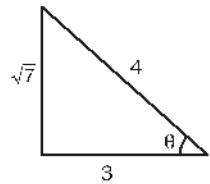
$$\text{48.(B)} \quad \tan^2 \alpha = \frac{1}{3}$$

$$\alpha = 30^\circ$$

$$\text{49.(D)} \quad \sin\alpha + \frac{1}{\sin\alpha} = \sqrt{3}$$

$$\sin^3\alpha + \frac{1}{\sin^3\alpha} = 3\sqrt{3} - 3\sqrt{3} = 0$$

50.(A) $8\cos^2\theta - 2\cos\theta - 3 = 0$
 $8\cos^2\theta + 4\cos\theta - 6\cos\theta - 3 = 0$
 $\cos\theta = \frac{3}{4}, -\frac{1}{2}$ (x)



$$4\cos\theta - 6\cos\theta - 3 = 0$$

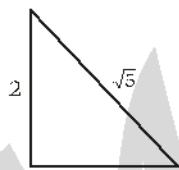
$$\cos\theta = \frac{3}{4}, -\frac{1}{2}$$
 (x)

$$\tan^2\theta + \sec^2\theta - \sin^2\theta$$

$$\frac{7}{9} + \frac{16}{9} - \frac{7}{16}$$

$$\frac{23}{9} - \frac{7}{16} = \frac{368 - 63}{144} = \frac{305}{144}$$

51.(B) $\operatorname{cosec}\theta = \frac{9}{2}$



$$\sec\theta + \tan\theta - \cot\theta \sin\theta$$

$$\sqrt{5} + 2 - \frac{1}{\sqrt{5}}$$

$$\frac{4}{\sqrt{5}} + 2$$

$$\Rightarrow 2 + \frac{4\sqrt{5}}{5}$$

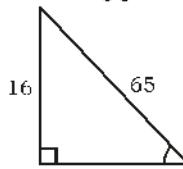
52.(C) $3\cot^2x - 7 - 7\cot^2x + 7 = 0$
 $-4\cot^2x = 0$
 $\cot x = 0$
 $x = 90^\circ$

53.(B) $= \frac{3}{4} + 1 + 2 - 4$

$$\frac{3}{4} - 1 = \frac{-1}{4}$$

54.(C) $2\tan x + 3\cot x = 5$
 $4\tan^2 x + 9\cot^2 x + 12 = 25$
 $4\tan^2 x + 9\cot^2 x = 13$

55.(C) $\sec\theta = \frac{65}{63}$

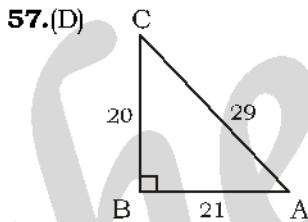


$$\Rightarrow 8(\operatorname{cosec}\theta - \cot\theta)$$

$$\Rightarrow 8 \times \left[\frac{65}{16} - \frac{63}{16} \right]$$

$$\Rightarrow \frac{2}{2} = 1$$

56.(C) $2\cos\theta + \sec\theta - 2\sqrt{2} = 0$
 By option $\theta = 45^\circ$ satisfied



$$\frac{1 + \sin A - \cos A}{1 + \sin A + \cos A} = \frac{\frac{1}{2} + \frac{20}{29} - \frac{21}{29}}{\frac{1}{2} + \frac{20}{29} + \frac{21}{29}}$$

$$= \frac{\frac{28}{29}}{\frac{70}{29}} = \frac{28}{70} = \frac{2}{5}$$

58.(D) $\operatorname{cosec}(58 + \theta) - \operatorname{cosec}(58 + \theta) + \frac{1}{2}$
 $= \frac{1}{2}$

59.(C) $\tan 3\theta = \frac{1}{2} + \frac{1}{2}$
 $\tan 3\theta = \tan 45^\circ$
 $\theta = 15^\circ$

$$\therefore \sin 4\theta = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

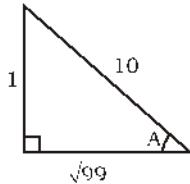
60.(B) $\tan\theta + \frac{1}{\tan\theta} = 3$
 $\tan^2\theta + \frac{1}{\tan^2\theta} = 9 - 2 = 7$

61.(C) $\tan A = \frac{12}{5}$

$$\frac{13 \sin A + 20 \tan A}{15 \tan A - 13 \cos A} = \frac{13 \times \frac{12}{5} + 20 \times \frac{12}{5}}{15 \times \frac{12}{5} - 13 \times \frac{5}{13}}$$

$$= \frac{12 + 48}{36 - 5} = \frac{60}{31} = 1\frac{29}{31}$$

62.(B) $\cosec A = 10$



$$20 \sin A + 9\sqrt{11} \sec A$$

$$20 \times \frac{1}{10} + 9\sqrt{11} \times \frac{10}{\sqrt{99}} \\ = 2 + 30 = 32$$

63.(B) $\tan^2 x = 3 \Rightarrow \tan x = \sqrt{3}$

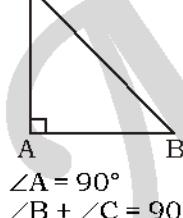
$$x = 60^\circ \Rightarrow \frac{x}{2} = 30^\circ$$

64.(B) $\sec \theta = \cosec \theta$

$$\theta = 45^\circ$$

$$\therefore \sec^2 45^\circ + \cosec^2 45^\circ \\ \Rightarrow 2 + 2 = 4$$

C



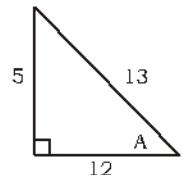
65. (0)

$$\angle A = 90^\circ$$

$$\angle B + \angle C = 90^\circ$$

$$\sin \frac{90}{2} \cos \frac{90}{2} \Rightarrow \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = \frac{1}{2}$$

66.(A)



$$\tan A + \sec A = \frac{3}{2}$$

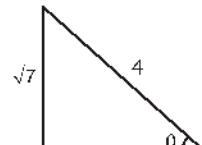
$$\sec A - \tan A = \frac{2}{3}$$

$$\sec A = \frac{13}{12}$$

$$\frac{10 \cot A + 13 \cos A}{12 \tan A + 5 \cosec A} = \frac{10 \times \frac{12}{5} + 13 \times \frac{12}{13}}{12 \times \frac{5}{12} + 5 \times \frac{13}{5}}$$

$$= \frac{24 + 12}{5 + 13} = \frac{36}{18} = 2$$

67.(A) By C & D $\frac{\cosec \theta}{\cot \theta} = \frac{8}{6}$



$$\sec \theta = \frac{4}{3}$$

$$\frac{4 \times \sin^2 \theta + 5}{4 \sin^2 \theta - 1} = \frac{4 \times \frac{7}{16} + 5}{4 \times \frac{7}{16} - 1} = \frac{\frac{7}{4} + 5}{\frac{7}{4} - 1} = 9$$

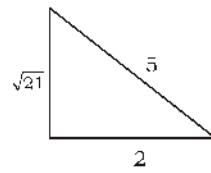
68.(A) $5 \sin^2 \theta = 3(1 + \cos \theta)$

$$5 - 5 \cos^2 \theta - 3 \cos \theta - 3 = 0$$

$$5 \cos^2 \theta + 3 \cos \theta - 2 = 0$$

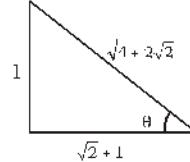
$$5 \cos^2 \theta + 5 \cos \theta - 2 \cos \theta - 2 = 0$$

$$\cos \theta = \frac{2}{5}, -1(x)$$



$$\therefore \cosec \theta + \cot \theta =$$

$$\frac{5}{\sqrt{21}} + \frac{2}{\sqrt{21}} \Rightarrow \frac{7}{\sqrt{21}} = \frac{7}{\sqrt{7} \times \sqrt{3}} = \sqrt{\frac{7}{3}}$$

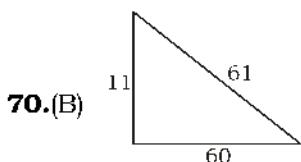


$$\cot \theta = \sqrt{2+1}$$

$$\cosec \theta \sec \theta = \frac{(\sqrt{4+2\sqrt{2}})}{1} \times \frac{(\sqrt{4+2\sqrt{2}})}{\sqrt{2+1}}$$

$$= \frac{4+2\sqrt{2}}{\sqrt{2+1}} \times \frac{\sqrt{2}-1}{\sqrt{2}-1}$$

$$= 4\sqrt{2} + 4 - 4 - 2\sqrt{2} = 2\sqrt{2}$$



70.(B) $\tan A = \frac{11}{60}$
 $4\cos A - 7\sin A$

$$4 \times \frac{60}{61} - 7 \times \frac{11}{61}$$

$$\frac{1}{61}[240 - 77] = \frac{163}{61} = 2\frac{41}{61}$$

71.(B)
$$\frac{(1 - \sin \theta)(\sec \theta + \tan \theta)\tan \theta}{(\tan \theta + \sec \theta + 1)(\cot \theta - \cosec \theta + 1)}$$

$$\frac{\sin \theta \sec \theta (1 - \sin \theta)(\sec \theta + \tan \theta)}{\left(\frac{\sin \theta}{\cos \theta} + \frac{1}{\cos \theta} + 1\right)\left(\frac{\cos \theta}{\sin \theta} - \frac{1}{\sin \theta} + 1\right)}$$

$$\Rightarrow \frac{\sin \theta (\sec \theta - \tan \theta)(\sec \theta + \tan \theta)}{(\sin \theta + \cos \theta + 1)(\sin \theta + \cos \theta - 1)} = \frac{\sin \theta (\sin \theta \cos \theta)}{(\sin \theta + \cos \theta)^2 - 1}$$

$$= \frac{\sin \theta}{2}$$

72.(A) $2\cos^2 \theta + (4 - \sqrt{3})\sin \theta - 2(1 + \sqrt{3}) = 0$
 $\Rightarrow 2 - 2\sin^2 \theta + (4 - \sqrt{3})\sin \theta - 2(1 + \sqrt{3}) = 0$
 $\Rightarrow 2\sin^2 \theta - (4 - \sqrt{3})\sin \theta + 2(1 + \sqrt{3}) - 2 = 0$
 $\Rightarrow 2\sin^2 \theta - (4 - \sqrt{3})\sin \theta + 2\sqrt{3}$
 $\Rightarrow 2\sin^2 \theta - 4\sin \theta + \sqrt{3}\sin \theta + 2\sqrt{3}$
 $\Rightarrow 2\sin \theta(\sin \theta - 2) - \sqrt{3}(\sin \theta - 2)$
 $\Rightarrow (\sin \theta - 2)(2\sin \theta - \sqrt{3})$
 $\Rightarrow \sin \theta = \frac{\sqrt{3}}{2}, 2(x)$
 $\Rightarrow \theta = 60^\circ$

73.(D)
$$\frac{3\sqrt{3}\sec \theta + 4\tan \theta}{3\tan \theta + \sqrt{3}\sec \theta} = 2$$

 $\Rightarrow 3\sqrt{3}\sec \theta - 2\sqrt{3}\sec \theta = 6\tan \theta - 4\tan \theta$
 $\Rightarrow \sqrt{3}\sec \theta = 2\tan \theta$
 $\Rightarrow \sin \theta = \frac{\sqrt{3}}{2}$
 $\Rightarrow \theta = 60^\circ$
 $\therefore \cos 60^\circ = \frac{1}{2}$

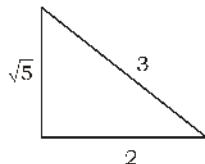
74.(D) $4\left[\left(\frac{\sqrt{3}}{2}\right)^4 + \left(\frac{\sqrt{3}}{2}\right)^4\right] - (1 - 3) + \frac{1}{2} - 2 + 4$

$$4\left(\frac{9}{16} + \frac{9}{16}\right) - (-2) + \frac{1}{2} + 2$$

$$\frac{9}{2} + \frac{1}{2} + 2 + 2 = 5 + 4 = 9$$

To get 2 $\Rightarrow 9 - 7 = 2$

75.(A)



$$\cos \theta = \frac{2}{3}$$

$$2\sec^2 \theta + 2\tan^2 \theta - 6$$

$$2 \times \frac{9}{4} + 2 \times \frac{5}{4} - 6$$

$$\frac{9}{2} + \frac{5}{2} - 6$$

$$7 - 6 = 1$$

76.(C) Given,
 $\sin \theta = \cos \theta$
 $\theta = 45^\circ$

$$\therefore 2\tan^2 45^\circ + \sin^2 45^\circ - 1$$

$$\therefore 2 + \frac{1}{2} - 1 = \frac{3}{2}$$

77.(A) $\sin A = \frac{1}{2}$ and $45^\circ < A < 540^\circ$

$$\begin{aligned} \sin A &= \sin(510^\circ) \\ A &= 510^\circ \end{aligned}$$

$$\therefore \frac{A}{3} = 170^\circ$$

78.(A)

$$\frac{(\sqrt{3})^2 - 2 \times \frac{1}{2}}{\sin 66^\circ \cosec 66^\circ \sin 53^\circ \cosec 53^\circ \cos 60^\circ + \sin^2 60^\circ}$$

$$\Rightarrow \frac{3 - 1}{\frac{1}{2} + \frac{3}{4}} = \frac{2 \times 4}{5} = 1\frac{3}{5}$$

79.(A) $\sin^2 x - 4\sin x + 3 = 0$
 $\sin^2 x - 3\sin x - \sin x + 3 = 0$
 $\sin x(\sin x - 3) - 1(\sin x - 3) = 0$
 $\sin x = 1, 3$ (not possible)

$$x = 90^\circ = \frac{\pi}{2}$$

80.(B) $\tan\theta = 15$

$$\therefore \sec\theta = \sqrt{1 + \tan^2\theta} \\ = \sqrt{1 + 225} = \sqrt{226}$$

81.(D) $\tan\theta + \cot\theta = 4$

$$\tan^2\theta + \cot^2\theta = 16 - 2 = 14 \dots\dots\dots(1)$$

$$\text{and } \frac{\sin^2\theta}{\cos^2\theta} + \frac{\cos^2\theta}{\sin^2\theta} = 14$$

$$\Rightarrow \frac{1 - 2\sin^2\theta\cos^2\theta}{\sin^2\theta\cos^2\theta} = 14$$

$$\Rightarrow \sec^2\theta\cosec^2\theta - 2 = 14$$

$$\Rightarrow 2\cosec^2\theta\sec^2\theta - 4 = 14 \times 2 \dots\dots(2)$$

by eq. (1) & (2)

$$\text{Ratio of } \frac{3(\tan^2\theta + \cot^2\theta)}{2\cosec^2\theta\sec^2\theta} = \frac{14 \times 3}{14 \times 2} = 3 : 2$$

82.(C) $\tan 35^\circ = y$

$$\Rightarrow 2\tan 55^\circ + \cot 55^\circ$$

$$\Rightarrow 2\cot 35^\circ + \tan 35^\circ$$

$$\Rightarrow \frac{2}{y} + y = \frac{2+y^2}{y}$$

83.(D) $\tan^2 x - 3\tan x + 2 = 0$

$$\tan^2 x - 2\tan x - \tan x + 2 = 0$$

$$\tan^2 x - 2\tan x - \tan x + 2 = 0$$

$$(\tan x - 2)(\tan x - 1) = 0$$

$$\tan x = 1, 2$$

$$\because 0 < x < 90^\circ$$

$$x = 45^\circ$$

84.(C) $\frac{\sin^2 33^\circ + 1 + \cos^2 33^\circ + 1}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

85.(B) $A = 60^\circ$

$$\text{and } 4\cos^3 A - 3\cos A$$

$$= \cos 3A$$

$$= \cos 180^\circ = -1$$

86.(C) $\sin\theta = \frac{12}{13}$

$$\Rightarrow \frac{\sin^2\theta - \cos^2\theta}{2\cos\theta\sin\theta} \times \cot^2\theta$$

$$\Rightarrow \frac{\frac{144}{169} - \frac{25}{169}}{2 \times \frac{12}{13} \times \frac{5}{13}} \times \frac{25}{144} = \frac{\frac{144 - 25}{169}}{\frac{120}{169}} \times \frac{25}{144}$$

$$\Rightarrow \frac{119}{120} \times \frac{25}{144} = \frac{595}{3456}$$

87.(D) $(\cos^2\theta - 1)(2\sec^2\theta) + \sec^2\theta + 2\tan^2\theta = 2$

$$\Rightarrow 2 - 2\sec^2\theta + \sec^2\theta + 2\tan^2\theta = 2$$

$$\Rightarrow 2(\tan^2\theta - \sec^2\theta) + \sec^2\theta = 0$$

$$\Rightarrow \sec^2\theta = 2$$

$$\Rightarrow \sec\theta = \sqrt{2}$$

$$\Rightarrow \theta = 45^\circ$$

$$\therefore \frac{\sec 45^\circ + \sin 45^\circ}{\cosec 45^\circ - \cos 45^\circ} = \frac{\sqrt{2} + \frac{1}{\sqrt{2}}}{\sqrt{2} - \frac{1}{\sqrt{2}}} = \frac{3}{1} = 3$$

88.(A) $1 + 2\tan^2\theta = \frac{5}{3} \quad 2\tan^2\theta = \frac{2}{3}$

$$\Rightarrow \tan^2\theta = \frac{1}{3}$$

$$\Rightarrow \tan\theta = \frac{1}{\sqrt{3}}$$

$$\Rightarrow \theta = 30^\circ$$

$$\Rightarrow \cosec 30^\circ = 2$$

89.(A) $21\tan\theta = 20$

$$\tan\theta = \frac{20}{21}$$

$$\frac{1 + \sin\theta - \cos\theta}{1 - \sin\theta + \cos\theta} = \frac{\frac{1+20}{29} - \frac{21}{29}}{1 - \frac{20}{29} + \frac{21}{29}} = \frac{29-1}{29+1} = \frac{14}{15}$$

90.(C) $\cos^2 30^\circ + \cos^2 40^\circ + \sin^2 40^\circ + \cos^2 60^\circ$

$$= \frac{3}{4} + 1 + \frac{1}{4} = 2$$

91.(A) Given

$$\tan\theta = 5K$$

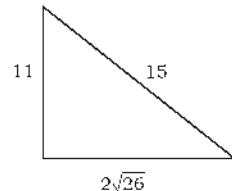
$$\sec\theta = \frac{5}{K}$$

$$\tan^2\theta - \sec^2\theta = 25k^2 - \frac{25}{k^2}$$

$$25\left(k^2 - \frac{1}{k^2}\right) = -1$$

$$10\left(k^2 - \frac{1}{k^2}\right) = \frac{-10}{25} = \frac{-2}{5}$$

92.(D)



$$\sin\theta = \frac{11}{15}$$

$$\Rightarrow \sec\theta - \tan\theta$$

$$\Rightarrow \frac{15}{2\sqrt{26}} - \frac{11}{2\sqrt{6}} = \frac{4}{2\sqrt{26}} = \frac{\sqrt{26}}{13}$$

93.(B) $\sin\theta(2\sin\theta + 3) = 2$

$$2\sin^2\theta + 3\sin\theta - 2 = 0$$

$$2\sin^2\theta + 4\sin\theta - \sin\theta - 2 = 0$$

$$2\sin\theta(\sin\theta + 2) - 1(\sin\theta + 2) = 0$$

$$\Rightarrow \sin\theta = \frac{1}{2}, -2$$

$$\Rightarrow \theta = 30^\circ$$

$$\Rightarrow \sec^2 30^\circ + \cot^2 30^\circ - \cos^2 30^\circ$$

$$= \frac{4}{3} + 3 - \frac{3}{4} = 3 + \frac{16-9}{12} = 3 + \frac{7}{12} = \frac{43}{12}$$

94.(C) $\frac{(1+\cos\theta)\sec\theta(\csc\theta-\cot\theta)}{\sin\theta(1-\sin\theta)(\sec\theta+\tan\theta)}$

$$= \frac{(\csc\theta-\cot\theta)(\csc\theta+\cot\theta)}{(1-\sin\theta)(1+\sin\theta)}$$

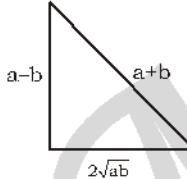
$$= \frac{\cosec^2\theta - \cot^2\theta}{1-\sin^2\theta} = \frac{1}{\cos^2\theta} = \sec^2\theta$$

95.(C) $\frac{3\cos^2 27^\circ - 5 + 3\cos^2 63^\circ}{\tan^2 32^\circ + 4 - \cosec^2 58^\circ} + \sin 35^\circ \cos 55^\circ + \cos 35^\circ \sin 55^\circ$

$$\frac{3-5}{4-1} + \sin^2 35^\circ + \cos^2 35^\circ$$

$$\frac{-2}{3} + 1 = \frac{1}{3}$$

96.(D)



$$\sin\theta = \frac{2\sqrt{ab}}{a+b}$$

$$\cos\theta = \frac{a-b}{a+b}$$

$$= \frac{a-b+1}{a-b-1} = \frac{a-b+a+b}{a-b-a-b} = \frac{2a}{-2b} = \frac{-a}{b}$$

97.(A) $3\cos^2\theta - 4\sin\theta + 1 = 0$

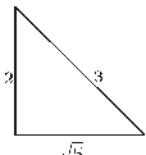
$$\Rightarrow 3 - 3\sin^2\theta - 4\sin\theta + 1 = 0$$

$$\Rightarrow 3\sin^2\theta + 4\sin\theta - 4 = 0$$

$$\Rightarrow 3\sin^2\theta + 6\sin\theta - 2\sin\theta - 4 = 0$$

$$\Rightarrow 3\sin(\sin\theta + 2) - 2(\sin\theta + 2) = 0$$

$$\sin\theta = \frac{2}{3}, -2$$



$$3 \times \left(\frac{\sqrt{5}}{3}\right)^2 + 5 \times \left(\frac{2}{\sqrt{5}}\right)^2$$

$$= 3 \times \frac{5}{9} + 5 \times \frac{4}{5} = 5\frac{2}{3}$$

98.(A) Given that

$$2\sqrt{3}\sin^2\theta + \cos\theta - \sqrt{3} = 0$$

$$\Rightarrow 2\sqrt{3} - 2\sqrt{3}\cos^2\theta + \cos\theta - \sqrt{3} = 0$$

$$\Rightarrow 2\sqrt{3}\cos^2\theta - \cos\theta - \sqrt{3} = 0$$

$$\Rightarrow 2\sqrt{3}\cos^2\theta - 3\cos\theta + 2\cos\theta - \sqrt{3} = 0$$

$$\Rightarrow \sqrt{3}\cos\theta(2\cos\theta - \sqrt{3}) + 1(2\cos\theta - \sqrt{3}) = 0$$

$$\Rightarrow (\sqrt{3}\cos\theta + 1)(2\cos\theta - \sqrt{3}) = 0$$

$$\Rightarrow \cos\theta = \frac{-1}{\sqrt{3}}, \frac{\sqrt{3}}{2} \Rightarrow \cos\theta = \frac{\sqrt{3}}{2}$$

$$\therefore \theta = 30^\circ$$

99.(D) $\sec\left(90 - \frac{3\theta}{2}\right) = \sqrt{2}, 0^\circ < \theta < 90^\circ$

$$\Rightarrow \cosec\frac{3\theta}{2} = \cosec 45^\circ$$

$$\Rightarrow \frac{3\theta}{2} = 45^\circ \Rightarrow \theta = 30^\circ$$

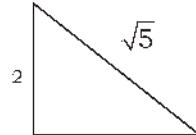
$$\therefore 2\sin 30^\circ + 4\cos 60^\circ$$

$$= 2 \times \frac{1}{2} + 4 \times \frac{1}{2} = 3$$

100.(A) $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = \frac{3}{1}$

$$\Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{4}{2}$$

$$\Rightarrow \tan\theta = 2$$



$$\Rightarrow \sin^4\theta - \cos^4\theta$$

$$(\sin^2\theta - \cos^2\theta)$$

$$\Rightarrow \left(\frac{2}{\sqrt{5}}\right)^2 - \left(\frac{1}{\sqrt{5}}\right)^2$$

$$= \frac{3}{5}$$

(SSC CHSL - 2019)

1. Find the value of $\frac{\cos 30^\circ - \sin 30^\circ}{\sin 60^\circ + \cos 60^\circ}$

$\frac{\cos 30^\circ - \sin 30^\circ}{\sin 60^\circ + \cos 60^\circ}$ का मान ज्ञात करें।

- (A) $2 + \sqrt{3}$ (B) $2 - \sqrt{3}$
 (C) $1 + \sqrt{3}$ (D) $1 - \sqrt{3}$

2. If $\operatorname{cosec}\theta + \cot\theta = 2$, then $\sin\theta$ is :

यदि $\operatorname{cosec}\theta + \cot\theta = 2$ है, तो $\sin\theta$ का मान ज्ञात करें।

- (A) $\frac{3}{5}$ (B) $\frac{2}{5}$ (C) $\frac{3}{4}$ (D) $\frac{4}{5}$

3. $(\sin\theta + \cos\theta)^2 = 2$, $0^\circ < \theta < 90^\circ$, then the value of θ is :

$(\sin\theta + \cos\theta)^2 = 2$, $0^\circ < \theta < 90^\circ$ तो θ का मान ज्ञात करें।

- (A) 0 (B) $\frac{\pi}{2}$ (C) π (D) $\frac{\pi}{4}$

4. If $\operatorname{cosec}A = \frac{25}{7}$, then what is the value of $\tan A$?

यदि $\operatorname{cosec}A = \frac{25}{7}$ तो $\tan A$ का मान क्या होगा ?

- (A) $\frac{7}{24}$ (B) $\frac{25}{24}$ (C) $\frac{7}{25}$ (D) $\frac{24}{25}$

5. Find x if $2 \sin^2 x - 1 = 0$.

यदि $2 \sin^2 x - 1 = 0$ है, तो x का मान ज्ञात करें।

- (A) $\frac{\pi}{4}$ (B) $\frac{\pi}{2}$ (C) 0 (D) π

6. If $\cot\theta = \frac{80}{39}$, find the value of $\operatorname{cosec}\theta$.

यदि $\cot\theta = \frac{80}{39}$ तो $\operatorname{cosec}\theta$ का मान ज्ञात करें।

- (A) $\frac{39}{80}$ (B) $\frac{89}{39}$ (C) $\frac{39}{89}$ (D) $\frac{89}{80}$

7. If $\sin\theta = \frac{4}{5}$, find the value of $\sin 3\theta$.

यदि $\sin\theta = \frac{4}{5}$ तो $\sin 3\theta$ का मान ज्ञात करें।

- (A) $\frac{32}{45}$ (B) $\frac{44}{125}$ (C) $\frac{64}{125}$ (D) $\frac{12}{25}$

8. If $\tan a = \frac{2}{\sqrt{13}}$, then the value of $\frac{\operatorname{cosec}^2 a + 2 \sec^2 a}{\operatorname{cosec}^2 a - 3 \sec^2 a}$ is :

यदि $\tan a = \frac{2}{\sqrt{13}}$ है, तो $\frac{\operatorname{cosec}^2 a + 2 \sec^2 a}{\operatorname{cosec}^2 a - 3 \sec^2 a}$ का मान ज्ञात कीजिए।

- (A) 21 (B) 14
 (C) 32 (D) 16

9. If $a \sin A + b \cos A = c$, then $a \cos A - b \sin A$ is equal to :

यदि $a \sin A + b \cos A = c$ है, तो $a \cos A - b \sin A$ का मान क्या है ?

- (A) $\sqrt{a^2 - b^2 - c^2}$ (B) $\sqrt{a^2 + b^2 - c^2}$
 (C) $\sqrt{a^2 + b^2 + c^2}$ (D) $\sqrt{a^2 - b^2 + c^2}$

10. $\frac{1 - \tan A}{1 + \tan A} = \frac{\tan 3^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 87^\circ}{\tan 27^\circ \tan 39^\circ \tan 51^\circ \tan 60^\circ \tan 63^\circ}$, then the value of $\cot A$ is :

$\frac{1 - \tan A}{1 + \tan A} = \frac{\tan 3^\circ \tan 15^\circ \tan 30^\circ \tan 75^\circ \tan 87^\circ}{\tan 27^\circ \tan 39^\circ \tan 51^\circ \tan 60^\circ \tan 63^\circ}$ है, तो $\cot A$ का मान ज्ञात कीजिए।

- (A) 3 (B) 2
 (C) 1 (D) 4

11. Find the value of $\sin(60 + \theta) - \cos(30 - \theta)$.
 $\sin(60 + \theta) - \cos(30 - \theta)$ का मान ज्ञात करें।

- (A) $\frac{1}{2}$ (B) 0 (C) -1 (D) 1

12. Find x if $\sin x = -\frac{1}{2}$.

यदि $\sin x = -\frac{1}{2}$ है, x का मान ज्ञात करें।

- (A) $\frac{13\pi}{6}$ (B) $\frac{5\pi}{6}$ (C) $\frac{\pi}{6}$ (D) $\frac{7\pi}{6}$

13. If $\sin\theta - \cos\theta = \frac{1}{29}$ find the value of $\sin\theta + \cos\theta$.

यदि $\sin\theta - \cos\theta = \frac{1}{29}$ है, तो $\sin\theta + \cos\theta$ का मान ज्ञात करें।

- (A) $\frac{41}{29}$ (B) $\frac{42}{29}$ (C) $\frac{22}{29}$ (D) $\frac{2}{29}$

26. If $\cos(x-y) = \frac{\sqrt{3}}{2}$ and $\sin(x+y) = \frac{1}{2}$, then the value of x, ($0 < x < 90^\circ$) is :
यदि $\cos(x-y) = \frac{\sqrt{3}}{2}$ और $\sin(x+y) = \frac{1}{2}$ है, तो x, ($0 < x < 90^\circ$) का मान क्या होगा ?
(A) 15° (B) 60°
(C) 45° (D) 30°

27. The least value of $8\operatorname{cosec}^2\theta + 25\sin^2\theta$ is :
 $8\operatorname{cosec}^2\theta + 25\sin^2\theta$ का न्यूनतम मान क्या होगा ?
(A) $30\sqrt{2}$ (B) $40\sqrt{2}$
(C) $10\sqrt{2}$ (D) $20\sqrt{2}$

28. If $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} = 8$, then the value of $\cot\theta$ is equal to :
यदि $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} = 8$ है, तो $\cot\theta$ का मान ज्ञात करें।
(A) $\frac{6}{5}$ (B) $\frac{9}{7}$ (C) $\frac{8}{7}$ (D) $\frac{7}{6}$

29. Find the value of $\frac{\tan 60^\circ - \tan 15^\circ}{1 + \tan 60^\circ \tan 15^\circ}$
 $\frac{\tan 60^\circ - \tan 15^\circ}{1 + \tan 60^\circ \tan 15^\circ}$ का मान बताइए।
(A) $\frac{\sqrt{3}}{2}$ (B) 1 (C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$

30. If $3\sec^2x - 4 = 0$, then the value of x ($0 < x < 90^\circ$)
यदि $3\sec^2x - 4 = 0$ है, तो x ($0 < x < 90^\circ$) का मान बताइये।
(A) 15° (B) 45°
(C) 30° (D) 60°

31. If $4\cos^2\theta - 3\sin^2\theta + 2 = 0$, then the value of $\tan\theta$ is
(where $0 \leq \theta < 90^\circ$)
यदि $4\cos^2\theta - 3\sin^2\theta + 2 = 0$ है, तो $\tan\theta$ का मान बताइए (जहाँ $0 \leq \theta < 90^\circ$).
(A) $\sqrt{6}$ (B) 1
(C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{3}}$

32. What is the value of $\sin^2 45^\circ + \cos^2 45^\circ$?
 $\sin^2 45^\circ + \cos^2 45^\circ$ का मान है :
(A) 1 (B) 2
(C) -1 (D) 0

33. If $\tan\theta = \frac{20}{21}$, then the value of $\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta}$ is :
यदि $\tan\theta = \frac{20}{21}$ है, तो $\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta}$ का मान है :
(A) $\frac{-1}{41}$ (B) $\frac{27}{21}$ (C) $\frac{29}{35}$ (D) $\frac{-29}{31}$

34. In $\sin x = \frac{12}{37}$, then what is the value of $\tan x$?
यदि $\sin x = \frac{12}{37}$ है, तो $\tan x$ का मान है :
(A) $\frac{35}{37}$ (B) $\frac{12}{35}$ (C) $\frac{37}{12}$ (D) $\frac{35}{12}$

35. The value of $\left[\frac{\sqrt{3} + 2\sin P}{1 - 2\cos P} \right]^3 + \left[\frac{1 + 2\cos P}{\sqrt{3} - 2\sin P} \right]^3$ is :
 $\left[\frac{\sqrt{3} + 2\sin P}{1 - 2\cos P} \right]^3 + \left[\frac{1 + 2\cos P}{\sqrt{3} - 2\sin P} \right]^3$ का मान ज्ञात करें।
(A) 0 (B) $\sin P \cos P$
(C) $2\sin P \cos P$ (D) 1

36. If $A = 2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)$ then the value of 3α such that $\cos\alpha = \sqrt{\frac{3+A}{5+A}}$ is :
यदि $A = 2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)$ है, तो $\cos\alpha = \sqrt{\frac{3+A}{5+A}}$ करने के लिए 3α का मान ज्ञात करें।
(A) 45° (B) 135°
(C) 180° (D) 90°

37. If $117\cos^2 A + 129\sin^2 A = 120$ and $170\cos^2 B + 158\sin^2 B = 161$, then the value of $\operatorname{cosec}^2 A \sec^2 B$ is :
यदि $117\cos^2 A + 129\sin^2 A = 120$ है और $170\cos^2 B + 158\sin^2 B = 161$ है, तो $\operatorname{cosec}^2 A \sec^2 B$ का मान ज्ञात करें।
(A) 1 (B) 9
(C) 4 (D) 16

38. If $\cos A, \sin A, \cot A$ are in geometric progression, then the value of $\tan^6 A - \tan^2 A$ is :
अगर $\cos A, \sin A, \cot A$ गुणोत्तर श्रेणी में हैं तो $\tan^6 A - \tan^2 A$ का मान क्या होगा ?
(A) $\frac{1}{2}$ (B) 3 (C) $\frac{1}{3}$ (D) 1

39. If $\frac{(1+\sin\theta-\cos\theta)}{(1+\sin\theta+\cos\theta)} + \frac{(1+\sin\theta+\cos\theta)}{(1+\sin\theta-\cos\theta)} = 4$, then which of the following values will be suitable for θ ?
 यदि $\frac{(1+\sin\theta-\cos\theta)}{(1+\sin\theta+\cos\theta)} + \frac{(1+\sin\theta+\cos\theta)}{(1+\sin\theta-\cos\theta)} = 4$ है, तो निम्नलिखित में से कौन सा मान θ के लिए सही होगा?
 (A) 90° (B) 60°
 (C) 45° (D) 30°
40. If $\sec A = \frac{\sqrt{11}}{3}$, then the value of $\frac{\operatorname{cosec}^2 A + \tan^2 A}{\sin^2 A + \cot^2 A}$ is:
 यदि $\sec A = \frac{\sqrt{11}}{3}$ है, तो $\frac{\operatorname{cosec}^2 A + \tan^2 A}{\sin^2 A + \cot^2 A}$ का मान ज्ञात कीजिए।
 (A) $\frac{9}{4}$ (B) $\frac{4}{9}$ (C) $\frac{11}{9}$ (D) $\frac{2}{11}$
41. If $\sin x - \cos x = 0$, then the value of $(\sin^3 x - \cos^3 x)$ is:
 यदि $\sin x - \cos x = 0$ है, तो $(\sin^3 x - \cos^3 x)$ का मान ज्ञात कीजिए।
 (A) 0 (B) 2
 (C) 1 (D) 4
42. $\frac{\cot x}{1+\operatorname{cosecx}} + \frac{1+\operatorname{cosecx}}{\cot x}$ is equal to:
 $\frac{\cot x}{1+\operatorname{cosecx}} + \frac{1+\operatorname{cosecx}}{\cot x}$ का मान के बराबर होगा।
 (A) $2\sec x$ (B) $2\cos x$
 (C) $2\operatorname{cosec} x$ (D) $2\sin x$
43. If $\tan x = \frac{m}{n}$ and $0^\circ \leq x \leq 90^\circ$, then the value of $(\sin x + \cos x)$ is:
 यदि $\tan x = \frac{m}{n}$ और $0^\circ \leq x \leq 90^\circ$ हो, तो $(\sin x + \cos x)$ का मान ज्ञात करें।
 (A) $\frac{1}{\sqrt{m^2-n^2}}$ (B) $\frac{1}{\sqrt{m^2+n^2}}$
 (C) $\frac{m+n}{\sqrt{m^2+n^2}}$ (D) $\sqrt{m^2-n^2}$
44. If $\cos x = \frac{24}{25}$, $0^\circ \leq x \leq 90^\circ$, then the value of $\cot x + \operatorname{cosec} x$ is:
 यदि $\cos x = \frac{24}{25}$, $0^\circ \leq x \leq 90^\circ$ है, तो $\cot x + \operatorname{cosec} x$ का मान क्या होगा?
 (A) 0 (B) 1 (C) 7 (D) $\frac{7}{2}$
45. If $\sec \theta$ and $\sin \theta$ ($0 < \theta < 90^\circ$) are the roots of the equation $\sqrt{6}x^2 - kx + \sqrt{6} = 0$, then the value of k is:
 यदि $\sec \theta$ और $\sin \theta$ ($0 < \theta < 90^\circ$) समीकरण $\sqrt{6}x^2 - kx + \sqrt{6} = 0$ के मूल हैं, तो k का मान ज्ञात करें।
 (A) $\sqrt{3}$ (B) $3\sqrt{2}$
 (C) $2\sqrt{3}$ (D) $3\sqrt{3}$
46. If $\tan x = \frac{3}{2}$, then the value of $\frac{3\sin x + 2\cos x}{3\sin x - 2\cos x}$ is:
 यदि $\tan x = \frac{3}{2}$ है, तो $\frac{3\sin x + 2\cos x}{3\sin x - 2\cos x}$ का मान क्या होगा?
 (A) $\frac{1}{5}$ (B) $\frac{5}{13}$ (C) $\frac{13}{5}$ (D) 5
47. Which of the following values suits for A to make the equation $\frac{A \tan 62^\circ \sec 28^\circ \cot 38^\circ}{\operatorname{cosec} 62^\circ \tan 11^\circ} = 1$ true?
 समीकरण $\frac{A \tan 62^\circ \sec 28^\circ \cot 38^\circ}{\operatorname{cosec} 62^\circ \tan 11^\circ} = 1$ सही करने के लिए A का निम्नलिखित में से कौन सा मान उपयुक्त होगा?
 (A) $\frac{\tan 38^\circ}{\tan 79^\circ \tan 28^\circ}$ (B) $\frac{\tan 28^\circ \tan 79^\circ}{\tan 38^\circ}$
 (C) $\frac{\tan 28^\circ \tan 38^\circ}{\tan 79^\circ}$ (D) $\frac{\tan 38^\circ \tan 79^\circ}{\tan 28^\circ}$
48. If A and B are acute angles and $\sec A = 3$; $\cot B = 4$, then the value of $\frac{\operatorname{cosec}^2 A + \sin^2 B}{\cot^2 A + \sec^2 B}$
 यदि A और B न्यून कोण हैं और $\sec A = 3$; $\cot B = 4$ है, तो $\frac{\operatorname{cosec}^2 A + \sin^2 B}{\cot^2 A + \sec^2 B}$ का मान ज्ञात कीजिए।
 (A) $\frac{25}{261}$ (B) $\frac{322}{323}$ (C) 2 (D) $\frac{1}{261}$
49. If $\tan^4 x - \tan^2 x = 1$, then the value of $\sin^4 x + \sin^2 x$ is:
 यदि $\tan^4 x - \tan^2 x = 1$ है, तो $\sin^4 x + \sin^2 x$ का मान ज्ञात कीजिए।
 (A) $\frac{3}{4}$ (B) $\frac{1}{2}$ (C) 1 (D) $\frac{3}{2}$
50. If $\sin \theta - \cos \theta = \frac{7}{17}$, then find the value of $\sin \theta + \cos \theta$.
 यदि $\sin \theta - \cos \theta = \frac{7}{17}$ हो, तो $\sin \theta + \cos \theta$ का मान ज्ञात करें।
 (A) $\frac{8}{17}$ (B) $\frac{23}{13}$ (C) $\frac{23}{17}$ (D) $\frac{8}{13}$

51. Find x if $\cos x = -\frac{1}{2}$.

यदि $\cos x = -\frac{1}{2}$ है, तो x का मान ज्ञात करें।

- (A) $\frac{3\pi}{2}$ (B) $\frac{2\pi}{3}$ (C) $\frac{5\pi}{2}$ (D) $\frac{3\pi}{4}$

52. $\frac{\cos x}{1+\sin x} + \frac{1+\sin x}{\cos x}$ is equal to :

$\frac{\cos x}{1+\sin x} + \frac{1+\sin x}{\cos x}$ का मान ज्ञात करें।

- (A) $2\sin x$ (B) $2\cos x$
(C) $2\operatorname{cosec} x$ (D) $2\sec x$

53. If $\cos x = \frac{p}{q}$ and $0^\circ < x < 90^\circ$, then the value of $\tan x$ is:

यदि $\cos x = \frac{p}{q}$ और $0^\circ < x < 90^\circ$ है, तो $\tan x$ का मान है।

- (A) $\frac{\sqrt{q^2-p^2}}{q}$ (B) $\frac{q}{\sqrt{q^2-p^2}}$
(C) $\frac{p}{\sqrt{p^2-q^2}}$ (D) $\frac{\sqrt{q^2-p^2}}{p}$

54. If $\sin x - \cos x = 0$, $0^\circ < x < 90^\circ$ then the value of $(\sec x + \operatorname{cosec} x)^2$ is :

यदि $\sin x - \cos x = 0$, $0^\circ < x < 90^\circ$ तो $(\sec x + \operatorname{cosec} x)^2$ का मान ज्ञात करें।

- (A) 8 (B) 4
(C) 10 (D) 6

55. If $\sin x = \frac{2}{3}$, then find the value of $\cos 3x$.

यदि $\sin x = \frac{2}{3}$ है, तो $\cos 3x$ का मान ज्ञात करें।

- (A) 0.6735 (B) -0.8765
(C) -0.5797 (D) 0.5678

56. Find the value of $\sin^2 35^\circ + \sin^2 55^\circ$.
 $\sin^2 35^\circ + \sin^2 55^\circ$ का मान ज्ञात करें।

- (A) -1 (B) $\frac{1}{2}$ (C) 0 (D) 1

57. If $\tan \theta + \cot \theta = 6$, then find the value of $\tan^2 \theta + \cot^2 \theta$.

यदि $\tan \theta + \cot \theta = 6$ है, तो $\tan^2 \theta + \cot^2 \theta$ का मान ज्ञात करें।

- (A) 26 (B) 34
(C) 24 (D) 36

58. Find the value of $\frac{\cos^2 30^\circ - \sin^2 30^\circ}{\sin^2 15^\circ + \cos^2 15^\circ}$

$\frac{\cos^2 30^\circ - \sin^2 30^\circ}{\sin^2 15^\circ + \cos^2 15^\circ}$ का मान ज्ञात कीजिए।

- (A) $\frac{1}{2}$ (B) 1 (C) $1-\sqrt{3}$ (D) 0

59. If $\sec \theta - \tan \theta = 3$, then $\cos \theta$ is equal to :

यदि $\sec \theta - \tan \theta = 3$ है, तो $\cos \theta$ का मान ज्ञात कीजिए।

- (A) $\frac{3}{7}$ (B) $\frac{2}{5}$ (C) $\frac{3}{5}$ (D) $\frac{4}{9}$

60. If $\tan^2 x - 3\sec^2 x + 3 = 0$, then the value of x ($0^\circ \leq x \leq 90^\circ$) is :

यदि $\tan^2 x - 3\sec^2 x + 3 = 0$ है, x ($0^\circ \leq x \leq 90^\circ$) का मान ज्ञात कीजिए।

- (A) 60° (B) 0°
(C) 30° (D) 45°

61. If $\cos^2 \theta + \cos^4 \theta = 1$, then the value of $\sin \theta + \sin^2 \theta$ is :

यदि $\cos^2 \theta + \cos^4 \theta = 1$ है, तो $\sin \theta + \sin^2 \theta$ का मान बताइए।

- (A) 0 (B) $\frac{1}{2}$ (C) 2 (D) 1

62. If $\cos(A+B) = 0$ and $\sin(A-B) = \frac{1}{2}$, then the value of B is : (Given $0^\circ < A, B < 90^\circ$)

यदि $\cos(A+B) = 0$ और $\sin(A-B) = \frac{1}{2}$ है, तो B का मान बताइए। (दिया है $0^\circ < A, B < 90^\circ$)

- (A) 45° (B) 90°
(C) 60° (D) 30°

63. If $\operatorname{cosec} \theta = \frac{(x^2+y^2)}{(x^2-y^2)}$, then what will be the value of $\tan \theta$?

यदि $\operatorname{cosec} \theta = \frac{(x^2+y^2)}{(x^2-y^2)}$ है, तो $\tan \theta$ का मान क्या होगा ?

- (A) $\frac{(x^2-y^2)}{(x^2+y^2)}$ (B) $\frac{2xy}{(x^2-y^2)}$

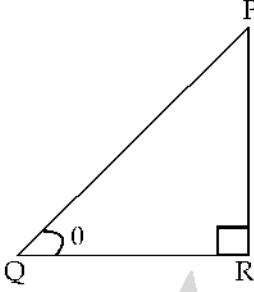
- (C) $\frac{(x^2-y^2)}{2xy}$ (D) $\frac{(x^2+y^2)}{2xy}$

64. If $\sin \theta + \operatorname{cosec} \theta = 2$, then the value of $\sin^2 \theta + \operatorname{cosec}^2 \theta$ is:

यदि $\sin \theta + \operatorname{cosec} \theta = 2$ तो $\sin^2 \theta + \operatorname{cosec}^2 \theta$ का मान ज्ञात करें।

- (A) 8 (B) 4
(C) 1 (D) 2

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65. The value of $\sin 20^\circ \cos 70^\circ + \sin 70^\circ \cos 20^\circ$ is :
 $\sin 20^\circ \cos 70^\circ + \sin 70^\circ \cos 20^\circ$ का मान ज्ञात करें।
 (A) 1 (B) $\frac{1}{\sqrt{2}}$ (C) 0 (D) 2
66. If $\tan 4A = \cot(A - 20^\circ)$, $0^\circ < A < 90^\circ$, then the value of A is :
 यदि $\tan 4A = \cot(A - 20^\circ)$, $0^\circ < A < 90^\circ$ है, तो A का मान ज्ञात करें।
 (A) 22° (B) 80° (C) 5° (D) 14°
67. In the given figure, if $PQ = 13$ cm and $PR = 12$ cm, then the value of $\sin \theta + \tan \theta$ is :
 दी गई आकृति में, यदि $PQ = 13$ cm और $PR = 12$ cm है, तो $\sin \theta + \tan \theta$ का मान क्या होगा ?
- 
- (A) $\frac{213}{5}$ (B) $\frac{218}{5}$ (C) $\frac{216}{13}$ (D) $\frac{216}{65}$
68. What is the value of $\cot 35^\circ \cot 40^\circ \cot 45^\circ \cot 50^\circ \cot 55^\circ$?
 $\cot 35^\circ \cot 40^\circ \cot 45^\circ \cot 50^\circ \cot 55^\circ$ का मान ज्ञात करें।
 (A) -1 (B) 2 (C) 1 (D) 0
69. Find the smallest positive angle which satisfies the given trigonometric equation.
 वह छोटा से छोटा धन कोण ज्ञात करें, जो दिए गए त्रिकोणमितीय समीकरण को संतुष्ट करेगा।
- $2\sin^2 x + \sqrt{3} \cos x + 1 = 0$
- (A) $\frac{\pi}{3}$ (B) $\frac{2\pi}{3}$ (C) $\frac{5\pi}{6}$ (D) $\frac{\pi}{6}$
70. The value of $\tan(63^\circ - \theta) - \cot(27^\circ + \theta) + \frac{\cosec^2 70 - \tan^2 20}{\sec^2 37 - \cot^2 53}$ is :
 $\tan(63^\circ - \theta) - \cot(27^\circ + \theta) + \frac{\cosec^2 70 - \tan^2 20}{\sec^2 37 - \cot^2 53}$ का मान ज्ञात करें।
 (A) 2 (B) 3 (C) 0 (D) 1
71. If $x = \cosec A + \cos A$ and $y = \cosec A - \cos A$, then find the value of $\left(\frac{2}{x+y}\right)^2 + \left(\frac{x-y}{2}\right)^2 - 1$.
 यदि $x = \cosec A + \cos A$ और $y = \cosec A - \cos A$ है, तो $\left(\frac{2}{x+y}\right)^2 + \left(\frac{x-y}{2}\right)^2 - 1$ का मान ज्ञात करें।
 (A) 3 (B) 0 (C) 2 (D) 1
72. If $0 < \theta < 90^\circ$, $3b \cosec \theta = a \sec \theta$ and $3a \sec \theta - b \cosec \theta = 8$, then the value of $9b^2 + a^2$ is :
 यदि $0 < \theta < 90^\circ$, $3b \cosec \theta = a \sec \theta$ और $3a \sec \theta - b \cosec \theta = 8$ है, तो $9b^2 + a^2$ का मान ज्ञात करें।
 (A) 6 (B) 8 (C) 9 (D) 7
73. If $\cosec^2 x - 2 = 0$, then the value of x ($0 < x < 90^\circ$) is :
 यदि $\cosec^2 x - 2 = 0$ है, तो x ($0 < x < 90^\circ$) का मान ज्ञात करें।
 (A) 15° (B) 45° (C) 30° (D) 60°
74. If $\cos 3\theta = \sin(\theta - 34^\circ)$, then the value of θ as an acute angle is :
 यदि $\cos 3\theta = \sin(\theta - 34^\circ)$ है, तो न्यून कोण के रूप में θ का मान ज्ञात करें।
 (A) 34° (B) 31° (C) 56° (D) 17°
75. If $\sqrt{3} \cos \theta = \sin \theta$, then the value of $\frac{4 \sin^2 \theta - 5 \cos \theta}{3 \cos \theta + 1}$ is :
 यदि $\sqrt{3} \cos \theta = \sin \theta$ है, तो $\frac{4 \sin^2 \theta - 5 \cos \theta}{3 \cos \theta + 1}$ का मान ज्ञात करें।
 (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) 5 (D) $\frac{2}{5}$
76. If $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$ and $x \sin \theta = y \cos \theta$, then the value of $x^2 + y^2$ is :
 यदि $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$ और $x \sin \theta = y \cos \theta$ है, तो $x^2 + y^2$ का मान ज्ञात करें।
 (A) 0 (B) 4 (C) 1 (D) 2
77. If θ is a positive acute angle and $\tan 2\theta \tan 3\theta = 1$, then the value of θ is :
 यदि θ एक धनात्मक न्यून कोण है और $\tan 2\theta \tan 3\theta = 1$ है, तो θ का मान है :
 (A) 45° (B) 18° (C) 60° (D) 36°

78. If $\sin(A+B) = \cos(A-B) = \frac{\sqrt{3}}{2}$ and A and B are acute angles. The measures of angle A and B (in degrees) will be :

यदि $\sin(A+B) = \cos(A-B) = \frac{\sqrt{3}}{2}$ तथा A और B न्यूनकोण हैं, तो कोण A और B का माप (अंश में) ज्ञात करें।

- (A) A = 45 and/और B = 15
 (B) A = 45 and/और B = 45
 (C) A = 15 and/और B = 45
 (D) A = 60 and/और B = 30

79. If $\cot\theta = \frac{3}{\sqrt{5}}$, $0^\circ < \theta < 90^\circ$, then the value of

$$\frac{6\sec^2\theta - \frac{5}{3}\cosec^2\theta}{\frac{3}{5}\sec^2\theta + \frac{4}{3}\cosec^2\theta}$$

is equal to :

यदि $\cot\theta = \frac{3}{\sqrt{5}}$, $0^\circ < \theta < 90^\circ$ है, तो $\frac{6\sec^2\theta - \frac{5}{3}\cosec^2\theta}{\frac{3}{5}\sec^2\theta + \frac{4}{3}\cosec^2\theta}$
 का मान है :

- (A) $\frac{2}{3}$ (B) 1 (C) $\frac{1}{2}$ (D) $\frac{1}{3}$

80. If $\cot A = \tan(2A - 45^\circ)$, A is an acute angle then $\tan A$ is equal to :

यदि $\cot A = \tan(2A - 45^\circ)$ जहाँ A एक न्यूनकोण है, तो $\tan A$ का मान ज्ञात करें ?

- (A) $\frac{1}{2}$ (B) 3 (C) $\sqrt{3}$ (D) 1

81. The value of $\sin^2 38^\circ - \cos^2 52^\circ$ is :

$\sin^2 38^\circ - \cos^2 52^\circ$ का मान है :

- (A) $\frac{1}{\sqrt{2}}$ (B) 1 (C) $\sqrt{2}$ (D) 0

82. If the value of $\sec B + \tan B = r$, then the value of $\sec B - \tan B$ is equal to :

यदि $\sec B + \tan B = r$ है, तो $\sec B - \tan B$ का मान के बराबर है।

- (A) 0 (B) $\frac{1}{r}$ (C) r^2 (D) -r

83. If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$ and θ is an acute angle, then the

value of $\frac{3\sin\theta + 4\cos\theta}{8\cos\theta - 3\sin\theta}$ is :

यदि If $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta} = 3$ है और θ एक न्यून कोण है, तो

$\frac{3\sin\theta + 4\cos\theta}{8\cos\theta - 3\sin\theta}$ का मान है :

- (A) 10 (B) $\frac{1}{2}$ (C) 5 (D) 2

84. If $\sin 7x = \cos 11x$, $0^\circ < x < 90^\circ$, then the value of $\tan 9x$ is :

यदि $\sin 7x = \cos 11x$, $0^\circ < x < 90^\circ$ है, तो $\tan 9x$ का मान है :

- (A) $\frac{\sqrt{3}}{2}$ (B) 1 (C) $\frac{1}{\sqrt{3}}$ (D) $\sqrt{3}$

85. If $\frac{\cos A}{\cosec A + 1} + \frac{\cos A}{\cosec A - 1} = 2$, $0^\circ \leq A \leq 90^\circ$, then A is equal to :

यदि $\frac{\cos A}{\cosec A + 1} + \frac{\cos A}{\cosec A - 1} = 2$, $0^\circ \leq A \leq 90^\circ$ हो, तो A का मान ज्ञात करें ?

- (A) 60° (B) 45°
 (C) 90° (D) 30°

86. If $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 5$ and θ is an acute angle, then the value of $\frac{3\cos^2\theta + 1}{3\cos^2\theta - 1}$ is :

यदि $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = 5$ और θ एक न्यून कोण है, तो

$\frac{3\cos^2\theta + 1}{3\cos^2\theta - 1}$ का मान है :

- (A) 3 (B) 2 (C) 1 (D) 4

87. If $\sin(\theta + 30^\circ) = \frac{3}{\sqrt{12}}$, then the value of θ is equal to :

यदि $\sin(\theta + 30^\circ) = \frac{3}{\sqrt{12}}$ है, तो θ का मान है :

- (A) 60° (B) 15°
 (C) 45° (D) 30°

88. If $\sin(A - B) = \frac{1}{2}$ and $\cos(A + B) = \frac{1}{2}$, where $A > B > 0^\circ$ and A + B is an acute angle, then the value of A is :

यदि $\sin(A - B) = \frac{1}{2}$ और $\cos(A + B) = \frac{1}{2}$ है, जहाँ $A > B > 0^\circ$ और A + B एक न्यून कोण है, तो A का मान है :

- (A) 45° (B) 30°
 (C) 15° (D) 60°

89. If $\alpha + \beta = 90^\circ$ and $\alpha = 2\beta$, then the value of $\cos^2\alpha + \sin^2\beta$ is :
यदि $\alpha + \beta = 90^\circ$ और $\alpha = 2\beta$ है, तो $\cos^2\alpha + \sin^2\beta$ का मान है :
(A) $\frac{1}{3}$ (B) $\frac{1}{5}$ (C) 1 (D) $\frac{1}{2}$
90. If $\sec\theta + \tan\theta = 2 + \sqrt{5}$ and θ is an acute angle, then the value of $\sin\theta$ is :
यदि $\sec\theta + \tan\theta = 2 + \sqrt{5}$ और θ एक न्यूनकोण है तो $\sin\theta$ का मान ज्ञात करो।
(A) $\frac{2\sqrt{5}}{5}$ (B) $\frac{3}{5}$ (C) $\frac{\sqrt{5}}{5}$ (D) $\frac{1}{5}$
91. The elimination of θ from $x \cos\theta - y \sin\theta = 2$ and $x \sin\theta + y \cos\theta = 4$ will give :
यदि $x \cos\theta - y \sin\theta = 2$ और $x \sin\theta + y \cos\theta = 4$ से θ का विलोपन किया जाए तो क्या प्राप्त होगा ?
(A) $3x^2 - y^2 = 20$ (B) $x^2 + y^2 = 20$
(C) $3x^2 + y^2 = 20$ (D) $x^2 - y^2 = 20$
92. If $\tan\theta + \cot\theta = 2$ and θ is acute, then the value of $\tan^{100}\theta + \cot^{100}\theta$ is equal to :
यदि $\tan\theta + \cot\theta = 2$ और θ न्यून कोण है, तो $\tan^{100}\theta + \cot^{100}\theta$ का मान क्या होगा ?
(A) 2 (B) $\sqrt{3}$
(C) 1 (D) 0
93. If A is an acute angle and $\cot A + \operatorname{cosec} A = 3$, then the value of $\cos A$ is equal to :
यदि A एक न्यूनकोण है और $\cot A + \operatorname{cosec} A = 3$ है, तो $\cos A$ का मान क्या होगा ?
(A) $\frac{4}{5}$ (B) $\frac{2}{5}$ (C) $\frac{1}{5}$ (D) $\frac{3}{5}$
94. If $\operatorname{cosec}\theta = \frac{13}{12}$, then the value of $\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta}$ is :
यदि $\operatorname{cosec}\theta = \frac{13}{12}$ है, तो $\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta}$ का मान क्या होगा ?
(A) 2 (B) 4 (C) 1 (D) 3
95. If $\sin(2x - 45^\circ) = \cos x$ and angle x and $(2x - 45^\circ)$ (in degrees) are acute angles, then the value of $\cot x$ is :
यदि $\sin(2x - 45^\circ) = \cos x$ और कोण x और $(2x - 45^\circ)$ न्यून कोण हैं तो $\cot x$ का मान होगा।
(A) 0 (B) $\frac{1}{2}$ (C) 1 (D) $\frac{1}{\sqrt{2}}$
96. $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ is equal to :
 $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}$ बराबर है।
(A) $\frac{1}{\sec\theta - \tan\theta}$ (B) $\frac{1}{\sec\theta + \tan\theta}$
(C) $(\sec\theta + \tan\theta)^2$ (D) $(\sec\theta - \tan\theta)^2$
97. The value of

$$\frac{\sin 23^\circ \cos 67^\circ \tan 45^\circ + \cos 23^\circ \sin 67^\circ \cot 45^\circ}{2 \sin 45^\circ \cos 45^\circ}$$
 is ?

$$\frac{\sin 23^\circ \cos 67^\circ \tan 45^\circ + \cos 23^\circ \sin 67^\circ \cot 45^\circ}{2 \sin 45^\circ \cos 45^\circ}$$
 का मान है।
(A) 0 (B) 2 (C) 1 (D) $\frac{1}{\sqrt{2}}$
98. If $\cos 27^\circ = x$, then the value of $\tan 63^\circ$ is :
अगर $\cos 27^\circ = x$ हो तो $\tan 63^\circ$ का मान क्या होगा।
(A) $\frac{\sqrt{1+x^2}}{x}$ (B) $\frac{x}{\sqrt{1+x^2}}$
(C) $\frac{\sqrt{1-x^2}}{x}$ (D) $\frac{x}{\sqrt{1-x^2}}$
99. If x, y are acute angles, where $0 < x + y < 90^\circ$ and $\sin(3x - 40^\circ) = \cos(3y + 40^\circ)$, then the value of $\tan(x + y)$ is equal to :
अगर x, y न्यून कोण हैं जहाँ $0 < x + y < 90^\circ$ और $\sin(3x - 40^\circ) = \cos(3y + 40^\circ)$ हो तो $\tan(x + y)$ का मान ज्ञात करें।
(A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{\sqrt{3}}$ (C) $\sqrt{3}$ (D) $\frac{1}{3}$
100. If $\tan\theta = \frac{2}{\sqrt{11}}$, $0 < \theta < 90^\circ$, then the value of $\frac{2\operatorname{cosec}^2\theta - 3\sec^2\theta}{3\operatorname{cosec}^2\theta + 4\sec^2\theta}$ is equal to :
अगर $\tan\theta = \frac{2}{\sqrt{11}}$, $0 < \theta < 90^\circ$ हो तो $\frac{2\operatorname{cosec}^2\theta - 3\sec^2\theta}{3\operatorname{cosec}^2\theta + 4\sec^2\theta}$ का मान ज्ञात करें।
(A) $\frac{11}{45}$ (B) $\frac{11}{49}$ (C) $\frac{13}{49}$ (D) $\frac{10}{49}$

Solution

$$1. \text{ (B)} \frac{\cos 30^\circ - \sin 30^\circ}{\sin 60^\circ + \cos 60^\circ} = \frac{\frac{\sqrt{3}}{2} - \frac{1}{2}}{\frac{\sqrt{3}}{2} + \frac{1}{2}} = \frac{\frac{\sqrt{3}-1}{2}}{\frac{\sqrt{3}+1}{2}}$$

$$= \frac{(\sqrt{3}-1)^2}{(\sqrt{3}+1)(\sqrt{3}-1)} = \frac{4-2\sqrt{3}}{2} = 2-\sqrt{3}$$

$$2. \text{ (D)} \operatorname{cosec}\theta + \cot\theta = 2$$

$$\Rightarrow \operatorname{cosec}\theta - \cot\theta = \frac{1}{2}$$

$$\text{So, } \operatorname{cosec}\theta = \frac{5}{4}$$

$$\Rightarrow \sin\theta = \frac{4}{5}$$

$$3. \text{ (D)} (\sin\theta + \cos\theta)^2 = 2$$

$$\Rightarrow 1 + 2\sin\theta \cos\theta = 2$$

$$\Rightarrow \theta = 45^\circ = \frac{\pi}{4}$$

$$4. \text{ (A)} \operatorname{cosec}A = \frac{25}{7}$$

$$\Rightarrow \sin A = \frac{7}{25}, \cos A = \frac{24}{25}$$

$$\tan A = \frac{7}{24}$$

$$5. \text{ (A)} 2\sin^2x - 1 = 0$$

$$\Rightarrow \sin x = \frac{1}{\sqrt{2}} = \sin 45^\circ$$

$$\text{So, } x = 45^\circ = \frac{\pi}{4}$$

$$6. \text{ (B)} \cot\theta = \frac{80}{39}$$

$$\Rightarrow \operatorname{cosec}\theta = \sqrt{1 + \left(\frac{80}{39}\right)^2} = \frac{89}{39}$$

$$7. \text{ (B)} \sin\theta = \frac{4}{5}$$

$$\sin 3\theta = 3\sin\theta - 4\sin^3\theta = 3 \times \frac{4}{5} - 4 \times \frac{64}{125}$$

$$= \frac{300 - 256}{125} = \frac{44}{125}$$

$$8. \text{ (A)} \tan a = \frac{2}{\sqrt{13}} \quad \cot a = \frac{\sqrt{13}}{2}$$

$$\Rightarrow \frac{\operatorname{cosec}^2 a + 2\sec^2 a}{\operatorname{cosec}^2 a - 3\sec^2 a}$$

$$\Rightarrow \frac{1 + \frac{13}{4} + 2 + \frac{8}{13}}{1 + \frac{13}{4} - 3 - \frac{12}{13}} = \frac{357}{17} = 21$$

$$9. \text{ (B)} a \sin A + b \cos A = c$$

$$a \cos A - b \sin A = \sqrt{a^2 + b^2 - c^2}$$

$$10. \text{ (B)} \frac{1 - \tan A}{1 + \tan A} = \frac{1/\sqrt{3}}{\sqrt{3}} \Rightarrow \frac{1 - \tan A}{1 + \tan A} = \frac{1}{3}$$

$$\tan A = \frac{1}{2}$$

$$\cot A = 2$$

$$11. \text{ (B)} \sin(60^\circ + \theta) - \cos(30^\circ - \theta)$$

$$\Rightarrow \sin(60^\circ + \theta) - \cos[90^\circ - (60^\circ + \theta)]$$

$$\Rightarrow \sin(60^\circ + \theta) - \sin(60^\circ + \theta)$$

$$\Rightarrow 0$$

$$12. \text{ (D)} \sin x = -\frac{1}{2} \quad \sin(210^\circ) = -\frac{1}{2}$$

$$210^\circ = \frac{7\pi}{6}$$

$$13. \text{ (A)} (\sin\theta - \cos\theta)^2 = \frac{1}{841}$$

$$2\sin\theta \cos\theta = \frac{840}{841} \dots \text{(i)}$$

$$(\sin\theta + \cos\theta)^2 = \sin^2\theta + \cos^2\theta + 2\sin\theta \cos\theta$$

$$= 1 + \frac{840}{841} = \frac{1681}{841}$$

$$\sin\theta + \cos\theta = \frac{41}{29}$$

$$14. \text{ (D)} \cos x = \frac{3}{5} \quad \sin x = \frac{4}{5}$$

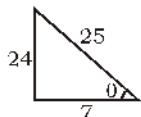
$$\sin x - \sin^3 x$$

$$\Rightarrow \frac{4}{5} - \frac{64}{125}$$

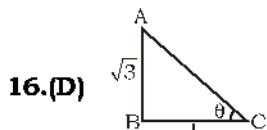
$$\Rightarrow \frac{36}{125}$$

$$\Rightarrow 0.288$$

15.(C) $\sin\theta = \frac{96}{100} = \frac{24}{25}$



$$\cot\theta = \frac{7}{24} = 0.2916$$



$$\tan\theta = \sqrt{3}$$

$$\theta = 60^\circ$$

17.(D) $\frac{\sin 30^\circ \cos 60^\circ + \cos 45^\circ \sin 45^\circ}{\tan 60^\circ \cot 30^\circ}$

$$= \frac{\frac{1}{2} \times \frac{1}{2} + \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}}{\sqrt{3} \times \sqrt{3}} = \frac{\frac{1}{4} + \frac{1}{2}}{3} = \frac{\frac{3}{4}}{3} = \frac{1}{4}$$

18.(B) $\frac{\sin x + \cos x}{\sin x - \cos x} = \frac{6}{5}$

Using compendo & dividendo

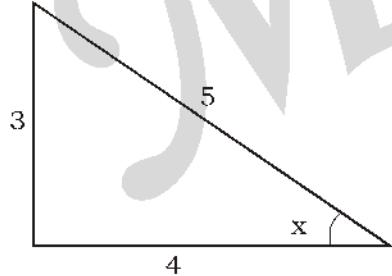
$$\frac{\sin x}{\cos x} = \frac{6+5}{6-5}$$

$$\tan x = 11$$

put value in equation

$$\frac{\tan^2 x + 1}{\tan^2 x - 1} = \frac{121 + 1}{121 - 1} = \frac{122}{120} = \frac{61}{60}$$

19.(B)



$$\cot x \cdot \sec x = \frac{4}{3} \times \frac{5}{4} = \frac{5}{3}$$

20.(B) $\frac{\sqrt{13} \times \frac{3}{\sqrt{13}} - 3 \times \frac{2}{3}}{3 \times \frac{2}{3} + \sqrt{13} \times \frac{2}{\sqrt{13}}}$

$$= \frac{3 - 2}{2 + 2} = \frac{1}{4}$$

21.(D) $\sin^2\theta + \cos^2\theta = 4x^2 + \frac{4}{x^2}$

$$1 = 4 \left(x^2 + \frac{1}{x^2} \right)$$

22.(D) $\tan 50^\circ = \frac{1}{x}$

$$2\tan 50^\circ = 2 \times \frac{1}{x} = \frac{2}{x}$$

23.(A) $\frac{\sqrt{\cosec x - 1}}{\sqrt{\cosec x + 1}} \times \frac{\sqrt{\cosec x - 1}}{\sqrt{\cosec x - 1}}$

$$\Rightarrow \frac{\cosec x - 1}{\sqrt{\cosec^2 x - 1}} \because \cosec^2 x - 1 = \cot^2 x$$

$$\Rightarrow \frac{\cosec x - 1}{\cot x}$$

$$\Rightarrow \sec x - \tan x$$

24.(D) $\cos(90^\circ - 61^\circ) \cosec 61^\circ + 2\sin(90^\circ - 55^\circ) \sec 55^\circ$

$$\frac{\sin 61^\circ}{\sin 61^\circ} + 2 \frac{\cos 55^\circ}{\cos 55^\circ}$$

$$3 \sin^2(90 - 48) + 3 \sin^2 48^\circ$$

$$\Rightarrow \frac{1+2}{3}$$

$$\Rightarrow \frac{3}{3} = 1$$

25.(B) $x \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$

$$\frac{x}{4} = \frac{1}{2}$$

$$x = 2$$

26.(D) ATQ,

$$\cos(x - y) = \frac{\sqrt{3}}{2} = \cos 30^\circ$$

$$\Rightarrow (x - y) = 30^\circ$$

$$\sin(x + y) = \frac{1}{2} = \sin 30^\circ$$

$$\Rightarrow (x + y) = 30^\circ$$

So,

$$x = 30^\circ$$

27.(D) ATQ,

$$\text{Min. Value} = 2\sqrt{8 \times 25} = 20\sqrt{2}$$

28.(B) $\frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta} = \frac{8}{1}$

⇒ Applying C & D

$$\Rightarrow \frac{\cos\theta}{\sin\theta} = \frac{8+1}{8-1} = \frac{9}{7}$$

$$\Rightarrow \cot\theta = \frac{9}{7}$$

29.(B) So,

$$\frac{\tan 60^\circ - \tan 15^\circ}{1 + \tan 60^\circ \tan 15^\circ} = \tan(60^\circ - 15^\circ) = \tan 45^\circ = 1$$

30.(C) ATQ,

$$3\sec^2 x - 4 = 0$$

$$\Rightarrow \sec x = \frac{2}{\sqrt{3}} = \sec 30^\circ$$

$$\Rightarrow x = 30^\circ$$

31.(A) $4\cos^2\theta - 3\sin^2\theta + 2 = 0$

$$\Rightarrow 7\cos^2\theta = 1$$

$$\Rightarrow \sec^2\theta = 7$$

$$\text{So, } \tan\theta = \sqrt{7-1} = \sqrt{6}$$

32.(A) $\sin^2 45^\circ + \cos^2 45^\circ = \frac{1}{2} + \frac{1}{2} = 1$

33.(A) $\tan\theta = \frac{20}{21}$

$$\text{So, } \frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta} = \frac{\tan\theta - 1}{\tan\theta + 1}$$

$$= \frac{\frac{20}{21} - 1}{\frac{20}{21} + 1} = \frac{-1}{41}$$

34.(B) $\sin x = \frac{12}{37}$

$$\Rightarrow \cos x = \sqrt{1 - \left(\frac{12}{37}\right)^2} = \frac{35}{37}$$

$$\text{So, } \tan x = \frac{12}{35}$$

35.(A) $\left(\frac{\sqrt{3} + 2\sin P}{1 - 2\cos P}\right)^3 + \left(\frac{1 + 2\cos P}{\sqrt{3} - 2\sin P}\right)^3$

$$= \left(\frac{\frac{\sqrt{3}}{2} + \sin P}{\frac{1}{2} - \cos P}\right)^3 + \left(\frac{\frac{1}{2} + \cos P}{\frac{\sqrt{3}}{2} - \sin P}\right)^3$$

$$\text{Put } \frac{\sqrt{3}}{2} = \cos 30^\circ, \frac{1}{2} = \sin 30^\circ$$

$$\Rightarrow \left(\frac{\cos 30^\circ + \sin P}{\sin 30^\circ - \cos P}\right)^3 + \left(\frac{\sin 30^\circ + \cos P}{\cos 30^\circ - \sin P}\right)^3$$

=

$$\left(\frac{\cos 30^\circ + \cos(90^\circ - P)}{\sin 30^\circ - \sin(90^\circ - P)}\right)^3 + \left(\frac{\sin 30^\circ + \sin(90^\circ - P)}{\cos 30^\circ - \cos(90^\circ - P)}\right)^3$$

$$= \left(\frac{2\cos\left(60^\circ - \frac{P}{2}\right)\cos\left(\frac{P}{2} - 30^\circ\right)}{2\cos\left(60^\circ - \frac{P}{2}\right)\sin\left(\frac{P}{2} - 30^\circ\right)}\right)^3 + \left(\frac{2\sin\left(60^\circ - \frac{P}{2}\right)\cos\left(\frac{P}{2} - 30^\circ\right)}{2\sin\left(60^\circ - \frac{P}{2}\right)\sin\left(30^\circ - \frac{P}{2}\right)}\right)^3$$

$$= \cot^3\left(\frac{P}{2} - 30^\circ\right) - \cot^3\left(\frac{P}{2} + 30^\circ\right) = 0$$

36.(B) $A = 2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta)$
 $= 2(1 - 3\sin^2\theta\cos^2\theta) - 3(1 - 2\sin^2\theta\cos^2\theta)$
 $= 2 - 6\sin^2\theta\cos^2\theta - 3 + 6\sin^2\theta\cos^2\theta = -1$

So,

$$\cos\alpha = \sqrt{\frac{3-1}{5-1}} = \frac{1}{\sqrt{2}} = \cos 45^\circ$$

So,

$$3\alpha = 45 \times 3 = 135^\circ$$

37.(D) $117\cos^2 A + 129\sin^2 A = 120$
 $\Rightarrow 117(\cos^2 A + \sin^2 A) + 12\sin^2 A = 120$

$$\Rightarrow \sin^2 A = \frac{3}{12} = \frac{1}{4}$$

$$170\cos^2 B + 158\sin^2 B = 161$$

$$\Rightarrow 12\cos^2 B + 158(\cos^2 B + \sin^2 B) = 161$$

$$\Rightarrow \cos^2 B = \frac{1}{4}$$

So,

$$\operatorname{cosec}^2 A \sec^2 B = 4 \times 4 = 16$$

38.(D) $\cos A \times \cot A = \sin^2 A$

$$\Rightarrow \sin^3 A = \cos^2 A$$

$$\Rightarrow \tan^3 A = \sec A$$

$$\Rightarrow \tan^6 A = \sec^2 A$$

$$\text{So, } \tan^6 A - \tan^2 A = \sec^2 A - \tan^2 A = 1$$

39.(D) $\left(\frac{1 + \sin\theta - \cos\theta}{1 + \sin\theta + \cos\theta}\right) + \left(\frac{1 + \sin\theta + \cos\theta}{1 + \sin\theta - \cos\theta}\right) = 4$

$$1 + \sin^2\theta + \cos^2\theta + 2\sin\theta - 2\cos\theta - 2\sin\theta$$

$$\cos\theta + 1 + \sin^2\theta + \cos^2\theta + 2\sin\theta + 2\cos\theta$$

$$\Rightarrow \frac{+2\sin\theta\cos\theta}{1 + \sin^2\theta + 2\sin\theta - \cos^2\theta} = 4$$

$$\Rightarrow \frac{2(2 + \sin \theta)}{\sin \theta(2 + \sin \theta)} = 4$$

$$\Rightarrow \sin \theta = \frac{1}{2} = \sin 30^\circ$$

$$\Rightarrow \theta = 30^\circ$$

40.(C) $\sec A = \frac{\sqrt{11}}{3}$

$$\Rightarrow \cos A = \frac{3}{\sqrt{11}}, \sin A = \frac{\sqrt{2}}{\sqrt{11}}$$

$$\tan A = \frac{\sqrt{2}}{3}, \cot A = \frac{3}{\sqrt{2}}$$

$$\cosec A = \frac{\sqrt{11}}{\sqrt{2}}$$

$$\text{So } \frac{\cosec^2 A + \tan^2 A}{\sin^2 A + \cot^2 A} = \frac{11/2 + 2/9}{2/11 + 9/2}$$

$$= \frac{103}{18} \times \frac{22}{103} = \frac{11}{9}$$

41.(A) $\sin x - \cos x = 0$

$$\Rightarrow \sin x = \cos x$$

$$\text{So, } \sin^3 x = \cos^3 x$$

$$\Rightarrow \sin^3 x - \cos^3 x = 0$$

42.(A) $\frac{\cot x}{1 + \cosec x} + \frac{1 + \cosec x}{\cot x}$

$$= \frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x}$$

$$= \frac{\cos^2 x + 1 + \sin^2 x + 2 \sin x}{\cos x(1 + \sin x)}$$

$$= \frac{2(1 + \sin x)}{\cos x(1 + \sin x)} = 2 \sec x$$

43.(C) $\tan x = \frac{m}{n}$

$$\Rightarrow \sin x = \frac{m}{\sqrt{m^2 + n^2}}, \cos x = \frac{n}{\sqrt{m^2 + n^2}}$$

$$\text{So, } (\sin x + \cos x) = \frac{m+n}{\sqrt{m^2 + n^2}}$$

44.(C) $\cos x = \frac{24}{25}$

$$\Rightarrow \sin x = \frac{7}{25}$$

$$\text{So } \cosec x = \frac{25}{7}, \cot x = \frac{24}{7}$$

$$\Rightarrow \cosec x + \cot x = \frac{25}{7} + \frac{24}{7} = 7$$

45.(D) ATQ

$$\sec \theta + \sin \theta = \frac{k}{\sqrt{6}}$$

$$\sec \theta \sin \theta = 1$$

$$\Rightarrow \tan \theta = 1 = \tan 45^\circ$$

$$\Rightarrow \theta = 45^\circ$$

$$\text{So, } \sqrt{2} + \frac{1}{\sqrt{2}} = \frac{k}{\sqrt{6}}$$

$$\Rightarrow k = 3\sqrt{3}$$

46.(C) $\tan x = \frac{3}{2}$

So,

$$\frac{3 \sin x + 2 \cos x}{3 \sin x - 2 \cos x} = \frac{3 \tan x + 2}{3 \tan x - 2}$$

$$= \frac{9+4}{9-4} = \frac{13}{5}$$

47.(C) ATQ

$$\frac{A \tan 62^\circ \sec 28^\circ \cot 38^\circ}{\cosec 62^\circ \tan 11^\circ} = 1$$

$$\Rightarrow A = \frac{\tan 11^\circ \tan 38^\circ}{\tan 62^\circ} = \frac{\tan 28^\circ \tan 38^\circ}{\tan 79^\circ}$$

48.(B) $\sec A = 3$

$$\Rightarrow \cosec A = \frac{3}{\sqrt{8}}, \cot A = \frac{1}{\sqrt{8}}$$

$$\cot B = 4$$

$$\Rightarrow \sin B = \frac{1}{\sqrt{17}}, \sec B = \frac{\sqrt{17}}{4}$$

$$\text{So } \frac{\cosec^2 A + \sin^2 B}{\cot^2 A + \sec^2 B} = \frac{9/8 + 1/17}{1/8 + 17/16}$$

$$= \frac{16/8 \times 17}{19/16} = \frac{322}{323}$$

49.(C) $\tan^4 x + \tan^2 x = 1$

$$\Rightarrow \tan^4 x = 1 + \tan^2 x = \sec^2 x$$

$$\Rightarrow \sin^4 x = \cos^4 x$$

$$\text{So } \sin^4 x + \sin^2 x = \cos^4 x + \sin^2 x = 1$$

50.(C) $\sin \theta - \cos \theta = \frac{7}{17}$

$$\Rightarrow 1 - 2\sin \theta \cos \theta = \frac{49}{289}$$

$$\Rightarrow \sin \theta \cos \theta = \frac{120}{289}$$

So,

$$\sin \theta + \cos \theta = \sqrt{1 + \frac{240}{289}} = \frac{23}{17}$$

51.(B) $\cos x = -\frac{1}{2} = \cos 120^\circ = \cos 240^\circ$

$$\Rightarrow x = 120^\circ, 240^\circ = \frac{2\pi}{3}, \frac{4\pi}{3}$$

52.(D) $\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x}$

$$= \frac{\cos^2 x + 1 + \sin^2 x + 2\sin x}{\cos x(1 + \sin x)}$$

$$= \frac{2(1 + \sin x)}{\cos x(1 + \sin x)}$$

$$= 2 \sec x$$

53.(D) $\cos x = \frac{p}{q}$

$$\Rightarrow \sec x = \frac{q}{p}$$

$$\text{So } \tan x = \sqrt{\left(\frac{q}{p}\right)^2 - 1} = \frac{\sqrt{q^2 - p^2}}{p}$$

54.(A) $\sin x - \cos x = 0$

$$\Rightarrow \tan x = 1 = \tan 45^\circ$$

$$\text{So } (\sec x + \cosec x)^2 = (\sqrt{2} + \sqrt{2})^2 = 8$$

55.(C) Given, $\sin x = \frac{2}{3}$

$$\cos x = \sqrt{1 - \sin^2 x}$$

$$\Rightarrow \cos x = \sqrt{1 - \left(\frac{4}{9}\right)} = \sqrt{\left(\frac{5}{9}\right)} = \frac{\sqrt{5}}{3}$$

$$\Rightarrow \cos 3x = 4\cos^3 x - 3\cos x$$

$$\Rightarrow \cos 3x = 4 \times \left(\frac{\sqrt{5}}{3}\right)^3 - 3 \times \frac{\sqrt{5}}{3}$$

$$\Rightarrow \cos 3x = \frac{20\sqrt{5}}{27} - \sqrt{5}$$

$$\Rightarrow \cos 3x = -\frac{7\sqrt{5}}{27}$$

$$\Rightarrow \cos 3x = -0.5797$$

56.(D) $\sin^2 35^\circ + \sin^2 55^\circ$

$$\Rightarrow \sin^2 35^\circ + \sin^2 (90^\circ - 35^\circ)$$

$$\Rightarrow \sin^2 35^\circ + \cos^2 35^\circ$$

$$\Rightarrow 1$$

57.(B) $x = \tan \theta$

$$x + \frac{1}{x} = 6$$

$$x^2 + \frac{1}{x^2} = 36 - 2$$

$$x^2 + \frac{1}{x^2} = 34$$

$$\tan^2 \theta + \frac{1}{\tan^2 \theta} = 34$$

$$\tan^2 \theta + \cot^2 \theta = 34$$

58.(A) $\frac{\cos^2 30^\circ - \sin^2 30^\circ}{\sin^2 15^\circ + \cos^2 15^\circ} = \frac{\frac{3}{4} - \frac{1}{4}}{1} = \frac{1}{2}$

59.(C) $\sec \theta - \tan \theta = 3$

$$\Rightarrow \sec \theta + \tan \theta = \frac{1}{3}$$

$$\Rightarrow \sec \theta = \frac{5}{3}$$

$$\text{So, } \cos \theta = \frac{3}{5}$$

60.(B) $\tan^2 x - 3\sec^2 x + 3 = 0$

$$\Rightarrow 2\sec^2 x = 2$$

$$\Rightarrow \sec x = 1 = \sec 0^\circ$$

$$\text{So } x = 0^\circ$$

61.(D) $\cos^4 \theta = 1 - \cos^2 \theta$

$$\cos^4 \theta = \sin^2 \theta$$

$$\sin \theta = \cos^2 \theta$$

ATQ

$$\sin^2 \theta = \sin^4 \theta$$

$$\Rightarrow \sin \theta + \sin^2 \theta = 1$$

73.(B) $\operatorname{cosec}^2 x - 2 = 0$

$$\Rightarrow \operatorname{cosec} x = \sqrt{2} = \operatorname{cosec} 45^\circ$$

$$\Rightarrow x = 45^\circ$$

74.(B) $\sin(90 - 3\theta) = \sin(\theta - 34^\circ)$

$$90 - 3\theta = \theta - 34$$

$$124 = 4\theta$$

$$\theta = \frac{124}{4}$$

$$\theta = 31^\circ$$

75.(B) $\tan \theta = \sqrt{3}$

$$\theta = 60^\circ$$

$$\frac{4 \left[\frac{\sqrt{3}}{2} \right]^2 - 5 \left[\frac{1}{2} \right]}{3 \left[\frac{1}{2} \right] + 1} = \frac{4 \times \frac{3}{4} - \frac{5}{2}}{2} = \frac{\frac{3}{1} - \frac{5}{2}}{2}$$

$$= \frac{1}{2} \times \frac{2}{5} = \frac{1}{5}$$

76.(C) put $\theta = 45^\circ$

$$x = y \quad (\text{i})$$

$$x \times \frac{1}{2\sqrt{2}} + y \times \frac{1}{2\sqrt{2}} = \frac{1}{2}$$

$$x + y = \sqrt{2}$$

$$2x = \sqrt{2}$$

$$x = \frac{1}{\sqrt{2}}$$

$$y = \frac{1}{\sqrt{2}}$$

$$x^2 + y^2 = \left(\frac{1}{\sqrt{2}} \right)^2 + \left(\frac{1}{\sqrt{2}} \right)^2$$

$$\frac{1}{2} + \frac{1}{2} = 1$$

77.(B) $\tan 2\theta = \frac{1}{\tan 3\theta}$

$$\tan 2\theta = \cot 3\theta$$

$$5\theta = 90^\circ$$

$$\theta = 18^\circ$$

78.(A) $A + B = 60^\circ$

$$A - B = 30^\circ$$

$$2A = 90^\circ$$

$$A = 45^\circ$$

$$B = 15^\circ$$

79.(B) $B = 3, P = \sqrt{5}, H = \sqrt{14}$

$$\frac{6 \times \frac{14}{9} - \frac{5}{3} \times \frac{14}{5}}{\frac{3}{5} \times \frac{14}{9} + \frac{4}{3} \times \frac{14}{5}}$$

$$\Rightarrow \frac{\frac{14}{3}}{\frac{14}{3} \left[\frac{1}{5} + \frac{4}{5} \right]}$$

$$\Rightarrow \frac{1+4}{5}$$

$$\Rightarrow \frac{5}{5} = 1$$

80.(D) $\tan(90 - A) = \tan(2A - 45)$

$$90 - A = 2A - 45$$

$$90 + 45 = 3A$$

$$A = 45^\circ$$

$$\tan 45^\circ = 1$$

81.(D) $\sin^2 38^\circ - \cos^2(90 - 38^\circ)$

$$\sin^2 38^\circ - \sin^2 38^\circ$$

$$= 0$$

82.(B) $\sec B + \tan B = r$

$$\sec B - \tan B = \frac{1}{r}$$

83.(C) $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} = 3$

$$\frac{\sin \theta}{\cos \theta} = \frac{4}{2} = 2$$

$$\tan \theta = 2$$

$$\frac{3 \tan \theta + 4}{8 - 3 \tan \theta}$$

$$\frac{10}{2} = 5$$

84.(B) $7x = 90 - 11x$

$$18x = 90$$

$$x = 5^\circ$$

$$\tan 9x = \tan 9 \times 5 = \tan 45 = 1$$

85.(B) Put $A = 45^\circ$

$$= \frac{1}{\sqrt{2} + 1} + \frac{1}{\sqrt{2} - 1}$$

$$= \frac{1}{\sqrt{2}} \times \left(\frac{\sqrt{2} - 1 + \sqrt{2} + 1}{2 - 1} \right) = \frac{1}{\sqrt{2}} \times 2\sqrt{2} = 2$$

86.(D) $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} = 5$ $\frac{\sec \theta}{\tan \theta} = \frac{5+1}{5-1}$

$$\sin \theta = \frac{2}{3} \quad \cos \theta = \frac{\sqrt{5}}{3}$$

$$\frac{3 \cos^2 \theta + 1}{3 \cos^2 \theta - 1} = \frac{3 \times \frac{5}{9} + 1}{3 \times \frac{5}{9} - 1} = \frac{8}{2} = 4$$

87.(D) $\sin(\theta + 30^\circ) = \frac{3}{2\sqrt{3}} = \frac{\sqrt{3}}{2}$

$$\sin(\theta + 30^\circ) = \sin 60^\circ$$

$$\theta + 30^\circ = 60^\circ$$

$$\theta = 30^\circ$$

88.(A) $\sin(A - B) = \sin 30^\circ$

$$A - B = 30^\circ$$

$$\cos(A + B) = \frac{1}{2} = \cos 60^\circ$$

$$A + B = 60^\circ$$

$$A = 45^\circ$$

89.(D) $2\beta + \beta = 90^\circ$ $\beta = \frac{90}{3} = 30^\circ$

$$\alpha = 60^\circ$$

$$\cos^2 60^\circ + \sin^2 30^\circ \Rightarrow \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

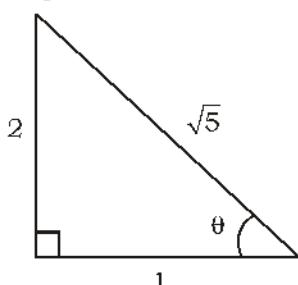
90.(A) $\sec \theta + \tan \theta = 2 + \sqrt{5}$ (i)

$$\sec \theta - \tan \theta = \frac{1}{2 + \sqrt{5}} \times \frac{\sqrt{5} - 2}{\sqrt{5} - 2}$$

$$\sec \theta - \tan \theta = \sqrt{5} - 2$$
(ii)

$$(1) + (2)$$

$$2 \sec \theta = 2\sqrt{5} \Rightarrow \sec \theta = \frac{\sqrt{5}}{1}$$



$$\sin \theta = \frac{2}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$$

91.(B) $x \cos \theta - y \sin \theta = 2$ (i)
 $x \sin \theta + y \cos \theta = 4$ (ii)
 $(1)^2 + (2)^2$
 $x^2 \cos^2 \theta + y^2 \sin^2 \theta - 2xy \sin \theta \cos \theta + x^2 \sin^2 \theta + y^2 \cos^2 \theta + 2xy \sin \theta \cos \theta = 20$
 $x^2 [\cos^2 \theta + \sin^2 \theta] + y^2 [\cos^2 \theta + \sin^2 \theta] = 20$
 $x^2 + y^2 = 20$

92.(A) Put $\theta = 45^\circ$

$$\tan 45^\circ + \cot 45^\circ = 2$$

$$\tan^{100} 45^\circ + \cot^{100} 45^\circ = (1)^{100} + (1)^{100} = 2$$

93.(A) $\operatorname{cosec} A + \cot A = 3$... (i)

$$\because \operatorname{cosec}^2 A - \cot^2 A = (\operatorname{cosec} A + \cot A)(\operatorname{cosec} A - \cot A)$$

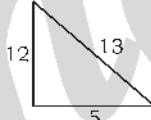
$$\operatorname{cosec} A - \cot A = \frac{1}{3} \quad \dots \text{(ii)}$$

From eq. (i) & (ii)

$$\operatorname{cosec} A = \frac{5}{3}; \quad \sin A = \frac{3}{5}$$

$$\cos A = \frac{4}{5}$$

94.(D)



$$\tan \theta = \frac{12}{5}$$

$$\frac{2 \tan \theta - 3}{4 \tan \theta - 9}$$

$$\frac{2 \times \frac{12}{5} - 3}{4 \times \frac{12}{5} - 9} = \frac{\frac{9}{5}}{\frac{3}{5}} = 3$$

95.(C) $2x - 45^\circ = 90^\circ - x$

$$3x = 135^\circ$$

$$x = \frac{135}{3}$$

$$x = 45^\circ$$

$$\cot(45^\circ) = 1$$

96.(C) $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} \times \frac{\sec \theta + \tan \theta}{\sec \theta + \tan \theta}$

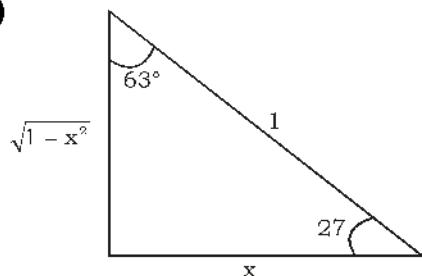
$$\Rightarrow \frac{(\sec \theta + \tan \theta)^2}{\sec^2 \theta - \tan^2 \theta} \quad \because \sec^2 \theta - \tan^2 \theta = 1$$

$$(\sec \theta + \tan \theta)^2$$

97.(C) $\frac{\sin(90 - 67)\cos 67 \tan 45 + \sin(90 - 67) \cdot \sin 67 \cot 45}{2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}}$

$$\frac{\cos^2 67 + \sin^2 67}{1} = 1$$

98.(D)



$$\tan 63 = \frac{x}{\sqrt{1-x^2}}$$

99.(B) $\sin(3x - 40) = \cos(3y + 40)$

$$3x - 40 = 90 - 3y - 40$$

$$3(x + y) = 90$$

$$x + y = 30$$

$$\tan(x + y) = \tan 30 = \frac{1}{\sqrt{3}}$$

100. (D) $\tan \theta = \frac{2}{\sqrt{11}}$

$$\text{So, } \sec^2 \theta = 1 + \tan^2 \theta = 1 + \frac{4}{11}$$

$$\text{And, } \cot \theta = \frac{\sqrt{11}}{2}$$

$$\text{So, cosec}^2 \theta = 1 + \frac{11}{4} = \frac{15}{4}$$

$$\therefore \frac{2 \times \frac{15}{4} - 3 \times \frac{11}{15}}{3 \times \frac{15}{4} + 4 \times \frac{11}{11}} = \frac{\frac{30}{4} - \frac{45}{11}}{\frac{45}{4} + \frac{60}{11}}$$

$$= \frac{330 - 180}{495 + 240} = \frac{150}{735} = \frac{10}{49}$$

(SSC CHSL - 2018)

1. $\frac{\cot\theta}{(1-\sin\theta)(\sec\theta+\tan\theta)}$ is equal to / का मान बराबर है :
 (A) cosecθ (B) sinθ
 (C) secθ (D) 1
2. If $2\cos^2\theta - 5\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$, then the value of (cosecθ + cotθ) is :
 यदि $2\cos^2\theta - 5\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$ है, तो (cosecθ + cotθ) का मान :
 (A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$ (C) $\frac{1}{3}$ (D) $2\sqrt{3}$
3. The value of / का मान

$$\frac{\tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ}{2\operatorname{cosec}^2 60^\circ (\cos^2 60^\circ - 3\cos 60^\circ + 2)}$$
 is :
 (A) 2 (B) 1 (C) $\frac{3}{2}$ (D) $\frac{1}{2}$
4. If $\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $4\operatorname{cosec}\theta + \cot\theta$?
 यदि $\cos^2\theta - \sin^2\theta - 3\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$ है, तो $4\operatorname{cosec}\theta + \cot\theta$ का मान कितना है ?
 (A) $3\sqrt{3}$ (B) 4
 (C) $4\sqrt{3}$ (D) 3
5. $\frac{(\sec\theta + \tan\theta)(1 - \sin\theta)}{\operatorname{cosec}\theta(1 + \cos\theta)(\operatorname{cosec}\theta - \cot\theta)}$ is equal to :

$$\frac{(\sec\theta + \tan\theta)(1 - \sin\theta)}{\operatorname{cosec}\theta(1 + \cos\theta)(\operatorname{cosec}\theta - \cot\theta)}$$
 बराबर है :
 (A) sinθ (B) secθ
 (C) cosθ (D) cosecθ
6. If $\cot\theta = \frac{1}{\sqrt{3}}$, then the value of $\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\operatorname{cosec}^2\theta + \sec\theta)$ is :
 यदि $\cot\theta = \frac{1}{\sqrt{3}}$, तो $\frac{2 - \sin^2\theta}{1 - \cos^2\theta} + (\operatorname{cosec}^2\theta + \sec\theta)$ का मान है :
 (A) 4 (B) 6
 (C) 7 (D) 5

7. If $\frac{1}{\sec\theta - \tan\theta} - \frac{1}{\cos\theta} = \sec\theta \times k$, $0^\circ < \theta < 90^\circ$, then k is equal to :
 यदि $\frac{1}{\sec\theta - \tan\theta} - \frac{1}{\cos\theta} = \sec\theta \times k$, $0^\circ < \theta < 90^\circ$ है, तो k बराबर है :
 (A) cosecθ (B) tanθ
 (C) sinθ (D) cotθ
8. If $\operatorname{cosec}31^\circ = x$, then $\sin^2 59^\circ + \frac{1}{\operatorname{cosec}^2 31^\circ} + \tan^2 59^\circ + \frac{1}{\sin^2 59^\circ \operatorname{cosec}^2 59^\circ}$ is equal to :
 यदि $\operatorname{cosec}31^\circ = x$ है, तो $\sin^2 59^\circ + \frac{1}{\operatorname{cosec}^2 31^\circ} + \tan^2 59^\circ + \frac{1}{\sin^2 59^\circ \operatorname{cosec}^2 59^\circ}$ बराबर है :
 (A) $x + 1$ (B) $x^2 - 1$
 (C) $x - 1$ (D) $x^2 + 1$
9. The simplified value of / का सरलीकृत मान है

$$\left(\frac{\sin^2 25^\circ + \sin^2 65^\circ}{\cos^2 24^\circ + \cos^2 66^\circ} + \sin^2 71^\circ + \cos 71^\circ \sin 19^\circ \right)$$

 (A) 0 (B) 1
 (C) 2 (D) 3
10. If $3\sin\theta = 2\cos^2\theta$, $0^\circ < \theta < 90^\circ$, then the value of $(\tan\theta + \cos\theta + \sin\theta)$ is :
 यदि $3\sin\theta = 2\cos^2\theta$, $0^\circ < \theta < 90^\circ$ है, तो $(\tan\theta + \cos\theta + \sin\theta)$ का मान है :
 (A) $\frac{5\sqrt{3}}{3}$ (B) $\frac{5\sqrt{3}}{6}$
 (C) $\frac{3+5\sqrt{3}}{6}$ (D) $\frac{3+5\sqrt{3}}{3}$
11. If $3\cos^2 A + 6\sin^2 A = 3$, $0^\circ \leq A \leq 90^\circ$, then the value of A is :
 यदि $3\cos^2 A + 6\sin^2 A = 3$, $0^\circ \leq A \leq 90^\circ$ है, तो A का मान है :
 (A) 30° (B) 0°
 (C) 90° (D) 45°

12. The value of / का मान है :

$$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \cosec 81^\circ)}{\sin 56^\circ \sec 34^\circ + \cos 25^\circ \cosec 65^\circ} \text{ is :}$$

- (A) $\frac{1}{2}$ (B) 4 (C) 2 (D) 1

13. A Simplified value of / का सरलीकृत मान है :

$$\left(\frac{\sin \theta}{1+\cos \theta} + \frac{1+\cos \theta}{\sin \theta} \right) \left(\frac{1}{\tan \theta + \cot \theta} \right)$$

- (A) $\cos \theta$ (B) $2\sin \theta$
(C) $\sin \theta$ (D) $2\cos \theta$

14. If $3 - 2\sin^2 \theta - 3\cos \theta = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $(2\cosec \theta + \tan \theta)$?

अगर $3 - 2\sin^2 \theta - 3\cos \theta = 0$, $0^\circ < \theta < 90^\circ$ है, तो $(2\cosec \theta + \tan \theta)$ का मान क्या है ?

- (A) $7\sqrt{3}$ (B) $5\sqrt{3}$ (C) $\frac{5\sqrt{3}}{3}$ (D) $\frac{7\sqrt{3}}{3}$

15. If $\cot \theta = \sqrt{6}$, then the value of $\frac{\cosec^2 \theta + \sec^2 \theta}{\cosec^2 \theta - \sec^2 \theta}$ is :

अगर $\cot \theta = \sqrt{6}$ है, तो $\frac{\cosec^2 \theta + \sec^2 \theta}{\cosec^2 \theta - \sec^2 \theta}$ का मान होगा :

- (A) $\frac{49}{36}$ (B) $\frac{43}{36}$ (C) $\frac{7}{5}$ (D) $\frac{48}{35}$

16. If $\sin \theta \sec^2 \theta = \frac{2}{3}$, $0^\circ < \theta < 90^\circ$, then the value of $(\tan^2 \theta + \cos^2 \theta)$ is :

यदि $\sin \theta \sec^2 \theta = \frac{2}{3}$, $0^\circ < \theta < 90^\circ$ है, तो $(\tan^2 \theta + \cos^2 \theta)$

का मान होगा :

- (A) $\frac{7}{6}$ (B) $\frac{11}{12}$ (C) $\frac{13}{12}$ (D) $\frac{5}{4}$

17. If $\frac{(\sin \theta - \cosec \theta)(\cos \theta - \sec \theta)}{\tan^2 \theta - \sin^2 \theta} = \gamma^3$, then $\gamma =$

अगर $\frac{(\sin \theta - \cosec \theta)(\cos \theta - \sec \theta)}{\tan^2 \theta - \sin^2 \theta} = \gamma^3$ है, तो $\gamma =$

- (A) $\sin \theta \cos \theta$ (B) $\tan \theta$
(C) $\cot \theta$ (D) $\cosec \theta \sec \theta$

18. If $\sqrt{\frac{1-\cos \theta}{1+\cos \theta}} \times \sqrt{\frac{\cosec \theta - \cos \theta}{\cosec \theta + \cos \theta}} = \frac{1-r}{1+r}$ then the value of r is :

अगर $\sqrt{\frac{1-\cos \theta}{1+\cos \theta}} \times \sqrt{\frac{\cosec \theta - \cos \theta}{\cosec \theta + \cos \theta}} = \frac{1-r}{1+r}$ है, तो r का मान होगा :

- (A) $\sin \theta$ (B) $\cosec \theta$
(C) $\sec \theta$ (D) $\cos \theta$

19. If $\frac{1}{1-\sin \theta} + \frac{1}{1+\sin \theta} = 4\sec \theta$, $0^\circ < \theta < 90^\circ$, then the value of $(3\cot \theta + \cosec \theta)$ is :

यदि $\frac{1}{1-\sin \theta} + \frac{1}{1+\sin \theta} = 4\sec \theta$, $0^\circ < \theta < 90^\circ$ है, तो $(3\cot \theta + \cosec \theta)$ का मान होगा :

- (A) $\frac{5\sqrt{3}}{3}$ (B) $4\sqrt{3}$ (C) $5\sqrt{3}$ (D) $\frac{2\sqrt{3}}{3}$

20. The value of / का मान है :

$$\frac{4\tan^2 30^\circ + \frac{1}{4}\sin^2 90^\circ + \frac{1}{8}\cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$$

- (A) $1\frac{3}{4}$ (B) 4 (C) $2\frac{1}{2}$ (D) $3\frac{1}{2}$

21. If $\left(\frac{1}{1+\cosec \theta} - \frac{1}{1-\cosec \theta} \right) \cos \theta = 2$, $0^\circ < 90^\circ$, then the value of $\sin^2 \theta + \cot^2 \theta + \sec^2 \theta$ is :

अगर $\left(\frac{1}{1+\cosec \theta} - \frac{1}{1-\cosec \theta} \right) \cos \theta = 2$, $0^\circ < 90^\circ$ है, तो $\sin^2 \theta + \cot^2 \theta + \sec^2 \theta$ का मान है :

- (A) 1 (B) $2\frac{1}{2}$ (C) $3\frac{1}{2}$ (D) 2

22. If $\tan x = \cot (60^\circ + 6x)$, then what is the value of x ?

यदि $\tan x = \cot (60^\circ + 6x)$ है, तो x का मान क्या होगा ?

- (A) 10° (B) $\frac{30^\circ}{7}$

- (C) $\frac{15^\circ}{2}$ (D) 12°

23. For θ being an acute angle, if $\cosec \theta = 1.25$, then the value of $\frac{4\tan \theta - 5\cos \theta}{\sec \theta + 4\cot \theta}$ is equal to :

θ के एक न्यून कोण होने पर, यदि $\cosec \theta = 1.25$ है, तो $\frac{4\tan \theta - 5\cos \theta}{\sec \theta + 4\cot \theta}$ का मान है :

- (A) $\frac{3}{7}$ (B) $\frac{4}{7}$ (C) $\frac{1}{4}$ (D) $\frac{1}{2}$

24. For $0^\circ < \theta < 90^\circ$, if $2\cos^2\theta = 3 \sin\theta$, then the value of $(\cosec^2\theta - \cot^2\theta + \cos^2\theta)$ is equal to :
 $0^\circ < \theta < 90^\circ$ के लिए, अगर $2\cos^2\theta = 3 \sin\theta$ है, तो $(\cosec^2\theta - \cot^2\theta + \cos^2\theta)$ का मान है :

(A) $1\frac{1}{2}$ (B) $2\frac{3}{4}$ (C) $1\frac{3}{4}$ (D) $2\frac{1}{4}$

25. For $0^\circ < \theta < 90^\circ$, if

$$\frac{\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)}{(\sec\theta-\tan\theta)^2} = \frac{1+k}{1-k} \text{ then } k \text{ is}$$

equal to :

$0^\circ < \theta < 90^\circ$ के लिए, अगर

$$\frac{\sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)}{(\sec\theta-\tan\theta)^2} = \frac{1+k}{1-k} \text{ है, तो } k \text{ बराबर है :}$$

(A) $\cosec\theta$ (B) $\cos\theta$
 (C) $\sec\theta$ (D) $\sin\theta$

26. If $\cos\theta = \frac{2p}{p^2+1}$, then $\sin\theta$ is equal to :

अगर $\cos\theta = \frac{2p}{p^2+1}$ है, तो $\sin\theta$ बराबर है :

(A) $\frac{p^2-1}{p^2+1}$ (B) $\frac{2p}{p^2-1}$
 (C) $\frac{p^2+1}{p^2-1}$ (D) $\frac{2p}{p^2+1}$

27. If $\tan x = \cot(65^\circ + 9x)$, then what is the value of x ?

यदि $\tan x = \cot(65^\circ + 9x)$ है, तो x का मान क्या होगा ?

(A) 2.5° (B) 1.0°
 (C) 2.0° (D) 1.5°

28. If $\cos\theta = \frac{2p}{p^2+1}$, ($p \neq 0$) then $\tan\theta$ is equal to :

अगर $\cos\theta = \frac{2p}{p^2+1}$, ($p \neq 0$) है, तो $\tan\theta$ बराबर है :

(A) $\frac{p^2+1}{p^2-1}$ (B) $\frac{p^2-1}{2p}$ (C) $\frac{2p}{p^2+1}$ (D) $\frac{2p}{p^2-1}$

29. If $2\sin^2\theta + 5 \cos\theta - 4 = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\tan\theta + \sin\theta$ is :

यदि $2\sin^2\theta + 5 \cos\theta - 4 = 0$, $0^\circ < \theta < 90^\circ$ है, तो $\tan\theta + \sin\theta$ का मान है :

(A) $\frac{\sqrt{3}}{3}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{2}{\sqrt{3}}$ (D) $\frac{3\sqrt{3}}{2}$

30. If $\cos\theta = \frac{2p}{p^2+1}$ ($p \neq \pm 1$) then $\cosec\theta$ is equal to :

अगर $\cos\theta = \frac{2p}{p^2+1}$ ($p \neq \pm 1$) है, तो $\cosec\theta$ बराबर है :

(A) $\frac{2p}{p^2-1}$ (B) $\frac{2p}{p^2+1}$

(C) $\frac{p^2-1}{2p}$ (D) $\frac{p^2+1}{p^2-1}$

31. If $2\sin^2\theta + 5 \cos\theta - 4 = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\cot\theta + \cosec\theta$ is :

अगर $2\sin^2\theta + 5 \cos\theta - 4 = 0$, $0^\circ < \theta < 90^\circ$ है, तो $\cot\theta + \cosec\theta$ का मान होगा :

(A) $\frac{3\sqrt{3}}{2}$ (B) $\sqrt{3}$ (C) $\frac{2}{\sqrt{3}}$ (D) $\frac{\sqrt{3}}{\sqrt{2}}$

32. If $12\cot^2\theta - 31 \cosec\theta + 32 = 0$, $0^\circ < \theta < 90^\circ$, then the values of $\sin\theta$ will be :

अगर $12\cot^2\theta - 31 \cosec\theta + 32 = 0$, $0^\circ < \theta < 90^\circ$ है, तो $\sin\theta$ के मान होंगे :

(A) $\frac{5}{4}, \frac{4}{3}$ (B) $\frac{2}{3}, \frac{1}{4}$ (C) $\frac{4}{5}, \frac{3}{4}$ (D) $\frac{1}{3}, \frac{3}{2}$

33. If $\cos x = \frac{-1}{2}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $4\tan^2x + 3\cosec^2x$ is :

अगर $\cos x = \frac{-1}{2}$ और $\pi < x < \frac{3\pi}{2}$ है, तो $4\tan^2x + 3\cosec^2x$ का मान है :

(A) 16 (B) 8
 (C) 4 (D) 10

34. If $6(\sec^2 59^\circ - \cot^2 31^\circ) + \frac{2}{3} \sin 90^\circ - 3\tan^2 56^\circ$ y

$\tan^2 34^\circ = \frac{y}{3}$, then the value of y is :

अगर $6(\sec^2 59^\circ - \cot^2 31^\circ) + \frac{2}{3} \sin 90^\circ - 3\tan^2 56^\circ$

y $\tan^2 34^\circ = \frac{y}{3}$ है, तो y का मान है :

(A) $\frac{2}{3}$ (B) $\frac{-2}{3}$ (C) 2 (D) -2

35. If $\sec\theta = 4x$ and $\tan\theta = \frac{4}{x}$, ($x \neq 0$) then the value

of $8\left(x^2 - \frac{1}{x^2}\right)$ is :

- अगर $\sec\theta = 4x$ और $\tan\theta = \frac{4}{x}$, ($x \neq 0$) है, तो $8\left(x^2 - \frac{1}{x^2}\right)$ का मान है :
- (A) $\frac{1}{16}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) $\frac{1}{8}$
- 36.** If $6(\sec^2 59^\circ - \cot^2 31^\circ) - \frac{2}{3} \sin 90^\circ - 3\tan^2 56^\circ$ $y \tan^2 34^\circ = \frac{y}{3}$, then the value of y is :
- यदि $6(\sec^2 59^\circ - \cot^2 31^\circ) - \frac{2}{3} \sin 90^\circ - 3\tan^2 56^\circ y \tan^2 34^\circ = \frac{y}{3}$ है तो y का मान है :
- (A) $\frac{8}{5}$ (B) $-\frac{8}{5}$ (C) $\frac{2}{3}$ (D) $-\frac{2}{3}$
- 37.** If $\sec\theta = 3x$ and $\tan\theta = \frac{3}{x}$ ($x \neq 0$) then the value of $9\left(x^2 - \frac{1}{x^2}\right)$ is :
- यदि $\sec\theta = 3x$ और $\tan\theta = \frac{3}{x}$ ($x \neq 0$) तो $9\left(x^2 - \frac{1}{x^2}\right)$ का मान है :
- (A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) 1 (D) $\frac{1}{4}$
- 38.** If $\cos x = \frac{-1}{2}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $2\tan^2 x - 3 \operatorname{cosec}^2 x$ is :
- यदि $\cos x = \frac{-1}{2}$ और $\pi < x < \frac{3\pi}{2}$ तो $2\tan^2 x - 3 \operatorname{cosec}^2 x$ का मान है :
- (A) 2 (B) 10 (C) 8 (D) 4
- 39.** If $2(\operatorname{cosec}^2 39^\circ - \tan^2 51^\circ) - \frac{2}{5} \sin 90^\circ - \tan^2 56^\circ$ $y \tan^2 34^\circ = \frac{y}{3}$, then the value of y is :
- यदि $2(\operatorname{cosec}^2 39^\circ - \tan^2 51^\circ) - \frac{2}{5} \sin 90^\circ - \tan^2 56^\circ y \tan^2 34^\circ = \frac{y}{3}$ है, तो y का मान ज्ञात कीजिये ?
- (A) 1 (B) $\frac{2}{3}$ (C) $-\frac{2}{3}$ (D) -1
- 40.** If $4(\operatorname{cosec}^2 65^\circ - \tan^2 25^\circ) - \sin 90^\circ - \tan^2 63^\circ$ $y \tan^2 27^\circ = \frac{y}{2}$, then the value of y is :
- अगर $4(\operatorname{cosec}^2 65^\circ - \tan^2 25^\circ) - \sin 90^\circ - \tan^2 63^\circ y \tan^2 27^\circ = \frac{y}{2}$ है, तब y का मान है :
- (A) $-\frac{1}{2}$ (B) 2 (C) -1 (D) 1
- 41.** If $\cos x = \frac{-\sqrt{3}}{2}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $2\cot^2 x + 3\operatorname{cosec}^2 x$ is :
- यदि $\cos x = \frac{-\sqrt{3}}{2}$ तथा $\pi < x < \frac{3\pi}{2}$, तो $2\cot^2 x + 3\operatorname{cosec}^2 x$ मान है :
- (A) 14 (B) 16 (C) 8 (D) 18
- 42.** If $7(\operatorname{cosec}^2 55^\circ - \tan^2 35^\circ) + 2\sin 90^\circ - \tan^2 52^\circ$ $y \tan^2 38^\circ = \frac{y}{2}$, then the value of y is :
- यदि $7(\operatorname{cosec}^2 55^\circ - \tan^2 35^\circ) + 2\sin 90^\circ - \tan^2 52^\circ y \tan^2 38^\circ = \frac{y}{2}$ है, तो y का मान ज्ञात कीजिये ?
- (A) 2 (B) 6 (C) 3 (D) 1
- 43.** If $\cos\theta = 4x$ and $\sin\theta = \frac{4}{x}$ ($x \neq 0$), then the value of $(x^2 + \frac{1}{x^2})$ is :
- यदि $\cos\theta = 4x$ और $\sin\theta = \frac{4}{x}$ ($x \neq 0$) है, तो $(x^2 + \frac{1}{x^2})$ का मान ज्ञात कीजिये ?
- (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{1}{16}$
- 44.** If $\cos x = \frac{-\sqrt{3}}{2}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $4\cot^2 x - 3\operatorname{cosec}^2 x$ is :
- यदि $\cos x = \frac{-\sqrt{3}}{2}$ और $\pi < x < \frac{3\pi}{2}$, तो $4\cot^2 x - 3\operatorname{cosec}^2 x$ का मान ज्ञात कीजिए :
- (A) 8 (B) 0 (C) 2 (D) 1
- 45.** If $7(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) + 2\sin 90^\circ - 4\tan^2 52^\circ$ $y \tan^2 38^\circ = \frac{y}{2}$, then the value of y is :
- यदि $7(\operatorname{cosec}^2 57^\circ - \tan^2 33^\circ) + 2\sin 90^\circ - 4\tan^2 52^\circ y \tan^2 38^\circ = \frac{y}{2}$ है, तो y का मान ज्ञात कीजिये :
- (A) 2 (B) 4 (C) 1 (D) 3

- 46.** If $\sec \theta = 8x$ and $\tan \theta = \frac{8}{x}$ ($x \neq 0$), then the value of $16 \left(x^2 - \frac{1}{x^2} \right)$ is:
 यदि $\sec \theta = 8x$ और $\tan \theta = \frac{8}{x}$ ($x \neq 0$), तो $16 \left(x^2 - \frac{1}{x^2} \right)$ का मान ज्ञात कीजिये।
 (A) $\frac{1}{4}$ (B) $\frac{1}{16}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$
- 47.** If θ is an acute angle and it is given that $5 \sin \theta + 12 \cos \theta = 13$, then what is the value of $\tan \theta$?
 यदि θ एक न्यून कोण है और $5 \sin \theta + 12 \cos \theta = 13$, दिया गया है, तो $\tan \theta$ का मान ज्ञात कीजिये?
 (A) $\frac{5}{13}$ (B) $\frac{13}{12}$ (C) $\frac{12}{13}$ (D) $\frac{5}{12}$
- 48.** Which among the following increases continuously in the range $0^\circ < \theta < 90^\circ$?
 निम्नलिखित में से कौन $0^\circ < \theta < 90^\circ$ की रेज में निरंतर बढ़ता है?
 (A) $\cot \theta$ (B) $\operatorname{cosec} \theta$
 (C) $\tan \theta$ (D) $\cos \theta$
- 49.** For θ being an acute angle, it is given that, $3(\operatorname{cosec}^2 \theta + \cot^2 \theta) = 5$. Then θ is equal to:
 अगर θ एक न्यून कोण है और $3(\operatorname{cosec}^2 \theta + \cot^2 \theta) = 5$ दिया गया है, तो θ किसके बराबर होगा?
 (A) 45° (B) 60°
 (C) 0° (D) 30°
- 50.** If $\frac{\cos \alpha}{\sin \alpha + \cos \beta} + \frac{\cos \beta}{\sin \beta - \cos \alpha} = \frac{x}{\sin \alpha - \cos \beta} + \frac{\cos \beta}{\sin \beta + \cos \alpha}$ then 'x' is equal to—
 अगर $\frac{\cos \alpha}{\sin \alpha + \cos \beta} + \frac{\cos \beta}{\sin \beta - \cos \alpha} = \frac{x}{\sin \alpha - \cos \beta} + \frac{\cos \beta}{\sin \beta + \cos \alpha}$ है, तो 'x' बराबर है—
 (A) $\cos \beta$ (B) $\cos \alpha$
 (C) $\sin \beta$ (D) $\sin \alpha$
- 51.** For θ being an acute angle, $4(2\sin^2 \theta + 7 \cos^2 \theta) = 13$. What is the value of θ ?
 यदि θ कोई न्यून कोण है, और $4(2\sin^2 \theta + 7 \cos^2 \theta) = 13$ है। θ का मान ज्ञात कीजिये?
 (A) 60° (B) 45°
 (C) 30° (D) 0°
- 52.** If $\sin \theta + \operatorname{cosec} \theta = 2$, then what is the value of $(\sin^{153} \theta + \operatorname{cosec}^{253} \theta)$?
 यदि $\sin \theta + \operatorname{cosec} \theta = 2$ है, तो $(\sin^{153} \theta + \operatorname{cosec}^{253} \theta)$ का मान क्या है?
 (A) $\frac{1}{153 \times 253}$ (B) $\frac{253}{153}$
 (C) 2 (D) $\frac{153}{253}$
- 53.** What is the simplified value of / का सरलीकृत मान क्या होगा?

$$\frac{\sin^3 21^\circ + \cos^3 19^\circ}{\sin 21^\circ + \cos 19^\circ} + \frac{\sin^2 69^\circ + \cos^2 71^\circ}{\sec 69^\circ \operatorname{cosec} 71^\circ}$$

 (A) 3 (B) 1
 (C) 4 (D) 2
- 54.** Which among the following is an irrational quantity?
 निम्नलिखित में से कौन सी एक अपरिमेय संख्या है?
 (A) $\tan 30^\circ \tan 60^\circ$ (B) $\sin 30^\circ$
 (C) $\tan 40^\circ$ (D) $\cos 30^\circ$
 (A) B (B) A
 (C) C (D) D
- 55.** θ being an acute angle, it is given that $\sec^2 \theta + 4\tan^2 \theta = 6$. What is the value of θ ?
 यदि θ एक न्यून कोण है और दिया गया है कि $\sec^2 \theta + 4\tan^2 \theta = 6$ है। θ का मान ज्ञात कीजिये?
 (A) 45° (B) 0°
 (C) 30° (D) 60°
- 56.** If $\theta = 9^\circ$, then what is the value of $\cot \theta \cot 2\theta \cot 3\theta \cot 4\theta \cot 6\theta \cot 7\theta \cot 8\theta \cot 9\theta$?
 यदि $\theta = 9^\circ$ हो, तो $\cot \theta \cot 2\theta \cot 3\theta \cot 4\theta \cot 6\theta \cot 7\theta \cot 8\theta \cot 9\theta$ का मान क्या होगा?
 (A) $\sqrt{3} - 1$ (B) 1 (C) $\sqrt{3}$ (D) $\frac{1}{\sqrt{3}}$
- 57.** For α and β both being acute angles, it is given that $\sin(\alpha + \beta) = 1$, $\cos(\alpha - \beta) = \frac{1}{2}$. The values of α and β are—
 अगर α और β दोनों न्यून कोण हैं और यह दिया गया है कि $\sin(\alpha + \beta) = 1$, $\cos(\alpha - \beta) = \frac{1}{2}$ है, तो α और β का मान क्या होगा?
 (A) $75^\circ, 15^\circ$ (B) $45^\circ, 15^\circ$
 (C) $75^\circ, 45^\circ$ (D) $60^\circ, 30^\circ$
- 58.** It is given that, $\sqrt{\frac{1 - \sin x}{1 + \sin x}} = a - \tan x$ then a is equal to—

- यदि दिया गया है कि $\sqrt{\frac{1-\sin x}{1+\sin x}} = a - \tan x$ है, तो a किसके समान होगा?
- (A) $\cos x$ (B) $\sin x$
 (C) $\operatorname{cosec} x$ (D) $\sec x$
59. What is the value (in degree) of $(a_1 + a_2 + a_3 + \dots + a_{20})$ given $\sin \alpha_1 + \sin \alpha_2 + \sin \alpha_3 + \dots + \sin \alpha_{20} = 20$?
 0° और 90° के बीच सभी α_i (i = 1, 2, 3, ..., 20) के लिए, दिया गया है कि $\sin \alpha_1 + \sin \alpha_2 + \sin \alpha_3 + \dots + \sin \alpha_{20} = 20$ तो $(a_1 + a_2 + a_3 + \dots + a_{20})$ का मान (डिग्री में) क्या है?
- (A) 1800 (B) 900
 (C) 0 (D) 20
60. What is the value of $\operatorname{cosec}^2 30^\circ + \sin^2 45^\circ + \sec^2 60^\circ + \tan^2 30^\circ$?
 $\operatorname{cosec}^2 30^\circ + \sin^2 45^\circ + \sec^2 60^\circ + \tan^2 30^\circ$ का मान ज्ञात कीजिये?
- (A) $\frac{53}{6}$ (B) 8 (C) $\frac{25}{3}$ (D) 9
61. For $0^\circ \leq \theta \leq 90^\circ$, what is θ , when $\sqrt{3} \cos \theta + \sin \theta = 1$?
 $0^\circ \leq \theta \leq 90^\circ$ के लिए θ क्या है जबकि $\sqrt{3} \cos \theta + \sin \theta = 1$?
- (A) 90° (B) 0°
 (C) 45° (D) 30°
62. For all α_i, s_i ($i = 1, 2, 3, \dots, 20$) lying between 0° and 90° , it is given that, $\cos \alpha_1 + \cos \alpha_2 + \cos \alpha_3 + \dots + \cos \alpha_{20} = 20$. What is the value of $(\alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20})$?
 0° और 90° के बीच सभी α_i, s_i ($i = 1, 2, 3, \dots, 20$) के लिए दिया गया है कि, $\cos \alpha_1 + \cos \alpha_2 + \cos \alpha_3 + \dots + \cos \alpha_{20} = 20$ तो $(\alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20})$ का मान क्या है?
- (A) 900° (B) 1800°
 (C) 0° (D) 20°
63. For $0^\circ < \theta < 90^\circ$, $\tan \theta + \cot \theta = 2$. θ is equal to—
 $0^\circ < \theta < 90^\circ$ के लिए $\tan \theta + \cot \theta = 2$ तो θ बराबर है—
- (A) 30° (B) 60°
 (C) 45° (D) 0°
64. What is the simplified value of/ का सरलीकृत मान क्या है?

$$\left(\frac{\sin^2 31^\circ + \sin^2 59^\circ}{\sec^2 35^\circ - \cot^2 55^\circ} + \tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ \right)$$
- (A) 0 (B) -1 (C) $\frac{1}{2}$ (D) 1
65. $(\sin^2 36^\circ + \tan^2 60^\circ + \sec^2 30^\circ + \sin^2 54^\circ)$ is equal to:
 $(\sin^2 36^\circ + \tan^2 60^\circ + \sec^2 30^\circ + \sin^2 54^\circ)$ किसके समान होगा?
- (A) 5 (B) $\frac{17}{3}$
 (C) $\frac{14}{3}$ (D) $\frac{16}{3}$
66. If $2\sin^2 \theta + 3\sin \theta - 2 = 0$, ($0^\circ < \theta < 90^\circ$) then the value of θ is:
 यदि $2\sin^2 \theta + 3\sin \theta - 2 = 0$, ($0^\circ < \theta < 90^\circ$) है, तो θ किसके समान होगा?
- (A) 45° (B) 30°
 (C) 90° (D) 60°
67. If $\tan \theta = \frac{3}{5}$, ($0^\circ < \theta < 90^\circ$) then $\sin \theta \cos \theta$ is equal to:
 यदि $\tan \theta = \frac{3}{5}$, ($0^\circ < \theta < 90^\circ$) हो, तो $\sin \theta \cos \theta$ किसके समान होगा?
- (A) $\frac{14}{\sqrt{34}}$ (B) $\sqrt{17}$
 (C) $\frac{16}{\sqrt{34}}$ (D) $\frac{15}{34}$
68. If $\operatorname{cosec} \theta = 3x$ and $\cot \theta = \frac{3}{x}$, ($x \neq 0$) then the value of $6\left(x^2 - \frac{1}{x^2}\right)$ is:
 यदि $\operatorname{cosec} \theta = 3x$ और $\cot \theta = \frac{3}{x}$, ($x \neq 0$) है, तो $6\left(x^2 - \frac{1}{x^2}\right)$ का मान क्या है:
- (A) $\frac{2}{3}$ (B) 1 (C) $\frac{1}{4}$ (D) $\frac{1}{2}$
69. If $\sin \theta = 3x$ and $\cos \theta = \frac{3}{x}$, ($x \neq 0$) then the value of $6\left(x^2 + \frac{1}{x^2}\right)$ is:
 यदि $\sin \theta = 3x$ और $\cos \theta = \frac{3}{x}$, ($x \neq 0$) हो, तो $6\left(x^2 + \frac{1}{x^2}\right)$ का मान ज्ञात कीजिए?
- (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{2}{3}$ (D) $\frac{1}{2}$

- 70.** If $\cos x = \frac{-\sqrt{3}}{2}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $2 \cot^2 x + 3 \sec^2 x$ is:

यदि $\cos x = \frac{-\sqrt{3}}{2}$ और $\pi < x < \frac{3\pi}{2}$ है, तो $2 \cot^2 x + 3 \sec^2 x$ का मान ज्ञात कीजिये?

- 71.** If $4(\operatorname{cosec}^2 66^\circ - \tan^2 24^\circ) + \frac{1}{2} \sin 90^\circ - 4 \tan^2 66^\circ y$

$$\tan^2 24^\circ = \frac{y}{2}, \text{ then the value of } y \text{ is:}$$

$$\text{यदि } 4(\cosec^2 66^\circ - \tan^2 24^\circ) + \frac{1}{2} \sin 90^\circ = 4$$

$\tan^2 66^\circ y \tan^2 24^\circ = \frac{y}{2}$ है, तो y का मान ज्ञात कीजिए?

- (A) $\frac{1}{2}$ (B) 1 (C) $-\frac{1}{2}$ (D) -1

- 72.** If $\cos x = \frac{-\sqrt{3}}{2}$ and $\pi < x < \frac{3\pi}{2}$, then the value of $2\cot^2 x - 3\sec^2 x$ is :

अगर $\cos x = \frac{-\sqrt{3}}{2}$ तथा $\pi < x < \frac{3\pi}{2}$ है, तो $2\cot^2 x - 3\sec^2 x$ का मान है :

- 73.** If $\cot\theta = 5x$ and $\operatorname{cosec}\theta = \frac{5}{x}$ ($x \neq 0$), then the value

of $5\left(x^2 - \frac{1}{x^2}\right)$ is:

$$\text{यदि } \cot\theta = 5x \text{ और } \operatorname{cosec}\theta = \frac{5}{x} (x \neq 0) \text{ हैं, तो } 5\left(x^2 - \frac{1}{x^2}\right)$$

का मान है :

- (A) $\frac{1}{5}$ (B) $\frac{1}{2}$ (C) $-\frac{1}{5}$ (D) $-\frac{1}{4}$

Solution

- $$\begin{aligned}1. \text{ (A)} \quad & \sec \theta + \tan \theta = \frac{1 + \sin \theta}{\cos \theta} \\& \Rightarrow \frac{\cot \theta \cos \theta}{(1 - \sin \theta)(1 + \sin \theta)} = \frac{\cot \theta \cos \theta}{\cos^2 \theta} \\& = \csc \theta \end{aligned}$$

- 2. (B)** $2\cos^2\theta - 5\cos\theta + 2 = 0$
By solving above equation
 $\theta = 60^\circ$

$$\Rightarrow \cosec 60^\circ + \cot 60^\circ = \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \sqrt{3}$$

- $$3. \text{ (D)} \quad \frac{1}{\left(2 \times \frac{4}{3}\right)\left(\frac{1}{4} - \frac{3}{2} + 2\right)} = \frac{1}{\left(\frac{8}{3}\right)\left(2 - \frac{5}{4}\right)}$$

$$= \frac{1}{\frac{8}{3} \times \frac{3}{4}} = \frac{1}{2}$$

- $$4. \text{ (A)} \cos^2\theta - (1 - \cos^2\theta) - 3\cos\theta + 2 = 0$$

$$2\cos^2\theta - 3\cos\theta + 1 = 0$$

$$\Rightarrow \cos\theta = \frac{1}{2} \quad \Rightarrow \theta = 60^\circ$$

$$\Rightarrow 4 \times \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{8}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{9}{\sqrt{3}}$$

- $$\begin{aligned}
 &= 3\sqrt{3} \\
 5. \quad (\text{C}) \quad &\frac{(\sec \theta + \tan \theta)(1 - \sin \theta)}{\cosec \theta (1 + \cos \theta)(\cosec \theta - \cot \theta)} \\
 &= \frac{(1 + \sin \theta)(1 - \sin \theta) \sin \theta}{(\cos \theta)(\cosec \theta)(1 + \cos \theta)(1 - \cos \theta)} \\
 &= \frac{(\cos^2 \theta)\sin^2 \theta}{\cos \theta (\sin^2 \theta)} \Rightarrow \cos \theta
 \end{aligned}$$

- $$\begin{aligned}
 6. \quad & (\text{D}) \quad \cot\theta = \frac{1}{\sqrt{3}} = \theta = 60^\circ \\
 & = \frac{1 + \cos^2 \theta}{1 - \cos^2 \theta} + \cos \sec^2 \theta + \sec \theta \\
 & = \frac{5}{3} + \frac{4}{3} + 2 = 5
 \end{aligned}$$

7. (C) As we know,

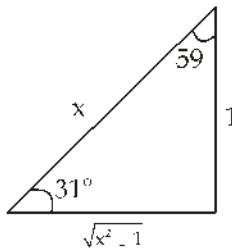
$$\frac{1}{\sec \theta - \tan \theta} = \sec \theta + \tan \theta$$

$$\Rightarrow \sec \theta + \tan \theta - \sec \theta = \sec \theta \times k$$

$$\tan \theta = \sec \theta \times k$$

$$k = \frac{\sin \theta}{\cos \theta} \times \cos \theta \Rightarrow k = \sin \theta$$

8. (D) $\cosec 31^\circ = x \Rightarrow \sin 31^\circ = \frac{1}{x}$



$$\cos^2 31^\circ + \sin^2 31^\circ + \tan^2 59^\circ + \frac{\sin^2 59^\circ}{\sin^2 59^\circ}$$

$$1 + \tan^2 59^\circ + 1 \Rightarrow 1 + x^2 - 1 + 1$$

$$9. (C) \frac{\sin^2 25^\circ + \cos^2 25^\circ}{\sin^2 66^\circ + \cos^2 66^\circ} + \sin^2 71^\circ + \cos 71^\circ \cdot \cos 71^\circ$$

$$1 + \sin^2 71^\circ + \cos^2 71^\circ$$

$$\Rightarrow 2$$

10.(C) $3\sin\theta = 2\cos^2\theta$

$$\Rightarrow \theta = 30^\circ$$

$$\tan\theta + \cos\theta + \sin\theta$$

$$\frac{1}{\sqrt{3}} + \frac{\sqrt{3}}{2} + \frac{1}{2} \Rightarrow \frac{2+3+\sqrt{3}}{2\sqrt{3}} = \frac{5+\sqrt{3}}{2\sqrt{3}} = \frac{5\sqrt{3}+3}{6}$$

11.(B) $3(\cos^2 A + \sin^2 A) + 3\sin^2 A = 3$

$$A = 0^\circ$$

12.(C) $\frac{2\cos 9^\circ \times 2\sec 9^\circ}{\sin 56^\circ + \cos 25^\circ} = \frac{4}{2} = 2$

$$\sin 56^\circ + \cos 25^\circ$$

13.(D) $\left(\frac{(\sin\theta)(1-\cos\theta)}{(1+\cos\theta)(1-\cos\theta)} + \frac{(1+\cos\theta)}{\sin\theta} \right) \times \left(\frac{1}{\frac{\sin\theta + \cos\theta}{\cos\theta + \sin\theta}} \right)$

$$\left(\frac{1-\cos\theta}{\sin\theta} + \frac{1+\cos\theta}{\sin\theta} \right) \times \frac{\sin\theta \cos\theta}{1}$$

$$\frac{2}{\sin\theta} \times \sin\theta \cos\theta$$

$$\Rightarrow 2\cos\theta$$

14.(D) $2\sin^2\theta + 3\cos\theta - 3 = 0$

$$2 - 2\cos^2\theta + 3\cos\theta - 3 = 0$$

$$2\cos^2\theta - 3\cos\theta + 1 = 0$$

$$\cos\theta = \frac{1}{2} \quad \theta = 60^\circ$$

$$\Rightarrow 2 \times \frac{2}{\sqrt{3}} + \sqrt{3} \Rightarrow \frac{4+3}{\sqrt{3}} = \frac{7}{\sqrt{3}} \Rightarrow \frac{7\sqrt{3}}{3}$$

15.(C) $\cot\theta = \sqrt{6}$

$$= \frac{\left(\frac{1}{\sin^2\theta} + \frac{1}{\cos^2\theta} \right)}{\left(\frac{1}{\sin^2\theta} - \frac{1}{\cos^2\theta} \right)} = \frac{1}{\cos^2\theta - \sin^2\theta}$$

Divide by $\cos^2\theta$

$$\frac{\sec^2\theta}{1 - \tan^2\theta} = \frac{1 + \tan^2\theta}{1 - \tan^2\theta} = \frac{1 + \frac{1}{6}}{1 - \frac{1}{6}} = \frac{7}{5}$$

16.(C) $\sin\theta \cdot \sec^2\theta = \frac{2}{3}$

$$\theta = 30^\circ$$

$$\tan^2\theta + \cos^2\theta = \frac{1}{3} + \frac{3}{4} \Rightarrow \frac{4+9}{12} = \frac{13}{12}$$

17.(C) $\frac{(\sin^2\theta - 1)(\cos^2\theta - 1)}{(\sin\theta)(\cos\theta)(\sin^2\theta)(\tan^2\theta)}$

$$= \frac{\sin\theta \cos\theta \cdot \cos^2\theta}{\sin^4\theta}$$

$$\cot^3\theta = r^3 \Rightarrow r = \cot\theta$$

18.(D) $\left(\frac{1-\cos\theta}{\sin\theta} \right) (\cosec\theta - \cot\theta) = \frac{1-r}{1+r}$

$$\left(\frac{1-\cos\theta}{\sin\theta} \right) \left(\frac{1-\cos\theta}{\sin\theta} \right)$$

$$\left(\frac{\cosec\theta - \cot\theta}{\cosec\theta + \cot\theta} \right) = \frac{1-r}{1+r} \Rightarrow \frac{\cosec\theta}{\cot\theta} = \frac{1}{r}$$

$$\Rightarrow r = \cos\theta$$

19.(A) $\frac{1-\sin\theta + 1 + \sin\theta}{\cos^2\theta} = 4 \sec\theta$

$$2\sec^2\theta = 4\sec\theta$$

$$\sec\theta = 2$$

$$\theta = 60^\circ$$

$$\Rightarrow 3\cot 60^\circ + \cosec 60^\circ$$

$$= 3 \times \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \frac{5}{\sqrt{3}} \Rightarrow \frac{5\sqrt{3}}{3}$$

20.(D) $\frac{\frac{4}{3} + \frac{1}{4} + \frac{1}{24} + \frac{1}{4} \times \frac{1}{2}}{\frac{3}{4} - \frac{1}{4}} = \frac{\left(\frac{7}{4} \right)}{\left(\frac{2}{4} \right)} = \frac{7}{2} = 3\frac{1}{2}$

21.(C) $\left(\frac{\sin\theta}{\sin\theta+1} - \frac{\sin\theta}{\sin\theta-1}\right)\cos\theta = 2$

$$(\sin\theta \cos\theta) \left(\frac{\sin\theta-1-\sin\theta-1}{\sin^2\theta-1}\right) = 2$$

$$\frac{(-2)\sin\theta\cos\theta}{-\cos^2\theta} = 2$$

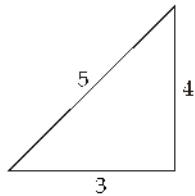
$$\theta = 45^\circ$$

$$\Rightarrow \frac{1}{2} + 1 + 2 = 3\frac{1}{2}$$

22.(B) $x + 60 + 6x = 90^\circ$

$$7x = 30^\circ \Rightarrow x = \frac{30}{7}$$

23.(D) $\operatorname{cosec}\theta = \frac{5}{4} \quad \Rightarrow \sin\theta = \frac{4}{5}$



$$\frac{4 \times \frac{4}{3} - 5 \times \frac{3}{5}}{\frac{5}{3} + 4 \times \frac{3}{4}} = \frac{\left(\frac{16}{3} - \frac{15}{5}\right)}{\left(\frac{5}{3} + 3\right)} = \frac{\left[\frac{(80-45)}{15}\right]}{\left[\frac{14}{3}\right]}$$

$$= \frac{35}{15} \times \frac{3}{14} = \frac{1}{2}$$

24.(C) $2 - 2\sin^2\theta = 3\sin\theta$

$$2\sin^2\theta + 3\sin\theta - 2 = 0$$

$$\theta = 30^\circ$$

$$1 + \cos^2\theta = 1 + \frac{3}{4} = 1\frac{3}{4}$$

25.(D) $\frac{(\sec\theta)(1-\sin\theta)(1+\sin\theta)}{(\cos\theta)(\sec\theta-\tan\theta)^2} = \frac{1+k}{1-k}$

$$\frac{\cos^2\theta}{\cos^2\theta(\sec\theta-\tan\theta)^2} = \frac{1+k}{1-k}$$

$$\frac{1}{(\sec\theta-\tan\theta)^2} = \frac{1+k}{1-k}$$

$$\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{1+k}{1-k} \Rightarrow \frac{\sec\theta}{\tan\theta} = \frac{1}{k}$$

$$\Rightarrow k = \sin\theta$$

26.(A) $\cos\theta = \frac{2p}{p^2+1}$

$$\Rightarrow \sin\theta = \frac{p^2-1}{p^2+1}$$

27.(A) $x + 65 + 9x = 90$

$$10x = 25$$

$$\Rightarrow x = 2.5^\circ$$

28.(B) $\cos\theta = \frac{2P}{P^2+1} \quad \tan\theta = \frac{P^2-1}{2P}$

29.(D) $2 - 2\cos^2\theta + 5\cos\theta - 4 = 0$

$$2\cos^2\theta - 5\cos\theta + 2 = 0$$

$$2\cos^2\theta - 4\cos\theta - 2\cos\theta + 2 = 0$$

$$2\cos\theta(2\cos\theta - 2) - 1(\cos\theta + 2) = 0$$

$$\Rightarrow \cos\theta = \frac{1}{2} = \theta = 60^\circ$$

$$\Rightarrow \tan 60^\circ \theta + \sin 60^\circ$$

$$\Rightarrow \sqrt{3} + \frac{\sqrt{3}}{2} = \frac{3\sqrt{3}}{2}$$

30.(D) $\cos\theta = \frac{2P}{P^2+1} \quad \sin\theta = \frac{P^2-1}{P^2+1}$

$$\operatorname{cosec}\theta = \frac{P^2+1}{P^2-1}$$

31.(B) $2 - 2\cos^2\theta + 5\cos\theta - 4 = 0$

$$2\cos^2\theta - 5\cos\theta + 2 = 0$$

$$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60^\circ$$

putting value of θ in given equation of question

$$\Rightarrow \cot 60^\circ + \operatorname{cosec} 60^\circ = \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \sqrt{3}$$

32.(C) $12(\operatorname{cosec}^2\theta - 1) - 31\operatorname{cosec}\theta + 32 = 0$

$$12\operatorname{cosec}^2\theta - 31\operatorname{cosec}\theta + 20 = 0$$

$$\operatorname{cosec}\theta = \frac{31 \pm \sqrt{31^2 - 4 \times 20 \times 12}}{2 \times 12}$$

$$= \frac{31 \pm 1}{24} = \operatorname{cosec}\theta = \frac{32}{24} = \frac{4}{3}$$

$$= \frac{30}{24} = \frac{15}{12} = \frac{5}{4}$$

33.(A) $\cos x = \frac{-1}{2} \quad x = \pi + \frac{\pi}{3} = \frac{4\pi}{3}$

$$= 4 \tan^2 \frac{4\pi}{3} + 3 \operatorname{cosec}^2 \frac{4\pi}{3}$$

$$= 4 \times 3 + 3 \times \frac{4}{3} = 12 + 4 = 16$$

34.(C) As $\cot 31^\circ = \tan 59^\circ$

$$\tan 34^\circ = \cot 56^\circ$$

Applying both changes in given equation,

$$6(1) + \frac{2}{3} - 3y = \frac{y}{3}$$

$$\frac{20}{3} = \frac{10y}{3} \Rightarrow y = 2$$

35. (C) $8\left(\frac{\sec^2 \theta}{16} - \frac{\tan^2 \theta}{16}\right)$

$$= \frac{8}{16} (\sec^2 \theta - \tan^2 \theta) = \frac{1}{2}$$

36.(A) Converting

$$\cot 31^\circ = \tan 59^\circ$$

$$\tan 34^\circ = \cot 56^\circ$$

Putting these conversion into equation
We get

$$6 - \frac{2}{3} - 3y = \frac{y}{3}$$

$$\Rightarrow \frac{16}{3} = \frac{10y}{3} \Rightarrow y = \frac{16}{10} = \frac{8}{5}$$

37.(C) $9\left(\frac{\sec^2 \theta}{9} - \frac{\tan^2 \theta}{9}\right) = 1$

38.(A) $\cos x = \frac{-1}{2}$

$$x = \pi + \frac{\pi}{3} = \frac{4\pi}{3}$$

$$= 2 \tan^2 \frac{4\pi}{3} - 3 \operatorname{cosec}^2 \frac{4\pi}{3}$$

$$= 2 \times \sqrt{(3)^2} - 3 \times \left(\frac{2}{\sqrt{3}}\right)^2 = 6 - 4 = 2$$

39.(A) Converting

$$\tan 51^\circ = \cot 39^\circ$$

$$\tan 34^\circ = \cot 56^\circ$$

Using conversion in given equation of question

$$\Rightarrow 2(1) - \frac{2}{3} - y = \frac{y}{3} \Rightarrow \frac{4y}{3} = \frac{4}{3} \Rightarrow y = 1$$

40.(B) Converting

$$\tan 25^\circ = \cot 65^\circ$$

$$\tan 27^\circ = \cot 63^\circ$$

using this conversion in question

$$4(1) - 1 - y = \frac{y}{2}$$

$$3 = \frac{3y}{2} \Rightarrow y = 2$$

41.(D) $\cos x = \frac{-\sqrt{3}}{2}$

$$\Rightarrow x = \pi + \frac{\pi}{6} = \frac{7\pi}{6}$$

$$2 \cot^2 \frac{7\pi}{6} + 3 \operatorname{cosec}^2 \frac{7\pi}{6} \\ = 2(3) + 3 \times 4 \Rightarrow 6 + 12 = 18$$

42.(B) Converting

$$\tan 35^\circ = \cot 55^\circ$$

$$\tan 38^\circ = \cot 52^\circ$$

Using this conversion in the given equation

$$7(1) + 2 - y = \frac{y}{2}$$

$$9 = \frac{3y}{2}$$

$$y = 6$$

43.(D) $x^2 + \frac{1}{x^2} = \left(\frac{\cos \theta}{4}\right)^2 + \left(\frac{\sin \theta}{4}\right)^2 = \frac{1}{16}$

44.(B) $\cos x = \frac{-\sqrt{3}}{2}$

$$x = \pi + \frac{\pi}{6} = \frac{7\pi}{6}$$

$$\Rightarrow 4 \cot^2 \frac{7\pi}{6} - 3 \operatorname{cosec}^2 \frac{7\pi}{6}$$

$$\Rightarrow 4(3) - 3 \times 4$$

$$\Rightarrow 0$$

45.(A) Converting

$$\tan^2 33^\circ = \cot^2 57^\circ$$

$$\tan^2 38^\circ = \cot^2 52^\circ$$

Using these conversions in the question and using trigonometric identities

$$\Rightarrow 7(1) + 2(1) - 4y = \frac{y}{2}$$

$$\Rightarrow 9 - 4y = \frac{y}{2} \Rightarrow 9 = \frac{9y}{2}$$

$$\Rightarrow y = 2$$

46.(A) $16\left(\frac{\sec^2 \theta}{64} - \frac{\tan^2 \theta}{64}\right)$

$$= \frac{1}{4} (\sec^2 \theta - \tan^2 \theta) = \frac{1}{4}$$

47.(D) $5 \sin \theta + 12 \cos \theta = 13$

$$\frac{5}{13} \sin \theta + \frac{12}{13} \cos \theta = 1$$

$$\Rightarrow \sin \theta = \frac{5}{13} \quad \cos \theta = \frac{12}{13}$$

$$\Rightarrow \tan \theta = \frac{5}{12}$$

48.(C) $\tan\theta$

$$49.(B) 1 + \cot^2\theta + \cot^2\theta = \frac{5}{3}$$

$$2\cot^2\theta = \frac{2}{3}$$

$$\theta = 60^\circ$$

50. (B)

$$51.(A) 4(2 + 5\cos^2\theta) = 13$$

$$5\cos^2\theta = \frac{13}{4} - 2$$

$$5\cos^2\theta = \frac{5}{4}$$

$$\Rightarrow \theta = 60^\circ$$

52.(C)

$$53.(D) \sin^2 21 + \cos^2 19 - \sin 21 \cos 19 + \sin^2 69 + \cos^2 71 + \cos 69 \sin 71 = 2$$

54.(D)

$$55.(A) 1 + 5\tan^2\theta = 6$$

$$\Rightarrow \theta = 45^\circ$$

56.(B) $\theta = 9^\circ$

$$\cot \cdot \cot 20 \cdot \cot 30 \cdot \cot 40 \cdot \cot 60 \cdot \cot 70 \cdot \cot 80 \\ \cot 90 = \cot 9 \cdot \cot 18 \cdot \cot 27 \cdot \cot 36 \cdot \cot 54 \cdot \cot 63 \\ \cot 72 \cdot \cot 81 = 1$$

$$57.(A) \alpha + \beta = 90^\circ \quad \alpha - \beta = 60^\circ$$

$$\Rightarrow 2\alpha = 150^\circ$$

$$\Rightarrow \alpha = 75^\circ \quad \Rightarrow \beta = 15^\circ$$

$$58.(D) \frac{1 - \sin x}{\cos x} = a - \tan x$$

$$\sec x - \tan x = a - \tan x$$

$$\Rightarrow a = \sec x$$

$$59.(A) \sin \alpha_1 + \sin \alpha_2 + \dots + \sin \alpha_{20} = 20$$

$$\alpha_1 = \alpha_2 = \dots = \alpha_{20} = 90^\circ$$

$$\Rightarrow \alpha_1 + \alpha_2 + \dots + \alpha_{20} = 90 \times 20 = 1800$$

$$60.(A) 4 + \frac{1}{2} + 4 + \frac{1}{3} \Rightarrow 8 + \frac{5}{6} = \frac{53}{6}$$

$$61.(A) \sqrt{3} \cos \theta + \sin \theta = 1$$

$$\Rightarrow \theta = 90^\circ$$

$$62.(C) \alpha_1 = \alpha_2 = \alpha_3 = \dots = \alpha_{20} = 0$$

$$\Rightarrow \alpha_1 + \alpha_2 + \dots + \alpha_{20} = 0$$

63.(C) $\theta = 45^\circ$
64.(A) $1 - 1 = 0$

$$65.(D) \sin^2 36^\circ + \tan^2 60^\circ + \sec^2 30^\circ + \sin^2 54^\circ$$

$$\sin^2 36^\circ + \tan^2 60^\circ + \sec^2 30^\circ + \cos^2 36^\circ$$

$$\Rightarrow 1 + (\sqrt{3})^2 + \left(\frac{2}{\sqrt{3}}\right)^2$$

$$1 + 3 + \frac{4}{3} = \frac{16}{3}$$

66.(B) $2\sin^2\theta + 4\sin\theta - \sin\theta - 2$

$$2\sin\theta(\sin\theta + 2) - (\sin\theta + 2)$$

$$\Rightarrow \sin\theta = \frac{1}{2} \quad \theta = 30^\circ$$

$$67.(D) \sin\theta = \frac{3}{\sqrt{34}} \quad \cos\theta = \frac{5}{\sqrt{34}}$$

$$\sin\theta \cdot \cos\theta = \frac{3}{\sqrt{34}} \times \frac{5}{\sqrt{34}} = \frac{15}{34}$$

$$68.(A) 6 \left[\left(\frac{\csc\theta}{3} \right)^2 - \left(\frac{\cot\theta}{3} \right)^2 \right]$$

$$\frac{6}{9} (\csc^2\theta - \cot^2\theta) = \frac{2}{3}$$

$$69.(C) 6 \left[\left(\frac{\sin\theta}{3} \right)^2 + \left(\frac{\cos\theta}{3} \right)^2 \right]$$

$$= \frac{6}{9} [\sin^2\theta + \cos^2\theta] = \frac{2}{3}$$

$$70.(A) \cos x = -\frac{\sqrt{3}}{2} \Rightarrow x = \frac{7\pi}{6}$$

$$2\cot^2 \frac{7\pi}{6} + 3\sec^2 \frac{7\pi}{6}$$

$$= 2 \times (\sqrt{3})^2 + 3 \times \frac{4}{3} = 6 + 4 = 10$$

71.(B) Converting

$$\tan 24^\circ = \cot 66^\circ$$

Using this conversion in the given equation of question

$$\Rightarrow 4(1) + \frac{1}{2} - 4y = \frac{y}{2}$$

$$\Rightarrow \frac{9}{2} = \frac{9y}{2} \Rightarrow y = 1$$

$$72.(D) \cos x = \frac{-\sqrt{3}}{2}$$

$$\Rightarrow x = \pi + \frac{\pi}{6} = \frac{7\pi}{6}$$

$$2\cot^2 \frac{7\pi}{6} - 3\sec^2 \frac{7\pi}{6}$$

$$= 2 \times (\sqrt{3})^2 - 3 \times \frac{4}{3}$$

$$= 6 - 4 = 2$$

$$73.(C) 5 \left(\frac{\cot^2\theta}{25} - \frac{\csc^2\theta}{25} \right)$$

$$= (\cot^2\theta - \csc^2\theta) = \frac{-1}{5}$$

(SSC CHSL – 2017)

1. What is the value of $\left(\frac{1}{3} - \cot 60^\circ\right)$?
 $\left(\frac{1}{3} - \cot 60^\circ\right)$ का मान क्या है ?
- (A) $\frac{2-\sqrt{3}}{2\sqrt{3}}$ (B) $\frac{\sqrt{2}-1}{\sqrt{2}}$
(C) $\frac{1-\sqrt{3}}{3}$ (D) $\frac{\sqrt{3}-4}{2\sqrt{3}}$
2. ΔXYZ is right angled at Y. If $\tan X = \frac{15}{8}$, then what is the value of $\sin Z$?
 ΔXYZ में Y पर समकोण है। यदि $\tan X = \frac{15}{8}$ तो $\sin Z$ का मान क्या है ?
- (A) $\frac{15}{17}$ (B) $\frac{17}{8}$ (C) $\frac{17}{15}$ (D) $\frac{8}{17}$
3. What is the value of $\left(\tan 30^\circ - \frac{\sqrt{3}}{2}\right)$
 $\left(\tan 30^\circ - \frac{\sqrt{3}}{2}\right)$ का मान क्या है ?
- (A) $-\frac{1}{2\sqrt{3}}$ (B) $\frac{2\sqrt{3}-\sqrt{6}}{2\sqrt{2}}$
(C) $\frac{2\sqrt{3}}{2}$ (D) $\frac{1}{6}$
4. ΔDEF is right angled at E. If $\cot D = \frac{5}{12}$, then what is the value of $\sin F$?
 ΔDEF में E पर समकोण है। यदि $\cot D = \frac{5}{12}$, तो $\sin F$ का मान क्या है ?
- (A) $\frac{5}{12}$ (B) $\frac{13}{5}$ (C) $\frac{5}{13}$ (D) $\frac{13}{12}$
5. What is the value of $(1/3 - \operatorname{cosec} 30^\circ)$
 $(1/3 - \operatorname{cosec} 30^\circ)$ का मान क्या है ?
- (A) $\frac{\sqrt{6}-1}{\sqrt{3}}$ (B) $-\frac{1}{2}$ (C) $-\frac{5}{3}$ (D) $\frac{3}{2}$

6. In ΔDEF measure of angle E is 90° . If $\sec D = \frac{25}{7}$, and $DE = 1.4$ cm, then what is the length (in cm) of side DF?
 ΔDEF में कोण E का माप 90° है। यदि $\sec D = \frac{25}{7}$ और $DE = 1.4$ सेमी. है, तो भुजा DF की लंबाई (सेमी. में) क्या है ?
- (A) 5 (B) 4.8
(C) 4 (D) 5.6
7. What is the value of $\left(\operatorname{cosec} 30^\circ - \frac{1}{\sqrt{3}}\right)$?
 $\left(\operatorname{cosec} 30^\circ - \frac{1}{\sqrt{3}}\right)$ का मान क्या है ?
- (A) $\frac{2\sqrt{3}-1}{\sqrt{3}}$ (B) $\frac{\sqrt{3}-4}{2\sqrt{3}}$
(C) $-\frac{1}{\sqrt{3}}$ (D) $\frac{2}{\sqrt{3}}$ (A)
8. In ΔXYZ measure of angle Y is 90° . If $\operatorname{cosec} X = \frac{13}{12}$, and $XY = 1$ cm, then what is the length (in cm) of side YZ?
 ΔXYZ में कोण Y का माप 90° है। यदि $\operatorname{cosec} X = \frac{13}{12}$ और $XY = 1$ सेमी. है, तो भुजा YZ की लंबाई (सेमी. में) क्या है ?
- (A) 2.6 (B) 1.5 (C) 2.4 (D) 2
9. ΔABC is right angled at B. If $m\angle A = 45^\circ$, then find the value of $(\operatorname{cosec} C + \frac{1}{\sqrt{3}})$.
 ΔABC में B पर समकोण है। यदि $m\angle A = 45^\circ$ है, तो $(\operatorname{cosec} C + \frac{1}{\sqrt{3}})$ का मान ज्ञात करें।
- (A) $\frac{3\sqrt{2}+1}{3}$ (B) $\frac{2+\sqrt{3}}{2}$
(C) $\frac{5}{\sqrt{3}}$ (D) $\frac{\sqrt{6}+1}{\sqrt{3}}$
10. In ΔUVW measure of angle V is 90° . If $\operatorname{cosec} U = \frac{13}{12}$, and $UV = 2.5$ cm, then what is the length (in cm) of side VW?
 ΔUVW में कोण V का माप 90° है। यदि $\operatorname{cosec} U = 13/12$ और $UV = 2.5$ सेमी., तो भुजा VW की लंबाई (सेमी. में) क्या है ?
- (A) 6.5 (B) 6 (C) 4 (D) 5.6

- 11.** What is the value of $(\cos 45^\circ + 1/3)$?
 ($\cos 45^\circ + 1/3$) का मान क्या है?
 (A) $2 + \sqrt{3}$ (B) $\frac{2\sqrt{2} + 1}{\sqrt{2}}$
 (C) $\frac{3 + \sqrt{2}}{3\sqrt{2}}$ (D) $\frac{5}{\sqrt{3}}$
- 12.** ΔDEF is right angled at E. If $\cos D = 8/17$, then what is the value of $\sec F$?
 ΔDEF में E पर समकोण है। यदि $\cos D = 8/17$, तो $\sec F$ का मान क्या है?
 (A) $17/8$ (B) $8/17$
 (C) $17/15$ (D) $15/17$
- 13.** What is the value of $(2 - \sin 30^\circ)$?
 $(2 - \sin 30^\circ)$ का मान क्या है?
 (A) $\frac{3}{2}$ (B) $\frac{3}{\sqrt{2}}$ (C) $2 - \sqrt{3}$ (D) $\frac{2\sqrt{3} - \sqrt{6}}{2\sqrt{2}}$
- 14.** ΔPQR is right angled at Q. If $\cos P = 5/13$, then what is the value of $\operatorname{cosec} R$?
 ΔPQR में Q पर समकोण है। यदि $\cos P = 5/13$, तो $\operatorname{cosec} R$ का मान क्या है?
 (A) $\frac{13}{5}$ (B) $\frac{5}{12}$ (C) $\frac{5}{13}$ (D) $\frac{13}{12}$
- 15.** What is the value of $(\cot 45^\circ - \sqrt{2})$?
 $(\cot 45^\circ - \sqrt{2})$ का मान क्या है?
 (A) $\frac{\sqrt{3} - 1}{2\sqrt{3}}$ (B) $\frac{\sqrt{3} - 1}{2}$
 (C) $1 - \sqrt{2}$ (D) $1 - \sqrt{3}$
- 16.** In ΔDEF measure of angle E is 90° . If $\tan D = 4/3$, and $DE = 6\text{cm}$, then what is the length (in cm) of side EF?
 ΔDEF में कोण E का माप 90° है। यदि $\tan D = 4/3$ और $DE = 6$ सेंटीमीटर है, तो भुजा EF की लंबाई (सेंटीमीटर में) क्या है?
 (A) 10 (B) 5 (C) 8 (D) 4
- 17.** What is the value of $(\operatorname{cosec} 45^\circ + \frac{\sqrt{3}}{2})$?
 $(\operatorname{cosec} 45^\circ + \frac{\sqrt{3}}{2})$ का मान क्या है?
 (A) $\frac{5}{6}$ (B) $\frac{4 + \sqrt{3}}{2\sqrt{3}}$
 (C) $\frac{2\sqrt{2} + \sqrt{3}}{2}$ (D) $\frac{3\sqrt{3}}{2}$
- 18.** ΔABC measure of angle B is 90° . If $\tan A = 15/8$, and $AB = 0.8\text{ cm}$, then what is the length (in cm) of side AC?
 ΔABC में कोण B का माप 90° है। यदि $\tan A = 15/8$ और $AB = 0.8$ सेमी. है, तो भुजा AC की लंबाई (सेमी. में) क्या है?
 (A) 1.7 (B) 1.5 (C) 2 (D) 2.5
- 19.** What is the value of $(\tan 60^\circ + \frac{1}{3})$?
 $(\tan 60^\circ + \frac{1}{3})$ का मान क्या है?
 (A) $\frac{2\sqrt{2} + 1}{2}$ (B) $\frac{\sqrt{3} + 1}{\sqrt{3}}$
 (C) $\frac{3\sqrt{3} + 1}{3}$ (D) $\frac{3 + \sqrt{2}}{3\sqrt{2}}$
- 20.** ΔPQR is right angled at Q. If $\cos P = 3/5$, then what is the value of $\cos R$?
 ΔPQR में Q पर समकोण है। यदि $\cos P = 3/5$ है, तो $\cos R$ का मान क्या है?
 (A) $\frac{3}{4}$ (B) $\frac{5}{3}$ (C) $\frac{4}{5}$ (D) $\frac{4}{3}$
- 21.** ΔABC is right angled at B. If $m\angle A = 30^\circ$, then find the value of $(\sin C + \frac{1}{3})$?
 ΔABC में B पर समकोण है। यदि $m\angle A = 30^\circ$ तो $(\sin C + \frac{1}{3})$ का मान ज्ञात करें।
 (A) $\frac{4}{3}$ (B) $\frac{\sqrt{3} + 1}{2}$
 (C) $\frac{\sqrt{3} + 2}{\sqrt{3}}$ (D) $\frac{3\sqrt{3} + 2}{6}$
- 22.** ΔDEF is right angled at E. If $\cos D = 5/13$, then what is the value of $\tan F$?
 ΔDEF में E पर समकोण है। यदि $\cos D = 5/13$, तो $\tan F$ का मान क्या है?
 (A) $\frac{5}{13}$ (B) $\frac{5}{12}$ (C) $\frac{13}{5}$ (D) $\frac{13}{12}$
- 23.** What is the value of $(\frac{1}{2} - \cot 45^\circ)$?
 $(\frac{1}{2} - \cot 45^\circ)$ का मान क्या है?
 (A) $\frac{(2\sqrt{2} - \sqrt{3})}{2}$ (B) $\frac{3}{2}$
 (C) $\frac{3\sqrt{3} - 1}{2}$ (D) $-\frac{1}{2}$

- 24.** In $\triangle ABC$ measure of angle B is 90° . If $\sin A = \frac{24}{25}$ and $AB = 1.4$ cm, then what is the length (in cm) of side BC?
- $\triangle ABC$ में कोण B का माप 90° है। यदि $\sin A = \frac{24}{25}$ और $AB = 1.4$ सेमी. है, तो भुजा BC की लंबाई (सेमी. में) क्या है?
- (A) 4.8 (B) 5 (C) 3 (D) 5.6
- 25.** $\triangle ABC$ is right angled at B. If $m\angle A = 45^\circ$, then find the value of $\left(\tan C + \frac{\sqrt{3}}{2}\right)$.
- $\triangle ABC$ में B पर समकोण है। यदि $m\angle A = 45^\circ$ है, तो $\left(\tan C + \frac{\sqrt{3}}{2}\right)$ का मान ज्ञात करें?
- (A) $\frac{4}{\sqrt{3}}$ (B) $\frac{2+\sqrt{3}}{2}$
 (C) $\frac{\sqrt{2}+2}{2\sqrt{2}}$ (D) $\frac{2+\sqrt{3}}{3}$
- 26.** In $\triangle XYZ$ measure of angle is 90° . If $\cot X = 5/12$, and $XY = 2.5$ cm, then what is the length (in cm) of side XZ?
- $\triangle XYZ$ में कोण Y का माप 90° है। यदि $\cot X = 5/12$ और $XY = 2.5$ सेमी. है, तो भुजा XZ की लंबाई (सेमी. में) क्या है?
- (A) 6 (B) 4
 (C) 5.6 (D) 6.5
- 27.** What is the value of $(\tan 60^\circ - 1/3)$?
 $(\tan 60^\circ - 1/3)$ का मान क्या है?
- (A) $3-\sqrt{2}$ (B) $\frac{2\sqrt{2}-\sqrt{3}}{2}$
 (C) $\frac{-1}{2\sqrt{3}}$ (D) $\frac{3\sqrt{3}-1}{3}$
- 28.** In $\triangle UVW$ measure of angle V is 90° . If $\sin U = 24/25$ and $UV = 0.7$ cm, then what is the length (in cm) of side VW?
- $\triangle UVW$ में कोण V का माप 90° है। यदि $\sin U = 24/25$ और $UV = 0.7$ सेंटीमीटर है, तो भुजा VW की लंबाई (सेंटीमीटर में) क्या है?
- (A) 2.5 (B) 3 (C) 2.4 (D) 4
- 29.** $\triangle ABC$ is right angled at B. If $m\angle A = 60^\circ$, then find the value of $(\sec C + 2)$.
- $\triangle ABC$ में B पर समकोण है। यदि $m\angle A = 60^\circ$, तो $(\sec C + 2)$ का मान ज्ञात करें।
- (A) $\frac{2+2\sqrt{3}}{\sqrt{2}}$ (B) $\frac{4}{3}$
 (C) $\frac{2+2\sqrt{3}}{\sqrt{3}}$ (D) $\frac{4}{\sqrt{3}}$
- 30.** In $\triangle ABC$ measure of angle B is 90° . If $\cos A = 5/13$, and $AB = 10$ cm, then what is the length (in cm) of side BC?
- $\triangle ABC$ में कोण B का माप 90° है। यदि $\cos A = 5/13$ और $AB = 10$ सेमी. है, तो भुजा BC की लंबाई (सेमी. में) क्या है?
- (A) 26 (B) 24 (C) 25 (D) 5
- 31.** What is the value of $(\sqrt{3} - \sec 60^\circ)$?
 $(\sqrt{3} - \sec 60^\circ)$ का मान क्या है?
- (A) $\sqrt{3} - 2$ (B) $\frac{1-\sqrt{6}}{\sqrt{2}}$
 (C) $\frac{2\sqrt{3}-\sqrt{6}}{\sqrt{2}}$ (D) $\frac{1-3\sqrt{2}}{\sqrt{3}}$
- 32.** $\triangle DEF$ is right angled at E. If $\cot D = 8/15$, then what is the value of $\cot F$?
- $\triangle DEF$ में E पर समकोण है। यदि $\cot D = 8/15$, तो $\cot F$ का मान क्या है?
- (A) $\frac{15}{8}$ (B) $\frac{15}{17}$ (C) $\frac{8}{17}$ (D) $\frac{17}{15}$
- 33.** What is the value of $(\sin 60^\circ - \frac{2}{\sqrt{3}})$?
 $(\sin 60^\circ - \frac{2}{\sqrt{3}})$ का मान क्या है?
- (A) $-\frac{1}{2\sqrt{3}}$ (B) $-\frac{1}{2}$
 (C) $\frac{1}{\sqrt{3}}$ (D) $\frac{1-2\sqrt{3}}{2}$
- 34.** $\triangle PQR$ is right angled at Q. If $\tan P = 24/7$, then what is the value of $\cos R$?
- $\triangle PQR$ में Q पर समकोण है। यदि $\tan P = 24/7$, तो $\cos R$ का मान क्या है?
- (A) $\frac{25}{7}$ (B) $\frac{24}{25}$ (C) $\frac{24}{7}$ (D) $\frac{7}{24}$

<p>35. What is the value of $(\cot 60^\circ + \frac{1}{\sqrt{3}})$? $(\cot 60^\circ + \frac{1}{\sqrt{3}})$ का मान क्या है ?</p> <p>(A) $\frac{4}{\sqrt{3}}$ (B) $\frac{2\sqrt{2}+\sqrt{3}}{2}$ (C) $\frac{2}{\sqrt{3}}$ (D) $\frac{2\sqrt{2}+1}{\sqrt{2}}$</p>	<p>41. What is the value of $(\cos 45^\circ - 1/3)$? $(\cos 45^\circ - 1/3)$ का मान क्या है ?</p> <p>(A) $2-\sqrt{3}$ (B) $\frac{2}{\sqrt{3}}$ (C) $\frac{3-\sqrt{2}}{3\sqrt{2}}$ (D) $\frac{1}{2\sqrt{3}}$</p>
<p>36. ΔPQR is right angled at Q. If $\sec P = 13/5$, then what is the value of $\sin R$? ΔPQR में Q पर समकोण है। यदि $\sec P = 13/5$ है, तो $\sin R$ का मान क्या है ?</p> <p>(A) $5/13$ (B) $5/12$ (C) $13/5$ (D) $13/12$</p>	<p>42. ΔUVW is right angled at V. If $\sec U = 5/3$, then what is the value of $\tan W$? ΔUVW में V पर समकोण है। यदि $\sec U = 5/3$ हो $\tan W$ का मान क्या है ?</p> <p>(A) $\frac{3}{4}$ (B) $\frac{5}{3}$ (C) $\frac{4}{5}$ (D) $\frac{4}{3}$</p>
<p>37. What is the value of $(1/3 - \sec 45^\circ)$? $(1/3 - \sec 45^\circ)$ का मान क्या है ?</p> <p>(A) $\frac{(4\sqrt{3})}{2}$ (B) $\frac{(\sqrt{6}-1)}{3}$ (C) $\frac{(1-3\sqrt{2})}{3}$ (D) $\frac{(\sqrt{2}-1)}{\sqrt{2}}$</p>	<p>43. ΔPQR is right angled at Q. If $m\angle R = 45^\circ$, then find the value of $(\tan P - 1/2)$. ΔPQR में Q पर समकोण है। यदि $m\angle R = 45^\circ$ है, तो $(\tan P - 1/2)$ का मान ज्ञात करें ?</p> <p>(A) $\frac{2-\sqrt{3}}{\sqrt{3}}$ (B) $\frac{2\sqrt{3}-\sqrt{6}}{2\sqrt{2}}$ (C) $\frac{1}{2}$ (D) $\frac{\sqrt{6}-6}{3\sqrt{3}}$</p>
<p>38. ΔABC is right angled at B. If $\sec A = 5/3$, then what is the value of $\operatorname{cosec} C$? ΔABC में B पर समकोण है। यदि $\sec A = 5/3$, तो $\operatorname{cosec} C$ का मान क्या है ?</p> <p>(A) $5/3$ (B) $3/4$ (C) $4/5$ (D) $4/3$</p>	<p>44. ΔDEF is right angled at E. If $\sec D = 25/7$, then what is the value of $\operatorname{cosec} F$? ΔDEF में E पर समकोण है। यदि $\sec D = 25/7$, तो $\operatorname{cosec} F$ का मान क्या है ?</p> <p>(A) $\frac{7}{25}$ (B) $\frac{24}{7}$ (C) $\frac{25}{7}$ (D) $\frac{7}{24}$</p>
<p>39. What is the value of $\left(\frac{1}{\sqrt{3}} + \cot 60^\circ\right)$? $\left(\frac{1}{\sqrt{3}} + \cot 60^\circ\right)$ का मान क्या है ?</p> <p>(A) $\frac{3\sqrt{3}}{2}$ (B) $\frac{7}{2\sqrt{3}}$ (C) $\frac{4+\sqrt{3}}{2\sqrt{3}}$ (D) $\frac{2}{\sqrt{3}}$</p>	<p>45. ΔXYZ is right angled at Y. If $m\angle Z = 45^\circ$, then find the value of $(\operatorname{cosec} X - \frac{2}{\sqrt{3}})$. ΔXYZ में Y पर समकोण है। यदि $m\angle Z = 45^\circ$ है, तो $(\operatorname{cosec} X - \frac{2}{\sqrt{3}})$ का मान ज्ञात करें।</p> <p>(A) $\frac{2-\sqrt{3}}{2\sqrt{3}}$ (B) $\frac{1-\sqrt{6}}{\sqrt{2}}$ (C) $\frac{\sqrt{6}-2}{\sqrt{3}}$ (D) $-\frac{1}{\sqrt{3}}$</p>
<p>40. ΔABC is right angled at B. If $\cot A = 7/24$ then what is the value of $\operatorname{cosec} C$? ΔABC में B पर समकोण है। यदि $\cot A = 7/24$ है, तो $\operatorname{cosec} C$ का मान क्या है ?</p> <p>(A) $\frac{7}{25}$ (B) $\frac{25}{7}$ (C) $\frac{24}{7}$ (D) $\frac{7}{24}$</p>	

- 46.** In $\triangle PQR$ measure of angle Q is 90° . If $\tan P = \frac{4}{3}$, and $PQ = 1.5$ cm, then what is the length (in cm) of side PR?
- $\triangle PQR$ में कोण Q का माप 90° है। यदि $\tan P = 4/3$ और $PQ = 1.5$ सेंटीमीटर है, तो भुजा PR की लंबाई (सेंटीमीटर में) क्या है?
- (A) 2 (B) 2.5 (C) 3 (D) 4.8
- 47.** $\triangle PQR$ is right angled at Q. If $m\angle P = 45^\circ$, then find the value of $(\operatorname{cosec} R + 1/3)$.
- $\triangle PQR$ में Q पर समकोण है। यदि $m\angle P = 45^\circ$ है, तो $(\operatorname{cosec} R + 1/3)$ का मान ज्ञात करें।
- (A) $\frac{\sqrt{3}+2}{2\sqrt{3}}$ (B) $\frac{\sqrt{3}+2}{2}$
 (C) $\frac{3\sqrt{2}+1}{3}$ (D) $\frac{2+2\sqrt{3}}{\sqrt{3}}$
- 48.** In $\triangle PQR$ measure of angle Q is 90° . If $\cos P = 5/13$ and $PQ = 2.5$ cm, then what is the length (in cm) of side PR?
- $\triangle PQR$ में कोण Q का माप 90° है। यदि $\cos P = 5/13$ और $PQ = 2.5$ सेंटीमीटर है, तो भुजा PR की लंबाई (सेंटीमीटर में) क्या है?
- (A) 6 (B) 6.5 (C) 4 (D) 5.6
- 49.** $\triangle XYZ$ is right angled at Y. If $m\angle Z = 30^\circ$, then find the value of $(\sin X - \frac{3}{\sqrt{2}})$.
- $\triangle XYZ$ में Y पर समकोण है। यदि $m\angle Z = 30^\circ$, तो $(\sin X - \frac{3}{\sqrt{2}})$ का मान ज्ञात करें।
- (A) $\frac{\sqrt{6}-6}{2\sqrt{2}}$ (B) $\frac{\sqrt{2}-\sqrt{3}}{\sqrt{6}}$
 (C) $-\frac{1}{2}$ (D) $\frac{1-2\sqrt{3}}{2}$
- 50.** In $\triangle DEF$ measure of angle E is 90° . If $\cos D = 8/17$, and $DE = 16$ cm, then what is the length (in cm) of side DF?
- $\triangle DEF$ में कोण E का माप 90° है। यदि $\cos D = 8/17$ और $DE = 16$ सेंटीमीटर है, तो भुजा DF की लंबाई (सेंटीमीटर में) क्या है?
- (A) 30 (B) 20 (C) 26 (D) 34
- 51.** $\triangle DEF$ is right angled at E. If $m\angle F = 45^\circ$, then find the value of $(\tan D - \frac{\sqrt{3}}{2})$.
- $\triangle DEF$ में E पर समकोण है। यदि $m\angle F = 45^\circ$ है, तो $(\tan D - \frac{\sqrt{3}}{2})$ का मान ज्ञात करें।
- (A) $-\frac{\sqrt{3}}{2}$ (B) $-\frac{1}{2\sqrt{3}}$
 (C) $\frac{2-\sqrt{3}}{2}$ (D) $\frac{3\sqrt{3}-1}{3}$
- 52.** $\triangle UVW$ is right angled at V. If $\cos U = 8/17$, then what is the value of $\sin W$?
- $\triangle UVW$ में V पर समकोण है। यदि $\cos U = 8/17$, तो $\sin W$ का मान क्या है?
- (A) $\frac{15}{17}$ (B) $\frac{17}{8}$ (C) $\frac{8}{17}$ (D) $\frac{17}{15}$
- 53.** What is the value of $(\sin 30^\circ + 1/3)$?
- $(\sin 30^\circ + \frac{1}{3})$ का मान क्या है?
- (A) $\frac{2\sqrt{2}+\sqrt{3}}{2}$ (B) $\frac{\sqrt{6}+1}{\sqrt{3}}$
 (C) $\frac{7}{3}$ (D) $\frac{5}{6}$
- 54.** $\triangle DEF$ is right angled at E. If $\sec D = 17/8$, then $\cos F$ का मान क्या है?
- $\triangle DEF$ में E पर समकोण है। यदि $\sec D = 17/8$ है, तो $\cos F$ का मान क्या है?
- (A) $\frac{15}{17}$ (B) $\frac{15}{8}$ (C) $\frac{8}{17}$ (D) $\frac{17}{15}$
- 55.** The total surface area of a cube is 253.5 cm^2 . Find its side (in cm).
- एक घन के सतह का कुल क्षेत्रफल 253.5 वर्ग सेंटीमीटर है। इसकी भुजा (सेंटीमीटर में) ज्ञात करें।
- (A) 7.5 (B) 5.5 (C) 6.5 (D) 8.5
- 56.** $\triangle DEF$ is right angled at E. If $m\angle F = 30^\circ$, then find the value of $(\sin D - 1/3)$.
- $\triangle DEF$ में E पर समकोण है। यदि $m\angle F = 30^\circ$, तो $(\sin D - 1/3)$ का मान ज्ञात करें।
- (A) $-\frac{1}{2\sqrt{3}}$ (B) $\frac{3\sqrt{3}-2}{6}$
 (C) $\frac{\sqrt{2}-\sqrt{3}}{\sqrt{6}}$ (D) $\frac{2\sqrt{2}-1}{\sqrt{2}}$

- 57.** $\triangle XYZ$ is right angled at Y. If $m\angle X = 45^\circ$, then find the value of $(\operatorname{cosec} Z + \frac{1}{3})$
 $\triangle XYZ$ में Y पर समकोण है। यदि $m\angle X = 45^\circ$, है, तो $(\operatorname{cosec} Z + \frac{1}{3})$ का मान ज्ञात करें।
 (A) $\frac{2\sqrt{2} + \sqrt{3}}{2}$ (B) $\frac{5}{6}$
 (C) $\frac{1+2\sqrt{3}}{2}$ (D) $\frac{\sqrt{2}+1}{\sqrt{2}}$
- 58.** $\triangle XYZ$ is right angled at Y. If $\sin X = 4/5$, then what is the value of $\cos Z$?
 $\triangle XYZ$ में Y पर समकोण है। यदि $\sin X = 4/5$ है, तो $\cos Z$ का मान क्या है?
 (A) $3/4$ (B) $5/3$ (C) $4/5$ (D) $4/3$
- 59.** What is the value of $(\cos 30^\circ + 1/2)$?
 $(\cos 30^\circ + 1/2)$ का मान क्या है?
 (A) $\frac{\sqrt{3}+1}{\sqrt{3}}$ (B) $\frac{\sqrt{2}+1}{\sqrt{2}}$
 (C) $\frac{\sqrt{3}+1}{2}$ (D) $\frac{2\sqrt{3}+1}{\sqrt{3}}$
- 60.** $\triangle DEF$ is right angled at E. If $\operatorname{cosec} D = 5/4$, then what is the value of $\operatorname{cosec} F$?
 $\triangle DEF$ में E पर समकोण है। यदि $\operatorname{cosec} D = 5/4$, तो $\operatorname{cosec} F$ का मान क्या है?
 (A) $5/3$ (B) $3/4$ (C) $4/5$ (D) $4/3$
- 61.** $\triangle ABC$ is right angled at B. If $m\angle C = 45^\circ$, then find the value of $(\operatorname{cosec} A - \sqrt{3})$.
 $\triangle ABC$ में B पर समकोण है। यदि $m\angle C = 45^\circ$, तो $(\operatorname{cosec} A - \sqrt{3})$ का मान ज्ञात करें।
 (A) $\frac{4-\sqrt{3}}{2}$ (B) $\sqrt{2}-\sqrt{3}$
 (C) $-\frac{\sqrt{3}}{2}$ (D) $\frac{\sqrt{6}-1}{\sqrt{3}}$
- 62.** In $\triangle PQR$ measure of angle Q is 90° . If $\sin P = 12/13$ and $PQ = 1$ cm, then what is the length (in cm) of side QR?
 $\triangle PQR$ में कोण Q का माप 90° है। यदि $\sin P = 12/13$ और $PQ = 1$ सेंटीमीटर है, तो भुजा QR की लंबाई (सेंटीमीटर में) क्या है?
 (A) 2.6 (B) 3 (C) 2.4 (D) 4
- 63.** What is the value of $(2 - \tan 60^\circ)$?
 $(2 - \tan 60^\circ)$ का मान क्या है?
 (A) $-\frac{1}{\sqrt{3}}$ (B) $\frac{\sqrt{3}-4}{2\sqrt{3}}$
 (C) $-\frac{1}{2}$ (D) $2 - \sqrt{3}$
- 64.** $\triangle UVW$ is right angled at V. If $\sin U = 24/25$, then what is the value of $\cos W$?
 $\triangle UVW$ में V पर समकोण है। यदि $\sin U = 24/25$, तो $\cos W$ का मान क्या है?
 (A) $\frac{25}{7}$ (B) $\frac{24}{7}$ (C) $\frac{7}{24}$ (D) $\frac{24}{25}$
- 65.** $\triangle PQR$ is right angled at Q. If $m\angle P = 60^\circ$, then find the value of $(\cot R + \frac{\sqrt{3}}{2})$.
 $\triangle PQR$ में Q पर समकोण है। यदि $m\angle P = 60^\circ$, तो $(\cot R + \frac{\sqrt{3}}{2})$ का मान ज्ञात करें।
 (A) $\frac{3\sqrt{3}}{2}$ (B) $1+\sqrt{3}$ (C) $\frac{2\sqrt{2}+1}{2}$ (D) $\frac{3\sqrt{3}+1}{6}$
- 66.** $\triangle ABC$ is right angled at B. If $\cot A = 8/15$, then what is the value of $\cos C$?
 $\triangle ABC$ में B पर समकोण है। यदि $\cot A = 8/15$ है, तो $\cos C$ का मान क्या है?
 (A) $\frac{15}{8}$ (B) $\frac{8}{17}$ (C) $\frac{17}{15}$ (D) $\frac{15}{17}$
- 67.** What is the value of $(\sin 45^\circ - \sqrt{3})$?
 $(\sin 45^\circ - \sqrt{3})$ का मान क्या है?
 (A) $\frac{1-\sqrt{6}}{\sqrt{2}}$ (B) $\frac{4-\sqrt{3}}{2\sqrt{3}}$
 (C) $-\frac{1}{2\sqrt{3}}$ (D) $\frac{2-\sqrt{3}}{2\sqrt{3}}$
- 68.** In $\triangle DEF$ measure of angle E is 90° . If $\cot D = 8/15$, and $DE = 16$ cm, then what is the length (in cm) of side EF?
 $\triangle DEF$ में कोण E का माप 90° है। यदि $\cot D = 8/15$ और $DE = 16$ सेंटीमीटर है, तो भुजा EF की लंबाई (सेंटीमीटर में) क्या है?
 (A) 34 (B) 15 (C) 30 (D) 14

69. What is the value of $\left(\frac{1}{\sqrt{3}} - \sin 45^\circ\right)$?

$\left(\frac{1}{\sqrt{3}} - \sin 45^\circ\right)$ का मान क्या है?

- (A) $\frac{1}{2\sqrt{3}}$ (B) $\frac{\sqrt{2} - \sqrt{3}}{\sqrt{6}}$
 (C) $1 - \sqrt{2}$ (D) $\frac{4 - \sqrt{3}}{2}$

70. In $\triangle PQR$ measure of angle Q is 90° . If $\cot P = 8/15$, and $PQ = 4$ cm, then what is the length (in cm) of side PR?

$\triangle PQR$ में कोण Q का माप 90° है। यदि $\cot P = 8/15$ और $PQ = 4$ सेंटीमीटर है, तो भुजा PR की लंबाई (सेंटीमीटर में) क्या है?

- (A) 8.5 (B) 7.5 (C) 5 (D) 4

71. $\triangle DEF$ is right angled at E. If $m\angle F = 30^\circ$, then find the value of $\left(\cos D - \frac{1}{\sqrt{2}}\right)$

$\triangle DEF$ में E पर समकोण है। यदि $m\angle F = 30^\circ$, तो $\left(\cos D - \frac{1}{\sqrt{2}}\right)$ का मान ज्ञात करें।

- (A) $-\frac{1}{2}$ (B) $\frac{\sqrt{6} - 1}{\sqrt{3}}$
 (C) $\frac{\sqrt{2} - 2}{2\sqrt{2}}$ (D) $\sqrt{3} - 2$

72. In $\triangle PQR$ measure of angle Q is 90° . If $\tan P = \frac{24}{7}$ and $PQ = 14$ cm, then what is the length (in cm) of side QR?

$\triangle PQR$ में कोण Q का माप 90° है। यदि $\tan P = \frac{24}{7}$ और $PQ = 14$ सेंटीमीटर है, तो भुजा QR की लंबाई (सेंटीमीटर में) क्या है?

- (A) 50 (B) 20 (C) 26 (D) 48

73. $\triangle PQR$ is right angled at Q. If $m\angle P = 60^\circ$, then find the value of $(\sec R + 1/2)$.

$\triangle PQR$ में Q पर समकोण है। यदि $m\angle P = 60^\circ$, तो $(\sec R + 1/2)$ का मान ज्ञात करें।

- (A) $\frac{2\sqrt{2} + \sqrt{3}}{2}$ (B) $\frac{\sqrt{3} + 4}{2\sqrt{3}}$
 (C) $\sqrt{3} + 2$ (D) $\frac{5}{6}$

74. In $\triangle PQR$ measure of angle Q is 90° . If $\cosec P = 17/15$, and $PQ = 0.8$ cm, then what is the length (in cm) of side QR?

$\triangle PQR$ में कोण Q का माप 90° है। यदि $\cosec P = 17/15$ और $PQ = 0.8$ सेंटीमीटर है, तो भुजा QR की लंबाई (सेंटीमीटर में) क्या है?

- (A) 1.7 (B) 2 (C) 2.5 (D) 1.5

75. What is the value of $(\cosec 60^\circ - 1/2)$? $(\cosec 60^\circ - 1/2)$ का मान क्या है?

- (A) $\frac{4 - \sqrt{3}}{2\sqrt{3}}$ (B) $\frac{2\sqrt{3} - 1}{\sqrt{3}}$
 (C) $\frac{3\sqrt{3} - 1}{3}$ (D) $\frac{1}{\sqrt{3}}$

76. In $\triangle DEF$ measure of angle E is 90° . If $\cot D = 5/12$, and $DE = 1$ cm, then what is the length (in cm) of side EF?

$\triangle DEF$ में कोण E का माप 90° है। यदि $\cot D = 5/12$ और $DE = 1$ सेंटीमीटर है, तो भुजा EF की लंबाई (सेंटीमीटर में) क्या है?

- (A) 2.4 (B) 2.6 (C) 1.5 (D) 2

77. What is the value of $(2 + \tan 60^\circ)$? $(2 + \tan 60^\circ)$ का मान क्या है?

- (A) 3 (B) $\frac{2}{\sqrt{3}}$ (C) $\frac{4}{\sqrt{3}}$ (D) $2 + \sqrt{3}$

78. $\triangle XYZ$ is right angled at Y. If $\sin X = 12/13$, then what is the value of $\cosec Z$?

$\triangle XYZ$ में Y पर समकोण है। यदि $\sin X = 12/13$ है, तो $\cosec Z$ का मान क्या है?

- (A) $\frac{5}{12}$ (B) $\frac{5}{13}$ (C) $\frac{13}{5}$ (D) $\frac{13}{12}$

79. $\triangle PQR$ is right angled at Q. If $m\angle R = 30^\circ$, then find the value of $\left(\cos P - \frac{1}{3}\right)$.

$\triangle PQR$ में Q पर समकोण है। यदि $m\angle R = 30^\circ$, तो $\left(\cos P - \frac{1}{3}\right)$ का मान ज्ञात करें।

- (A) $\frac{1}{6}$ (B) $\frac{2\sqrt{2} - 1}{\sqrt{2}}$ (C) $-\frac{1}{\sqrt{3}}$ (D) $\frac{\sqrt{3} - 4}{2\sqrt{3}}$

- 80.** In $\triangle ABC$ measure of angle B is 90° . If $\cot A = \frac{8}{15}$, and $AB = 0.8$, then what is the length (in cm) of side BC?
- $\triangle ABC$ में कोण B का माप 90° है। यदि $\cot A = \frac{8}{15}$ और $AB = 0.8$ सेमीटर है, तो भुजा BC की लंबाई (सेमीटर में) क्या है?
- (A) 1.7 (B) 2 (C) 1.5 (D) 2.5
- 81.** What is the value of $\left(\frac{1}{\sqrt{3}} + \cos 60^\circ\right)$ $\left(\frac{1}{\sqrt{3}} + \cos 60^\circ\right)$ का मान क्या है?
- (A) $\frac{2+2\sqrt{3}}{\sqrt{3}}$ (B) $\frac{2+\sqrt{3}}{2\sqrt{3}}$
 (C) $\frac{7}{3}$ (D) $\frac{\sqrt{2}+1}{\sqrt{2}}$
- 82.** $\triangle ABC$ is right angled at B. If $\cos A = 8/17$, then what is the value of $\cot C$?
- $\triangle ABC$ में B पर समकोण है। यदि $\cos A = 8/17$ है, तो $\cot C$ का मान क्या है?
- (A) $\frac{15}{8}$ (B) $\frac{15}{17}$ (C) $\frac{8}{17}$ (D) $\frac{17}{15}$
- 83.** What is the value of $(\tan 30^\circ + \frac{\sqrt{3}}{2})$ $(\tan 30^\circ + \frac{\sqrt{3}}{2})$ का मान क्या है?
- (A) $\frac{4+\sqrt{3}}{2}$ (B) $\frac{5}{2\sqrt{3}}$
 (C) $\frac{4+\sqrt{3}}{2\sqrt{3}}$ (D) $\frac{\sqrt{3}+1}{\sqrt{3}}$
- 84.** In $\triangle XYZ$ measure of angle Y is 90° . If $\sec X = \frac{17}{8}$, and $XY = 0.8$ cm, then what is the length (in cm) of side XZ?
- $\triangle XYZ$ में कोण Y का माप 90° है। यदि $\sec X = \frac{17}{8}$ और $XY = 0.8$ सेमी. है, तो भुजा XZ की लंबाई (सेमी. में) क्या है?
- (A) 1.7 (B) 1.5 (C) 2 (D) 2.5
- 85.** What is the value of $(\sec 45^\circ + \frac{1}{\sqrt{3}})$? $(\sec 45^\circ + \frac{1}{\sqrt{3}})$ का मान क्या है?
- (A) $\frac{2+\sqrt{3}}{2\sqrt{3}}$ (B) $\frac{2+2\sqrt{3}}{\sqrt{3}}$
 (C) $\frac{2+2\sqrt{3}}{3}$ (D) $\frac{\sqrt{6}+1}{\sqrt{3}}$
- 86.** In $\triangle ABC$ measure of angle B is 90° . If $\cos A = \frac{8}{17}$, and $AB = 4$ cm, then what is the length (in cm) of side BC?
- $\triangle ABC$ में कोण B का माप 90° है। यदि $\cos A = \frac{8}{17}$ और $AB = 4$ सेमीटर है, तो भुजा BC की लंबाई (सेमीटर में) क्या है?
- (A) 8.5 (B) 7.5 (C) 5 (D) 6
- 87.** $\triangle DEF$ is right angled at E. If $m\angle D = 30^\circ$ then find the value of $(\cos F + \sqrt{3})$.
- $\triangle DEF$ में E पर समकोण है। यदि $m\angle D = 30^\circ$, तो $(\cos F + \sqrt{3})$ का मान ज्ञात करें।
- (A) $\frac{7}{2\sqrt{3}}$ (B) $\frac{1+2\sqrt{3}}{2}$ (C) $\frac{4}{\sqrt{3}}$ (D) $\frac{\sqrt{3}+4}{2}$
- 88.** $\triangle DEF$ is right angled at E. If $\sin D = \frac{15}{17}$, then what is the value of $\cot F$?
- $\triangle DEF$ में E पर समकोण है। यदि $\sin D = \frac{15}{17}$, तो $\cot F$ का मान क्या है?
- (A) $\frac{15}{17}$ (B) $\frac{8}{17}$ (C) $\frac{15}{8}$ (D) $\frac{17}{15}$
- 89.** $\triangle XYZ$ is right angled at Y. If $m\angle Z = 30^\circ$, then find the value of $\left(\cos X - \frac{1}{\sqrt{3}}\right)$.
- $\triangle XYZ$ में Y पर समकोण है। यदि $m\angle Z = 30^\circ$, तो $\left(\cos X - \frac{1}{\sqrt{3}}\right)$ का मान ज्ञात करें।
- (A) $\frac{3}{2}$ (B) $1 - \sqrt{2}$ (C) $\frac{4 - \sqrt{3}}{2\sqrt{3}}$ (D) $\frac{\sqrt{3} - 2}{2\sqrt{3}}$

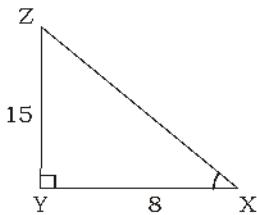
- 100.** In $\triangle ABC$ measure of angle B is 90° . If $\sec A = 25/7$, and $AB = 14$ cm, then what is the length (in cm) of side BC?
 ΔABC में कोण B का माप 90° है। यदि $\sec A = 25/7$ और $AB = 14$ सेंटीमीटर है, तो भुजा BC की लंबाई (सेंटीमीटर में) क्या है?
 (A) 50 (B) 48 (C) 20 (D) 26
- 101.** $\triangle XYZ$ is right angled at Y. If $m\angle Z = 60^\circ$, then find the value of $(\cot X - 1/3)$.
 ΔXYZ में Y पर समकोण है। यदि $m\angle Z = 60^\circ$ है, तो $(\cot X - 1/3)$ का मान ज्ञात करें।
 (A) $\frac{3\sqrt{3} - 1}{3}$ (B) $\frac{2\sqrt{3} - \sqrt{6}}{2\sqrt{2}}$
 (C) $-\frac{5}{3}$ (D) $\frac{2 - \sqrt{3}}{2\sqrt{3}}$
- 102.** $\triangle PQR$ is right angled at Q. If $\sin P = 12/13$, then what is the value of $\tan R$?
 ΔPQR में Q पर समकोण है। यदि $\sin P = 12/13$, तो $\tan R$ का मान क्या है?
 (A) $\frac{5}{13}$ (B) $\frac{13}{5}$ (C) $\frac{13}{12}$ (D) $\frac{5}{12}$
- 103.** What is the value of $(\frac{1}{3} + \operatorname{cosec} 30^\circ)$?
 $(\frac{1}{3} + \operatorname{cosec} 30^\circ)$ का मान क्या है?
 (A) $\frac{\sqrt{6} + 1}{3}$ (B) $\frac{7}{3}$
 (C) $\frac{4 + \sqrt{3}}{2}$ (D) $\frac{\sqrt{3} + 1}{2}$
- 104.** In $\triangle DEF$ measure of angle E is 90° . If $\sin D = 15/17$, and $DE = 4$ cm, then what is the length (in cm) of side EF?
 ΔDEF में कोण E का माप 90° है। यदि $\sin D = 15/17$ और $DE = 4$ सेंटीमीटर है, तो भुजा EF की लंबाई (सेंटीमीटर में) क्या है?
 (A) 8.5 (B) 7.5 (C) 5 (D) 6
- 105.** $\triangle DEF$ is right angled at E. If $m\angle D = 45^\circ$, then find the value of $(\tan F + 1/3)$.
 ΔDEF में E पर समकोण है। यदि $m\angle D = 45^\circ$ है, तो $(\tan F + 1/3)$ का मान ज्ञात करें।
 (A) $\frac{4}{3}$ (B) $\frac{3\sqrt{3}}{2}$ (C) $\frac{\sqrt{2} + 1}{\sqrt{2}}$ (D) $\frac{3\sqrt{2} + 1}{3}$
- 106.** In $\triangle XYZ$ measure of angle Y is 90° . If $\operatorname{cosec} X = 17/15$, and $XY = 4$ cm, then what is the length (in cm) of side YZ?
 ΔXYZ में कोण Y का माप 90° है। यदि $\operatorname{cosec} X = 17/15$ और $XY = 4$ सेमी. है, तो भुजा YZ की लंबाई (सेमी. में) क्या है?
 (A) 7.5 (B) 8.5 (C) 5 (D) 6
- 107.** $\triangle PQR$ is right angled at Q. If $m\angle R = 60^\circ$, then find the value of $(\sec P - \frac{1}{\sqrt{3}})$.
 ΔPQR में Q पर समकोण है। यदि $m\angle R = 60^\circ$ है, तो $(\sec P - \frac{1}{\sqrt{3}})$ का मान ज्ञात करें।
 (A) $\frac{\sqrt{6} - 6}{3\sqrt{3}}$ (B) $\frac{1 - 3\sqrt{2}}{3}$ (C) $\frac{1}{\sqrt{3}}$ (D) $\frac{2}{\sqrt{3}}$
- 108.** $\triangle PQR$ is right angled at Q. If $\operatorname{cosec} P = 25/24$, then what is the value of $\cot R$?
 ΔPQR में Q पर समकोण है। यदि $\operatorname{cosec} P = 25/24$ है, तो $\cot R$ का मान क्या है?
 (A) $\frac{25}{7}$ (B) $\frac{24}{25}$ (C) $\frac{7}{24}$ (D) $\frac{24}{7}$
- 109.** What is the value of $(\tan 45^\circ - \frac{1}{\sqrt{2}})$?
 $(\tan 45^\circ - \frac{1}{\sqrt{2}})$ का मान क्या है?
 (A) $-\frac{\sqrt{3}}{2}$ (B) $\frac{2\sqrt{2} - 1}{\sqrt{2}}$ (C) $\frac{2\sqrt{2} - \sqrt{3}}{2}$ (D) $\frac{\sqrt{2} - 1}{\sqrt{2}}$
- 110.** $\triangle UVW$ is right angled at V. If $\sin U = 4/5$, then what is the value of $\operatorname{cosec} W$?
 ΔUVW में V पर समकोण है। यदि $\sin U = 4/5$ है, तो $\operatorname{cosec} W$ का मान क्या है?
 (A) $\frac{3}{4}$ (B) $\frac{4}{5}$ (C) $\frac{5}{3}$ (D) $\frac{4}{3}$
- 111.** $\triangle XYZ$ is right angled at Y. If $m\angle X = 60^\circ$, then find the value of $(\cot Z + 2)$.
 ΔXYZ में Y पर समकोण है। यदि $m\angle X = 60^\circ$, तो $(\cot Z + 2)$ का मान ज्ञात करें।
 (A) $\frac{2\sqrt{2} + 1}{2}$ (B) $\sqrt{3} + 2$
 (C) $\frac{\sqrt{6} + 1}{\sqrt{3}}$ (D) $\frac{2\sqrt{2} + \sqrt{3}}{2}$
- 112.** In $\triangle ABC$ measure of angle B is 90° . If $\tan A = 12/5$, and $AB = 1$ cm, then what is the length (in cm) of side BC?
 ΔABC में कोण B का माप 90° है। यदि $\tan A = 12/5$ और $AB = 1$ सेंटीमीटर है, तो भुजा BC की लंबाई (सेंटीमीटर में) क्या है?
 (A) 2.6 (B) 2.4 (C) 1.5 (D) 2

Solution

1. (C) $\frac{1}{3} - \frac{1}{\sqrt{3}} = \frac{\sqrt{3} - 3}{3\sqrt{3}}$

$$= \frac{\sqrt{3}(1 - \sqrt{3})}{3\sqrt{3}} = \frac{1 - \sqrt{3}}{3}$$

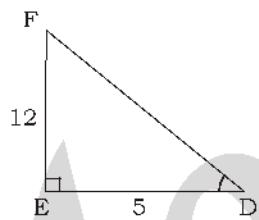
2. (D) $\tan x = \frac{15}{8}$



$$\sin z = \frac{xy}{xz} = \frac{8}{\sqrt{15^2 + 8^2}} = \frac{8}{17}$$

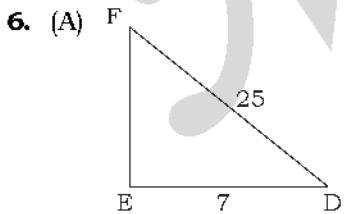
3. (A) $\frac{1}{\sqrt{3}} - \frac{\sqrt{3}}{2} = \Rightarrow \frac{2 - 3}{2\sqrt{3}} = -\frac{1}{2\sqrt{3}}$

4. (C) $\cot D = \frac{5}{12}$



$$\sin F = \frac{ED}{FD} = \frac{5}{\sqrt{12^2 + 5^2}} = \frac{5}{13}$$

5. (C) $\frac{1}{3} - 2 = -\frac{5}{3}$



$$\sec D = \frac{25}{7}$$

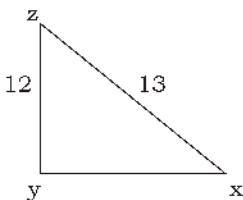
$$\therefore DE = 7 \rightarrow 1.4$$

$$1 \rightarrow .2$$

$$\therefore DF = 25 \times 0.2 = 5$$

7. (A) $2 - \frac{1}{\sqrt{3}} = \frac{2\sqrt{3} - 1}{\sqrt{3}}$

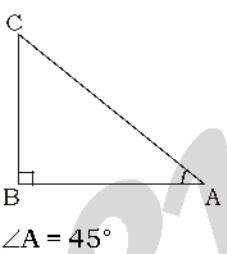
8. (C)



$$\cosec x = \frac{13}{12} \Rightarrow xy = 5 \rightarrow 1$$

$$\therefore 1 \rightarrow \frac{1}{5} \Rightarrow yz = 12 \rightarrow \frac{12}{5} = 2.4$$

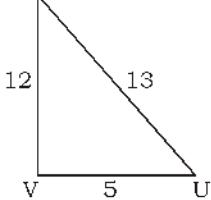
9. (D)



$$\cosec C = \cosec 45^\circ = \sqrt{2}$$

$$\therefore \sqrt{2} + \frac{1}{\sqrt{3}} \Rightarrow \frac{\sqrt{6} + 1}{\sqrt{3}}$$

10. (B)



$$UV = 2.5$$

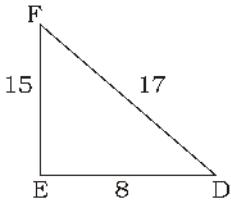
$$5 \rightarrow 2.5$$

$$1 \rightarrow .5$$

$$\therefore VW = 12 \rightarrow 12 \times .5 = 6$$

11. (C) $\frac{1}{\sqrt{2}} + \frac{1}{3} = \frac{3 + \sqrt{2}}{3\sqrt{2}}$

12. (C)



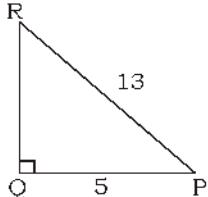
$$\cos D = \frac{8}{17}$$

$$EF = \sqrt{17^2 - 8^2} = 15$$

$$\therefore \sec F = \frac{17}{15}$$

13.(A) $2 - \frac{1}{2} = \frac{3}{2}$

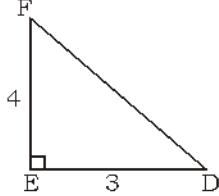
14.(A)



$$\cos P = \frac{5}{13}, \Rightarrow \operatorname{cosec} R = \frac{13}{5}$$

15.(C) $\cot 45^\circ = \sqrt{2} = 1 - \sqrt{2}$

16.(C)



$$\tan D = \frac{4}{3}$$

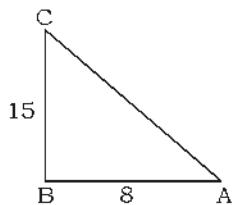
$$\Rightarrow DE = 3 \rightarrow 6$$

$$1 \rightarrow 2$$

$$\therefore EF = 4 \rightarrow 4 \times 2 = 8$$

17.(C) $\operatorname{cosec} 45^\circ + \sqrt{\frac{3}{2}} = \sqrt{2} + \sqrt{\frac{3}{2}}$
 $= \frac{2+\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} \Rightarrow \frac{2\sqrt{2} + \sqrt{6}}{2}$

18.(A) $\tan A = \frac{15}{18}$



$$AC = \sqrt{15^2 + 8^2} = 17$$

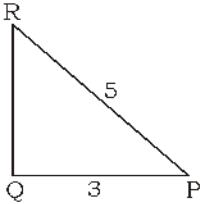
$$AB = 8 \rightarrow 0.8$$

$$1 \rightarrow 0.1$$

$$\therefore 17 \rightarrow 17 \times 0.1 = 1.7$$

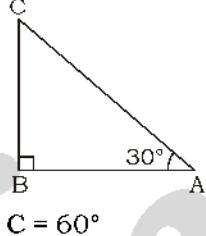
19.(C) $\tan 60^\circ + \frac{1}{3} = \sqrt{3} + \frac{1}{3} = \frac{3\sqrt{3}+1}{3}$

20.(C)



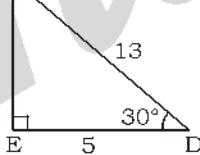
$$QR = 4 \Rightarrow \cos R = \frac{4}{5}$$

21.(D)



$$\sin 60^\circ = \frac{\sqrt{3}}{2} \Rightarrow \frac{\sqrt{3}}{2} + \frac{1}{3} = \frac{3\sqrt{3}+2}{6}$$

22.(B)

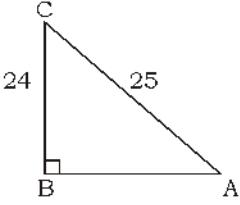


$$\cos D = \frac{5}{13} \Rightarrow EF = \sqrt{13^2 - 5^2} = 12$$

$$\tan F = \frac{5}{12}$$

23.(D) $\frac{1}{2} - \cot 45^\circ \Rightarrow \frac{1}{2} - 1 \Rightarrow -\frac{1}{2}$

24.(A)



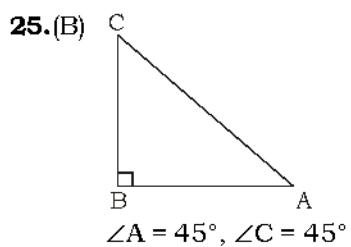
$$\sin A = \frac{24}{25}$$

$$AB = \sqrt{25^2 - 24^2} = 7$$

$$AB = 7 \rightarrow 1.4$$

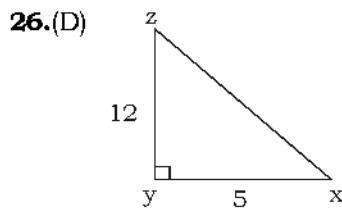
$$1 \rightarrow 0.2$$

$$\therefore BC = 24 \rightarrow 24 \times 0.2 = 4.8$$



$$\tan C + \frac{\sqrt{3}}{2} \Rightarrow \tan 45^\circ + \frac{\sqrt{3}}{2}$$

$$\Rightarrow 1 + \frac{\sqrt{3}}{2} = \frac{2+\sqrt{3}}{2}$$



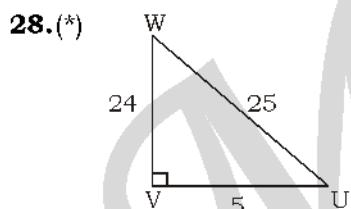
$$\cot X = \frac{5}{12} \Rightarrow XZ = 13$$

$$XY = 5 \rightarrow 2.5$$

$$1 \rightarrow 0.5$$

$$\therefore XZ = 13 \rightarrow 13 \times 0.5 = 6.5$$

27.(D) $\tan 60^\circ - \frac{1}{3} = \sqrt{3} - \frac{1}{3} = \frac{3\sqrt{3}-1}{3}$

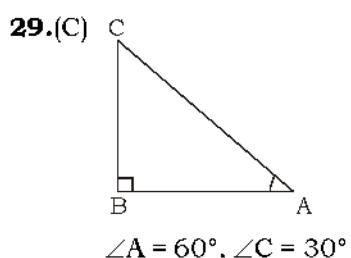


$$\sin U = \frac{24}{25} \Rightarrow UV = \sqrt{25^2 - 24^2}$$

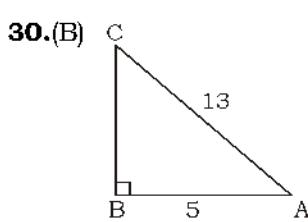
$$= 7 \rightarrow 0.7$$

$$= 1 \rightarrow 0.1$$

$$VW = 24 \rightarrow 24 \times 0.1 = 2.4$$



$$\sec C + 2 = \sec 30^\circ + 2 = \frac{2}{\sqrt{3}} + 2 \Rightarrow \frac{2+2\sqrt{3}}{\sqrt{3}}$$



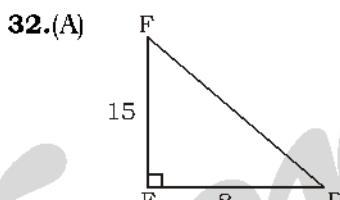
$$\cos A = \frac{5}{13}$$

$$AB = 5 \rightarrow 10$$

$$1 \rightarrow 2$$

$$\therefore BC = 12 \rightarrow 12 \times 2 = 24$$

31.(A) $\sqrt{3} - \sec 60^\circ = \sqrt{3} - 2$

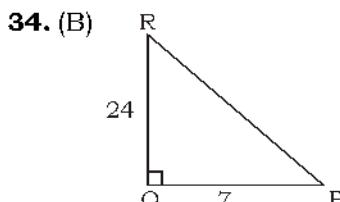


$$\cot D = \frac{8}{15}$$

$$\cot F = \frac{EF}{ED} = \frac{15}{8}$$

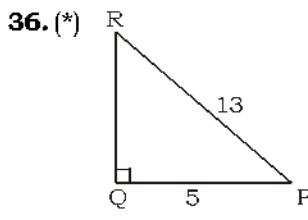
33. (A) $\sin 60^\circ - \frac{2}{\sqrt{3}} \Rightarrow \frac{\sqrt{3}}{2} - \frac{2}{\sqrt{3}}$

$$\Rightarrow \frac{3-4}{2\sqrt{3}} = \frac{-1}{2\sqrt{3}}$$



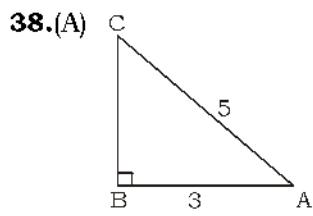
$$\tan P = \frac{24}{7} \quad \cos R = \frac{24}{\sqrt{24^2 + 7^2}} = \frac{24}{25}$$

35. (C) $\cot 60^\circ + \frac{1}{\sqrt{3}} \Rightarrow \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$



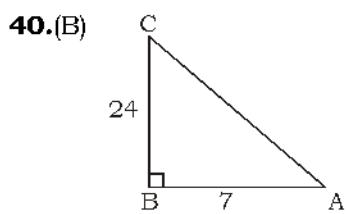
$$\sec P = \frac{13}{5}, \quad \sin R = \frac{5}{13}$$

37.(C) $\frac{1}{3} - \sec 45^\circ \Rightarrow \frac{1}{3} - \sqrt{2} \Rightarrow \frac{1-3\sqrt{2}}{3}$



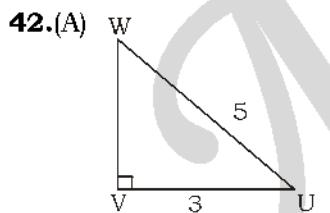
$$\sec A = \frac{5}{3} \quad \text{Cosec } C = \frac{AC}{AB} = \frac{5}{3}$$

39.(D) $\frac{1}{\sqrt{3}} + \cot 60^\circ \Rightarrow \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{3}} = \frac{2}{\sqrt{3}}$

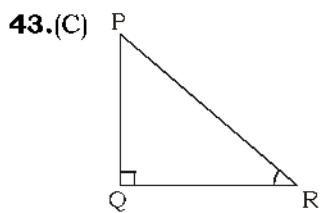


$$\cot A = \frac{7}{24} \quad \text{Cosec } C = \frac{AC}{AB} = \frac{\sqrt{24^2+7^2}}{7} = \frac{25}{7}$$

41.(C) $\cos 45^\circ = \frac{1}{3} \Rightarrow \frac{1}{\sqrt{2}} = \frac{1}{3} \Rightarrow \frac{3-\sqrt{2}}{3\sqrt{2}}$

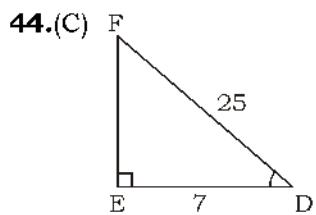


$$\sec U = \frac{5}{3}, \tan W = \frac{3}{4}$$

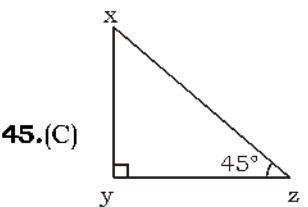


$$\angle P = 45^\circ, \angle R = 45^\circ$$

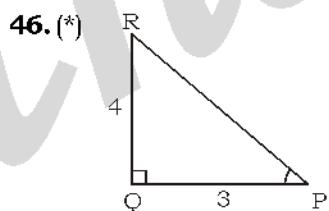
$$\therefore \tan 45^\circ = \frac{1}{2} \\ \Rightarrow 1 - \frac{1}{2} = \frac{1}{2}$$



$$\sec D = \frac{25}{7}, \Rightarrow \text{cosec } F = \frac{25}{7}$$



$$z = 45^\circ, x = 45^\circ \\ \Rightarrow \text{cosec } 45^\circ = \frac{2}{\sqrt{3}} \\ \Rightarrow \sqrt{2} = \frac{2}{\sqrt{3}} = \frac{\sqrt{6}-2}{\sqrt{3}}$$

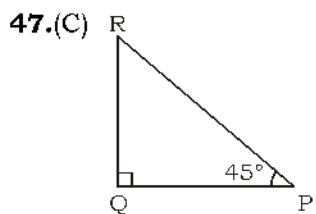


$$\tan P = \frac{4}{3}$$

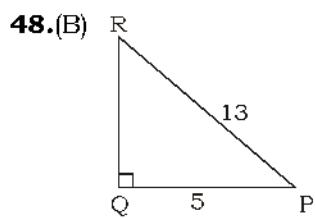
$$PQ = 3 \rightarrow 1.5$$

$$1 \rightarrow 0.5$$

$$\therefore PR = \sqrt{3^2+4^2} = 5 \rightarrow 5 \times .5 = 2.5$$



$$\angle R = 45^\circ \Rightarrow \text{cosec } R + \frac{1}{3} \\ \Rightarrow \text{cosec } 45^\circ + \frac{1}{3} \Rightarrow \sqrt{2} + \frac{1}{3} = \frac{3\sqrt{2}+1}{3}$$

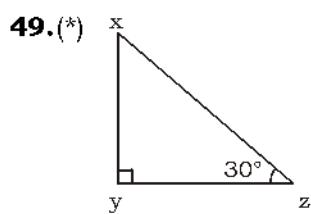


$$\cos P = \frac{5}{13}$$

$$PQ = 5 \rightarrow 2.5$$

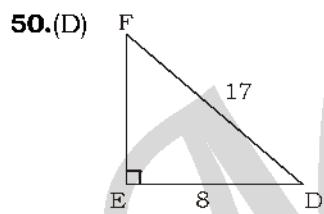
$$1 \rightarrow 0.5$$

$$\therefore PR = 13 \rightarrow 13 \times .5 = 6.5$$



$$\angle X = 90^\circ - 30^\circ = 60^\circ$$

$$\left(\sin 60^\circ - \frac{3}{\sqrt{2}} \right) = \frac{\sqrt{3}}{2} - \frac{3}{\sqrt{2}} = \frac{\sqrt{6} - 6}{2\sqrt{2}}$$

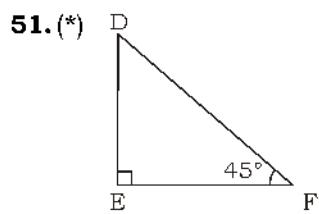


$$\cos D = \frac{8}{17}$$

$$DE = 8 \rightarrow 16$$

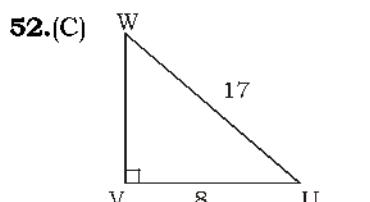
$$1 \rightarrow 2$$

$$\therefore DF = 17 \rightarrow 17 \times 2 = 34$$



$$\angle D = 45^\circ$$

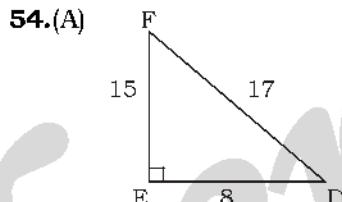
$$\tan D = \frac{\sqrt{3}}{2} \Rightarrow 1 - \frac{\sqrt{3}}{2} = \frac{2 - \sqrt{3}}{2}$$



$$VW = \sqrt{17^2 - 8^2} = 15$$

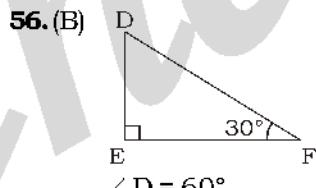
$$\sin W = \frac{VW}{UW} = \frac{8}{17}$$

53.(D) $\sin 30^\circ + \frac{1}{3}$
 $\Rightarrow \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$



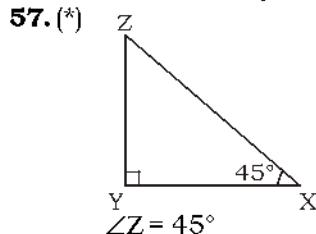
$$\sec D = \frac{17}{18}, \Rightarrow \cos F = \frac{15}{17}$$

55. (*)

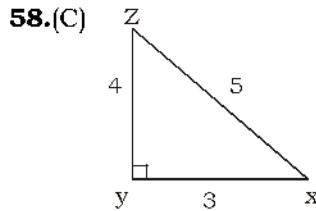


$$\angle D = 60^\circ$$

$$\therefore \sin 60^\circ = \frac{1}{3} \Rightarrow \frac{\sqrt{3}}{2} = \frac{1}{3} = \frac{3\sqrt{3} - 2}{6}$$

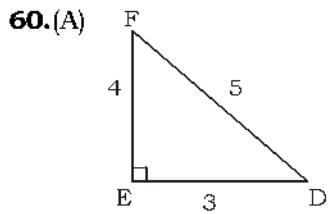


$$\operatorname{cosec} 45^\circ + \frac{\sqrt{3}}{2} \Rightarrow \sqrt{2} + \frac{\sqrt{3}}{2} = \frac{2\sqrt{2} + \sqrt{3}}{2}$$

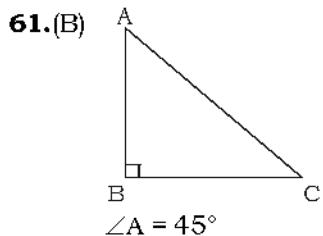


$$\sin x = \frac{4}{5}, \cos z = \frac{4}{5}$$

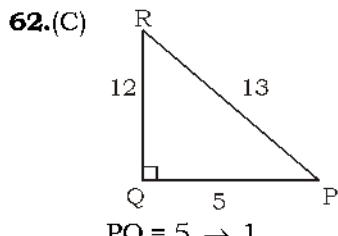
59.(C) $\cos 30^\circ + \frac{1}{2} \Rightarrow \frac{\sqrt{3}}{2} + \frac{1}{2} = \frac{\sqrt{3} + 1}{2}$



$$\operatorname{cosec} D = \frac{5}{4}, \quad \Rightarrow \operatorname{cosec} F = \frac{5}{3}$$

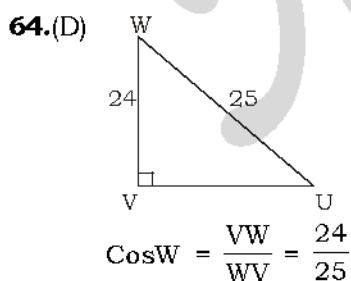


$$\angle A = 45^\circ \\ \operatorname{cosec} 45^\circ - \sqrt{3} = 2 - \sqrt{3}$$

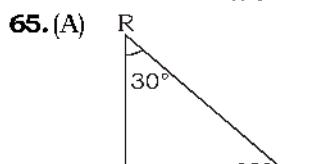


$$PQ = 5 \rightarrow 1 \\ 1 \rightarrow \frac{1}{5} \\ \therefore QR = 12 \rightarrow 12 \times \frac{1}{5} = 2.4$$

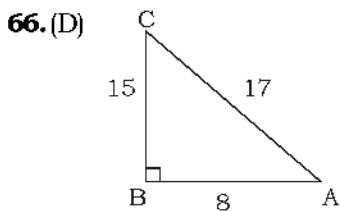
63.(D) $2 - \tan 60^\circ \Rightarrow 2 - \sqrt{3}$



$$\cos W = \frac{VW}{WV} = \frac{24}{25}$$

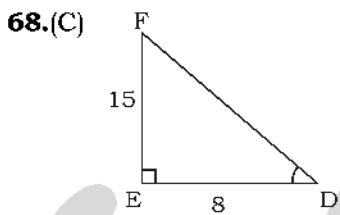


$$\cot 30^\circ + \frac{\sqrt{3}}{2} \Rightarrow \sqrt{3} + \frac{\sqrt{3}}{2} = \frac{3\sqrt{3}}{2}$$



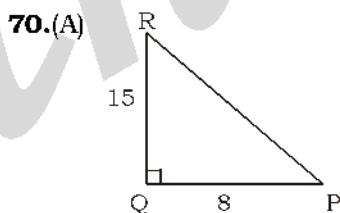
$$\cos C = \frac{15}{17}$$

67.(A) $\sin 45^\circ - \sqrt{3} = \frac{1}{\sqrt{2}} - \sqrt{3} \Rightarrow \frac{1 - \sqrt{6}}{\sqrt{2}}$



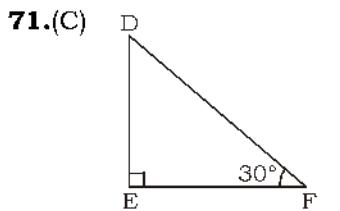
$$DE = 8 \rightarrow 16 \\ 1 \rightarrow 2 \\ \therefore EF = 15 \rightarrow 2 \times 15 = 30 \text{ cm.}$$

69. (*) $\frac{1}{\sqrt{3}} - \sin 45^\circ \Rightarrow \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{2}} \Rightarrow \frac{\sqrt{2} - \sqrt{3}}{\sqrt{6}}$



$$PR = \sqrt{15^2 + 8^2} = 17$$

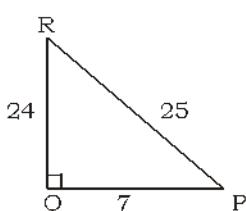
$$PQ = 8 \rightarrow 4 \\ 1 \rightarrow 1/2 \\ \therefore 17 \rightarrow 17 \times 1/2 = 8.5$$



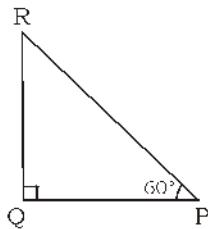
$$\angle D = 90^\circ - 30^\circ = 60^\circ$$

$$\Rightarrow \cos D = \frac{1}{\sqrt{2}} \Rightarrow \cos 60^\circ = \frac{1}{\sqrt{2}}$$

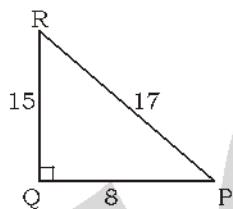
$$\Rightarrow \frac{1}{2} - \frac{1}{\sqrt{2}} = \frac{\sqrt{2} - 2}{2\sqrt{2}}$$

72.(D)


$$\begin{aligned} PQ &= 7 \rightarrow 1 \\ 1 &\rightarrow 2 \\ \therefore QR &= 24 \rightarrow 24 \times 2 = 48 \end{aligned}$$

73.(B)


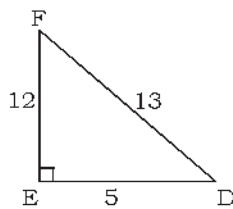
$$\begin{aligned} \Rightarrow \left(\sec R + \frac{1}{2} \right) &\Rightarrow \sec 30^\circ + \frac{1}{2} \\ \Rightarrow \frac{2}{\sqrt{3}} + \frac{1}{2} &= \frac{4 + \sqrt{3}}{2\sqrt{3}} \end{aligned}$$

74.(D)


$$\begin{aligned} PQ &= 8 \rightarrow 0.8 \\ 1 &\rightarrow 0.1 \\ \therefore QR &= 15 \rightarrow 15 \times 0.1 = 1.5 \end{aligned}$$

75.(A) $\operatorname{Cosec} 60^\circ - \frac{1}{2}$

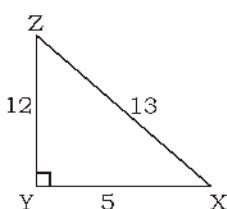
$$\Rightarrow \frac{2}{\sqrt{3}} - \frac{1}{2} = \frac{4 - \sqrt{3}}{2\sqrt{3}}$$

76.(A)


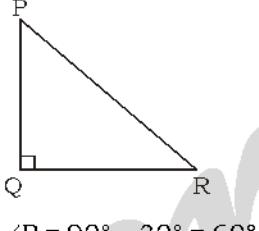
$$\begin{aligned} DE &= 5 \rightarrow 1 \\ 1 &\rightarrow \frac{1}{5} \\ \therefore EF &= 12 \rightarrow 12 \times \frac{1}{5} = 2.4 \end{aligned}$$

77.(D) $2 + \tan 60^\circ$

$$= 2 + \sqrt{3}$$

78.(C)


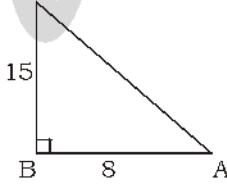
$$\operatorname{Cosec} z = \frac{XZ}{XY} = \frac{13}{5}$$

79.(A)


$$\angle P = 90^\circ - 30^\circ = 60^\circ$$

$$\therefore \cos P - \frac{1}{3} = \cos 60^\circ - \frac{1}{3}$$

$$\Rightarrow \frac{1}{2} - \frac{1}{3} = \frac{1}{6}$$

80.(C)


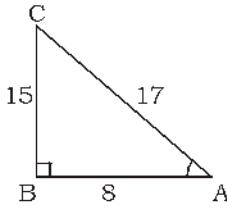
$$\operatorname{Cot} A = \frac{8}{15}$$

$$AB = 8 \rightarrow 0.8$$

$$1 \rightarrow 0.1$$

$$\therefore BC = 15 \rightarrow 15 \times 0.1 = 1.5$$

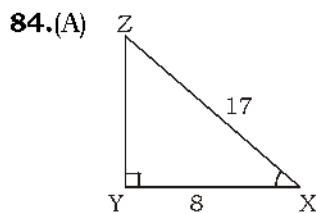
$$81.(B) \quad \frac{1}{\sqrt{3}} + \cos 60^\circ \Rightarrow \frac{1}{\sqrt{3}} + \frac{1}{2} = \frac{2 + \sqrt{3}}{2\sqrt{3}}$$

82.(A)


$$\cos A = \frac{8}{17}$$

$$\operatorname{Cot} C = \frac{BC}{AB} = \frac{15}{18}$$

83.(B) $\tan 30^\circ + \frac{\sqrt{3}}{2} \Rightarrow \frac{1}{\sqrt{3}} + \frac{\sqrt{3}}{2} = \frac{2+3}{2\sqrt{3}} = \frac{5}{2\sqrt{3}}$



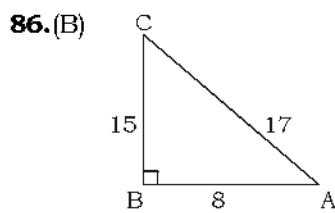
$$\sec X = \frac{17}{8}$$

$$XY = 8 \rightarrow 0.8$$

$$1 \rightarrow 0.1$$

$$\therefore XZ = 17 \rightarrow 17 \times 0.1 = 1.7$$

85.(D) $\sec 45^\circ + \frac{1}{\sqrt{3}} \Rightarrow \sqrt{2} + \frac{1}{\sqrt{3}} = \frac{\sqrt{6}+1}{\sqrt{3}}$

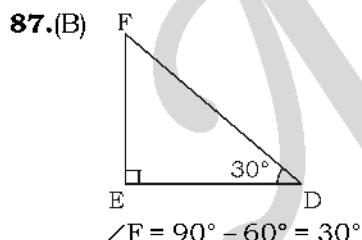


$$\cos A = \frac{8}{17}$$

$$AB = 8 \rightarrow 0.8$$

$$1 \rightarrow \frac{1}{2}$$

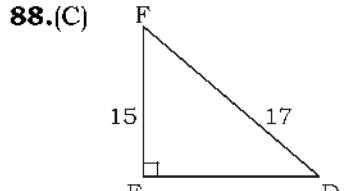
$$\therefore BC = 15 \rightarrow 15 \times \frac{1}{2} = 7.5$$



$$\angle F = 90^\circ - 60^\circ = 30^\circ$$

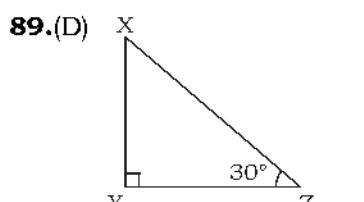
$$\therefore \cos F + \sqrt{3}$$

$$\Rightarrow \cos 60^\circ + \sqrt{3} = \frac{1}{2} + \sqrt{3} = \frac{1+2\sqrt{3}}{2}$$



$$ED = \sqrt{17^2 - 15^2} = 8$$

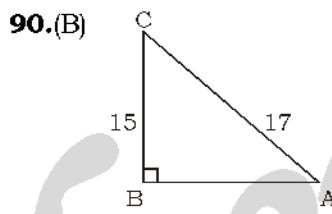
$$\therefore \cot F = \frac{EF}{ED} = \frac{15}{8}$$



$$\angle X = 90^\circ - 30^\circ = 60^\circ$$

$$\therefore \cos X - \frac{1}{\sqrt{3}} = \cos 60^\circ - \frac{1}{\sqrt{3}}$$

$$\Rightarrow \frac{1}{2} - \frac{1}{\sqrt{3}} = \frac{\sqrt{3}-2}{2\sqrt{3}}$$



$$\sin A = \frac{15}{17}$$

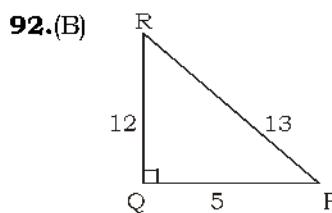
$$AB = \sqrt{17^2 - 15^2} = 8$$

$$AB = 8 \rightarrow 0.8$$

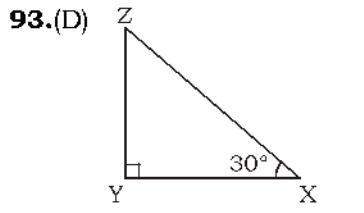
$$1 \rightarrow 0.1$$

$$\therefore BC = 15 \rightarrow 15 \times 0.1 = 1.5$$

91.(B) $\frac{2}{\sqrt{3}} + \tan 45^\circ \Rightarrow \frac{2}{\sqrt{3}} + 1 \Rightarrow \frac{2+\sqrt{3}}{\sqrt{3}}$

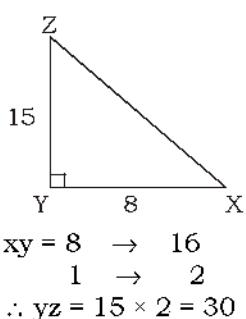


$$\tan R = \frac{QP}{QR} = \frac{5}{12}$$



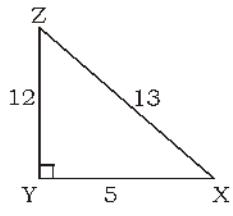
$$\angle Z = 90^\circ - 30^\circ = 60^\circ$$

$$\therefore \cos Z + \frac{1}{3} \Rightarrow \frac{1}{2} + \frac{1}{3} = \frac{5}{6}$$

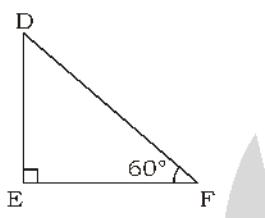
94.(B)


$$xy = 8 \rightarrow 16 \\ 1 \rightarrow 2 \\ \therefore yz = 15 \times 2 = 30$$

95.(A) $\frac{\sqrt{2}}{3} - \text{Cosec}60^\circ \Rightarrow \frac{\sqrt{2}}{3} - \frac{2}{\sqrt{3}} = \frac{\sqrt{6}-6}{3\sqrt{3}}$

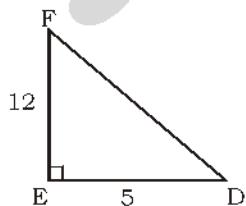
96.(C)


$$\text{Sec}Z = \frac{XZ}{YZ} = \frac{13}{12}$$

97.(B)


$$\angle D = 90^\circ - 60^\circ = 30^\circ$$

$$\begin{aligned} \therefore \cot D &= \frac{2}{\sqrt{3}} \\ &= \cot 30^\circ = \frac{2}{\sqrt{3}} \\ &= \sqrt{3} - \frac{2}{\sqrt{3}} = \frac{3-2}{\sqrt{3}} = \frac{1}{\sqrt{3}} \end{aligned}$$

98.(D)


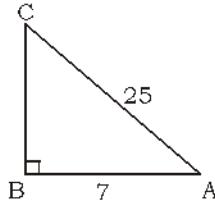
$$\tan D = \frac{12}{5}$$

$$DF = \sqrt{12^2 + 5^2} = 13$$

$$\sec F = \frac{EF}{FD} = \frac{12}{13}$$

99.(D) $\frac{1}{2} - \sec 30^\circ$

$$\Rightarrow \frac{1}{2} - \frac{2}{\sqrt{3}} \Rightarrow \frac{\sqrt{3}-4}{2\sqrt{3}}$$

100. (B)


$$BC = \sqrt{25^2 - 7^2} = 24$$

$$AB = 7 \rightarrow 14$$

$$1 \rightarrow 2 \\ \therefore BC = 1 \rightarrow 24 \times 2 = 48$$

101. (A)
102. (D)
103. (B)
104. (B)
105. (A)
106. (A)
107. (C)
108. (D)
109. (D)
110. (C)
111. (B)
112. (B)

(SSC CGL (PRE) - 2021)

1. If $4\sin^2\theta = 3(1 + \cos\theta)$, $0^\circ < \theta < 90^\circ$, then what is the value of $(2\tan\theta + 4\sin\theta - \sec\theta)$?
यदि $4\sin^2\theta = 3(1 + \cos\theta)$ है, $0^\circ < \theta < 90^\circ$ है, तो $(2\tan\theta + 4\sin\theta - \sec\theta)$ का मान ज्ञात करें।
 (A) $15\sqrt{3} + 3$ (B) $4\sqrt{15} - 3$
 (C) $15\sqrt{3} - 4$ (D) $3\sqrt{15} - 4$
2. The value of
 $\frac{\sin 23^\circ \cos 67^\circ + \sec 52^\circ \sin 38^\circ}{\cosec^2 20^\circ - \tan^2 70^\circ}$ is :
 $\frac{\sin 23^\circ \cos 67^\circ + \sec 52^\circ \sin 38^\circ}{\cosec^2 20^\circ - \tan^2 70^\circ}$ का मान ज्ञात कीजिए-
3. The angle of elevation of the top of an unfinished tower at a point distant 78 m from its base is 30° . How much higher must the tower be raised (in m) so that the angle of elevation of the top of the finished tower at the same point will be 60° ?
एक अधूरी मीनार के आधार से 78 मी. की दूरी से अधूरी मीनार के शिखर का उन्नयन कोण 30° है। मीनार को कितना ऊँचा (मी. में) बनाया जाना चाहिए ताकि उसी बिन्दु से तैयार मीनार के शिखर का उन्नयन कोण 60° हो जाए?
 (A) $78\sqrt{3}$ (B) $26\sqrt{3}$
 (C) 80 (D) $52\sqrt{3}$
4. A vertical pole and a vertical tower are on the same level of ground in such a way that from the top of the pole, the angle of elevation of the top of the tower is 60° and the angle of depression of the bottom of the tower is 30° . If the height of the tower is 76 m, then find the height (in m) of the pole.
एक उर्ध्वाधर खंभा और एक उर्ध्वाधर मीनार समतल जमीन पर इस प्रकार स्थिति है कि खंभे के शीर्ष से मीनार के शिखर का उन्नयन कोण 60° तथा मीनार के तेल का अवनमन कोण 30° है। यदि मीनार की ऊँचाई 76 मी. है, तो खंभे की ऊँचाई (मी. में) ज्ञात कीजिए-
 (A) 19 (B) 57
 (C) 38 (D) $19\sqrt{3}$

5. If $\cos(A - B) = \frac{\sqrt{3}}{2}$ and $\sec A = 2$, $0^\circ \leq A \leq 90^\circ$, $0^\circ \leq B \leq 90^\circ$, then what is the measure of B?
यदि $\cos(A - B) = \frac{\sqrt{3}}{2}$ और $\sec A = 2$, $0^\circ \leq A \leq 90^\circ$, $0^\circ \leq B \leq 90^\circ$ है, तो B का माप क्या है?
 (A) 90° (B) 30°
 (C) 60° (D) 0°
6. What is the value of $8\sqrt{3} \sin 30^\circ \tan 60^\circ - 3\cos 0^\circ + 3\sin^2 45^\circ + 2\cos^2 30^\circ$?
 $8\sqrt{3} \sin 30^\circ \tan 60^\circ - 3\cos 0^\circ + 3\sin^2 45^\circ + 2\cos^2 30^\circ$ का मान ज्ञात करें।
 (A) 12 (B) 15
 (C) 9 (D) 18
7. If $\sec A = \frac{17}{8}$, given that $A < 90^\circ$, what is the value of the following $\frac{34 \sin A + 15 \cot A}{68 \cos A - 16 \tan A}$?
यदि $\sec A = \frac{17}{8}$ है, जबकि $A < 90^\circ$ है, तो निम्नलिखित का मान क्या है? $\frac{34 \sin A + 15 \cot A}{68 \cos A - 16 \tan A}$
 (A) 30 (B) 38
 (C) 23 (D) 19
8. If $\tan^2 A + 2\tan A - 63 = 0$ Given that $0 < A < \frac{\pi}{2}$ what is the value of $(2\sin A + 5\cos A)$?
यदि $\tan^2 A + 2\tan A - 63 = 0$ है, दिया गया है कि $0 < A < \frac{\pi}{2}$ है, तो $(2\sin A + 5\cos A)$ का मान ज्ञात करें।
 (A) $\frac{19}{\sqrt{50}}$ (B) $\frac{15}{\sqrt{50}}$
 (C) $15\sqrt{50}$ (D) $19\sqrt{50}$
9. If $3\sec^2\theta + \tan\theta - 7 = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $\left(\frac{2\sin\theta + 3\cos\theta}{\cosec\theta + \sec\theta}\right)$?
यदि $3\sec^2\theta + \tan\theta - 7 = 0$, $0^\circ < \theta < 90^\circ$ है तो $\left(\frac{2\sin\theta + 3\cos\theta}{\cosec\theta + \sec\theta}\right)$ का मान कितना होगा?
 (A) $\frac{5}{2}$ (B) $4\sqrt{2}$ (C) $\frac{5}{4}$ (D) 10

10. If $\cot B = \frac{12}{5}$, what is the value of $\sec B$?

यदि $\cot B = \frac{12}{5}$ है तो $\sec B$ का मान कितना होगा?

- (A) $\frac{13}{5}$ (B) $\frac{12}{13}$
 (C) $\frac{13}{12}$ (D) $\frac{5}{12}$

11. A vertical pole and a vertical tower are on the same level ground in such a way that, from the top of the pole, the angle of elevation of the top of the tower is 60° and the angle of depression of the bottom of the tower is 30° . If the height of the pole is 24 m, then find the height of the tower (in m).

एक ऊर्ध्वाधर खम्बा और एक ऊर्ध्वाधर मीनार एक ही समतल जमीन पर इस प्रकार हैं कि खम्बे के शिखर से मीनार के शिखर का उन्नयन कोण 60° है तथा मीनार के तल का अवनमन कोण 30° है। यदि खम्बे की ऊँचाई 24 मी. है, तो मीनार की ऊँचाई (मी. में) ज्ञात कीजिए।

- (A) $24(\sqrt{3} + 1)$ (B) $24\sqrt{3}(\sqrt{3} + 1)$
 (C) 96 (D) 72

12. The value of $1 + \sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}}$, if $0^\circ < \theta < 90^\circ$, is equal to :

यदि $0^\circ < \theta < 90^\circ$ है, तो $1 + \sqrt{\frac{\cot\theta + \cos\theta}{\cot\theta - \cos\theta}}$ का मान ज्ञात कीजिए-

- (A) $1 - \sec\theta + \tan\theta$ (B) $1 + \sec\theta - \tan\theta$
 (C) $1 - \sec\theta - \tan\theta$ (D) $1 + \sec\theta + \tan\theta$

13. The value of $\left(\frac{1 - \cot\theta}{1 - \tan\theta}\right)^2 - 1$ when $0^\circ < \theta < 90^\circ$, is equal to :

$\left(\frac{1 - \cot\theta}{1 - \tan\theta}\right)^2 - 1$ का मान ज्ञात कीजिए, यदि $0^\circ < \theta < 90^\circ$ है।

- (A) $\sin^2\theta - 1$ (B) $\sec^2\theta + 1$
 (C) $\cos^2\theta - 1$ (D) $\cot^2\theta - 1$

14. $\tan^2 A + 5\sec A = 13$, where $0 < A < 90^\circ$. Solve for A (in degrees).

$\tan^2 A + 5\sec A = 13$ है, जहाँ $0 < A < 90^\circ$ है। A का माप (डिग्री में) बताइए।

- (A) 30 (B) 60
 (C) 0 (D) 45

15. If $2k\sin 30^\circ \cos 30^\circ \cot 60^\circ =$

$\frac{\cot^2 30^\circ \sec 60^\circ \tan 45^\circ}{\cosec^2 45^\circ \cosec 30^\circ}$, then find the value of k.

यदि $2k\sin 30^\circ \cos 30^\circ \cot 60^\circ =$

$\frac{\cot^2 30^\circ \sec 60^\circ \tan 45^\circ}{\cosec^2 45^\circ \cosec 30^\circ}$ है, तो k का मान ज्ञात कीजिए।

- (A) 1 (B) $\frac{3}{2}$
 (C) 3 (D) 6

16. From a point P on a level ground, the angle of elevation of the top of a tower is 30° . If the tower is $110\sqrt{3}$ m high, what is the distance (in m) of point P from the foot of the tower?

समतल भूमि पर किसी बिन्दु P से एक मीनार के शीर्ष का उन्नयन कोण 30° है। यदि मीनार $110\sqrt{3}$ मी. ऊँची है, तो मीनार के पाद से बिन्दु P की दूरी (मी. में) क्या है?

- (A) 110 (B) 330
 (C) 220 (D) 115

17. If $5\sin\theta - 4\cos\theta = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\frac{5\sin\theta + 2\cos\theta}{5\sin\theta + 3\cos\theta}$ is :

यदि $5\sin\theta - 4\cos\theta = 0$, $0^\circ < \theta < 90^\circ$ है, तो $\frac{5\sin\theta + 2\cos\theta}{5\sin\theta + 3\cos\theta}$ का मान बताइए।

- (A) $\frac{4}{7}$ (B) $\frac{2}{7}$
 (C) $\frac{3}{7}$ (D) $\frac{6}{7}$

18. Find the value of the following expression :

$$\frac{\tan^3 45^\circ + 4\cos^3 60^\circ}{2\cosec^2 45^\circ - 3\sec^2 30^\circ + \sin 30^\circ}$$

निम्नलिखित व्यंजक का मान ज्ञात कीजिए।

$$\frac{\tan^3 45^\circ + 4\cos^3 60^\circ}{2\cosec^2 45^\circ - 3\sec^2 30^\circ + \sin 30^\circ}$$

- (A) $\frac{3}{4}$ (B) $1 + \sqrt{2}$
 (C) $\frac{4}{3}$ (D) 3

19. The expression $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 3$ is equal to :

व्यंजक $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 3$ का मान ज्ञात कीजिए।

- (A) 0 (B) -1
 (C) 2 (D) 1

50. If $\frac{\sin^2\phi - 3\sin\phi + 2}{\cos^2\phi} = 1$, where $0^\circ < \phi < 90^\circ$, then what is the value of $(\cos 2\phi - \sin 3\phi + \operatorname{cosec} 2\phi)$

यदि $\frac{\sin^2\phi - 3\sin\phi + 2}{\cos^2\phi} = 1$ है, जहाँ $0^\circ < \phi < 90^\circ$ है, तो $(\cos 2\phi - \sin 3\phi + \operatorname{cosec} 2\phi)$ का मान क्या है?

- (A) $\frac{-3 - 4\sqrt{3}}{6}$ (B) $\frac{-3 + 4\sqrt{3}}{6}$
 (C) $\frac{3 + 4\sqrt{3}}{6}$ (D) $\frac{3 - 4\sqrt{3}}{6}$

51. A ladder 18m long rests against a wall so that the angle between the ladder and the wall is 30° . How far (in m) is the base of the ladder from the wall?

एक 18 m लंबी सीढ़ी किसी दीवार के सहारे ऐसे टिकी हुई है कि सीढ़ी और दीवार के बीच का कोण 30° है। सीढ़ी का आधार दीवार से कितनी दूर (m में) है?

- (A) 18 (B) $9\sqrt{3}$
 (C) 9 (D) $18\sqrt{3}$

52. If $\sec^2\alpha + 4\cos^2\alpha = 4$ and $0^\circ \leq \alpha \leq 90^\circ$, then find the value of α .

यदि $\sec^2\alpha + 4\cos^2\alpha = 4$ और $0^\circ \leq \alpha \leq 90^\circ$ है, तो α का मान ज्ञात कीजिए।

- (A) 30° (B) 0°
 (C) 45° (D) 60°

53. If $\tan A = \frac{2.4}{0.7}$ what is the value of $(50 \cos A + 24 \cot A)$?

यदि $\tan A = \frac{2.4}{0.7}$ है, तो $(50 \cos A + 24 \cot A)$ का मान ज्ञात करें।

- (A) 21 (B) 37
 (C) 26 (D) 34

54. The length of the shadow of a vertical tower on level ground increases by 8.4 cm when the altitude of the sun changes from 45° to 30° . What is the height of the tower (in m)?

जब सूर्य का उन्नयन कोण 45° से 30° हो जाता है, तो समतल भूमि पर एक ऊर्ध्वाधर मीनार की छाया की लंबाई 8.4 cm बढ़ जाती है। मीनार की ऊँचाई (m में) कितनी है?

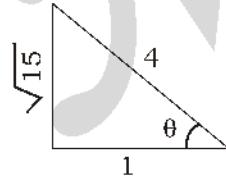
- (A) $4.2(\sqrt{3} - 1)$ (B) $8.4(\sqrt{3} + 3)$
 (C) $4.2(\sqrt{3} + 3)$ (D) $4.2(\sqrt{3} + 1)$

Solution

$$\begin{aligned} 1. \quad (D) \quad 4\sin^2\theta &= 3(1+\cos\theta) \\ \Rightarrow 4 - 4\cos^2\theta - 3 - 3\cos\theta &= 0 \\ \Rightarrow 4\cos^2\theta + 3\cos\theta - 1 &= 0 \end{aligned}$$

$$\cos\theta = \frac{1}{4}, -1(x)$$

$$\Rightarrow \cos\theta = \frac{1}{4}$$



$$\therefore 2\tan\theta + 4\sin\theta - \sec\theta$$

$$= 2 \times \sqrt{15} + 4 \times \frac{\sqrt{15}}{4} - \frac{4}{1}$$

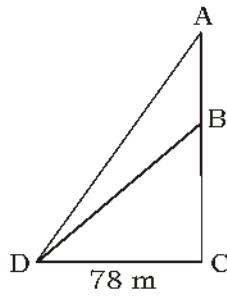
$$= 2\sqrt{15} + \sqrt{15} - 4$$

$$= 3\sqrt{15} - 4$$

$$2. \quad (C) \quad \frac{\sin 23^\circ \cdot \sin 23^\circ + \operatorname{cosec} 38^\circ \cdot \sin 38^\circ + \cos 23^\circ \cdot \cos 23^\circ + \sec 38^\circ \cdot \cos 38^\circ}{\operatorname{Sec}^2 70^\circ - \tan^2 70^\circ}$$

$$= \frac{\sin^2 23^\circ + \cos^2 23^\circ + 1 + 1}{1} = \frac{3}{1} = 3$$

3. (D) DC = 78m (given)



$$AB : BC = 1 : 2$$

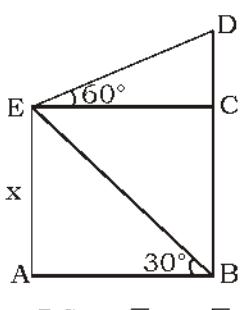
$$\Rightarrow BC = \frac{78}{\sqrt{3}} = 26\sqrt{3}$$

$$AB = 52\sqrt{3}$$

4. (A) BD = 76m (given)

$$AB = EC = x\sqrt{3}$$

$$\tan 60^\circ = \sqrt{3} = \frac{DC}{EC}$$



$$\Rightarrow DC = \sqrt{3} \times x\sqrt{3}$$

$$DC = 3x$$

ATQ,

$$3x + x = 76$$

$$\Rightarrow x = 19$$

\therefore height of pole = 19m.

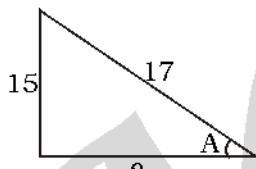
5. (B) $A-B = 30^\circ$

$$A = 60^\circ$$

$$\Rightarrow B = 30^\circ$$

6. (A) $= 8\sqrt{3} \times \frac{1}{2} \times \sqrt{3} - 3 + \frac{3}{2} + 2 \times \frac{3}{4}$
 $= 9 + \frac{3}{2} + \frac{3}{2} = 12$

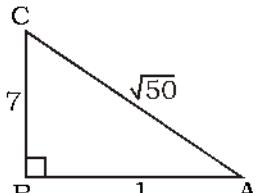
7. (D) $\sec A = \frac{17}{8}, \frac{34 \sin A + 15 \cot A}{68 \cos A - 16 \tan A}$



$$= \frac{34 \times \frac{15}{17} + 15 \times \frac{8}{15}}{68 \times \frac{8}{17} - 16 \times \frac{15}{8}}$$

$$= \frac{30 + 8}{32 - 30} = \frac{38}{2} = 19$$

8. (A) $\tan^2 A + 2\tan A - 63 = 0$



$$\Rightarrow (\tan A + 7)(\tan A - 7) = 0$$

$$\tan A = 7$$

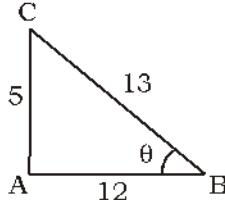
$\therefore 2\sin A + 5\cos A$

$$= 2 \times \frac{7}{\sqrt{50}} + 5 \times \frac{1}{\sqrt{50}} = \frac{19}{\sqrt{50}}$$

9. (C) $3\sec^2 \theta + \tan \theta - 7 = 0$
 $3(1 + \tan^2 \theta) + \tan \theta - 7 = 0$
 $3\tan^2 \theta + \tan \theta - 4 = 0$
 $3\tan^2 \theta + 4 \tan \theta - 3\tan \theta - 4$
 $\tan \theta(3\tan \theta + 4) - 1(3\tan \theta + 4)$
 $\tan \theta = 1$
 $\theta = 45^\circ$

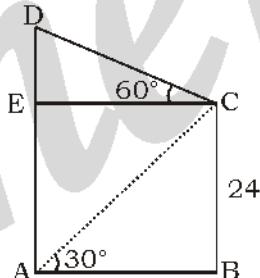
$$\frac{2\sin \theta + 3\cos \theta}{\cosec \theta + \sec \theta} = \frac{2 \times \frac{1}{\sqrt{2}} + \frac{3}{\sqrt{2}}}{2\sqrt{2}} = \frac{5}{4}$$

10. (A)



$$\cot B = \frac{12}{5} \left(\frac{A}{L}\right) \quad \sec B = \frac{13}{5} \left(\frac{K}{L}\right)$$

11. (C)



(Pole) BC \Rightarrow 24

(Tower) AD \Rightarrow ? (AE + ED)

ΔABC

$$\tan 30^\circ \Rightarrow \frac{BC}{AB} \Rightarrow \frac{1}{\sqrt{3}} \Rightarrow \frac{24}{AB}$$

$$AB \Rightarrow 24\sqrt{3} = CE$$

ΔDEC

$$\tan 60^\circ \Rightarrow \frac{DE}{EC}$$

$$\sqrt{3} \Rightarrow \frac{DE}{24\sqrt{3}}$$

Height of Tower $\Rightarrow 72 + 24 \Rightarrow 96$

12. (D) $1 + \sqrt{\frac{\cot \theta + \cos \theta}{\cot \theta - \cos \theta}}$

$$\Rightarrow 1 + \sqrt{\frac{\frac{\cos \theta}{\sin \theta} + \frac{\cos \theta}{\sin \theta}}{\frac{\cos \theta}{\sin \theta} - \cos \theta}}$$

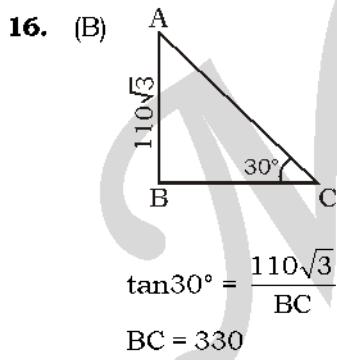
$$\Rightarrow 1 + \sqrt{\frac{1+\sin\theta}{1-\sin\theta} \times \frac{(1+\sin\theta)}{(1+\sin\theta)}} \\ = 1 + \sqrt{\frac{(1+\sin\theta)^2}{\cos^2\theta}} \Rightarrow 1 + \sec\theta + \tan\theta$$

13. (D) $\left(\frac{1-\cot\theta}{1-\tan\theta}\right)^2 - 1$

$$\left(\frac{1-\cot\theta}{1-\frac{1}{\cot\theta}}\right)^2 - 1 \Rightarrow \left(\frac{1-\cot\theta}{\frac{\cot-1}{\cot}}\right)^2 - 1 \\ \cot^2\theta - 1$$

14. (B) $\tan^2 A + 5\sec A = 13$
 $\sec^2 A + 5\sec A - 14 = 0$
 $(\sec A - 2)(\sec A + 7)$
 $\sec A = 2$
 $A = 60^\circ$

15. (C) $K = \frac{\cot^2 30^\circ \sec 60^\circ \times \tan 45}{2 \times \cosec^2 45^\circ \cosec 30^\circ \cdot \cos 30^\circ \cdot \cot 60^\circ \times \sin 30^\circ}$
 $K = \frac{3 \times 2 \times 1}{2 \times 2 \times \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{3}}} = 3$



17. (D) $5\sin\theta = 4\cos\theta \Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{4}{5}$

$$\frac{(5\sin\theta + 2\cos\theta) \times \frac{1}{\cos\theta}}{(5\sin\theta + 3\cos\theta) \times \frac{1}{\cos\theta}} \Rightarrow \frac{5\frac{\sin\theta}{\cos\theta} + 2}{5\frac{\sin\theta}{\cos\theta} + 3}$$

$$\Rightarrow \frac{5\left(\frac{4}{5}\right) + 2}{5\left(\frac{4}{5}\right) + 3} \Rightarrow \frac{4+2}{4+3} = \frac{6}{7}$$

18. (D) $\frac{(1)^3 + 4\left(\frac{1}{2}\right)^3}{2\left(\sqrt{2}\right)^2 - 3\left(\frac{2}{\sqrt{3}}\right)^2 + \frac{1}{2}} \Rightarrow \frac{1 + \frac{1}{2}}{4 - 4 + \frac{1}{2}} \Rightarrow \frac{\frac{3}{2}}{\frac{1}{2}} = 3$

19. (A) $(\cos^6\theta + \sin^6\theta - 1)(\tan^2\theta + \cot^2\theta + 2) + 3$
 We know that,
 $\Rightarrow \sin^6\theta + \cos^6\theta = (\sin^2\theta + \cos^2\theta)^3 - 3\sin^2\theta \cdot \cos^2\theta$
 $\Rightarrow (1 - 3\sin^2\theta \cdot \cos^2\theta - 1)(\tan\theta + \cot\theta)^2 + 3$
 $\Rightarrow (-3 \cdot \sin^2\theta \cdot \cos^2\theta)(\tan\theta + \cot\theta)^2 + 3$
 $\Rightarrow -3(\sin^2\theta \cdot \cos^2\theta) \left(\frac{\sin^2\theta + \cos^2\theta}{\cos\theta \cdot \sin\theta} \right)^2 + 3$
 $\Rightarrow -3(\sin^2\theta \cdot \cos^2\theta) \left(\frac{1}{\sin^2\theta \cdot \cos^2\theta} \right) + 3$

20. (B) $5\sin\theta = 4\cos\theta \Rightarrow \frac{\sin\theta}{\cos\theta} = \frac{4}{5}$

$$\frac{(5\sin\theta - \cos\theta) \frac{1}{\cos\theta}}{(5\sin\theta + 3\cos\theta) \frac{1}{\cos\theta}} \Rightarrow \frac{5(4/5) - 1}{5(4/5) + 3}$$

$$\Rightarrow \frac{4 - 1}{4 + 3} = \frac{3}{7}$$

21. (C) $(\sin^2\theta - \cos^2\theta) - 3\sin\theta + 2 = 0$
 $(\sin^2\theta - 1 + \sin^2\theta) - 3\sin\theta + 2 = 0$
 $\Rightarrow 2\sin^2\theta - 1 - 3\sin\theta + 2 = 0$
 $\Rightarrow 2\sin^2\theta - 3\sin\theta + 1 = 0$
 $\sin\theta = -\frac{-(-3) + \sqrt{9 - 4(2)(1)}}{2(2)}, -\frac{-(-3) - \sqrt{9 - 4(2)(1)}}{2(2)}$

$$\Rightarrow \frac{1}{2}, 1$$

$\therefore \theta = 0^\circ < \theta < 90^\circ$

So, $\sin\theta = \frac{1}{2}$

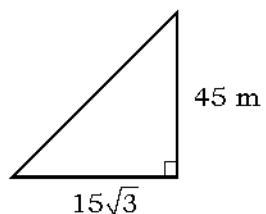
$\theta = 30^\circ$

$1 + \sec 30^\circ + \tan 30^\circ$

$$\Rightarrow 1 + \frac{2}{\sqrt{3}} + \frac{1}{\sqrt{3}} \Rightarrow \frac{\sqrt{3} + 3}{\sqrt{3}}$$

$$\Rightarrow 1 + \sqrt{3}$$

22. (A)



$$\tan \theta = \frac{45}{15\sqrt{3}} = \sqrt{3}$$

$$\theta = 60^\circ$$

23. (A) $(\sec \phi - \tan \phi)^2 \cdot \frac{(1 + \sin \phi)^2}{\cos \phi^2}$

$\Rightarrow (\sec \phi - \tan \phi)^2 \cdot (\sec \phi + \tan \phi)^2$

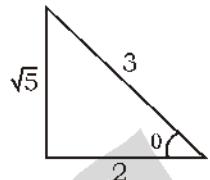
$\Rightarrow \sec \phi - \tan \phi = \frac{1}{\sec \phi + \tan \phi}$

$= \frac{1}{(\sec \phi + \tan \phi)^2} \times (\sec \phi + \tan \phi)^2 = 1$

24. (A) $\frac{(8 \cos 60^\circ + 7 \sec 60^\circ - \tan^2 60^\circ)}{10 \sin 30^\circ}$

$\frac{4 + 14 - 3}{5} \Rightarrow 3$

25. (B)



$(1 + \tan^2 \theta) + \tan^2 \theta \Rightarrow 3 \frac{1}{2}$

$2 \tan^2 \theta = \frac{5}{2} \Rightarrow \tan \theta = \frac{\sqrt{5}}{2}$

$\cos \theta + \sin \theta \Rightarrow \frac{2}{3} + \frac{\sqrt{5}}{3} \Rightarrow \frac{2 + \sqrt{5}}{3}$

 26. (C) If $\theta = 45^\circ$

$$\frac{(\cos 645^\circ + \sin 645^\circ - 1)}{(\tan^2 45^\circ + \cot^2 45^\circ + 2)} + 1$$

$$\frac{-3}{4} \times 4 + 1$$

$$-2$$

27. (A)

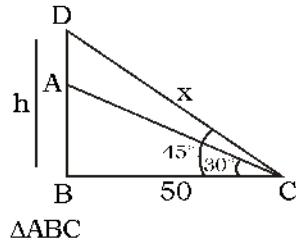
$$2 - \sqrt{\frac{\cos \theta + \cos \theta}{\sin \theta}}$$

$$\frac{\cos \theta}{\sin \theta} - \cos \theta$$

$$\Rightarrow 2 - \sqrt{\frac{1 + \sin \theta}{1 - \sin \theta} \times \frac{1 + \sin \theta}{1 + \sin \theta}}$$

$$\Rightarrow 2 - \frac{1 + \sin \theta}{\cos \theta} = 2 - \sec \theta - \tan \theta$$

28. (B)



$$\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{AB}{50} \Rightarrow AB = \frac{50}{\sqrt{3}}$$

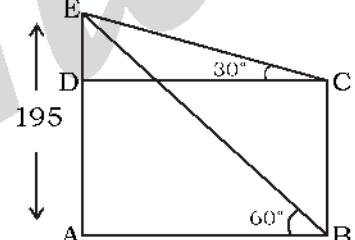
ΔDBC

$$\tan 45^\circ = 1 = \frac{BD}{50} \Rightarrow 1 = \frac{\sqrt{3}}{50}$$

$$h = 50 - \frac{50}{\sqrt{3}} \Rightarrow 200 = \frac{100(3 - \sqrt{3})}{3}$$

$$h = \frac{(50)(3 - \sqrt{3})}{3}$$

29. (C)



$$AE \Rightarrow 195$$

$$\tan 60^\circ = \frac{195}{AB} = \sqrt{3}$$

$$AB = \frac{195}{\sqrt{3}} \left(\frac{\sqrt{3}}{\sqrt{3}} \right) \Rightarrow 65\sqrt{3} \text{ (DC)}$$

$$\tan 30^\circ = \frac{h}{65\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$h = 65$$

$$195 - 65 \Rightarrow 130$$

 30. (C) $A = 10^\circ$

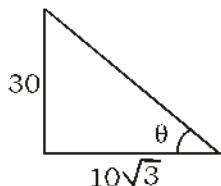
$$\frac{12 \sin 30^\circ + 5 \cos 45^\circ}{9 \sin 45^\circ - 4 \cos 60^\circ}$$

$$\frac{6 + \frac{5}{\sqrt{2}}}{\frac{9}{\sqrt{2}} - 2} = \frac{6\sqrt{2} + 5}{9 - 2\sqrt{2}}$$

31. (A) $2(1-\cos^2\theta) + 3\cos\theta = 3$
 $2\cos^2\theta - 3\cos\theta + 1 = 0$
 $(2\cos\theta - 1)(\cos\theta - 1) = 0$
 $\theta = 60^\circ$

$$(4) + \frac{1}{3} \Rightarrow 4\frac{1}{3}$$

32. (A)



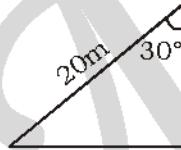
$$\frac{P}{B} \Rightarrow \frac{30}{10\sqrt{3}} \Rightarrow \sqrt{3}$$

$$\tan q \Rightarrow \sqrt{3} = \theta \Rightarrow 60^\circ$$

33. (C) $\frac{10\sin 30^\circ + 8\cos 60^\circ}{7\sin 90^\circ - 12\cos 60^\circ} \Rightarrow$
 $\frac{5+4}{7-6} \Rightarrow 9$

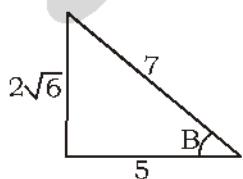
34. (A) $3(1-\cos^2\theta) + 4\cos\theta - 4 = 0$
 $3-3\cos^2\theta + 4\cos\theta - 4 = 0$
 $3\cos^2\theta - 4\cos\theta - 1 = 0$
 $(3\cos\theta - 1)(\cos\theta + 1) = 0$
 $\cos\theta = \frac{1}{3}$
 $\cosec^2\theta + \cot^2\theta$
 $\Rightarrow \left(\frac{3}{\sqrt{8}}\right)^2 + \left(\frac{1}{\sqrt{8}}\right)^2 \Rightarrow \frac{9}{8} + \frac{1}{8} \Rightarrow \frac{5}{4}$

35. (D)



$$\sin 30^\circ = \frac{x}{20} = \frac{1}{2} \Rightarrow x = 10\text{m}$$

36. (D)



$$\cos B = \frac{5}{7}$$

$$\cosec B + \cot B \Rightarrow \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}}$$

$$\Rightarrow \frac{12}{2\sqrt{6}} = \sqrt{6}$$

37. (C) $\sec 53^\circ + \cot 37^\circ$

$$\Rightarrow \frac{1}{\cos 53^\circ} + \tan 53^\circ \Rightarrow \frac{1 + \sin 53^\circ}{\cos 53^\circ}$$

$$= \frac{1 + \frac{\sqrt{y^2 - x^2}}{y}}{\frac{x}{y}} = \frac{(y + \sqrt{y^2 - x^2})}{yx}$$

$$\Rightarrow \frac{y + \sqrt{y^2 - x^2}}{x}$$

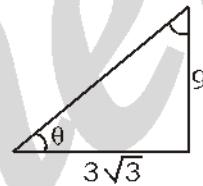
38. (D) $\frac{\cos\theta}{1 - \frac{\sin\theta}{\cos\theta}} + \frac{\sin\theta}{1 - \frac{\cos\theta}{\sin\theta}} - \sin\theta$

$$= \frac{\cos^2\theta}{\cos\theta - \sin\theta} - \frac{\sin^2\theta}{\cos\theta - \sin\theta} - \sin\theta$$

$$= \frac{(\cos^2\theta - \sin^2\theta)}{(\cos\theta - \sin\theta)} - \sin\theta$$

$$= \cos\theta + \sin\theta - \sin\theta = \cos\theta$$

39. (C)

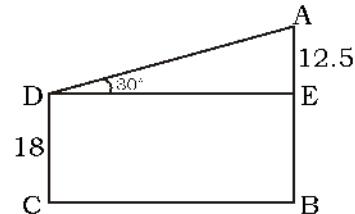


$$\tan\theta = \frac{9}{3\sqrt{3}}$$

$$\Rightarrow \tan\theta = \frac{3}{\sqrt{3}} = \sqrt{3}$$

40. (B) $\cot^2\alpha + \tan^2\alpha = 2$
 put $\alpha = 45^\circ$

41. (B)



$$AB = 30.5\text{m}$$

$$CD = 18\text{ m}$$

$$AE = 12.5$$

$$\Rightarrow \sin 30^\circ = \frac{12.5}{x}$$

$$\Rightarrow \frac{1}{2} = \frac{12.5}{x}$$

$$\Rightarrow x = 25\text{ m}$$

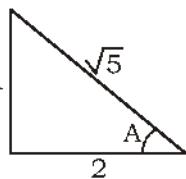
\therefore length of wire = 25 m

42. (D) $\cosec^4 A (1 - \cos^2 A) - 2\cot^2 A - 1$
 Put $A = 45^\circ$

$$= 4\left(1 - \frac{1}{4}\right) - 2 - 1 \\ = 4 - 1 - 3 = 0$$

43. (D) $6\tan A (\tan A + 1) = 5 - \tan A$
 $\Rightarrow 6\tan^2 A + 7\tan A - 5 = 0$
 $\Rightarrow 6\tan^2 A + 10\tan A - 3\tan A - 5 = 0$
 $\Rightarrow 2\tan A(3\tan A + 5) - 1(3\tan A + 5) = 0$

$$\Rightarrow \tan A = \frac{1}{2}$$



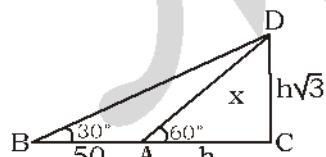
$$\therefore \sin A + \cos A = \frac{1}{\sqrt{5}} + \frac{2}{\sqrt{5}} = \frac{3}{\sqrt{5}}$$

44. (A) $\tan B = \frac{5}{3}$

$$\Rightarrow \frac{\cosec B + \sin B}{\cos B - \sec B} = \frac{\frac{\sqrt{34}}{5} + \frac{5}{\sqrt{34}}}{\frac{3}{\sqrt{34}} - \frac{\sqrt{34}}{3}}$$

$$= \frac{\frac{34+25}{9-34}}{\frac{5\sqrt{34}}{3\sqrt{34}}} = \frac{-59 \times 3}{25 \times 5} = \frac{-177}{125}$$

45. (A)



let $AC = h$

$$\therefore CD = h\sqrt{3}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h\sqrt{3}}{h+50}$$

$$\Rightarrow h = 25$$

$$\text{height of tree} = 25\sqrt{3}$$

$$\Rightarrow 40\% \text{ of } 25\sqrt{3} = \frac{2}{5} \times 25\sqrt{3} = 10\sqrt{3}$$

46. (C) $\tan^2 A - 6\tan A + 9 = 0$
 $\Rightarrow (\tan A - 3)^2 = 0$
 $\tan A = 3$

$$\therefore 6\cot A + 8\sqrt{10} \cos A = 6 \times \frac{1}{3} + 8\sqrt{10} \times \frac{1}{\sqrt{10}} \\ = 2 + 8 = 10$$

47. (B) $\frac{8\sin 30^\circ + 11\cosec 30^\circ - \cot^2 30^\circ}{10\cos 60^\circ}$

$$\Rightarrow \frac{8\left(\frac{1}{2}\right) + 11(2) - (\sqrt{3})^2}{10\left(\frac{1}{2}\right)} \Rightarrow \frac{4 + 22 - 3}{5}$$

$$\Rightarrow \frac{23}{5} = 4\frac{3}{5}$$

48. (D) $(2\cos A + 1)(2\cos A - 1) = 0$
 So either $2\cos A + 1 = 0$ or $2\cos A - 1 = 0$
 $\therefore A = 0 < A < 90^\circ$

$$\text{So, } 2\cos A - 1 = 0 \cos A = \frac{1}{2}$$

$$\text{So, } A = 60^\circ$$

49. (C) $\cosec A = \sec B \Rightarrow \cosec A = \cosec(90 - B)$
 $\Rightarrow A = 90 - B \text{ or } A + B = 90^\circ$

50. (B) $\sin^2 \phi - 3\sin \phi + 2 = \cos^2 \phi$
 $\Rightarrow \sin^2 \phi - 3\sin \phi + 2 = 1 - \sin^2 \phi$
 $\Rightarrow 2\sin^2 \phi - 3\sin \phi + 1 = 0$
 $\Rightarrow 2\sin^2 \phi - 2\sin \phi - \sin \phi + 1 = 0$
 $\Rightarrow 2\sin \phi (\sin \phi - 1) - 1(\sin \phi - 1) = 0$
 $\Rightarrow (\sin \phi - 1)(2\sin \phi - 1) = 0$

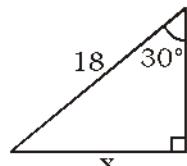
$$\sin \phi = 1, \frac{1}{2} \quad \phi = 30^\circ$$

$$\cos 60^\circ - \sin 90^\circ + \cosec 60^\circ$$

$$\Rightarrow \frac{1}{2} - 1 + \frac{2}{\sqrt{3}} \Rightarrow \frac{2}{\sqrt{3}} - \frac{1}{2}$$

$$\Rightarrow \frac{4 - \sqrt{3}}{2\sqrt{3}} \Rightarrow \frac{4\sqrt{3} - 3}{6}$$

51. (C)



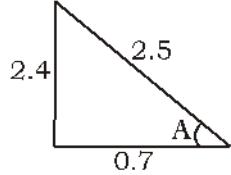
$$\sin 30^\circ = \frac{x}{18} = \frac{1}{2} \Rightarrow x = 9\text{m}$$

52. (C) $\frac{1}{\cos^2 \alpha} + 4\cos^2 \alpha = 4 \Rightarrow 2\cos^2 \alpha + \frac{1}{2\cos^2 \alpha} = 2$

$$\text{So, } 2\cos^2 \alpha = 1 \Rightarrow \cos^2 \alpha = \frac{1}{2}$$

$$\Rightarrow \cos \alpha = \frac{1}{\sqrt{2}} \Rightarrow \alpha = 45^\circ$$

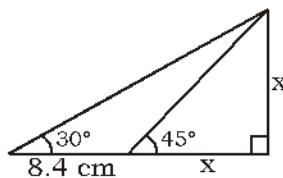
53. (A)



$$\tan A = \frac{2.4}{0.7}$$

$$\text{So } \left(\frac{.7}{2.5}\right) + 24\left(\frac{.7}{2.4}\right) \Rightarrow 14 + 7 = 21$$

54. (D)



$$\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{x}{x + 8.4}$$

$$\Rightarrow x + 8.4 = \sqrt{3}x$$

$$\Rightarrow 8.4 = (\sqrt{3} - 1)x$$

$$\Rightarrow x = \frac{8.4}{(\sqrt{3} - 1)} \text{ or } \frac{8.4(\sqrt{3} + 1)}{2}$$

$$\Rightarrow x = 4.2(\sqrt{3} + 1)$$

(SSC CGL (PRE) - 2020)

- 1.** If $\frac{\cos^2\theta}{\cot^2\theta + \sin^2\theta - 1} = 3$, $0^\circ < \theta < 90^\circ$, then the value of $(\tan\theta + \operatorname{cosec}\theta)$ is :
- यदि $\frac{\cos^2\theta}{\cot^2\theta + \sin^2\theta - 1} = 3$, $0^\circ < \theta < 90^\circ$, तो $(\tan\theta + \operatorname{cosec}\theta)$ का मान ज्ञात करो।
- (A) $\frac{5\sqrt{3}}{3}$ (B) $3\sqrt{3}$ (C) $2\sqrt{3}$ (D) $\frac{4\sqrt{3}}{3}$
- 2.** $\frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta - 1} + \frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta + 1} - \tan^2\theta$, $0^\circ < \theta < 90^\circ$, is equal to.
- $\frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta - 1} + \frac{\operatorname{cosec}\theta}{\operatorname{cosec}\theta + 1} - \tan^2\theta$, $0^\circ < \theta < 90^\circ$ के बराबर है।
- (A) $\sec^2\theta + 1$ (B) $\sec^2\theta$
 (C) $2\sec^2\theta$ (D) $1 - \tan^2\theta$
- 3.** Find the value of $\cot 25^\circ \cot 35^\circ \cot 45^\circ \cot 55^\circ \cot 65^\circ$.
- $\cot 25^\circ \cot 35^\circ \cot 45^\circ \cot 55^\circ \cot 65^\circ$ का मान ज्ञात कीजिए।
- (A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$ (C) $\frac{\sqrt{3}}{2}$ (D) 1
- 4.** Find the value of
- $$\frac{8 \sin 30^\circ \sin^2 60^\circ - 4 \sin 90^\circ - \sec^2 45^\circ}{\tan^2 45^\circ - \cot^2 30^\circ}$$
- $$\frac{8 \sin 30^\circ \sin^2 60^\circ - 4 \sin 90^\circ - \sec^2 45^\circ}{\tan^2 45^\circ - \cot^2 30^\circ}$$
- का मान ज्ञात कीजिए।
- (A) $-\frac{1}{2}$ (B) $\frac{5}{2}$ (C) $\frac{3}{4}$ (D) $\frac{3}{2}$
- 5.** The value of
- $$\frac{2 \sin^2 30^\circ \tan 60^\circ - 3 \cos^2 60^\circ \sec^2 30^\circ}{4 \cot^2 45^\circ - \sec^2 60^\circ + \sin^2 60^\circ + \cos^2 90^\circ}$$
- $$\frac{2 \sin^2 30^\circ \tan 60^\circ - 3 \cos^2 60^\circ \sec^2 30^\circ}{4 \cot^2 45^\circ - \sec^2 60^\circ + \sin^2 60^\circ + \cos^2 90^\circ}$$
- का मान ज्ञात करो।
- (A) $\frac{2(\sqrt{3}-2)}{3}$ (B) $\frac{(\sqrt{3}+2)}{3}$
 (C) $\frac{2(\sqrt{3}+2)}{3}$ (D) $\frac{(\sqrt{3}-2)}{3}$
- 6.** If $2\cos^2\theta = 3\sin\theta$, $0^\circ < \theta < 90^\circ$, then the value of $(\sec^2\theta - \tan^2\theta + \cos^2\theta)$ is:
- यदि $2\cos^2\theta = 3\sin\theta$, $0^\circ < \theta < 90^\circ$ तो $(\sec^2\theta - \tan^2\theta + \cos^2\theta)$ का मान है:
- (A) $\frac{9}{4}$ (B) $\frac{5}{4}$ (C) $\frac{3}{4}$ (D) $\frac{7}{4}$
- 7.** If $3\tan\theta = 2\sqrt{3} \sin\theta$, $0^\circ < \theta < 90^\circ$, then find the value of $2\sin^2 2\theta - 3\cos^2 3\theta$.
- यदि $3\tan\theta = 2\sqrt{3} \sin\theta$, $0^\circ < \theta < 90^\circ$, तो $2\sin^2 2\theta - 3\cos^2 3\theta$ का मान ज्ञात करो।
- (A) $-\frac{3}{2}$ (B) $\frac{1}{2}$ (C) $\frac{3}{2}$ (D) 1
- 8.** If $3\sec\theta + 4\cos\theta - 4\sqrt{3} = 0$, where θ is an acute angle then the angle of θ is:
- यदि $3\sec\theta + 4\cos\theta - 4\sqrt{3} = 0$ जहाँ θ एक न्यून कोण है, तो θ का मान है।
- (A) 45° (B) 60°
 (C) 20° (D) 30°
- 9.** The value of $\frac{\tan(45^\circ - \alpha)}{\cot(45 + \alpha)}$ -
- $$\frac{(\cos 19^\circ + \sin 71^\circ)(\sec 19^\circ + \operatorname{cosec} 71^\circ)}{\tan 12^\circ \tan 24^\circ \tan 66^\circ \tan 78^\circ}$$
- $$\frac{\tan(45^\circ - \alpha)}{\cot(45 + \alpha)} -$$
- $$\frac{(\cos 19^\circ + \sin 71^\circ)(\sec 19^\circ + \operatorname{cosec} 71^\circ)}{\tan 12^\circ \tan 24^\circ \tan 66^\circ \tan 78^\circ}$$
- का मान है।
- (A) -3 (B) 2
 (C) -2 (D) 0
- 10.** $1 + 2\tan^2\theta + 2\sin\theta\sec^2\theta$, $0^\circ < \theta < 90^\circ$, is equal to:
 $1 + 2\tan^2\theta + 2\sin\theta\sec^2\theta$, $0^\circ < \theta < 90^\circ$, बराबर है।
- (A) $\frac{1 - \cos\theta}{1 + \cos\theta}$ (B) $\frac{1 + \cos\theta}{1 - \cos\theta}$
 (C) $\frac{1 - \sin\theta}{1 + \sin\theta}$ (D) $\frac{1 + \sin\theta}{1 - \sin\theta}$

- 11.** If $\frac{\operatorname{cosec}\theta + \cot\theta}{\operatorname{cosec}\theta - \cot\theta} = 7$, then the value of $\frac{4\sin^2\theta - 1}{4\sin^2\theta + 5}$ is:
- यदि $\frac{\operatorname{cosec}\theta + \cot\theta}{\operatorname{cosec}\theta - \cot\theta} = 7$ तो $\frac{4\sin^2\theta - 1}{4\sin^2\theta + 5}$ का मान है:
- (A) $-\frac{1}{9}$ (B) $\frac{1}{3}$ (C) $-\frac{1}{3}$ (D) $\frac{1}{9}$
- 12.** If $3\cos^2\theta - 4\sin\theta + 1 = 0$, $0^\circ < \theta < 90^\circ$, then $\tan\theta + \sec\theta = ?$
- यदि $3\cos^2\theta - 4\sin\theta + 1 = 0$, $0^\circ < \theta < 90^\circ$ तो $\tan\theta + \sec\theta = ?$
- (A) $2\sqrt{5}$ (B) $2\sqrt{3}$
 (C) $3\sqrt{3}$ (D) $\sqrt{5}$
- 13.** $\frac{\cot^3\theta}{\operatorname{cosec}^2\theta} + \frac{\tan^3\theta}{\sec^2\theta} + 2\sin\theta\cos\theta = ?$
- $\frac{\cot^3\theta}{\operatorname{cosec}^2\theta} + \frac{\tan^3\theta}{\sec^2\theta} + 2\sin\theta\cos\theta$ का मान ज्ञात करो।
- (A) $\operatorname{cosec}\theta\sec\theta$ (B) $\sin\theta\cos\theta$
 (C) $\operatorname{cosec}^2\theta\sec^2\theta$ (D) $\sin^2\theta\cos\theta$
- 14.** If $2\sin(3x - 15)^\circ = 1$, $0^\circ < (3x - 15) < 90^\circ$, then find the value of $\cos^2(2x + 15)^\circ + \cot^2(x + 15)^\circ$.
- यदि $2\sin(3x - 15)^\circ = 1$, $0^\circ < (3x - 15) < 90^\circ$ है, तो $\cos^2(2x + 15)^\circ + \cot^2(x + 15)^\circ$ का मान ज्ञात करो।
- (A) $\frac{7}{2}$ (B) 1 (C) $-\frac{7}{2}$ (D) $\frac{5}{2}$
- 15.** If $\sin\left(\frac{2A+B}{2}\right) = \cos\left(\frac{2A-B}{2}\right) = \frac{\sqrt{3}}{2}$, $0^\circ < \frac{2A+B}{2} < 90^\circ$ and $0^\circ < \frac{2A-B}{2} < 90^\circ$, then find the value of $\sin[3(A - B)]$.
- यदि $\sin\left(\frac{2A+B}{2}\right) = \cos\left(\frac{2A-B}{2}\right) = \frac{\sqrt{3}}{2}$, $0^\circ < \frac{2A+B}{2} < 90^\circ$ और $0^\circ < \frac{2A-B}{2} < 90^\circ$ तो $\sin[3(A - B)]$ का मान है।
- (A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{\sqrt{2}}$
 (C) $\frac{1}{2}$ (D) 1

- 16.** The value of $4(\sin^4 30^\circ + \cos^4 30^\circ) - 3(\sin^2 45^\circ - 2\cos^2 45^\circ)$ is:
 $4(\sin^4 30^\circ + \cos^4 30^\circ) - 3(\sin^2 45^\circ - 2\cos^2 45^\circ)$ का मान है।
- (A) 0 (B) 4
 (C) 2 (D) 1
- 17.** The value of

$$\frac{\tan^2 30^\circ + \sin^2 90^\circ + \cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$$

$$\frac{\tan^2 30^\circ + \sin^2 90^\circ + \cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$$
 का मान है।
- (A) $\frac{47}{12}$ (B) $\frac{37}{12}$ (C) $\frac{43}{12}$ (D) $\frac{25}{12}$
- 18.** Find the value of $\frac{3}{4} \cot^2 30^\circ + \cos^2 30^\circ - 3\operatorname{cosec}^2 60^\circ + \tan^2 60^\circ$.
 $\frac{3}{4} \cot^2 30^\circ + \cos^2 30^\circ - 3\operatorname{cosec}^2 60^\circ + \tan^2 60^\circ$ का मान है।
- (A) -4 (B) 10 (C) $\frac{\sqrt{3}}{4}$ (D) 2
- 19.** $\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} \left(\frac{\sin\theta(1+\cos\theta)}{1+\cos\theta-\sin^2\theta} \right)$, $0^\circ < \theta < 90^\circ$ is equal to:

$$\sqrt{\sec^2\theta + \operatorname{cosec}^2\theta} \left(\frac{\sin\theta(1+\cos\theta)}{1+\cos\theta-\sin^2\theta} \right)$$
, $0^\circ < \theta < 90^\circ$ बराबर है।
- (A) $\sec^2\theta$ (B) $\operatorname{cosec}^2\theta$
 (C) $\cot\theta$ (D) $\tan\theta$
- 20.** If $\cos(A - B) = \frac{\sqrt{3}}{2}$ and $\cot(A + B) = \frac{1}{\sqrt{2}}$, where A - B and A + B are acute angles, then $(2A - 3B)$ is equal to:
- यदि $\cos(A - B) = \frac{\sqrt{3}}{2}$ और $\cot(A + B) = \frac{1}{\sqrt{2}}$ जहाँ A - B और A + B न्यून कोण हैं, तो $(2A - 3B)$ बराबर है।
- (A) 45° (B) 30°
 (C) 15° (D) 60°

21. If $\sin A = \frac{1}{2}$, A is an acute angle, then find the value of $\frac{\tan A - \cot A}{\sqrt{3}(1 + \csc A)}$.

यदि $\sin A = \frac{1}{2}$, A न्यून कोण है, तो $\frac{\tan A - \cot A}{\sqrt{3}(1 + \csc A)}$ का मान है?

$$(A) \frac{4\sqrt{3}}{9} \quad (B) \frac{2}{9} \quad (C) -\frac{2}{9} \quad (D) -\frac{4\sqrt{3}}{9}$$

22. For $0^\circ < \theta < 90^\circ$, $\frac{1}{\cos \theta} + \frac{1}{\tan \theta - \sec \theta}$, is equal to:

$0^\circ < \theta < 90^\circ$ के लिए, $\frac{1}{\cos \theta} + \frac{1}{\tan \theta - \sec \theta}$ बराबर है-

$$(A) \sec \theta \quad (B) -\sec \theta \\ (C) -\tan \theta \quad (D) \tan \theta$$

23. If $\cos \theta - \sin \theta = \sqrt{3} (90^\circ - \theta)$, $0^\circ < \theta < 90^\circ$, then find the value of $\tan \theta - \cot \theta$.

यदि $\cos \theta - \sin \theta = \sqrt{3} (90^\circ - \theta)$, $0^\circ < \theta < 90^\circ$, है, तो $(\tan \theta - \cot \theta)$ का मान ज्ञात करें।

$$(A) \frac{3 - 2\sqrt{3}}{1 + \sqrt{3}} \quad (B) -\frac{3 + 2\sqrt{3}}{1 + \sqrt{3}}$$

$$(C) -\frac{3 + 2\sqrt{3}}{1 - \sqrt{3}} \quad (D) \frac{3 + 2\sqrt{3}}{1 + \sqrt{3}}$$

24. If $7\cos^2 \theta + 5\sin^2 \theta - 6 = 0$, ($0^\circ < \theta < 90^\circ$), then

what is the value of $\sqrt{\frac{\cosec \theta + \tan \theta}{\sec \theta - \cot \theta}}$

यदि $7\cos^2 \theta + 5\sin^2 \theta - 6 = 0$, ($0^\circ < \theta < 90^\circ$), है, तो

$$\sqrt{\frac{\cosec \theta + \tan \theta}{\sec \theta - \cot \theta}} \text{ का मान है।}$$

$$(A) \sqrt{2} + 1 \quad (B) \sqrt{2} - 1 \\ (C) \sqrt{3} + 1 \quad (D) \sqrt{3} - 1$$

25. If $4\sin^2(2x - 10)^\circ = 3$, $0 \leq (2x - 10) \leq 90$, then find the value of :

$$\frac{\sin^4(x - 5^\circ) + \cos^4(x - 5^\circ)}{1 - 2\sin^2(3x - 15)^\circ \cos^2(3x - 15)^\circ}$$

यदि $4\sin^2(2x - 10)^\circ = 3$, $0 \leq (2x - 10) \leq 90$, है, तो $\frac{\sin^4(x - 5^\circ) + \cos^4(x - 5^\circ)}{1 - 2\sin^2(3x - 15)^\circ \cos^2(3x - 15)^\circ}$ का मान ज्ञात करें।

$$(A) \frac{5}{8} \quad (B) -1 \quad (C) 1 \quad (D) -\frac{5}{8}$$

26. The value of $\frac{\sqrt{2}\tan(60^\circ - \theta)\tan(30^\circ + \theta)}{\sin^2(45^\circ + \theta) + \sin^2(45^\circ - \theta)}$ is:

$\frac{\sqrt{2}\tan(60^\circ - \theta)\tan(30^\circ + \theta)}{\sin^2(45^\circ + \theta) + \sin^2(45^\circ - \theta)}$ का मान है:

$$(A) \sqrt{2} \quad (B) 2$$

$$(C) 1 \quad (D) \frac{1}{\sqrt{2}}$$

27. If $3\sin^2 \theta - \cos \theta - 1 = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $\cot \theta + \cosec \theta$?

यदि $3\sin^2 \theta - \cos \theta - 1 = 0$, $0^\circ < \theta < 90^\circ$ है, तो $\cot \theta + \cosec \theta$ का मान ज्ञात करें।

$$(A) \frac{3\sqrt{2}}{2} \quad (B) 2\sqrt{3}$$

$$(C) \sqrt{5} \quad (D) 2\sqrt{5}$$

28. The value of $(\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ) - \frac{4\cos^2 37^\circ - 7 + 4\cos^2 53^\circ}{\tan^2 47^\circ - \cosec^2 43^\circ}$ is:

$(\sin 37^\circ \cos 53^\circ + \cos 37^\circ \sin 53^\circ) - \frac{4\cos^2 37^\circ - 7 + 4\cos^2 53^\circ}{\tan^2 47^\circ - \cosec^2 43^\circ}$ का मान है।

$$(A) -2 \quad (B) 0 \\ (C) 1 \quad (D) 2$$

29. The value of $\sin^{130^\circ} + \cos^{130^\circ} - \sin^{25^\circ} \cos^{65^\circ} - \sin^{65^\circ} \cos^{25^\circ}$. $\sin^{130^\circ} + \cos^{130^\circ} - \sin^{25^\circ} \cos^{65^\circ} - \sin^{65^\circ} \cos^{25^\circ}$ का मान क्या होगा?

$$(A) -\frac{3}{8} \quad (B) 0 \quad (C) \frac{5}{8} \quad (D) \frac{13}{8}$$

30. If $\tan \theta = \sqrt{5}$, then the value of $\frac{\cosec^2 \theta + \sec^2 \theta}{\cosec^2 \theta - \sec^2 \theta}$ is:

यदि $\tan \theta = \sqrt{5}$, तो $\frac{\cosec^2 \theta + \sec^2 \theta}{\cosec^2 \theta - \sec^2 \theta}$ का मान ज्ञात करें।

$$(A) -\frac{7}{5} \quad (B) \frac{7}{5} \quad (C) -\frac{3}{2} \quad (D) \frac{3}{2}$$

- 31.** If $5\sin^2\theta - 4\cos\theta - 4 = 0$, $0^\circ < \theta < 90^\circ$, then the value of $\cot\theta + \operatorname{cosec}\theta$ is:
 $3\cot\theta + \tan\theta - 2\sqrt{3} = 0$, $0^\circ < \theta < 90^\circ$.
 यदि $5\sin^2\theta - 4\cos\theta - 4 = 0$, $0^\circ < \theta < 90^\circ$, है, तो $\cot\theta + \operatorname{cosec}\theta$ का मान ज्ञात करें।
 (A) $\frac{\sqrt{6}}{2}$ (B) $\frac{\sqrt{6}}{3}$ (C) $\frac{3}{2}$ (D) $\frac{2}{3}$
- 32.** In $\triangle PQR$, $\angle Q = 90^\circ$. If $\tan R = \frac{1}{3}$, then what is the value of $\frac{\sec P(\cos R + \sin P)}{\operatorname{cosec} R(\sin R - \operatorname{cosec} P)}$.
 यदि $\triangle PQR$ में, $\angle Q = 90^\circ$, $\tan R = \frac{1}{3}$ है, तो $\frac{\sec P(\cos R + \sin P)}{\operatorname{cosec} R(\sin R - \operatorname{cosec} P)}$ का मान ज्ञात करें।
 (A) $\frac{18}{7}$ (B) $-\frac{18}{7}$ (C) $-\frac{2}{7}$ (D) $\frac{2}{7}$
- 33.** If $\sin(A+B) = 1$ and $\cos(A-B) = \frac{\sqrt{3}}{2}$, $A+B \leq 90^\circ$ and $A > B$, then the value of $\frac{5\sin^2 B + 4\tan^2 A}{2\sin B \cos A}$ is :
 यदि $\sin(A+B) = 1$, $\cos(A-B) = \frac{\sqrt{3}}{2}$, $A+B \leq 90^\circ$,
 $A > B$ है, तो $\frac{5\sin^2 B + 4\tan^2 A}{2\sin B \cos A}$ का मान ज्ञात करें।
 (A) $16\frac{1}{2}$ (B) 18 (C) 20 (D) $26\frac{1}{2}$
- 34.** If $\sin^6\theta + \cos^6\theta = \frac{1}{3}$, $0^\circ < \theta < 90^\circ$, then what is the value of $\sin\theta\cos\theta$?
 यदि $\sin^6\theta + \cos^6\theta = \frac{1}{3}$, $0^\circ < \theta < 90^\circ$, है तो $\sin\theta\cos\theta$ का मान ज्ञात करें।
 (A) $\frac{\sqrt{2}}{3}$ (B) $\frac{\sqrt{6}}{6}$ (C) $\frac{\sqrt{2}}{\sqrt{3}}$ (D) $\frac{2}{9}$
- 35.** $(\sec\theta + \tan\theta)^2 + \frac{1+\operatorname{cosec}\theta}{1-\operatorname{cosec}\theta}$, $0^\circ < \theta < 90^\circ$ is :
 $(\sec\theta + \tan\theta)^2 + \frac{1+\operatorname{cosec}\theta}{1-\operatorname{cosec}\theta}$, $0^\circ < \theta < 90^\circ$ है :
 (A) 0 (B) -2 (C) 1 (D) 2
- 36.** If $\sec(5\alpha - 15^\circ) = \operatorname{cosec}(15^\circ - 2\alpha)$, then the value of $\cos\alpha + \sin 2\alpha + \tan(1.5\alpha)$ is:
 यदि $\sec(5\alpha - 15^\circ) = \operatorname{cosec}(15^\circ - 2\alpha)$ है, तो $\cos\alpha + \sin 2\alpha + \tan(1.5\alpha)$ का मान है:
 (A) $\sqrt{3} + 1$ (B) $\sqrt{2} - 1$
 (C) $\sqrt{3} - 1$ (D) $\sqrt{2} + 1$
- 37.** If $(\sin 20 + x)^\circ = \cos 60^\circ$, $0 \leq (20 + x)$, then find the value of $2\sin^2(3x + 15)^\circ - \operatorname{cosec}^2(2x + 10)^\circ$.
 यदि $(\sin 20 + x)^\circ = \cos 60^\circ$, $0 \leq (20 + x)$ है, तो $2\sin^2(3x + 15)^\circ - \operatorname{cosec}^2(2x + 10)$ का मान ज्ञात कीजिए।
 (A) 3 (B) -3
 (C) $-\frac{1}{3}$ (D) -2
- 38.** Find the value of $\tan 35^\circ \cot 40^\circ \tan 45^\circ \cot 50^\circ \tan 55^\circ$.
 $\tan 35^\circ \cot 40^\circ \tan 45^\circ \cot 50^\circ \tan 55^\circ$ का मान ज्ञात कीजिए।
 (A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$
 (C) -1 (D) 1
- 39.** If $2\cos^2\theta - 5\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$, then the value of $(\sec\theta + \tan\theta)$ is:
 यदि $2\cos^2\theta - 5\cos\theta + 2 = 0$, $0^\circ < \theta < 90^\circ$ है, तो $(\sec\theta + \tan\theta)$ का मान ज्ञात करें।
 (A) $2 + \sqrt{3}$ (B) $1 - \sqrt{3}$
 (C) $1 + \sqrt{3}$ (D) $2 - \sqrt{3}$
- 40.** If $\cot\theta = \frac{15}{8}$, θ is an acute angle, then find the value of $\frac{(1 - \cos\theta)(2 + 2\cos\theta)}{(2 - 2\sin\theta)(1 + \sin\theta)}$.
 यदि $\cot\theta = \frac{15}{8}$, θ एक न्यून कोण है, तो $\frac{(1 - \cos\theta)(2 + 2\cos\theta)}{(2 - 2\sin\theta)(1 + \sin\theta)}$ का मान ज्ञात कीजिए।
 (A) $\frac{225}{64}$ (B) $\frac{64}{225}$ (C) $\frac{16}{15}$ (D) $\frac{8}{15}$
- 41.** If $\cos(2\theta + 54^\circ) = \sin\theta$, $0^\circ < (2\theta + 54^\circ) < 90^\circ$, then what is the value of $\frac{1}{\cot 5\theta + \sec \frac{5\theta}{2}}$?
 यदि $\cos(2\theta + 54^\circ) = \sin\theta$, $0^\circ < (2\theta + 54^\circ) < 90^\circ$ है, तो $\frac{1}{\cot 5\theta + \sec \frac{5\theta}{2}}$ का मान क्या होगा?
 (A) $\frac{\sqrt{3}}{2}$ (B) $\frac{2\sqrt{3}}{3}$ (C) $\frac{\sqrt{3}}{3}$ (D) $\frac{1}{3}$

42. The value of

$$\frac{\tan 13^\circ \tan 36^\circ \tan 45^\circ \tan 54^\circ \tan 77^\circ}{2 \sec^2 60^\circ (\sin^2 60^\circ - 3 \cos 60^\circ + 2)}$$
 is:

$\frac{\tan 13^\circ \tan 36^\circ \tan 45^\circ \tan 54^\circ \tan 77^\circ}{2 \sec^2 60^\circ (\sin^2 60^\circ - 3 \cos 60^\circ + 2)}$ का मान है।

- (A) $\frac{1}{10}$ (B) $-\frac{1}{4}$ (C) $\frac{1}{4}$ (D) $-\frac{1}{10}$

43. The value of $\sin^2 60^\circ \cos^2 45^\circ + 2 \tan^2 60^\circ - \operatorname{cosec}^2 30^\circ$ is equal to

$\sin^2 60^\circ \cos^2 45^\circ + 2 \tan^2 60^\circ - \operatorname{cosec}^2 30^\circ$ का मान बराबर है-

- (A) $\frac{17}{24}$ (B) $\frac{19}{8}$ (C) $-\frac{17}{24}$ (D) $-\frac{19}{8}$

44. The value of $\sec^2 \theta (1 - \sin^2 \theta) - 2 \tan^2 \theta$ is:
 $\sec^2 \theta (1 - \sin^2 \theta) - 2 \tan^2 \theta$ का मान है-

- (A) $\frac{1}{2}$ (B) 1
 (C) -1 (D) 0

45. If $\frac{\sin^2 \theta}{\tan^2 \theta - \sin^2 \theta} = 5$, θ is an acute angle, then

the value of $\frac{24 \sin^2 \theta - 15 \sec^2 \theta}{6 \operatorname{cosec}^2 \theta - 7 \cot^2 \theta}$ is:

यदि $\frac{\sin^2 \theta}{\tan^2 \theta - \sin^2 \theta} = 5$, θ एक न्यून कोण है तो

- $\frac{24 \sin^2 \theta - 15 \sec^2 \theta}{6 \operatorname{cosec}^2 \theta - 7 \cot^2 \theta}$ का मान है:
 (A) -2 (B) 2
 (C) 14 (D) -14

46. If $0^\circ < \theta < 90^\circ$, $\sqrt{\frac{\sec^2 \theta + \operatorname{cosec}^2 \theta}{\tan^2 \theta - \sin^2 \theta}}$ is equal to :

यदि $0^\circ < \theta < 90^\circ$ है, तो $\sqrt{\frac{\sec^2 \theta + \operatorname{cosec}^2 \theta}{\tan^2 \theta - \sin^2 \theta}}$ का मान है-

- (A) $\sec^3 \theta$ (B) $\operatorname{cosec}^3 \theta$
 (C) $\sin^2 \theta$ (D) $\sec^2 \theta$

47. $(\operatorname{cosec} \theta - \cot \theta)(1 + \cos \theta) = ?$

$(\operatorname{cosec} \theta - \cot \theta)(1 + \cos \theta)$ का मान ज्ञात करें।

- (A) $\cos \theta$ (B) $\sin \theta$
 (C) $\cot \theta$ (D) $\operatorname{cosec} \theta$

48. If $\frac{1}{1 - \sin \theta} + \frac{1}{1 + \sin \theta} = 4 \sec \theta$, $0^\circ < \theta < 90^\circ$, then the value of $\cot \theta + \operatorname{cosec} \theta$ is :

यदि $\frac{1}{1 - \sin \theta} + \frac{1}{1 + \sin \theta} = 4 \sec \theta$, $0^\circ < \theta < 90^\circ$ है, तो $\cot \theta + \operatorname{cosec} \theta$ का मान है।

- (A) $\frac{4\sqrt{3}}{3}$ (B) $\sqrt{3}$ (C) $\frac{5\sqrt{3}}{3}$ (D) $3\sqrt{3}$

49. Find the value of $\operatorname{cosec}(60^\circ + A) - \sec(30^\circ - A) + \frac{\operatorname{cosec} 49^\circ}{\sec 41^\circ}$.

$\operatorname{cosec}(60^\circ + A) - \sec(30^\circ - A) + \frac{\operatorname{cosec} 49^\circ}{\sec 41^\circ}$ का मान है।

- (A) 1 (B) 0
 (C) -1 (D) 2

50. If $\sin \alpha + \sin \beta = \cos \alpha + \cos \beta = 1$, then $\sin \alpha + \cos \alpha = ?$

यदि $\sin \alpha + \sin \beta = \cos \alpha + \cos \beta = 1$ है, तो $\sin \alpha + \cos \alpha = ?$

- (A) -1 (B) 0
 (C) 1 (D) 2

51. If $\tan \theta + 3 \cot \theta - 2\sqrt{3} = 0$, $0^\circ < \theta < 90^\circ$, then what is the value of $(\operatorname{cosec}^2 \theta + \cos^2 \theta)$?

यदि $\tan \theta + 3 \cot \theta - 2\sqrt{3} = 0$, $0^\circ < \theta < 90^\circ$ है, तो $(\operatorname{cosec}^2 \theta + \cos^2 \theta)$ का मान है।

- (A) $\frac{2}{3}$ (B) $\frac{19}{12}$ (C) $\frac{14}{3}$ (D) $\frac{11}{12}$

52. In $\triangle ABC$, right angled at B. If $\cot A = \frac{1}{2}$, then

the value of $\frac{\sin A(\cos C + \cos A)}{\cos C(\sin C - \sin A)}$.

$\triangle ABC$ में, B पर समकोण है, यदि $\cot A = \frac{1}{2}$ है तो

$\frac{\sin A(\cos C + \cos A)}{\cos C(\sin C - \sin A)}$ का मान है-

- (A) 3 (B) -3
 (C) -2 (D) 2

53. Simplify $\sec^2 \alpha + \left(1 + \frac{1}{\operatorname{cosec} \alpha}\right) \left(1 - \frac{1}{\operatorname{cosec} \alpha}\right)$

सरल कीजिए : $\sec^2 \alpha + \left(1 + \frac{1}{\operatorname{cosec} \alpha}\right) \left(1 - \frac{1}{\operatorname{cosec} \alpha}\right)$

- (A) $\tan^2 \alpha$ (B) $\sin^2 \alpha$
 (C) 1 (D) -1

5. (A) $\frac{2 \times \frac{1}{4} \times \sqrt{3} - 3 \times \frac{1}{4} \times \frac{4}{3}}{4 \times 1 - 4 + \frac{3}{4} + 0} = \frac{\frac{\sqrt{3}}{2} - \frac{3}{4} \times \frac{4}{3}}{4 - 4 + \frac{3}{4}}$

$$= \frac{\frac{\sqrt{3}}{2} - 1}{\frac{3}{4}} = \frac{2(\sqrt{3} - 2)}{3}$$

6. (D) $2 - 2\sin^2\theta - 3\sin\theta = 0$
 $\Rightarrow 2\sin^2\theta + 3\sin\theta - 2 = 0$
 $\Rightarrow (\sin\theta + 2)(2\sin\theta - 1) = 0$
 $\Rightarrow \sin\theta = \frac{1}{2}, \theta = 30^\circ$
 $\therefore \sec^2 30^\circ - \tan^2 30^\circ + \cos^2 30^\circ$
 $\Rightarrow \frac{4}{3} - \frac{1}{3} + \frac{3}{4} = 1 + \frac{3}{4} = \frac{7}{4}$

7. (C) $3\tan\theta = 2\sqrt{3}\sin\theta$

$$\Rightarrow \cos\theta = \frac{3}{2\sqrt{3}} = \frac{\sqrt{3}}{2}$$
 $\Rightarrow \theta = 30^\circ$
 $\therefore 2\sin^2 60^\circ - 3\cos^2 90^\circ$
 $\Rightarrow 2 \times \frac{3}{4} - 0 = \frac{3}{2}$

8. (D) $3\sec\theta + 4\cos\theta - 4\sqrt{3} = 0$

$\Rightarrow 3\sec\theta + 4\cos\theta = 4\sqrt{3}$

$\Rightarrow \theta = 30^\circ$ satisfied

9. (A) $\tan(45 - \alpha)\tan(45 + \alpha) -$

$$\frac{1 + \cos 19^\circ \csc 71^\circ + \sin 71^\circ \sec 19^\circ + 1}{1}$$

$$\Rightarrow 1 - \frac{1+1+1+1}{1} \quad \left[\begin{array}{l} a+b=90^\circ \\ \tan a \tan b = 1 \end{array} \right]$$

$= -3$

10. (D) $1 + 2\tan^2\theta + 2\sin\theta\sec^2\theta$

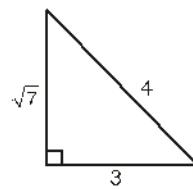
$\Rightarrow 1 + \tan^2\theta + \tan^2\theta + 2\tan\theta\sec\theta$

$\Rightarrow (\tan\theta + \sec\theta)^2$

$\Rightarrow \frac{(1+\sin\theta)^2}{\cos^2\theta} = \frac{(1+\sin\theta)^2}{(1-\sin\theta)(1+\sin\theta)} = \frac{1+\sin\theta}{1-\sin\theta}$

11. (D) $\frac{\cosec\theta + \cot\theta}{\cosec\theta - \cot\theta} = \frac{7}{1} \quad \frac{\cosec\theta}{\cot\theta} = \frac{8}{6}$

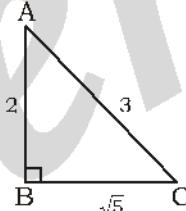
$\therefore \sec\theta = \frac{4}{3} \quad \therefore \cos\theta = \frac{3}{4}$



$$\therefore \frac{4\sin^2\theta - 1}{4\sin^2\theta + 5} = \frac{4 \times \frac{7}{16} - 1}{4 \times \frac{7}{16} + 5} = \frac{28 - 16}{28 + 80} = \frac{1}{9}$$

12. (D) $3\cos^2\theta - 4\sin\theta + 1 = 0$
 $\Rightarrow 3 - 3\sin^2\theta - 4\sin\theta + 1 = 0$
 $\Rightarrow 3\sin^2\theta + 4\sin\theta - 4 = 0$
 $\Rightarrow 3\sin^2\theta + 6\sin\theta - 2\sin\theta - 4 = 0$
 $\Rightarrow (3\sin\theta - 2)(\sin\theta + 2) = 0$

$\Rightarrow \sin\theta = -2 \text{ (x)}, \frac{2}{3}$



$$\therefore \tan\theta + \sec\theta \Rightarrow \frac{2}{\sqrt{5}} + \frac{3}{\sqrt{5}} = \sqrt{5}$$

13. (A) $\frac{\cot^3\theta}{\cosec^2\theta} + \frac{\tan^3\theta}{\sec^2\theta} + 2\sin\theta\cos\theta$
 $\Rightarrow \frac{\cot^3\theta \sec^2\theta + \tan^3\theta \cosec^2\theta}{\cosec^2\theta \sec^2\theta} + 2\sin\theta\cos\theta$
 $\Rightarrow \text{Put } \theta = 45^\circ$
 $= \frac{1 \times 2 + 1 \times 2}{4} + 2 \times \frac{1}{2} \Rightarrow \frac{4}{4} + 1 = 2$

$\text{Option (A) } \cosec\theta \sec\theta = \sqrt{2} \times \sqrt{2} = 2$

14. (A) $\sin(3x - 15^\circ) = \frac{1}{2}$

$\Rightarrow \sin(3x - 15^\circ) = \cos 60^\circ$

$\Rightarrow (3x - 15^\circ) + 60^\circ = 90^\circ$

$\Rightarrow x = 15^\circ$

$\therefore \cos^2(30 + 15) + \cot^2(15 + 15)$

$\Rightarrow \cos^2(45^\circ) + \cot^2(30^\circ)$

$\Rightarrow \frac{1}{2} + 3 = \frac{7}{2}$

15.(B) $\sin\left(\frac{2A+B}{2}\right) = \sin 60^\circ$
 $\Rightarrow 2A + B = 120^\circ \quad \dots \dots \dots (1)$

and $\cos\left(\frac{2A-B}{2}\right) = \cos 30^\circ$
 $\Rightarrow 2A - B = 60^\circ \quad \dots \dots \dots (2)$

From Eq.(1) & (2)

$$2A + B = 120^\circ$$

$$2A - B = 60^\circ$$

$$\Rightarrow A = 45^\circ$$

$$\Rightarrow B = 30^\circ$$

$$\therefore \sin(3(45^\circ - 30^\circ)) = \sin 45^\circ = \frac{1}{\sqrt{2}}$$

16.(B) $4\left[\left(\frac{1}{2}\right)^4 + \left(\frac{\sqrt{3}}{2}\right)^4\right] - 1\left(\frac{1}{2} - 1\right)$
 $= 4\left[\frac{1}{16} + \frac{9}{16}\right] + \frac{3}{2} \Rightarrow \frac{10}{4} + \frac{6}{4} = 4$

17.(C) $\frac{\frac{1}{3} + 1 + \frac{1}{3} + \frac{1}{4} \times \frac{1}{2}}{\frac{1}{2}} = \frac{\frac{2}{3} + 1 + \frac{1}{8}}{\frac{1}{2}}$
 $= \frac{2(43)}{24} = \frac{43}{12}$

18.(D) $\frac{3}{4} \times 3 + \frac{3}{4} - 3 \times \frac{4}{3} + 3$
 $= \frac{9}{4} + \frac{3}{4} - 4 + 3$
 $= 3 - 4 + 3 = 2$

19.(A) $\sqrt{\frac{\sin^2\theta + \cos^2\theta}{\sin^2\theta \cos^2\theta}} \times \frac{\sin\theta(1+\cos\theta)}{1+\cos\theta-1+\cos^2\theta}$
 $= \frac{1}{\sin\theta \cos\theta} \times \frac{\sin\theta}{\cos\theta} = \sec^2\theta$

20.(A) $\cos(A - B) = \cos 30^\circ$
 and $\cot(A + B) = \frac{1}{\sqrt{3}} = \cot 60^\circ$
 $\Rightarrow A + B = 60^\circ$
 $\Rightarrow A - B = 30^\circ$
 $\Rightarrow A = 45^\circ, B = 15^\circ$
 $\therefore 2A - 3B = 90^\circ - 45^\circ = 45^\circ$

21.(C) $\sin A = \frac{1}{2} \quad A = 30^\circ$

$$\Rightarrow \frac{\tan 30^\circ - \cot 30^\circ}{\sqrt{3}(1 + \csc 30^\circ)} = \frac{\frac{1}{\sqrt{3}} - \sqrt{3}}{\sqrt{3}(1+2)} = \frac{-2}{\sqrt{3}(3)} = \frac{-2}{9}$$

22.(C) $\frac{1}{\cos\theta} - \tan\theta - \sec\theta$

$$\left[\begin{array}{l} \because \sec^2\theta - \tan^2\theta = 1 \\ \sec\theta + \tan\theta = \frac{1}{\sec\theta - \tan\theta} \end{array} \right]$$

$$\Rightarrow \sec\theta - \tan\theta - \sec\theta$$

$$\Rightarrow -\tan\theta$$

23.(B) $\cos\theta - \sin\theta = \sqrt{3} \sin\theta$

$$\Rightarrow \cot\theta = \sqrt{3} + 1$$

$$\text{and } \tan\theta = \frac{1}{\sqrt{3} + 1}$$

$$\text{ATQ, } \tan\theta - \cot\theta = \frac{1}{\sqrt{3} + 1} - \sqrt{3} - 1$$

$$= \frac{1 - 3 - \sqrt{3} - \sqrt{3} - 1}{\sqrt{3} + 1}$$

$$= \frac{-3 - 2\sqrt{3}}{1 + \sqrt{3}} = -\frac{3 + 2\sqrt{3}}{1 + \sqrt{3}}$$

24.(A) $7\cos^2\theta + 5\sin^2\theta - 6 = 0$

$$7\cos^2\theta + 5 - 5\cos^2\theta - 6 = 0$$

$$\Rightarrow 2\cos^2\theta - 1 = 0$$

$$\Rightarrow \cos\theta = \frac{1}{\sqrt{2}}, \theta = 45^\circ$$

$$\therefore \sqrt{\frac{(\sqrt{2}+1)}{(\sqrt{2}-1)}} = (\sqrt{2}+1)$$

25.(A) $4\sin^2(2x - 10)^\circ = 3$

$$\Rightarrow \sin(2x - 10)^\circ = \frac{\sqrt{3}}{2} = \sin 60^\circ$$

$$\Rightarrow x = 35^\circ$$

$$\therefore \frac{\sin^4(30^\circ) + \cos^4(30^\circ)}{1 - 2\sin^2(90^\circ)\cos^2(90^\circ)} = \frac{\frac{1}{16} + \frac{9}{16}}{1} = \frac{5}{8}$$