26.(A) $\dfrac{\sqrt{2}\tan(60°-\theta)\tan(30°+\theta)}{\sin^2(45°+\theta)+\sin^2(45°-\theta)}$

Put $\theta = 0°$

$\Rightarrow \dfrac{\sqrt{2}\tan 60°\tan 30°}{\sin^2 45°+\sin^2 45°} = \dfrac{\sqrt{2}\times\sqrt{3}\times\frac{1}{\sqrt{3}}}{\frac{1}{2}+\frac{1}{2}} = \sqrt{2}$

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

$\Rightarrow 3 - 3\cos^2\theta - \cos\theta - 1 = 0$

$\Rightarrow 3\cos^2\theta + \cos\theta - 2 = 0$

$\Rightarrow \cos\theta = \dfrac{2}{3}, -1(\times)$

$\therefore \cot\theta + \operatorname{cosec}\theta = \dfrac{2}{\sqrt{5}} + \dfrac{3}{\sqrt{5}} = \dfrac{5}{\sqrt{3}} = \sqrt{5}$

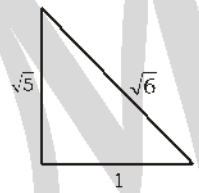
28.(A) $(\sin^2 37° + \cos^2 37°) - \dfrac{4(\cos^2 37° + \cos^2 53°) - 7}{\cot^2 43° - \operatorname{cosec}^2 43°}$

$1 - \dfrac{4-7}{-1} = 1 - 3 = -2$

29.(A) $1 - 2\sin^2 30°\cos^2 30° - (\sin^2\theta + \cos^2\theta)$

$= 1 - 2\times\dfrac{1}{4}\times\dfrac{3}{4} - 1 = -\dfrac{3}{8}$

30.(C) $\tan\theta = \dfrac{\sqrt{5}}{1}$



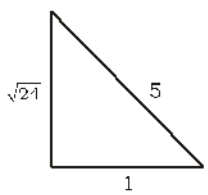
$\dfrac{\operatorname{cosec}^2\theta + \sec^2\theta}{\operatorname{cosec}^2\theta - \sec^2\theta} = \dfrac{\frac{6}{5}+\frac{6}{1}}{\frac{6}{5}-\frac{6}{1}} = \dfrac{36}{-24} = -\dfrac{3}{2}$

31.(A) $5 - 5\cos^2\theta - 4\cos\theta - 4 = 0$

$\Rightarrow 5\cos^2\theta + 4\cos\theta - 1 = 0$

$\Rightarrow 5\cos^2\theta + 5\cos\theta - \cos\theta - 1 = 0$

$\Rightarrow \cos\theta = \dfrac{1}{5}, -1$



$\Rightarrow \cot\theta + \operatorname{cosec}\theta$

$\Rightarrow \dfrac{1}{\sqrt{24}} + \dfrac{5}{\sqrt{24}} = \dfrac{6}{\sqrt{24}} = \dfrac{\sqrt{6}}{2}$

32.(B) $\tan R = \dfrac{1}{3}$

$\Rightarrow \dfrac{\sec P(\cos R + \sin P)}{\operatorname{cosec} R(\sin R - \operatorname{cosec} P)}$

$\Rightarrow \dfrac{\frac{\sqrt{10}}{1}\left(\frac{3}{\sqrt{10}}+\frac{3}{\sqrt{10}}\right)}{\sqrt{10}\left(\frac{1}{\sqrt{10}}-\frac{\sqrt{10}}{3}\right)}$

$\Rightarrow \dfrac{\frac{\sqrt{10}}{1}\left(\frac{3}{\sqrt{10}}+\frac{3}{\sqrt{10}}\right)}{\sqrt{10}\left(\frac{1}{\sqrt{10}}-\frac{\sqrt{10}}{3}\right)}$

$\Rightarrow \dfrac{\frac{6}{\sqrt{10}}}{\frac{-7}{3\sqrt{10}}} = -\dfrac{18}{7}$

33.(D) $\sin(A+B) = \sin 90°$

$\cos(A-B) = \cos 30°$

$\Rightarrow A + B = 90°$

$\Rightarrow A - B = 30°$

$\therefore A = 60°, B = 30°$

$\Rightarrow \dfrac{5\sin^2 30° + 4\tan^2 60°}{2\sin 30°\cos 60°}$

$\Rightarrow \dfrac{5\times\frac{1}{4}+4\times 3}{2\times\frac{1}{2}\times\frac{1}{2}} = \dfrac{\frac{5}{4}+12}{\frac{1}{2}} = \dfrac{53\times 2}{4} = 26\dfrac{1}{2}$

34.(A) $1 - 3\sin^2\theta\cos^2\theta = \dfrac{1}{3}$

$\Rightarrow \sin^2\theta\cos^2\theta = \dfrac{2}{3\times 3}$

$\Rightarrow \sin^2\theta\cos^2\theta = \dfrac{2}{3\times 3}$

$\Rightarrow \sin\theta\cos\theta = \dfrac{\sqrt{2}}{3}$

35.(A) $(\sec\theta + \tan\theta)^2 + \dfrac{1+\operatorname{cosec}\theta}{1-\operatorname{cosec}\theta}$

Put $\theta = 45°$

$\Rightarrow \left(\sqrt{2}+1\right)^2 + \dfrac{1+\sqrt{2}}{1-\sqrt{2}}$

$\Rightarrow \left(\sqrt{2}+1\right)\left[\left(\sqrt{2}+1\right) + \dfrac{1}{1-\sqrt{2}}\right]$

$\Rightarrow \sqrt{2} + 1(\sqrt{2} + 1 - \sqrt{2} - 1)$

$\Rightarrow 0$

36.(A) $\sec(5\alpha - 15°) = \operatorname{cosec}(15 - 2\alpha)$

$\Rightarrow 5\alpha - 15° + 15° - 2\alpha = 90°$

$\Rightarrow 3\alpha = 90°$

$\Rightarrow \alpha = 30°$

$\therefore \cos30° + \sin60° + \tan(45°)$

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

$\Rightarrow \sqrt{3} + 1$

37.(B) $20° + x + 60° = 90°$

$\Rightarrow x = 10°$

$\Rightarrow 2\sin^2 45° - \operatorname{cosec}^2 30°$

$\Rightarrow 2 \times \dfrac{1}{2} - 4 = 1 - 4 = -3$

38.(D) $\tan35°\cot35°\cot40°\tan40°\tan45°$

$\Rightarrow \tan45° = 1$

39.(A) $2\cos^2\theta - 4\cos\theta - \cos\theta + 2 = 0$

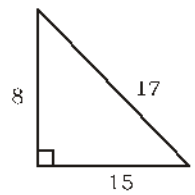
$\Rightarrow 2\cos\theta(\cos\theta - 2) - 1(\cos\theta - 2) = 0$

$\Rightarrow \cos\theta = 2(\times)$ and $\cos\theta = \dfrac{1}{2} \quad \Rightarrow \theta = 60°$

$\Rightarrow \sec60° + \tan60°$

$\Rightarrow 2 + \sqrt{3}$

40.(B) $\cot\theta = \dfrac{15}{8}$



$\Rightarrow \dfrac{2(1-\cos\theta)(1+\cos\theta)}{2(1-\sin\theta)(1+\sin\theta)}$

$\Rightarrow \dfrac{\sin^2\theta}{\cos^2\theta} = \tan^2\theta = \dfrac{64}{225}$

41.(C) $\cos(2\theta + 54°) = \sin\theta$

$\Rightarrow 3\theta + 54° = 90°$

$\Rightarrow \theta = 12°$

$\therefore \dfrac{1}{\cot 60° + \sec 30°} = \dfrac{1}{\frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}}}$

$= \dfrac{\sqrt{3}}{3}$

42.(A) $\dfrac{\tan13°\tan77°.\tan36°\tan54°\tan45°}{2\times4\left(\frac{3}{4} - 3\times\frac{1}{2} + 2\right)}$

$= \dfrac{1}{8\left(\frac{3}{4}+\frac{1}{2}\right)} = \dfrac{1}{2\times5} = \dfrac{1}{10}$

43.(B) $\dfrac{3}{4} \times \dfrac{1}{2} + 2 \times 3 - 4$

$\Rightarrow \dfrac{3}{8} + 6 - 4$

$\Rightarrow \dfrac{19}{8}$

44.(B) $\sec^2\theta \times \cos^2\theta(1 + \sin^2\theta) - 2\tan^2\theta$

$1 + \sin^2\theta - 2\tan^2\theta$

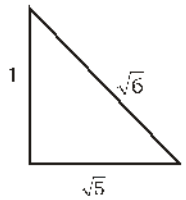
Put $\theta = 0$

$= 1$

45.(D) $\dfrac{\sin^2\theta}{\tan^2\theta \times \sin^2\theta} = 5$

$[\because \tan^2\theta - \sin^2\theta = \tan^2\theta \times \sin^2\theta]$

$\Rightarrow \tan\theta = \dfrac{1}{\sqrt{5}}$



$\Rightarrow \dfrac{24\sin^2\theta - 15\sec^2\theta}{6\operatorname{cosec}^2\theta - 7\cot^2\theta} = \dfrac{24\times\frac{1}{6} - 15\times\frac{6}{5}}{6\times6 - 7\times5}$

$\Rightarrow \dfrac{4-18}{36-35} = -14$

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46.(B) $\sqrt{\frac{\sec^2\theta+\operatorname{cosec}^2\theta}{\tan^2\theta\sin^2\theta}} = \sqrt{\frac{\sec^2\theta\operatorname{cosec}^2\theta}{\tan^2\theta\sin^2\theta}}$

$= \frac{\sec\theta\operatorname{cosec}\theta}{\tan\theta\sin\theta}$

$= \frac{1}{\sin^3\theta} = \operatorname{cosec}^3\theta$

47.(B) $\frac{1}{\sin\theta}(1-\cos\theta)(1+\cos\theta)$

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

48.(B) $\frac{(1+\sin\theta+1-\sin\theta)}{\cos^2\theta} = 4\sec\theta$

$\Rightarrow 2\sec^2\theta = 4\sec\theta$

$\Rightarrow \sec\theta = 2$

$\Rightarrow \theta = 60°$

$\therefore \cot\theta + \operatorname{cosec}\theta = \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \sqrt{3}$

49.(D) $\operatorname{cosec}(60°+A) - \operatorname{cosec}(60°+A) + \frac{\sec 41°}{\sec 41°} = 2$

50.(B) $\sin\alpha + \sin\beta = \cos\alpha + \cos\beta = 1$

Put $\alpha = 0°$ and $\beta = 90°$

$\Rightarrow \sin\alpha + \cos\beta = \sin0° + \cos90° = 0$

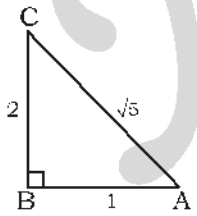
51.(B) $\tan\theta + 3\cot\theta = 2\sqrt{3}$

$\Rightarrow \theta = 60°$ satisfied

$\Rightarrow \operatorname{cosec}^2 60° + \cos^2 60°$

$\Rightarrow \frac{4}{3} + \frac{1}{4} = \frac{19}{12}$

52.(B)



$\Rightarrow \frac{\sin A(\cos C + \cos A)}{\cos C(\sin C - \sin A)} = \frac{\frac{2}{\sqrt{5}}\left(\frac{2}{\sqrt{5}} + \frac{1}{\sqrt{5}}\right)}{\frac{2}{\sqrt{5}}\left(\frac{1}{\sqrt{5}} - \frac{2}{\sqrt{5}}\right)}$

$\Rightarrow \frac{\frac{3}{\sqrt{5}}}{-\frac{1}{\sqrt{5}}} = -3$

53.(C) $\sec^2\alpha\left(1+\frac{1}{\sin^2\alpha}\right)(1-\sin\alpha)$

$= \sec^2\alpha \times \cos^2\alpha = 1$

54.(C) $\sin^2\theta - 2\sin\theta + 1 = 0$

$\sin^2\theta - \sin\theta - \sin\theta + 1 = 0$

$\Rightarrow \sin\theta = 1,\ \theta = 90°$

$\Rightarrow \frac{1+\operatorname{cosec}90°}{1-\cos90°} = \frac{2}{1} = 2$

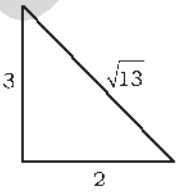
55.(A) $\frac{4\times\frac{1}{2}+4}{\sqrt{3}\times2-4\times1} = \frac{6}{2\sqrt{3}-4} = \frac{3}{\sqrt{3}-2}$

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

56.(D) $\frac{3}{4} + \frac{3}{4} - \frac{1}{2} - 3$

$\Rightarrow \frac{3}{2} - \frac{1}{2} - 3 \Rightarrow \frac{3-1-6}{2} = -2$

57.(B) $\frac{\sin\theta}{\cos\theta} = \frac{6}{4} \Rightarrow \tan\theta = \frac{3}{2}$



$\therefore \frac{4\times\sin^2\theta+3}{2\times\cos^2\theta+2} = \frac{4\times\frac{9}{13}+3}{2\times\frac{4}{13}+2} = \frac{\frac{36}{13}+3}{\frac{8}{13}+2} = \frac{75}{34}$

58.(B) $\frac{(\sin\theta+\sec\theta)^2+(\cos\theta+\operatorname{cosec}\theta)^2}{(1+\sec\theta\operatorname{cosec}\theta)^2}$

$\Rightarrow$ Put $\theta = 45°$

$\Rightarrow \frac{\left(\frac{1+2}{\sqrt{2}}\right)^2+\left(\frac{1+2}{\sqrt{2}}\right)^2}{\left(1+\sqrt{2}\times\sqrt{2}\right)^2} = \frac{\frac{9}{2}+\frac{9}{2}}{9} = 1$

59.(C) $\sec31° = x$

$\Rightarrow \cos^2 31° + \cos^2 31° - 1$

$\Rightarrow \frac{1}{x^2} + \frac{1}{x^2} - 1$

$\Rightarrow \frac{2-x^2}{x^2}$

(SSC CGL (PRE) – 2019)

1. If A lies in the first quadrant and 6tanA = 5, then the value of $\frac{8\sin A - 4\cos A}{\cos A + 2\sin A}$ is :

यदि A प्रथम चतुर्थांश में स्थित है और 6tanA = 5 है, तो $\frac{8\sin A - 4\cos A}{\cos A + 2\sin A}$ का मान बताइए।

(A) 16 (B) 1
(C) 4 (D) – 2

2. If $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{3}{5}$, then the value of $\frac{\text{cosec}\theta + \cot\theta}{\text{cosec}\theta - \cot\theta}$ is :

यदि $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{3}{5}$ है, तो $\frac{\text{cosec}\theta + \cot\theta}{\text{cosec}\theta - \cot\theta}$ का मान बताइए।

(A) $31 + 8\sqrt{15}$ (B) $33 + 4\sqrt{15}$
(C) $27 + \sqrt{15}$ (D) $24 + \sqrt{15}$

$$\frac{\text{cosec}\theta + \cot\theta}{\text{cosec}\theta - \cot\theta} = \frac{4 + \sqrt{15}}{4 - \sqrt{15}}$$

$$\frac{4 + \sqrt{15}}{4 - \sqrt{15}} \times \frac{4 + \sqrt{15}}{4 - \sqrt{15}} = 16 + 15 + 8\sqrt{15}$$

$$= 31 + 8\sqrt{15}$$

3. If $2\sin\theta + 15\cos^2\theta = 7$, $0° < \theta < 90°$, then $\tan\theta + \cos\theta + \sec\theta$ = ?

यदि $2\sin\theta + 15\cos^2\theta = 7$, $0° < \theta < 90°$ है, तो $\tan\theta + \cos\theta + \sec\theta$ का मान ज्ञात कीजिए।

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

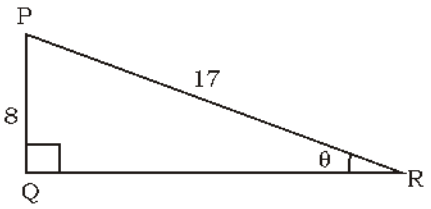
4. The value of $\frac{\tan 30° + \tan 60°}{\cos 30°}$ is :

$\frac{\tan 30° + \tan 60°}{\cos 30°}$ का मान ज्ञात कीजिए।

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

5. In the figure, what is the value of cot θ ?

दी गई आकृति में, cotθ का मान क्या है ?



(A) $\frac{15}{8}$ (B) $\frac{15}{17}$ (C) $\frac{17}{18}$ (D) $\frac{8}{15}$

6. If $5\sin^2\theta + 14\cos\theta = 13$, $0° < \theta < 90°$, then what is the value of $\frac{\sec\theta + \cot\theta}{\text{cosec}\theta + \tan\theta}$?

यदि $5\sin^2\theta + 14\cos\theta = 13$, $0° < \theta < 90°$ है, तो $\frac{\sec\theta + \cot\theta}{\text{cosec}\theta + \tan\theta}$ का मान क्या होगा ?

(A) $\frac{9}{8}$ (B) $\frac{31}{29}$
(C) $\frac{21}{28}$ (D) $\frac{32}{27}$

7. The value of $\frac{\tan 30°\,\text{cosec}60° + \tan 60°\sec 30°}{\sin^2 30° + 4\cot^2 45° - \sec^2 60°}$ is:

$\frac{\tan 30°\,\text{cosec}60° + \tan 60°\sec 30°}{\sin^2 30° + 4\cot^2 45° - \sec^2 60°}$ का मान ज्ञात करें।

(A) $\frac{2}{3}$ (B) $\frac{32}{3}$
(C) $\frac{8}{3}$ (D) $\frac{32}{99}$

8. If $7\sin^2\theta - \cos^2\theta + 2\sin\theta = 2$, $0° < \theta < 90°$, then the value of $\frac{\sec 2\theta + \cot 2\theta}{\text{cosec}2\theta + \tan 2\theta}$ is :

यदि $7\sin^2\theta - \cos^2\theta + 2\sin\theta = 2$, $0° < \theta < 90°$ है, तो $\frac{\sec 2\theta + \cot 2\theta}{\text{cosec}2\theta + \tan 2\theta}$ का मान ज्ञात कीजिए।

(A) $\frac{2\sqrt{3} + 1}{3}$ (B) 1
(C) $\frac{1}{5}\left(1 + 2\sqrt{3}\right)$ (D) $\frac{2}{5}\left(1 + \sqrt{3}\right)$

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9. The expression $3\sec^2\theta \tan^2\theta + \tan^6\theta - \sec^6\theta$ is equal to :

व्यंजक $3\sec^2\theta \tan^2\theta + \tan^6\theta - \sec^6\theta$ का मान बताइए।

(A) –2 (B) 1
(C) 2 (D) –1

10. The value of $\frac{\tan^2\theta - \sin^2\theta}{2 + \tan^2\theta + \cot^2\theta}$ is :

$\frac{\tan^2\theta - \sin^2\theta}{2 + \tan^2\theta + \cot^2\theta}$ का मान ज्ञात कीजिए।

(A) $\text{cosec}^6\theta$ (B) $\text{cosec}^4\theta$
(C) $\sin^6\theta$ (D) $\sec^4\theta$

11. If $7\cos^2\theta + 3\sin^2\theta = 6, 0° < \theta < 90°$, then the value of $\frac{\cot^2 2\theta + \sec^2 2\theta}{\tan^2 2\theta - \sin^2 2\theta}$ is :

यदि $7\cos^2\theta + 3\sin^2\theta = 6$, $0° < \theta < 90°$, है, तो $\frac{\cot^2 2\theta + \sec^2 2\theta}{\tan^2 2\theta - \sin^2 2\theta}$ का मान ज्ञात कीजिये।

(A) $\frac{52}{27}$ (B) $\frac{26}{15}$ (C) $\frac{28}{27}$ (D) $\frac{49}{45}$

12. The value of $\frac{(\cos 9° + \sin 81°)(\sec 9° + \text{cosec}81°)}{2\sin^2 63° + 1 + 2\sin^2 27°}$ is :

$\frac{(\cos 9° + \sin 81°)(\sec 9° + \text{cosec}81°)}{2\sin^2 63° + 1 + 2\sin^2 27°}$ का मान ज्ञात कीजिये।

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

13. The value of / का मान ज्ञात कीजिये।

$\frac{\sec^6\theta - \tan^6\theta - 3\sec^2\theta\tan^2\theta + 1}{\cos^4\theta - \sin^4\theta + 2\sin^2\theta + 2}$ is :

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

14. If $5\sin\theta = 4$, then the value of $\frac{\sec\theta + 4\cot\theta}{4\tan\theta - 5\cos\theta}$ is :

यदि $5\sin\theta = 4$ है, तो $\frac{\sec\theta + 4\cot\theta}{4\tan\theta - 5\cos\theta}$ का मान ज्ञात कीजिये।

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

15. If $12\cos^2\theta - 2\sin^2\theta + 3\cos\theta = 3, 0° < \theta < 90°$, then what is the value of $\frac{\text{cosec}\theta + \sec\theta}{\tan\theta + \cot\theta}$?

यदि $12\cos^2\theta - 2\sin^2\theta + 3\cos\theta = 3$, $0° < \theta < 90°$ है, तो $\frac{\text{cosec}\theta + \sec\theta}{\tan\theta + \cot\theta}$ का मान क्या है ?

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

16. What is the value of / का मान क्या है ?

$$\frac{\text{cosec}(78° + \theta) - \sec(12° - \theta) - \tan(67° + \theta) + \cot(23° - \theta)}{\tan 13° \tan 37° \tan 45° \tan 53° \tan 77°} ?$$

(A) 1 (B) 0
(C) 2 (D) –1

17. If $5\cos\theta - 12\sin\theta = 0$, then what is the value of $\frac{1 + \sin\theta + \cos\theta}{1 - \sin\theta + \cos\theta}$?

यदि $5\cos\theta - 12\sin\theta = 0$ है, तो $\frac{1 + \sin\theta + \cos\theta}{1 - \sin\theta + \cos\theta}$ का मान क्या है ?

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

18. If $11\sin^2\theta - \cos^2\theta + 4\sin\theta - 4 = 0, 0° < \theta < 90°$, then what is the value of $\frac{\cos 2\theta + \cot 2\theta}{\sec 2\theta - \tan 2\theta}$?

यदि $11\sin^2\theta - \cos^2\theta + 4\sin\theta - 4 = 0$, $0° < \theta < 90°$ है, तो $\frac{\cos 2\theta + \cot 2\theta}{\sec 2\theta - \tan 2\theta}$ का मान क्या है ?

(A) $\frac{12+7\sqrt{3}}{6}$ (B) $\frac{12+5\sqrt{3}}{3}$
(C) $\frac{10+5\sqrt{3}}{3}$ (D) $\frac{10+7\sqrt{3}}{6}$

19. The value of $\sqrt{\tan^2 60° + \sin 90°} - 2\tan 45°$ is :

$\sqrt{\tan^2 60° + \sin 90°} - 2\tan 45°$ का मान ज्ञात कीजिये।

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

20. The value of cos0° cos30° cos45° cos60° cos90° is :
cos0° cos30° cos45° cos60° cos90° का मान ज्ञात कीजिये।

(A) $\frac{\sqrt{6}}{8}$ (B) 5
(C) 0 (D) 3

21. If tanθ – cotθ = cosecθ, 0° < θ < 90°, then what is the value of $\frac{2\tan\theta-\cos\theta}{\sqrt{3}\cot\theta+\sec\theta}$?
यदि tanθ – cotθ = cosecθ, 0° < θ < 90° है, तो $\frac{2\tan\theta-\cos\theta}{\sqrt{3}\cot\theta+\sec\theta}$ का मान क्या होगा?

(A) $\frac{2\left(2\sqrt{3}-1\right)}{3}$ (B) $\frac{4\sqrt{3}-1}{6}$
(C) $\frac{3\sqrt{3}-1}{6}$ (D) $\frac{2\sqrt{3}-1}{3}$

22. Solve the following /निम्न को हल करें—

$$\frac{\sin 40^\circ}{\cos 50^\circ}+\frac{\text{cosec}\,50^\circ}{\sec 40^\circ}-4\cos 50^\circ\,\text{cosec}\,40^\circ$$

(A) 2 (B) –2
(C) –1 (D) 1

23. If xcosA – ysinA = 1 and xsinA + ycosA = 4, then the value of $17x^2 + 17y^2$ is :
यदि xcosA – ysinA = 1 और xsinA + ycosA = 4, है, तो $17x^2 + 17y^2$ का मान बताइए।
(A) 0 (B) 7
(C) 49 (D) 289

24. If (2sinA + cosecA) = $2\sqrt{2}$, 0° < A < 90°, then the value of $2(\sin^4 A + \cos^4 A)$ is :
यदि (2sinA + cosecA) = $2\sqrt{2}$, 0° < A < 90°, है, तो $2(\sin^4 A + \cos^4 A)$ का मान बताइए।
(A) 2 (B) 1
(C) 4 (D) 0

25. The value of $\frac{\sin 30^\circ \sin 60^\circ}{\cos 60^\circ \cos 30^\circ}-\tan 45^\circ$ is :

$\frac{\sin 30^\circ \sin 60^\circ}{\cos 60^\circ \cos 30^\circ}-\tan 45^\circ$ का मान ज्ञात कीजिये।

(A) 0 (B) $\frac{2-\sqrt{2}}{2}$
(C) 5 (D) 2

26. If $(\cos^2\theta - 1)(1 + \tan^2\theta) + 2\tan^2\theta = 1$, $0° \le \theta \le 90°$ then θ is :
यदि $(\cos^2\theta - 1)(1 + \tan^2\theta) + 2\tan^2\theta = 1$, $0° \le \theta \le 90°$ है, तो θ का मान क्या है?
(A) 60° (B) 45° (C) 90° (D) 30°

27. Solve the following. sin0°sin30°sin45° sin60°sin90° = ?
निम्न को हल कीजिये :
sin0°sin30°sin45° sin60°sin90° = ?

(A) 1 (B) 0 (C) $\frac{\sqrt{6}}{8}$ (D) 4

28. The value of $4\left[\frac{(1-\sec A)^2+(1+\sec A)^2}{1+\sec^2 A}\right]$ is :

$4\left[\frac{(1-\sec A)^2+(1+\sec A)^2}{1+\sec^2 A}\right]$ का मान बताइए।

(A) 8 (B) 1 (C) 4 (D) 2

29. If 0 < A, B < 45°, cos(A + B) = $\frac{24}{25}$ and sin(A – B) = $\frac{15}{17}$, then tan2A is :
यदि 0 < A, B < 45°, cos(A + B) = $\frac{24}{25}$ और sin(A – B) = $\frac{15}{17}$ है, तो tan2A का मान ज्ञात करें।

(A) $\frac{213}{4}$ (B) 0 (C) 1 (D) $\frac{416}{87}$

30. If A lies in third quadrant, and 20tanA = 21, then the value of $\frac{5\sin A-2\cos A}{4\cos A-\frac{5}{7}\sin A}$ is :
यदि A तीसरे चतुर्थांश में स्थित है और 20tanA = 21 है, तो $\frac{5\sin A-2\cos A}{4\cos A-\frac{5}{7}\sin A}$ का मान ज्ञात कीजिये।

(A) $\frac{5}{29}$ (B) $\frac{-65}{29}$ (C) 1 (D) $\frac{-65}{29}$

31. The value of $\frac{1-2\sin^2\theta\cos^2\theta}{\sin^4\theta+\cos^4\theta}-1$ is :

$\frac{1-2\sin^2\theta\cos^2\theta}{\sin^4\theta+\cos^4\theta}-1$ का मान ज्ञात कीजिये।

(A) –1 (B) 1
(C) $-2\sin^2\theta\cos^2\theta$ (D) 0

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32. What is the value of $\sin30° + \cos30° - \tan45°$?
$\sin30° + \cos30° - \tan45°$ का मान _____ है।

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

33. If $\frac{\sin A + \cos A}{\cos A} = \frac{17}{12}$, then the value of $\frac{1-\cos A}{\sin A}$ is

यदि $\frac{\sin A + \cos A}{\cos A} = \frac{17}{12}$ है, तो $\frac{1-\cos A}{\sin A}$ का मान ज्ञात कीजिये।

(A) $\frac{1}{5}$ (B) $\frac{5}{12}$ (C) -5 (D) 1

34. If $3\sec^2\theta + \tan\theta = 7$, $0° < \theta$ 90°, then the value of $\frac{\text{cosec}2\theta + \cos\theta}{\sin2\theta + \cot\theta}$ is :
यदि $3\sec^2\theta + \tan\theta = 7$, $0° < \theta$ 90° है, तो $\frac{\text{cosec}2\theta + \cos\theta}{\sin2\theta + \cot\theta}$ का मान ज्ञात कीजिये।

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

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

35. if $\cot\theta + \tan\theta = 2\sec\theta$, $0° < \theta < 90°$, then the value of is :
यदि $\cot\theta + \tan\theta = 2\sec\theta$, $0° < \theta < 90°$ है, तो $\frac{\tan2\theta - \sec\theta}{\cot2\theta + \text{cosec}\theta}$ का मान ज्ञात कीजिए।

(A) $\frac{3-\sqrt{2}}{11}$ (B) $\frac{2\sqrt{3}-1}{5}$

(C) $\frac{2\sqrt{3}-1}{11}$ (D) $\frac{3-\sqrt{2}}{5}$

36. If $5\cos^2\theta + 1 = 3\sin^2\theta$, $0° < \theta < 90°$, then what is the value of ?
यदि $5\cos^2\theta + 1 = 3\sin^2\theta$, $0° < \theta < 90°$ तो का मान है—

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

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

37. If $6\tan\theta - 5\sqrt{3}\sec\theta + 12\cot\theta = 0, 0° < \theta < 90°$, then the value of $(\text{cosec}\theta + \sec\theta)$ is :
यदि $6\tan\theta - 5\sqrt{3}\sec\theta + 12\cot\theta = 0, 0° < \theta < 90°$, है, तो $(\text{cosec}\theta + \sec\theta)$ का मान ज्ञात कीजिये।

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

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

38. Seema flies a kite on a 16 m string at an inclination of 60°. What is the height (h) of the kite above the ground ?
सीमा 60° की आनति (inclination) पर 16 मी. लंबी डोर से पतंग उड़ाती है। जमीन से कितनी ऊँचाई (ऊँचाई) पर पतंग उड़ रही है।

(A) $16\sqrt{3}$ m/मी (B) $8\sqrt{3}$ m/मी
(C) $4\sqrt{3}$ m/मी (D) $6\sqrt{3}$ m/मी

39. Solve the following. / निम्नलिखित को हल करें।
$\frac{2\sin22°}{\cos68°} - \frac{2\cot75°}{5\tan15°} - \frac{8\tan45°\tan20°\tan40°\tan50°\tan70°}{5}$

(A) 3 (B) 2 (C) 0 (D) 1

40. If $5\cot\theta = 3$, find the value of $\frac{6\sin\theta - 3\cos\theta}{7\sin\theta + 3\cos\theta}$
यदि $5\cot\theta = 3$ है, तो $\frac{6\sin\theta - 3\cos\theta}{7\sin\theta + 3\cos\theta}$ का मान ज्ञात कीजिये।

(A) $\frac{44}{21}$ (B) $\frac{20}{41}$ (C) $\frac{21}{44}$ (D) $\frac{11}{40}$

41. The value of $(\text{cosec}A + \cot A + 1)(\text{cosec}A - \cot A + 1) - 2\text{cosec}A$ is :
$(\text{cosec}A + \cot A + 1)(\text{cosec}A - \cot A + 1) - 2\text{cosec}A$ का मान ज्ञात कीजिये।
(A) $2\text{cosec}A$ (B) 0 (C) 2 (D) $4\text{cosec}A$

42. The value of $\frac{3(1-2\sin^2 x)}{\cos^2 x - \sin^2 x}$ is :
$\frac{3(1-2\sin^2 x)}{\cos^2 x - \sin^2 x}$ का मान ज्ञात कीजिये।
(A) 2 (B) 1 (C) 3 (D) 4

43. The value of $(\text{cosec}30° - \tan45°)\cot60°\tan30°$ is :
का मान बताइए।

(A) $(2-1)\frac{1}{\sqrt{3}} \times \frac{1}{\sqrt{3}}$ (B) 3

(C) $\frac{1}{3}$ (D) 1

44. The value of $\cos10°\cos30°\cos50°\cos70°\cos90°$ is :
का मान ज्ञात कीजिये।
(A) 5 (B) 3 (C) 1 (D) 0

Solution

1. (B) $6\tan A = 5$

$$\tan A = \frac{5}{6} = \frac{\sin\theta}{\cos\theta} = \frac{5}{6}$$

$$\frac{8\sin A - 4\cos A}{\cos A + 2\sin A}$$

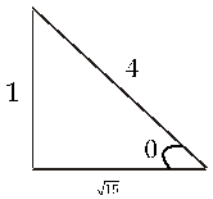
$$= \frac{8\times5 - 4\times6}{6 + 2\times5} = \frac{40-24}{16} = \frac{16}{16} = 1$$

2. (A) $\frac{\sec\theta - \tan\theta}{\sec\theta + \tan\theta} = \frac{3}{5}$

$$\Rightarrow \frac{1-\sin\theta}{1+\sin\theta} = \frac{3}{5}$$

$\Rightarrow 5 - 5\sin\theta = 3 + 3\sin\theta$

$$\Rightarrow \sin\theta = \frac{1}{4}$$



$\Rightarrow \text{cosec}\theta = 4$

$\Rightarrow \cot\theta = \sqrt{15}$

$$\frac{\text{cosec}\theta + \cot\theta}{\text{cosec}\theta - \cot\theta} = \frac{4+\sqrt{15}}{4-\sqrt{15}}$$

$$\frac{4+\sqrt{15}}{4-\sqrt{15}} \times \frac{4+\sqrt{15}}{4-\sqrt{15}} = 16 + 15 + 8\sqrt{15}$$

$$= 31 + 8\sqrt{15}$$

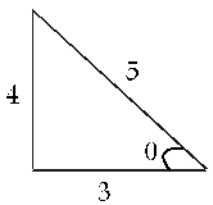
3. (C) $2\sin\theta + 15\cos^2\theta = 7$

$2\sin\theta + 15 - 15\sin^2\theta = 7$

$15\sin^2\theta - 2\sin\theta - 8 = 0$

$$\sin\theta = \frac{2 \pm \sqrt{4+480}}{30}$$

$$\sin\theta = \frac{2\pm22}{30}; \qquad \sin\theta = -\frac{2}{3}, \frac{4}{5}$$



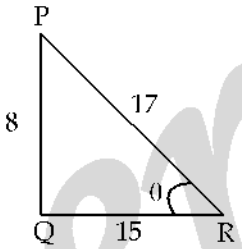
$\tan\theta + \cos\theta + \sec\theta$

$$\frac{4}{3} + \frac{3}{5} + \frac{5}{3} = \frac{20+9+25}{15} = \frac{54}{15} = \frac{18}{5} = 3\frac{3}{5}$$

4. (D) $\frac{\tan30° + \tan60°}{\cos30°}$

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

5. (A)



$QR = \sqrt{17^2 - 8^2}$

$QR = 15$

$$\cot\theta = \frac{15}{8}$$

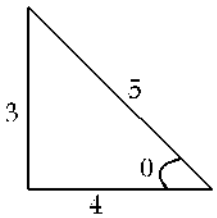
6. (B) $5\sin^2\theta + 14\cos\theta = 13$

$5 - 5\cos^2\theta + 14\cos\theta - 13 = 0$

$5\cos^2\theta - 14\cos\theta + 8 = 0$

$$\cos\theta = \frac{14 \pm \sqrt{196 - 4\times5\times8}}{10}$$

$$\cos\theta = \frac{14\pm6}{10}; \qquad \cos\theta = 2, \frac{4}{5}$$



$$\frac{\sec\theta + \cot\theta}{\text{cosec}\theta + \tan\theta} = \frac{\frac{5}{4} + \frac{4}{3}}{\frac{5}{3} + \frac{3}{4}} = \frac{31}{29}$$

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7. (B) $\dfrac{\tan 30^\circ \operatorname{cosec} 60^\circ + \tan 60^\circ \sec 30^\circ}{\sin^2 30^\circ + 4\cot^2 45^\circ - \sec^2 60^\circ}$

$$= \frac{\frac{1}{\sqrt{3}} \times \frac{2}{\sqrt{3}} + \sqrt{3} \times \frac{2}{\sqrt{3}}}{\frac{1}{4} + 4 - 4} = \frac{\frac{2}{3} + 2}{\frac{1}{4}} = \frac{\frac{8}{3}}{\frac{1}{4}} = \frac{32}{3}$$

8. (C) $7\sin^2\theta - \cos^2\theta + 2\sin\theta = 2$

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

$8\sin^2\theta + 2\sin\theta - 3 = 0$

$$\sin\theta = \frac{-2 \pm \sqrt{4+96}}{16} = \frac{-2 \pm 10}{16}$$

$$\sin\theta = -\frac{3}{4}, \frac{1}{2}$$

$\because 0^\circ < \theta < 90$

So, $\sin\theta = \dfrac{1}{2}$

and $\theta = 30^\circ$

$$\frac{\sec 2\theta + \cot 2\theta}{\operatorname{cosec} 2\theta + \tan 2\theta}$$

Put $\theta = 30^\circ$

$$\frac{\sec 60^\circ + \cot 60^\circ}{\operatorname{cosec} 60^\circ + \tan 60^\circ}$$

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

9. (D) $\tan^6\theta - \sec^6\theta + 3\sec^2\theta \tan^2\theta$

$(\tan^2\theta)^3 - (\sec^2\theta)^3 - 3\sec^2\theta \tan^2\theta (\tan^2\theta - \sec^2\theta)$

$(\tan^2\theta - \sec^2\theta)^3 = (-1)^3 = -1$

10. (C) $\dfrac{\tan^2\theta - \sin^2\theta}{2 + \tan^2\theta + \cot^2\theta} = \dfrac{\tan^2\theta - \sin^2\theta}{(\tan + \cot\theta)^2}$

$$\frac{\tan^2\theta - \sin^2\theta}{\sec^2\theta \operatorname{cosec}^2\theta}$$

$$= \frac{\tan^2\theta}{\sec^2\theta.\operatorname{cosec}^2\theta} - \frac{\sin^2\theta}{\sec^2\theta.\operatorname{cosec}^2\theta}$$

$= \sin^4\theta - \sin^4\theta \cos^2\theta$

$= \sin^4\theta (1 - \cos^2\theta)$

$= \sin^6\theta$

11. (A) $7\cos^2\theta + 3\sin^2\theta = 6$

Put $\theta = 30^\circ$

$$7 \times \frac{3}{4} + 3 \times \frac{1}{4} = 6$$

So, $\dfrac{\cot^2 2\theta + \sec^2 2\theta}{\tan^2 2\theta - \sin^2 2\theta} = \dfrac{\frac{1}{3} + 4}{3 - \frac{3}{4}}$

$$= \frac{13}{3} \times \frac{4}{9} = \frac{52}{27}$$

12. (B) $\dfrac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{2\sin^2 63^\circ + 1 + 2\sin^2 27^\circ}$

$$\frac{(\cos 9^\circ + \sin 81^\circ)(\sec 9^\circ + \operatorname{cosec} 81^\circ)}{3}$$

[$\sin 63^\circ = \cos 27^\circ$]

$$\Rightarrow \frac{(2\sin 81^\circ)(2\operatorname{cosec} 81^\circ)}{3} = \frac{4}{3}$$

13. (B) $\dfrac{\sec^6\theta - \tan^6\theta - 3\sec^2\theta \tan^2\theta + 1}{\cos^4\theta - \sin^4\theta + 2\sin^2\theta + 2}$

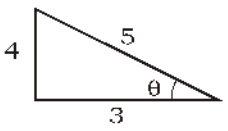
$$= \frac{(\sec^2\theta - \tan^2\theta)^3 + 1}{(\cos^2\theta + \sin^2\theta)(\cos^2\theta - \sin^2\theta) + 2\sin^2\theta + 2}$$

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

14. (A) $5\sin\theta = 4$

$$\sin\theta = \frac{4}{5}$$

$$\cos\theta = \frac{3}{5}$$



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

$$\frac{\sec\theta + 4\cot\theta}{4\tan\theta - 5\cos\theta} = \frac{\frac{5}{3} + 4 \times \frac{3}{4}}{4 \times \frac{4}{3} - 5 \times \frac{3}{5}}$$

$$= \frac{14}{\frac{3}{7}} = \frac{14}{7} = 2$$

15. (D) $12\cos^2\theta - 2\sin^2\theta + 3\cos\theta = 3$

$12\cos^2\theta - 2 + 2\cos^2\theta + 3\cos\theta = 3$

$14\cos^2\theta + 3\cos\theta - 5 = 0$

$$\cos\theta = \frac{-3+\sqrt{9+280}}{28}$$

$$\cos\theta = \frac{-3+17}{28}$$

$$\cos\theta = \frac{1}{2} \Rightarrow \theta = 60^\circ$$

$$\frac{\operatorname{cosec}\theta + \sec\theta}{\cot\theta + \tan\theta}$$

Put $\theta = 60^\circ$

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

$$\frac{2+2\sqrt{3}}{4} = \frac{1+\sqrt{3}}{2}$$

16. (B) $$\frac{\operatorname{cosec}(78^\circ+\theta) - \sec(12^\circ-\theta) - \tan(67^\circ+\theta) + \cot(23^\circ-\theta)}{\tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ}$$

$$\frac{\operatorname{cosec}(78^\circ+\theta) - \sec[90^\circ-(78^\circ+\theta)] - \tan(67^\circ+\theta) + \cot[90^\circ-(67^\circ+\theta)]}{\tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ}$$

So, $$\frac{0}{\tan 13^\circ \tan 37^\circ \tan 45^\circ \tan 53^\circ \tan 77^\circ}$$

$= 0$

17. (B) $5\cos\theta - 12\sin\theta = 0$

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

$$\frac{1+\sin\theta+\cos\theta}{1-\sin\theta+\cos\theta} = \frac{1+\frac{5}{13}+\frac{12}{13}}{1-\frac{5}{13}+\frac{12}{13}}$$

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

18. (A) $11\sin^2\theta - \cos^2\theta + 4\sin\theta = 4$

If $\theta = 30^\circ$

$$11 \times \frac{1}{4} - \frac{3}{4} + 4 \times \frac{1}{2} = 4 \Rightarrow 4$$

RHS = LHS

$$\frac{\cos 60^\circ + \cot 60^\circ}{\sec 60^\circ - \tan 60^\circ} = \frac{\frac{1}{2}+\frac{1}{\sqrt{3}}}{2-\sqrt{3}}$$

$$= \frac{7+4\sqrt{3}}{2\sqrt{3}} \Rightarrow \frac{12+7\sqrt{3}}{6}$$

19. (C) $\sqrt{\tan^2 60^\circ + \sin 90^\circ} - 2\tan 45^\circ$

$\sqrt{4} - 2 = 0$

20. (C) $\cos 0^\circ \cos 30^\circ \cos 45^\circ \cos 60^\circ \cos 90^\circ$

$$= 1 \times \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{2}} \times \frac{1}{2} \times 0 = 0$$

21. (B) $\tan\theta - \cot\theta = \operatorname{cosec}\theta$

for $\theta = 60^\circ \Rightarrow \tan\theta - \cot\theta = \operatorname{cosec}\theta$

so,

$$\frac{2\tan\theta - \cos\theta}{\sqrt{3}\cot\theta + \sec\theta} = \frac{2\sqrt{3} - \frac{1}{2}}{\sqrt{3} \times \frac{1}{\sqrt{3}} + 2}$$

$$= \frac{4\sqrt{3}-1}{6}$$

22. (B) $$\frac{\sin 40^\circ}{\cos 50^\circ} + \frac{\operatorname{cosec} 50^\circ}{\sec 40^\circ} - 4\cos 50^\circ \operatorname{cosec} 40^\circ$$

$$= 1 + 1 - 4 = -2 \left\{\begin{matrix}\text{If } \theta_1 + \theta_2 = 90^\circ \\ \sin\theta_1 = \cos\theta_2 \\ \sec\theta_1 = \operatorname{cosec}\theta_2\end{matrix}\right\}$$

23. (D) $x\cos A - y\sin A = 1$ ...(i)

$x\sin A + y\cos A = 4$ ...(ii)

$(i)^2 + (ii)^2$

$x^2 + y^2 = 17$

$17(x^2 + y^2) = 289$

24. (B) $2\sin A + \operatorname{cosec} A = 2\sqrt{2}$

Put, $\theta = 45^\circ$

$$2(\sin^4 A + \cos^4 A) = 2\left(\frac{1}{4}+\frac{1}{4}\right) = 1$$

25. (A) $$\frac{\sin 30^\circ \sin 60^\circ}{\cos 60^\circ \cos 30^\circ} - \tan 45^\circ$$

$= \tan 30^\circ \tan 60^\circ - \tan 45^\circ$

$$= \frac{1}{\sqrt{3}} \times \sqrt{3} - 1 = 0$$

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26. (B) $(\cos^2\theta - 1)(1 + \tan^2\theta) + 2\tan^2\theta = 1$
$\cos^2\theta + \sin^2\theta - 1 - \tan^2\theta + 2\tan^2\theta = 1$
$1 - 1 + \tan^2\theta = 1$
$\tan^2\theta = 1$
$\tan\theta = 1$
$\theta = 45°$

27. (B) $\sin0° \sin30° \sin45° \sin60° \sin90°$
$\because \sin0° = 0$
$= 0$

28. (A) $$4\left[\frac{(1-\sec A)^2 + (1+\sec A)^2}{1+\sec^2 A}\right]$$

$$= \frac{4\times 2(1+\sec^2 A)}{1+\sec^2 A} = 8$$

29. (D) $\text{Cos}(A + B) = \frac{24}{25} \Rightarrow \tan(A + B) = \frac{7}{24}$

$$\sin(A - B) = \frac{15}{17} \Rightarrow \tan(A - B) = \frac{15}{8}$$

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

$$= \frac{\frac{7}{24} + \frac{15}{8}}{1 - \frac{7}{24}\times\frac{15}{8}} = \frac{416}{87}$$

30. (C) $\tan A = \frac{21}{20}$

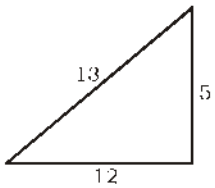
$$\therefore \quad \frac{5\tan A - 2}{4 - \frac{5}{7}\tan A} = \frac{5\times\frac{21}{20} - 2}{4 - \frac{5}{7}\times\frac{21}{20}} = \frac{\frac{21}{4} - 2}{4 - \frac{3}{4}} = 1$$

31. (D) $$\frac{1 - 2\sin^2\theta\cos^2\theta}{\sin^4\theta + \cos^4\theta} - 1$$
If $\theta = 0$
$1 - 1 = 0$

32. (A) $\sin30° + \cos30° - \tan45°$

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

33. (A)



$$\frac{\sin A + \cos A}{\cos A} = \frac{17}{12}$$

$$\tan A + 1 = \frac{17}{12}$$

$$\tan A = \frac{5}{12}$$

$$\frac{1 - \cos A}{\sin A} = \frac{1 - \frac{12}{13}}{\frac{5}{13}} = \frac{1}{5}$$

34. (C) $3\sec^2\theta + \tan\theta = 7$
Put, $\theta = 45°$

$$\frac{\text{cosec}\,2\theta + \cos\theta}{\sin 2\theta + \cot\theta} = \frac{1 + \frac{1}{\sqrt{2}}}{1+1}$$

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

35. (C) $\cot\theta + \tan\theta = 2\sec\theta$
$\cos^2\theta + \sin^2\theta = 2\sin\theta$
$\sin\theta = 1/2$
$\theta = 30°$

$$\frac{\tan 2\theta - \sec\theta}{\cot 2\theta + \text{cosec}\theta} = \frac{\sqrt{3} - 2\sqrt{3}}{\frac{1}{\sqrt{3}} + 2} = \frac{2\sqrt{3}-1}{11}$$

36. (C) $5\cos^2\theta + 1 = 3\sin^2\theta$
$5\cos^2\theta + 1 + 5\sin^2\theta = 3\sin^2\theta + 5\sin^2\theta$
$5(1) + 1 = 8\sin^2\theta$
$\sin^2\theta = 6/8$

$$\sin\theta = \frac{\sqrt{3}}{2} \qquad \theta = 60°$$

$$\frac{\tan\theta + \sec\theta}{\cot\theta + \text{cosec}\theta} = \frac{\sqrt{3} + 2}{\frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}}} = \frac{3 + 2\sqrt{3}}{3}$$

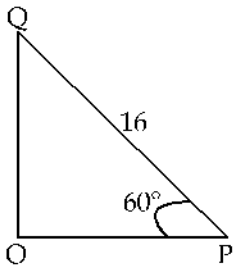
37. (D) $6\tan\theta - 5\sqrt{3}\sec\theta + 12\cot\theta = 0$
Let $\theta = 60$

$$6\sqrt{3} - 5\sqrt{3}\times 2 + 12\times\frac{1}{\sqrt{3}}$$

$$10\sqrt{3} - 10\sqrt{3} = 0$$
So, $\theta = 60°$
$(\text{cosec}\theta + \sec\theta)$

$$= \frac{2}{\sqrt{3}} + 2 = \frac{2}{3}\left(3 + \sqrt{3}\right)$$

38. (B)



$QO = 8\sqrt{3}$

39. (C) $\frac{2\sin 22^\circ}{\cos 68^\circ} - \frac{2\cot 75^\circ}{5\tan 15^\circ}$

$$- \frac{8\tan 45^\circ \tan 20^\circ \tan 40^\circ \tan 50^\circ \tan 70^\circ}{5}$$

$$2 - \frac{2}{5} - \frac{8}{5} = \frac{10-2-8}{5} = \frac{10-10}{5} = 0$$

40. (C) $5\cot\theta = 3 \Rightarrow \text{Tan}\theta = \frac{5}{3}$

$$\frac{6\sin\theta - 3\cos\theta}{7\sin\theta + 3\cos\theta}$$

$$= \frac{\cos\theta[6\text{Tan}\theta - 3]}{\cos\theta[7\text{Tan}\theta + 3]} = \frac{6\times\frac{5}{3} - 3}{7\times\frac{5}{3} + 3}$$

$$= \frac{30-9}{35+9} = \frac{21}{44}$$

41. (C) $(\text{cosec}A+1+\cot A)(\text{cosec}A + 1-\cot A) - 2\,\text{cosec}A$
$[(\text{cosec}A+1)^2 - \cot^2 A] - 2\,\text{cosec}A$
$[\text{cosec}^2 A+1+2\,\text{cosec}A - \cot^2 A] - 2\,\text{cosec}A$
$1+1+2\,\text{cosec}A - 2\,\text{cosec}A = 2$

42. (C) $\frac{3(1-2\text{Sin}^2 x)}{\text{Cos}^2 x - \text{Sin}^2 x} = \frac{3\cos 2x}{\cos 2x} = 3$

43. (C) $(\text{cosec}30^\circ - \tan 45^\circ)\cot 60^\circ \tan 30^\circ$

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

44. (D) $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ \cos 90^\circ = 0$

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(SSC CGL (PRE) – 2018)

1. If $4 - 2\sin^2\theta - 5\cos\theta = 0$, $0° < \theta < 90°$, then the value of $\sin\theta + \tan\theta$ is :
यदि $4 - 2\sin^2\theta - 5\cos\theta = 0$, $0° < \theta < 90°$ हो, तो $\sin\theta + \tan\theta$ का मान ज्ञात कीजिए ?
(A) $\frac{3\sqrt{2}}{2}$ (B) $\frac{3\sqrt{3}}{2}$
(C) $3\sqrt{2}$ (D) $2\sqrt{3}$

2. If $\sin\theta = \frac{P^2-1}{P^2+1}$ then $\cos\theta$ is equal to :
यदि $\sin\theta = \frac{P^2-1}{P^2+1}$ है, तो $\cos\theta$ बराबर है :
(A) $\frac{2P}{1+P^2}$ (B) $\frac{P}{P^2-1}$
(C) $\frac{P}{1+P^2}$ (D) $\frac{2P}{P^2-1}$

3. $\frac{2+\tan^2\theta+\cot^2\theta}{\sec\theta\,\mathrm{cosec}\,\theta}$ is equal to / बराबर है :
(A) $\cot\theta$ (B) $\cos\theta\sin\theta$
(C) $\sec\theta\,\mathrm{cosec}\,\theta$ (D) $\tan\theta$

4. If $\cos\theta = \frac{2p}{(1+p^2)}$, then $\tan\theta$ is equal to:
यदि $\cos\theta = \frac{2p}{(1+p^2)}$ है, तो $\tan\theta$ बराबर है :
(A) $\frac{p^2}{1+p^2}$ (B) $\frac{2p^2}{1-p^2}$ (C) $\frac{1-p^2}{1+p^2}$ (D) $\frac{1-p^2}{2p}$

5. If $0° < \theta < 90°$ and $\cos^2\theta = 3(\cot^2\theta - \cos^2\theta)$ then the value of $\left(\frac{1}{2}\sec\theta + \sin\theta\right)^{-1}$ is :
यदि $0° < \theta < 90°$ और $\cos^2\theta = 3(\cot^2\theta - \cos^2\theta)$ है, तो $\left(\frac{1}{2}\sec\theta + \sin\theta\right)^{-1}$ का मान होगा :
(A) $\sqrt{3}+2$ (B) $2\left(2-\sqrt{3}\right)$
(C) $2\left(\sqrt{3}-1\right)$ (D) $\sqrt{3}+1$

6. $\left(\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}\right)^2 + 1$, $\theta \neq 45°$, is equal to :
$\left(\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}\right)^2 + 1$, $\theta \neq 45°$ बराबर है :
(A) $\mathrm{cosec}^2\theta$ (B) $\sec^2\theta$
(C) $\cot^2\theta$ (D) $2\tan^2\theta$

7. If $\sec\theta - \tan\theta = P$, then $\mathrm{cosec}\,\theta = ?$
यदि $\sec\theta - \tan\theta = P$, तो $\mathrm{cosec}\,\theta = ?$
(A) $\frac{2P}{1-P^2}$ (B) $\frac{1-P^2}{1+P^2}$
(C) $\frac{P^2+1}{1-P^2}$ (D) $\frac{2P}{1+P^2}$

8. The value of θ, if $\sqrt{3}\cos\theta + \sin\theta = 1$ $(0° \le \theta \le 90°)$, is
यदि $\sqrt{3}\cos\theta + \sin\theta = 1$ $(0° \le \theta \le 90°)$, तो θ का मान है:
(A) 90° (B) 30°
(C) 60° (D) 0°

9. $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = ?$
(A) $\sec\theta\sin\theta$ (B) $\sec\theta\tan\theta$
(C) $\sec\theta + \tan\theta$ (D) $\sec\theta - \tan\theta$

10. The value of $\sqrt{\sec^2\theta + \mathrm{cosec}^2\theta} \times \sqrt{\tan^2\theta - \sin^2\theta}$ is equal to:
$\sqrt{\sec^2\theta + \mathrm{cosec}^2\theta} \times \sqrt{\tan^2\theta - \sin^2\theta}$ का मान बराबर है:
(A) $\mathrm{cosec}\theta\sec^2\theta$ (B) $\sin\theta\sec^2\theta$
(C) $\sin\theta\cos^2\theta$ (D) $\mathrm{cosec}\theta\cos^2\theta$

11. If $12\cot^2\theta - 31\,\mathrm{cosec}\theta + 32 = 0$, $0° < \theta < 90°$, then the values of $\tan\theta$ will be:
यदि $12\cot^2\theta - 31\,\mathrm{cosec}\theta + 32 = 0$, $0° < \theta < 90°$ है, तो $\tan\theta$ के मान हैं:
(A) $\frac{4}{3}, \frac{3\sqrt{7}}{7}$ (B) $\frac{4}{5}, \frac{5\sqrt{7}}{7}$
(C) $\frac{5}{4}, \frac{4}{3}$ (D) $\frac{4}{5}, \frac{4}{3}$

12. If $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$, $0° < \theta < 90°$, then the value of $\cot\theta + \mathrm{cosec}\,\theta$ is:
यदि $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$, $0° < \theta < 90°$ है, तो $\cot\theta + \mathrm{cosec}\,\theta$ का मान है:
(A) $\sqrt{3}$ (B) $\frac{\sqrt{3}}{2}$ (C) $2\sqrt{3}$ (D) $\frac{3\sqrt{3}}{4}$

13. If $\sin\theta = 4\cos\theta$, then what is the value of $\sin\theta\cos\theta$?
यदि $\sin\theta = 4\cos\theta$ है, तो $\sin\theta\cos\theta$ का मान कितना है ?
(A) $\frac{2}{9}$ (B) $\frac{3}{10}$ (C) $\frac{4}{17}$ (D) $\frac{3}{4}$

14. Let a= $\frac{2\sin x}{1+\sin x+\cos x}$ and b = $\frac{c}{1+\sin x}$ and a= b, Then c = ?

माना a= $\frac{2\sin x}{1+\sin x+\cos x}$ और b = $\frac{c}{1+\sin x}$ और a = b है, तो c = ?

(A) 1 – sinx cosx (B) 1+sinx – cosx
(C) 1+sinx cosx (D) 1 + cosx – sinx

15. The value of $\frac{1}{\sin\theta}-\frac{\cot^2\theta}{1+\text{cosec}\theta}$ is:

$\frac{1}{\sin\theta}-\frac{\cot^2\theta}{1+\text{cosec}\theta}$ का मान है:

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

16. If $\frac{\cos\theta}{1-\sin\theta}+\frac{\cos\theta}{1+\sin\theta}$=4, 0° < θ < 90°, then the value of (tanθ + cosecθ) is :

यदि $\frac{\cos\theta}{1-\sin\theta}+\frac{\cos\theta}{1+\sin\theta}$ = 4, 0° < θ < 90°, तब (tanθ + cosecθ) का मान है:

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

17. If $(1+\tan^2\theta)+(1+(\tan^2\theta)^{-1})=k$, then $\sqrt{k}$ = ?

यदि $(1+\tan^2\theta)+(1+(\tan^2\theta)^{-1})=k$, तो $\sqrt{k}$ = ?

(A) cosecθ secθ (B) cosecθ cosθ
(C) sinθ cosθ (D) sinθ secθ

18. $\left(\frac{1}{1+\sin^2\theta}+\frac{1}{1+\text{cosec}^2\theta}\right)$ = ?

(A) $\sin^2\theta$ (B) 1
(C) $\text{cosec}^2\theta$ (D) 2

19. The value of $\frac{1}{\sec x-\tan x}-\frac{1}{\cos x}$, 0° < x < 90°, is equal to:

$\frac{1}{\sec x-\tan x}-\frac{1}{\cos x}$, 0° < x < 90°, का मान बराबर है:

(A) 2secx (B) tanx
(C) 2 cosx (D) cotx

20. If $\tan^2\theta-3\sec\theta+3=0$, 0° < θ < 90°
यदि $\tan^2\theta-3\sec\theta+3=0$, 0° < θ < 90° है, तो sinθ + cotθ का मान है:

(A) $\frac{5\sqrt{3}}{6}$ (B) $2\sqrt{3}$ (C) $\frac{5\sqrt{3}}{3}$ (D) $3\sqrt{3}$

21. If cotθ = $\sqrt{7}$, then the value of $\frac{\text{cosec}^2\theta-\sec^2\theta}{\text{cosec}^2\theta+\sec^2\theta}$ is:

यदि cotθ= $\sqrt{7}$ है, तो $\frac{\text{cosec}^2\theta-\sec^2\theta}{\text{cosec}^2\theta+\sec^2\theta}$ का मान है:

(A) $\frac{3}{4}$ (B) $\frac{2}{3}$ (C) $\frac{8}{9}$ (D) $\frac{7}{9}$

22. If sinθ = $\frac{a}{\sqrt{a^2+b^2}}$, 0 < θ < 90°, then the value of secθ + tanθ is:

यदि sinθ = $\frac{a}{\sqrt{a^2+b^2}}$, 0 < θ < 90°, तो secθ + tanθ का मान है:

(A) $\frac{\sqrt{a^2+b^2}+a}{b}$ (B) $\frac{\sqrt{a^2+b^2}+b}{2a}$
(C) $\frac{\sqrt{a^2+b^2}+a}{2b}$ (D) $\frac{\sqrt{a^2+b^2}+b}{a}$

23. If $\cos^2\theta-3\cos\theta+2=\sin^2\theta$, 0° < θ < 90°, then the value of 2cosecθ + 4cotθ is:
यदि $\cos^2\theta-3\cos\theta+2=\sin^2\theta$, 0° < θ < 90°, तो 2cosecθ + 4cotθ का मान है:

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

24. If $\left(\frac{\tan\theta-\sec\theta+1}{\tan\theta+\sec\theta-1}\right)\sec\theta=\frac{1}{k}$ then k = _____.

यदि $\left(\frac{\tan\theta-\sec\theta+1}{\tan\theta+\sec\theta-1}\right)\sec\theta=\frac{1}{k}$, तो k = _____.

(A) 1+sinθ (B) 1– cosθ
(C) 1 + cosθ (D) 1 – sinθ

25. If $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$ = 1 + k, then k = _____.

यदि $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$ = 1 + k हो, तो k = _____

(A) cot θ + sec θ (B) tan θ cosec θ
(C) tan θ + sec θ (D) cosec θ sec θ

26. $\left(\frac{2\tan30°}{1-\tan^230°}\right)$ = ?

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

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27. If $\frac{1}{\text{cosec}\,\theta-1}+\frac{1}{\text{cosec}\,\theta+1}=2\sec\theta$, $0°<\theta<90°$, then the value of $(\cot\theta+\cos\theta)$ is:

यदि $\frac{1}{\text{cosec}\,\theta-1}+\frac{1}{\text{cosec}\,\theta+1}=2\sec\theta$, $0°<\theta<90°$, तो $(\cot\theta+\cos\theta)$ का मान है:

(A) $\frac{1+\sqrt{2}}{2}$ (B) $\frac{2+\sqrt{2}}{2}$

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

28. The value of $\sin^2 30°\cos^2 45°+4\tan^2 30°+\frac{1}{2}\sin^2 90°+2\cos 90°$ is :

$\sin^2 30°\cos^2 45°+4\tan^2 30°+\frac{1}{2}\sin^2 90°+2\cos 90°$ का मान है:

(A) $\frac{15}{8}$ (B) $\frac{47}{24}$ (C) $\frac{23}{12}$ (D) 2

29. In ΔABC, right angled at B, AB = 7 cm and (AC – BC) = 1 cm. The value of (secC + cotA) is :

ΔABC में, B पर समकोण है, AB = 7 cm और (AC – BC) = 1 cm है। (secC + cotA) का मान है :

(A) $\frac{19}{24}$ (B) $\frac{4}{3}$ (C) $\frac{3}{4}$ (D) 1

30. If $3\sin\theta=2\cos^2\theta$, $0°<\theta<90°$, then the value of $(\tan^2\theta+\sec^2\theta-\text{cosec}^2\theta)$ is :

यदि $3\sin\theta=2\cos^2\theta$, $0°<\theta<90°$ है, तो $(\tan^2\theta+\sec^2\theta-\text{cosec}^2\theta)$ का मान क्या है ?

(A) –2 (B) $-\frac{7}{3}$ (C) $\frac{7}{3}$ (D) 2

31. If $\frac{\tan\theta+\sin\theta}{\tan\theta-\sin\theta}=\frac{k+1}{k-1}$, then k = ?

यदि $\frac{\tan\theta+\sin\theta}{\tan\theta-\sin\theta}=\frac{k+1}{k-1}$ है, तो k = ?

(A) $\text{cosec}\theta$ (B) $\sec\theta$
(C) $\cos\theta$ (D) $\sin\theta$

32. If $\tan\theta=\frac{2}{3}$, then $\frac{3\sin\theta-4\cos\theta}{3\sin\theta+4\cos\theta}$ is equal to :

यदि $\tan\theta=\frac{2}{3}$ है, तो $\frac{3\sin\theta-4\cos\theta}{3\sin\theta+4\cos\theta}$ किसके बराबर होगा ?

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

33. If $\sec 4\theta=\text{cosec}(\theta+20°)$, then θ is equal to :

यदि $\sec 4\theta=\text{cosec}(\theta+20°)$ है तो θ किसके बराबर होगा ?

(A) 22° (B) 18°
(C) 14° (D) 20°

34. The value of $\sin^2 38°+\sin^2 52°+\sin^2 30°-\tan^2 45°$ is equal to :

$\sin^2 38°+\sin^2 52°+\sin^2 30°-\tan^2 45°$ का मान किसके बराबर है ?

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

35. When $2\sin^2\theta=3\cos\theta$ and $0\le\theta\le 90°$, then θ = ?

जब $2\sin^2\theta=3\cos\theta$ तथा $0\le\theta\le 90°$ तो θ = ?

(A) 45° (B) 30°
(C) 90° (D) 60°

36. The value of $\sin^2 60°-\cos^2 45°+\sec 60°+\cos^2 40°+\cos^2 50°$ is equal to :

$\sin^2 60°-\cos^2 45°+\sec 60°+\cos^2 40°+\cos^2 50°$ का मान है :

(A) $\frac{13}{4}$ (B) $\frac{7}{2}$ (C) $\frac{11}{4}$ (D) $\frac{9}{14}$

37. If $\tan\theta=\frac{3}{4}$, then $\frac{4\sin\theta-\cos\theta}{4\sin\theta+\cos\theta}$ is equal to :

यदि $\tan\theta=\frac{3}{4}$ है, तो $\frac{4\sin\theta-\cos\theta}{4\sin\theta+\cos\theta}$ किसके बराबर होगा ?

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

38. If $\cot\theta=\frac{3}{4}$, then $\sin\theta+\cos\theta-\tan\theta$ is equal to :

यदि $\cot\theta=\frac{3}{4}$ है, तो $\sin\theta+\cos\theta-\tan\theta$ किसके बराबर होगा ?

(A) $-\frac{1}{20}$ (B) $\frac{2}{15}$ (C) $\frac{1}{20}$ (D) $\frac{1}{15}$

39. The value of $\sec^2 28°-\cot^2 62°+\sin^2 60°+\text{cosec}^2 30°$ is equal to:

$\sec^2 28°-\cot^2 62°+\sin^2 60°+\text{cosec}^2 30°$ का मान है:

(A) $\frac{7}{2}$ (B) 3 (C) $\frac{19}{4}$ (D) $\frac{23}{4}$

40. If $\tan 4\theta = \cot(2\theta + 30°)$, then θ is equal to:
यदि $\tan 4\theta = \cot(2\theta + 30°)$ है, तो θ बराबर होगा ?
(A) 15° (B) 10°
(C) 20° (D) 25°

41. The value of $\cot^2 62° - \sec^2 28° + \text{cosec}^2 30° + \tan^2 60°$ is equal to :
$\cot^2 62° - \sec^2 28° + \text{cosec}^2 30° + \tan^2 60°$ का मान बराबर है :
(A) 8 (B) $\frac{10}{3}$ (C) 6 (D) $\frac{16}{3}$

42. If $\text{cosec}\ \theta = \frac{13}{12}$, then $\sin\theta + \cos\theta - \tan\theta$ is equal to:
यदि $\text{cosec}\ \theta = \frac{13}{12}$ है, तो $\sin\theta + \cos\theta - \tan\theta$ बराबर है :
(A) $\frac{91}{65}$ (B) $\frac{139}{65}$ (C) $\frac{71}{65}$ (D) $-\frac{71}{65}$

43. If $\sin\theta = \cos(50° + \theta)$, then θ is equal to:
यदि $\sin\theta = \cos(50° + \theta)$ है, तो θ बराबर है :
(A) 20° (B) 25°
(C) 30° (D) 35°

44. The value of $\sin^2 48° + \sin^2 42° - \sec^2 30° + \tan^2 60°$ is equal to:
$\sin^2 48° + \sin^2 42° - \sec^2 30° + \tan^2 60°$ का मान बराबर है :
(A) $\frac{8}{3}$ (B) 2 (C) $\frac{7}{3}$ (D) $\frac{5}{3}$

45. If $\sec\theta = \frac{25}{7}$, then $\tan\theta - \sin\theta + \cos\theta$ is equal to:
यदि $\sec\theta = \frac{25}{7}$ है, तो $\tan\theta - \sin\theta + \cos\theta$ बराबर है:
(A) $\frac{481}{175}$ (B) $\frac{485}{175}$ (C) $\frac{719}{175}$ (D) $\frac{721}{175}$

46. If $\sin 5\theta = \cos(50° - 3\theta)$, then $\sin3\theta + \cos3\theta + \tan3\theta + \cot3\theta$ is equal to:
यदि $\sin 5\theta = \cos(50° - 3\theta)$ है, तो $\sin3\theta + \cos3\theta + \tan3\theta + \cot3\theta$ बराबर है:
(A) $\frac{11+\sqrt{3}}{2\sqrt{3}}$ (B) $\frac{11-\sqrt{3}}{2\sqrt{3}}$
(C) $\frac{12+\sqrt{3}}{2\sqrt{3}}$ (D) $\frac{12-\sqrt{3}}{2\sqrt{3}}$

47. If $\cos\theta = \frac{4}{5}$, then $\sin^2\theta\cos\theta + \cos^2\theta\sin\theta$ is equal to :
यदि $\cos\theta = \frac{4}{5}$ है, तो $\sin^2\theta\cos\theta + \cos^2\theta\sin\theta$ बराबर है:
(A) $\frac{16}{25}$ (B) $\frac{84}{125}$ (C) $\frac{14}{25}$ (D) $\frac{82}{125}$

48. The value of $\frac{\sin 44°}{\cos 46°} + \sin^2 60° - \cos^2 45° + \sec 60°$ is equal to :
$\frac{\sin 44°}{\cos 46°} + \sin^2 60° - \cos^2 45° + \sec 60°$ का मान बराबर है :
(A) $\frac{13}{4}$ (B) $\frac{11}{4}$ (C) $\frac{11}{3}$ (D) $\frac{7}{4}$

49. If $\tan 4\theta = \cot(40° - 2\theta)$, then θ is equal to :
यदि $\tan 4\theta = \cot(40° - 2\theta)$ है, तो θ बराबर है :
(A) 20° (B) 25°
(C) 35° (D) 30°

50. The value of $\sin^2 20° + \sin^2 70° - \tan^2 45° + \sec 60°$ is equal to :
$\sin^2 20° + \sin^2 70° - \tan^2 45° + \sec 60°$ का मान किसके बराबर है :
(A) 1 (B) 2
(C) 2.5 (D) 3

51. If $3\sin\theta = 4\cos\theta$, then $\tan^2\theta + \sin\theta - \cos\theta$ is equal to :
यदि $3\sin\theta = 4\cos\theta$ है, तो $\tan^2\theta + \sin\theta - \cos\theta$ बराबर है :
(A) $\frac{88}{45}$ (B) 2 (C) $\frac{89}{45}$ (D) $\frac{17}{9}$

52. If $\text{cosec}3\theta = \sec(20° + 2\theta)$, then θ is equal to :
यदि $\text{cosec}3\theta = \sec(20° + 2\theta)$ है तो θ बराबर है :
(A) 30° (B) 20°
(C) 15° (D) 14°

53. $\sec^2 29° - \cot^2 61° + \sin^2 60° + \text{cosec}^2 30°$ is equal to :
$\sec^2 29° - \cot^2 61° + \sin^2 60° + \text{cosec}^2 30°$ बराबर है:
(A) $\frac{19}{4}$ (B) $\frac{23}{4}$ (C) $\frac{15}{4}$ (D) $\frac{11}{4}$

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54. If $\text{cosec}4\theta = \sec(60° - 2\theta)$, then θ is equal to :
यदि $\text{cosec}4\theta = \sec(60° - 2\theta)$ है, तो θ बराबर है :
(A) 18° (B) 25°
(C) 15° (D) 20°

55. If $12\sin\theta = 5\cos\theta$, then $\sin\theta + \cos\theta - \cot\theta$ is equal to :
यदि $12\sin\theta = 5\cos\theta$ है, तो $\sin\theta + \cos\theta - \cot\theta$ बराबर है:
(A) $\frac{139}{156}$ (B) $-\frac{71}{65}$ (C) $\frac{116}{156}$ (D) $-\frac{16}{65}$

56. The value of $\sin^2 42° + \sin^2 48° + \tan^2 60° - \text{cosec}30°$ is equal to :
The value of $\sin^2 42° + \sin^2 48° + \tan^2 60° - \text{cosec}30°$ का मान बराबर है :
(A) 5 (B) 3
(C) 4 (D) 2

57. If $\sin 3\theta = \cos(20° - \theta)$, then θ is equal to :
यदि $\sin 3\theta = \cos(20° - \theta)$ है, तो θ बराबर है :
(A) 25 (B) 35
(C) 28 (D) 30

58. If $3\sin\theta = 2\cos\theta$, then $\frac{4\sin\theta - \cos\theta}{4\cos\theta - \sin\theta}$ is equal to:
यदि $3\sin\theta = 2\cos\theta$ है, तो $\frac{4\sin\theta - \cos\theta}{4\cos\theta - \sin\theta}$ समान है :
(A) $\frac{5}{7}$ (B) $\frac{5}{8}$ (C) $\frac{1}{2}$ (D) $\frac{5}{11}$

59. If $2\sin\theta = 5\cos\theta$, then $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta}$ is equal to:
यदि $2\sin\theta = 5\cos\theta$ है, तो $\frac{\sin\theta + \cos\theta}{\sin\theta - \cos\theta}$ बराबर है:
(A) $\frac{5}{3}$ (B) $\frac{9}{5}$ (C) $\frac{2}{3}$ (D) $\frac{7}{3}$

60. The value of $\sin^2 32° + \sin^2 58° - \sin 30° + \sec^2 60°$ is equal to:
$\sin^2 32° + \sin^2 58° - \sin 30° + \sec^2 60°$ का मान बराबर है:
(A) 5.5 (B) 3.5
(C) 4.5 (D) 4.75

61. If $\text{cosec}\,2\theta = \sec(3\theta - 15°)$, then θ is equal to:
यदि $\text{cosec}\,2\theta = \sec(3\theta - 15°)$ हो, तो θ बराबर है:
(A) 22° (B) 20°
(C) 25° (D) 21°

62. If $\tan x = \cot(45° + 2x)$, then what is value of x?
यदि $\tan x = \cot(45° + 2x)$ है, तो x का मान है ?
(A) $\frac{45°}{2}$ (B) 20° (C) 15° (D) 45°

63. The value of / का मान है :
$$\left[\frac{\sin^2 24° + \sin^2 66°}{\cos^2 24° + \cos^2 66°} + \sin^2 61° + \cos 61° \sin 29°\right]$$
(A) 3 (B) 1
(C) 2 (D) 0

64. If $3\cos^2 A + 7\sin^2 A = 4$, then what is the value of cot A, given that A is an acute angle?
यदि $3\cos^2 A + 7\sin^2 A = 4$ है और A न्यून कोण दिया गया है तो cot A का मान होगा ?
(A) 1 (B) $\sqrt{3}$ (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{1}{\sqrt{3}}$

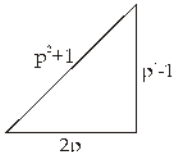
Solution

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

$\Rightarrow \cos\theta = \frac{1}{2} \qquad \Rightarrow \theta = 60°$

$\sin 60° + \tan 60° = \frac{\sqrt{3}}{2} + \sqrt{3} = \frac{3\sqrt{3}}{2}$

2. (A) $\sin\theta = \frac{p^2 - 1}{p^2 + 1}$



(Using pythagorus theorem)

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

3. (C) $\frac{\left(2 + \frac{\sin^4\theta + \cos^4\theta}{\sin^2\theta\cos^2\theta}\right)}{1}$

$\sin\theta\cos\theta$

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

$= \sec\theta\,\text{cosec}\theta$

4. (D) $\cos\theta = \frac{2P}{1 + P^2} = \frac{\text{base}}{\text{hyp.}}$

$\Rightarrow \text{Perpendicular} = \sqrt{(P^2 + 1)^2 - (2P)^2}$

$= P^2 - 1$ or $1 - P^2$

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

5. (B) $\cos^2\theta = 3\left(\frac{\cos^2\theta}{\sin^2\theta} - \cos^2\theta\right)$

$1 = 3\left(\frac{1}{\sin^2\theta} - 1\right)$

$1 = 3\ (\text{cosec}^2\theta - 1)$

$1 = 3\ \cot^2\theta$

$\Rightarrow \cot^2\theta = \frac{1}{3} \quad \Rightarrow \cot\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 60°$

$\left(\frac{1}{2}\sec 60 + \sin 60\right)^1 = \left(\frac{1}{2}\times 2 + \frac{\sqrt{3}}{2}\right)^{-1}$

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

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

6. (B) $\left(\frac{\sin\theta\left(1-2\sin^2\theta\right)}{\cos\theta\left(2\cos^2\theta-1\right)}\right)^2 + 1 = \left(\frac{\sin\theta.\cos 2\theta}{\cos\theta\cos 2\theta}\right)^2 + 1$

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

7. (C) $\sec\theta - \tan\theta = P$

$\sec\theta + \tan\theta = \frac{1}{P}$

$\Rightarrow 2\sec\theta = p + \frac{1}{p}$

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

$\cos\theta = \frac{2p}{p^2+1} = \frac{\text{base}}{\text{hyp.}}$

using pythagorus theorem

Perpendicular = $P^2 - 1$

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

$\Rightarrow \text{cosec}\theta = \frac{p^2+1}{p^2-1}$

8. (A) $\sqrt{3}\cos\theta + \sin\theta = 1$

By hit and trial

$\Rightarrow \theta = 90°$

9. (C) $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1}$ Put $\theta = 45°$

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

By option put $\theta = 45°$

(C) will be satisfied

sec 45 + tan 45

$\sqrt{2}+1$

10. (B) $\sqrt{\sec^2\theta + \text{cosec}^2\theta} \times \sqrt{\tan^2\theta - \sin^2\theta}$

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

$= \sqrt{\frac{\sin^2\theta + \cos^2\theta}{\sin^2\theta.\cos^2\theta}} \times \sqrt{\sin^2\theta\left[\frac{1-\cos^2\theta}{\cos^2\theta}\right]}$

$= \sqrt{\text{cosec}^2\theta.\sec^2\theta} \times \sqrt{\frac{\sin^4\theta}{\cos^2\theta}}$

$= \sqrt{\text{cosec}^2\theta \times \sin^4\theta \times \sec^2\theta \times \sec^2\theta}$

$= \sqrt{\sin^2\theta \times \sec^4\theta}$

$= \sin\theta\sec^4\theta$

11. (A) $12\ (\text{cosec}^2\theta - 1) - 31\ \text{cosec}\theta + 32 = 0$

$12\text{cosec}^2\theta - 31\text{cosec}\theta + 20 = 0$

$12\text{cosec}^2\theta - 15\text{cosec}\theta - 16\ \text{cosec}\theta + 20 = 0$

$3\text{cosec}\theta\ (4\text{cosec}\theta - 5) - 4\ (4\text{cosec}\theta - 5) = 0$

$\Rightarrow \text{cosec}\theta = \frac{4}{3}, \frac{5}{4}$

$\Rightarrow \tan\theta = \frac{3}{\sqrt{7}}, \frac{4}{3} \quad \Rightarrow \tan\theta = \frac{3\sqrt{7}}{7}, \frac{4}{3}$

12. (A) $\frac{\cos^2\theta}{\left(\frac{\cos^2\theta}{\sin^2\theta}\right) - \cos^2\theta}$

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

$\Rightarrow \tan^2\theta = 3$

$\theta = 60°$

$\cot 60 + \text{cosec}\,60 = \frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}} = \sqrt{3}$

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13. (C) $\tan\theta = 4$

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

$$= \frac{2\tan\theta}{2(1+\tan^2\theta)} = \frac{4}{1+16} = \frac{4}{17}$$

14. (B) Put $x = 45°$

$$a = \frac{\sqrt{2}}{1+\sqrt{2}} = \frac{c\sqrt{2}}{1+\sqrt{2}} \Rightarrow c = 1$$

By this option B and D satisfies
If $x = 0°$
$a = 0$

$$o = \frac{c}{1+\sin x}$$

Here option B satisfies

15. (B) $\operatorname{cosec}\theta - \left[\frac{(\operatorname{cosec}^2\theta - 1)}{\operatorname{cosec}\theta + 1}\right]$

$= \operatorname{cosec}\theta - (\operatorname{cosec}\theta - 1) = 1$

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

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

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

$\Rightarrow \theta = 60°$
$\Rightarrow \tan 60 + \operatorname{cosec} 60°$

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

17. (B) $\sec^2\theta + 1 + \frac{1}{\tan^2\theta} = k$

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

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

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

$\Rightarrow \sqrt{k} = \operatorname{cosec}\theta\sec\theta$

18. (B) $\frac{1}{1+\sin^2\theta} + \frac{\sin^2\theta}{1+\sin^2\theta}$

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

19. (B) As we know = $\sec x - \tan x = \frac{1}{\sec x + \tan x}$

So $\sec x + \tan x - \sec x = \tan x$

20. (A) $\because \tan^2\theta = \sec^2\theta - 1$
$\sec^2\theta - 3\sec\theta + 2 = 0$
$\sec\theta = 2, 1$
Let, $\sec = 2$

$$\sin\theta = \frac{\sqrt{3}}{2}; \cot\theta = \frac{1}{\sqrt{3}}$$

$$\sin\theta + \cot\theta = \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{3}} = \frac{5\sqrt{3}}{6}$$

21. (A) $\frac{\operatorname{cosec}^2\theta - \sec^2\theta}{\operatorname{cosec}^2\theta + \sec^2\theta} = \frac{1+\cot^2\theta - 1 - \tan^2\theta}{1+\cot^2\theta + 1 + \tan^2\theta}$

$$= \frac{\cot^2\theta - \tan^2\theta}{2+\cot^2\theta+\tan^2\theta} = \frac{7-\frac{1}{7}}{2+7+\frac{1}{7}} = \frac{3}{4}$$

22. (A) $\sin\theta = \frac{L}{K} = \frac{a}{\sqrt{a^2+b^2}}$

$$\sec\theta + \tan\theta = \frac{\sqrt{a^2+b^2}}{b} + \frac{a}{b}$$

$$= \frac{\sqrt{a^2+b^2}+a}{b}$$

23. (A) $\cos^2\theta - 3\cos\theta + 2 = 1 - \cos^2\theta$
$2\cos^2\theta - 3\cos\theta + 1 = 0$

$$\cos\theta = \frac{1}{2}, (\because 0 < \theta < 90)$$

$$\operatorname{cosec}\theta = \frac{2}{\sqrt{3}}, \cot\theta = \frac{1}{\sqrt{3}}$$

$$2\operatorname{cosec}\theta + 4\cot\theta = \frac{8}{\sqrt{3}} = \frac{8\sqrt{3}}{3}$$

24. (A) Put $\sec\theta + \tan\theta = \frac{1}{\sec\theta - \tan\theta}$

$$\frac{1}{k} = (\sec\theta - \tan\theta).\sec\theta$$

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

$k = 1 + \sin\theta$

25. (D) $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$

$= \frac{\tan\theta}{1-\left(\frac{1}{\tan\theta}\right)}+\frac{1}{(\tan\theta)(1-\tan\theta)}$

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

$= \frac{\tan^3\theta-1}{(\tan\theta)(\tan\theta-1)}$

Using formula $a^3 - b^3$

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

$= \tan\theta + \cot\theta + 1$

$= 1 + k$ (Given)

$k = \tan\theta + \cot\theta$

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

$= \frac{1}{\cos\theta\sin\theta} = \sec\theta\,\mathrm{cosec}\theta$

26. (C) $\left(\frac{2\tan 30^\circ}{1-\tan^2 30^\circ}\right)$

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

$= \sqrt{3}$

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

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

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

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

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

$\Rightarrow \cot\theta + \cos\theta = \cot 45^\circ + \cos 45^\circ$

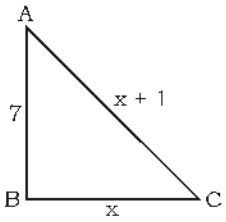
$= 1 + \frac{1}{\sqrt{2}} = \frac{\sqrt{2}+1}{\sqrt{2}} = \frac{2+\sqrt{2}}{2}$

28.. (B) $\left(\frac{1}{2}\right)^2\cdot\left(\frac{1}{\sqrt{2}}\right)^2+4\left(\frac{1}{\sqrt{3}}\right)^2+\frac{1}{2}(1)^2+2(0)$

$= \frac{1}{4}\times\frac{1}{2}+\frac{4}{3}+\frac{1}{2}+0 = \frac{1}{8}+\frac{4}{3}+\frac{1}{2}$

$= \frac{3+32+12}{24}=\frac{47}{24}$

29. (A)



Let, BC = x

Given,

AC – BC = 1

$\Rightarrow$ AC = 1 + x

Using pythagorus theorem in given triangle

$49 + x^2 = x^2 + 1 + 2x$

$48 = 2x$

$\Rightarrow x = 24$

To find,

secC + cotA

Here, $\cos C = \frac{24}{25}$

$\mathrm{Cot}\,A = \frac{7}{24}$

$\Rightarrow \frac{25}{24}+\frac{7}{24}=\frac{32}{24}=\frac{8}{6} = \frac{4}{3}=1\frac{1}{3}$

30. (B) $3\sin\theta = 2\cos^2\theta$

$\Rightarrow 3\sin\theta - 2(1-\sin^2\theta)=0$

$= 3\sin\theta - 2 + 2\sin^2\theta = 0$

$\Rightarrow \theta = 30^\circ$

Put value of $\theta = 30^\circ$ in the given equation

$\tan^2 30^\circ + \sec^2 30^\circ - \mathrm{cosec}^2 30^\circ$

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

$= \frac{5}{3}-4 = \frac{-7}{3}$

31. (B) $\frac{\tan\theta+\sin\theta}{\tan\theta-\sin\theta}=\frac{K+1}{K-1}$

using C & D

$\frac{2\tan\theta}{2\sin\theta}=\frac{2K}{2\times1}$

$\Rightarrow \frac{1}{\cos\theta} = K \Rightarrow K = \sec\theta$

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32. (A) $\tan\theta = \frac{2}{3}$ (Given)

Dividing numerator and denominator of original equation by $\cos\theta$

$$\frac{3\tan\theta - 4}{3\tan\theta + 4} = \frac{2-4}{2+4} = \frac{-2}{6} = \frac{-1}{3}$$

33. (C) $4\theta + \theta + 20° = 90°$

$5\theta = 70°$

$\theta = 14°$

34. (B) $\sin^2 38° + \cos^2 38° + \frac{1}{4} - 1$

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

35. (D) $2(1 - \cos^2\theta) = 3\cos\theta$

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

$\Rightarrow 2\cos^2\theta + 3\cos\theta - 2 = 0$

$\Rightarrow \cos\theta = 1/2 \Rightarrow \theta = 60°$

36. (A) $\sin^2 60 - \cos^2 45 + \text{Sec}60 + \cos^2 40 + \sin^2 40$

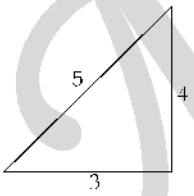
$$\frac{3}{4} - \frac{1}{2} + 2 + 1 \Rightarrow \frac{3}{4} + \frac{1}{2} + 2 \Rightarrow \frac{3+2+8}{4} \Rightarrow \frac{13}{4}$$

37. (D) $\tan\theta = \frac{3}{4}$

By dividing numerator and denominator by $\cos\theta$ we get-

$$\frac{4\tan\theta - 1}{4\tan\theta + 1} = \frac{3-1}{3+1} = \frac{2}{4} = \frac{1}{2}$$

38. (D) $\cot\theta = \frac{3}{4}$ $\sin\theta = \frac{4}{5}$



$$\sin\theta + \cos\theta - \tan\theta = \frac{4}{5} + \frac{3}{5} - \frac{4}{3}$$

$$= \frac{7}{5} - \frac{4}{3} = \frac{21-20}{15} = \frac{1}{15}$$

39. (D) $\sec^2 28 - \tan^2 28 + \frac{3}{4} + 4$

$$1 + 4 + \frac{3}{4} \Rightarrow 5 + \frac{3}{4} = \frac{23}{4}$$

40. (B) $4\theta + 2\theta + 30° = 90°$

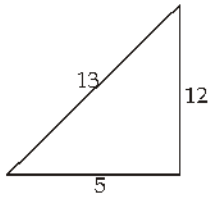
$6\theta = 60°$

$\theta = 10°$

41. (A) $\cot^2 62 - \text{cosec}^2 62 + 4 + 3$

$= 1 + 4 + 3 = 8$

42. (D) $\sin\theta = \frac{12}{13}$



$$\sin\theta = \frac{12}{13} = \frac{\text{Perpendicular}}{\text{hypotenuse}}$$

$\Rightarrow$ base $= \sqrt{13^2 - 12^2} = 5$

$\Rightarrow \sin\theta + \cos\theta - \tan\theta$

$$= \frac{12}{13} + \frac{5}{13} - \frac{12}{5} = \frac{60 + 25 - 156}{65}$$

$$= \frac{85 - 156}{65} = \frac{-71}{65}$$

43. (A) $\theta + 50 + \theta = 90°$

$2\theta = 40°$

$\theta = 20°$

44. (A) $\sin^2 48° + \sin^2 42° - \sec^2 30° + \tan^2 60°$

$$\Rightarrow \cos^2 42° + \sin^2 42° - \left(\frac{2}{\sqrt{3}}\right)^2 + \left(\sqrt{3}\right)^2$$

$$\Rightarrow 1 - \frac{4}{3} + 3 \Rightarrow \frac{8}{3}$$

45. (A) $\sec\theta = \frac{25}{7}$ $\cos\theta = \frac{7}{25}$

$\tan\theta = \frac{24}{7}$ $\cos\theta = \frac{7}{25}$

$\sin\theta = \frac{24}{25}$

$\Rightarrow \tan\theta - \sin\theta + \cos\theta$

$$\Rightarrow \frac{24}{7} - \frac{24}{25} + \frac{7}{25} = \frac{24}{7} - \frac{17}{25}$$

$$\Rightarrow \frac{24 \times 25 - 17 \times 7}{25 \times 7} = \frac{481}{175}$$

46. (A) $\sin 5\theta = \sin(90 - 50 + 3\theta)$

$\Rightarrow 5\theta = 90 - 50 + 3\theta$

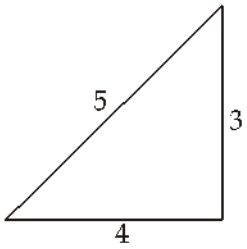
$\Rightarrow 2\theta = 40$

$\Rightarrow \theta = 20°$

$\sin 3\theta + \cos 3\theta + \tan 3\theta + \cot 3\theta$

$$\Rightarrow \frac{\sqrt{3}}{2} + \frac{1}{2} + \sqrt{3} + \frac{1}{\sqrt{3}} \Rightarrow \frac{\sqrt{3} + 3 + 8}{2\sqrt{3}} = \frac{11 + \sqrt{3}}{2\sqrt{3}}$$

48. (B) $\cos\theta = \frac{4}{5}$ $\sin\theta = \frac{3}{5}$



Putting value of these trigonometric terms in given equation of question.

$$\left(\frac{3}{5}\right)^2 \times \frac{4}{5} + \frac{16}{25} \times \frac{3}{5} \Rightarrow \frac{36}{125} + \frac{48}{125} = \frac{84}{125}$$

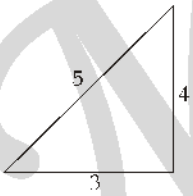
48. (A) $\frac{\sin 44}{\sin 44} + \frac{3}{4} - \frac{1}{2} + 2 \Rightarrow 1 + \frac{1}{4} + 2$

$$\Rightarrow 3 + \frac{1}{4} = \frac{13}{4}$$

49. (B) $4\theta + 40° - 2\theta = 90°$
$2\theta = 50°$
$\theta = 25°$

50. (B) $\sin^2 20 + \cos^2 20 - 1 + 2$
$1 - 1 + 2 = 2$

51. (C) $\tan\theta = \frac{4}{3}$



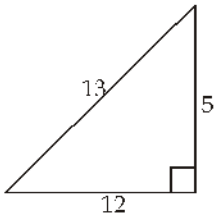
$$\frac{16}{9} + \frac{4}{5} - \frac{3}{5} \Rightarrow \frac{16}{9} + \frac{1}{5} = \frac{80+9}{45} = \frac{89}{45}$$

52. (D) $3\theta + 20° + 2\theta = 90°$
$5\theta = 70°$
$\theta = 14°$

53. (B) $\sec^2 29 - \tan^2 \Rightarrow 29 + \frac{3}{4} + 4 \Rightarrow 5 + \frac{3}{4} = \frac{23}{4}$

54. (C) $4\theta + 60° - 2\theta = 90°$
$2\theta = 30°$
$\theta = 15°$

55. (B) $\tan\theta = \frac{5}{12}$



$\sin\theta + \cos\theta - \cot\theta$

$$= \frac{5}{13} + \frac{12}{13} - \frac{12}{5} = \frac{17}{13} - \frac{12}{5} \Rightarrow \frac{85-156}{65} = \frac{-71}{65}$$

56. (D) $\sin^2 42 + \cos^2 42 + 3 - 2$
$1 + 3 - 2 = 2$

57. (B) $90° = 3\theta + 20° - \theta$
$2\theta = 70°$
$\theta = 35°$

58. (C) $\tan\theta = \frac{2}{3}$

Dividing numerator and denominator by $\cos\theta$
We will get

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

59. (D) $\tan\theta = \frac{5}{2}$

By dividing numerator and denominator by $\cos\theta$

We get $\frac{\tan\theta + 1}{\tan\theta - 1} = \frac{\frac{5}{2} + 1}{\frac{5}{2} - 1} = \frac{7}{3}$

60. (C) $\sin^2 32° + \cos^2 32° - \sin^2 30° + \sec^2 60°$

$$= 1 - \frac{1}{4} + 4 \Rightarrow 5 - \frac{1}{4} = \frac{19}{4} = 4.75$$

61. (D) $90 = 2\theta + (3\theta - 15°)$
$5\theta = 105°$
$\theta = 21°$

62. (C) $90° = x + 45° + 2x$
$3x = 45°$
$x = 15°$

63. (C) $\frac{\sin^2 24 + \cos^2 24}{\sin^2 66 + \cos^2 66} + \sin^2 61 + \cos^2 61$

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

64. (B) $3\cos^2 A + 7 - 7\cos^2 A = 4$
$4\cos^2 A = 3$

$\cos A = \frac{\sqrt{3}}{2}$

$A = 30°$

$\Rightarrow \cot 30° = \sqrt{3}$

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(SSC CGL (PRE) – 2018)

1. What is the simplified value of $\frac{\cot A + \tan B}{\cot B + \tan A}$?

$\frac{\cot A + \tan B}{\cot B + \tan A}$ का सरलीकृत मान क्या है ?

(A) tan B cot A (B) tan A cot B
(C) tan A tan B (D) cot A cot B

2. What is the simplified value of $\left(\frac{1}{\cos ecA + \cot A}\right)^2$?

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

(A) sec A + tan A (B) (1-cos A)/(1+cosA)
(C) (1-cosec A)/(1+cosecA) (D) sin A

3. If $\cos^2\theta - \sin\theta = \frac{1}{4}$, then what is the value of $\sin\theta$?

यदि $\cos^2\theta - \sin\theta = \frac{1}{4}$, तो $\sin\theta$ का मान क्या होगा ?

(A) -1 (B) 1/2 (C) 1 (D) 3/2

4. What is the simplified value of $\tan\left(\frac{\theta}{2}\right) + \cot\left(\frac{\theta}{2}\right)$?

$\tan\left(\frac{\theta}{2}\right) + \cot\left(\frac{\theta}{2}\right)$ का सरलीकृत मान क्या है ?

(A) 2 cosec θ (B) 2 sec θ
(C) sin θ (D) cosec θ

5. What is the simplified value of $\frac{(\sec^3 x - \tan^3 x)}{(\sec x - \tan x)} - 2\tan^2 x - \sec x \tan x$?

$\frac{(\sec^3 x - \tan^3 x)}{(\sec x - \tan x)} - 2\tan^2 x - \sec x \tan x$ का सरलीकृत मान क्या है ?

(A) 0 (B) 2
(C) –1 (D) 1

6. If $\sin^8\theta + \cos^8\theta - 1 = 0$, then what is the value of $\cos^2\theta \sin^2\theta$ (If $\theta \neq 0$ or $\pi/2$)?

यदि $\sin^8\theta + \cos^8\theta - 1 = 0$ है, तो $\cos^2\theta \sin^2\theta$ का मान क्या है (यदि $\theta \neq 0$ या $\pi/2$) ?

(A) – 1 (B) 0
(C) 1 (D) 2

7. What is the value of Cot 45° - (1/ $\sqrt{3}$)Cosec 60°?

Cot 45° - (1/ $\sqrt{3}$)Cosec 60° का मान क्या है ?

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

8. If Cot θ = 21/20, then what is the value of Cosec θ ?

यदि Cot θ = 21/20 है, तो Cosec θ का मान क्या है ?

(A) 21/29 (B) 29/21
(C) 20/29 (D) 29/20

9. What is the value of tan 6° tan 36° tan 84° tan 54° tan 45°?

tan 6°tan36° tan 84°tan54°tan45° का मान क्या है ?

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

10. What is the value of 1/ $\sqrt{2}$ Cot 30° + 1/ $\sqrt{3}$ Cosec 60°?

1/ $\sqrt{2}$ Cot 30° + 1/ $\sqrt{3}$ Cosec 60° का मान क्या है ?

(A) (3 $\sqrt{3}$ + 2 $\sqrt{2}$)/3 $\sqrt{2}$
(B) (3 $\sqrt{3}$ – 2 $\sqrt{2}$)/3 $\sqrt{2}$
(C) (3 $\sqrt{3}$ + 2 $\sqrt{2}$)/ $\sqrt{2}$
(D) (3 $\sqrt{3}$ – 2 $\sqrt{2}$)/ $\sqrt{2}$

11. $\triangle$ ABC is right angled at B. If $\angle A = 60°$, then what is the value of 2 Sec C x 1/2 Sin A?

$\triangle$ ABC B पर समकोण है। यदि $\angle A = 60°$ है, तो 2 Sec C x 1/2 Sin A का मान क्या होगा ?

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

12. If tan θ = 7/24, then what is the value of Cosec θ ?

यदि tan θ =7/24 है, तो cosec θ का मान क्या है ?

(A) 25/24 (B) 25/7
(C) 24/7 (D) 24/25

13. What is the simplified value of $\frac{\sin 2A}{1+\cos 2A}$?

$\frac{\sin 2A}{1+\cos 2A}$ का सरलीकृत मान क्या है ?

(A) tan A (B) cot A
(C) sin A (D) cos A

14. What is the simplified value of $\left(\frac{\sec A}{\cot A+\tan A}\right)^2$?

$\left(\frac{\sec A}{\cot A+\tan A}\right)^2$ का सरलीकृत मान क्या है ?

(A) $1-\cos^2 A$ (B) $2-\sin^2 A$
(C) $\sec^2 A$ (D) $\text{coses}^2 A$

15. What is the simplified value of 1+ tan A tan (A/2)?
1+ tan A tan (A/2) का सरलीकृत मान क्या है ?
(A) sin A/2 (B) cos A
(C) sec A (D) sin A

16. What is the simplified value of $\sin^2(90-\theta) - [\{\sin(90-\theta)\sin\theta\}/\tan\theta]$?
$\sin^2(90-\theta) - [\{\sin(90-\theta)\sin\theta\}/\tan\theta]$ का सरलीकृत मान क्या है ?
(A) 1 (B) cosec θ
(C) 0 (D) cos θ

17. What is simplified value of $\left[\frac{\cos^2\theta}{1+\sin\theta}-\frac{\sin^2\theta}{1+\cos\theta}\right]^2$?

$\left[\frac{\cos^2\theta}{1+\sin\theta}-\frac{\sin^2\theta}{1+\cos\theta}\right]^2$ का सरलीकृत मान क्या है ?

(A) sinθ (B) 1-sin2θ
(C) $1-\sin^2\theta$ (D) 1- sinθ

18. If $5\sec\theta - 3\tan\theta = 5$, then what is the value of $5\tan\theta - 3\sec\theta$?
यदि $5\sec\theta - 3\tan\theta = 5$, तो $5\tan\theta - 3\sec\theta$ का मान क्या होगा ?
(A) 1 (B) 2
(C) 3 (D) 4

19. If $\sec^2\theta + \tan^2\theta = 5/3$, then what is the value of tan 2θ ?
यदि $\sec^2\theta + \tan^2\theta = 5/3$, तो tan 2θ का मान होगा ?
(A) $2\sqrt{3}$ (B) $\sqrt{3}$ (C) $1\sqrt{3}$
(D) Cannot be determined

20. A tower is broken at a point P above the ground. The top of the tower makes an angle 60° with the ground at Q. From another point R on the opposite side of Q angle of elevation of point P is 30°. If QR = 180 m, then what is the total height (in meters) of the tower?
एक मीनार, मैदान से ऊपर स्थित बिंदु P से टूट गया है। मीनार का ऊपरी सिरा बिंदु Q पर मैदान के साथ 60° का कोण बनाता है। बिंदु Q के विपरित दिशा में स्थित बिंदु R से बिंदु P का उन्नयन कोण 30° है। यदि QR = 180 मीटर है, तो मीनार की कुल ऊँचाई (मीटर में) कितनी है ?
(A) 90 (B) $45\sqrt{3}$
(C) $45(\sqrt{3}+1)$ (D) $45(\sqrt{3}+2)$

21. If $\sin\theta + \sin 5\theta = \sin 3\theta$ and $0<\theta<(\pi/2)$, then what is the value of θ (in degrees)?
यदि $\sin\theta + \sin 5\theta = \sin 3\theta$ and $0<\theta<(\pi/2)$, तो θ का मान (डिग्री में) क्या होगा ?
(A) 30 (B) 45
(C) 60 (D) 75

22. What is the simplified value of cosec 2A + cot 2A?
cosec2A + cot 2A का सरलीकृत मान क्या है ?
(A) sec A (B) sec (A/2)
(C) cot A (D) cot2 A

23. If A = 30°, B = 60° and C = 135°, then what is the value of $\sin^3 A + \cos^3 B + \tan^3 C + 3\sin A\cos B\tan C$
यदि A=30°, B=60° तथा C = 135° है, तो $\sin^3 A + \cos^3 B + \tan^3 C + 3\sin A\cos B\tan C$ का मान क्या होगा ?
(A) 0 (B) 1
(C) 8 (D) 9

24. What is the least value of $\tan^2\theta + \cot^2\theta + \sin^2\theta + \cos^2\theta + \sec^2\theta + \text{cosec}^2\theta$?
$\tan^2\theta + \cot^2\theta + \sin^2\theta + \cos^2\theta + \sec^2\theta + \text{cosec}^2\theta$ का न्यूनतम मान क्या है ?
(A) 1 (B) 3
(C) 5 (D) 7

25. What is the simplified value of (sec A + cos A)(sec A – cos A)?
(sec A + cos A)(sec A – cos A) का सरलीकृत मान क्या है ?
(A) $2\tan^2 A$
(B) $2\sin^2 A$
(C) $\sin^2 A\tan^2 A$
(D) $\sin^2 A + \tan^2 A$

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26. What is the simplified value of $\left(\frac{\text{cosec}A}{\cot A+\tan A}\right)^2$?

$\left(\frac{\text{cosec}A}{\cot A+\tan A}\right)^2$ का सरलीकृत मान क्या है ?

(A) $2\cos^2 A$ (B) $1-\sin^2 A$
(C) $\sec^2 A$ (D) $\sec A \tan A$

27. What is the simplified value of $\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}-\frac{2}{\sin 2A}$ का सरलीकृत मान क्या है ?

$\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}-\frac{2}{\sin 2A}$ का सरलीकृत मान क्या है ?

(A) –1 (B) 0
(C) 1 (D) 2

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

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

(A) sin A (B) cos A/2
(C) $\cos^2 A$ (D) 2 sin A/2

29. What is the simplified value of $\left(\frac{1}{\sec A+\tan A}\right)^2$?

$\left(\frac{1}{\sec A+\tan A}\right)^2$ का सरलीकृत मान क्या है ?

(A) sec A + tan A
(B) sin A cos A
(C) (1–sin A)/(1+sin A)
(D) (1–cos A)/(1+cos A)

30. What is the simplified value of $(\text{cosec}^4 A-\cot^2 A)-(\cot^4 A+\text{cosec}^2 A)$?

$(\text{cosec}^4 A-\cot^2 A)-(\cot^4 A+\text{cosec}^2 A)$ का सरलीकृत मान क्या है ?

(A) 0 (B) 5
(C) 6 (D) 9

31. What is the simplified value of (cos A + sin A)(cot A + tan A)?

(cos A + sin A)(cot A + tan A) का सरलीकृत मान क्या है ?

(A) sec A + cosec A (B) sin A + cos A
(C) tan A + cot A (D) sec A – cosec A

32. If $2\cos\theta = 2-\sin\theta$, then what is the value of $\cos\theta$?

यदि $2\cos\theta = 2-\sin\theta$, तो $\cos\theta$ का मान क्या होगा ?

(A) 1 or/या 3/5 (B) 1 or/या –1/2
(C) –1 or/या–1/2 (D) –1 or/या 3/5

33. What is the simplified value of $\sqrt{\sec^4\theta-\sec^2\theta\tan^2\theta}$?

$\sqrt{\sec^4\theta-\sec^2\theta\tan^2\theta}$ का सरलीकृत मान क्या है ?

(A) $\text{cosec}\,\theta$ (B) $\sec\theta$
(C) $\cot\theta$ (D) $\sec\theta\tan\theta$

34. What is the simplified value of (sin A – cosec A)(sec A – cos A) (tan A + cot A)?

(sin A – cosec A)(sec A – cos A) (tan A + cot A) का सरलीकृत मान क्या है ?

(A) 1 (B) – 1
(C) 0 (D) 2

35. If $(1/\cos\theta)-(1/\cot\theta)=1/\pi$, then what is the value of $\cos\theta$?

यदि $(1/\cos\theta)-(1/\cot\theta)=1/\pi$ है, तो $\cos\theta$ का मान क्या होगा ?

(A) $(\pi+1)/(\pi-1)$ (B) $(\pi^2+1)/2\pi$
(C) $2(\pi^2+1)/\pi$ (D) $2\pi/(\pi^2+1)$

36. What is the simplified value of $\text{cosec}^6 A-\cot^6 A-3\,\text{cosec}^2 A\cot^2 A$?

$\text{cosec}^6 A-\cot^6 A-3\,\text{cosec}^2 A\cot^2 A$ का सरलीकृत मान क्या है ?

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

37. $\sin4°\sin43°\sec47°\sec86°$= ?

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

38. If $\tan A = 1/2$ and $\tan B = 1/3$, then what is the value of $\tan(2A+B)$?

यदि $\tan A = 1/2$ तथा $\tan B = 1/3$ तो $\tan(2A+B)$ का मान क्या होगा ?

(A) 1 (B) 3
(C) 5 (D) 9

39. What is the simplified value of $[(\tan^2\theta-\sin^2\theta)/\tan^2\theta\sin^2\theta]$?

$[(\tan^2\theta-\sin^2\theta)/\tan^2\theta\sin^2\theta]$ का सरलीकृत मान क्या है ?

(A) –1 (B) 0
(C) 1 (D) 2

40. If sec (3x – 20°) = cosec (3y + 20°), then what is the value of tan (x + y)?
यदि sec(3x – 20°) = cosec (3y + 20°), तो tan (x + y) का मान क्या है ?
(A) 1 (B) $\sqrt{3}$
(C) $\frac{1}{\sqrt{3}}$ (D) $2\sqrt{3}$

41. If cot A = x/(x + 1) and cot B = 1/(2x + 1), then what is the value of cot (A + B)?
If cot A= x/(x + 1) तथा cotB = 1/(2x + 1), तो cot(A + B) का मान क्या है ?
(A) –1 (B) 0
(C) 1 (D) 2

42. What is the simplified value of (1- sin A cos A) (sin A + cos A)?
(1- sin A cos A)(sin A + cos A) का सरलीकृत मान क्या है ?
(A) $\sin^2 A - \cos^2 A$ (B) $\sin^3 A + \cos^3 A$
(C) 0 (D) $\cos^2 A - \sin^2 A$

43. What is the simplified value of $\sqrt{\frac{1-\sin A}{1+\sin A}}$?
$\sqrt{\frac{1-\sin A}{1+\sin A}}$ का सरलीकृत मान क्या है ?
(A) tan A (B) sec A
(C) sec A + tan A (D) sec A - tan A

44. What is the simplified value of $\sqrt{\frac{1}{\sin^2 A}+\frac{1}{\cos^2 A}}$?
$\sqrt{\frac{1}{\sin^2 A}+\frac{1}{\cos^2 A}}$ का सरलीकृत मान क्या है ?
(A) sin A cos A (B) tan A + cot A
(C) sin 2A (D) tan A cot A

45. What is the value of $[1/(1-\tan\theta)] - [1/(1+\tan\theta)]$?
$[1/(1-\tan\theta)] - [1/(1+\tan\theta)]$ का मान क्या है ?
(A) $\tan\theta$ (B) $\cot 2\theta$
(C) $\tan 2\theta$ (D) $\cot\theta$

46. If $\tan\theta + \cot\theta = x$, then what is the value of $\tan^4\theta + \cot^4\theta$?
यदि $\tan\theta + \cot\theta = x$ है तो $\tan^4\theta + \cot^4\theta$ का मान क्या है ?
(A) $(x^3 - 3)2 + 2$ (B) $(x^4 - 2x) + 4$
(C) $x(x - 4) + 2$ (D) $x^2(x^2 - 4) + 2$

47. If $\tan^2\theta + \cot^2\theta = 2$, then what is the value of $2^{\sec\theta \operatorname{cosec}\theta}$?
यदि $\tan^2\theta + \cot^2\theta = 2$ है तो $2^{\sec\theta \operatorname{cosec}\theta}$ का मान क्या है ?
(A) 0 (B) 1
(C) 2 (D) 4

48. What is the value of $\sin(-\pi/3) + \cos(-\pi/6)$?
$\sin(-\pi/3) + \cos(-\pi/6)$ का मान क्या है ?
(A) 0 (B) 1
(C) 2 (D) 3

49. If θ is acute angle and $\tan\theta - \cot\theta = 0$, then what is the value of $\tan^{26}\theta + \cot^{100}\theta$?
का मान क्या होगा ?
(A) -2 (B) 0
(C) 1 (D) 2

50. If $\sin 3\theta \sec 2\theta = 1$, then what is the value of $[3\tan^2(5\theta/2)-1]$
यदि $\sin 3\theta \sec 2\theta = 1$, तो $[3\tan^2(5\theta/2)-1]$ का मान क्या होगा ?
(A) 0 (B) 1
(C) 2 (D) 3

51. What is the simplified value of (cosec A + sin A)(cosec A – sin A)?
(cosec A + sin A)(cosec A – sin A) का सरलीकृत मान क्या है ?
(A) $\cos^2 A + \cot^2 A$ (B) $2\cos^2 A$
(C) $2\cot^2 A$ (D) 2 cos A cot A

52. What is the value of $\sqrt{\frac{\sec\theta}{\sec\theta-1}+\frac{\sec\theta}{\sec\theta+1}}$?
$\sqrt{\frac{\sec\theta}{\sec\theta-1}+\frac{\sec\theta}{\sec\theta+1}}$ का सरलीकृत मान क्या है ?
(A) cosec θ (B) $\sqrt{2}$ cosec θ
(C) 2 sec2θ (D) sec θ

53. What is the simplified value of
$\left[\frac{\cos A}{(1-\tan A)}+\frac{\sin A}{(1-\cot A)}\right]^2$?
$\left[\frac{\cos A}{(1-\tan A)}+\frac{\sin A}{(1-\cot A)}\right]^2$ का सरलीकृत मान क्या है ?
(A) sin A + cos A (B) 1 + sin 2A
(C) 1 + cos ^{2}A (D) tan A + cot A

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54. What is the simplified value of [2/(cot A-tan A)]?
[2/(cot A-tan A)] का सरलीकृत मान क्या है ?
(A) sin A cos A (B) tan 2A
(C) $\tan^2 A$ (D) $\sin^2 A \cos^2 A$

55. What is the simplified value of $\sqrt{\frac{\cos ecA-1}{\cos ecA+1}}$?
$\sqrt{\frac{\cos ecA-1}{\cos ecA+1}}$ का सरलीकृत मान क्या है ?
(A) cosec A (B) sec A – tan A
(C) cosec ^{2}A (D) tan A – cosec A

56. What is the simplified value of $(\sec^4 A - \tan^2 A) - (\tan^4 A + \sec^2 A)$?
$(\sec^4 A - \tan^2 A) - (\tan^4 A + \sec^2 A)$ का सरलीकृत मान क्या है ?
(A) –1 (B) –1/2
(C) 0 (D) 1

57. What is the value of [sec θ/ (sec θ –1)] + [sec θ/ (secθ + 1)]?
[sec θ/ (sec θ –1)] + [sec θ/(secθ + 1)] का मान क्या है ?
(A) $2\sin^2\theta$ (B) $2(1+\tan^2\theta)$
(C) $2\,\text{cosec}^2\theta$ (D) $\sin^2\theta$

58. If cosec $\theta = \frac{1}{4x} + x$, then what is the value of cosec θ + cot θ ?
यदि cosec $\theta = \frac{1}{4x} + x$ है, तो cosec θ + cot θ का मान क्या है ?
(A) 3x (B) x
(C) 4x (D) 2x or 1/(2x)

59. What is the simplified value of $\sec^6 A - \tan^6 A - 3\sec^2 A \tan^2 A$?
$\sec^6 A - \tan^6 A - 3\sec^2 A \tan^2 A$ का सरलीकृत मान क्या है ?
(A) -1 (B) 0
(C) 1 (D) sec A tan A

60. What is the simplified value of (cosec A - sin A)(sec A - cos A) (tan A + cot A)?
(cosec A - sin A)(sec A - cos A) (tan A + cot A) का सरलीकृत मान क्या है ?
(A) -1 (B) 0
(C) 1 (D) 2

61. What is the simplified value of $(\cos^4 A - \sin^4 A)$?
$(\cos^4 A - \sin^4 A)$ का सरलीकृत मान क्या है ?
(A) 0 (B) $2\cos^2 A$
(C) cos 2A (D) 1

62. If $\text{coesc}^2\theta = 625/576$, then what is the value of $[(\sin\theta - \cos\theta)/(\sin\theta + \cos\theta)]$?
यदि $\text{coesc}^2\theta = 625/576$, तो $[(\sin\theta - \cos\theta)/(\sin\theta + \cos\theta)]$ का मान क्या होगा ?
(A) 1 (B) 31/17
(C) 17/31 (D) 14/25

63. What is the value of $\frac{3}{2}\left(\frac{\cos 39}{\sin 51}\right) - \sqrt{\sin^2 39 + \sin^2 51}$?
$\frac{3}{2}\left(\frac{\cos 39}{\sin 51}\right) - \sqrt{\sin^2 39 + \sin^2 51}$ का मान क्या है ?
(A) 1/2 (B) 5/2 (C) 0
(D) Both 1/2 and 5/2/ दोनों 1/2 तथा 5/2

64. If cot A = [sin B/(1-cos B)], then what is the value of cot 2 A?
यदि cot A = [sin B/(1-cos B)], तो cot2A का मान क्या होगा ?
(A) cot (B/2) (B) cot 2B
(C) cot B (D) tan B

65. What is the value of Tan 45° + 4/ $\sqrt{3}$ Sec 60°=?
Tan 45° + 4/ $\sqrt{3}$ Sec 60° का मान क्या है ?
(A) $(\sqrt{3}+8)/\sqrt{3}$ (B) $(\sqrt{3}+8)/3$
(C) $(\sqrt{3}-8)/\sqrt{3}$ (D) $(\sqrt{3}-8)/3$

66. Δ DEF is right angled at E. If ∠ D = 30°. What is the length (in cm) of DE, if EF = 2 $\sqrt{3}$ cm?
Δ DEF E पर समकोण है। यदि ∠ D = 30° है, तो DE की लंबाई (से.मी. में) क्या होगी, यदि EF = 2 $\sqrt{3}$ से.मी. है ?
(A) 3 (B) 4
(C) 6 (D) 2

67. If Sin θ = 20/29, then what is the value of Cos θ ?
यदि If Sin θ = 20/29, तो Cos θ का मान क्या होगा ?
(A) 29/21 (B) 21/29
(C) 21/20 (D) 20/29

68. What is the value of Tan 60° + cosec 60°?
Tan 60° + Cosec 60° का मान क्या है ?
(A) 5/3 (B) 5/ $\sqrt{3}$
(C) $\sqrt{\frac{5}{3}}$ (D) $\frac{\sqrt{5}}{3}$

69. Δ XYZ is right angled at Y. If ∠Z = 60°, then what is the value of $(1/\sqrt{2})$ Sec X?

Δ XYZ, Y पर समकोण है। यदि ∠Z = 60° है, तो $(1/\sqrt{2})$ Sec X का मान क्या है ?

(A) $2/\sqrt{3}$ (B) $1/\sqrt{6}$

(C) $1/\sqrt{3}$ (D) $2/\sqrt{6}$

70. If Cosecθ = 17/8, then what is the value of Cos θ ?

यदि Cosecθ = 17/8 है, तो Cos θ का मान क्या है ?

(A) 15/8 (B) 15/17

(C) 8/15 (D) 17/15

71. What is the value of $(1/\sqrt{2})$ Cot 45° + $(1/\sqrt{3})$ Cosec 60°?

$(1/\sqrt{2})$ Cot 45° + $(1/\sqrt{3})$ Cosec 60° का मान क्या है ?

(A) $(\sqrt{6}+1)/\sqrt{3}$ (B) $\sqrt{3}$

(C) $(1+3\sqrt{2})/\sqrt{3}$ (D) $(3+2\sqrt{2})/3\sqrt{2}$

72. Δ ABC, is right angled at B. If m<A = 60°, then what is the value of sec C. sin A?

Δ ABC, B पर समकोण है। यदि m<A = 60°, है, तो sec C. sin A का मान क्या है ?

(A) $2/\sqrt{3}$ (B) $\sqrt{3}/2$

(C) 2/3 (D) 1

73. If Tan θ = 7/24 then what is the value of Sec θ?

यदि Tan θ = 7/24, तो Sec θ का मान क्या होगा ?

(A) 24/25 (B) 24/7

(C) 25/7 (D) 25/24

74. What is the value of $\sqrt{2}$ Sec 45° - Tan 30°?

$\sqrt{2}$ Sec 45° - Tan 30° का मान क्या है ?

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

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

75. Δ ABC is right angled at B. If ∠A = 60° then what is the value of $1/\sqrt{3}$ Cosec C?

Δ ABC, B पर समकोण है। यदि ∠A = 60° है, तो $1/\sqrt{3}$ Cosec C का मान क्या है ?

(A) $2/\sqrt{3}$ (B) 2/3

(C) $\sqrt{2}/\sqrt{3}$ (D) $\sqrt{2}/3$

76. If Cosec θ = 25/7, then what is the value of Cot θ ?

यदि Cosec θ = 25/7 है, तो Cot θ का मान क्या है ?

(A) 24/25 (B) 7/24

(C) 7/25 (D) 24/7

77. What is the value of Cot 60° - sec 30°?

Cot 60° - Sec 30° का मान क्या है ?

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

(C) $1/\sqrt{3}$ (D) 1/3

78. Δ ABC is right angled at B. If ∠A = 30°, What is the length (in cm) of AB, if AC = 8 cm?

Δ ABC, B पर समकोण है। यदि ∠A = 30° है, तो AB की लंबाई (सेंटीमीटर में) क्या है, यदि AC = 8 सेंटीमीटर है ?

(A) $2\sqrt{3}$ (B) $4\sqrt{3}$

(C) $4\sqrt{3}$ (D) $2\sqrt{3}$

79. If Cot θ = 24/7, then what is the value of Sec θ ?

यदि Cot θ = 24/7, तो Sec θ का मान क्या है ?

(A) 7/25 (B) 25/24

(C) 8/25 (D) 9/25

80. What is the value of $\sqrt{2}$ Sec 45° + $(1/\sqrt{3})$Tan 30°?

$\sqrt{2}$ Sec 45° + $(1/\sqrt{3})$Tan 30° का मान क्या है ?

(A) $(1+\sqrt{3})/2$ (B) $(1+3\sqrt{2})/\sqrt{3}$

(C) 7/3 (D) $(3+2\sqrt{2})/3\sqrt{2}$

81. If Cos θ = 15/17, then what is the value of Cosec θ ?

If Cos θ = 15/17, तो Cosec θ का मान क्या है ?

(A) 17/8 (B) 8/17

(C) 8/15 (D) 17/15

82. What is the value of Sin 30° - $\sqrt{2}$ Cos 30°?

Sin 30° - $\sqrt{2}$ Cos 30° का मान क्या है ?

(A) $(1-\sqrt{6})/\sqrt{2}$ (B) $(1-\sqrt{6})/2$

(C) $(3-\sqrt{6})/2$ (D) $(3-\sqrt{6})/\sqrt{2}$

83. If Sec θ = 13/12, then what is the value of Sin θ ?

यदि Sec θ = 13/12 है, तो Sin θ का मान क्या है ?

(A) 5/13 (B) 12/5

(C) 12/13 (D) 5/12

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84. What is the value of Sin 60° + (1/2)Cosec 45°?
Sin 60° + (1/2)Cosec 45° का मान क्या है ?
(A) $(\sqrt{3}+2)/2$ (B) $(\sqrt{3}+\sqrt{2})/\sqrt{2}$
(C) $(\sqrt{3}+2)/\sqrt{2}$ (D) $(\sqrt{3}+\sqrt{2})/2$

85. If Cos θ = 35/37, then what is the value of Cosec θ?
यदि Cos θ = 35/37 है, तो Cosec θ का मान क्या है ?
(A) 37/12 (B) 33/12
(C) 35/12 (D) 12/35

86. What is the value of (1/2) Sec 30° + $\sqrt{2}$ Tan 60°?
(1/2) Sec 30° + $\sqrt{2}$ Tan 60°? का मान क्या है ?
(A) $(1+3\sqrt{2})/\sqrt{3}$ (B) $(\sqrt{3}+2)/\sqrt{3}$
(C) $\sqrt{3}+2$ (D) $(\sqrt{3}+2)/2$

87. ΔDEF is right angled at E. If m∠ D = 45°, then what is the value of cosecF X cotD?
ΔDEF, E पर समकोण है। यदि m∠ D = 45° है, तो cosecF X cotD का मान क्या है ?
(A) $\frac{1}{\sqrt{2}}$ (B) 2 (C) $\frac{1}{2}$ (D) $\sqrt{2}$

88. If Sec θ = 25/24, then what is the value of Sin θ?
यदि Sec θ = 25/24 तो Sin θ का मान क्या है ?
(A) 24/25 (B) 7/25
(C) 24/7 (D) 25/7

89. What is the value of Sin 30° + Cos 30°?
Sin 30° + Cos 30° का मान क्या है ?
(A) $\frac{\sqrt{6}+1}{\sqrt{3}}$ (B) $\frac{\sqrt{3}+2}{\sqrt{3}}$ (C) $\frac{1+\sqrt{3}}{2}$ (D) $\frac{5}{\sqrt{3}}$

90. ΔABC, is right angled at B. If m∠ A = 30°., then Sec C =?
ΔABC, B पर समकोण है। अगर m∠ A = 30° है, तो Sec C= ?
(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) 2 (D) $\frac{1}{\sqrt{3}}$

91. If Sin θ = 12/13, then what is the value of Cot θ?
यदि sinθ =12/13, तो Cot θ का मान क्या है ?
(A) 13/12 (B) 5/13
(C) 5/12 (D) 13/5

92. What is the value of Tan 45° + 1/ $\sqrt{3}$ sec 60°?
Tan 45° + 1/ $\sqrt{3}$ sec60° का मान क्या है ?
(A) $\frac{(1-2\sqrt{3})}{2}$ (B) $\frac{(\sqrt{2}-\sqrt{3})}{\sqrt{6}}$
(C) $\frac{(3+2\sqrt{3})}{3}$ (D) $\frac{(1-2\sqrt{2})}{2}$

93. ΔDEF is right angled at E. If ∠ D = 30°., What is the length of DE (in cm), if EF = $6\sqrt{3}$ cm?
ΔDEF, E पर समकोण है। यदि ∠ D = 30° है, तो DE की लंबाई (से.मी. में) क्या है, यदि EF = $6\sqrt{3}$ से.मी. है ?
(A) 18 (B) $12\sqrt{3}$
(C) $18\sqrt{3}$ (D) 12

94. If Sinθ = 20/29, then what is the value of Secθ?
यदि Sinθ = 20/29 तो Secθ का मान क्या है ?
(A) 29/21 (B) 29/20
(C) 21/20 (D) 21/29

95. What is the value of Cot 45° + Cosec 60°?
cot45° + Cosec60° का मान क्या है ?
(A) $(\sqrt{6}+1)/\sqrt{3}$ (B) $(1+\sqrt{3})/2$
(C) $5/\sqrt{3}$ (D) $(\sqrt{3}+2)/\sqrt{3}$

96. ΔLMN is right angled at M. If m∠ N = 60°., then Tan L =_____.
ΔLMN ये M पर समकोण है। यदि m∠ N = 60° हैं, तो Tan L = ... ।
(A) 1/2 (B) $1/\sqrt{3}$
(C) $1/\sqrt{2}$ (D) 2

97. If Tanθ = 4/3, then what is the value of Sin θ?
यदि Tanθ = 4/3 तो Sinθ का मान क्या है ?
(A) 1.25 (B) 0.8
(C) 4/3 (D) 3/4

98. What is the value of 2 Sec 45° + Tan 30° ?
2 sec 45°+ Tan 30° का मान क्या है ?
(A) $(2\sqrt{6}+1)/\sqrt{3}$ (B) $\sqrt{3}$
(C) $(2\sqrt{2}+3)/\sqrt{6}$ (D) $(9+2\sqrt{3})/9$

99. ΔABC is right angled at B. If m∠ A = 60°, then what is the value of Cot C?
ΔABC, B पर समकोण है। यदि m∠ A = 60° है, तो Cot C का मान क्या होगा ?
(A) $\sqrt{2}$ (B) $1/\sqrt{3}$
(C) $\sqrt{3}$ (D) $2/\sqrt{3}$

100. If Cosec θ = 25/7 , then what is the value of Cos θ ?
यदि Cosec θ = 25/7, तो cos θ का मान क्या होगा ?
(A) 25/24 (B) 7/24
(C) 24/25 (D) 7/25

101. What is the value of Cot 60° – Sec 45° ?
Cot 60° - Sec 45° का मान क्या है ?
(A) $(\sqrt{2} - \sqrt{3})/\sqrt{6}$ (B) $(\sqrt{3} - 3\sqrt{2})/3$
(C) $(1 - 2\sqrt{2})/2$ (D) $(1 - \sqrt{3})/2$

102. If Cotθ = 24/7, then Sinθ = ?
यदि Cotθ = 24/7 तो Sinθ = ?
(A) 24/25 (B) 8/25
(C) 7/25 (D) 9/25

103. What is the value of Cot 60° - Cos 45°?
cot 60° – cos 45° का मान क्या है ?
(A) $(9 - 2\sqrt{3})/9$ (B) $(2\sqrt{6} - 1)/\sqrt{3}$
(C) $(1 - 2\sqrt{3})/2$ (D) $(\sqrt{2} - \sqrt{3})/\sqrt{6}$

104. If Tan θ = 9/40, then Sec θ = ?
यदि Tan θ = 9/40, तो Sec θ =?
(A) 40/41 (B) 9/41
(C) 41/40 (D) 41/9

105. What is the value of Sec 30° + Tan 60°?
Sec 30° + Tan 60° का मान क्या है ?
(A) $\frac{5}{\sqrt{3}}$ (B) $\frac{\sqrt{6}+1}{\sqrt{3}}$ (C) $\frac{\sqrt{3}+1}{\sqrt{3}}$ (D) $\frac{1+\sqrt{3}}{2}$

106. ΔPQR is right angled at Q. If $\angle$ R = 30°, then what is the value of Cot P?
ΔPQR ये Q पर समकोण है। यदि $\angle$ R = 30° है, तो Cot P का मान क्या है ?
(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$
(C) $\frac{1}{\sqrt{3}}$ (D) 2

107. If Secθ = 5/3, then what is the value of Cosecθ ?
यदि Secθ = 5/3, तो Cosecθ का मान क्या है ?
(A) 0.8 (B) 1.25
(C) 4/3 (D) 3/4

108. Sec 45° + Tan 30° =
(A) $(\sqrt{6} + 1)/\sqrt{3}$ (B) $(1 + \sqrt{3})/2$
(C) $(\sqrt{3} + 2)/\sqrt{3}$ (D) $5/\sqrt{3}$

109. ΔDEF is right angled at E. If m $\angle$ D = 45°., then Cosec F =
ΔDEF ये E पर समकोण है। यदि m $\angle$ D = 45° है, तो Cosec F =
(A) $\frac{1}{2}$ (B) $\frac{1}{\sqrt{2}}$ (C) $\sqrt{2}$ (D) $\frac{1}{\sqrt{3}}$

110. If Cos θ = $\frac{5}{13}$, then Cosec θ = ?
यदि Cos θ = $\frac{5}{13}$, तो Cosec θ = ?
(A) $\frac{5}{12}$ (B) $\frac{12}{5}$ (C) $\frac{13}{5}$ (D) $\frac{13}{12}$

111. What is the value of Sin 30° - Cosec 45°?
Sin 30° - Cosec 45° का मान क्या है ?
(A) $(2\sqrt{6} - 1)/\sqrt{3}$ (B) $(1 - 2\sqrt{3})/2$
(C) $(\sqrt{2} - \sqrt{3})/\sqrt{6}$ (D) $(1 - 2\sqrt{2})/2$

112. If Cos θ = 35/37 , then what is the value of Cot θ ?
यदि cos θ =35/37, तो Cot θ का मान क्या है ?
(A) 12/35 (B) 35/12
(C) 37/12 (D) 12/37

113. Tan 45° + Cosec 60° = ?
(A) $\frac{(1+2\sqrt{2})}{2}$ (B) $\frac{(\sqrt{3}+2)}{\sqrt{6}}$
(C) $\frac{5}{\sqrt{3}}$ (D) $\frac{(3+2\sqrt{3})}{3}$

114. Δ XYZ is right angled at Y. If $\angle$ Z = 60°, then Cosec X =
Δ XYZ, Y पर समकोण है। यदि $\angle$ Z = 60° है, तो Cosec X=
(A) 2 (B) 1/2 (C) $\frac{1}{\sqrt{2}}$ (D) $\frac{1}{\sqrt{3}}$

115. If Cosecθ = 17/8, then Cot θ = ?
यदि Cosecθ =17/8, तो cotθ =?
(A) 17/8 (B) 15/8
(C) 8/15 (D) 17/15

116. What is the value of Sin 30° + 2 Cos 30°?
Sin30° + 2 Cos 30° का मान क्या है ?
(A) $(2\sqrt{2} + 3)/\sqrt{6}$ (B) $(9 + 2\sqrt{3})/9$
(C) $(1 + 2\sqrt{3})/2$ (D) $(2\sqrt{6} + 1)/\sqrt{3}$

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117. If Sec θ = 13/12, then Cot θ = ?
यदि Sec θ = 13/12, तो cot θ = ?
(A) 12/5 (B) 13/5
(C) 5/13 (D) 5/12

118. What is the value of Cot 45° + 1/3 Cosec 60°?
Cot 45° + 1/3 Cosec 60° का मान क्या है ?
(A) $\sqrt{3}$ + 2
(B) $(9 + 2\sqrt{3})/9$
(C) $\sqrt{3}$
(D) $(2\sqrt{2} + 3)/\sqrt{6}$

119. ΔDEF is right angled at E. If m∠F = 45°, then what is the value of Sin F x Tan F?
ΔDEF, E पर समकोण है। यदि m∠F = 45° है, तो Sin F x Tan F का मान क्या होगा ?
(A) $\sqrt{2}$ (B) $1/\sqrt{3}$
(C) $1/\sqrt{2}$ (D) $2/\sqrt{3}$

120. If Cot θ = 21/20, then what is the value of Sec θ?
यदि Cot θ = 21/20, तो Sec θ का मान क्या होगा ?
(A) 29/21 (B) 21/29
(C) 29/20 (D) 20/29

Solution

1. (A) $\dfrac{\frac{1}{\tan A}+\tan B}{\frac{1}{\tan B}+\tan A}=\dfrac{1+\tan A\tan B}{\frac{\tan A}{\tan B}}$

$=\dfrac{\tan B}{\tan A}=\tan B\cot A$

2. (B) $\left(\dfrac{1}{\text{cosec}\,A+cotA}\right)^2 \Rightarrow \left(\dfrac{1}{\frac{1}{\text{sin}A}+\frac{\cos A}{\sin A}}\right)^2$

$\Rightarrow \dfrac{\sin^2 A}{(1+\cos A)^2}$

$\therefore (1-\cos^2 A=\sin^2 A)$

$\dfrac{1-\cos^2 A}{(1+\text{cos}A)^2} \Rightarrow \dfrac{(1-\cos A)(1+\cos A)}{(1+\cos A)^2} =$

$\dfrac{1-\cos A}{1+\cos A}$

3. (B) $\cos^2\theta - \sin\theta = \dfrac{1}{4}$

$\therefore(\cos^2\theta=1-\sin^2\theta)$

$1 - \sin^2\theta - \sin\theta = \dfrac{1}{4}$

$-4\sin^2\theta - 4\sin\theta = -3$

$\Rightarrow -4\sin^2\theta - 6\sin\theta + 2\sin\theta + 3 = 0$

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

4. (A) $\tan\left(\dfrac{\theta}{2}\right) + \cot\left(\dfrac{\theta}{2}\right)$

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

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

$= 2\,\text{cosec}\theta$

5. (D) $\dfrac{\sec^3 x-\tan^3 x}{\sec x-\tan x}-2\tan^2 x-\sec x\tan x$

We know that $a^3 - b^3 = (a - b)(a^2 + b^2 + ab)$

$\Rightarrow \dfrac{(\sec x-\tan x)(\sec^2 x+\tan^2 x+\sec x\tan x)}{(\sec x-\tan x)}$

$- 2\tan^2 x - \text{secxtanx}$

$\Rightarrow \sec^2 x + \tan^2 x + \text{secxtanx} - 2\tan^2 x$

$- \text{secxtanx}$

$\Rightarrow \sec^2 x - \tan^2 x = 1$

6. (D)

7. (D) $\cot 45° - \dfrac{1}{\sqrt{3}}\,\text{cosec}60° = 1 - \dfrac{1}{\sqrt{3}} \times \dfrac{2}{\sqrt{3}} = \dfrac{1}{3}$

8. (D) $\text{Cot}\,\theta = \dfrac{21}{20}; \quad \dfrac{\cos^2\theta}{\sin^2\theta} = \dfrac{441}{400}$

$\dfrac{1-\sin^2\theta}{\sin^2\theta} = \dfrac{441}{400} \quad \text{cosec}^2\theta = \dfrac{441}{400} + 1$

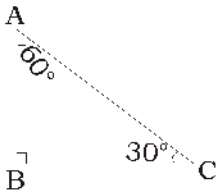
$\text{cosec}\,\theta = \dfrac{29}{20}$

9. (C) $\tan 6° \tan 36° \tan 84° \tan 54° \tan 45°$
$= \tan 6° \tan 36° \cot 6° \cot 36° \tan 45°$
$= 1 \times 1 \times 1 = 1$

10. (A) $\frac{1}{\sqrt{2}} \cot 30° + \frac{1}{\sqrt{3}} \text{Cosec} 60°$

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

11. (C)



$= 2 \sec C \times \frac{1}{2} \sin A = 2 \sec 30° \times \frac{1}{2} \sin 60°$

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

12. (B) $\tan\theta = \frac{7}{24} = \frac{P}{B}$

$H = \sqrt{7^2 + 24^2} \Rightarrow \sqrt{49+576} = 25$

$\text{Cosec}\,\theta = \frac{25}{7}$

13. (A) $= \frac{\sin 2A}{1+\cos 2A}$

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

14. (A) $= \left(\frac{\sec A}{\cot A + \tan A}\right)^2$

$= \left(\frac{\frac{1}{\cos A}}{\frac{\cos^2 A + \sin^2 A}{\cos A \sin A}}\right)^2 = \sin^2 A = 1 - \cos^2 A$

15. (C) $\Rightarrow 1 + \tan A \tan\left(\frac{A}{2}\right)$

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

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

$\Rightarrow \frac{1+\tan^2\frac{A}{2}}{1-\tan^2\frac{A}{2}} = \text{Sec}A$

16. (C) $\sin^2(90-\theta) - \left[\frac{\{\sin(90-\theta)\sin\theta\}}{\tan\theta}\right]$

$\Rightarrow \cos^2\theta - \frac{\cos\theta\sin\theta}{\sin\theta} \times \cos\theta$
$\Rightarrow \cos^2\theta - \cos^2\theta,$
$= 0$

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

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

18. (C) $5\sec\theta - 3\tan\theta = 5$
$5\tan\theta - 3\sec\theta = ?$
$\Rightarrow (5\sec\theta)^2 = (5 + 3\tan\theta)^2$
$\Rightarrow 25(1 + \tan^2\theta) = 25 + 9\tan^2\theta + 30\tan\theta$
$\Rightarrow 25 + 25\tan^2\theta = 25 + 9\tan^2\theta + 30\tan\theta$
$\Rightarrow 16\tan^2\theta = 30\tan\theta$

$\Rightarrow \tan\theta = \frac{15}{8} \quad \Rightarrow \sec\theta = \frac{17}{8}$

ATQ, $5 \times \frac{15}{8} - \frac{3\times 17}{8} = \frac{75-51}{8} = \frac{24}{8} = 3$

19. (B) $\sec^2\theta + \tan^2\theta = \frac{5}{3}$
$3\sec^2\theta + 3\tan^2\theta = 5$
$(\because \sec^2 = 1 + \tan^2\theta)$
$3(1 + \tan^2\theta) + 3\tan^2\theta = 5$

$\tan^2\theta = \frac{1}{3}$

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

$\theta = 30°$
$\tan 2\theta = ?$
$\tan 60° = \sqrt{3}$

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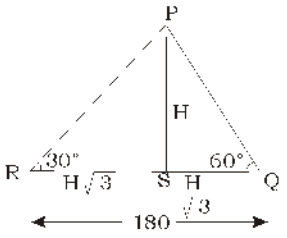
20. (D)



$$h\sqrt{3} + \frac{h}{\sqrt{3}} = 180$$

$$h = 45\sqrt{3}$$

$$\frac{PS}{PQ} = \sin 60°$$

$$\Rightarrow \frac{45\sqrt{3}}{PQ} = \frac{\sqrt{3}}{2} \Rightarrow PQ = 90$$

$$\Rightarrow (PS + PQ) = (45\sqrt{3} + 90) = 45(\sqrt{3} + 2)$$

22. (C) $\text{cosec}2A + \cot 2A$

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

$$= \frac{1 + 2\cos^2 A - 1}{2\sin A\cos A} = \frac{2\cos^2 A}{2\sin A.\cos A} = \cot A$$

23. (A) $A = 30°, B = 60°, C = 135°$

$\sin^3 A + \cos^3 B + \tan^3 C + 3\sin A\cos B\tan C$

$\sin A = \frac{1}{2}$, $\cos B = \frac{1}{2}$

$\tan C = \tan(90 + 45°) = -\cot 45 = -1$

A.T.Q.

$$= \frac{1}{8} + \frac{1}{8} - 1 + 3 \times \frac{1}{2} \times \frac{1}{2} \times 1 \Rightarrow \frac{1}{4} - 1 + \frac{3}{4} = 0$$

24. (D) min. value of

$\tan^2\theta + \cot^2\theta + \sin^2\theta + \cos^2\theta + \sec^2\theta + \text{cosec}^2\theta$

$\sin^2\theta + \cos^2\theta + \sec^2\theta + \tan^2\theta + \cot^2\theta + \text{cosec}^2\theta$

$= 1 + (1 + 2\tan^2\theta + \tan^2\theta)(1 + \cot^2\theta + \cot^2\theta)$

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

$\therefore$ minimum value of $\tan^2\theta + \cot^2\theta = 2\sqrt{ab}$

$= 1 + 1 + 1 + 2(\tan^2\theta + \cot^2\theta)$

$= 3 + 2 \times 2 = 7$

25. (D) $(\sec A + \cos A)(\sec A - \cos A)$

$= \sec^2 A - \cos^2 A$

$= 1 + \tan^2 A - (1 - \sin^2 A)$

$= 1 + \tan^2 A - 1 + \sin^2 A$

$= \tan^2 A + \sin^2 A$

26. (B) $\left(\frac{\text{cosec}A}{\cot A + \tan A}\right)^2$

$$= \left[\frac{\left(\frac{1}{\sin A}\right)}{\frac{\cos A}{\sin A} + \frac{\sin A}{\cos A}}\right]^2 = \left[\frac{\left(\frac{1}{\sin A}\right)}{\frac{\cos^2 A + \sin^2 A}{\sin A\cos A}}\right]^2$$

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

27. (C) $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} - \frac{2}{\sin 2A}$

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

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

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

$$= \frac{\sin^3 A - \cos^3 A}{\sin A\cos A(\sin A - \cos A)} - \frac{2}{\sin 2A}$$

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

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

$$= \frac{\sin A\cos A}{\sin A\cos A} = 1$$

28. (A) $\frac{2}{\cos\frac{A}{2} + \tan\frac{A}{2}}$ की Simplified form

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

$= \sin A$

29. (C) $\left(\frac{1}{\sec A + \tan A}\right)^2$ की Simplified form

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

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

30. (A) $(\text{cosec}^4A - \cot^2A) - (\cot^4A - \text{cosec}^2A)$
$= \text{cosec}^4A - \cot^2A - \cot^4A - \text{cosec}^2A$
$= (\text{cosec}^4A - \cot^4A) - (\cot^2A + \text{cosec}^2A)$
$= (\text{cosec}^2A - \cot^2A)\ (\text{cosec}^2A + \cot^2A) - (\cot^2A + \text{cosec}^2A)$
$= (\text{cosec}^2A - \cot^2A)\ - (\cot^2A + \text{cosec}^2A) = 0$

31. (A) $(\cos A+\sin A)\ (\cot A + \tan A)$

$$\Rightarrow (\cos A+ \sin A)\left(\frac{\cos A}{\sin A} + \frac{\sin A}{\cos A}\right)$$

$$\Rightarrow (\cos A+ \sin A)\left(\frac{\cos^2 A + \sin^2 A}{\sin A \cos A}\right)$$

$$\Rightarrow \frac{\cos A + \sin A}{\sin A \cos A} = \sec A + \text{cosec} A$$

32. (A)
$$2\cos\theta = 2 - \sin\theta$$
$$\sin\theta = 2 - 2\cos\theta$$
$$\sin^2\theta = 4 + 4\cos^2\theta - 8\cos\theta$$
$$1 - \cos^2\theta = 4 + 4\cos^2\theta - 8\cos\theta$$
$$5\cos^2\theta - 8\cos\theta + 3 = 0$$
$$5\cos^2\theta - 5\cos\theta - 3\cos\theta + 3 = 0$$
$$5\cos\theta(\cos\theta - 1) - 3(\cos\theta - 1) = 0$$
$$\cos\theta = 1, \frac{3}{5}$$

33. (B) $\sqrt{\sec^4\theta - \sec^2\theta \tan^2\theta}$

$$= \sqrt{\sec^2\theta\left(\sec^2\theta - \tan^2\theta\right)}$$

$$= \sqrt{\sec^2\theta}$$

$$= \sec\theta$$

34. (B) $(\sin A - \text{cosec} A)\ (\sec A - \cos A)\ (\tan A + \cot A)$

$$= \left(\frac{\sin^2 A - 1}{\sin A}\right)\left(\frac{1-\cos^2 A}{\cos A}\right)\left(\frac{\sin^2 A + \cos^2 A}{\sin A \cos A}\right)$$

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

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

35. (D) $\frac{1}{\cos\theta} - \frac{1}{\cot\theta} = \frac{1}{\pi} \Rightarrow \frac{1-\sin\theta}{\cos\theta} = \frac{1}{\pi}$

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

$$= \frac{\cos\theta}{1+\sin\theta} = \frac{1}{\pi}$$

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

36. (D) $\text{cosec}^6A - \cot^6A - 3\text{cosec}^2A \cot^2A$
$(\text{cosec}^2A)^3 - (\cot^2A)^3 - 3\text{cosec}^2A \cot^2A$
$\Rightarrow (\text{cosec}^2A - \cot^2A)\ (\text{cosec}^4A + \cot^4A + \text{cosec}^2A \cot^2A) - 3\text{cosec}^2A \cot^2A$
$\Rightarrow \text{cosec}^4A + \cot^4A - 2\text{cosec}^2A \cot^2A$
$\Rightarrow (\text{cosec}^2A - \cot^2A)^2$
$\Rightarrow (1)^2 = 1$

37. (B) $\sin4° \sin43° \sec47° \sec86°$
$\Rightarrow \sin4° \cos47° \sec47° \text{cosec}86° = 1$

38. (B) $\tan A = \frac{1}{2}$ $\tan B = \frac{1}{3}$

$$\tan 2A = \frac{2\tan A}{1-\tan^2 A} = \frac{2 \times \frac{1}{2}}{1 - \frac{1}{4}} = \frac{4}{3}$$

$$\text{Now } \tan(2A + B) = \frac{\tan 2A + \tan B}{1 - \tan 2A . \tan B}$$

$$\tan(2A+ B) = \frac{\frac{4}{3} + \frac{1}{3}}{1 - \frac{4}{3} \times \frac{1}{3}} = \frac{\frac{5}{3}}{\frac{5}{9}} = 3$$

39. (C) $\frac{\tan^2\theta - \sin^2\theta}{\tan^2\theta . \sin^2\theta} = \frac{1}{\sin^2\theta} - \frac{1}{\tan^2\theta}$

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

40. (C) $\sec(3x - 20°) = \text{cosec}(3y + 20°)$
$\Rightarrow 3x - 20 + 3y + 20 = 90°$
$\Rightarrow 3(x + y) = 90°$
$\Rightarrow x + y = 30°$

$$\Rightarrow \tan(30°) = \frac{1}{\sqrt{3}}$$

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41. (A) $\cot A = \frac{x}{(x+1)}$; $\cot B = \frac{1}{(2x+1)}$

$\cot (A + B)$ = ?

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

$$= \frac{x - (x+1)(2x+1)}{x(2x+1) + (x+1)} = \frac{x - 2x^2 - 3x - 1}{2x^2 + x + x + 1}$$

$$= \frac{-(2x^2 + 2x + 1)}{(2x^2 + 2x + 1)} = -1$$

42. (B) $(1 - \sin A \cos A)(\sin A + \cos A)$

Here we can write

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

$= (\sin^2 A + \cos^2 A - \sin A \cos A).(\sin A + \cos A)$

$= (\sin A)^3 + (\cos A)^3$

$= \sin^3 A + \cos^3 A$

43. (D) $\sqrt{\frac{1 - \sin A}{1 + \sin A}} = \sqrt{\frac{(1 - \sin A)(1 - \sin A)}{1 - \sin^2 A}}$

$$= \frac{1 - \sin A}{\cos A} = \sec A - \tan A$$

44. (B) $\sqrt{\frac{1}{\sin^2 A} + \frac{1}{\cos^2 A}} = \sqrt{\frac{\cos^2 A + \sin^2 A}{\sin^2 A \cos^2 A}}$

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

$= \tan A + \cot A$

45. (C) $\frac{1}{1 - \tan\theta} - \frac{1}{1 + \tan\theta} = \frac{1 + \tan\theta - 1 + \tan\theta}{1 - \tan^2\theta}$

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

46. (D) $\tan\theta + \cot\theta = x$

$\tan^4\theta + \cot^4\theta$ = ?

$\Rightarrow \tan^2\theta + \cot^2\theta + 2 = x^2$

$\Rightarrow \tan^2\theta + \cot^2\theta = x^2 - 2$

Squaring again

$\Rightarrow \tan^4\theta + \cot^4\theta + 2 = x^4 + 4 - 4x^2$

$\Rightarrow \tan^4\theta + \cot^4\theta = x^4 - 4x^2 + 2$

47. (D) $\tan^2\theta + \cot^2\theta = 2$

than

$2^{\sec\theta \cdot \operatorname{cosec}\theta}$ = ?

Condition when

$\theta = 45°$

$2^{\sqrt{2}.\sqrt{2}} = 2^2 = 4$

48. (A) $\sin\left(-\frac{\pi}{3}\right) + \cos\left(-\frac{\pi}{6}\right)$

$= -\sin\frac{\pi}{3} + \cos\frac{\pi}{6}$

$= -\sin 60 + \cos 30$

$= \frac{-\sqrt{3}}{2} + \frac{\sqrt{3}}{2} = 0$

49. (D) If $\tan\theta - \cot\theta = 0$

θ is acute

than $\theta = 45°$

$\tan^{26}\theta + \cot^{100}\theta = 2$

50. (C) $\sin 3\theta . \sec 2\theta = 1$

$\sin 3\theta = \cos 2\theta$

$(3\theta + 2\theta) = 90°$

$\theta = 18°$

$3\tan^2\left(\frac{5}{2}\theta\right) - 1$

$= 3\tan^2 45 - 1$

$= 2$

51. (A) $(\operatorname{cosec} A + \sin A)(\operatorname{cosec} A - \sin A)$

$$= \left(\frac{1}{\sin A} + \sin A\right)\left(\frac{1}{\sin A} - \sin A\right)$$

$$= \left(\frac{1 + \sin^2 A}{\sin A}\right)\left(\frac{1 - \sin^2 A}{\sin A}\right) = \frac{(1 + \sin^2 A)\cos^2 A}{\sin^2 A}$$

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

52. (B) $\sqrt{\frac{\sec\theta}{\sec\theta - 1} + \frac{\sec\theta}{\sec\theta + 1}}$

$$\sqrt{\frac{\sec\theta(\sec\theta + 1) + \sec\theta(\sec\theta - 1)}{(\sec\theta - 1)(\sec\theta + 1)}}$$

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

$\sec^2\theta - \tan^2\theta = 1$

$$\sqrt{\frac{2\sec^2\theta}{\tan^2\theta}} = \sqrt{2\sec^2\theta\cot^2\theta}$$

$$\sqrt{\frac{2}{\sin^2\theta}} = \sqrt{2}\operatorname{cosec}\theta$$

53. (B) $\left[\frac{\cos A}{(1-\tan A)}+\frac{\sin A}{(1-\cot A)}\right]^2$

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

$= \left[\left(\frac{\cos^2 A}{\cos A-\sin A}\right)-\left(\frac{\sin^2 A}{\cos A-\sin A}\right)\right]^2$

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

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

$(\cos A+\sin A)^2$

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

$= 1 + \sin 2A$

54. (B) $\frac{2}{\cot A-\tan A} = \frac{2}{\frac{\cos A}{\sin A}-\frac{\sin A}{\cos A}}$

$= \frac{2\sin A\cos A}{\cos^2 A-\sin^2 A} = \frac{\sin 2A}{\cos 2A} = \tan 2A$

55. (B) $\sqrt{\frac{\operatorname{cosec} A-1}{\operatorname{cosec} A+1}} \times \frac{\sqrt{(\operatorname{cosec} A-1)}}{\sqrt{(\operatorname{cosec} A-1)}}$

$\frac{(\operatorname{cosec} A-1)}{\sqrt{\operatorname{cosec}^2 A-1}} = \frac{\operatorname{cosec} A-1}{\cot A}$

$= \frac{1-\sin A}{\cos A}$

$= \sec A - \tan A$

56. (C) $(\sec^4 A - \tan^2 A) - (\tan^4 A + \sec^2 A)$

$= (\sec^4 A - \tan^4 A) - (\sec^2 A + \tan^2 A)$

$= (\sec^2 A - \tan^2 A)(\sec^2 A + \tan^2 A) - (\sec^2 A + \tan^2 A)$

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

$= \sec^2 A + \tan^2 A - (\sec^2 A + \tan^2 A)$

$= 0$

57. (C) $\frac{\sec\theta}{\sec\theta-1}+\frac{\sec\theta}{\sec\theta+1}$

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

$= \frac{2\sec^2\theta}{(\sec^2\theta-1)}$

$= 2\operatorname{cosec}^2\theta$

58. (D) $\operatorname{cosec}\theta = \frac{1}{4x}+x$ ... (1)

$\operatorname{cosec}\theta + \cot\theta = ?$

Let $\operatorname{cosec}\theta + \cot\theta = y$

$\operatorname{cosec}\theta - \cot\theta = \frac{1}{y}$

$2\operatorname{cosec}\theta = y + \frac{1}{y}$

$\operatorname{cosec}\theta = \frac{y}{2}+\frac{1}{2y}$ ... (2)

(1) = (2)

$\frac{1}{4x}+x = \frac{y}{2}+\frac{1}{2y} \Rightarrow y+\frac{1}{y} = 2x+\frac{1}{2x}$

$y = 2x \text{ or } \frac{1}{2x}$

$= \operatorname{cosec}\theta + \cot\theta = 2x \text{ or } \frac{1}{2x}$

59. (C) $\sec^6 A - \tan^6 A - 3\sec^2 A\tan^2 A = ?$

$(\sec^2 A)^3 - (\tan^2 A)^3 - 3\sec^2 A.\tan^2 A$

$(\sec^2 A - \tan^2 A)$

$\because \sec^2 A - \tan^2 A = 1$

$\Rightarrow (\sec^2 A - \tan^2 A)^3 = 1$

60. (C) $(\operatorname{cosec} A - \sin A)(\sec A - \cos A)(\tan A + \cot A)$

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

61. (C) $\cos^4 A - \sin^4 A$

$\Rightarrow (\cos^2 A - \sin^2 A)(\cos^2 A + \sin^2 A)$

$\Rightarrow \cos^2 A - \sin^2 A \Rightarrow \cos 2A$

62. (C) $\operatorname{cosec}^2\theta = \frac{625}{576}$ $\operatorname{cosec}\theta = \frac{25}{24}$

$\sin\theta = \frac{24}{25}$ $\cos\theta = \frac{7}{25}$

$= \left[\frac{\sin\theta-\cos\theta}{\sin\theta+\cos\theta}\right] = \left[\frac{24-7}{\frac{25}{24+7}}\right] = \frac{17}{31}$

63. (A) $\frac{3}{2}\left[\frac{\cos 39}{\sin 51}\right] - \sqrt{\sin^2 39+\sin^2 51}$

$\sin 51 = \sin(90-39) = \cos 39$

$\therefore \frac{3}{2}\times 1 - (+1)$

$= \frac{3}{2}-1 = \frac{1}{2}$

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64. (C) $\cot A = \dfrac{2\sin B/2\cos B/2}{2\sin^2 B/2}$

$= \dfrac{\cos B/2}{\sin B/2}$

$\cot A = \cot B/2$

$A = B/2$

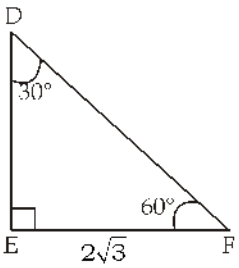
$\Rightarrow \quad 2A = B$

$\cot 2A = \cot B$

65. (A) $\tan 45° + \dfrac{4}{\sqrt{3}} \sec 60°$

$= 1 + \dfrac{4}{\sqrt{3}}.2 = \dfrac{(\sqrt{3}+8)}{\sqrt{3}}$

66. (C)



If $EF = 2\sqrt{3}$

$DE = 2\sqrt{3}.\sqrt{3} = 6$

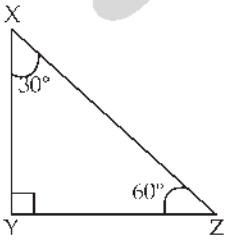
67. (B) $\sin\theta = \dfrac{20}{29}$

$\cos\theta = \sqrt{1-\left(\dfrac{20}{29}\right)^2} = \sqrt{\dfrac{29^2-20^2}{29}} = \dfrac{21}{29}$

68. (B) $\tan 60° + \operatorname{cosec} 60°$

$= \sqrt{3} + \dfrac{2}{\sqrt{3}} = \dfrac{5}{\sqrt{3}}$

69. (D)



$\dfrac{1}{\sqrt{2}} \sec x = \dfrac{1}{\sqrt{2}} \sec 30°$

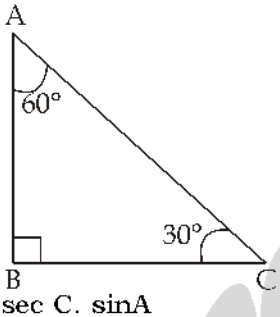
$= \dfrac{1}{\sqrt{2}}.\dfrac{2}{\sqrt{3}} = \dfrac{2}{\sqrt{6}}$

70. (B) $\operatorname{cosec}\theta = \dfrac{17}{8} \quad \sin\theta = \dfrac{8}{17} \quad \cos\theta = \dfrac{15}{17}$

71. (D) $\dfrac{1}{\sqrt{2}}.\cot 45° + \dfrac{1}{\sqrt{3}} \operatorname{cosec} 60°$

$= \dfrac{1}{\sqrt{2}}.1 + \dfrac{1}{\sqrt{3}}.\dfrac{2}{\sqrt{3}} \Rightarrow \dfrac{1}{\sqrt{2}} + \dfrac{2}{3} = \dfrac{3+2\sqrt{2}}{3\sqrt{2}}$

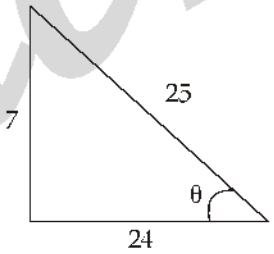
72. (D)



sec C. sinA

$\sec.30 \,.\, \sin 60° \Rightarrow \dfrac{2}{\sqrt{3}} \times \dfrac{\sqrt{3}}{2} = 1$

73. (D) $\tan\theta = \dfrac{7}{24}$

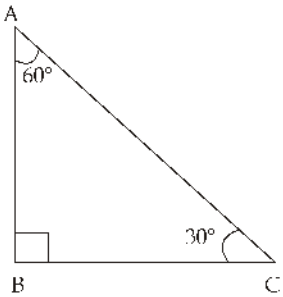


$\sec\theta = \dfrac{25}{24}$

74. (C) $\sqrt{2}\ \sec 45° - \tan 30°$

$= \sqrt{2} \,.\, \sqrt{2} - \dfrac{1}{\sqrt{3}} \Rightarrow 2 - \dfrac{1}{\sqrt{3}} = \dfrac{(2\sqrt{3}-1)}{\sqrt{3}}$

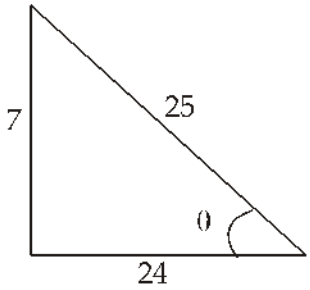
75. (A)



$\operatorname{cosec} C = \operatorname{cosec} 30° = 2$

$\dfrac{1}{\sqrt{3}}.\operatorname{cosec} C = \dfrac{2}{\sqrt{3}}$

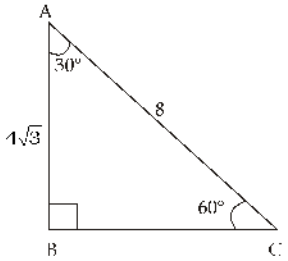
76. (D)



$\text{cosec}\theta = \frac{25}{7}$ $\quad \cot\theta = \frac{24}{7}$

77. (B) $\cot 60° - \sec 30° = \frac{1}{\sqrt{3}} - \frac{2}{\sqrt{3}} = -\frac{1}{\sqrt{3}}$

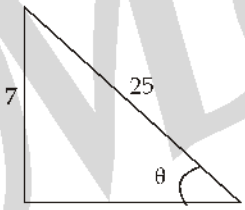
78. (C)



$\frac{8}{2} = 4$

$AB = 4\sqrt{3}$ cm

79. (B) $\text{Cot}\,\theta = \frac{24}{7}$



$\text{Sec}\,\theta = \frac{25}{24}$

80. (C) $\sqrt{2}\sec 45 + \frac{1}{\sqrt{3}}\tan 30°$

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

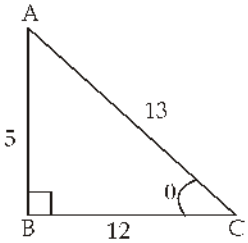
$= 2 + \frac{1}{3} = \mathbf{\frac{7}{3}}$

81. (A) $\cos\theta = \frac{15}{17}$; $\quad \text{cosec}\,\theta = \frac{17}{8}$

82. (B) $\sin 30° - \sqrt{2}\cos 30°$

$= \frac{1}{2} - \sqrt{2} \times \frac{\sqrt{3}}{2} = \frac{1-\sqrt{6}}{2}$

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

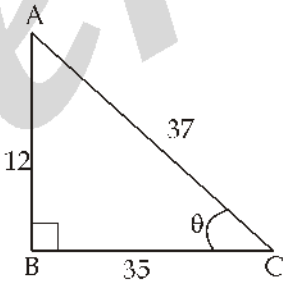


$\sin\theta = \frac{5}{13}$

84. (D) $\sin 60° + \text{cosec}\,45°$

$\frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} = \frac{\left(\sqrt{3}+\sqrt{2}\right)}{2}$

85. (A) $\cos\theta = \frac{35}{37}$



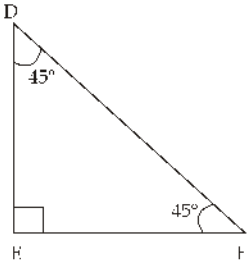
$\Rightarrow \quad \text{cosec}\,\theta = \frac{37}{12}$

86. (A) $\frac{1}{2}\sec 30 + \sqrt{2}\tan 60$

$= \frac{1}{2} \times \frac{2}{\sqrt{3}} + \sqrt{2} \times \sqrt{3} = \frac{1}{\sqrt{3}} + \sqrt{6}$

$\frac{\left(1+3\sqrt{2}\right)}{\sqrt{3}}$

87. (D)



$= \text{cosecF} \times \text{cotD}$

$= \text{cosec}45 \times \cot 45 = \sqrt{2} \times 1 = \sqrt{2}$

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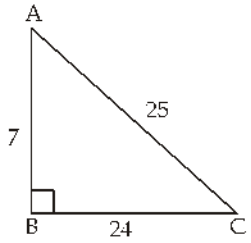
88. (B) $\sec\theta = \frac{25}{24}$

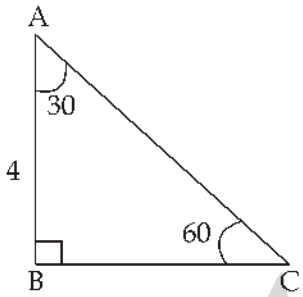


$\therefore \quad \sin\theta = \frac{7}{25}$

89. (C) $\sin 30 + \cos 30$

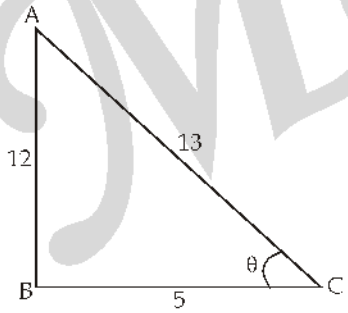
$$\frac{1}{2} + \frac{\sqrt{3}}{2} = \frac{1+\sqrt{3}}{2}$$

90. (C)



$\sec C = \sec 60 = 2$

91. (C) $\sin\theta = \frac{12}{13}$



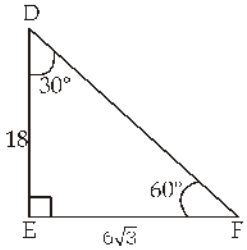
$\cot\theta = \frac{5}{12}$

92. (C) $\tan 45° \times \frac{1}{\sqrt{3}} \sec 60$

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

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

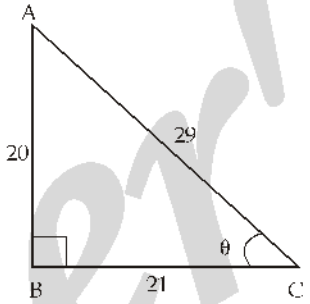
93. (A)



$\tan 60 = \frac{DE}{EF}$

$DE = \sqrt{3} \times 6\sqrt{3} = 18$

94. (A) $\sin\theta = \frac{20}{29}$

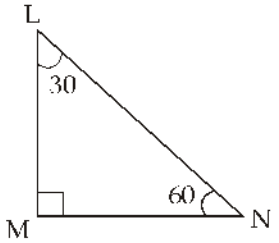


$\sec\theta = \frac{29}{21}$

95. (D) $\cot 45° + \operatorname{cosec} 60°$

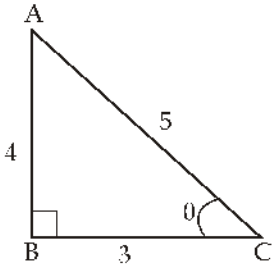
$$1 + \frac{2}{\sqrt{3}} = \frac{\sqrt{3}+2}{\sqrt{3}}$$

96. (B)



$\tan L = \tan 30° = \frac{1}{\sqrt{3}}$

97. (B) $\tan\theta = \frac{4}{3}$

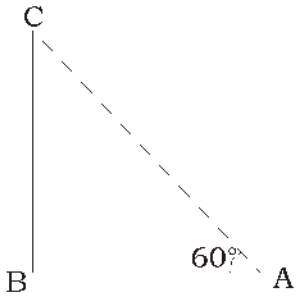


$\Rightarrow \sin\theta = \frac{4}{5} = 0.8$

98. (A) $2\sec 45° + \tan 30°$

$$\Rightarrow 2\sqrt{2} + \frac{1}{\sqrt{3}} = \frac{2\sqrt{6}+1}{\sqrt{3}}$$

99. (C)



$\angle A = 60°$; $\angle B = 90°$; $\angle C = 30°$

A.T.Q.

$$\cot C = \cot 30° = \sqrt{3}$$

100. (C) $\operatorname{cosec}\theta = \frac{25}{7}$

$$\frac{H}{P} = \frac{25}{7}$$

By pythagoras theoram

$$B^2 = (25)^2 - 7^2$$
$$= 625 - 49$$
$$B = 24$$

$$\cos\theta = \frac{B}{H} = \frac{24}{25}$$

or

$$\operatorname{cosec}\theta = \frac{25}{7}$$

$$\sin\theta = \frac{7}{25}$$

$\cos^2\theta = 1 - \sin^2\theta \quad \cos^2\theta = 1 - \frac{49}{625}$

$\cos^2\theta = \frac{576}{625} \qquad \cos\theta = \frac{24}{25}$

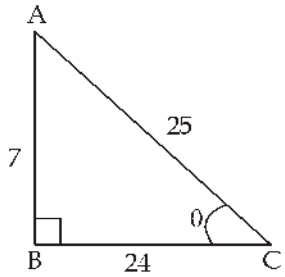
101. (B) $\cot 60° - \sec 45°$

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

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

$$\frac{\left(\sqrt{3} - 3\sqrt{2}\right)}{3}$$

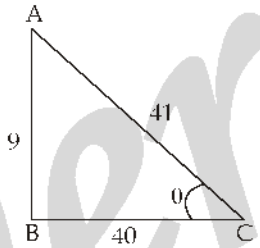
102. (C) $\cot\theta = \frac{24}{7}$



$\therefore \qquad \sin\theta = \frac{7}{25}$

103. (D) $\cot 60° - \cos 45 \Rightarrow \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{2}} = \frac{\sqrt{2}-\sqrt{3}}{\sqrt{6}}$

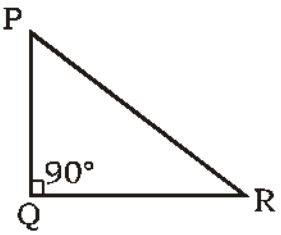
104. (C)



$$\sec\theta = \frac{41}{40}$$

105. (A) $\text{Sec}30° + \tan 60° \Rightarrow \frac{2}{\sqrt{3}} + \sqrt{3} = \frac{5}{\sqrt{3}}$

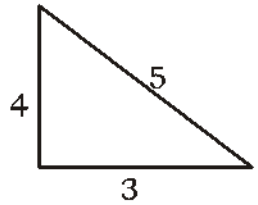
106. (C)



$\angle R = 30°$

So $\angle P = 60°$

107. (B)



$\text{Sec}\theta = \frac{5}{3} \Rightarrow \text{Cos}\theta = \frac{1}{\sec\theta} = \frac{3}{5}$

$\operatorname{cosec}\theta = \frac{5}{4} = 1.25$

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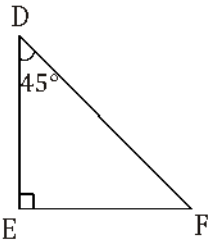
108. (A) $\sqrt{2}+\frac{1}{\sqrt{3}}=\frac{\sqrt{6}+1}{\sqrt{3}}$

109. (C)



$\angle F = 45°$ Cosec F = $\sqrt{2}$

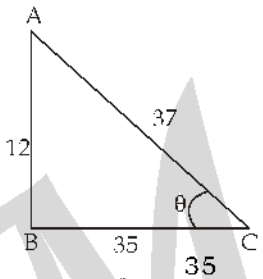
110. (D) $\cos\theta = \frac{5}{13} = \frac{\text{Base}}{\text{hypotenuse}}$

Perpendicular = $\sqrt{13^2-5^2} = 12$

$\text{Cosec}\,\theta = \frac{13}{12}$

111. (D) $\sin 30 - \text{cosec}45 \Rightarrow \frac{1}{2}-\sqrt{2} = \frac{(1-2\sqrt{2})}{2}$

112. (B) $\cos\theta = \frac{35}{37}$

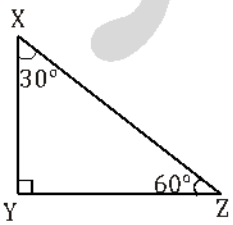


$\cot\theta = \frac{35}{12}$

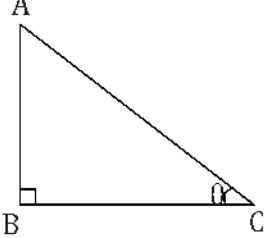
113. (D) $\tan 45° + \text{cosec}\,60°$

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

114. (A)



115. (B) $\text{Cosec}x = \text{cosec}30° = 2$



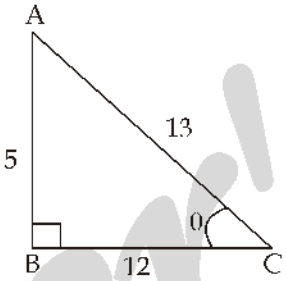
$\text{cosec}\,\theta = \frac{17}{8} \Rightarrow \sin\theta = \frac{8}{17}$

$\cot\theta = \frac{15}{8}$

116. (C) $\text{Sin}30° + 2\cos 30°$

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

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

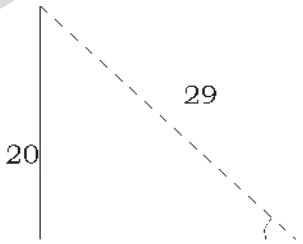


$\cot\theta = \frac{12}{5}$

118. (B) $1+\frac{1}{3}\times\frac{2}{\sqrt{3}} \Rightarrow \left(\frac{3\sqrt{3}+2}{3\sqrt{3}}\right)\times\frac{\sqrt{3}}{\sqrt{3}} = \frac{(9+2\sqrt{3})}{9}$

119. (C) $\sin F \times \text{Tan}\,F = \frac{1}{\sqrt{2}}\times 1 = \frac{1}{\sqrt{2}}$

120. (A)



$\cot\theta = \frac{21}{20}$

$\sec\theta = \frac{29}{21}$

CDS II (2021)

TRIGONOMETRY
(Previous Year Questions)

1. What is the minimum value of $\cos^3\theta + \sec^3\theta$ where $0° \leq \theta < 90°$?
$\cos^3\theta + \sec^3\theta$ का न्यूनतम मान क्या है, जहाँ $0° \leq \theta < 90°$ है ?
(A) 0 (B) 1
(C) 2 (D) None of the above

2. If $14\sin^2\theta + 10\cos^2\theta = 11$ where $0° < \theta < 90°$, then what is the value of $\tan\theta + \cot\theta$?
यदि $14\sin^2\theta + 10\cos^2\theta = 11$ है, जहाँ $0° < \theta < 90°$ है, तो $\tan\theta + \cot\theta$ का मान क्या है ?
(A) $\frac{4}{\sqrt{3}}$ (B) $\frac{2}{\sqrt{3}}$
(C) $\sqrt{3}$ (D) $2\sqrt{3}$

3. What is $\frac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} + \frac{\sin^3\theta - \cos^3\theta}{\sin\theta - \cos\theta}$ equal to :
$\frac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} + \frac{\sin^3\theta - \cos^3\theta}{\sin\theta - \cos\theta}$ किसके बराबर है ?
(A) 0 (B) 1
(C) 2 (D) 4

4. What is the maximum value of $1 + 2\sin^2\theta\cos^2\theta - \sin^4\theta - \cos^4\theta$ where $0° < \theta < 90°$?
$1 + 2\sin^2\theta\cos^2\theta - \sin^4\theta - \cos^4\theta$ का अधिकतम मान क्या है, जहाँ $0° < \theta < 90°$ है ?
(A) 1 (B) 2
(C) 3 (D) 4

5. If $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$
Where $0° < \theta < 90°$ then what is $\sin^2\theta + \cos\theta$ equal to:
यदि $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$ है, जहां $0° < \theta < 90°$ है तो $\sin^2\theta + \cos\theta$ किसके बराबर है ?
(A) $\frac{5}{4}$ (B) $\frac{3}{2}$
(C) $\frac{7}{4}$ (D) 2

6. Consider the following :
निम्नलिखित पर विचार कीजिए-
1. $\sin^4\theta - \sin^2\theta = \cos^4\theta - \cos^2\theta$
2. $\sin^4\theta + \cos^4\theta = 1 + 2\sin^2\theta\cos^2\theta$
3. $\tan^4\theta + \tan^2\theta = \sec^4\theta - \sec^2\theta$
Which of the above are indentities:
उपर्युक्त में से कौन-सी सर्वसमिकाएँ हैं-
(A) 1 & 2 only (B) 2 & 3 only
(C) 1 and 3 only (D) 1, 2 & 3

7. What is the value of$\sin24°\sin66° - \cos24°\cos 66° + \tan24°\tan66° - \cot24°\cot66°$?
$\sin24°\sin66° - \cos24°\cos 66° + \tan24°\tan66° - \cot24°\cot66°$ का मान क्या है ?
(A) 0 (B) 1
(C) 2 (D) 3

8. If $x = p\sin A\cos B$, $y = p\sin A\sin B$ and $z = p\cos A$, then what is the value of $x^2 + y^2 + z^2$
यदि $x = p\sin A\cos B$, $y = p\sin A\sin B$ और $z = p\cos A$ है, तो $x^2 + y^2 + z^2$ का मान क्या है ?
(A) $-p^2$ (B) 0
(C) p^2 (D) $2p^2$

9. If $x = m\sec A + n\tan A$ and $y = m\tan A + n\sec A$ then $x^2 - y^2$ is equal to?
यदि $x = m\sec A + n\tan A$ और $y = m\tan A + n\sec A$ है, तो $x^2 - y^2$ किसके बराबर है ?
(A) $m^2 - n^2$ (B) $m^2 + n^2$
(C) $m^2 + n^2 - mn$ (D) $m^2 - n^2 + mn$

10. If for some θ lying between 0° and 90°, $\tan^2\theta - 1$, then what is the value of $\sin^2\theta - 2\sin\theta\cos\theta$?
यदि 0° और 90° के बीच स्थित किसी θ के लिए $\tan\theta = 1$ है, तो $\sin^2\theta - 2\sin\theta\cos\theta$ का मान क्या है ?
(A) -1 (B) 0
(C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

11. What is $\frac{2\sin^3\theta - \sin\theta}{\cos\theta - 2\cos^3\theta}$, $(0° < \theta < 90°)$ equal to?
$\frac{2\sin^3\theta - \sin\theta}{\cos\theta - 2\cos^3\theta}$, $(0° < \theta < 90°)$ किसके बराबर है ?
(A) $\sin\theta$ (B) $\cos\theta$
(C) $\tan\theta$ (D) $\cot\theta$

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12. If A, B and C are interior angles of a triangle ABC, then what is $\tan\left(\frac{B+C}{2}\right)+\sin\left(\frac{B+C}{2}\right)-\cot\left(\frac{A}{2}\right)-\cos\left(\frac{A}{2}\right)$ equal to?

यदि A, B और C एक त्रिभुज ABC के आंतरिक कोण हैं, तो $\tan\left(\frac{B+C}{2}\right)+\sin\left(\frac{B+C}{2}\right)-\cot\left(\frac{A}{2}\right)-\cos\left(\frac{A}{2}\right)$ किसके बराबर हैं ?

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

(C) $\sin\left(\frac{A+B+C}{4}\right)$ (D) $\tan\left(\frac{A+B+C}{4}\right)$

13. In a triangle ABC, right-angled at B, AB + BC = $10\left(1+\sqrt{3}\right)$ cm and length of the hypotenuse is 20 cm. What is the value of tanA + tanC?

एक त्रिभुज ABC में, जो कि B पर समकोण है, AB + BC = $10\left(1+\sqrt{3}\right)$ सेमी. है और कर्ण की लम्बाई सेमी. है। tanA + tanC का मान क्या है ?

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

(C) $\sqrt{3}$ (D) $2\sqrt{3}$

HEIGHT & DISTANCE

14. A ladder 10 m long reaches a point 10 m below the top of a vertical flagstaff. From foot of the ladder, the elevation of top of the flagstaff is 60°. What is the height of flagstaff?

एक 10 मीटर लंबी सीढ़ी एक ऊर्ध्वाधर ध्वजदंड के शीर्ष से 10 मीटर नीचे एक बिन्दु तक पहुंचती है। सीढ़ी के पाद से, ध्वजदंड के शीर्ष का उन्नयन 60° है। ध्वजदंड की ऊँचाई कितनी है ?

(A) 12 m
(B) 15 m
(C) 16 m
(D) 20 m

15. From an aeroplane flying above a river at an altitue of 1200 m, it is observed that the angels of depression of opposite points on the two banks of a river are 30° and θ. If the width of the river is 3000m, then which one of the following is correct?

किसी नदी के ऊपर 1200 मीटर की ऊँचाई पर उड़ते हुए किसी विमान से यह देखा जाता है कि नदी के दोनों किनारों पर सम्मुख बिन्दुओं के अवनमन कोण 30° और θ हैं। यदि नदी की चौड़ाई 3000 मी. है, तो निम्नलिखित में से कौन-सा सही है ?

(A) $\theta < 30°$
(B) $30° < \theta < 45°$
(C) $45° < \theta < 60°$
(D) $60° < \theta < 90°$

Solution

1. (C) AM ≥ GM

$$\frac{\sec^3\theta+\cos^3\theta}{2} \geq \sec^3\theta.\cos^3\theta$$

$\sec^3\theta + \cos^3\theta \geq 2$

∴ minmum value = 2

2. (A) $14\sin^2\theta + 10\cos^2\theta = 11$

$14\sin^2\theta + 10 - 10\sin^2\theta = 11$

$4\sin^2\theta = 1$

$\sin^2\theta = \frac{1}{4} \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30°$

$\tan\theta + \cot\theta = \frac{1}{\sqrt{3}} + \sqrt{3} = \frac{4}{\sqrt{3}}$

3. (C) $\frac{\sin^3\theta+\cos^3\theta}{\sin\theta+\cos\theta}+\frac{\sin^3\theta-\cos^3\theta}{\sin\theta-\cos\theta}$

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

= 2

4. (A) $= 1 + 2\sin^2\theta\cos^2\theta - \sin^4\theta - \cos^4\theta$

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

$= 1 - (1 - 2\cos^2\theta)^2$

$= 1 - (\cos^2\theta)^2$

$= 1 - \cos_2^2\theta \Rightarrow \sin_2^2\theta$

Max value of $\sin_2^2\theta$ in $0 < \theta < 90° = 1$

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

$\cos^2\theta - 3\cos\theta + 2 = 1 - \cos^2\theta$

$2\cos^2\theta - 3\cos\theta + 1 = 0$

$\cos\theta = \frac{1}{2}$ or $(1) \times (\because 0° < \theta < 90°)$

$\Rightarrow \theta = 60°$

$\sin^2\theta + \cos\theta = \frac{3}{4}+\frac{2}{4} = \frac{5}{4}$

6. (C) **1.** $\sin^4\theta - \sin^2\theta = \cos^4\theta - \cos^2\theta$
$\sin^4\theta - \cos^4\theta = \sin^2\theta - \cos^2\theta$
$(\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta) = (\sin^2\theta - \cos^2\theta)$
$\Rightarrow \sin^2\theta + \cos^2\theta = 1$
2. $\sin^4\theta + \cos^4\theta = 1 + 2\sin^2\theta\cos^2\theta$
$\sin^4\theta + \cos^4\theta = (\sin^2\theta + \cos^2\theta)^2 + 2\sin^2\theta\cos^2\theta$
$\Rightarrow$ No identity
3. a $\sec^2\theta \tan^4\theta + \tan^2\theta = \sec^4\theta - \sec^2\theta$
$\sec^2\theta + \tan^2\theta = \sec^4\theta - \tan^4\theta$
$\sec^2\theta + \tan^2\theta = (\sec^2\theta - \tan^2\theta)(\sec^2\theta + \tan^2\theta)$
$\sec^2\theta - \tan^2\theta = 1$
(1) and (3) only

7. (A) $\sin24° \sin66° - \cos24° \cos66°$
$= \cos66°\sin66° - \sin66° \cos66°$
$= 0$

8. (C) $x = p\sin A \cos B$
$y = p\sin A \sin B$
$z = p\cos A$
$x^2 + y^2 + z^2 =$
$p^2\sin^2A\cos^2B + p^2\sin^2A\sin^2B + p^2\cos^2A$
$= P^2\sin^2A(\cos^2B + \sin^2B) + p^2\cos^2A$
$= p^2\sin^2A + P^2\cos^2A$
$= p^2$

9. (A) $x = m\sec A + n\tan A$
$y = m\tan A + n\sec A$
$x^2 - y^2 = m^2\sec^2A + n^2\tan^2A + 2mn\ \sec A\tan A$
$- (m^2\tan^2A + n^2\sec^2A + 2mn\tan A\sec A)$
$= m^2(\sec^2A - \tan^2A) + n^2\ (\tan^2A - \sec^2A)$
$= m^2 - n^2$

10. (D) $\theta = 45°$

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

11. (C) $\dfrac{2\sin^3\theta - \sin\theta}{\cos\theta - 2\cos^3\theta}$

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

12. (A) $\tan\left(\dfrac{B+C}{2}\right) + \sin\left(\dfrac{B+C}{2}\right) - \cot\dfrac{A}{2} - \cos\dfrac{A}{2}$

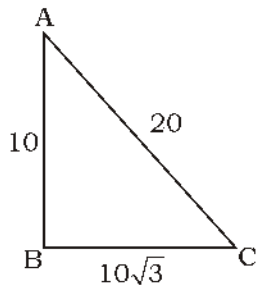
$$A + B + C = 180° \Rightarrow \frac{A+B+C}{2} = 90°$$

$$\frac{B+C}{2} = 90 - \frac{A}{2}$$

$$\tan\left(90 - \frac{A}{2}\right) + \sin\left(90 - \frac{A}{2}\right) - \cot\frac{A}{2} - \cos\frac{A}{2}$$

$$= \cot\frac{A}{2} + \cos\frac{A}{2} - \left(\cot\frac{A}{2} + \cos\frac{A}{2}\right) = 0$$

13. (A)



$$\tan A + \tan C = \frac{10\sqrt{3}}{10} + \frac{10}{10\sqrt{3}}$$

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

14. (C) $\tan30° = \dfrac{OB}{AB}$

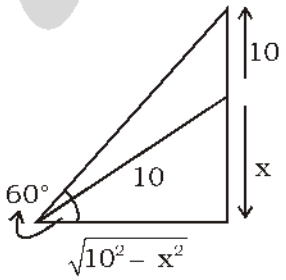
$$\frac{1}{\sqrt{3}} = \frac{1200}{AB} \Rightarrow \frac{AB = 1200\sqrt{3}}{AB = 2078.46}$$

$\Rightarrow BC \approx 922$

$$\tan\theta = \frac{OB}{BC} = \frac{1200}{922} \Rightarrow \tan\theta = 1.30$$

$\Rightarrow \theta$ lies between 45° and 60° as $\tan 45° = 1$ & $\tan 60° = 1.73$.

15. (B)



$$\tan60° = \frac{10 + x}{\sqrt{10^2 - x^2}}$$

$$\sqrt{3}\left(\sqrt{10^2 - x^2}\right) = (10 + x)$$

$$\sqrt{3}\left(\sqrt{10} - x\right)\left(\sqrt{10} + x\right) = 10 + x$$

$$\sqrt{3}\left(\sqrt{10} - x\right) = \sqrt{10} + x$$

$3(10 - x) = 10 + x$
$30 - 3x = 10 + x$
$20 = 4x$
$x = 5cm$
Height = 10 + 5
= 15 cm

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CDS I & II (2010-2021)

TRIGONOMETRY
(Previous Year Questions)

1. What is the least value of $3\sin^2\theta + 4\cos^2\theta$?
$3\sin^2\theta + 4\cos^2\theta$ का न्यूनतम मान क्या है ? **(CDS-2021-I)**
(A) 5 (B) 4
(C) 3 (D) 2

2. If $\sin\theta\cos\theta = k$, where $0 \le \theta \le \frac{\pi}{2}$, then which one of the following is correct ?
यदि $\sin\theta\cos\theta = k$ है, जहाँ $0 \le \theta \le \frac{\pi}{2}$ हो, तो निम्नलिखित में से कौनसा सही है ? **(CDS-2021-I)**
(A) $0 \le k \le 1$ (B) $0 \le k \le 0.5$ only
(C) $0.5 \le k \le 1$ only (D) $0 < k < 1$

3. If $p = \sin^2\theta + \cos^4\theta$ for $0 \le \theta \le \frac{\pi}{2}$, then consider the following statements :
यदि $0 \le \theta \le \frac{\pi}{2}$ के लिए $p = \sin^2\theta + \cos^4\theta$ है, तो निम्नलिखित कथनों पर विचार कीजिए : **(CDS-2021-I)**
i. p can be less than $\frac{3}{4}$./ p, $\frac{3}{4}$ से कम हो सकता है।
ii. p can be more than 1./ p, 1 से अधिक हो सकता है।
Which of the above statements is/are correct ?
उपर्युक्त कथनों में से कौन-सा/से सही है/हैं ?
(A) i Only (B) ii Only
(C) Both i and ii (D) Neither i nor ii

4. What is the ratio of the greatest to the smallest value of $2 - 2\sin x - \sin^2 x$, $0 \le x \le \frac{\pi}{2}$?
$2 - 2\sin x - \sin^2 x$, $0 \le x \le \frac{\pi}{2}$ के महत्तम मान का इसके लघुत्तम मान से अनुपात क्या है ? **(CDS 2021-I)**
(A) –3 (B) –2
(C) 2 (D) 3

5. If the equation $x^2 + y^2 - 2xy\sin^2\theta = 0$ contains real solution for x and y then.
यदि समीकरण $x^2 + y^2 - 2xy\sin^2\theta = 0$ में x और y के लिए वास्तविक हल है, तो- **(CDS 2021-I)**
(A) x = y (B) x = –y
(C) x = 2y (D) 2x = y

6. Cosider the following inequalities :
निम्नलिखित असमिकाओं (इनइक्वालिटी) पर विचार कीजिए : **(CDS-2021-I)**
i. $\sin 1° < \cos 57°$
ii. $\cos 60° > \sin 57°$
Which of the above is/are correct?
उपर्युक्त में से कौन-सा/से सही है/हैं ?
(A) i Only (B) ii Only
(C) Both i and ii (D) Neither i nor ii

7. If $p = \sec\theta - \tan\theta$ and $q = \operatorname{cosec}\theta + \cot\theta$, then what is $p + q(p - 1)$ equal to ?
यदि $p = \sec\theta - \tan\theta$ और $q = \operatorname{cosec}\theta + \cot\theta$ है, तो $p + q(p - 1)$ किसके बराबर है ? **(CDS-2021-I)**
(A) –1 (B) 0
(C) 1 (D) 2

8. If $\operatorname{cosec}\theta - \cot\theta = m$ then what is $\operatorname{cosec}\theta$ equal to ?
यदि $\operatorname{cosec}\theta - \cot\theta = m$ है, तो $\operatorname{cosec}\theta$ किसके बराबर है ? **(CDS-2021-I)**
(A) $m + \frac{1}{m}$ (B) $m - \frac{1}{m}$
(C) $\frac{m}{2} + \frac{2}{m}$ (D) $\frac{m}{2} + \frac{1}{2m}$

9. Let ABC be a triangle right angled at C, then what is tanA + tanB equal to ?
मान लीजिए ABC एक त्रिभुज है, जिसका C पर समकोण है, तो tanA + tanB किसके बराबर है ? **(CDS-2021-I)**
(A) $\frac{a}{bc}$ (B) $\frac{a^2}{bc}$ (C) $\frac{b^2}{ca}$ (D) $\frac{c^2}{ab}$

10. Let $\cos\alpha + \cos\beta = 2$ and $\sin\alpha + \sin\beta = 0$, where $0 \le \alpha \le 90°$, $0 \le \beta \le 90°$. What is the value of $\cos 2\alpha - \cos 2\beta$?
मान लीजिए $\cos\alpha + \cos\beta = 2$ और $\sin\alpha + \sin\beta = 0$ है, जहाँ $0 \le \alpha \le 90°$, $0 \le \beta \le 90°$ है। $\cos 2\alpha - \cos 2\beta$ का मान क्या है ? **(CDS-2021-I)**
(A) 0
(B) 1
(C) 2
(D) Cannot be determined due to insufficient data

11. If $\sec\theta + \cos\theta = \frac{5}{2}$, where $0 \le \theta \le 90°$, then what is the value of $\sin^2\theta$?

यदि $\sec\theta + \cos\theta = \frac{5}{2}$, जहाँ $0 \le \theta \le 90°$ है, तो $\sin^2\theta$ का मान क्या है ? **(CDS-2021)**

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

12. What is $(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta)$ equal to ? **(CDS-2021)**

$(1 + \cot\theta - \operatorname{cosec}\theta)(1 + \tan\theta + \sec\theta)$ किसके बराबर है ?

(A) 4 (B) 3
(C) 2 (D) 1

13. If $6 + 8\tan\theta = \sec\theta$ and $8 - 6\tan\theta = k\sec\theta$, then what is the value of k^2 ?

यदि $6 + 8\tan\theta = \sec\theta$ और $8 - 6\tan\theta = k\sec\theta$ है, तो k^2 का मान क्या है ? **(CDS-2021)**

(A) 11 (B) 22
(C) 77 (D) 99

14. What is $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} - \frac{\sin\theta + 1}{\cos\theta}$ equal to?

$\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} - \frac{\sin\theta + 1}{\cos\theta}$ किसके बराबर है ? ***(CDS 2020(I))***

(A) 0 (B) 1
(C) $2\sin\theta$ (D) $2\cos\theta$

15. What is $(\tan x + \tan y)(1 - \cot x.\cot y) + (\cot x + \cot y)(1 - \tan x.\tan y)$ equal to?

$(\tan x + \tan y)(1 - \cot x.\cot y) + (\cot x + \cot y)(1 - \tan x.\tan y)$ किसके बराबर है ? ***(CDS 2020(I))***

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

16. What is $\sqrt{\frac{\sec x - \tan x}{\sec x + \tan x}}$ equal to?

$\sqrt{\frac{\sec x - \tan x}{\sec x + \tan x}}$ किसके बराबर है ? ***(CDS 2020(I))***

(A) $\frac{1}{\sin x + \cos x}$ (B) $\frac{1}{\tan x + \cot x}$

(C) $\frac{1}{\sec x + \tan x}$ (D) $\frac{1}{\operatorname{cosec} x + \cot x}$

17. If θ lies in the first quadrant and $\cot\theta = \frac{63}{16}$, then what is the value of $(\sin\theta + \cos\theta)$?

यदि θ, प्रथम चतुर्थांश में आता है और $\cot\theta = \frac{63}{16}$ है, तो $(\sin\theta + \cos\theta)$ का मान क्या है ? ***(CDS 2020(I))***

(A) 1 (B) $\frac{69}{65}$ (C) $\frac{79}{65}$ (D) 2

18. What is the value of $\frac{1 - 2\sin^2\theta\cos^2\theta}{\sin^4\theta + \cos^4\theta} + 4$ equal to? ***(CDS 2020(I))***

$\frac{1 - 2\sin^2\theta\cos^2\theta}{\sin^4\theta + \cos^4\theta} + 4$ का मान किसके बराबर है ?

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

19. What is the least value of $(25\operatorname{cosec}^2 x + \sec^2 x)$?

$(25\operatorname{cosec}^2 x + \sec^2 x)$ का न्यूनतम मान क्या है ? ***(CDS 2020(I))***

(A) 40 (B) 36
(C) 26 (D) 24

20. Let $0 < \theta < 90°$ and $100\theta = 90°$. If $\alpha = \prod_{n=1}^{99} \cot n\theta$, then which one of the following is correct?

मान लीजिए कि $0 < \theta < 90°$ और $100\theta = 90°$ है। यदि $\alpha = \prod_{n=1}^{99} \cot n\theta$ है, तो निम्नलिखित में से कौन-सा एक सही है ? ***(CDS 2020(I))***

(A) $\alpha = 1$ (B) $\alpha = 0$
(C) $\alpha > 1$ (D) $0 < \alpha < 1$

21. If $\tan 6\theta = \cot 2\theta$, where $0 < 6\theta < \frac{\pi}{2}$, then what is the value of $\sec 4\theta$?

यदि $\tan 6\theta = \cot 2\theta$, जहाँ $0 < 6\theta < \frac{\pi}{2}$ है,तो $\sec 4\theta$ का मान क्या है ? ***(CDS 2020(I))***

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

22. What is $\frac{\cos\theta}{1 + \sin\theta} + \frac{1}{\cot\theta}$ equal to?

$\frac{\cos\theta}{1 + \sin\theta} + \frac{1}{\cot\theta}$ का मान किसके बराबर होगा ? ***(CDS 2020(I))***

(A) $\operatorname{cosec}\theta$ (B) $\sec\theta$
(C) $\sec\theta + \operatorname{cosec}\theta$ (D) $\operatorname{cosec}\theta - \cot\theta$

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23. A wheel makes 360 revolutions in one minute. What is the number of radians it turns in one second?
एक पहिया एक मिनट में 360 चक्कर लगाता है, तो वह एक सेकण्ड में कितने रेडियन घूमता है ?
(A) 4π (B) 6π
(C) 12π (D) 16π

24. What is the value of $\sin^2 6° + \sin^2 12° + \sin^2 18° + ... + \sin^2 84° + \sin^2 90°$?
$\sin^2 6° + \sin^2 12° + \sin^2 18° + ... + \sin^2 84° + \sin^2 90°$ का मान बताओ।
(A) 1 (B) 2
(C) 4 (D) 8

25. If $\text{cosec}\,\theta - \sin\theta = m$ and $\sec\theta - \cos\theta = n$, then what is $m^{\frac{4}{3}}n^{\frac{2}{3}} + m^{\frac{2}{3}}n^{\frac{4}{3}}$ equal to ?
यदि $\text{cosec}\,\theta - \sin\theta = m$ और $\sec\theta - \cos\theta = n$ है तो $m^{\frac{4}{3}}n^{\frac{2}{3}} + m^{\frac{2}{3}}n^{\frac{4}{3}}$ किसके बराबर हैं ? ***(CDS 2020(II))***
(A) 0 (B) 1
(C) mn (D) m^2n^2

26. If $\cos\theta + \sec\theta = k$ then what is the value of $\sin^2\theta - \tan^2\theta$?
यदि $\cos\theta + \sec\theta = k$ तो $\sin^2\theta - \tan^2\theta$ का मान ज्ञात करें हैं ? ***(CDS 2020(II))***
(A) $4 - k$ (B) $4 - k^4$
(C) $k^2 - 4$ (D) $k^2 + 2$

27. ABC is a triangle inscribed in a semicircle of diameter AB. What is $\cos(A + B) + \sin(A + B)$ equal to ?
ABC व्यास AB के अर्धवृत्त में बना एक त्रिभुज हैं $\cos(A + B) + \sin(A + B)$ के बराबर हैं ? ***(CDS 2020(II))***
(A) 0 (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 1

28. Consider the following statement:
निम्नलिखित कथन पर विचार करें:
i. $\sin\theta = x + \frac{1}{x}$ is possible for some real value of x.
$\sin\theta = x + \frac{1}{x}$, x के कुछ वास्तविक मूल्य के लिए संभव हैं।
ii. $\cos\theta = x + \frac{1}{x}$ is possible for some real value of x.
$\cos\theta = x + \frac{1}{x}$, x के कुछ वास्तविक मूल्य के लिए संभव हैं।
What of the above statement is/are correct?
उपरोक्त कथन क्या हैं ? ***(CDS 2020(II))***
(A) i Only (B) ii Only
(C) Both i and ii (D) Neither i nor ii

29. What is the magnitude (in radian) of the interior angle of a regular pentagon ?
नियमित पंचभुज के आंतरिक कोण का परिमाण (रेडियन में) क्या हैं ?
(CDS 2020(II))
(A) $\frac{\pi}{5}$ (B) $\frac{2\pi}{5}$ (C) $\frac{3\pi}{5}$ (D) $\frac{4\pi}{5}$

30. The difference between two angles is 15° and the sum of the angle in radian is $\frac{5\pi}{12}$. The bigger angle is k times the smaller angle. What is k equal to ?
दो कोणों के बीच का अंतर 15° हैं और रेडियन में कोण का योग हैं $\frac{5\pi}{12}$, बड़ा कोण छोटे कोण का k गुना हैं तो k किसके बराबर हैं ?
(CDS 2020(II))
(A) $\frac{4}{3}$ (B) $\frac{3}{2}$ (C) $\frac{6}{5}$ (D) $\frac{7}{6}$

31. Cosider the following statements :
निम्नलिखित कथनों पर विचार करें।
i. The equation $2\sin^2\theta - \cos\theta + 4 = 0$ is possible for all θ.
समीकरण $2\sin^2\theta - \cos\theta + 4 = 0$ सभी θ के लिए संभव हैं
ii. $\tan\theta + \cot\theta$ cannot be less than 2, where $0 < \theta < \frac{\pi}{2}$.
$\tan\theta + \cot\theta$, 2 से कम नहीं हो सकता जहाँ $0 < \theta < \frac{\pi}{2}$
Which of the above statements is/are correct?
उपरोक्त कथनों में से कौन-सा सही है। ***(CDS 2020(II))***
(A) i Only (B) ii Only
(C) Both i and ii (D) Neither i nor ii

32. A road curve is to be laid out on a circle. What radius should be used if the track is to change direction by 42° in distance of 44 m ?(Assume $\pi = 22/7$)
एक सर्कल पर एक रोड वक्र बिछाया जाना हैं। अगर ट्रैक को 44 मीटर की दूरी में 42° से दिशा बदलने के लिए कितने त्रिज्या का उपयोग किया जाना चाहिए ? (मान ले = 22/7) ***(CDS 2020(II))***
(A) 60 m (B) 66 m
(C) 75 m (D) 80 m

33. What is the maximum value of $3\sin\theta - 4$?
$3\sin\theta - 4$ का अधिकतम मूल्य क्या हैं ? ***(CDS 2020(II))***
(A) –4 (B) –1
(C) 0 (D) 1

34. If $\sin\theta + \cos\theta = \sqrt{2}$ then what is $\sin^6\theta + \cos^6\theta + 6\sin^2\theta\cos^2\theta$ equal to ?
यदि $\sin\theta + \cos\theta = \sqrt{2}$ है तो $\sin^6\theta + \cos^6\theta + 6\sin^2\theta\cos^2\theta$ किसके बराबर हैं ? ***(CDS 2020(II))***
(A) $\frac{1}{4}$ (B) $\frac{3}{4}$ (C) 1 (D) $\frac{7}{4}$

35. What is the least value of $9\sin^2\theta + 16\cos^2\theta$?
$9\sin^2\theta + 16\cos^2\theta$ न्यूनतम मान किया होगा। ***(CDS 2020(II))***
(A) 0 (B) 9
(C) 16 (D) 25

36. If $\cos 47° + \sin 47° = k$ then what is the value of $\cos^2 47° - \sin^2 47°$?
यदि $\cos 47° + \sin 47° = k$ है तो $\cos^2 47° - \sin^2 47°$ का मान क्या हैं ? ***(CDS 2020(II))***
(A) $k\sqrt{2-k^2}$ (B) $-k\sqrt{2-k^2}$
(C) $k\sqrt{1-k^2}$ (D) $-k\sqrt{1-k^2}$

37. If $\text{cosec}\theta - \sin\theta = p^3$ and $\sec\theta - \cos\theta = q^3$ then what is the value of $\tan\theta$?
यदि $\text{cosec}\theta - \sin\theta = p^3$ और $\sec\theta - \cos\theta = q$ है तो $\tan\theta$ का मूल्य क्या हैं ? ***(CDS 2020(II))***
(A) $\frac{p}{q}$ (B) $\frac{q}{p}$ (C) pq (D) p^2q^2

38. If $0 \leq \alpha, \beta \leq 90°$ such that $\cos(\alpha - \beta) = 1$ then what is $\sin\alpha - \sin\beta + \cos\alpha - \cos\beta$ equal to ?
यदि $0 \leq \alpha, \beta \leq 90°$ ऐसा हैं कि $\cos(\alpha - \beta) = 1$ है तो $\sin\alpha - \sin\beta + \cos\alpha - \cos\beta$ किसके बराबर हैं ? ***(CDS 2020(II))***
(A) –1 (B) 0
(C) 1 (D) 2

39. Cosider the following statements :
निम्नलिखित कथनों पर विचार करें।
i. The value of $\cos 61° + \sin 29°$ cannot exceed 1.
$\cos 61° + \sin 29°$ का मान 1 से अधिक नहीं हो सकता।
ii. The value of $\tan 23° - \cot 67°$ is less than 0.
$23° - \cot 67°$ का मान 0 से कम हैं।
Which of the above statements is/are correct?
उपरोक्त कथनों में से कौन-सा सही है। ***(CDS 2020(II))***
(A) i Only (B) ii Only
(C) Both i and ii (D) Neither i nor ii

40. If $\tan x = 1, 0 < x < 90°$, then what is the value of $2 \sin x \cos x$?
यदि $\tan x = 1, 0 < x < 90°$ हैं, तो $2 \sin x \cos x$ का मान क्या हैं ? **[CDS 2019-I]**
(A) $\frac{1}{2}$ (B) 1 (C) $\frac{\sqrt{3}}{2}$ (D) $\sqrt{3}$

41. What is the value of $\sin 46° \cos 44° + \cos 46° \sin 44°$? **[CDS 2019-I]**
$\sin 46° \cos 44° + \cos 46° \sin 44°$ का मान क्या हैं ?
(A) $\sin 2°$ (B) 0
(C) 1 (D) 2

42. Suppose $0 < \theta < 90°$, then for every θ, $4\sin^2\theta + 1$ is greater than or equal to ?
मान लीजिए $0 < \theta < 90°$ हैं, तो प्रत्येक θ के लिये $4\sin^2\theta + 1$ किससे बड़ा अथवा बराबर हैं ? **[CDS 2019-I]**
(A) 2 (B) $4\sin\theta$
(C) $4\cos\theta$ (D) $4\tan\theta$

43. What is the value of $\tan 1° \tan 2° \tan 3° \ldots\ldots \tan 89°$? **[CDS 2019-I]**
$\tan 1° \tan 2° \tan 3° \ldots\ldots \tan 89°$ का मान क्या हैं ?
(A) 0 (B) 1
(C) 2 (D) ∞

44. If $3\tan\theta = \cot\theta$ where $0 < \theta < \frac{\pi}{2}$ then what is the value of θ ? **[CDS 2019-I]**
यदि $3\tan\theta = \cot\theta$ जहाँ $0 < \theta < \frac{\pi}{2}$ हैं, तो θ का मान क्या हैं ?
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

45. What is the value of $\sin^2 25° + \sin^2 65°$?
$\sin^2 25° + \sin^2 65°$ का मान क्या हैं ? **[CDS 2019-I]**
(A) 0 (B) 1
(C) 2 (D) 4

46. What is the value of $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta - 1$?
$\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta - 1$ का मान क्या हैं ? **[CDS 2019-I]**
(A) 0 (B) 1
(C) 2 (D) 4

47. Consider the following for real numbers α, β, γ and δ?
वास्तविक संख्याओं α, β, γ और δ के लिए निम्नलिखित पर विचार कीजिए: **[CDS 2019-I]**

(i) $\sec\alpha = \frac{1}{4}$ (ii) $\tan\beta = 20$

(iii) $\operatorname{cosec}\gamma = \frac{1}{2}$ (iv) $\cos\delta = 2$

How many of the above statements are not possible?
उपर्युक्त में से कितने विवरण सम्भव नहीं हैं ?
(A) Only (i) (B) Only (ii)
(C) (i), (iii) or (iv) (D) (i), (ii), (iii) or (iv)

48. What is the value of $\frac{\sin 19^\circ}{\cos 71^\circ} + \frac{\cos 73^\circ}{\sin 17^\circ}$?
$\frac{\sin 19^\circ}{\cos 71^\circ} + \frac{\cos 73^\circ}{\sin 17^\circ}$ का मान क्या हैं ? **[CDS 2019-II]**
(A) 0 (B) 1
(C) 2 (D) 4

49. If $0 < \theta < 90^\circ$, $\sin\theta = \frac{3}{5}$ and $x = \cot\theta$, then what is the value of $1 + 3x + 9x^2 + 27x^3 + 81x^4 + 243x^5$?
यदि $0 < \theta < 90^\circ$, $\sin\theta = \frac{3}{5}$ और $x = \cot\theta$ हैं, तो $1 + 3x + 9x^2 + 27x^3 + 81x^4 + 243x^5$ का मान क्या हैं ? **[CDS 2019-II]**
(A) 941 (B) 1000
(C) 1220 (D) 1365

50. If $\cos^2 x + \cos x = 1$, then what is the value of $\sin^{12}x + 3\sin^{10}x + 3\sin^8 x + \sin^6 x$?
यदि $\cos^2 x + \cos x = 1$ हैं, तो $\sin^{12}x + 3\sin^{10}x + 3\sin^8 x + \sin^6 x$ का मान क्या है ? **[CDS 2019-II]**
(A) 1 (B) 2
(C) 4 (D) 8

51. What is the value of $\log_{10}(\cos\theta) + \log_{10}(\sin\theta) + \log_{10}(\tan\theta) + \log_{10}(\cot\theta) + \log_{10}(\sec\theta) + \log_{10}(\operatorname{cosec}\theta)$? **[CDS 2019-II]**
$\log_{10}(\cos\theta) + \log_{10}(\sin\theta) + \log_{10}(\tan\theta) + \log_{10}(\cot\theta) + \log_{10}(\sec\theta) + \log_{10}(\operatorname{cosec}\theta)$ का मान क्या हैं ?
(A) –1 (B) 0
(C) 0.5 (D) 1

52. What is $\sin^4\theta - \cos^4\theta$ equal to for any real number θ? **[CDS 2018 I]**
किसी वास्तविक संख्या θ के लिए $\sin^4\theta - \cos^4\theta$ किसके बराबर है ?
(A) 1 (B) $1 - 2\sin^2\theta$
(C) $2\cos^2\theta + 1$ (D) $1 - 2\cos^2\theta$

53. What is $\cot 1^\circ \cot 23^\circ \cot 45^\circ \cot 67^\circ \cot 89^\circ$ equal to?
$\cot 1^\circ \cot 23^\circ \cot 45^\circ \cot 67^\circ \cot 89^\circ$ किसके बराबर है ? **[CDS 2018 I]**
(A) 0 (B) 1 (C) $\frac{1}{2}$ (D) $\frac{1}{3}$

54. What angle does the hour hand of a clock describe in 10 min of time?
किसी घड़ी की घण्टे की सुई, समय के 10 मिनट में, कितने डिग्री का कोण बनाती है ? **[CDS 2018 I]**
(A) 1° (B) 5°
(C) 6° (D) 10°

55. Consider the following statements :
निम्नलिखित कथनों पर विचार कीजिए–
I. $(\sec^2\theta - 1)(1 - \operatorname{cosec}^2\theta) = 1$
II $\sin\theta(1 + \cos\theta)^{-1} + (1 + \cos\theta)(\sin\theta)^{-1} = 2\operatorname{cosec}\theta$
Which of the above is/ are correct?
उपर्युक्त में से कौन-सा सही है/हैं ? **[CDS 2018 I]**
(A) I Only (B) II Only
(C) Both I and II (D) Neither I nor II

56. If $\sec x \operatorname{cosec} x = 2$, then what is $\tan^n x + \cot^n x$ equal to?
यदि $\sec x \operatorname{cosec} x = 2$ है, तो $\tan^n x + \cot^n x$ किसके बराबर है ? **[CDS 2018 I]**
(A) 2 (B) 2^{n+1}
(C) 2^n (D) 2^{n-1}

57. If $\cos x + \cos^2 x = 1$, then what is $\sin^2 x + \sin^4 x$ equal to?
यदि $\cos x + \cos^2 x = 1$ है, तो $\sin^2 x + \sin^4 x$ किसके बराबर है ? **[CDS 2018 I]**
(A) 1 (B) 1.5
(C) 2 (D) 3

58. If $\sin A + \cos A = p$ and $\sin^3 A + \cos^3 A = q$, then which one of the following is correct?
यदि $\sin A + \cos A = p$ और $\sin^3 A + \cos^3 A = q$ है, तो निम्नलिखित में से कौन-सा सही है ? **[CDS 2018 I]**
(A) $p^3 - 3p + q = 0$ (B) $q^3 - 3q + 2p = 0$
(C) $p^3 - 3p + 2q = 0$ (D) $p^3 + 3p + 2q = 0$

59. If $x = \frac{\sec^2\theta - \tan\theta}{\sec^2\theta + \tan\theta}$, then which one of the following is correct?
यदि $x = \frac{\sec^2\theta - \tan\theta}{\sec^2\theta + \tan\theta}$ है, तो निम्नलिखित में से कौन-सा सही है ? **[CDS 2018 I]**
(A) $\frac{1}{3} < x < 3$ (B) $x \notin \left[\frac{1}{3}, 3\right]$
(C) $-3 < x < \frac{1}{3}$ (D) $\frac{1}{3} \le x \le 3$

60. If $\cos\theta = \frac{1}{\sqrt{5}}$, where $0 < \theta < \frac{\pi}{2}$, then $\frac{2\tan\theta}{1-\tan^2\theta}$ is equal to :

यदि $\cos\theta = \frac{1}{\sqrt{5}}$, जहाँ $0 < \theta < \frac{\pi}{2}$ है, तो $\frac{2\tan\theta}{1-\tan^2\theta}$ किसके बराबर है ? **[CDS 2018 II]**

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

61. If $0° < \theta < 90°$, $0° < \phi, < 90°$ and $\cos\theta < \cos\phi$, then which one of the following is correct?

यदि $0° < \theta < 90°$, $0° < \phi, < 90°$ और $\cos\theta < \cos\phi$ है, तो निम्नलिखित में से कौन-सा एक सही है ? **[CDS 2018 II]**

(A) $\theta < \phi$ (B) $\theta > \phi$
(C) $\theta + \phi = 90°$
(D) No conclusion can be drawn

62. Let $\sin(A + B) = \frac{\sqrt{3}}{2}$ and $\cos B = \frac{\sqrt{3}}{2}$, where A, B are acute angles. What is $\tan(2A - B)$ equal to?

मान लीजिए $\sin(A + B) = \frac{\sqrt{3}}{2}$ और $\cos B = \frac{\sqrt{3}}{2}$ है, जहाँ A, B न्यून कोण हैं। $\tan(2A - B)$ किसके बराबर है ? **[CDS 2018 II]**

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

63. Consider the following statements :

I. If $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4$, where $0 < \theta < 90°$, then $\theta = 60°$

II If $3\tan\theta + \cot\theta = 5\operatorname{cosec}\theta$, where $0 < \theta < 90°$, then $\theta = 60°$

Which of the statements given above is/ are correct?

निम्नलिखित कथनों पर विचार कीजिए।

I. यदि $\frac{\cos\theta}{1-\sin\theta} + \frac{\cos\theta}{1+\sin\theta} = 4$, जहाँ $0 < \theta < 90°$ है, तो $\theta = 60°$

II यदि $3\tan\theta + \cot\theta = 5\operatorname{cosec}\theta$ जहाँ $0 < \theta < 90°$ है, तो $\theta = 60°$

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं ? **[CDS 2018 II]**

(A) I Only (B) II Only
(C) Both I and II (D) Neither I nor II

64. Consider the following statements :

I. $\cos^2\theta = 1 - \frac{p^2+q^2}{2pq}$, where p,q are non-zero real numbers, is possible only when p = q.

II $\tan^2\theta = \frac{4pq}{(p+q)^2} - 1$, where p,q are non-zero real numbers, is possible only when p = q.

Which of the statements given above is/ are correct?

निम्नलिखित कथनों पर विचार कीजिए-

I. $\cos^2\theta = 1 - \frac{p^2+q^2}{2pq}$, जहाँ p, q शून्येतर वास्तविक संख्याएँ है, केवल तभी संभव हैं जब p = q.

II $\tan^2\theta = \frac{4pq}{(p+q)^2} - 1$, जहाँ p, q शून्येतर वास्तविक संख्याएँ हैं, केवल तभी संभव है जब p = q.

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं ? **[CDS 2018 II]**

(A) I Only (B) II Only
(C) Both I and II (D) Neither I nor II

65. Consider the following statements :

I. $\cos\theta + \sec\theta$ can never be equal to 1.5.

II $\sec^2\theta + \operatorname{cosec}^2\theta$ can never be less than 4.

Which of the statements given above is/ are correct?

निम्नलिखित कथनों पर विचार कीजिए-

I. $\cos\theta + \sec\theta$ कभी भी 1.5 के बराबर नहीं हो सकता।

II $\sec^2\theta + \operatorname{cosec}^2\theta$ कभी भी 4 से कम नहीं हो सकता।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं ? **[CDS 2018 II]**

(A) I Only (B) II Only
(C) Both I and II (D) Neither I nor II

66. If $\sin^2x + \sin x = 1$, then what is the value of $\cos^{12}x + 3\cos^{10}x + 3\cos^8x + \cos^6x$?

यदि $\sin^2x + \sin x = 1$ है, तो $\cos^{12}x + 3\cos^{10}x + 3\cos^8x + \cos^6x$ का मान क्या है ? **[CDS 2018 II]**

(A) −1 (B) 0
(C) 1 (D) 8

67. If $3\sin\theta + \cos\theta = 4$, then what is the value of $(3\cos\theta - 5\sin\theta)^2$?

यदि $3\sin\theta + \cos\theta = 4$ है, तो $(3\cos\theta - 5\sin\theta)^2$ का मान क्या है ? **[CDS 2018 II]**

(A) 9 (B) 12
(C) 16 (D) 18

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68. If $\cot\theta(1 + \sin\theta) = 4m$ and $\cot\theta(1 - \sin\theta) = 4n$, then which one of the following is correct?
यदि $\cot\theta(1 + \sin\theta) = 4m$ और $\cot\theta(1 - \sin\theta) = 4n$ है, तो निम्नलिखित में से कौन-सा एक सही है ? **[CDS 2018 II]**
(A) $(m^2 + n^2)^2 = mn$ (B) $(m^2 - n^2)^2 = mn$
(C) $(m^2 - n^2)^2 = m^2n^2$ (D) $(m^2 + n^2)^2 = m^2n^2$

69. If D is the number of degrees and R is the number of radians in an angle θ, then which one of the following is correct?
यदि किसी कोण θ में, D अंशाकों की तथा R रेडियनों की संख्या है, तो निम्नलिखित में से कौन-सा संबंध सही है ? **[CDS 2017 I]**
(A) $\pi D = 180R$ (B) $\pi D = 90R$
(C) $\pi R = 180D$ (D) $\pi R = 90D$

70. What is the minimum value of $9\tan^2\theta + 4\cot^2\theta$?
$9\tan^2\theta + 4\cot^2\theta$ का अल्पतम मान क्या है ? **[CDS 2017 I]**
(A) 6 (B) 9
(C) 12 (D) 13

71. If $x\sin\theta = y\cos\theta = \frac{2z\tan\theta}{1 - \tan^2\theta}$, then what is $4z^2(x^2 + y^2)$ equal to ?
यदि $x\sin\theta = y\cos\theta = \frac{2z\tan\theta}{1 - \tan^2\theta}$ है, तो $4z^2(x^2 + y^2)$ किसके बराबर है ? **[CDS 2017 I]**
(A) $(x^2 + y^2)^3$ (B) $(x^2 - y^2)^2$
(C) $(x^2 - y^2)^3$ (D) $(x^2 + y^2)^2$

72. If $\cos\theta_1 + \cos\theta_2 + \cos\theta_3 = 3$, then what is equal to $\sin\theta_1 + \sin\theta_2 + \sin\theta_3$ equal to ?
यदि $\cos\theta_1 + \cos\theta_2 + \cos\theta_3 = 3$ है, तो $\sin\theta_1 + \sin\theta_2 + \sin\theta_3$ किसके बराबर है ? **[CDS 2017 I]**
(A) 0 (B) 1
(C) 2 (D) 3

73. What is the value of θ which satisfies the equation $\cos\theta + \tan\theta = 1$?
θ का कौन-सा मान समीकरण $\cos\theta + \tan\theta = 1$ को सन्तुष्ट करता है ? **[CDS 2017 I]**
(A) 0° (B) 30°
(C) 45° (D) 60°

74. What is the value of $\sin x\sqrt{\frac{1}{1+\cos x} + \frac{1}{1-\cos x}}$?
$\sin x\sqrt{\frac{1}{1+\cos x} + \frac{1}{1-\cos x}}$ का मान क्या है ? **[CDS 2017 I]**
(A) $\sqrt{2}$ (B) $2\sqrt{2}$ (C) $\sqrt{2}\tan x$ (D) 0

75. What is $\frac{\cos^4 A - \sin^4 A}{\cos^2 A - \sin A}$ equal to?
$\frac{\cos^4 A - \sin^4 A}{\cos^2 A - \sin A}$ किसके बराबर है ? **[CDS 2017 I]**
(A) $\cos^2 A - \sin^2 A$ (B) $\cos A - \sin A$
(C) 1 (D) 2

76. If $7\sin^2 x + 3\cos^2 x = 4$, $0 < x < 90°$, then what is the value of tanx?
यदि $7\sin^2 x + 3\cos^2 x = 4$, $0 < x < 90°$ है, तो tanx का मान क्या है ? **[CDS 2017 I]**
(A) $\sqrt{2}$ (B) 1 (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{1}{\sqrt{3}}$

77. If $x = a\cos\theta + b\sin\theta$ and $y = a\sin\theta - b\cos\theta$ then what is $x^2 + y^2$ equal to?
यदि $x = a\cos\theta + b\sin\theta$ और $y = a\sin\theta - b\cos\theta$ है, तो $x^2 + y^2$ किसके बराबर है ? **[CDS 2017 I]**
(A) 2ab (B) a + b
(C) $a^2 + b^2$ (D) $a^2 - b^2$

78. If a triangle has sides, 5, and 13 and 12 units and θ is the acute angle of the triangle, then what is the value of $(\sin\theta + \cos\theta)$? **[CDS 2017 II]**
यदि एक त्रिभुज की भुजाएँ 5, 13 और 12 इकाई हैं और θ त्रिभुज का न्यून कोण है, तो $(\sin\theta + \cos\theta)$ का मान क्या है ?
(A) $\frac{5}{13}$ (B) $\frac{7}{13}$ (C) $\frac{12}{13}$ (D) $\frac{17}{13}$

79. If $0 < x < \frac{\pi}{2}$, then (sinx + cosecx) is
यदि $0 < x < \frac{\pi}{2}$ है, (sinx + cosecx) तो है। **[CDS 2017 II]**
(A) > 2 (B) < 2
(C) ≥ 2 (D) ≤ 2

80. If $\sin\theta = \frac{m^2 - n^2}{m^2 + n^2}$ and $0 < \theta < \frac{\pi}{2}$, then what is the value of cosθ?
यदि $\sin\theta = \frac{m^2 - n^2}{m^2 + n^2}$ और $0 < \theta < \frac{\pi}{2}$ है, तो cosθ का मान क्या है ? **[CDS 2017 II]**
(A) $\frac{2mn}{m^2 + n^2}$ (B) $\frac{2mn}{m^2 - n^2}$
(C) $\frac{m^2 + n^2}{2mn}$ (D) $\frac{m^2 - n^2}{2mn}$

81. If $A = \frac{\sin 45° - \sin 30}{\cos 45° + \cos 60°}$ and $B = \frac{\sec 45° - \tan 45°}{\text{cosec}\,45° + \cot 45°}$ then which one of the following is correct?

यदि $A = \frac{\sin 45° - \sin 30}{\cos 45° + \cos 60°}$ और $B = \frac{\sec 45° - \tan 45°}{\text{cosec}\,45° + \cot 45°}$ है, तो निम्नलिखित में से कौन-सा सही है ? **[CDS 2017 II]**

(A) $A = B$ (B) $A > B > 0$
(C) $A < B$ (D) $B < A < 0$

82. If θ measured in radians is the angle between the hour and the minute hand of a clock when the time is 4:36pm, then which one of the following is correct?

यदि θ, जिसकी माप रेडियन में है, किसी घड़ी के घण्टे की सुई और मिनट की सुई के बीच का कोण है जब समय 4 : 36 अपराह्न है, तो निम्नलिखित में से कौन-सा सही है ? **[CDS 2017 II]**

(A) $\frac{3\pi}{5} < \theta < \frac{4\pi}{5}$ (B) $\frac{2\pi}{5} < \theta < \frac{3\pi}{5}$

(C) $\frac{\pi}{5} \le \theta \le \frac{2\pi}{5}$ (D) $\frac{7\pi}{15} \le \theta \le \frac{8\pi}{15}$

83. Consider the following statements :

I. If $45° < \theta < 60°$, then $\sec^2 + \text{cosec}^2 = \alpha^2$ for some real number $\alpha > 1$.

II. If $0° < \theta < 45°$, then $\frac{1+\cos\theta}{1-\cos\theta} = x^2$ for some real number $x > 2$.

III. If $0° < \theta < 45°$, then $\frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta} \ge 2$

What is the number of true statements?

निम्नलिखित कथनों पर विचार कीजिए-

I. यदि $45° < \theta < 60°$ तो $\sec^2\theta + \text{cosec}^2\theta = \alpha^2$ किसी वास्तविक संख्या $\alpha > 1$ के लिए है।

II. यदि $0° < \theta < 45°$ है, तो $\frac{1+\cos\theta}{1-\cos\theta} = x^2$ किसी वास्तविक संख्या $x > 2$ के लिए है।

III. यदि $0° < \theta < 45°$ है, तो $\frac{\cos\theta}{1-\tan\theta} + \frac{\sin\theta}{1-\cot\theta} \ge 2$ है।

सही कथनों की संख्या है- **[CDS 2017 II]**

(A) Zero (B) One
(C) Two (D) Three

84. The value of $\frac{\sin 1°}{\sin 1°}$ where 1° represents 1 radian is :

$\frac{\sin 1°}{\sin 1°}$ का मान क्या है, जहाँ 1°, 1 रेडियन को निरूपित करता है ?

[CDS 2017 II]

(A) Equal to 1 (B) Less than 1
(C) Greater than 1 but less than 2
(D) Greater than 2

85. If $\tan\theta + \cot\theta = \frac{4}{\sqrt{3}}$, where $0 < \theta < \frac{\pi}{2}$, then $\sin\theta + \cos\theta$ is equal to :

यदि $\tan\theta + \cot\theta = \frac{4}{\sqrt{3}}$ है, जहाँ $0 < \theta < \frac{\pi}{2}$, तो $\sin\theta + \cos\theta$ किसके बराबर है ? **[CDS 2016 I]**

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

86. Consider the following statements :

I. There exists a positive real number m such that $\cos x = 2^{m+1}$.

II. $mn \ge m + n$, for all m, n belonging to set of natural numbers.

Which of the above statement(s) is/ are correct?

निम्नलिखित कथनों पर विचार कीजिए।

I. एक धनात्मक वास्तविक संख्या m का अस्तित्व इस प्रकार है कि $\cos x = 2^{m+1}$ है।

II. $mn \ge m + n$, जहाँ सभी m, n धन पूर्णांकों के समुच्चय के सदस्य हैं।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं ? **[CDS 2016 I]**

(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

87. If $\frac{x}{a} - \frac{y}{b}\tan\theta = 1$ and $\frac{x}{a}\tan\theta + \frac{y}{b} = 1$, then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is :

यदि $\frac{x}{a} - \frac{y}{b}\tan\theta = 1$ और $\frac{x}{a}\tan\theta + \frac{y}{b} = 1$ है, तो $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ का मान क्या है ? **[CDS 2016 I]**

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

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88. Consider the following :
निम्नलिखित पर विचार कीजिए–

I. $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \text{cosec}\theta - \cot\theta$

II $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \text{cosec}\theta + \cot\theta$

Which of the above is/are true identity/ identities?
उपर्युक्त में से कौन-सी सर्वसमिका/सर्वसमिकाएँ सत्य है/हैं ?
[CDS 2016 I]

(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

89. If $p = \cot\theta + \tan\theta$ and $q = \sec\theta - \cos\theta$, then $(p^2q)^{2/3} - (q^2p)^{2/3}$ is equal to :
यदि $p = \cot\theta + \tan\theta$ और $q = \sec\theta - \cos\theta$ है, तो $(p^2q)^{2/3} - (q^2p)^{2/3}$ किसके बराबर है ? **[CDS 2016 I]**

(A) 0 (B) 1
(C) 2 (D) 3

90. If $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$, where $0 < \theta < \frac{\pi}{2}$, then which of the following statement(s) is/ are correct?

I. There are two values of θ satisfying the above equation.
II. $\theta = 60°$ is satisfied by the above equation.

Select the correct answer using the code given below. **[CDS 2016 I]**

यदि $\frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$, जबकि $0 < \theta < \frac{\pi}{2}$ है, तो निम्नलिखित कथनों में से कौन-सा/से सही है/हैं ?

I. उपर्युक्त समीकरण को सन्तुष्ट करने वाले θ के दो मान हैं।
II. $\theta = 60°$, उपर्युक्त समीकरण से सन्तुष्ट है।

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए:

(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

91. Which of the following is correct in respect of the equation $3 - \tan^2\theta = \alpha(1 - 3\tan^2\theta)$? (given that α is a real number) : **[CDS 2016 I]**
निम्नलिखित में से कौन-सा समीकरण $3 - \tan^2\theta = \alpha(1 - 3\tan^2\theta)$ के बारे में सही है ? (दिया गया है कि α एक वास्तविक संख्या है)

(A) $\alpha \in \left[\frac{1}{3}, 3\right]$ (B) $\alpha \in (-\infty \frac{1}{3}] \cup [3, \infty)$

(C) $\alpha \in \left(-\infty, \frac{1}{3}\right) \cup [3, \infty)$ (D) None of these

92. $\left(\frac{\sin 35°}{\cos 55°}\right)^2 - \left(\frac{\cos 55°}{\sin 35°}\right)^2 + 2\sin 30°$ is equal to :

$\left(\frac{\sin 35°}{\cos 55°}\right)^2 - \left(\frac{\cos 55°}{\sin 35°}\right)^2 + 2\sin 30°$ किसके बराबर है ? **[CDS 2016 I]**

(A) –1 (B) 0
(C) 1 (D) 2

93. If $\sin\theta + \cos\theta = \frac{\sqrt{7}}{2}$, then what is $\sin\theta - \cos\theta$ equal to :
यदि $\sin\theta + \cos\theta = \frac{\sqrt{7}}{2}$ है, तो $\sin\theta - \cos\theta$ किसके बराबर है ? **[CDS 2016 II]**

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

94. If $\sin x + \sin^2 x = 1$, then what is the value of $\cos^8 x + 2\cos^6 x + \cos^4 x$?
यदि $\sin x + \sin^2 x = 1$ है, तो $\cos^8 x + 2\cos^6 x + \cos^4 x$ का मान क्या है ? **[CDS 2016 II]**

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

95. What is the value of
$\text{cosec}^2 68° + \sec^2 56° - \cot^2 34° - \tan^2 22°$?
$\text{cosec}^2 68° + \sec^2 56° - \cot^2 34° - \tan^2 22°$ का मान क्या है ? **[CDS 2016 II]**

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

96. If $2y\cos\theta = x\sin\theta$ and $2x\sec\theta - y\text{cosec}\theta = 3$, then what is $x^2 + 4y^2$ equal to?
यदि $2y\cos\theta = x\sin\theta$ और $2x\sec\theta - y\text{cosec}\theta = 3$ है, तो $x^2 + 4y^2$ का मान किसके बराबर है ? **[CDS 2016 II]**

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

97. If $\sin\theta + \cos\theta = \frac{1+\sqrt{3}}{2}$, where $0 < \theta < \frac{\pi}{2}$, then what is $\tan\theta + \cot\theta$ equal to?

यदि $\sin\theta + \cos\theta = \frac{1+\sqrt{3}}{2}$ है, जहाँ $0 < \theta < \frac{\pi}{2}$ है, तो $\tan\theta + \cot\theta$ किसके बराबर है ? **[CDS 2016 II]**

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

98. If $A = \sin^2\theta + \cos^4\theta$, where $0 \le \theta < \frac{\pi}{2}$, then which one of the following is correct?

यदि $A = \sin^2\theta + \cos^4\theta$ है, जहाँ $0 \le \theta < \frac{\pi}{2}$ है, तो निम्नलिखित में से कौन-सा एक सही है ? **[CDS 2016 II]**

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

(C) $\frac{13}{16} \le A \le 2$ (D) $\frac{3}{4} \le A \le \frac{13}{16}$

99. What is $\frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1}$ equal to?

$\frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1}$ का मान किसके बराबर है ? **[CDS 2016 II]**

(A) $\frac{1+\cos A}{\sin A}$ (B) $\frac{1-\cos A}{\sin A}$

(C) $\frac{1+\sin A}{\cos A}$ (D) $\frac{1-\sin A}{\cos A}$

100. Consider the following :
निम्नलिखित पर विचार कीजिए-
I. $\sin 1° > \sin 1^c$
II. $\cos 1° < \cos 1^c$
III. $\tan 1° > \tan 1^c$
Which of the above are not correct?
उपरोक्त में से कौन-सा सही नहीं है ? **[CDS 2016 II]**
(A) I and II (B) II and III
(C) I and III (D) I, II and III

101. If $\tan^2 x + \frac{1}{\tan^2 x} = 2$ and $0° < x < 90°$, then what is the value of x?

यदि $\tan^2 x + \frac{1}{\tan^2 x} = 2$ और $0° < x < 90°$ है, तो x का मान क्या है ? **[CDS 2016 II]**
(A) 15° (B) 30°
(C) 45° (D) 60°

102. Consider the following :
निम्नलिखित पर विचार कीजिए-
I. $\frac{\cos 75°}{\sin 15°} + \frac{\sin 12°}{\cos 78°} - \frac{\cos 18°}{\sin 72°} = 1$
II. $\frac{\cos 35°}{\sin 55°} - \frac{\sin 11°}{\cos 79°} + \cos 28° \operatorname{cosec} 62° = 1$
III. $\frac{\sin 80°}{\cos 10°} - \sin 59° \sec 31° = 0$
Which of the above are correct?
उपरोक्त में से कौन-सा सही है ? **[CDS 2016 II]**
(A) I and II (B) II and III
(C) I and III (D) I, II and III

103. What is the value of $\tan 1° \tan 2° \tan 3° \tan 4° \ldots \tan 89°$? **[CDS 2016 II]**
$\tan 1° \tan 2° \tan 3° \tan 4° \ldots \tan 89°$ का मान क्या है ?
(A) 0 (B) 1
(C) 2 (D) $\sqrt{3}$

104. If $\cos A = \tan B$, $\cos B = \tan C$ and $\cos C = \tan A$, then $\sin A$ is equal to :
यदि $\cos A = \tan B$, $\cos B = \tan C$ और $\cos C = \tan A$, तो $\sin A$ किसके बराबर है ? **[CDS 2015 I]**

(A) $\frac{\sqrt{5}-1}{4}$ (B) $\frac{\sqrt{5}-1}{2}$

(C) $\frac{\sqrt{3}-1}{4}$ (D) $\frac{\sqrt{3}-1}{2}$

105. If $\frac{3 - \tan^2 A}{1 - 3\tan^2 A} = k$, where k is a real number, then $\operatorname{cosec} A(3\sin A - 4\sin^3 A)$ is equal to :

यदि $\frac{3 - \tan^2 A}{1 - 3\tan^2 A} = k$, जहाँ k एक वास्तविक संख्या है, तो $\operatorname{cosec} A(3\sin A - 4\sin^3 A)$ किसके बराबर है ? **[CDS 2015 I]**

(A) $\frac{2k}{k-1}$, where $k \ge 3, k < \frac{1}{3}$

(B) $\frac{2k}{k-1}$, where $\frac{1}{3} \le k \le 3$

(C) $\frac{2k}{k-1}$, where $k < \frac{1}{3}$ or $k > 3$

(D) $\frac{2k}{k+1}$

106. If $\tan A + \cot A = 4$, then $\tan^4 A + \cot^4 A$ is equal to:
यदि $\tan A + \cot A = 4$, तो $\tan^4 A + \cot^4 A$ किसके बराबर है ? **[CDS 2015 I]**
(A) 110 (B) 191
(C) 80 (D) 194

107. If $p = \sqrt{\frac{1-\sin x}{1+\sin x}}$, $q = \frac{1-\sin x}{\cos x}$ and $r = \frac{\cos x}{1+\sin x}$, then which of the following is/are correct?

यदि $p = \sqrt{\frac{1-\sin x}{1+\sin x}}$, $q = \frac{1-\sin x}{\cos x}$ तथा $r = \frac{\cos x}{1+\sin x}$

तो निम्नलिखित में से कौन-सा/से कथन सही है/हैं ?

I. $p = q = r$

II $p^2 = qr$

Select the correct answer using the codes given below:

नीचे दिए गए कूट का प्रयोग कर सही उत्तर चुनिए : **[CDS 2015 I]**

(A) Only I (B) Only II

(C) Both I and II (D) Neither I nor II

108. Consider the following identity :

निम्नलिखित कथनों पर विचार कीजिए-

I. $\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A} = \sin A + \cos A$

II $(1 - \sin A - \cos A)^2 = 2(1 - \sin A)(1 + \cos A)$

Which of the above identity/ identitiesis/are correct ?

उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2015 I]**

(A) Only I (B) Only II

(C) Both I and II (D) Neither I nor II

109. ABC is a right angled triangle at B and AB : BC = 3 : 4. What is sinA + sinB + sinC equal to :

यदि ABC एक त्रिभुज है, जो B पर समकोण बनाता है और AB : BC = 3 : 4 है, तो sinA + sinB + sinC किसके बराबर है ?

[CDS 2015 I]

(A) 2 (B) $\frac{11}{5}$

(C) $\frac{12}{5}$ (D) 3

110. The value of $\text{cosec}^2 67° + \sec^2 57° - \cot^2 33° - \tan^2 23°$ is :

$\text{cosec}^2 67° + \sec^2 57° - \cot^2 33° - \tan^2 23°$ का मान क्या है ? **[CDS 2015 I]**

(A) $2\sqrt{2}$ (B) 2

(C) $\sqrt{2}$ (D) 0

111. Consider the following statement:

I. There exists atleast one value of x between 0 and $\frac{\pi}{2}$ which satisfies the equation $\sin^4 x - 2\sin^2 x - 1 = 0$

II. sin 1.5 is greater than cos1.5

Which of the above statement(s) is/are correct?

निम्नलिखित कथनों पर विचार कीजिए-

I. 0 और $\frac{\pi}{2}$ के बीच x का कम से कम एक मान अस्तित्व में है, जो समीकरण $\sin^4 x - 2\sin^2 x - 1 = 0$ को सन्तुष्ट करता है।

II. sin 1.5, cos1.5 से बड़ा है।

उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2015 I]**

(A) Only I (B) Only II

(C) Both I and II (D) Neither I nor II

112. If sinx + cosx = c, then $\sin^6 x + \cos^6 x$ is equal to:

यदि sinx + cosx = c, तो $\sin^6 x + \cos^6 x$ किसके बराबर है ?

[CDS 2015 I]

(A) $\frac{1+6c^2-3c^4}{16}$ (B) $\frac{1+6c^2-3c^4}{4}$

(C) $\frac{1+6c^2+3c^4}{16}$ (D) $\frac{1+6c^2+3c^4}{4}$

113. Consider the following statements:

I. There exists no value of x such that $\frac{1}{1-\sin x} = 4 + 2\sqrt{3}, 0 < x < \frac{\pi}{2}$

II. $\sin x = 3^{\sin^2 x}$ does not hold good for any real x.

Which of the above statement(s) is/are correct?

निम्नलिखित कथनों पर विचार कीजिए-

I. x के किसी ऐसे मान का अस्तित्व नहीं है कि $\frac{1}{1-\sin x} = 4 + 2\sqrt{3}, 0 < x < \frac{\pi}{2}$

II. $\sin x = 3^{\sin^2 x}$ किसी भी वास्तविक x के लिए लागू नहीं होता।

उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2015 I]**

(A) Only I (B) Only II

(C) Both I and II (D) Neither I nor II

113. If $\tan(A + B) = \sqrt{3}$ and tanA = 1, then tan(A – B) is equal to:

यदि $\tan(A + B) = \sqrt{3}$ और tanA = 1 है, तो tan(A – B) किसके बराबर है ? **[CDS 2015 I]**

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

114. Consider the following statements :

I. $\frac{1+\tan^2\theta}{1+\cot^2\theta} = \left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2$ is true for all $0 < \theta < \frac{\pi}{2}, \theta \neq \frac{\pi}{4}$

II $\cot\theta = \frac{1}{\tan\theta}$ is true for $\theta = 45°$

Which of the above statements(s) is/are correct?

निम्नलिखित कथनों पर विचार कीजिए-

I. $\frac{1+\tan^2\theta}{1+\cot^2\theta} = \left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2$ सभी $0 < \theta < \frac{\pi}{2}, \theta \neq \frac{\pi}{4}$ के लिए सत्य है।

II. $\cot\theta = \frac{1}{\tan\theta}$ केवल $\theta = 45°$ के लिए सत्य है।

उपर्युक्त कथनों में कौन-सा/से सही है/हैं ? **[CDS 2015 II]**

(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

115. If $x = a\cos\theta$ and $y = b\cot\theta$, then $(ax^{-1} - by^{-1})(ax^{-1} + by^{-1})$ is equal to :

यदि $x = a\cos\theta$ और $y = b\cot\theta$, तो $(ax^{-1} - by^{-1})(ax^{-1} + by^{-1})$ किसके बराबर है ? **[CDS 2015 II]**

(A) 0 (B) 1
(C) $\tan^2\theta$ (D) $\sin^2\theta$

116. $\frac{\cos\theta}{1-\sin\theta}$ is equal to $\left(\text{where}, \theta \neq \frac{\pi}{2}\right)$

$\frac{\cos\theta}{1-\sin\theta}$ (जहाँ, $\theta \neq \frac{\pi}{2}$) किसके बराबर है ? **[CDS 2015 II]**

(A) $\frac{\tan\theta - 1}{\tan\theta + 1}$ (B) $\frac{1+\sin\theta}{\cos\theta}$

(C) $\frac{\tan\theta + 1}{\tan\theta - 1}$ (D) $\frac{1+\cos\theta}{\sin\theta}$

117. If $\tan(x + 40)° \tan(x + 20)° \tan(3x)°\tan(70 - x)° \tan(50 - x)° = 1$, then the value of x is :

यदि $\tan(x + 40)° \tan(x + 20)° \tan(3x)°\tan(70 - x)° \tan(50 - x)° = 1$, तो x का मान क्या है ? **[CDS 2015 II]**

(A) 30 (B) 20
(C) 15 (D) 10

118. If θ is an acute angle and $\sin\theta\cos\theta = 2\cos^3\theta - 1.5\cos\theta$, then what is $\sin\theta$ equal to?

यदि θ एक न्यून कोण है और $\sin\theta\cos\theta = 2\cos^3\theta - 1.5\cos\theta$, तो $\sin\theta$ किसके बराबर है ? **[CDS 2015 II]**

(A) $\frac{\sqrt{5}-1}{4}$ (B) $\frac{1-\sqrt{5}}{4}$

(C) $\frac{\sqrt{5}+1}{4}$ (D) $-\frac{\sqrt{5}+1}{4}$

119. Consider the following statements :

I. $\sin66°$ is less than $\cos66°$.
II $\sin26°$ is less than $\cos26°$.

Which of the above statement(s) is/ are correct?

निम्नलिखित कथनों पर विचार कीजिए।

I. $\sin66°$, $\cos66°$ से कम है।
II. $\sin26°$, $\cos26°$ से कम है।

उपर्युक्त कथनों में से कौन-सा/से सही है/हैं ? **[CDS 2015 II]**

(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

120. If a and b are positive, then the relation $\sin\theta = \frac{2a+3b}{3b}$ is :

यदि a और b धनात्मक हैं, तो सम्बन्ध $\frac{2a+3b}{3b}$ **[CDS 2015 II]**

(A) not possible (B) possible only if a=b
(C) possible, if a > b (D) possible, if a < b

121. If $\tan\theta + \sec\theta = 2$, the $\tan\theta$ is equal to :

यदि $\tan\theta + \sec\theta = 2$, तो $\tan\theta$ किसके बराबर है ? **[CDS 2015 II]**

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

122. The minimum value of $\cos^2x + \cos^2y - \cos^2z$ is :

$\cos^2x + \cos^2y - \cos^2z$ का न्यूनतम मान क्या है ? **[CDS 2015 II]**

(A) –1 (B) 0
(C) 2 (D) 2

123. The value of $32\cot^4\left(\frac{\pi}{4}\right) - 8\sec^4\left(\frac{\pi}{3}\right) + 8\cos^3\left(\frac{\pi}{6}\right)$ is :

$32\cot^4\left(\frac{\pi}{4}\right) - 8\sec^4\left(\frac{\pi}{3}\right) + 8\cos^3\left(\frac{\pi}{6}\right)$ का मान किसके बराबर है ? **[CDS 2015 II]**

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

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124. The value of cos25° – sin25° is.
cos25° – sin25° का मान कितना है ? **[CDS 2014 I]**
(A) positive but less than 1
(B) positive but greater than 1
(C) negative (D) 0

125. In a right angled Δ ABC, right angle at B, if cosA = $\frac{4}{5}$, then what is sinC is equal to?
एक समकोण Δ ABC में, जिसमें B पर समकोण है, यदि cosA = $\frac{4}{5}$ है, तो sinC किसके तुल्य है ? **[CDS 2014 I]**
(A) $\frac{3}{5}$ (B) $\frac{4}{5}$ (C) $\frac{3}{4}$ (D) $\frac{2}{5}$

126. If α and β are complementary angles, then what is $\sqrt{\cos\alpha\,\text{cosec}\,\beta - \cos\alpha\sin\beta}$ equal to?
यदि α और β पूरक कोण है, तो $\sqrt{\cos\alpha\,\text{cosec}\,\beta - \cos\alpha\sin\beta}$ किसके तुल्य है ? **[CDS 2014 I]**
(A) secβ (B) cosα
(C) sinα (D) –tanβ

127. If 2cotθ = 3, then what is $\frac{2\cos\theta - \sin\theta}{2\cos\theta + \sin\theta}$ equal to?
यदि 2cotθ = 3 है, तो $\frac{2\cos\theta - \sin\theta}{2\cos\theta + \sin\theta}$ किसके तुल्य है ? **[CDS 2014 I]**
(A) $\frac{2}{3}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{3}{4}$

128. If sinθcosθ = $\frac{1}{2}$, then what is $\sin^6\theta + \cos^6\theta$ equal to?
यदि sinθcosθ = $\frac{1}{2}$ है, तो $\sin^6\theta + \cos^6\theta$ किसके तुल्य है ? **[CDS 2014 I]**
(A) 1 (B) 2 (C) 3 (D) $\frac{1}{4}$

129. If secθ + tanθ = 2, then what is the value of secθ?
यदि secθ + tanθ = 2 है, तो secθ का मान क्या है ? **[CDS 2014 I]**
(A) $\frac{3}{2}$ (B) $\sqrt{2}$ (C) $\frac{5}{2}$ (D) $\frac{5}{4}$

130. What is cosec(75° + θ) – sec(15° – θ) – tan (55° + θ) + cot(35° – θ) equal to?
cosec(75° + θ) – sec(15° – θ) – tan (55° + θ) + cot(35° – θ) किसके तुल्य है ? **[CDS 2014 I]**
(A) –1 (B) 0
(C) 1 (D) $\frac{3}{2}$

131. If sinθ + 2cosθ = 1, where $0 \le \theta \le \frac{\pi}{2}$, then what is 2sinθ – cosθ equal to?
यदि sinθ + 2cosθ = 1, जहाँ $0 \le \theta \le \frac{\pi}{2}$ है, तो 2sinθ – cosθ किसके तुल्य है ? **[CDS 2014 I]**
(A) –1 (B) 1/2
(C) 2 (D) 1

132. If cosx + secx = 2, when what $\cos^n x + \sec^n x$ equal to, where n is a positive integer?
यदि cosx + secx = 2 है, तो $\cos^n x + \sec^n x$ किसके तुल्य है, जहाँ n धन पूर्णांक है ? **[CDS 2014 I]**
(A) 2 (B) 2^{n-2}
(C) 2^{n-1} (D) 2^n

133. What is sin25°sin35°sec65°sec55° equal to?
sin25°sin35°sec65°sec55° किसके तुल्य है ? **[CDS 2014 I]**
(A) –1 (B) 0 (C) $\frac{1}{2}$ (D) 1

134. If tan8θ = cot2θ, where $0 < 8\theta < \frac{\pi}{2}$, then what is the value of tan5θ?
यदि tan8θ = cot2θ है, जहाँ $0 < 8\theta < \frac{\pi}{2}$ है, तो tan5θ का मान क्या है ? **[CDS 2014 I]**
(A) $\frac{1}{\sqrt{3}}$ (B) 1 (C) $\sqrt{3}$ (D) 0

135. If sin(A + B) = 1, where 0° < B < 45°, then what is cos(A – B) equal to?
यदि sin(A + B) = 1, जहाँ 0° < B < 45° है, तो cos(A – B) किसके तुल्य है ? **[CDS 2014 I]**
(A) sin2B (B) sinB
(C) cos2B (D) cosB

136. At what point of time after 3O' clock, hour hand and the minute hand of a clock occur at right angles for the first time?
एक घड़ी में 3 बजे के पश्चात् घण्टे और मिनट की सुइयाँ प्रथम बार कितने समय पर समकोणिक होंगी ? **[CDS 2014 I]**
(A) 9 O' clock (B) 4 h $37\frac{1}{6}$ min
(C) 3 h $30\frac{8}{11}$ min (D) 3 h $32\frac{8}{11}$ min

137. If $0 < \theta < \frac{\pi}{4}$, then what is $\sqrt{1-2\sin\theta\cos\theta}$ equal to?

यदि $0 < \theta < \frac{\pi}{4}$ तो $\sqrt{1-2\sin\theta\cos\theta}$ किसके बराबर है ?

[CDS 2014 II]

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

138. If $\tan\theta + \cot\theta = 2$, then what is $\sin\theta + \cos\theta$ equal to? **[CDS 2014 II]**

यदि $\tan\theta + \cot\theta = 2$ है, तो $\sin\theta + \cos\theta$ किसके बराबर है ?

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

139. What is $\frac{\sec x}{\cot x + \tan x}$ equal to?

$\frac{\sec x}{\cot x + \tan x}$ किसके बराबर है ? **[CDS 2014 II]**

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

140. What is $\frac{\sin x - \cos x + 1}{\sin x + \cos x - 1}$ equal to?

$\frac{\sin x - \cos x + 1}{\sin x + \cos x - 1}$ किसके बराबर है ? **[CDS 2014 II]**

(A) $\frac{\sin x - 1}{\cos x}$ (B) $\frac{\sin x + 1}{\cos x}$

(C) $\frac{\sin x - 1}{\cos x + 1}$ (D) $\frac{\sin x + 1}{\cos x + 1}$

141. What is $(\sin^2 x - \cos^2 x)(1 - \sin^2 x\cos^2 x)$ equal to?

$(\sin^2 x - \cos^2 x)(1 - \sin^2 x\cos^2 x)$ किसके बराबर है ?

[CDS 2014 II]

(A) $\sin^4 x - \cos^4 x$ (B) $\sin^6 x - \cos^6 x$
(C) $\cos^8 x - \sin^8 x$ (D) $\sin^8 x - \cos^8 x$

142. What is $(\sin x\cos y + \cos x\sin y)(\sin x\cos y - \cos x\sin y)$ equal to?

$(\sin x\cos y + \cos x\sin y)(\sin x\cos y - \cos x\sin y)$ किसके बराबर है ? **[CDS 2014 II]**

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

143. What is $(1 + \cot x - \operatorname{cosec} x)(1 + \tan x + \sec x)$ equal to? **[CDS 2014 II]**

$(1 + \cot x - \operatorname{cosec} x)(1 + \tan x + \sec x)$ किसके बराबर है ?

(A) 1 (B) 2
(C) $\sin x$ (D) $\cos x$

144. What is $(\operatorname{cosec} x - \sin x)(\sec x - \cos x)(\tan x + \cot x)$ equal to?

$(\operatorname{cosec} x - \sin x)(\sec x - \cos x)(\tan x + \cot x)$ किसके बराबर है ? **[CDS 2014 II]**

(A) $\sin x + \cos x$ (B) $\sin x - \cos x$
(C) 2 (D) 1

145. Consider the following statements :
I. $\sin 1^\circ > \sin 1$ **II.** $\cos 1^\circ < \cos 1$
Which of the above statement(s) is are/ correct?

निम्नलिखित कथनों पर विचार कीजिए–
I. $\sin 1^\circ > \sin 1$ *II.* $\cos 1^\circ < \cos 1$
उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2014 II]**

(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

146. If $\sin x + \operatorname{cosec} x = 2$, then what is $\sin^9 x + \operatorname{cosec}^9 x$ equal to?

यदि $\sin x + \operatorname{cosec} x = 2$ है, तो $\sin^9 x + \operatorname{cosec}^9 x$ किसके बराबर है ? **[CDS 2014 II]**

(A) 2 (B) 18
(C) 512 (D) 1024

147. If $\sin x + \cos x = p$ and $\sin^3 x + \cos^3 x = q$, then what is $p^3 - 3p$ equal to?

यदि $\sin x + \cos x = p$ तथा $\sin^3 x + \cos^3 x = q$ है, तो $p^3 - 3p$ किसके बराबर है ? **[CDS 2014 II]**

(A) 0 (B) $-2q$
(C) $2q$ (D) $4q$

148. If $\cos A + \cos^2 A = 1$, then what is the value of $2(\sin^2 A + \sin^4 A)$?

यदि $\cos A + \cos^2 A = 1$ है, तो $2(\sin^2 A + \sin^4 A)$ किसके तुल्य है ? **[CDS 2013 I]**

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

149. $(1 - \tan A)^2 + (1 + \tan A)^2 + (1 - \cot A)^2 + (1 + \cot A)^2$ is equal to?

$(1 - \tan A)^2 + (1 + \tan A)^2 + (1 - \cot A)^2 + (1 + \cot A)^2$ किसके तुल्य है ? **[CDS 2013 I]**

(A) $\sin^2 A\cos^2 A$ (B) $\sec^2 A\operatorname{cosec}^2 A$
(C) $2\sec^2 A\operatorname{cosec}^2 A$ (D) None of these

Directions (Q. Nos. 150-153) : Read the following information carefully to answer the questions that follows.
The angle A, B, C and D of a quadraletral ABCD are the ratio 1 : 2 : 4 : 5.

नीचे दी गई जानकारी को पढ़कर दिए गए प्रश्नों के उत्तर दीजिए–
यदि A, B, C और D चतुर्भुज ABCD के कोण हैं, जो 1 : 2 : 4 : 5 के अनुपात में हैं।

150. What is the value of cos(A + B)?
cos(A + B) किसके तुल्य है ? **[CDS 2013 I]**
(A) 0 (B) 1/2
(C) 1 (D) None of these

151. What is the value of cosec(C – D + B)?
cosec(C – D + B) किसके तुल्य है ? **[CDS 2013 I]**
(A) 1 (B) 2
(C) 3 (D) 4

152. Consider the following statements :
I. ABCD is a cyclic quadrilateral.
II $\sin(B - A) = \cos(D - C)$
Which of the above statement(s) is/ are correct?
निम्नलिखित कथनों पर विचार कीजिए-
I. ABCD एक चक्रीय चतुर्भुज है।
II $\sin(B - A) = \cos(D - C)$
उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2013 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

153. What is the value of $\sec^2 D - \tan^2 D$?
$\sec^2 D - \tan^2 D$ किसके तुल्य है ? **[CDS 2013 I]**
(A) 1/2 (B) 2/3
(C) 1 (D) None of these

154. What is the value of $\frac{\tan A - \sin A}{\sin^3 A}$?
$\frac{\tan A - \sin A}{\sin^3 A}$ किसके तुल्य है ? **[CDS 2013 I]**
(A) $\frac{\sec A}{1 - \cos A}$ (B) $\frac{\sec A}{1 + \cos^2 A}$
(C) $\frac{\sec A}{1 + \cos A}$ (D) None of these

155. Consider the following statements for $0° < \theta < 90°$
I. The value of $\sin\theta + \cos\theta$ is always greater than 1.
II The value of $\tan\theta + \cot\theta$ is always greater than 1.
Which of the above statement(s) is/ are correct?
$0° < \theta < 90°$ के लिए निम्नलिखित कथनों पर विचार कीजिए-
I. $\sin\theta + \cos\theta$ का मान सदैव 1 से बड़ा होता है।
II $\tan\theta + \cot\theta$ का मान सदैव 1 से बड़ा होता है।
उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2013 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

156. If sinA = 3/5 and A is an acute angle, then tanA + secA is equal to?
यदि sinA = 3/5 तथा A न्यून कोण है, तो tanA + secA किसके तुल्य है ? **[CDS 2013 I]**
(A) 0 (B) 1
(C) 2 (D) –1

157. If $\sin\theta = \frac{x^2 - y^2}{x^2 + y^2}$, then which one of the following is correct?
यदि $\sin\theta = \frac{x^2 - y^2}{x^2 + y^2}$ है, तो निम्नलिखित में से कौनसा एक सही है ? **[CDS 2013 I]**
(A) $\cos\theta = \frac{2xy}{x^2 - y^2}$ (B) $\cos\theta = \frac{2xy}{x^2 + y^2}$
(C) $\cos\theta = \frac{x - y}{x^2 + y^2}$ (D) $\cos\theta = \frac{xy(x - y)}{x^2 + y^2}$

158. If $a^2 = \frac{1 + 2\sin\theta\cos\theta}{1 - 2\sin\theta\cos\theta}$, then what is the value of $\frac{a + 1}{a - 1}$? **[CDS 2013 I]**
यदि $a^2 = \frac{1 + 2\sin\theta\cos\theta}{1 - 2\sin\theta\cos\theta}$ है, तो $\frac{a + 1}{a - 1}$ किसके तुल्य है ?
(A) $\sec\theta$ (B) 1
(C) 0 (D) $\tan\theta$

159. If $5\sin\theta + 12\cos\theta = 13$, then what is $5\cos\theta - 12\sin\theta$ equal to?
यदि $5\sin\theta + 12\cos\theta = 13$ है, तो $5\cos\theta - 12\sin\theta$ किसके तुल्य है ? **[CDS 2013 II]**
(A) –2 (B) –1
(C) 0 (D) 1

160. If $4\tan\theta = 3$, then what is $\frac{4\sin\theta - \cos\theta}{4\sin\theta + 9\cos\theta}$ equal to? **[CDS 2013 II]**
यदि $4\tan\theta = 3$ है, तो $\frac{4\sin\theta - \cos\theta}{4\sin\theta + 9\cos\theta}$ किसके तुल्य है ?
(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) $\frac{1}{6}$

161. If $\sin\theta - \cos\theta = 0$, then what is $\sin^4\theta + \cos^4\theta$ equal to?
यदि $\sin\theta - \cos\theta = 0$ है, तब $\sin^4\theta + \cos^4\theta$ किसके तुल्य है ? **[CDS 2013 II]**
(A) 1 (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) $\frac{1}{4}$

162. Consider the following statements :
I. $\tan\theta$ increases faster than $\sin\theta$ as θ increases.
II. The value of $\sin\theta + \cos\theta$ is always greater than 1.
Which of the statement(s) given above is/ are correct?
निम्नलिखित कथनों पर विचार कीजिए-
I. θ के बढ़ने पर, $\sin\theta$ की अपेक्षा $\tan\theta$ तेजी से बढ़ता है।
II. $\sin\theta + \cos\theta$ का मान सदैव 1 से अधिक होता है।
[CDS 2013 II]
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

163. What is $\frac{(\sin\theta+\cos\theta)(\tan\theta+\cot\theta)}{\sec\theta+\operatorname{cosec}\theta}$ equal to?
$\frac{(\sin\theta+\cos\theta)(\tan\theta+\cot\theta)}{\sec\theta+\operatorname{cosec}\theta}$ किसके तुल्य है ?
[CDS 2013 II]
(A) 1 (B) 2
(C) $\sin\theta$ (D) $\cos\theta$

164. What is $\frac{\cos^2(45^\circ+\theta)-\cos^2(45^\circ-\theta)}{\tan(60^\circ+\theta)\tan(30^\circ+\theta)}$ equal to ?
$\frac{\cos^2(45^\circ+\theta)-\cos^2(45^\circ-\theta)}{\tan(60^\circ+\theta)\tan(30^\circ+\theta)}$ किसके तुल्य है ?
[CDS 2013 II]
(A) -1 (B) 0
(C) 1 (D) 2

165. What is $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta$ equal to?
$\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta$ किसके तुल्य है ?
[CDS 2013 II]
(A) 0 (B) 1
(C) 2 (D) 4

166. What is $\frac{(1+\sec\theta-\tan\theta)\cos\theta}{(1+\sec\theta+\tan\theta)(1-\sin\theta)}$ equal to?
$\frac{(1+\sec\theta-\tan\theta)\cos\theta}{(1+\sec\theta+\tan\theta)(1-\sin\theta)}$ किसके तुल्य है ?
[CDS 2013 II]
(A) 1 (B) 2
(C) $\tan\theta$ (D) $\cot\theta$

167. If $\sin\theta + \cos\theta = \sqrt{3}$, then what is $\tan\theta + \cot\theta$ equal to? **[CDS 2013 II]**
यदि $\sin\theta + \cos\theta = \sqrt{3}$ है, तो $\tan\theta + \cot\theta$ किसके तुल्य है ?
(A) 1 (B) $\sqrt{2}$
(C) 2 (D) $\sqrt{3}$

168. If $\tan\theta + \sec\theta = m$, then what is $\sec\theta$ equal to?
यदि $\tan\theta + \sec\theta = m$ है, तो $\sec\theta$ किसके तुल्य है ?
[CDS 2013 II]
(A) $\frac{m^2-1}{2m}$ (B) $\frac{m^2+1}{2m}$
(C) $\frac{m+1}{m}$ (D) $\frac{m^2+1}{m}$

169. What is $\operatorname{cosesc}(75^\circ+\theta) - \sec(15^\circ-\theta)$ equal to?
$\operatorname{cosesc}(75^\circ+\theta) - \sec(15^\circ-\theta)$ किसके तुल्य है ?
[CDS 2013 II]
(A) 0 (B) 1
(C) $2\sin\theta$ (D) $2\cos\theta$

170. If ΔABC ir right angled at C, then what is $\cos(A+B) + \sin(A+B)$ equal to?
यदि ΔABC, C पर समकोणिक है, तो $\cos(A+B) + \sin(A+B)$ किसके तुल्य है ? **[CDS 2013 II]**
(A) 0 (B) $\frac{1}{2}$
(C) 1 (D) 2

171. If α, β and γ are acute angles such that $\sin\alpha = \frac{\sqrt{3}}{2}$, $\cos\beta = \frac{\sqrt{3}}{2}$ and $\tan\gamma = 1$, then what is $\alpha+\beta+\gamma$ equal to?
यदि α, β और γ न्यून कोण ऐसे हैं कि $\sin\alpha = \frac{\sqrt{3}}{2}$, $\cos\beta = \frac{\sqrt{3}}{2}$ तथा $\tan\gamma = 1$ हो, तो $\alpha+\beta+\gamma$ किसके तुल्य है ? **[CDS 2013 II]**
(A) 105° (B) 120°
(C) 135° (D) 150°

172. Consider the following :
I. $\sin^2 1^\circ + \cos^2 1^\circ = 1$
II $\sec^2 33^\circ - \cot^2 57^\circ = \operatorname{cosec}^2 37^\circ - \tan^2 53^\circ$
Which of the above statement(s) is/ are correct?
निम्नलिखित पर विचार कीजिए-
I. $\sin^2 1^\circ + \cos^2 1^\circ = 1$
II $\sec^2 33^\circ - \cot^2 57^\circ = \operatorname{cosec}^2 37^\circ - \tan^2 53^\circ$
उपरोक्त कथनों में कौन-सा/से कथन सही है/हैं ? **[CDS 2012 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

173. If $p = a\sin x + b\cos x$ and $q = a\cos x - b\sin x$, then what is the value of $p^2 + q^2$?
यदि $p = a\sin x + b\cos x$ तथा $q = a\cos x - b\sin x$, हो, तो $p^2 + q^2$ किसके बराबर है ? **[CDS 2012 I]**
(A) $a + b$ (B) ab
(C) $a^2 + b^2$ (D) $a^2 - b^2$

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174. The expression $\sin^2x + \cos^2x - 1 = 0$ is satisfied by how many values of x?
x के कितने मानों के द्वारा व्यंजक $\sin^2x + \cos^2x - 1 = 0$ सन्तुष्ट होता है ? **[CDS 2012 I]**
(A) only one value of x/ x का केवल एक मान
(B) Two values of x/ x के दो मान
(C) Infinite values of x/ x के अनन्त मान
(D) No value of x /x का कोई मान नहीं

175. Consider the following statements :
I. The angular measure in radian of a circular arc of fixed length subtending at its centre decreases, if the radius of the arc increases.
II 1800° is equal to 5π radian.
Which of the above statement(s) is/ are correct?
निम्नलिखित कथनों पर विचार करें-
I. चाप की त्रिज्या में वृद्धि होने पर, उसके केन्द्र पर स्थिर लम्बाई के एक वृत्ताकार चाप के रेडियन में कोणीय माप घटता है।
II 1800°, 5π रेडियन के बराबर है।
Which of the above statement(s) is/ are correct?
उपरोक्त में से कौन-सा/से कथन सही है/हैं ? **[CDS 2012 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

176. Consider the following statements :
I. There is only one value of x in the first quadrant that satisfies sinx + cosx = 2.
II. There is only one value of x in the first quadrant that satisfies sinx – cosx = 0.
Which of the above statement(s) is/ are correct?
निम्नलिखित कथनों पर विचार कीजिए :
I. प्रथम चतुर्थांश में x का केवल एक मान है, जो sinx + cosx = 2 को सन्तुष्ट करता है।
II. प्रथम चतुर्थांश में x का केवल एक मान है, जो sinx – cosx = 0 को सन्तुष्ट करता है।
उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2012 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

177. If x lies in the first quadrant and cosx = 5/13, then what is the value of tanx – cotx?
यदि x प्रथम चतुर्थांश में हो तथा cosx = 5/13, हो, तो tanx – cotx B किसके बराबर है ? **[CDS 2012 I]**
(A) $-\frac{139}{60}$ (B) $\frac{139}{65}$ (C) $\frac{139}{60}$ (D) None

178. Consider the following :
I. $\frac{\cot 30° + 1}{\cot 30° - 1} = 2(\cos 30° + 1)$
II. $2\sin 45°\cos 45° - \tan 45°\cot 45° = 0$
Which of the above identify/identities is/ are correct?
निम्नलिखित कथनों पर विचार कीजिए-
I. $\frac{\cot 30° + 1}{\cot 30° - 1} = 2(\cos 30° + 1)$
II. $2\sin 45°\cos 45° - \tan 45°\cot 45° = 0$
उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2012 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

179. If 3sinx + 5cosx = 5, then what is the value of (3cosx – 5sinx)?
यदि 3sinx + 5cosx = 5 हो, तो (3cosx – 5sinx) का मान क्या है ? **[CDS 2012 I]**
(A) 0 (B) 2
(C) 3 (D) 5

180. If tanθ = 3/4 and θ is acute, then what is the value of sinθ?
यदि tanθ = 3/4 और θ न्यून कोण है, तो sinθ किसके बराबर है ? **[CDS 2012 II]**
(A) $-\frac{3}{5}$ (B) $\frac{3}{5}$ (C) $\frac{4}{5}$ (D) $-\frac{4}{5}$

181. What is the value of sec(90° – θ).sinθsec45°?
sec(90° – θ).sinθsec45° का मान क्या है ? **[CDS 2012 II]**
(A) 1 (B) $\frac{\sqrt{3}}{2}$ (C) $\sqrt{2}$ (D) $\sqrt{3}$

182. If an angle measures p degrees and q radians, then which one of the following is correct?
यदि कोई कोण p डिग्री और q रेडियन को मापता है, तो निम्न में से कौनसा सही है ? **[CDS 2012 II]**
(A) πp = 90q (B) πp = 360q
(C) πp = 180q (D) πq = 180p

183. If the angle θ is in the first quadrant and tanθ = 3, then what is the value of (sinθ + cosθ)?
यदि कोण θ प्रथम चतुर्थांश में है और tanθ = 3, तो (sinθ + cosθ) का मान क्या है ? **[CDS 2012 II]**
(A) $\frac{1}{\sqrt{10}}$ (B) $\frac{2}{\sqrt{10}}$ (C) $\frac{3}{\sqrt{10}}$ (D) $\frac{4}{\sqrt{10}}$

184. If $0 < \theta < 90°$, then all the trigonometric ratios can be obtained when
यदि $0 < \theta < 90°$, तो सभी त्रिकोणमितीय अनुपात प्राप्त किए जा सकते हैं। **[CDS 2012 II]**
(A) only $\sin\theta$ is given/ केवल $\sin\theta$ दिया गया हो
(B) only $\cos\theta$ is given/ केवल $\cos\theta$ दिया गया हो
(C) only $\tan\theta$ is given/ केवल $\tan\theta$ दिया गया हो
(D) any one of the six ratios is given/ छः अनुपातों में से कोई एक दिया गया हो।

185. What is the value of $\sin A\cos A\tan A + \cos A\sin A\cot A$?
$\sin A\cos A\tan A + \cos A\sin A\cot A$ किसके बराबर है ? **[CDS 2012 II]**
(A) $\sin^2A + \cos A$ (B) $\sin^2A + \tan^2A$
(C) $\sin^2A + \cot^2A$ (D) $\text{cosec}^2A - \cot^2A$

186. What is the value of $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta}$?
$\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta}$ किसके बराबर है ? **[CDS 2012 II]**
(A) $2\text{cosec}\theta$ (B) $2\sec\theta$
(C) $\sec\theta$ (D) $\text{cosec}\theta$

187. If $\sin\theta\cos\theta = \sqrt{3}/4$, then $\sin^4\theta + \cos^4\theta$ is equal to :
यदि $\sin\theta\cos\theta = \sqrt{3}/4$ है, तो $\sin^4\theta + \cos^4\theta$ का मान क्या है ? **[CDS 2012 II]**
(A) 7/8 (B) 5/8
(C) 3/8 (D) 1/8

188. What is $\cot15°\cot20°\cot70°\cot75°$ equal to?
$\cot15°\cot20°\cot70°\cot75°$ किसके बराबर है ? **[CDS 2011 I]**
(A) −1 (B) 0
(C) 1 (D) 2

189. If $\sin3\theta = \cos(\theta - 2°)$, where 3θ and $(\theta - 2°)$ are acute angles, the what is the value of θ?
यदि $\sin3\theta = \cos(\theta - 2°)$, जहाँ 3θ और $(\theta - 2°)$ न्यून कोण हैं, तो θ का मान क्या है ? **[CDS 2011 I]**
(A) 22° (B) 23°
(C) 24° (D) 25°

190. What is $\frac{\sin^6\theta - \cos^6\theta}{\sin^2\theta - \cos^2\theta}$ equal to?
$\frac{\sin^6\theta - \cos^6\theta}{\sin^2\theta - \cos^2\theta}$ किसके बराबर है ? **[CDS 2011 I]**
(A) $\sin^4\theta - \cos^4\theta$ (B) $1 - \sin^2\theta\cos^2\theta$
(C) $1 + \sin^2\theta\cos^2\theta$ (D) $1 - 3\sin^2\theta\cos^2\theta$

191. Consider the following :
निम्नलिखित कथनों पर विचार कीजिए-
I. $\tan^2\theta - \sin^4\theta = \tan^2\theta\sin^4\theta$
II. $(\text{cosec}\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1$
Which of the above identify/identities is/ are correct?
उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2011 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

192. If $\tan A = \frac{1-\cos B}{\sin B}$, then what is $\frac{2\tan A}{1-\tan^2 A}$ equal to?
यदि $\tan A = \frac{1-\cos B}{\sin B}$ हो, तो $\frac{2\tan A}{1-\tan^2 A}$ किसके बराबर है ? **[CDS 2011 I]**
(A) $\frac{\tan B}{2}$ (B) $2\tan B$
(C) $\tan B$ (D) $4\tan B$

193. Assume the Earth to be a sphere of radius R. What is the radius of the circle of latitude 40°S?
यदि पृथ्वी R त्रिज्या का गोला है, तब 40° S अक्षांश के वृत्त की त्रिज्या क्या है ? **[CDS 2011 I]**
(A) $R\cos40°$ (B) $R\sin80°$
(C) $R\sin40°$ (D) $R\tan40°$

194. If α and β are complementary angles, then what is $\sqrt{\text{cosec}\alpha.\text{cosec}\beta}\left(\frac{\sin\alpha}{\sin\beta} + \frac{\cos\alpha}{\cos\beta}\right)$ equal to?
यदि α और β पूरक कोण हैं, तो $\sqrt{\text{cosec}\alpha.\text{cosec}\beta}\left(\frac{\sin\alpha}{\sin\beta} + \frac{\cos\alpha}{\cos\beta}\right)$ किसके बराबर है ? **[CDS 2011 II]**
(A) 0 (B) 1
(C) 2 (D) None of these

195. If A, B, C and D are ths successive angles of a cyclic quadrilateral, then what is $\cos A + \cos B + \cos C + \cos D$ equal to?
यदि किसी चक्रीय चतुर्भुज के उत्तरोत्तर कोण क्रमशः A, B, C तथा D हैं, तो $\cos A + \cos B + \cos C + \cos D$ किसके बराबर है ? **[CDS 2011 II]**
(A) 4 (B) 2
(C) 1 (D) 0

196. A unit radian is approximately equal to :
एक इकाई रेडियन लगभग किसके बराबर है ? **[CDS 2011 II]**
(A) 57°17'43" (B) 57°16'22"
(C) 57°17'47" (D) 57°17'49"

197. How many degrees are there in an angle which equals two-third of its complement?
जो कोण अपने पूरक का दो-तिहाई है, उसमें कितने अंश हैं ?
[CDS 2011 II]
(A) 36° (B) 45°
(C) 48° (D) 60°

198. If $\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = 2$ with $0° < \theta < 90°$, then what is θ equal to?
यदि $0° < \theta < 90°$ के साथ $\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = 2$ हो, तो θ किसके बराबर है ? **[CDS 2011 II]**
(A) 30° (B) 45°
(C) 60° (D) 75°

199. If $A = \frac{\pi}{6}$ and $B = \frac{\pi}{3}$, then which of the following is/ are correct?
यदि $A = \frac{\pi}{6}$ और $B = \frac{\pi}{3}$ हो, तो नीचे दिए गए कथनों में से कौन-सा/से सही है/हैं ?
I. $\sin A + \sin B = \cos A + \cos B$
II. $\tan A + \tan B = \cot A + \cot B$
Which of the correct answer using the codes given below:
उपरोक्त कथनों में से कौन-सा/से कथन सही है/हैं ? **[CDS 2011 I]**
(A) Only I (B) Only II
(C) Both I and II (D) Neither I nor II

200. The earth takes 24 h to rotate about its own axis. Through what angle will it turn in 4 h and 12 min?
अपने अक्ष के चारों ओर घूमने में पृथ्वी को 24 घण्टे लगते हैं। 4 घण्टे 12 मिनट में यह किस कोण से घूमेगी ? **[CDS 2011 II]**
(A) 63° (B) 64°
(C) 65° (D) 70°

201. If $\cos1° = p$ and $\cos89° = q$, then which one of the following is correct?
यदि $\cos1° = p$ और $\cos89° = q$ है तो निम्नांकित में से कौनसा सत्य है ? **[CDS 2010 I]**
(A) p is close to 0 and q is close to 1
(B) $p < q$
(C) $p = q$
(D) p is close to 1 and q is close to 0.

202. Which one of the following is correct?
निम्नलिखित में से कौन-सा एक सही है ? **[CDS 2010 I]**
(A) There is only one θ with $0° < \theta < 90°$ such that $\sin\theta = a$, where a is a real number.
(B) There is more than one θ with $0° < \theta < 90°$ such that $\sin\theta = a$, where a is a real number.
(C) There is no θ with $0° < \theta < 90°$ such that $\sin\theta = a$, where a is a real number.
(D) There are exactly θ's with $0° < \theta < 90°$ such that $\sin\theta = a$, where a is a real number.

203. If $7\cos^2\theta + 3\sin^2\theta = 4$ and $0° < \theta < \frac{\pi}{2}$, then what is the value of $\tan\theta$?
यदि $7\cos^2\theta + 3\sin^2\theta = 4$ और $0° < \theta < \frac{\pi}{2}$ है, तो $\tan\theta$ का मान क्या है ? **[CDS 2010 I]**
(A) $\sqrt{7}$ (B) $\frac{7}{3}$ (C) 3 (D) $\sqrt{3}$

204. What is the value of $[(1 - \sin^2\theta)\sec^2\theta + \tan^2\theta](\cos^2\theta + 1)$ when $0° < \theta < 90°$?
जब $0° < \theta < 90°$ हो, तो $[(1 - \sin^2\theta)\sec^2\theta + \tan^2\theta](\cos^2\theta + 1)$ का मान क्या है ? **[CDS 2010 I]**
(A) 2 (B) > 2 (C) ≥ 2 (D) < 2

205. If $0 \leq \theta < \frac{\pi}{2}$ and $p = \sec^2\theta$, then which one of the following is correct?
यदि $0 \leq \theta < \frac{\pi}{2}$ और $p = \sec^2\theta$ है, तो निम्नलिखित में से कौन-सा एक सही है ? **[CDS 2010 I]**
(A) $p < 1$ (B) $p = 1$ (C) $p > 1$ (D) $p \geq 1$

206. In ΔABC, $\angle ABC = 90°$, $\angle ACB = 30°$, AB = 5 cm, What is the length of AC?
यदि किसी ΔABC में $\angle ABC = 90°$, $\angle ACB = 30°$ तथा AB = 5 cm है, तब AC की लम्बाई क्या है ? **[CDS 2010 I]**
(A) 10 cm (B) 5 cm
(C) $5\sqrt{2}$ cm (D) $5\sqrt{3}$ cm

207. If $0 \leq \theta \leq \frac{\pi}{2}$ and $\cos\theta + \sqrt{3}\sin\theta = 2$, then what is the value of θ?
यदि $0 \leq \theta \leq \frac{\pi}{2}$ और $\cos\theta + \sqrt{3}\sin\theta = 2$ हो, तो θ का मान क्या है ? **[CDS 2010 I]**
(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

208. If ABC is a right angles triangle at C and having u units, v units and w units as the lengths of its sides opposite to be vertices A, B and C respectively, then what is tanA + tanB equal to?
यदि ABC, C पर समकोणीय त्रिभुज है, जिसके शीर्ष A, B और C की सम्मुख भुजाओं की लम्बाई क्रमशः u इकाई, v इकाई और w इकाई हैं तो tanA + tanB किसके बराबर है ? **[CDS 2010 I]**

(A) $\frac{u^2}{vw}$ (B) 1

(C) u + v (D) $\frac{w^2}{uv}$

209. ABC is a right angle triangle with right angle at A. If the value of tan B = $\frac{1}{\sqrt{3}}$, then for any real k the length of the hypotenuse is of the form.
ABC, A पर समकोण वाला, एक समकोण त्रिभुज है। यदि tan B = $\frac{1}{\sqrt{3}}$ हो, तो किसी वास्तविक k के लिए कर्ण की लम्बाई का रूप क्या है ? **[CDS 2010 I]**

(A) 3k (B) 2k
(C) 5k (D) 9k

210. What is the value of $\sin^2 15° + \sin^2 20° + \sin^2 25° + ... + \sin^2 75°$?
$\sin^2 15° + \sin^2 20° + \sin^2 25° + ... + \sin^2 75°$ का मान क्या है ? **[CDS 2010 I]**

(A) $\tan^2 15° + \tan^2 20° + \tan^2 25° + ... + \tan^2 75°$
(B) $\cos^2 15° + \cos^2 20° + \cos^2 25° + ... + \cos^2 75°$
(C) $\cot^2 15° + \cot^2 20° + \cot^2 25° + ... + \cot^2 75°$
(D) $\sec^2 15° + \sec^2 20° + \sec^2 25° + ... + \sec^2 75°$

211. If α is an acute angle and $\sin\alpha = \sqrt{\frac{(x-1)}{2x}}$, then what is $\tan\alpha$ equal to ?
यदि α एक न्यून कोण है और $\sin\alpha = \sqrt{\frac{(x-1)}{2x}}$ है, तो $\tan\alpha$ किसके बराबर है ? **[CDS 2010 I]**

(A) $\sqrt{\frac{x-1}{x+1}}$ (B) $\sqrt{\frac{x+1}{x-1}}$

(C) $\sqrt{x^2-1}$ (D) $\sqrt{x^2+1}$

212. If $\cos\theta \geq \frac{1}{2}$ in the first quadrant, then which one of the following is correct?
यदि प्रथम चतुर्थांश में $\cos \geq \frac{1}{2}$ है, तो निम्नलिखित में से कौन-सा एक सही है ? **[CDS 2010 II]**

(A) $\theta \leq \frac{\pi}{3}$ (B) $\theta \geq \frac{\pi}{3}$

(C) $\theta \leq \frac{\pi}{6}$ (D) $\theta \geq \frac{\pi}{6}$

213. What is the value of $\cos1°\cos2°\cos3° ..... \cos90°$?
$\cos1°\cos2°\cos3° ..... \cos90°$ का मान क्या है ? **[CDS 2010 II]**

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

214. If $\sin\theta + \cos\theta = 1$, then what is the value of $\sin\theta\cos\theta$?
यदि $\sin\theta + \cos\theta = 1$ है, तो $\sin\theta\cos\theta$ का मान क्या है ? **[CDS 2010 II]**

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

215. What is $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$ equal to?
$\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$ के बराबर क्या है ? **[CDS 2010 II]**

(A) $\sec\theta - \tan\theta$ (B) $\sec\theta + \tan\theta$
(C) $\operatorname{cosec}\theta + \cot\theta$ (D) $\operatorname{cosec}\theta - \cot\theta$

216. Two sides of an acute angle triangle are 6 cm and 2 cm, respectively. Which one of the following represents the correct range of the third side in cm?
एक न्यून कोण त्रिभुज की दो भुजाएँ क्रमशः 6 सेमी. एवं 2 सेमी. की हैं। निम्नलिखित में से कौन-सा एक, तीसरी भुजा की सही परास को सेन्टीमीटर में निरूपित करता है ? **[CDS 2010 II]**

(A) (4, 8)
(B) $(4, 2\sqrt{10})$
(C) $(4\sqrt{2}, 8)$
(D) $(4\sqrt{2}, 2\sqrt{10})$

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Solution

1. (C) minimum value of $3\sin^2\theta + 4\cos^2\theta$

$\Rightarrow$ Put $\theta = 90°$

$\Rightarrow$ $3(1) + 4(0) = 3$

2. (B) $\sin\theta\cos\theta = k$

$2\sin\theta\cos\theta = 2k$

$\Rightarrow \quad \frac{\sin 2\theta}{2} = k$

$\Rightarrow \quad 0 \le \theta \le 45°$

$\Rightarrow \quad 0 \le k \le \frac{1}{2}$

$\Rightarrow \quad 0 \le k \le 0.5$ only

3. (D) $p = \sin^2\theta + \cos^4\theta$

$= 1 - \cos^2\theta + \cos^4\theta$

$= 1 - \cos^2\theta(1 - \cos^2\theta)$

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

$= 1 - \frac{\sin^2 2\theta}{4}$

$= 1$, if $\theta \le 0°$

$= \frac{3}{4}$, if $\theta \le 45°$

4. (B) $2 - 2\sin x - \sin^4 x$

$\max \to x = 0°$

$\Rightarrow \quad 2 - 0 - 0 = 2$

$\min = x = 90°$

$= 2 - 2 - 1 = -1$

ratio $= \frac{2}{-1} = -2$

5. (A) Equation $x^2 + y^2 - 2xy\sin^2\theta = 0$

Put $\theta = 90°$

then $x^2 + y^2 - 2xy = 0$

$(x - y)^2 = 0 \quad \Rightarrow \quad x = y$

6. (A) only 1

i. $\sin 1° < \cos 57°$

$\sin 1° < \cos 57° \quad \Rightarrow \cos 89° < \cos 57°$ correct

ii. $\cos 60° > \sin 57°$

$\Rightarrow \cos 60° > \cos 43°$ incorrect

7. (A) Put $\theta = 45°$

$p = (\sqrt{2} - 1), \quad q = (\sqrt{2} + 1)$

$\therefore \quad p + pq - q =$

$(\sqrt{2} - 1) + (\sqrt{2} - 1)(\sqrt{2} + 1) - (\sqrt{2} - 1)$

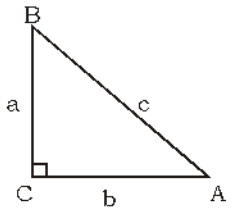
$= \sqrt{2} - 1 + 2 - 1 - \sqrt{2} - 1 = -1$

8. (D) $\operatorname{cosec}\theta - \cot\theta = m$

$\operatorname{cosec}\theta + \cot\theta = \frac{1}{m}$

$2\operatorname{cosec}\theta = m + \frac{1}{m} \Rightarrow \operatorname{cosec}\theta = \frac{m}{2} + \frac{1}{2m}$

9. (D)



$\tan A + \tan B$

$= \frac{a}{b} + \frac{b}{a} \Rightarrow \frac{a^2 + b^2}{ab} = \frac{c^2}{ab}$

10. (A) Put $= \alpha = \beta = 0$

then $\cos 2\alpha - \cos 2\beta$

$= 1 - 1 = 0$

11. (C) Put $\theta = 60°$

L.H.S.

$\sec 60° + \cos 60°$

$= 2 + \frac{1}{2} = \frac{5}{2}$ (R.H.S.)

$\Rightarrow \quad \sin^2 60° = \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{3}{4}$

12. (C) Put $\theta = 45°$

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

$= (2 - \sqrt{2})(2 + \sqrt{2})$

$= 4 - 2 = 2$

13. (D) $6 + 8\tan\theta = \sec\theta$ .....(i)

$8 - 6\tan\theta = k\sec\theta$ .....(ii)

$(i)^2 + (ii)^2$

$\Rightarrow 36 + 64\tan^2\theta + 96\tan\theta = \sec^2\theta$

$\Rightarrow 64 + 36\tan^2\theta - 96\tan\theta = k^2\sec^2\theta$

$\Rightarrow 36(1 + \tan^2\theta) + 64(1 + \tan^2\theta) = \sec^2\theta(k^2 + 1)$

$\Rightarrow 36\sec^2\theta + 64\sec^2\theta = \sec^2\theta(k^2 + 1)$

$\Rightarrow 100\sec^2\theta = \sec^2\theta(k^2 + 1)$

$\Rightarrow k^2 = 100 - 1 = 99$

14.(A) $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} - \frac{\sin\theta + 1}{\cos\theta}$

Divide neumrater and denominator by $\cos\theta$, then we get

$\frac{\tan\theta - 1 + \sec\theta}{\tan\theta - \sec\theta + 1} - \tan\theta - \sec\theta$

$\frac{(\tan\theta + \sec\theta) - 1}{(\tan\theta - \sec\theta) + 1} - \tan\theta - \sec\theta$

$\frac{((\tan\theta + \sec\theta) - 1)(\tan\theta + \sec\theta)}{((\tan\theta - \sec\theta) + 1)(\tan\theta + \sec\theta)} - \tan\theta - \sec\theta$

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

$$\frac{((\tan\theta+\sec\theta)-1)(\tan\theta+\sec\theta)}{-1+(\tan\theta+\sec\theta)}-\tan\theta-\sec\theta$$

$= \tan\theta + \sec\theta - \tan\theta - \sec\theta = 0$

15.(A) $(\tan x + \tan y)(1 - \cot x \cot y) + (\cot x + \cot y)(1 - \tan x \tan y)$

Convert every term in tan from.

Then we get

$$= \frac{(\tan x+\tan y)(\tan x\tan y-1)}{\tan x\tan y} + \frac{(\tan x+\tan y)(1-\tan x\tan y)}{\tan x\tan y}$$

$$= \frac{(\tan x+\tan y)(\tan x\tan y-1)}{\tan x\tan y} - \frac{(\tan x+\tan y)(\tan x\tan y-1)}{\tan x\tan y} = 0$$

16.(C) $\sqrt{\frac{\sec x-\tan x}{\sec x+\tan x}}$

Multiply numerator and denominator by $\sqrt{\sec+\tan x}$

Then, $\sqrt{\frac{\sec x-\tan x}{\sec x+\tan x}}\frac{\sqrt{\sec x+\tan x}}{\sqrt{\sec x+\tan x}}$

$$\sqrt{\frac{\sec^2 x-\tan^2 x}{(\sec x+\tan x)^2}}=\sqrt{\frac{1}{(\sec x+\tan)^2}}=\frac{1}{(\sec x+\tan x)}$$

17.(C) $\cot\theta = \frac{\text{base}}{\text{perpendicular}} = \frac{63}{16}$

Now, here we have base = 63, perpendicular = 16, then with the help of Pythagoras theorem, we can find the hypotenuse as 65.

hypo = $\sqrt{\text{perp.}^2 + \text{base}^2}$

hypo = $\sqrt{16^2+63^2}$

Hypo = 65

Then, $\sin\theta = \frac{16}{65}$ & $\cos\theta = \frac{63}{65}$

Then, $\sin\theta + \cos\theta = \frac{16}{65} + \frac{63}{65} = \frac{79}{65}$

18.(D) Either you can directly check it by just putting some values of θ for ex:

as θ = 0 or 90°, you will get 5 as your answer.

Or go through the conventional method.

Put 1 as $(\sin2\theta + \cos2\theta)^2$ and expand it.

$$\frac{1-2\sin^2\theta\cos^2\theta}{\sin^4\theta+\cos^4\theta}$$

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

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

$$\frac{\sin^4\theta+\cos^4\theta}{\sin^4\theta+\cos^4\theta} = 1$$

Then, $\frac{1-2\sin^2\theta\cos^2\theta}{\sin^4\theta+\cos^4\theta} + 4 = 1 + 4 = 5$

19.(B) Given $(25\text{cosec}^2x + \sec^2x)$

We have, $a\,\text{cosec}^2\theta + b\sec^2\theta$

Then, minimum value of the given function

$= \left(\sqrt{a}+\sqrt{b}\right)^2$ (remember it)

i.e., $\left(\sqrt{25}+\sqrt{1}\right)^2$

$= (5 + 1)^2 = 6^2 = 36$

20.(A) Given $\alpha = \prod_{n-1}^{99} \cot n\theta$

An it is given that $100\theta = 90°$ it implies that $90° = 100\theta$

Then,

$\alpha = \cot\theta.\cot2\theta.\cot3\theta$ .....$\cot99\theta$

$\alpha = \cot\theta.\cot2\theta.\cot3\theta$ .....$\tan(90° - 99\theta)$

$\alpha = \cot\theta.\cot2\theta.\cot3\theta$ .....$\tan(100\theta - 99\theta)$

$\alpha = \cot\theta.\cot2\theta.\cot3\theta$ .....$\tan\theta$

Now, re-arrange the terms

$\alpha =$

$\cot\theta.\tan\theta\cot2\theta.\tan2\theta.\cot3\theta.\tan3\theta$.....

Then $\alpha = 1$

21.(A) $\tan6\theta = \cot2\theta$

It is only possible when $6\theta + 2\theta = 90°$

i.e., $8\theta = 90°$

$4\theta = 45°$

Then $\sec4\theta = \sec45° = \sqrt{2}$

22.(B) $\frac{\cos\theta}{1+\sin\theta} + \frac{1}{\cot\theta} \Rightarrow \frac{\cos\theta}{1+\sin\theta} + \frac{\sin\theta}{\cos\theta}$

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

$$\frac{1+\sin\theta}{\cos\theta(1+\sin\theta)} = \frac{1}{\cos\theta} = \sec\theta$$

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23.(C) A wheel makes 360 revolutions in one minute
Means 6 revolution per second
And we know that 1 revolution = 2π radians
Then in 1 sec the number of radians it turns
= $6 \times 2\pi$ radians = 12π.

24.(D) $\sin^2 6° + \sin^2 12° + \sin^2 18° + \ldots\ldots + \sin^2 84° + \sin^2 90°$
$(\sin^2 6° + \sin^2 84° + \sin^2 12° + \sin^2 78° \ldots) + \sin^2 90°$
(A.P= 6,12,18,24,.....84)
Total terms = 14 $[\because \sin^2\theta + \cos^2\theta = 1]$
Value of total terms = $\frac{14}{2} = 7 + 1 = 8$

25.(B) $\operatorname{cosec}\theta - \sin\theta = m$
$\sec\theta - \cos\theta = n$
$\theta = 45 \quad m = \frac{1}{\sqrt{2}}, n = \frac{1}{\sqrt{2}}$
$m = n$
$m^{2/3} n^{2/3} [m^{2/3} + n^{2/3}]$
$m^{4/3}\ 2m^{2/3}$
$2m^4 \Rightarrow 2\left(\frac{1}{\sqrt{2}}\right)^2 = 1$

26.(B) $\cos\theta + \sec\theta = k$
$\sin^4\theta - \tan^4\theta$
$\theta = 45°$

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

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

$$4 - k^2 \Rightarrow 4 - \left(\frac{3}{\sqrt{2}}\right)^2 = 4 - \frac{9}{2} = -\frac{1}{2}$$

27.(D)

$\cos(A + B) + \sin(A + B)$
$\cos 90° + \sin 90°$
= 1

28. (D) $\sin\theta = x + \frac{1}{x}$
$-1 \le \sin\theta \le 1$
$\cos\theta$
$\theta \le \cos\theta \le 1$
for any value of x both statement is not satisfied
(D) Neither i or nor ii.

29.(C) Interiar angle = $\frac{(n-2)180}{n} = \frac{(5-2)180}{5}$

$= \frac{3\times 180}{5}$
Interior angle = $108° = \frac{3}{5}\pi$

30.(B) $a - b = 15$
$a + b = \frac{5}{12}\pi = 75$
$2a = 90$
$a = 45°; \quad b = 30°$
$k = \frac{45°}{30°} = \frac{3}{2}$

31.(B)
i. $2\sin^2\theta - \cos\theta + 4 = 0$
Put $\theta = 90°$
$2 \times 1 - 0 + 4 = 0$
6 Not satisfied
ii. $\tan\theta + \cot\theta$
$\theta = 45°$
$1 + 1 = 2$
$\theta = 30°$

$$\frac{1}{\sqrt{3}} + \sqrt{3} = \frac{3+1}{\sqrt{3}} = 2.3094$$

Statement (ii) is correct

32.(A) $\frac{2\pi r\theta}{360^\circ} = c$

$$\frac{2\times 22\times r\times 42}{7\quad 360} = 44 \Rightarrow \frac{2r}{60} = 2$$

$r = 60$

33.(B) For maximum value
$\sin\theta = 1$
$3\sin\theta - 4$
$= 3 \times 1 - 4$
$= -1$

34.(D) $\sin\theta + \cos\theta = \sqrt{2}$
Put$\theta = 45°$

$$\left(\frac{1}{\sqrt{2}}\right)^6 + \left(\frac{1}{\sqrt{2}}\right)^6 + 6\times\left(\frac{1}{\sqrt{2}}\right)^2 \cdot \left(\frac{1}{\sqrt{2}}\right)^2$$

$$= \frac{1}{8} + \frac{1}{8} + 6\times\frac{1}{2}\times\frac{1}{2} \Rightarrow \frac{1}{4} + \frac{6}{4} = \frac{7}{4}$$

35.(B) $9\sin^2\theta + 16\cos^2\theta$
for least value
$\theta = 90°$
$= 9 \times 1 + 16\times 0 \Rightarrow 9$

36.(A) $\cos 47° + \sin 47° = k$
$\cos^2 47° + \sin^2 47° + 2\sin 47° \cos 47° = k^2$
$2\sin 47° \cdot \cos 47° = k^2 - 1$
$(\cos 47° - \sin 47°)^2 = \cos^2 47° + \cos^2 47° - 2\cos 47° \sin 47° = 1 - k^2 + 1$

$(\cos 47° - \sin 47°) = \sqrt{2 - k^2}$
$(\cos 47° + \sin 47°) = k$

$\cos^2 47° - \sin^2 47° = k\sqrt{2 - k^2}$

37.(A) $\frac{1-\sin^2\theta}{\sin\theta} = p^3$ $\frac{\cos^2\theta}{\sin\theta} = p^3$

$\frac{1-\cos^2\theta}{\cos\theta} = q^3$ $\frac{\sin^2\theta}{\cos\theta} = q^3$

$\tan^3\theta = \frac{p^3}{q^3}$ $\tan\theta = \frac{p}{q}$

38.(B) $\cos(\alpha-\beta) = 1$
$\cos(\alpha-\beta) = \cos 0°$
$\alpha - \beta = 0$
$\alpha = \beta$
$\sin\alpha - \sin\alpha + \cos\alpha - \cos\alpha = 0$

39.(A) Statement – (i)
$\cos 61° + \sin 29°$
$= 2\sin 29°$
$\sin 29°$ Is less 0.5
Statement (i) is correct
Statement – (ii)
$\tan 23° - \cot 67°$
$\tan 23° - \tan 23°$
$= 0$
Statement (ii) is wrong

40.(B) $\tan x = 1$ then $x = 45°$

$2\sin x.\cos x = 2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = 1$

41.(C) $\sin 46°.\cos 44° + \cos 46°.\sin 44°$
$\sin 46°.\sin(90-44)° + \cos 46°.\cos(90-44)°$
$= \sin^2 46° + \cos^2 46° = 1$

42.(B) We know that,
Arithmetic mean ≥ Geometric mean

$(4\sin^2\theta + 1) \geq 2\sqrt{4\sin^2\theta \cdot 1}$

$4\sin^2\theta + 1 \geq 2.2\sin\theta$
$4\sin^2\theta + 1 \geq 4\sin\theta$

43.(B) $\tan 1° \cdot \tan 89° = \tan 1° \cdot \cot 1° = 1$
similarly,
$\tan 2° \cdot \tan 88° = \tan 2° \cdot \cot 2° = 1$
$\tan 3° \cdot \tan 87° = \tan 3° \cdot \cot 3° = 1$
hence the equation will reduce to $\tan 45° = 1$

44.(A) $3\tan\theta = \cot\theta$ $3\tan\theta = \frac{1}{\tan\theta}$

$\tan^2\theta = \frac{1}{3} \Rightarrow \tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = \frac{\pi}{6}$

45.(B) $\sin^2 25° + \sin^2 65° = \sin^2 25° + \sin^2(90-25)°$
$= \sin^2 25° + \cos^2 25° = 1$

46.(A) $\sin^6\theta + \cos^6\theta + 3\sin^2\theta \cdot \cos^2\theta - 1$
$\sin^6\theta + \cos^6\theta + 3\sin^6\theta \cdot \cos^6\theta \cdot 1 - 1$
$\sin^6\theta + \cos^6\theta + 3\sin^2\theta \cdot \cos^2\theta \cdot (\sin^2\theta + \cos^2\theta) - 1$
$(\sin^2\theta + \cos^2\theta)^3 - 1 = 1 - 1 = 0$

47.(C) Sec of any number can never be less than 1 tan can take any value from $-\infty$ to $+\infty$
cosec of any number can never be less than 1
cos of any number can never be greater than 1
so option 1,3,4 are not possible

48.(C) We have $\frac{\sin 19°}{\cos 71°} + \frac{\cos 73°}{\sin 19°}$

$\Rightarrow \frac{\sin(90-71)°}{\cos 71°} + \frac{\cos(90-17)°}{\sin 17°}$

$\Rightarrow \frac{\cos 71°}{\cos 71°} + \frac{\sin 17°}{\sin 17°}$
$\Rightarrow 1 + 1 = 2$

49.(D) If $0 < \theta < 90°$ then all the ratios will be positive.

Given that $\sin\theta = \frac{3}{5}$

$\Rightarrow x = \cot\theta = \sqrt{\operatorname{cosec}^2\theta - 1} = \sqrt{\frac{25}{9} - 1} = \frac{4}{3}$

$\Rightarrow 3x = 4$
So,
$1 + 3x + 9x^2 + 27x^3 + 81x^4 + 243x^5$
$\Rightarrow 1 + 3x + (3x)^2 + (3x)^3 + (3x)^4 + (3x)^5$
$\Rightarrow 1 + 4 + 4^2 + 4^3 + 4^4 + 4^5$

$\Rightarrow \frac{4^6 - 1}{4 - 1} = \frac{4095}{3} = 1365$

50.(A) We have
$\cos^2 x + \cos x = 1$
$\Rightarrow \cos x = 1 - \cos^2 x = \sin^2 x$ .....(i)
$\sin^{12}x + 3\sin^{10}x + 3\sin^8 x + \sin^6 x$
$\Rightarrow \cos^6 x + 3\cos^5 x + 3\cos^4 x + \cos^3 x$
$\Rightarrow (\cos^2 x)^3 + 3(\cos^2 x)^2(\cos x) + 3(\cos^2 x)(\cos x)^2 + (\cos x)^3$
$\Rightarrow (\cos^2 x + \cos x)^2$
$\Rightarrow 1^2 = 1$

51.(B) We have
$\log_{10}(\cos\theta) + \log_{10}(\sin\theta) + \log_{10}(\tan\theta) + \log_{10}(\cot\theta) + \log_{10}(\sec\theta) + \log_{10}(\operatorname{cosec}\theta)$
$\Rightarrow \log_{10}(\cos\theta \cdot \sin\theta \cdot \tan\theta \cdot \cot\theta \sec\theta \cdot \operatorname{cosec}\theta)$

$\Rightarrow \log_{10}\left(\frac{\cos\theta \cdot \sin\theta \cdot \tan\theta}{\cos\theta \cdot \sin\theta \cdot \tan\theta}\right)$
$\Rightarrow \log_{10} 1$
$\Rightarrow 0$

52.(D) $\sin^4\theta - \cos^4\theta$
$(\sin^2\theta)^2 - (\cos^2\theta)^2$
$= (\sin^2\theta + \cos^2\theta)(\sin^2\theta - \cos^2\theta)$
$[\because a^2 - b^2 = (a+b)(a-b)]$

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

53.(B) $\cot1°\cot23°\cot45°\cot67°\cot89°$
$\cot1°.(\tan90° - 23°)\cot45°\cot67°.\tan(90° - 89°)$
$[\because \tan(90° - \theta) = \cot\theta]$
$\cot1°.\tan67°.\cot45°.\cot67°.\tan1° = \cot45°$
$[\because \tan\theta.\cot\theta = 1]$
$= 1$ $[\because \cot45° = 1]$

54.(B) The hour hand of the clock covers 360° in 12 h
$\therefore$ Angle covered by hour hand in 1 h or

$$60 \text{ min.} = \frac{360}{12} = 30°$$

And angle covered by hour hand in 10 min.

$$= \frac{30}{60} \times 10 = 5°$$

55.(B) Statement I
$LHS = (\sec^2\theta - 1)(1 - \text{cosec}^2\theta)$
$= (\tan^2\theta) \times (-\cot^2\theta)$
$[\because 1 + \tan^2\theta = \sec^2\theta \text{ and } 1 + \cot^2\theta = \text{cosec}^2\theta]$
$= -1$ $[\because \tan\theta.\cot\theta = 1]$
Statement I is incorrect
Statement II
LHS
$= \sin\theta(1 + \cos\theta)^{-1} + (1 + \cos\theta)(\sin\theta)^{-1}$

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

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

$[\because (a+b)^2 = a^2 + 2ab + b^2]$

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

$$= \frac{2(1+\cos\theta)}{\sin\theta(1+\cos\theta)} \quad \left(\because \text{cosec}\theta = \frac{1}{\sin\theta}\right)$$

$= 2\text{cosec}\theta = RHS$

56.(A) We have $\sec x \,\text{cosec} x = 2$

$$\frac{1}{\text{six}\cos x} = 2$$

$\Rightarrow$ $2\sin x\cos x = 1$
$\Rightarrow$ $\sin2x = 1$

$$\Rightarrow \quad 2x = \frac{\pi}{2} \qquad x = \frac{\pi}{4}$$

$$\Rightarrow \quad \tan^n x + \cot^n x = \left(\tan\frac{\pi}{4}\right)^{11} + \left(\cot\frac{\pi}{4}\right)^{11}$$

$= 1 + 1 = 2$

57.(A) $\cos x + \cos^2 x = 1$ (given)
$1 - \cos^2 x = \cos x$ ..... (i)
Now, $\sin^2 x + \sin^4 x$
$= (1 - \cos^2 x) + (1 - \cos^4 x)^2$
$[\because \sin^2\theta + \cos^2\theta = 1]$
$= \cos x + \cos^2 x$ (from eq. (i))
But, $\cos x + \cos^2 x = 1$
$\therefore$ $\sin^2 x + \sin^4 x = 1$

58.(C) Given, $\sin A + \cos A = p$ ..... (i)
$\sin^3 A + \cos^3 A = q$ ..... (ii)
Squaring eq. (i), we get
$(\sin A + \cos A)^2 = p^2$
$\Rightarrow$ $\sin^2 A + \cos^2 A + 2\sin A\cos A = p^2$
or $2\sin A\cos A = p^2 - 1$
$[\because \sin^2 A + \cos^2 A = 1]$

$$\Rightarrow \quad \sin A\cos A = \frac{p^2 - 1}{2} \qquad \text{..... (iii)}$$

Now, cubing both sides of Eq. (i), we get
$(\sin A + \cos A)^3 = p^3$
$\sin^3 A + \cos^3 A + 3\sin A\cos A(\sin A + \cos A) = p^3$
$[\because (a+b)^3 = a^3 + b^3 + 3ab(a+b)]$

$$\Rightarrow \quad q + 3\left(\frac{p^2 - 1}{2}\right)p = p^3$$

$\Rightarrow$ $2q + 3p^3 - 3p = 2p^3$
$\Rightarrow$ $p^3 - 3p + 2q = 0$
Hence, option (C) is correct.

59.(D) $$x = \frac{\sec^2\theta - \tan\theta}{\sec^2\theta + \tan\theta}$$

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

$$= \frac{2 - 2\sin\theta\cos\theta}{2 + 2\sin\theta\cos\theta} = \frac{2 - \sin2\theta}{2 + \sin2\theta}$$

We know that, minimum and maximum value of $\sin2\theta$ are -1 and 1.

$$\therefore \quad x = \frac{2-(-1)}{2+(-1)} = 3 \quad \text{and} \quad x = \frac{2-1}{2+1} = \frac{1}{3}$$

Hence, $\frac{1}{3} \le x \le 3$

60.(B) We have $\cos\theta = \frac{1}{\sqrt{5}}$

$$\Rightarrow \quad \tan\theta = \sqrt{\sec^2\theta - 1} = \sqrt{5-1} = 2$$

$$\therefore \quad \frac{2\tan\theta}{1 - \tan^2\theta} = \frac{2(2)}{1-(2)^2} = \frac{4}{1-4} = \frac{-4}{3}$$

61.(B) $0° < \theta < 90°, 0° < \phi, < 90°$
and $\cos\theta < \cos\phi$

$\theta > \phi$ [cosx is decreasing function in $\left[0, \frac{\pi}{2}\right]$]

62.(C) We have, $\sin(A + B) = \frac{\sqrt{3}}{2}$

$\Rightarrow \quad A + B = 60°$ ..... (i)

And $\cos B = \frac{\sqrt{3}}{2}$

$\Rightarrow \quad B = 30°$ .....(ii)

Solving Eqx. (i) and (ii), we get

$A = 30°$

$\Rightarrow \quad \tan(2A - B) = \tan(60° - 30°)$

$= \tan 30° = \frac{1}{\sqrt{3}}$

63.(C) We have,

I. $\frac{\cos\theta}{1 - \sin\theta} + \frac{\cos\theta}{1 + \sin\theta} = 4$

$\Rightarrow \frac{\cos\theta(1 + \sin\theta + 1 - \sin\theta)}{1 - \sin^2\theta} = 4$

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

$\Rightarrow \quad \cos\theta = \frac{1}{2} = \cos 60°$

$\Rightarrow \quad \theta = 60°$

$\therefore$ Statement I is correct.

II. $3\tan\theta + \cot\theta = 5\text{cosec}\theta$

put $\theta = 60°$

$\because 3\tan 60° + \cot 60° = 5\text{cosec}60°$

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

$\Rightarrow \quad \frac{9+1}{\sqrt{3}} = \frac{10}{\sqrt{3}}$

$\Rightarrow \quad \frac{10}{\sqrt{3}} = \frac{10}{\sqrt{3}}$

$\therefore$ Statement II is also correct.

64.(C) $\cos^2\theta = 1 - \frac{p^2 + q^2}{2pq}$

$0 \le \cos^2\theta \le 1$

$0 \le 1 - \frac{p^2 \times q^2}{2pq} \le 1$

$0 \le 2pq - (p^2 + q^2) \le 2pq$

$\Rightarrow \quad p^2 + q^2 - pq \le 0$

$\Rightarrow \quad (p - q)^2 \le 0$

It is possible only when $p = q$

$\therefore$ Statement I is correct.

$$\tan^2\theta = \frac{4pq}{(p+q)^2} - 1$$

$\Rightarrow \quad \tan^2\theta \ge 0$

$\Rightarrow \quad \frac{4pq}{(p+q)^2} - 1 \ge 0$

$\Rightarrow \quad 4pq - (p + q)^2 \ge 0$

$\Rightarrow \quad (p + q)^2 - 4pq \le 0$

$\Rightarrow \quad p^2 + q^2 + 2pq - 4pq \le 0$

$\Rightarrow \quad (p - q)^2 \le 0$

It is possible only $p = q$

$\therefore$ Statement II is correct.

65.(C) $\cos\theta + \sec\theta$

$\Rightarrow \quad \cos\theta + \frac{1}{\cos\theta}$

$\Rightarrow \quad \cos\theta + \frac{1}{\cos\theta} \ge 2$

$\therefore$ Statement I is correct.

$\sec^2\theta + \text{cosec}^2\theta$

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

$$= \frac{4}{(2\sin\theta\cos\theta)^2} = \frac{4}{\sin^2 2\theta}$$

$\therefore \quad \frac{4}{\sin^2 2\theta} \ge 4$

Statement II is also correct.

66.(C) We have $\sin^2 x + \sin x = 1$

$\Rightarrow \quad \sin x = 1 - \sin^2 x = \cos^2 x$

$\Rightarrow \quad \sin^2 x = \cos^4 x$

$\Rightarrow \quad 1 - \cos^2 x = \cos^4 x$

$\Rightarrow \quad \cos^4 x + \cos^2 x = 1$

cubing both side

$(\cos^4 x + \cos^2 x)^3 = (1)^3$

$\Rightarrow \quad \cos^{12} x + 3\cos^{10} x + 3\cos^8 x + \cos^6 x = 1$

67.(D) We have $3\sin\theta + \cos\theta = 4$

squaring both sides

$9\sin^2\theta + 25\cos^2\theta + 30\sin\theta\cos\theta = 16$

$\Rightarrow \quad 9 - 9\cos^2\theta + 25 - 25\sin^2\theta + 30\sin\theta\cos\theta = 16$

$\Rightarrow \quad 9\cos^2\theta + 25\sin^2\theta - 30\sin\theta\cos\theta = 9 + 25 - 16$

$\Rightarrow \quad 3(\cos\theta - 5\sin\theta)^2 = 18$

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68.(B) We have $\cot\theta(1 + \sin\theta) = 4m$ ..... (i)

$\cot\theta(1 - \sin\theta) = 4n$ .....(ii)

$16mn = \cot^2\theta\,(1 - \sin^2\theta)$

$16mn = \cot^2\theta \cos^2\theta$ .....(iii)

Now, add eqs. (i) and (ii), we get

$\cot\theta = 2(m + n)$

Subtracting eqs. (ii) from (i), we get

$\cot\theta\sin\theta = 2(m - n)$

$\Rightarrow \quad \cos\theta = 2(m - n)$

Putting the value of $\cot\theta$ and $\cos\theta$ in eq. (iii), we get

$16mn = (2^2(m - n)^2)(2^2(m + n)^2)$

$= 16\,(m^2 - n^2)^2$

$\Rightarrow \quad mn = (m^2 - n^2)^2$

69.(C) We know that,

π Radian = 180°

$$\therefore \quad 1 \text{ Radian} = \frac{180^\circ}{\pi}$$

$$\Rightarrow \quad R \text{ Radian} = \frac{180^\circ}{\pi}$$

$\Rightarrow \quad \pi R = 180^\circ D$

70.(C) We know that, AM ≥ GM

$$\therefore \quad \frac{9\tan^2\theta + 4\cot^2\theta}{2} \geq [(9\tan^2\theta)(4\cot^2\theta)]^{1/2}$$

$$\Rightarrow \quad \frac{9\tan^2\theta + 4\cot^2\theta}{2} \geq 6$$

$[\because \tan\theta\cot\theta = 1]$

$\Rightarrow \quad 9\tan^2\theta + 4\cot^2\theta \geq 12$

$\therefore$ Minimum value of $9\tan^2\theta + 4\cot^2\theta$ is 12

71.(B) Let $x\sin\theta = y\cos\theta = \dfrac{2z\tan\theta}{1 - \tan^2\theta} = k$

Taking $x\sin\theta = y\cos\theta$

$$\Rightarrow \quad \frac{y}{x} = \tan\theta \quad \text{..... (i)}$$

Now, $x = k\,\text{cosec}\theta$ ..... (ii)

$y = k\sec\theta$ ..... (iii)

$$\text{and } z = k\left(\frac{1 - \tan^2\theta}{2\tan\theta}\right) = k\left(\frac{1 - \frac{y^2}{x^2}}{2\frac{y}{x}}\right)$$

$$= k\left(\frac{x^2 - y^2}{x^2} \times \frac{x}{2y}\right) = k\left(\frac{x^2 - y^2}{2xy}\right) \quad \text{..... (iv)}$$

From eq. (ii) & (iii)

$x^2 + y^2 = k^2(\text{cosec}^2\theta + \sec^2\theta)$

$= k^2(\tan^2\theta + \cot^2\theta + 2)$

$= k^2(\tan\theta + \cot\theta)^2$

$$\Rightarrow \quad x^2 + y^2 = k^2\left(\frac{y}{x} + \frac{x}{y}\right)^2 = k^2\left(\frac{x^2 + y^2}{xy}\right)^2$$

$$\Rightarrow \quad k^2 = \frac{x^2 + y^2}{\left(\frac{x^2 + y^2}{xy}\right)^2}$$

$$\Rightarrow \quad (x^2 + y^2) \times \frac{x^2y^2}{(x^2 + y^2)^2} = \frac{x^2y^2}{x^2 + y^2}$$

From Eq. (iv)

$$z^2 = \left(\frac{x^2y^2}{x^2 + y^2}\right)\left(\frac{x^2 - y^2}{2xy}\right)$$

$\therefore \quad 4z^2(x^2 + y^2)$

$$\Rightarrow \quad 4\left(\frac{x^2y^2}{x^2 + y^2}\right)\left(\frac{x^2 - y^2}{2xy}\right)^2 (x^2 + y^2)$$

$\Rightarrow \quad (x^2 - y^2)^2$

72.(A) We have,

$\cos\theta_1 + \cos\theta_2 + \cos\theta_3 = 3$ .....(i)

Since $0 \leq \cos\theta \leq 1$

$\therefore$ From Eqs. (i) to be true

$\cos\theta_1 = \cos\theta_2 = \cos\theta_3 = 1$

$\therefore \quad \theta_1 = \theta_2 = \theta_3 = 2n\pi$

Now, $\sin\theta_1 + \sin\theta_2 + \sin\theta_3$

$= \sin2n\pi + \sin2n\pi + \sin2n\pi$

$= 0 + 0 + 0$ $[\because \sin2n\pi = 0]$

$= 0$

73.(A) We have,

$\cos\theta + \tan\theta = 1$

When $\theta = 0^\circ$

$\cos0^\circ + \tan0^\circ = 1 + 0 = 1$

When $\theta = 30^\circ$

$$\cos30^\circ + \tan30^\circ = \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{3}} = \frac{5}{2\sqrt{3}}$$

When $\theta = 45^\circ$

$$\cos45^\circ + \tan45^\circ = \frac{1}{\sqrt{2}} + 1 = \frac{1 + \sqrt{2}}{\sqrt{2}}$$

When $\theta = 60^\circ$

$$\cos60^\circ + \tan60^\circ = \frac{1}{\sqrt{2}} + \sqrt{3} = \frac{1 + 2\sqrt{3}}{2}$$

$\therefore$ It is clear that, $\cos\theta + \tan\theta = 1$ is valid only when $\theta = 0^\circ$

74.(A) We have,

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

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

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

$$= \sin x.\frac{\sqrt{2}}{\sin x} = \sqrt{2}$$

75.(A) We have, $\frac{\cos^4 A - \sin^4 A}{\cos^2 A - \sin A}$

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

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

$[\because a^2 - b^2 = (a+b)(a-b)]$

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

76.(D) We have, $7\sin^2 x + 3\cos^2 x = 4$

$$\Rightarrow 7\frac{\sin^2 x}{\cos^2 x} + 3\frac{\cos^2 x}{\cos^2 x} = \frac{4}{\cos^2 x}$$

$\Rightarrow 7\tan^2 x + 3 = 4\sec^2 x$

$\Rightarrow 7\tan^2 x + 3 = 4(1 + \tan^2 x)$

$\Rightarrow 7\tan^2 x + 3 = 4 + 4\tan^2 x$

$\Rightarrow 3\tan^2 x = 1$

$\Rightarrow \tan^2 x = \frac{1}{3}$ $[\because 0 < x < 90°]$

$\Rightarrow \tan x = \frac{1}{\sqrt{3}}$

77.(D) We have, $x = a\cos\theta + b\sin\theta$

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

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

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

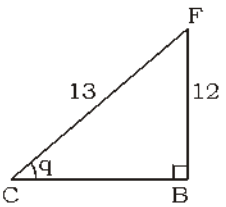
$= a^2\cos^2\theta + a^2\sin^2\theta + b^2\sin^2\theta + b^2\cos^2\theta$

$= a^2 + b^2$ $[\because \sin^2\theta + \cos^2\theta = 1]$

78.(A) We have

Slides of triangle are 5, 13 and 12.

This is a pythagorous triplate is ΔABC



$\sin\theta = \frac{12}{13}$, $\cos\theta = \frac{5}{13}$

$\therefore \quad \sin\theta + \cos\theta = \frac{12}{13} + \frac{5}{13} = \frac{17}{13}$

79.(A) We have

$\sin x + \operatorname{cosec} x \quad x \in \left(0, \frac{\pi}{2}\right)$

$$\therefore \frac{\sin x + \operatorname{cosec} x}{2} \geq \sqrt{\sin x \operatorname{cosec} x}$$

$[\because$ A.M. $\geq$ G.M.$]$

$\Rightarrow \quad \sin x + \operatorname{cosec} x \geq 2$

Since $x \in \left(0, \frac{\pi}{2}\right)$

$\therefore \quad \sin x + \operatorname{cosec} x > 2$

80.(A) We have, $\sin\theta = \frac{m^2 - n^2}{m^2 + n^2}$

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

$$\cos\theta = \sqrt{1 - \frac{(m^2 - n^2)^2}{(m^2 + n^2)^2}}$$

$$\cos\theta = \sqrt{\frac{(m^2 + n^2)^2 - (m^2 - n^2)^2}{(m^2 + n^2)^2}}$$

$$\cos\theta = \sqrt{\frac{4m^2n^2}{(m^2 + n^2)^2}}$$

$$\cos\theta = \frac{2mn}{m^2 + n^2}$$

81.(A) We have,

$$A = \frac{\sin 45° - \sin 30}{\cos 45° + \cos 60°}$$

$$A = \frac{\frac{1}{\sqrt{2}} - \frac{1}{2}}{\frac{1}{\sqrt{2}} + \frac{1}{2}} = \frac{\sqrt{2} - 1}{\sqrt{2} + 1}$$

$$B = \frac{\sec 45° - \tan 45°}{\operatorname{cosec} 45° + \cot 45°}$$

$$B = \frac{\sqrt{2} - 1}{\sqrt{2} + 1}$$

Hence A = B

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82.(B) We know that hour completes are rotation in 12 hours while hand completes are rotation in 60 minutes.
∴ Angle traced by hour hand in 12 hours = 2π
⇒ Angle traced by the hour hand in 4 hrs. 36 min i.e. $\left(4+\frac{36}{60}\right)$ hr

or $\frac{23}{5}$ hrs = $\frac{2\pi}{12}\times\frac{23}{5}=\frac{23\pi}{30}$

Also, angle traced by the minute hand in 60 min. = 2π
⇒ The angle traced by the minute hand in 36 min. = $\frac{2\pi}{60}\times 36=\frac{6\pi}{5}$

Hence, the required angle between two hands
$=\frac{6\pi}{5}-\frac{23\pi}{30}=\frac{36\pi-23\pi}{30}=\frac{13\pi}{30}$

which lies between $\frac{2\pi}{5}$ and $\frac{3\pi}{5}$

$\left[\because \frac{2\pi}{5}=\frac{12\pi}{30}\text{ and }\frac{3\pi}{5}=\frac{18\pi}{30}\right]$

83.(B) We have,
I. $45°<\theta<60°$

$\sec^2 + \operatorname{cosec}^2 = \alpha^2$

$\theta=45°$

$\sec^2 45° + \operatorname{cosec}^2 45° = 2+2=4$

$\theta=60°$

$\sec^2 60° + \operatorname{cosec}^2 60° = 4+\frac{4}{3}=\frac{16}{3}$

$4<\alpha^2<\frac{16}{3}$ True

II. $0°<\theta<45°$

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

Put $\theta=30°$ ⇒ $\frac{1+\cos 30°}{1-\cos 30°}$

$=\frac{2+\sqrt{3}}{2-\sqrt{3}}<2$ False

III. $0°<\theta<45°$

$\frac{\cos\theta}{1-\tan\theta}+\frac{\sin\theta}{1-\cot\theta}$

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

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

Maximum value of $\cos\theta + \sin\theta$ is $\sqrt{2}$ false.

84.(B) We know that
1 radian = 57° (approx.)
∴ $\sin 1° < \sin 57°$

⇒ $\frac{\sin 1°}{\sin 57°}<1$ ⇒ $\frac{\sin 1°}{\sin 1°}<1$

85.(C) We have, $\tan\theta+\cot\theta=\frac{4}{\sqrt{3}}$

$\frac{\sin\theta}{\cos\theta}+\frac{\cos\theta}{\sin\theta}=\frac{4}{\sqrt{3}}$ ⇒ $\frac{\sin^2\theta+\cos^2\theta}{\cos\theta\sin\theta}=\frac{4}{\sqrt{3}}$

$\frac{1}{\frac{\sin 2\theta}{2}}=\frac{4}{\sqrt{3}}$ ⇒ $\sin 2\theta=\frac{\sqrt{3}}{2}$

$2\theta=\frac{\pi}{3}$ ⇒ $\theta=\frac{\pi}{6}$

$\sin\theta+\cos\theta=\sin\frac{\pi}{6}+\cos\frac{\pi}{6}$

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

86.(D) ..... between – 1 and 1, then $\cos x = 2^{m+1}$. does not ..... value of m.

∴ $\frac{m+n}{2}\geq\sqrt{mn}$, so $mn \geq (m+n)$ does not hold true for m, n belonging to natural numbers.
Let's take an example.
If m = 1, then $n \geq 1 + n$ this cannot be true.
Hence, neither 1 nor 2 is correct.

87.(D) Given, $\frac{x}{a}-\frac{y}{b}\tan\theta=1$ .....(i)

and $\frac{x}{a}\tan\theta+\frac{y}{b}=1$ .....(ii)

On solving Eqs. (i) and (ii), we get

$\frac{x}{a}=\frac{1+\tan\theta}{\sec^2\theta}$ and $\frac{y}{b}=\frac{1-\tan\theta}{\sec^2\theta}$

$\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{(1+\tan\theta)^2+(1-\tan\theta)^2}{\sec^4\theta}$

$=\frac{2\sec^2\theta}{\sec^4\theta}=2\cos^2\theta$

88.(C) I. $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \sqrt{\frac{1-\cos\theta}{1+\cos\theta}\times\frac{1-\cos\theta}{1-\cos\theta}}$

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

$= \sqrt{\frac{(1-\cos\theta)^2}{\sin^2\theta}} = \frac{1-\cos\theta}{\sin\theta} = \text{cosec}\theta - \cot\theta$

Hence, Statement I is true.

II. $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \sqrt{\frac{1+\cos\theta}{1-\cos\theta}\times\frac{1+\cos\theta}{1+\cos\theta}}$

$= \sqrt{\frac{(1+\cos\theta)^2}{\sin^2\theta}} = \frac{1+\cos\theta}{\sin\theta} = \text{cosec}\theta + \cot\theta$

Hence, Statement II is true.

89.(B) We have, $p = \cot\theta + \tan\theta = \text{cosec}\theta.\sec\theta$

$q = \sec\theta - \cos\theta = \sin^2\theta.\sec\theta$

$\therefore (p^2)q^{2/3} - (q^2p)^{2/3} = (\text{cosec}^2\theta.\sec^2\theta.\sin^2\theta.\sec\theta)^{2/3} - (\sin^4\theta.\sec^2\theta.\text{cosec}\theta.\sec\theta)^{2/3}$

$= (\sec^3\theta)^{2/3} - (\sin^3\theta.\sec^3\theta)^{2/3}$

$= \sec^2\theta - \sin^2\theta.\sec^2\theta = \sec^2\theta(1 - \sin^2\theta) = 1$

90.(C) $\because \frac{\cos^2\theta - 3\cos\theta + 2}{\sin^2\theta} = 1$

$\Rightarrow \cos^2\theta - 3\cos\theta + 1 + 1 - \sin^2\theta = 0$

$\Rightarrow \cos^2\theta - 3\cos\theta + 1 + \cos^2\theta = 0$

$\Rightarrow 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow (2\cos\theta - 1)(\cos\theta - 1) = 0$

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

$\therefore \theta = 60°$ or $\theta = 0°$

Hence, both statements are correct.

91.(C)

92.(C) $\left(\frac{\sin 35°}{\cos 55°}\right)^2 - \left(\frac{\cos 55°}{\sin 35°}\right)^2 + 2\sin 30°$

$= \left[\frac{\sin(90° - 55°)}{\cos 55°}\right]^2 - \left[\frac{\cos(90° - 35°)}{\sin 35°}\right]^2$

$= \left(\frac{\cos 55°}{\cos 55°}\right)^2 - \left(\frac{\sin 35°}{\sin 35°}\right)^2 + 1$

$= 1^2 - 1^2 + 1 = 1$

93.(B) Given, $\sin\theta + \cos\theta = \frac{\sqrt{7}}{2}$

On squaring both sides, we get

$(\sin\theta + \cos\theta)^2 = \left(\frac{\sqrt{7}}{2}\right)^2$

$\Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = \frac{7}{4}$

$\Rightarrow 1 + 2\sin\theta\cos\theta = \frac{7}{4}$

$\Rightarrow 1 + 2\sin\theta\cos\theta = \frac{7}{4}$

$\Rightarrow 2\sin\theta\cos\theta = \frac{7}{4} - 1$

$\Rightarrow 2\sin\theta\cos\theta = \frac{3}{4}$

Now, $(\sin\theta - \cos\theta)^2 = \sin^2\theta + \cos^2\theta - 2\sin\theta\cos\theta$

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

$\Rightarrow (\sin\theta - \cos\theta)^2 = \frac{1}{4}$

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

94.(B) Given, $\sin x + \sin^2 x = 1$

$\Rightarrow \sin x = 1 - \sin^2 x$

$\Rightarrow \sin x = \cos^2 x$ ..... (i)

Now, $\cos^8 x + \cos^6 x + \cos^4 x$

$= (\cos^2 x)^4 + 2(\cos^2 x)^3 + (\cos^2 x)^2$

$= \sin^4 x + 2\sin^3 x + \sin^2 x$ [from eq. (i)]

$= \sin^2 x(\sin^2 x + 2\sin x + 1)$

$= \sin^2 x(\sin x + 1)^2$

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

$= (\sin^2 x + \sin x)^2$

$= (1)^2$ [$\because \sin^2 x + \sin x = 1$]

95.(D) We have,

$\text{cosec}^2 68° + \sec^2 56° - \cot^2 34° - \tan^2 22°$

$= \text{cosec}^2 68° - \tan^2 22° + \sec^2 56° - \cot^2 34°$

$= \text{cosec}^2 68° - \tan^2(90° - 68°) + \sec^2 56° - \cot^2(90° - 56°)$

$= \text{cosec}^2 68° - \cot^2 68° + \sec^2 56° - \tan^2 56°$

$= 1 + 1 = 2$

96.(C) Given, $2y\cos\theta = x\sin\theta$

$\Rightarrow x\sin\theta - 2y\cos\theta = 0$ ..... (i)

and $2x\sec\theta - y\,\text{cosec}\theta = 3$

$\Rightarrow \frac{2x}{\cos\theta} - \frac{y}{\sin\theta} = 3$

[$\because \sec\theta = \frac{1}{\cos\theta}$ and $\text{cosec}\theta = \frac{1}{\sin\theta}$]

$\Rightarrow 2x\sin\theta - y\cos\theta = 3\sin\theta\cos\theta$ ..... (ii)

On multiplying both sides of eq. (ii) by 2, then subtract the result from eq. (i), we get

$x\sin\theta - 2y\cos\theta - 4x\sin\theta + 2y\cos\theta = 0 - 6\sin\theta\cos\theta$

$\Rightarrow -3x\sin\theta = -6\sin\theta\cos\theta$

$\Rightarrow \quad x = \frac{-6\sin\theta\cos\theta}{-3\sin\theta}$

$\Rightarrow \quad x = 2\cos\theta$ ..... (iii)

On putting $x = 2\cos\theta$ in eq. (i), we get

$2\cos\theta\sin\theta - 2y\cos\theta = 0$

$\Rightarrow \quad y = \frac{2\cos\theta\sin\theta}{2\cos\theta}$

$\Rightarrow \quad y = \sin\theta$ ..... (iv)

$\therefore \quad x^2 + 4y^2 = (2\cos\theta)^2 + 4(\sin\theta)^2$

[from eq. (iii) and (iv)]

$= 4\cos^2\theta + 4\sin^2\theta$

$= 4(\cos^2\theta + \sin^2\theta)$

$= 4 \quad [\because \sin^2\theta + \cos^2\theta = 1]$

97.(C) Given, $\sin\theta + \cos\theta = \frac{1+\sqrt{3}}{2}$

On squaring both sides, we get

$(\sin\theta + \cos\theta)^2 = \left(\frac{1+\sqrt{3}}{2}\right)^2$

$\Rightarrow \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta$

$= \frac{1^2 + \left(\sqrt{3}\right)^2 + 2\times1\times\sqrt{3}}{4}$

$[\because (a+b)^2 = a^2 + b^2 + 2ab]$

$\Rightarrow 1 + 2\sin\theta\cos\theta = \frac{1+3+2\sqrt{3}}{4}$

$\Rightarrow 2\sin\theta\cos\theta = \frac{1+3+2\sqrt{3}}{4} - 1$

$= \frac{4+2\sqrt{3}-4}{4} = \frac{2\sqrt{3}}{4}$

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

$\Rightarrow \sin\theta\cos\theta = \frac{\sqrt{3}}{4}$ ..... ()

Now, $\tan\theta + \cot\theta = \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}$

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

$= \frac{1}{\left(\frac{\sqrt{3}}{4}\right)}$ [from Eq. (i)]

$= \frac{4}{\sqrt{3}}$

98.(B) The value of A, when $\theta = 0°$

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

When $\theta = 45°$

$\sin^2\theta + \cos^1\theta = \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$

When $\theta = 30°$

$\sin^2\theta + \cos^1\theta = \frac{1}{4} + \frac{9}{16} = \frac{13}{16}$

$\therefore$ Average value of A,

$\frac{3}{4} \le A \le 1$

99.(A) Let $y = \frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1}$

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

$\because \cot\theta = \frac{\cos\theta}{\sin\theta}$ and $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$

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

$= \frac{\cos A + (1 - \sin A)}{\cos A - (1 - \sin A)} \times \frac{\cos A + (1 - \sin A)}{\cos A + (1 - \sin A)}$

[by rationalisation]

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

$[\because (a-b)(a+b) = a^2 - b^2]$

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

$[\because (a+b)^2 = a^2 + b^2 + 2ab]$

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

$[\because \cos^2\theta = 1 - \sin^2\theta]$

100. (D) We know that,

radian $= \frac{180}{\pi}$ degree $= 57°17'45''$

Now,

I. $\sin 1° > \sin 1°$

$\sin 1° > \sin\frac{180°}{\pi}$

False, since, $\sin\theta$ is an increasing function for

$$\theta \in \left[0, \frac{\pi}{2}\right]$$

II. $\cos 1° < \cos\frac{180°}{\pi}$

False, since, $\cos\theta$ is an increasing function for

$$\theta \in \left[0, \frac{\pi}{2}\right]$$

III. $\tan 1° > \tan\frac{180°}{\pi}$

False, since, $\tan\theta$ is an increasing function for

$$\theta \in \left[0, \frac{\pi}{2}\right]$$

101. (C) Given,

$$\tan^2 x + \frac{1}{\tan^2 x} = 2$$

$\Rightarrow \tan^4 x + 1 - 2\tan^2 x = 0$

$\Rightarrow (\tan^2 x - 1)^2 = 0$

$\Rightarrow \tan^2 x - 1 = 0$

$\Rightarrow \tan^2 x = 1$

$\Rightarrow \tan x = \pm 1$

$\Rightarrow \tan x = \tan 45°$

$\Rightarrow x = 45°$

102. (C) $\frac{\cos 75°}{\sin 15°} + \frac{\sin 12°}{\cos 78°} - \frac{\cos 18°}{\sin 72°}$

$= \frac{\cos(90° - 15°)}{\sin 15°} + \frac{\sin(90° - 78°)}{\cos 78°} - \frac{\cos(90° - 72°)}{\cos 72°}$

$= \frac{\sin 15°}{\sin 15°} + \frac{\cos 78°}{\cos 78°} - \frac{\sin 72°}{\sin 72°}$

$= 1 + 1 - 1$

$= 1 = \text{RHS}$

LHS $= \frac{\cos 35°}{\sin 55°} - \frac{\sin 11°}{\cos 79°} + \cos 28° \operatorname{cosec} 62°$

$= \frac{\cos(90° - 55°)}{\sin 55°} - \frac{\sin(90° - 79°)}{\cos 79°} + \cos 28° . \frac{1}{\sin 62°}$

$= \frac{\sin 55°}{\sin 55°} - \frac{\cos 79°}{\cos 79°} + \frac{\cos(90° - 62°)}{\sin 62°}$

$= 1 - 1 + 1 \Rightarrow 1 = \text{RHS}$

103. (B) We have, $\tan 1° \tan 2° \tan 3° \tan 4° \ldots \tan 89°$

$= \tan 1° \tan 2° \tan 3° \ldots \tan 45° \tan 46° \tan 47° \ldots \tan 89°$

$= (\tan 1° \tan 89°).(\tan 2° \tan 88°) \ldots (\tan 44° \tan 46°). \tan 45°$

$= 1 - 1 \ldots\ldots\ldots = 1 \quad [\because \tan\theta \tan(90° - \theta) = 1]$

LHS $= \frac{\sin 80°}{\cos 10°} - \sin 59° \sec 31°$

$= \frac{\sin 80°}{\cos(90° - 80°)} - \sin 59° \sec(90° - 59°)$

$= \frac{\sin 80°}{\sin 80°} - \sin 59° \operatorname{cosec} 59°$

$= 1 - \sin 59° \frac{1}{\sin 59°}$

$= 1 - 1 \Rightarrow 0 = \text{RHS}$

104.(B) Let $\sin A = x$ ..... (i)

Then, $\cos A = \tan B$

$\Rightarrow \sqrt{1 - \sin^2 A} = \tan B$

$\Rightarrow \sqrt{1 - x^2} = \tan B$ ..... (ii)

Now, $\cos B = \tan C$

$\Rightarrow \frac{1}{\sec B} = \tan C \quad \Rightarrow \frac{1}{\sqrt{1 + \tan^2 B}} = \tan C$

from eq. (ii) we get

$\frac{1}{\sqrt{1 + 1 - x^2}} = \tan C$

$\Rightarrow \frac{1}{\sqrt{2 - x^2}} = \tan C$ ..... (iii)

Now, $\cos C = \frac{1}{\sqrt{\sec^2 C}} = \frac{1}{\sqrt{1 + \tan^2 C}}$

$= \frac{1}{\sqrt{1 + \frac{1}{2 - x^2}}}$ [from eq. (iii)]

$\Rightarrow \cos C = \frac{\sqrt{2 - x^2}}{\sqrt{3 - x^2}}$ ..... (iv)

$\because \cos C = \tan A \quad \Rightarrow \quad \cos C = \frac{\sin A}{\cos A}$

$\Rightarrow \cos C = \frac{\sin A}{\sqrt{1 - \sin^2 A}}$

from eq. (i) and (iv), we get

$\frac{\sqrt{2 - x^2}}{\sqrt{3 - x^2}} = \frac{x}{\sqrt{1 - x^2}} \quad \Rightarrow x = \frac{\sqrt{2 - x^2} \times \sqrt{1 - x^2}}{\sqrt{3 - x^2}}$

On squaring both side we get

$(3 - x^2)x^2 = (2 - x^2)(1 - x^2)$

$\Rightarrow \quad 3x^2 - x^4 = 2 - 2x^2 - x^2 + x^4$

$\Rightarrow \quad 3x^2 - x^4 = 2 - 3x^2 + x^4$

$\Rightarrow \quad x^4 - 3x^2 + 2 - 3x^2 + x^4 = 0$

$\Rightarrow \quad 2x^4 - 6x^2 + 2 = 0$

$\Rightarrow \quad x^4 - 3x^2 + 1 = 0$

Let $x^2 = t$

$\therefore \quad t^2 - 3t + 1 = 0$

Now comparing $at^2 + bt + c = 0$, we get

$a = 1, b = -3$ and $c = 1$

$$\therefore \quad t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{3 \pm \sqrt{9 - 4 \times 1 \times 1}}{2 \times 1}$$

$$\Rightarrow \quad t = 3 \pm \frac{\sqrt{5}}{2}$$

Now put $t = x^2$

$$\therefore \ x^2 = 3 \pm \frac{\sqrt{5}}{2} = \frac{2}{2} \times \left(\frac{3 \pm \sqrt{5}}{2}\right) = \frac{6 \pm 2\sqrt{5}}{4}$$

$$= \frac{1 + 5 \pm 2\sqrt{5}}{4} = \frac{\left(1 \pm \sqrt{5}\right)^2}{4}$$

$$\therefore \ x = \frac{\sqrt{5} - 1}{2} \qquad \Rightarrow \sin A = \frac{\sqrt{5} - 1}{2}$$

105. (A) Given $\dfrac{3 - \tan^2 A}{1 - 3\tan^2 A} = k$

$\Rightarrow \quad 3 - \tan^2 A = k(1 - 3\tan^2 A)$

$\Rightarrow \quad 3k\tan^2 A - \tan^2 A = k - 3$

$\Rightarrow \quad \tan^2 A(3k - 1) = k - 3$

$$\Rightarrow \quad \tan^2 A = \frac{k - 3}{3k - 1}$$

$$\Rightarrow \quad \tan A = \sqrt{\frac{k - 3}{3k - 1}} = \frac{\sqrt{k - 3}}{\sqrt{3k - 1}}$$

In right angled ΔABC,

$AC^2 = BC^2 + AB^2$

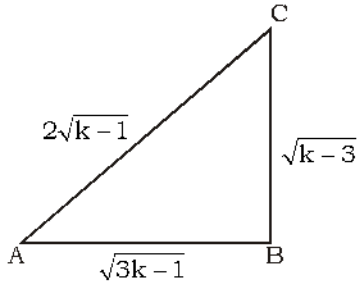
$$\Rightarrow \quad AC^2 = \left(\sqrt{k - 3}\right)^2 + \left(\sqrt{3k - 1}\right)^2$$

$\Rightarrow \quad AC^2 = k - 3 + 3k - 1$

$\Rightarrow \quad AC^2 = 4k - 4 \quad \Rightarrow \quad AC^2 = 4(k - 1)$

$\therefore \quad AC = 2\sqrt{k - 1}$

From the figure,



$$\sin A = \frac{BC}{AC} = \frac{\sqrt{k - 3}}{2\sqrt{k - 1}}$$

Now, $\operatorname{cosec} A(3\sin A - 4\sin^3 A)$

$= \operatorname{cosec} A \times \sin A(3 - 4\sin^2 A)$

$$= \frac{1}{\sin A} \times \sin A(3 - 4\sin^2 A) \qquad \left[\because \operatorname{cosec} A = \frac{1}{\sin A}\right]$$

$$= 3 - 4\sin^2 A = 3 - 4\left(\frac{\sqrt{k - 3}}{2\sqrt{k - 1}}\right)^2$$

$$= 3 - 4\left[\frac{k - 3}{4(k - 1)}\right] = 3 - \frac{(k - 3)}{(k - 1)}$$

$$= \frac{3(k - 1) - (k - 3)}{k - 1} = \frac{3k - 3 - k + 3}{k - 1}$$

$$= \frac{2k}{k - 1}$$

106.(D) Given, $\tan A + \cot A = 4$

On squaring both sides, we get

$(\tan A + \cot A)^2 = (4)^2$

$\Rightarrow \quad \tan^2 A + \cot^2 A + 2\tan A \cot A = 16$

$\Rightarrow \quad \tan^2 A + \cot^2 A + 2 = 16$

$\Rightarrow \quad \tan^2 A + \cot^2 A = 14$

Again, squaring both sides, we get

$(\tan^2 A + \cot^2 A)^2 = (14)^2$

$\Rightarrow \quad \tan^4 A + \cot^4 A + 2\tan^2 A \cot^2 A = 196$

$\Rightarrow \quad \tan^4 A + \cot^4 A + 2 = 196$

$\Rightarrow \quad \tan^4 A + \cot^4 A = 194$

107.(C) Given, $p = \sqrt{\dfrac{1 - \sin x}{1 + \sin x}}$

$$p = \sqrt{\frac{(1 - \sin x)(1 - \sin x)}{(1 + \sin x)(1 - \sin x)}} = \frac{1 - \sin x}{\sqrt{1 - \sin^2 x}}$$

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

$$r = \frac{\cos x}{1 + \sin x} \times \frac{(1 - \sin x)}{(1 - \sin x)} = \frac{\cos x(1 - \sin x)}{1 - \sin^2 x}$$

$$= \frac{\cos x(1 - \sin x)}{\cos^2 x} = \frac{1 - \sin x}{\cos x}$$

$\therefore \quad p = q = r$

$$\text{Now, } p^2 = \left(\frac{1 - \sin x}{\cos x}\right)^2 = \frac{(1 - \sin x)}{\cos x} \times \frac{(1 - \sin x)}{\cos x}$$

$\Rightarrow \quad p^2 = q \times r$

108. (A) I. $LHS = \frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A}$

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

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

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

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

= (cosA + sinA) = RHS

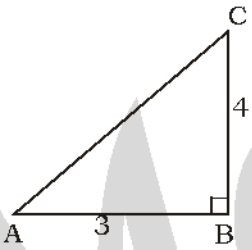
109.(C) In right angled Δ ABC, AB : BC = 3 : 4 or

$$\frac{AB}{BC} = \frac{3}{4}$$

Now, in Δ ABC, $AC^2 = AB^2 + BC^2$

$= 3^2 + 4^2 = 9 + 16 = 25$

$\Rightarrow$ AC = 5 $\quad \sin A = \frac{BC}{AC} = \frac{4}{5}$



$\sin B = \sin 90° = 1$ and $\sin C = \frac{AB}{AC} = \frac{3}{5}$

Now, $\sin A + \sin B + \sin C = \frac{4}{5} + 1 + \frac{3}{5}$

$$= \frac{4+5+3}{5} = \frac{12}{5}$$

110.(B) $\text{cosec}^2 67° + \sec^2 57° - \cot^2 33° - \tan^2 23°$

$= \text{cosec}^2(90° - 23°) + \sec^2(90° - 33°) - \cot^2 33° - \tan^2 23°$

$= \sec^2 23° + \text{cosec}^2 33° - \cot^2 33° - \tan^2 23°$

$= 1 + \tan^2 23° + 1 + \cot^2 33° - \cot^2 33° - \tan^2 23°$

$[\because 1+\tan^2\theta = \sec^2\theta$ and $1 + \cot^2\theta = \text{cosec}^2\theta]$

= 2

111. (B) I. $\sin^4 x - 2\sin^2 x - 1 = 0$

$$\Rightarrow \quad \sin^2 x = \frac{2 \pm \sqrt{4+4}}{2} = \frac{2 \pm \sqrt{8}}{2}$$

$$\Rightarrow \quad \sin^2 x = \frac{2 \pm 2\sqrt{2}}{2} = 1 \pm \sqrt{2}$$

$\Rightarrow \quad \sin^2 x = 1 + \sqrt{2} > 1$

or $\sin^2 x = 1 - \sqrt{2} < 0$

Hence, both are not possible.

II. Since, 1.5 radian is in IInd quadrant.

Therefore, sin1.5 > 0 and cos1.5 < 0

$\therefore \quad \sin 1.5 > \cos 1.5$

so,only ii is correct.

112. (B) Give, sinx + cosx = c

On squaring both sides, we get

$(\sin x + \cos x)^2 = c^2$

$\Rightarrow \quad \sin^2 x + \cos^2 x + 2\sin x \cos x = c^2$

$\Rightarrow \quad 1 + 2\sin x \cos x = c^2$

$$\Rightarrow \quad \sin x \cos x = \frac{c^2 - 1}{2} \quad \ldots\ldots\ldots\ldots \text{(i)}$$

Now, $\sin^6 x + \cos^6 x = (\sin^2 x)^3 + (\cos^2 x)^3$

$= (\sin^2 x + \cos^2 x)[\sin^4 x + \cos^4 x - \sin^2 x \cos^2 x]$

$[\because a^3 + b^3 = (a+b)(a^2 + b^2 - ab)]$

$= 1[(\sin^2 x + \cos^2 x)^2 - 3\sin^2 x \cos^2 x]$

$= (1 - 3\sin^2 x \cos^2 x)$

$\sin^6 x + \cos^6 x = 1 - 3\sin^2 x \cos^2 x$

$$= 1 - 3\left(\frac{c^2-1}{2}\right)^2 \quad \text{[from Eq. (i)]}$$

$$= 1 - 3\left(\frac{c^4 + 1 - 2c^2}{4}\right) = \frac{4 - 3c^4 - 3 + 6c^2}{4}$$

$$= \frac{1 + 6c^2 - 3c^4}{4}$$

113. (C) I. $1 - \sin x \neq 0 \quad \Rightarrow \quad \sin x \neq 0$

$\Rightarrow \quad x \neq 0$, which does not belong to be given interval.

So, there is no value of x.

II. $\sin x = 3^{\sin^2 x} \quad \Rightarrow \quad 1 = \sin x . 3^{-\sin^2 x}$

On multiplying 3 both sides, we get

$3 = \sin x . 3^{-\sin^2 x} . 3 \quad \Rightarrow \quad 3 = \sin x . 3^{1 - \sin^2 x}$

$\Rightarrow \quad 3 = \sin x . 3^{\cos^2 x}$

$\Rightarrow$ RHS is less than 3 while LHS is 3.

Thus, the equation does not hold for any x.

114. (C) Given, $\tan(A + B) = \sqrt{3}$

$\Rightarrow \quad \tan(A + B) = \tan 60°$

$\therefore \quad A + B = 60° \quad \ldots\ldots\ldots\ldots\ldots \text{(i)}$

and $\tan A = 1 \quad \Rightarrow \quad \tan A = \tan 45°$

$\therefore \quad A = 45°$

From Eq. (i), $\quad A + B = 60°$

$\Rightarrow \quad 45° + B = 60° \quad \Rightarrow \quad B = 15°$

Now, $\tan(A - B) = \tan(45° - 15°)$

$$= \tan 30° = \frac{1}{\sqrt{3}}$$

Hence, the value of $\tan(A - B)$ is $\frac{1}{\sqrt{3}}$

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115.(A) I. LHS $= \frac{1+\tan^2\theta}{1+\cot^2\theta} = \frac{\sec^2\theta}{\operatorname{cosec}^2\theta} = \tan^2\theta$

RHS $= \left(\frac{1-\tan\theta}{1-\cot\theta}\right)^2 = \tan^2\theta$

At $\theta = \frac{\pi}{4}$, RHS $= \frac{0}{0}$ form, which is indeterminante

$\therefore$ Statement I is correct.

II. $\cot\theta = \frac{1}{\tan\theta} \Rightarrow \tan\theta.\cot\theta = 1$

Which is true for all values of θ.

Hence, Statement II is incorrect but statement I is correct.

116. (B) We have, $x = a\cos\theta$ and $y = b\cot\theta$

$\therefore \left(\frac{a}{x}-\frac{b}{y}\right)\left(\frac{a}{x}+\frac{b}{y}\right) = \frac{a^2}{x^2}-\frac{b^2}{y^2}$

$= \sec^2\theta - \tan^2\theta = 1$

117. (B) We have, $\frac{\cos\theta}{1-\sin\theta} \times \frac{1+\sin\theta}{1+\sin\theta}$

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

118. (C) We have $\tan(x+40)^\circ \tan(x+20)^\circ \tan(3x)^\circ \tan(70-x)^\circ \tan(50-x)^\circ = 1$

$[\because \cot(90^\circ-\theta) = \tan\theta]$

$\Rightarrow \tan(x+40)^\circ \tan(x+20)^\circ \tan(3x)^\circ \cot(90^\circ - 70^\circ + x)^\circ \cot(90-50-x)^\circ = 1$

$\Rightarrow \tan(x+40)^\circ \tan(x+20)^\circ \tan(3x)^\circ \cot(20^\circ + x)^\circ \cot(40+x)^\circ = 1$

$\Rightarrow \tan(3x)^\circ = 1$

$\Rightarrow \tan(3x)^\circ = \tan45^\circ \Rightarrow 3x = 45$

$\therefore x = 15$

119. (A) We have, $\sin\theta\cos\theta = 2\cos^3\theta - \frac{3}{2}\cos\theta$

$= 2\sin\theta\cos\theta = 4\cos^3\theta - 3\cos\theta$

$= \cos\theta \neq 0;\ = 2\sin\theta = 4\cos^2\theta - 3$

$\Rightarrow 2\sin\theta = 4 - 4\sin^2\theta - 3$

$\Rightarrow 4\sin^2\theta + 2\sin\theta - 1 = 0$

$\therefore \sin\theta = \frac{-2 \pm \sqrt{4+16}}{8} = \frac{-2 \pm 2\sqrt{5}}{8}$

$\Rightarrow \sin\theta = \frac{-1 \pm \sqrt{5}}{4}$

Since, θ is an acute angle,

$\sin\theta > 0$

$\sin\theta = \frac{\sqrt{5}-1}{4}$

120. (B) I. If $45^\circ < \theta < 90^\circ$

The, $\sin\theta > \cos\theta$

$\therefore \sin66^\circ > \cos66^\circ$ incorrect.

II. When $0^\circ < \theta < 45^\circ$, $\cos\theta > \sin\theta$, $\cos26^\circ > \sin26^\circ$ or $\sin26^\circ < \cos26^\circ$. It is correct.

Hence, only II is correct.

121. (A) We have, $\sin\theta = \frac{2a+3b}{3b} = 1 + \frac{2a}{3b}$

Since, $\sin\theta$ is always smaller or equal to 1

but $1 + \frac{2a}{3} > 1$.

Hence, it is not possible.

122. (A) We have, $\tan\theta + \sec\theta = 2 \Rightarrow \sec\theta = 2 - \tan\theta$

On squaring both sides, we get

$\Rightarrow \sec^2\theta = 4 + \tan^2\theta - 4\tan\theta$

$\Rightarrow 1 + \tan^2\theta = 4 + \tan^2\theta - 4\tan\theta$

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

123. (A) Since, $0 \le \cos^2x \le 1$

$\because -1 \le \cos^2x + \cos^2y - \cos^2z \le 2$

$\therefore$ Minimum value of the given expression is -1.

124. (D) We have, $32\cot^2\left(\frac{\pi}{4}\right) - 8\sec^2\left(\frac{\pi}{3}\right) + 8\cos^3\left(\frac{\pi}{6}\right)$

$= 32.(1) - 8.(2)^2 + 8.\left(\frac{\sqrt{3}}{2}\right)^3$

$= 32 - 8.(4) + 8.\frac{3\sqrt{3}}{8} = 32 - 32 + 3\sqrt{3} = 3\sqrt{3}$

125. (A) Since, value of $\cos\theta$ decreases, from 0° to 90° and 45° it is equal to the value of $\sin\theta$.

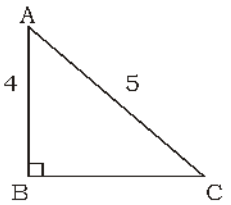
Similarly, value of $\sin\theta$ increases from 0 to 90° and at 45° it is equal to the value of $\cos\theta$.

For $0^\circ < \theta < 45^\circ$, $\cos\theta > \sin\theta$.

So, value of $\cos25^\circ - \sin25^\circ$ is always positive but less than 1.

126. (B) In ΔABC, $\cos A = \frac{4}{5}$, i.e. AB = 4 and AC = 5

$\sin C = \frac{AB}{AC} = \frac{4}{5}$



127. (C) Since, α and β are complementary angles.

$\therefore \quad \alpha = 90° - \beta$

Now, $\sqrt{\cos\alpha \operatorname{cosec}\beta - \cos\alpha \sin\beta}$

$$= \sqrt{\frac{\cos\alpha}{\sin\beta} - \cos\alpha \sin\beta}$$

$$= \sqrt{\frac{\cos\alpha}{\cos(90-\beta)} - \cos\alpha \cos(90-\beta)}$$

$$= \sqrt{\frac{\cos\alpha}{\cos\alpha} - \cos\alpha.\cos\alpha} = \sqrt{1-\cos^2\alpha}$$

$$= \sqrt{\sin^2\alpha} = \sin\alpha$$

128.(C) $\because \ 2\cot\theta = 3 \quad \Rightarrow \quad \cot\theta = \frac{3}{2}$

$$\therefore \quad \frac{2\cos\theta - \sin\theta}{2\cos\theta + \sin\theta} = \frac{2\cot\theta - 1}{2\cot\theta + 1}$$

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

129. (D) $\sin^6\theta + \cos^6\theta = (\sin^2\theta)^3 + (\cos^2\theta)^3$

$= (\sin^2\theta + \cos^2\theta)(\sin^4\theta + \cos^4\theta - \sin^2\theta\cos^2\theta)$

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

$$= (1 - 3\sin^2\theta\cos^2\theta) = 1 - 3 \times \frac{1}{4} = 1 - \frac{3}{4} = \frac{1}{4}$$

130. (D) By trigonometric identity, $\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow \quad (\sec\theta + \tan\theta).(\sec\theta - \tan\theta) = 1$

$$\Rightarrow \quad \sec\theta - \tan\theta = \frac{1}{2} \qquad \ldots\ldots\ldots\ldots \text{(i)}$$

and given $\sec\theta + \tan\theta = 2$ ..... (ii)

On adding Eqs. (i) and (ii) we get

$$\Rightarrow \quad 2\sec\theta = \frac{1}{2} + 2$$

$$\therefore \quad \sec\theta = \frac{5}{4}$$

131. (B) $\operatorname{cosec}(75° + \theta) - \sec(15° - \theta) - \tan(55° + \theta) + \cot(35° - \theta)$

$= \operatorname{cosec}(75° + \theta) - \operatorname{cosec}[90° - (15° - \theta)] - \tan(55° + \theta) + \tan[90° - (35° - \theta)]$

$= \operatorname{cosec}(75° + \theta) - \operatorname{cosec}(75° + \theta) - \tan(55° + \theta) + \tan(55° - \theta) = 0$

132. (D) $\sin\theta + 2\cos\theta = 1$

On squaring both sides, we get

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

$\Rightarrow \quad \sin^2\theta + 4\cos^2\theta + 4\sin\theta\cos\theta = 1$

$\Rightarrow \quad (1 - \cos^2\theta) + 4(1 - \sin^2\theta) + 4\sin\theta\cos\theta = 1$

$\Rightarrow \quad -(\cos^2\theta + 4\sin^2\theta + 4\sin\theta\cos\theta = 1 - 5$

$\Rightarrow \quad \cos^2\theta + 4\sin^2\theta - 4\sin\theta\cos\theta = 4$

$\Rightarrow \quad (2\sin\theta - \cos\theta)^2 = 4$

$\Rightarrow \quad 2\sin\theta - \cos\theta = 2$

133. (A) $\cos x + \sec x = 2$ ..... (i)

On squaring both sides, we get

$\cos^2 x + \sec^2 x + 2 = 4$

$\Rightarrow \quad \cos^2 x + \sec^2 x = 2$ ..... (ii)

On cubing Eq. (i) we get

$\Rightarrow \quad \cos^3 x + \sec^3 x + 3(\cos x + \sec x) = 8$

$\Rightarrow \quad \cos^3 x + \sec^3 x + 3(2) = 8$

$\Rightarrow \quad \cos^3 x + \sec^3 x = 2$ ..... (iii)

From Eq. (i), (ii) and (iii)

$\cos^n x + \sec^n x = 2$

134. (D) $\sin25°\sin35°\sec65°\sec55°$

$$= \sin25°.\sin35°.\frac{1}{\cos65°}.\frac{1}{\cos55°}$$

$$= \sin25°.\sin35°.\frac{1}{\cos(90-25°)}.\frac{1}{\cos(90-35°)}$$

$$= \sin25°.\sin35°.\frac{1}{\sin25°}.\frac{1}{\sin35°} = 1$$

135. (B) Given, $\tan8\theta = \cot2\theta$

$\Rightarrow \quad \tan8\theta = \tan(90° - 2\theta)$

$\Rightarrow \quad 8\theta = 90° - 2\theta \qquad \Rightarrow \theta = 9°$

$\therefore \quad \tan5\theta = \tan45° = 1$

136. (A) $\because \quad \sin(A + B) = 1$

$\Rightarrow \quad (A + B) = 90°$

$\therefore \quad B = 90° - A$

$\Rightarrow \quad A = 90° - B$

Now, $\cos(A - B) = \cos A\cos B + \sin A\sin B$

$= \cos(90° - B)\cos B + \sin(90° - B)\sin B$

$= \sin B\cos B + \cos B\sin B$

$= 2\sin B\cos B = \sin2B$

137. (D) Clock will make right angle at $(5n + 15) \times \frac{12}{11}$ min. past n.

Here, n = 3

$$\therefore \quad (5 \times 3 + 15) \times \frac{12}{11} \text{ min. past 3}$$

$$= 30 \times \frac{12}{11} \text{ min past.}$$

$$= 32\frac{8}{11} \text{ min past 3 i.e. 3 h } 32\frac{8}{11} \text{ min.}$$

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138. (A) Given, $0 < \theta < \frac{\pi}{4}$, then $\sqrt{1-2\sin\theta\cos\theta}$

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

$[\because \sin^2\theta + \cos^2\theta = 1]$

$= \sqrt{(\cos\theta - \sin\theta)^2}$

$\because 0 < \theta < \frac{\pi}{4}$, $\cos\theta > \sin\theta$, so we take $(\cos\theta - \sin\theta)^2$

$= \cos\theta - \sin\theta$

139. (C) Given, $\tan\theta + \cot\theta = 2$

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

$\Rightarrow \frac{1}{\sin\theta\cos\theta} = 2 \quad \Rightarrow \sin\theta\cos\theta = \frac{1}{2}$ .... (i)

Now, $(\sin\theta + \cos\theta)^2 = \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta$

$= 1 + 2 \times \frac{1}{2} = 1 + 1$ [From Eq. (i)]

$\Rightarrow (\sin\theta + \cos\theta)^2 = 2$

$\therefore \sin\theta + \cos\theta = \sqrt{2}$

140. (A) $\frac{\sec x}{\cot x + \tan x} = \frac{\frac{1}{\cos x}}{\frac{\cos x}{\sin x} + \frac{\sin x}{\cos x}}$

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

$= \frac{1}{\cos x} \times \frac{\sin x \cos x}{1} = \sin x$

141. (B) $(\sin^2 x - \cos^2 x)(1 - \sin^2 x\cos^2 x)$

$= (\sin^2 x - \cos^2 x)[(\sin^2 x + \cos^2 x)^2 - \sin^2 x\cos^2 x]$

$[\because \sin^2 x + \cos^2 x = 1]$

$= (\sin^2 x - \cos^2 x)$

$[(\sin^4 x + \cos^4 x + 2\sin^2 x\cos^2 x) - \sin^2 x\cos^2 x]$

$= (\sin^2 x - \cos^2 x)(\sin^4 x + \cos^4 x + \sin^2 x\cos^2 x)$

$= \sin^6 x + \sin^4\cos^4 x + \sin^4 x\cos^2 x - \cos^2 x \sin^4 x - \cos^6 x - \sin^2 x\cos 4x$

$= \sin^6 x - \cos^6 x$

142. (D) $(\sin x\cos y + \cos x\sin y)(\sin x\cos y - \cos x\sin y)$

$= \sin(x + y).\sin(x - y)$

$= \sin^2 x - \sin^2 y$

$[\because \sin^2 A - \sin^2 B = \sin(A + B)\sin(A - B)]$

143. (B) $(1 + \cot x - \operatorname{cosec} x)(1 + \tan x + \sec x)$

$= (1 + \cot x - \operatorname{cosec} x)\left(1 + \frac{1}{\cot x} + \sec x\right)$

$= \frac{(1 + \cot x - \operatorname{cosec} x)(1 + \cot x + \operatorname{cosec} x)}{\cot x}$

$= \frac{(1 + \cot x)^2 - (\operatorname{cosec} x)^2}{\cot x}$

$= \frac{1^2 + \cot^2 x + 2\cot x - \operatorname{cosec}^2 x}{\cot x}$

$= \frac{1 + 2\cot x - (\operatorname{cosec}^2 x - \cot^2 x)}{\cot x}$

$= \frac{1 + 2\cot x - 1}{\cot x} = 2$

144. (D) $(\operatorname{cosec} x - \sin x)(\sec x - \cos x)(\tan x + \cot x)$

$= \left(\frac{1}{\sin x} - \sin x\right)\left(\frac{1}{\cos x} - \cos x\right)\left(\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x}\right)$

$= \frac{(1 - \sin^2 x)(1 - \cos^2 x)(\sin^2 x + \cos^2 x)}{\sin x\cos x.\sin x\cos x}$

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

145. (D) We know that, $\sin 1° < \sin 1$ and $\cos 1° < \cos 1$

Hence, neither Statement I nor II is correct.

146. (A) Given, $\sin x + \operatorname{cosec} x = 2$ ..... (i)

On cubing Eq.(i) both sides, we get

$\Rightarrow (\sin^3 x + \operatorname{cosec}^3 x) + 3\sin x\operatorname{cosec} x.$

$(\sin x\operatorname{cosec} x) = 8$

$\Rightarrow \sin^3 x + \operatorname{cosec}^3 x + 3(2) = 8$

$\Rightarrow \sin^3 x + \operatorname{cosec}^3 x = 8 - 6$

$\Rightarrow \sin^3 x + \operatorname{cosec}^3 x = 2$ ..... (ii)

On cubing Eq.(ii) both sides, we get

$\Rightarrow (\sin^3 x)^3 + (\operatorname{cosec}^3 x)^3 + 3\sin^3 x\operatorname{cosec}^3 x$

$(\sin^3 x + \operatorname{cosec}^3 x) = (2)^3$

$\Rightarrow \sin^9 x + \operatorname{cosec}^9 x + 3(2) = 8$

$\Rightarrow \sin^9 x + \operatorname{cosec}^9 x = 8 - 6 = 2$

147. (B) Given, $\sin x + \cos x = p$ ..... (i)

and $\sin^3 x + \cos^3 x = q$ ..... (ii)

On cubing Eq. (i) both sides, we get

$\sin^3 x + \cos^3 x + 3\sin x\cos x(\sin x + \cos x) = p^3$

$\Rightarrow q + 3\sin x\cos x(p) = p^3$ ..... (iii)

[From Eqs. (i) and (ii)]

On squaring Eq. (i) both sides, we get

$\sin^2 x + \cos^2 x + 2\sin x\cos x = p^2$

$\Rightarrow \sin x\cos x = \frac{p^2 - 1}{2}$ $[\because \sin^2 x + \cos^2 x = 1]$

From Eq. (iii), $q + \frac{3(p^2 - 1)p}{2} = p^3$

$\Rightarrow 2q + 3p^3 - 3p = 2p^3 \quad \Rightarrow p^3 - 3p = -2q$

148. (B) Given, that $\cos A + \cos^2 A = 1$

$\Rightarrow \quad \cos A = 1 - \cos^2 A = \sin^2 A$ ..... (i)

Now, $2(\sin^2 A + \sin^4 A = 2(\sin^2 A + \cos^2 A)$ [from Eq. (i)]

$= 2.(1) = 2$ [$\because \sin^2\theta + \cos^2\theta = 1$]

149. (C) $(1 - \tan A)^2 + (1 + \tan A)^2 + (1 - \cot A)^2 + (1 + \cot A)^2$

$= 1 + \tan^2 A - 2\tan A + 1 + \tan^4 A + 2\tan A + 1 + \cot^2 A - 2\cot A + 1 + \cot^2 A + \cot A$

$= 4 + 2(\tan^2 A + \cot^2 A)$

$= (2 + 2\tan^2 A) + (2 + 2\cot^2 A) = 2\sec^2 A + 2\operatorname{cosec}^2 A$

$$= 2\left(\frac{1}{\cos^2 A} + \frac{1}{\sin^2 A}\right) = 2\left(\frac{\sin^2 A + \cos^2 A}{\sin^2 A.\cos^2 A}\right)$$

$$= \frac{2.(1)}{\sin^2 A.\cos^2 A} = 2\sec^2 A.\operatorname{cosec}^2 A$$

150. (B) Now, $\cos(A + B) = \cos(30° + 60°) = \cos 90° = 0$

$$A = \frac{360°}{12} \times 1 = 30°, \quad B = \frac{360°}{12} \times 2 = 60°,$$

$$C = \frac{360°}{12} \times 4 = 120°, \quad D = \frac{360°}{12} \times 5 = 150°$$

151. (B) Now, $\operatorname{cosec}(C - D + B)$

$= \operatorname{cosec}(120° - 150° + 60°)$

$= \operatorname{cosec}(180° - 150°) = \operatorname{cosec} 30° = 2$

152. (D) If ABCD is a cyclic quadrilateral, then sum of opposite angles should be 180° but here

$30° + 120° = 150° \neq 180°$

and $60° + 150° = 210° \neq 180°$

So, statement I is incorrect.

Now, $\sin(B - A) = \sin(60° - 30°) = \sin 30° = \frac{1}{2}$

$\cos(D - C) = \cos(150° - 120°) = \cos 30° = \frac{\sqrt{3}}{2}$

$\Rightarrow \quad \sin(B - A) \neq \cos(D - C)$

So, Statement II is also incorrect.

153. (C) $\sec^2 D - \tan^2 D = \sec^2(150°) - \tan^2(150°)$

$= \sec^2(90° + 60°) - \tan^2(90° + 60°)$

$= \operatorname{cosec}^2 60° - \cot^2 60°$

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

154. (C) $$\frac{\tan A - \sin A}{\sin^3 A} = \frac{\frac{\sin A}{\cos A} - \sin A}{\sin^3 A}$$

$$= \frac{(1 - \cos A)}{\cos A \cdot \sin^2 A} \times \frac{(1 + \cos A)}{(1 + \cos A)}$$

$$= \frac{(1 - \cos^2 A)}{\cos A \cdot \sin^2 A(1 + \cos A)}$$

$$= \frac{1}{\cos A} \cdot \frac{1}{1 + \cos A} = \frac{\sec A}{1 + \cos A}$$

155. (B) Let $f(\theta) = \sin\theta + \cos\theta$

Maximum and minimum value of a $\cos\theta + b\sin\theta$ is

$-\sqrt{a^2 + b^2} \leq a\cos\theta + b\sin\theta \leq \sqrt{a^2 + b^2}$

$\therefore \quad -\sqrt{1+1} \leq \cos\theta + \sin\theta \leq \sqrt{1+1}$

$\Rightarrow \quad -\sqrt{2} \leq \cos\theta + \sin\theta \leq \sqrt{2}$

$\Rightarrow \quad -1.414 \leq \cos\theta + \sin\theta \leq 1.414$

$\therefore \quad f(\theta) = (\sin\theta + \cos\theta) \in [-1.414, 1.414]$

and let $g(\theta) = \tan\theta + \cot\theta$

$$= \tan\theta + \frac{1}{\tan\theta} \qquad [\because AM \geq GM]$$

$$\Rightarrow \quad \frac{\tan\theta + \frac{1}{\tan\theta}}{2} \geq \left(\tan\theta.\frac{1}{\tan\theta}\right)^{\frac{1}{2}}$$

$\Rightarrow \quad (\tan\theta + \cot\theta) \geq 2$

So, $(\tan\theta + \cot\theta)$ is always greater than 1.

Hence, statement I is false and Statement II is true.

156. (C) Given that,

$\sin A = \frac{3}{5}$ [A is acute i.e. $0 \leq A < 90°$]

Then, $\cos A = \sqrt{1 - \sin^2 A}$

$= \sqrt{1 - (3/5)^2} = \sqrt{1 - 9/25}$

$= \sqrt{16/25} = 4/5$

$$\therefore \quad \tan A + \sec A = \frac{\sin A}{\cos A} + \frac{1}{\cos A} = \frac{1 + \sin A}{\cos A}$$

$$= \frac{1 + 3/5}{4/5} = \frac{8/5}{4/5} = \frac{8}{4} = 2$$

157. (B) Given that, $\sin\theta = \frac{x^2 - y^2}{x^2 + y^2}$

$$\because \quad \cos^2\theta = 1 - \sin^2\theta = 1 - \left(\frac{x^2 - y^2}{x^2 + y^2}\right)^2$$

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

$$= \frac{2x^2.2y^2}{(x^2 + y^2)^2} = \frac{4x^2y^2}{(x^2 + y^2)^2} = \left(\frac{2xy}{x^2 + y^2}\right)^2$$

$$\therefore \quad \cos\theta = \frac{2xy}{x^2 + y^2}$$

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158. (D) Given that a^2

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

$$\Rightarrow a^2 = \frac{(\sin^2\theta+\cos^2\theta)+2\sin\theta\cos\theta}{(\sin^2\theta+\cos^2\theta)-2\sin\theta\cos\theta}$$

$$\Rightarrow a^2 = \frac{(\sin\theta+\cos\theta)^2}{(\sin\theta-\cos\theta)^2}$$

$$\Rightarrow \frac{a}{1} = \frac{\sin\theta+\cos\theta}{\sin\theta-\cos\theta}$$

$$\Rightarrow \frac{a+1}{a-1} = \frac{(\sin\theta+\cos\theta)+(\sin\theta-\cos\theta)}{(\sin\theta+\cos\theta)-(\sin\theta-\cos\theta)}$$

[applying componedo and dividendo formula]

$$\Rightarrow \frac{a+1}{a-1} = \frac{2\sin\theta}{2\cos\theta} = \tan\theta$$

159. (C) $\because$ $5\sin\theta + 12\cos\theta = 13$

On squaring both sides, we get

$25\sin^2\theta + 144\cos^2\theta + 120\sin\theta\cos\theta = 169$

$\Rightarrow$ $25(1 - \cos^2\theta) + 144(1 - \sin^2\theta) + 120\sin\theta\cos\theta = 169$

$\Rightarrow$ $25 - 25\cos^2\theta + 144 - 144\sin^2\theta + 120\sin\theta\cos\theta = 169$

$\Rightarrow$ $25\cos^2\theta + 144\sin^2\theta - 120\sin\theta\cos\theta = 169 - 169$

$\Rightarrow$ $(5\cos\theta - 12\sin\theta)^2 = 0$

$\therefore$ $5\cos\theta - 12\sin\theta = 0$

160. (D) $\dfrac{4\sin\theta-\cos\theta}{4\sin\theta+9\cos\theta}$

On dividing both numerator and denominator by $\cos\theta$, we get

$$= \frac{\frac{4\sin\theta}{\cos\theta}-\frac{\cos\theta}{\cos\theta}}{\frac{4\sin\theta}{\cos\theta}+\frac{9\cos\theta}{\cos\theta}} = \frac{4\tan\theta-1}{4\tan\theta+9}$$

$$= \frac{3-1}{3+9} = \frac{2}{12} = \frac{1}{6}$$

161. (C) $\because$ $\sin\theta - \cos\theta = 0$

$\therefore$ $\sin\theta = \cos\theta$

Since, $\sin\theta$ and $\cos\theta$ are equal for $\theta = 45°$

$\therefore$ $\sin^4\theta + \cos^4\theta = (\sin45°)^4 + (\cos45°)^4$

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

$$\Rightarrow \frac{1+1}{4} = \frac{2}{4} = \frac{1}{2}$$

162. (A) Only statement I is correct as $\tan\theta$ increases faster than $\sin\theta$ as θ increases while Statement II is wrong as the value of $\sin\theta + \cos\theta$ is not always greater than I. It may also be equal to 1.

163. (A) $\dfrac{(\sin\theta+\cos\theta)(\tan\theta+\cot\theta)}{\sec\theta+\operatorname{cosec}\theta}$

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

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

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

164. (C) $\dfrac{\cos^2(45°+\theta)-\cos^2(45°-\theta)}{\tan(60°+\theta)\tan(30°+\theta)}$

$$= \frac{\frac{\cos(90°+2\theta)+1}{2} + \frac{\cos(90°-2\theta)+1}{2}}{\tan(60°+\theta)\tan[90°(60°+\theta)]}$$

[$\because$ $\cos2\theta = 2\cos^2\theta - 1$]

$$= \frac{\cos(90°+2\theta)+1+\cos(90°-2\theta)+1}{\frac{2}{\tan(60°+\theta)\cot(60°+\theta)}}$$

$$= \frac{\frac{-\sin2\theta+1+\sin2\theta+1}{2}}{1} = \frac{2}{2} = 1$$

165. (B) $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta$

$= (\sin^2\theta)^3 + (\cos^2\theta)^3 + 3\sin^2\theta\cos^2\theta\,(\sin^2\theta + \cos^2\theta)$

[$\because$ $(a+b)^3 = a^3 + b^3 + 3ab(a+b)$]

$= (\sin^2\theta + \cos^2\theta)^3 = (1)^3 = 1$ [$\because$ $\sin^2\theta + \cos^2\theta = 1$]

166. (A) $\dfrac{(1+\sec\theta-\tan\theta)\cos\theta}{(1+\sec\theta+\tan\theta)(1-\sin\theta)}$

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

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

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

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

$[\because 1 - \sin^2\theta = \cos^2\theta]$

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

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

167. (A) $\sin\theta + \cos\theta = \sqrt{3}$

On squaring both sides, we get

$(\sin\theta + \cos\theta)^2 = (\sqrt{3})^2$

$\Rightarrow \quad \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3$

$\Rightarrow \quad 1 + 2\sin\theta\cos\theta = 3$

$$\Rightarrow \quad \sin\theta\cos\theta = \frac{3-1}{2} = \frac{2}{2} = 1 \qquad \text{..... (i)}$$

$$\text{Now, } \tan\theta + \cot\theta = \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}$$

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

$$\text{From Eq. (i) } \tan\theta + \cot\theta = \frac{1}{1} = 1$$

168. (B) $\tan\theta + \sec\theta = m \quad \Rightarrow \quad \sec\theta = m - \tan\theta$

On squaring both sides, we get

$(\sec\theta)^2 = (m - \tan\theta)^2$

$\Rightarrow \quad \sec^2\theta = m^2 + \tan^2\theta - 2m\tan\theta$

$\Rightarrow \quad \sec^2\theta - \tan^2\theta = m^2 - 2m\tan\theta$

$\Rightarrow \quad 1 = m^2 - 2m\tan\theta \quad [\because \sec^2\theta - \tan^2\theta = 1]$

$$\Rightarrow \quad \tan\theta = \frac{m^2 - 1}{2m}$$

On putting the value of $\tan\theta$ in initial equation, we get

$$\Rightarrow \quad \frac{m^2 - 1}{2m} + \sec\theta = m$$

$$\Rightarrow \quad \sec\theta = m - \frac{m^2 - 1}{2m}$$

$$\therefore \quad \sec\theta = \frac{2m^2 - m^2 + 1}{2m} = \frac{m^2 + 1}{2m}$$

169. (A) $\text{cosesc}(75° + \theta) - \sec(15° - \theta)$

$= \text{cosesc}(75° + \theta) - \sec[90° - (75° + \theta)]$

$= \text{cosesc}(75° + \theta) - \text{cosec}(75° + \theta) = 0$

170. (C) In ΔABC, if $\angle C$ is 90°, then

$\angle A + \angle B = 180° - 90° = 90°$

Now, $\cos(A + B) + \sin(A + B)$

$= \cos 90° + \sin 90° = 0 + 1 = 1$

171. (C) $\because \sin\alpha = \frac{\sqrt{3}}{2} \quad \Rightarrow \alpha = 60° \quad \left[\because \sin 60° = \frac{\sqrt{3}}{2}\right]$

$$\text{Now, } \cos\beta = \frac{\sqrt{3}}{2} \Rightarrow \beta = 30° \left[\because \cos 30° = \frac{\sqrt{3}}{2}\right]$$

and $\tan\gamma = 1 \quad \Rightarrow \gamma = 45° \quad [\because \tan 45° = 1]$

$\therefore \quad \alpha + \beta + \gamma = 60° + 30° + 45° = 135°$

172. (A) We know that, $\sin^2\theta + \cos^2\theta = 1$ is true

I. $\sin^2 1° + \cos^2 1° = 1$ which is also true.

II. $\sec^2 33° - \cot^2 57° = \text{cosec}^2 37° - \tan^2 53°$

Now, $\sec^2(90° - 57°) = \text{cosec}^2 57°$

and $\cot^2 57° = \cot^2(90 - 33°) = \tan^2 33°$

$\therefore \sec^2 33° - \cot^2 57° = \text{cosec}^2 57° - \tan^2 33°$

Hence, Statement II is not true.

173. (C) Given, $p = a\sin x + b\cos x$

and $q = a\cos x - b\sin x$

$\Rightarrow \quad p^2 = a^2\sin^2 x + b^2\cos^2 x + 2ab\sin x\cos x$

and $q^2 = a^2\cos^2 x + b^2\sin^2 x - 2ab\sin x\cos x$

$\therefore \quad p^2 + q^2 = a^2(\sin^2 x + \cos^2 x) + b^2(\cos^2 x + \sin^2 x)$

$= a^2 + b^2$

174. (C) Given that, $\sin^2 x + \cos^2 x - 1 = 0$

$\Rightarrow \quad \sin^2 x + \cos^2 x = 1$

Which is an identity of trigonometric ratio and always true for every real value of x.

So, the equation have an infinite solution.

175. (A) I. We know that,

$$\text{Radius} = \frac{\text{Arc}}{\text{Angle}} \quad \text{[given arc length is constant]}$$

$$\text{Radius} \propto \frac{1}{\text{Angle}}$$

So, angular measure in radian decreases, if the radius of the arc increases.

II. $\quad 1800° \times \frac{\pi}{180°} = 10\pi$

Hence, only statement I is correct.

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176. (B) I. Given that $\sin x + \cos x = 2$

$\Rightarrow (\sin x + \cos x)^2 = 4$

$\Rightarrow (\sin^2 x + \cos^2 x) + 2\sin x\cos x = 4$

$\Rightarrow 1 + \sin 2x = 4$

$\Rightarrow \sin 2x = 3 \quad \Rightarrow \sin 2x \neq 3$

Hence, there is no value of x in the first quadrant that satisfies.

$\sin x + \cos x = 2$

II. $\sin x - \cos x = 0 \quad \Rightarrow \tan x = 1 = \frac{\pi}{4}$

$\Rightarrow x = \frac{\pi}{4}$

Also, there is only value of x in the first quadrant that satisfies $\sin x - \cos x = 0$

177. (C)

178. (C) I. $\frac{\cot 30° + 1}{\cot 30° - 1} = 2(\cos 30° + 1)$

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

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

$\Rightarrow \frac{3+1+2\sqrt{3}}{3-1} = \sqrt{3}+2 \quad \Rightarrow \frac{4+2\sqrt{3}}{2} = \sqrt{3}+2$

$\Rightarrow \frac{2\left(2+\sqrt{3}\right)}{2} = \sqrt{3}+2 \quad \Rightarrow \sqrt{3}+2 = \sqrt{3}+2$

$\Rightarrow 1 - 1 = 0$

Hence, both statement are true.

179. (C) Given that, $3\sin x + 5\cos x = 5$

On squaring both sides, we get

$9\sin^2 x + 25\cos^2 x + 30\sin x\cos x = 25$

$\Rightarrow 9(1 - \cos^2 x) + 25(1 - \sin^2 x) + 30\sin x\cos x = 25$

$\Rightarrow 9 + 25 - \{9\cos^2 x + 25\sin^2 x - 30\sin x\cos x\} = 25$

$\Rightarrow 9 = (3\cos x - 5\sin x)^2$

$\Rightarrow 3\cos x - 5\sin x = 3$

180. (B) Given that, $\tan\theta = \frac{3}{4}$ and $0° < \theta° < 90°$ [acute]

$\because 1 + \tan^2\theta = \sec^2\theta$

$\Rightarrow \sec^2\theta = 1 + \left(\frac{3}{4}\right)^2 = 1 + \frac{9}{16} = \frac{25}{16}$

$\Rightarrow \sec\theta = \frac{5}{4} \quad \Rightarrow \cos\theta = \frac{5}{4}$ [since θ is acute]

$\because \sin^2\theta = 1 - \cos^2\theta = 1 - \left(\frac{4}{5}\right)^2$

$= 1 - \frac{16}{25} = \frac{9}{25}$

$\therefore \sin\theta = \frac{3}{5}$ [since, θ is acute]

181. (C) Given, $\sec(90° - \theta).\sin\theta\sec 45°$

$= \operatorname{cosec}\theta\sin\theta\sec 45° = \frac{1}{\sin\theta}.\sin\theta(\sqrt{2}) = \sqrt{2}$

182. (C) Given that, $p° = q^c$

$\Rightarrow \left(p\frac{\pi}{180}\right)^c = q^c \quad [\because 180° = \pi^c]$

$\Rightarrow (p\pi)^c = (q180)^c$

$\therefore p\pi = q180$

183. (D) Given that, θ lies in first quadrant and $\tan\theta = 3$

$\therefore \tan^2\theta = 9 \quad \Rightarrow 1 + \tan^2\theta = 10$

$\Rightarrow \sec^2\theta = 10 \quad \Rightarrow \sec\theta = \sqrt{10}$

$\Rightarrow \cos\theta = \frac{1}{\sqrt{10}}$ ..... (i)

$\because \sin^2\theta = 1 - \cos^2\theta = 1 - \frac{1}{10} = \frac{9}{10}$

184. (D) If $0° < \theta° < 90°$, then all the trigonometric ratios can be obtained when any one of the six ratios is given.

We use any of the following identity to get any trigonometric ratios

$\sin^2\theta + \cos^2\theta = 1$,

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

$\Rightarrow \sin\theta = \frac{3}{\sqrt{10}}$ ..... (ii)

On adding Eqs. (i) and (ii), we get

$\sin\theta + \cos\theta = \frac{3}{\sqrt{10}} + \frac{1}{\sqrt{10}} = \frac{4}{\sqrt{10}}$

[since, θ lies in first quadrant]

185. (D) $\sin A\cos A\tan A + \cos A\sin A\cot A$

$\Rightarrow \sin A \cdot \cos A \cdot \left(\frac{\sin A}{\cos A} + \frac{\cos A}{\sin A}\right)$

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

$[\because \sin^2\theta + \sin^2\theta = 1]$

$= \operatorname{cosec}^2 A - \cot^2 A$

$[\because 1 + \cot^2\theta + \operatorname{cosec}^2\theta]$

186. (A) Let $f(\theta) = \frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta}$

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

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

$$= \frac{2}{\sin\theta} = 2\text{cosec}\theta$$

187. (B) Given that, $\sin\theta.\cos\theta = \frac{\sqrt{3}}{4}$ ..... (i)

$\therefore$ $\sin^4\theta + \cos^4\theta = (\sin^2\theta + \cos^2\theta)^2 - 2\sin^2\theta\cos^2\theta$
$= (1)^2 - 2(\sin\theta.\cos\theta)^2$

$$= 1 - 2\left(\frac{\sqrt{3}}{4}\right)^2 = 1 - 2.\frac{3}{16} = 1 - \frac{3}{8} = \frac{5}{8}$$

188. (C) $\cot15°\cot20°\cot70°\cot75°$
$= \tan(90° - 15°)\tan(90° - 20°)\cot70°\cot75°$
$= \tan75°\tan70°\cot70°\cot75°$

$$= \tan75°\tan70°\ \frac{1}{\tan70°}.\frac{1}{\tan75°} = 1$$

189. (B) Given, $\sin3\theta = \cos(\theta - 2°)$

$\Rightarrow$ $\sin3\theta = \sin[90° - (\theta - 2°)]$

$\Rightarrow$ $3\theta = 90° - \theta + 2°$

$\Rightarrow$ $4\theta = 92°$

$\Rightarrow$ $\theta = \frac{92°}{4} = 23°$

190. (B) $\frac{\sin^6\theta - \cos^6\theta}{\sin^2\theta - \cos^2\theta} = \frac{(\sin^2\theta)^3 - (\cos^2\theta)^3}{\sin^2\theta - \cos^2\theta}$

$$= \frac{(\sin^2\theta - \cos^2\theta)\left(\sin^4\theta + \cos^4\theta + \sin^2\theta\cos^2\theta\right)}{\sin^2\theta - \cos^2\theta}$$

$= \sin^4\theta + \cos^4\theta + 2\sin^2\theta\cos\theta^2 - 2\sin^2\theta\cos\theta^2$
$= (\sin^2\theta + \cos^2\theta)^2 - \sin^2\theta\cos\theta^2 = 1 - \sin^2\theta\cos\theta^2$

191. (C) $\tan^2\theta - \sin^2\theta = \frac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta,\ \theta \neq (2n+1)\frac{\pi}{2}$

$$= \frac{\sin^2\theta(1 - \cos^2\theta)}{\cos^2\theta}, \qquad \theta \neq (2n+1)\frac{\pi}{2}$$

$$= \frac{\sin^2\theta}{\cos^2\theta}.\sin^2\theta, \qquad \theta \neq (2n+1)\frac{\pi}{2}$$

$$= \tan^2\theta.\sin^2\theta, \qquad \theta \neq (2n+1)\frac{\pi}{2}$$

192. (C) $\because \tan A = \frac{1 - \cos B}{\sin B}$

$$\therefore \frac{2\tan A}{1 - \tan^2 A} = \frac{2 \times \frac{1 - \cos B}{\sin B}}{1 - \left(\frac{1 - \cos B}{\sin B}\right)^2}$$

$$= \frac{2(1 - \cos B)}{\sin B} \times \frac{\sin^2 B}{\sin^2 B - (1 - \cos B)^2}$$

$$= \frac{2\sin B(1 - \cos B)}{\sin^2 B - (1 - \cos B)^2}$$

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

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

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

$$= \frac{2\sin B(1 - \cos B)}{2\cos B(1 - \cos B)} = \tan B$$

193. (A)

194. (B) Given, $\alpha + \beta = 90°$ ..... (i)

$$\therefore \sqrt{(\text{cosec}\alpha \cdot \text{cosec}\beta)}\left(\frac{\sin\alpha}{\sin\beta} + \frac{\cos\alpha}{\cos\beta}\right)^{\frac{1}{2}}$$

$$= \frac{1}{(\sin\alpha \cdot \sin\beta)^{\frac{1}{2}}}\left(\frac{\sin\alpha \cdot \cos\beta + \cos\alpha \cdot \sin\beta}{\sin\beta\cos\beta}\right)^{\frac{1}{2}}$$

$$= \frac{1}{(\sin\alpha \cdot \sin\beta)^{\frac{1}{2}}}\left(\frac{\sin 90°}{\cos(90° - \alpha)\sin\beta}\right)^{\frac{1}{2}}$$

[from Eq,(i)]

$$= \frac{1}{(\sin\alpha \cdot \sin\beta)^{\frac{1}{2}}} \times (\sin\alpha \cdot \sin\beta)^{\frac{1}{2}} = 1$$

195. (D) We know that, in a cyclic quadrilateral sum of opposite angles is 180°.

$\therefore$ $A + C = 180°$ ..... (i)

and $B + D = 180°$ .....(ii)

$\therefore$ $\cos A + \cos B + \cos C + \cos D$
$= \cos A + \cos B + \cos(180° - A) + \cos(180° - B)$
$= \cos A + \cos B - \cos A - \cos B = 0$

[from Eq. (i) and (ii)]

196. (B) We know that, π radian = 180°

$$1 \text{ radian} = \frac{180°}{\pi} = \frac{180°}{22} \times 7°$$

$$= \frac{630°}{11} = 57\frac{3°}{11} = 57° + \frac{3 \times 60}{11} \text{ min.}$$

$$= 57° + 16' + \frac{4}{11} \text{ min} = 57° + 16' + \frac{4}{11} \times 60\text{s}$$

$= 57° + 16' + 21.8'' = 57°16'21.8'' = 57°16'22''$

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197. (A) Given, $\alpha + \beta = 90°$ .... (i)

By given condition

$$\beta = \frac{2}{3}\alpha$$

$$\therefore \quad \beta = \frac{2}{3}\alpha = \frac{2}{3}(90° - \beta) \quad \text{[From Eq. (i)]}$$

$$\Rightarrow \quad \beta = 60° - \frac{2}{3}\beta = \quad \Rightarrow \quad \beta = 36°$$

198. (B) Given, $\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = 2$

$\therefore \quad \sin^2\theta + \cos^2\theta = 2\sin\theta\cos\theta$

$\Rightarrow \quad \sin2\theta = 1 = \sin90° \quad \Rightarrow 2\theta = 90°$

$\Rightarrow \quad \theta = 45°$

199. (C) Given, $A = \frac{\pi}{6}$ and $B = \frac{\pi}{3}$

I. $\text{LHS} = \sin A + \sin B = \sin\frac{\pi}{6} + \sin\frac{\pi}{3}$

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

$$\text{RHS} = \cos A + \cos B = \cos\frac{\pi}{6} + \frac{\cos\pi}{3}$$

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

$\Rightarrow \quad \sin A + \sin B = \cos A + \cos B$

II. $\text{LHS} = \tan A + \tan B = \tan\frac{\pi}{6} + \tan\frac{\pi}{3}$

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

$$\text{RHS} = \cot A + \cot B = \cot\frac{\pi}{6} + \cot\frac{\pi}{3}$$

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

$\Rightarrow \quad \tan A + \tan B = \cot A + \cot B$

Hence, both statments are true.

200. (A) $\because$ In 24h, Earth rotate about its own = 360°

In 1 h, Earth rotate about its own axis

$$= \frac{360°}{24} = 15°$$

In 4 h, Earth rotate about its own axis

$= 15° \times 4 = 60°$

Since, in 60 min, Earth rotate its own axis = 15°

In, 12 min, Earth rotate about its own axis

$$= \frac{15° \times 12°}{60°} = 3°$$

$\therefore$ In 4h 12 min, Earth rotate about its own axis= 60° + 3° = 63°

201. (D) We know that the value of cosθ is decreasing from 0 to 90°.

$\therefore \quad \cos1° > \cos89° \quad \Rightarrow \quad p > q$

Also, cos1° is close to 1 and cos89° is close to 0.

202. (A) It is true for $0° < \theta < 90°$, there exists only one θ such that $\sin\theta = a$.

203. (D) Put $\theta = 60°$

$$\tan60° = \sqrt{3}$$

(

204. (B) $[(1 - \sin^2\theta)\sec^2\theta + \tan^2\theta](\cos^2\theta + 1)$

$= [\cos^2\theta.\sec^2\theta + \tan^2\theta](\cos^2\theta + 1)$

$= (1 + \tan^2\theta)(\cos^2\theta + 1)$

$= \sec^2\theta.(\cos^2\theta + 1) \quad [\because \quad \sec^2\theta - \tan^2\theta = 1]$

$= \sec^2\theta.\cos^2\theta + \sec^2\theta$

$= 1 + \sec^2\theta > 1 + 1 > 2$

$[\because \sec^2\theta > 1 \text{ for } 0 < \theta < 90°]$

205. (D) We know in the interval $\theta \in \left[0, \frac{\pi}{2}\right]$, $\sec^2\theta$ is increasing from 1 to ∞.

$\therefore \quad p \geq 1$

206. (A)

207. (A) Given, $\cos\theta + \sqrt{3}\sin\theta = 2$

$$\Rightarrow \quad \frac{1}{2}\cos\theta + \frac{\sqrt{3}}{2}\sin\theta = 1$$

$\Rightarrow \quad \sin30°\cos\theta + \cos30°\sin\theta = 1$

$\Rightarrow \quad \sin(30° + \theta) = \sin90°$

$\Rightarrow \quad 30° + \theta = 90°$

$\therefore \quad \theta = 60°$

$$\Rightarrow \quad \theta = \frac{\pi}{3}$$

208. (D)

209. (B)

210. (B) $\sin^2 15° + \sin^2 20° + \sin^2 25° + \ldots\ldots + \sin^2 75°$

$= \sin^2(90° - 75°) + \sin^2(90° - 70°) + \ldots.. + \sin^2(90° - 15°)$

$= \cos^2 75° + \cos^2 70° + \ldots.. + \cos^2 15°$

211. (A) Given, $\sin\alpha = \sqrt{\frac{x-1}{2x}}$

In ΔABC, using pythgoras theoram

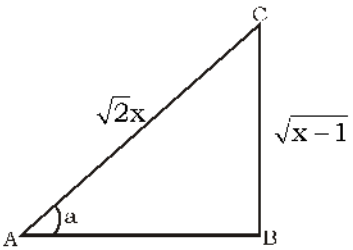
$AC^2 = AB^2 + BC^2$

212. (A) We know that, if value of $\cos\theta$ increases, then the value of θ decreases.

$\because \quad \cos\theta \geq \frac{1}{2}$

$\therefore \quad \cos\theta \geq \cos\frac{\pi}{3}$

$\Rightarrow \quad \theta \leq \frac{\pi}{3}$



$\Rightarrow 2x = AB^2 + (x - 1)$

$\Rightarrow AB^2 = x + 1 \Rightarrow AB = \sqrt{x+1}$

$\therefore \tan\alpha = \frac{BC}{AB} = \frac{\sqrt{x-1}}{\sqrt{x+1}}$

213. (B) $\because \quad \cos90° = 0$

$\therefore \quad \cos1°\cos2°\cos3° \ldots\ldots \cos90° = 0$

214. (B) Given, $\sin\theta + \cos\theta = 1$

On squaring both sides, we get

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

$\Rightarrow \quad 1 + 2\sin\theta\cos\theta = 1$

$\Rightarrow \quad 2\sin\theta\cos\theta = 0$

$\Rightarrow \quad \sin\theta\cos\theta = 0$

215. (B) $\sqrt{\frac{1+\sin\theta}{1-\sin\theta}}$

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

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

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

$= \frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = \sec\theta + \tan\theta$

216. (B) $\because \quad \cos\theta = \frac{a^2 + b^2 - c^2}{2ab}$ [by cosing rule]

$= \frac{6^2 + 2^2 - c^2}{2 \times 6 \times 2} = \frac{40 - c^2}{24}$

for acute angle, $\cos\theta > 0$

$\Rightarrow \quad \frac{40 - c^2}{24} > 0 \quad \Rightarrow \quad c^2 < 40$

$\Rightarrow \quad 0 < c < 2\sqrt{10}$ ..... (i)

[since, c cannot be negative]

Also, $b + c > a$

$c > 6 - 2$

$\Rightarrow \quad c > 4$ ..... (ii)

From Eqs. (i) and (ii), $c \in (4, 2\sqrt{10})$

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CDS I & II (2015-2021)

HEIGHT & DISTANCE

(Previous Year Questions)

1. A pole on the ground leans at 60° with the vertical. At a point x metre away from the base of the pole on the ground, two halves of the pole subtend the same angle. If the pole and the point are in the same vertical plane, then what is the length of the pole ?

जमीन पर एक खंभा ऊर्ध्वाधर रेखा के साथ 60° के कोण पर झुका हुआ है। जमीन पर खंभे के आधार से x मीटर की दूरी पर स्थित एक बिन्दु पर खंभे के दो हिस्से समान कोण अंतरित (सबटेंड) करते हैं। यदि खंभा और बिन्दु दोनों एक ही ऊर्ध्वाधर समतल में हैं, तो खंभे की लम्बाई क्या है ? **(CDS-2021)**

(A) $\sqrt{2}$ x metre/ मीटर (B) $\sqrt{3}$ x metre/ मीटर

(C) 2x metre/ मीटर (D) $2\sqrt{2}$ x metre/ मीटर

2. A vertical tower standing at the corner of a rectangular field subtends angles of 60° and 45° at the two nearer corners. If θ is the angle that the tower subtends at the farthest corver, then what is cotθ equal to ?

एक आयताकार खेत के कोने पर एक ऊर्ध्वाधर टॉवर इसके निकटतम दो कोनों पर 60° और 45° के कोण अंतरित (सबटेंड) करता है। यदि टॉवर सबसे दूर वाले कोने पर θ का कोण अंतरित करता है, तो cotθ किसके बराबर होगा ? **(CDS-2021)**

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

3. If a tree height 15 m is broken by wind in such a way that its top touches the ground and makes an angle 30° with the ground. height from the ground to the point where tree is broken?

15 m ऊँचा एक वृक्ष हवा चलने से इस प्रकार टूटता है कि उसका शीर्ष भूमि (तल) को छूता है और तल के साथ 30° का कोण बनाता है। तल से उस बिन्दु की ऊँचाई कितनी है, जहाँ से वृक्ष टूटा है ? ***(CDS 2020(I))***

(A) 10m (B) 7m

(C) 5m (D) 3m

4. The angles of elevation of the top of a tower from two points at distances p and q from the base and on the same straight line are 27° and 63° respectively. What is the height of the tower?

एक मीनार के तल से p और q की दूरी पर और एक ही सरल रेखा में स्थित दो बिन्दुओं से मीनार के शीर्ष के उन्नयन कोण क्रमशः 27° और 63° हैं। मीनार की ऊँचाई क्या है ? ***(CDS 2020(I))***

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

5. On a plane area there are two vertical towers separated by 100 feet apart. The shorter tower is 40 feet tall. A pole of length 6 feet stands on the line joining the base of two towers so that the tip of the towers and tip of the pole are also on the same line. If the distance of the pole from the shorter tower is 75 feet, then what is the height of the taller tower (approximately)?

एक विमान क्षेत्र में 100 फीट की दूरी पर दो ऊर्ध्वाधर टॉवर हैं। इनमें से छोटा टॉवर 40 फीट लम्बा है। वहीं, 6 फीट लम्बा एक खम्भा दो टॉवरों के आधार को मिलाने वाली लाइन पर खड़ा होता है ताकि टॉवरों के शीर्ष और पोल का शीर्ष भी एक ही लाइन पर हो। यदि छोटे टॉवर से खम्भे की दूरी 75 फीट है, तो लम्बे टॉवर (लगभग) की ऊँचाई कितनी है ?

(A) 80 feet (B) 110 feet

(C) 85 feet (D) 140 feet

6. A ladder is resting against a vertical wall and its bottom is 2.5 m away from the wall. If it slips 0.8 m down the wall, then its bottom will move away from the wall by 1.4 m. What is the length of the ladder ?

एक सीढ़ी एक ऊर्ध्वाधर दीवार के सहारे खड़ी हुई है और इसका तला दीवार से 2.5 मी. दूर हैं। यदि यह दीवार पर 0.8 मी. नीचे की ओर सरक जाती हैं, तो इसका तला दीवार से 1.4 मी. और अधिक दूर हो जाता हैं। सीढ़ी की लम्बाई कितनी हैं ? **[CDS 2019-I]**

(A) 6.2 m (B) 6.5 m

(C) 6.8 m (D) 7.5 m

7. Consider a regular hexagon ABCDEF. Two towers are situated at B and C. The angle of elevation from A to the top of the tower at B is 30°, and the angle of elevation to the top of the tower at C is 45°.What is the ratio of the height of towers at B and C?

एक समषट्भुज ABCDEF पर विचार कीजिए। B और C पर दो टॉवर स्थित हैं। A से, B पर स्थित टॉवर के शीर्ष का उन्नयन कोण 30° हैं, और C पर स्थित टॉवर के शीर्ष का उन्नयन कोण 45° हैं। B और C पर स्थित टॉवरों की ऊँचाइयों के अनुपात क्या हैं ?

[CDS 2019-I]

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

(C) 1 : 2 (D) $1:2\sqrt{3}$

8. There are two parallel streets each directed north to south. A person in the first street travelling from south to north wishes to take the second street which is on his right side. At some place, he makes a 150° turn to the right and he travels for 15 minutes at the speed of 20 km/hr. After that he takes a left turn of 60° and travels for 20 minutes at the speed of 30 km/hr in order to meet the second street. What is the distance between the two streets?

दो समांतर गलियाँ हैं, प्रत्येक गली उत्तर से दक्षिण की ओर दिष्ट हैं। पहली गली में दक्षिण से उत्तर की ओर जाता हुआ एक व्यक्ति दूसरी गली में जाना चाहता हैं जो उसके दायीं ओर हैं। किसी जगह पर वह दायी ओर 150° मुड़ता हैं और 15 मिनट तक 20 किमी/घं. की गति से चलता हैं। उसके बाद वह 60° बायीं ओर मुड़ता हैं और 20 मिनट तक 30 किमी/घं. की गति से चलकर दूसरी गली में पहुँच जाता हैं। दोनों गलियों के बीच की दूरी कितनी हैं ? **[CDS 2019-I]**

(A) 7.5 km (B) 10.5 km

(C) 12.5 km (D) 15 km

9. A plane is going in circles around an airport. The plane takes 3 minutes to complete one round. The angle of elevation of the plane from a point P on the ground at time t seconds is equal to that at time (t + 30) seconds. At time (t + x) seconds, the plane flies vertically above the point P. What is x equal to ?

एक विमान एक हवाई पतन के चारों ओर वृत्ताकार चक्कर लगा रहा हैं। एक चक्कर पूरा करने में विमान 3 मिनट लेता हैं। भूमि पर बिन्दु P से समय t सेकण्ड पर और समय (t + 30) सेकण्ड पर विमान के उन्नयन कोण बराबर हैं। समय (t + x) सेकण्ड पर, विमान बिन्दु P के ऊर्ध्वाधर उड़ता हैं। x किसके बराबर हैं ? **[CDS 2019-I]**

(A) 75 seconds (B) 90 seconds

(C) 105 seconds (D) 135 seconds

10. The angles of elevation of the tops of two pillars of heights h and 2h from a point P on the line joining the feet of the two pillars are complementary. If the distances of the foot of the pillars from the point P are x and y respectively, then which one of the following is correct ?

h और 2h ऊँचाई वाले दो खम्भों के आधारों (अधोभाग) को मिलाने वाली रेखा पर स्थित किसी बिन्दु P से दोनों के शीर्षों के उन्नयन कोण एक दूसरे के पूरक हैं। यदि बिन्दु P से खम्भों के आधार की दूरियाँ क्रमशः x और y हैं, तो निम्नलिखित में से कौन-सा एक सही हैं ?

[CDS 2019-II]

(A) $2h^2 = x^4y$ (B) $2h^2 = xy^4$

(C) $2h^2 = xy$ (D) $2h^2 = x^2y^2$

11. Each corner of a square subtends an angle of 60° at the top of a tower of height h m standing at the centre of the square. If l is the length of each side of the square, then what is h^4 equal to? **[CDS 2018 I]**

किसी वर्ग का प्रत्येक शीर्ष, उस वर्ग के केन्द्र पर स्थित h मी. की ऊँचाई वाले एक टॉवर के शीर्ष (सिरे) पर 60° का कोण अन्तरित करती है। यदि वर्ग की प्रत्येक भुजा की लम्बाई l है, तो h^4 किसके बराबर है ?

(A) $2l^2$ (B) $\frac{l^2}{2}$ (C) $\frac{3l^2}{2}$ (D) $\frac{3l^2}{2}$

12. From a height of h units, a man observes the angle of elevation as α and angle of depression as β of the top and the bottom respectively of a tower of height H(>4h). To what further height should he climb so that the values of angle of elevation and angle of depression get interchanged for the top and bottom of the tower?

h इकाई की ऊँचाई से एक व्यक्ति देखता है कि H(>4h) ऊँचाई वाले एक टॉवर के शीर्ष और तल का क्रमशः उन्नयन कोण α और अवनमन कोण β है। उसे आगे और कितना ऊँचा चढ़ना चाहिए, ताकि टॉवर के शीर्ष और तल के उन्नयन कोण और अवनमन कोण के मान अन्तर्बदल हो जाएँ? **[CDS 2018 I]**

(A) H – h units (B) H – 2h units

(C) H – 3h units (D) H – 4h units

13. On the top of a hemispherical dome of radius r, there stands a flag of height h. From a point on the ground, the elevation of the top of the flag is 30°. After moving a distance d towards the dome, when the flag is just visible, the elevation is 45°. The ratio of h to r is equal to :

r त्रिज्या वाले एक अर्धगोलाकार गुम्बद के शीर्ष पर h ऊँचाई वाला एक झण्डा लगा है। तल के एक बिन्दु से झण्डे के शीर्ष का उन्नयन कोण 30° है। गुम्बद की ओर d दूरी चलने के बाद जहाँ तक झण्डा मात्र दिखाई देता रहे, उन्नयन कोण 45° है। यहाँ h से r का अनुपात किसके बराबर है ? **[CDS 2018 II]**

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

(C) $\frac{\sqrt{3}+1}{2\sqrt{2}}d$ (D) $\frac{\left(\sqrt{3}+1\right)\left(\sqrt{2}-1\right)}{2\sqrt{2}}d$

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14. Let AB represents a building of height h metre with A being is top, B being its bottom. Let A'B' represents a tower of height (h + x) metre (x > 0) with A' being its top and B' being its bottom. Let BB' = d metre. Let the angle of elevation of A' as seen from A be 45°. Consider the following statements.

Statement I : h + x > d

Statement II : The angle of depression of B as seen from A' is less than 45°.

Which one of the following is correct in respect of the above statements?

माना AB, h मीटर ऊँचाई की एक इमारत को निरूपित करता है जहाँ A उसका शीर्ष और B उसका तल है, तथा A'B' (h + x) (जहाँ x > 0) ऊँचाई की एक मीनार को निरूपित करता है जहाँ A' उसका शीर्ष तथा B' उसका तल है। मान लीजिए BB' = d मीटर है। मान लीजिए A से देखा गया A' का उन्नयन कोण 45° है।

निम्नलिखित कथनों पर विचार कीजिए–

कथन I : h + x > d

कथन II : A' से देखा गया B का अवनमन कोण 45° से कम है।

उपरोक्त कथनों के संदर्भ में निम्नलिखित में से कौन-सा सही है ?

[CDS 2017 II]

(A) Both statement I and statement II are true and statement II is the correct explanation of statement I.

(B) Both statement I and statement II are true and statement II is not the correct explanation of statement I.

(C) Statement I is true but statement II is false.

(D) Statement I is false but statement II is true.

15. A man standing at a point X on the bank XY of a river that cannot be crossed, observes a tower to be N α° E on the opposite parallel bank. He than walks 200 m along the bank to the point Y towards East, and finds the tower to be N β° W. From these observations, the breadth of the river will be (Given that $\tan\alpha^\circ = 2$ and $\tan\beta^\circ = 0.5$)

एक नदी, जिसे पार नहीं किया जा सकता, के XY किनारे पर X बिन्दु पर खड़ा हुआ एक व्यक्ति सामने वाले समानान्तर किनारे पर एक मीनार को N α° E के अनुसार देखता है। फिर वह व्यक्ति किनारे के साथ पूर्व दिशा की ओर Y बिन्दु तक 200 मी. चलता है, और मीनार को N β° W की स्थिति में पाता है। इन प्रेक्षणों के अनुसार, नदी की चौड़ाई क्या होगी ? (दिया है $\tan\alpha^\circ = 2$ और $\tan\beta^\circ = 0.5$ है)

[CDS 2017 II]

(A) 60 m (B) 70 m

(C) 80 m (D) 90 m

16. An aeroplane flying at a height of 300 m above the ground passes vertically above another plane at an instant when the angles of elevation of the two planes from the same point on the ground are 60° and 45° respectively. What is the height of the lower plane from the ground?

एक हवाई जहाज, जो धरती से 300 मी. की ऊँचाई पर उड़ रहा है, किसी क्षण पर एक दूसरे हवाई जहाज के ऊर्ध्वाधर ऊपर से गुजरता है। उस क्षण पर धरती के एक ही बिन्दु से दोनों हवाई जहाजों के उन्नयन कोण क्रमशः 60° व 45° थे। नीचे वाले हवाई जहाज की धरती से ऊँचाई क्या है ? **[CDS 2017 I]**

(A) $100\sqrt{3}$ m (B) $\frac{100}{\sqrt{3}}$ m

(C) $50\sqrt{3}$ m (D) $150(\sqrt{3}+1)$

17. From the top of a building 90 m high, the angles of depression of the top and the bottom of a tree are 30° and 45° respectively. What is the height of the tree? **[CDS 2017 I]**

किसी 90 मी. ऊँची एक इमारत के शीर्ष से एक वृक्ष के शीर्ष और तल के अवनमन कोण क्रमशः 30° और 45° हैं। वृक्ष की ऊँचाई क्या है ?

(A) $30\sqrt{3}$ m (B) $90 - 30\sqrt{3}$ m

(C) $90 + 30\sqrt{3}$ m (D) $60 + 30\sqrt{3}$ m

18. From an aeroplane vertically over a straight horizontal road, the angles of depression of two consecutive kilometer-stones on the opposite sides of the aeroplane are observed to be α and β. The height of the aeroplane above the road is :

एक सीधी क्षैतिज सड़क के ऊर्ध्वाधर ऊपर एक हवाई जहाज से, दो क्रमागत किलोमीटर के पत्थरों, जो हवाई जहाज के विपरीत दिशाओं में हैं, के अवनमन कोण α और β प्रेक्षित किए गए हैं। सड़क के ऊपर हवाई जहाज की ऊँचाई क्या है ? **(CDS 2017 I)**

(A) $\frac{\tan\alpha\tan\beta}{\tan\alpha\tan\beta}$

(B) $\frac{\tan\alpha\tan\beta}{\tan\alpha+\tan\beta}$

(C) $\frac{\cot\alpha\cot\beta}{\cot\alpha+\cot\beta}$

(D) $\frac{\cot\alpha+\cot\beta}{\cot\alpha\cot\beta}$

19. A man from the top of a 100 m high tower seen a car moveing towards the tower at an angle of depression 30°. After some time, the angle of depression becomes 60°. What is the distance travelled by the car during this time?

100 मीटर ऊँचे एक टॉवर के शीर्ष से एक आदमी 30° के अवनमन कोण से एक कार को टॉवर की ओर आते हुए देखता है। कुछ समय बाद, अवनमन कोण 60° हो जाता है। इतने समय में कार द्वारा तय की गई दूरी कितनी है ? **[CDS 2016 II]**

(A) $100\sqrt{3}$ m (B) $\frac{200\sqrt{3}}{3}$ m

(C) $\frac{100\sqrt{3}}{3}$ m (D) $200\sqrt{3}$ m

20. If the length of the shadow of a tower is equal to its height, then what is the Sun's altitude at that time?
यदि किसी टॉवर की छाया की लम्बाई उसकी ऊँचाई के बराबर है, तो उस समय पर सूर्य का उन्नतांश कितना है ? **[CDS 2016 II]**

(A) 15° (B) 30°
(C) 45° (D) 60°

21. A pole stands vertically inside a triangular park ABC. If the angle of elevation of the top of the pole from each corner of the park is same, then in the triangle ABC, the foot of the pole is at the:
एक त्रिकोणीय पार्क(उद्यान) ABC के अन्दर एक स्तम्भ ऊर्ध्वाधर खड़ा है। यदि पार्क के प्रत्येक कोने से स्तम्भ के शीर्ष की उच्चता का कोण एक समान है, तो त्रिकोण ABC में स्तम्भ का पाद कहाँ पर है ?
[CDS 2016 II]

(A) centroid/ केन्द्रक (B) circumcentre/ परिकेन्द्र
(C) incentre/अन्तः केन्द्र (D) orthocentre / लम्बकेन्द्र

22. Two observers are stationed due North of a tower (of height x meter) at a distance y m from each other. the angles of elevation of the tower observed by them are 30° and 45° respectively. Then, x/y is equal to : **(CDS 2016 I)**
दो प्रेक्षक एक मीनार (x मी. ऊँची) के ठीक उत्तर में एक दूसरे से y मी. की दूरी पर उपस्थित हैं। यदि उन दोनों द्वारा प्रेक्षित मीनार के उन्नयन कोण क्रमशः 30° और 45° हैं, तो $\frac{x}{y}$ किसके बराबर है ?

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

23. Two poles are placed at P and Q on either side of a road such that the line joining P and Q is perpendicular to the length of the road. A person moves x m away from P parallel to the road and places another pole at R. Then, the person moves further x m in teh same direction and turns and moves a distance y m away from the road perpendicularly, where he finds himself, Q and R on the same line. The distance between P and Q (i.e. the width of the road) in metre is :
दो खम्भे एक सड़क के दोनों किनारों पर P और Q इस प्रकार लगाए जाते हैं कि P और Q को मिलाने वाली रेखा सड़क की लम्बाई पर लम्ब होती है। एक व्यक्ति सड़क के समान्तर P से x मी. दूर चलता है और एक अन्य खम्भा R पर लगाता है। उसके बाद वह व्यक्ति उसी दिशा में x मी. बढ़कर मुड़ जाता है और सड़क के अनुलम्ब y मी. की दूरी तय करता है, जहाँ वह पाता है कि वह स्वयं, Q और R एक ही रेखा पर हैं। P और Q के बीच की दूरी (अर्थात् सड़क की चौड़ाई) मीटर में क्या है ? **(CDS 2016 I)**

(A) x (B) x/2
(C) y (D) 2y

24. An aeroplane flying at a height of 3000 m passes vertically above another aeroplane at an instant, when the angles of elevation of the two planes from some point on the ground are 60° and 45° respctively. Then, the vertical distance between the two planes is. **(CDS 2015 II)**
3000 मी. की ऊँचाई पर उड़ता हुआ एक हवाई जहाज किसी दूसरे हवाई जहाज के ऊर्ध्वाधर ऊपर से उस क्षण गुजरता है जब दोनों हवाई जहाज समतल के किसी बिन्दु से क्रमशः 60° और 45° के उन्नयन कोण पर हैं, तो दोनों हवाई जहाजों के बीच की ऊर्ध्वाधर दूरी क्या है ?

(A) $1000\left(\sqrt{3}-1\right)$ मी. (B) $1000\sqrt{3}$ मी.

(C) $1000\left(3-\sqrt{3}\right)$ मी. (D) $3000\sqrt{3}$ मी.

25. A pole is standing erect on the ground which is horizontal. The tip of the pole is tied tight with a rope of length $\sqrt{12}$ m to a point on the ground. if the rope is making 30° with the horizontal, then the height of the pole is **(CDS 2015 II)**
एक खम्भा क्षैतिज धरातल पर सीधा खड़ा है। खम्भे का शीर्ष $\sqrt{12}$ मी. लम्बाई की एक रस्सी से धरातल के किसी बिन्दु से खींच कर बाँधा गया है। यदि रस्सी, क्षैतिज से 30° का कोण बना रही है, तो खम्भे की ऊँचाई क्या है ?

(A) $2\sqrt{3}$ मी. (B) $3\sqrt{2}$ मी.
(C) 3 मी. (D) $\sqrt{3}$ मी.

26. The angles of elevation of the top of a tower from two points P and Q at distance m^2 and n^2 respectively, from the base and in the same straight line with it are complementary. The height of the tower is
P और Q दो बिन्दु एक मीनार के आधार से क्रमशः m^2 और n^2 की दूरी पर एक ही सरल रेखा पर स्थित है। मीनार के शीर्ष के, P और Q से, उन्नयन कोण पूरक हैं। मीनार की ऊँचाई क्या है ? **(CDS 2015 I)**

(A) $(mn)^{1/2}$ (B) $mn^{1/2}$
(C) $m^{1/2}n$ (D) mn

27. The angle of elevation of a cloud from a point 200 m above a lake is 30^0 and the angle of depression of its reflection in the lake is 60^0. The height of the cloud is
एक झील के 200 मी. ऊपर स्थित एक बिन्दु से किसी बादल का उन्नयन कोण 30° है और उसके झील में प्रतिबिम्ब का अवनमन कोण 60° है, तो बादल की ऊँचाई क्या है ? **(CDS 2015 I)**
(A) 200 मी. (B) 300 मी.
(C) 400 मी. (D) 600 मी.

28. From the top of a tower, the angles of depression of two objects P and Q (situated on the ground on the same side of the tower) separated at a distrance of 100 $\left(3-\sqrt{3}\right)$ m are 45^0 and 60^0, respectively. The height of the tower is
किसी मीनार की एक ही तरफ भूतल पर स्थित दो वस्तुओं P और Q के, जिनके बीच की दूरी 100 $\left(3-\sqrt{3}\right)$ मी. है, मीनार के शिखर से अवनमन कोण क्रमश: 45° और 60° हैं। मीनार की ऊँचाई क्या है ? **(CDS 2015 I)**
(A) 200 मी. (B) 250 मी.
(C) 300 मी. (D) इनमें से कोई नहीं

29. The shadow of a tower standing on a level plane is found to be 50 m longer when the Sun's elevation is 30^0, then when it is 60^0. What is the height of the tower.
यदि समतल पर खड़ी मीनार की छाया, सूर्य का उन्नयन 30° होने पर, उस छाया से 50 मी. लम्बी है, जो सूर्य का उन्नयन कोण 60° होने पर है, तो मीनार की ऊँचाई कितनी है ? **(CDS 2014 I)**
(A) 25 मी. (B) $25\sqrt{3}$ मी.
(C) $\frac{25}{\sqrt{3}}$ मी. (D) 30 मी.

30. The angle of elevation of the top of a tower 30 m high from the foot of another tower in the same plane is 60^0 and the angle of elevation of the top of the second tower from the foot of the first tower is 30^0. The distance between the two towers is m times the height of the shorter tower. What is m equal to?
एक 30 मी. ऊँची मीनार के शीर्ष का उसी समतल पर दूसरी मीनार के पाद से उन्नयन कोण 60° है और दूसरी मीनार के शीर्ष का पहले वाली मीनार के पार से उन्नयन कोण 30° है। यदि दोनों मीनारों के बीच की दूरी, छोटे वाले मीनार की ऊँचाई की m गुनी है, तो m किसके तुल्य है ? **(CDS 2014 I)**
(A) $\sqrt{2}$ (B) $\sqrt{3}$
(C) $\frac{1}{2}$ (D) $\frac{1}{3}$

31. A sphericla balloon of radius r subtends angle 60^0 at the eye of an observer. If the angle of elevation of its centre is 60^0 and h is the height of the centre of the balloon, then which one of the following is correct?
r त्रिज्या का एक गोल गुब्बारा किसी प्रेक्षक की आँख पर कोण 60° अन्तरित करता है। यदि उसके केन्द्र का उन्नयन कोण 60° है और गुब्बारे के केन्द्र की ऊँचाई h है, तो निम्नलिखित में से कौन-सा एक सही है ? **(CDS 2013 II)**
(A) h = r (B) h = $\sqrt{2}$r
(C) h = $\sqrt{3}$r (D) h = 2r

32. What is the angle of elevation of the Sun, when the shadow of a pole of height x m is $\frac{x}{\sqrt{3}}$ m?
यदि x मी. ऊँचाई के खम्भे की छाया $\frac{x}{\sqrt{3}}$ है, तो सूर्य का उन्नयन कोण कितना है ? **(CDS 2013 II)**
(A) 30° (B) 45°
(C) 60° (D) 75°

Directions (Q. Nos. 33-36) Read the following information carefully to answer the questions that follow.
As seen from the top and bottom of a buiding of height h m. the angles of elevation of the top of a tower of height $\frac{\left(3+\sqrt{3}\right)h}{2}$ m are α and β respectively.
नीचे दी गई जानकारी को ध्यानपूर्वक पढ़कर दिए गए प्रश्नों के उत्तर दीजिए।
h मी. ऊँचाई वाले एक भवन के शीर्ष और तल से देखने पर $\frac{\left(3+\sqrt{3}\right)h}{2}$ मी. ऊँचाई वाली मीनार के शीर्ष के उन्नयन कोण क्रमश: α और β हैं।

33. If $\beta = 30^0$, then what is the vlaue of $\tan\alpha$
यदि $\beta = 30^0$ है, तो $\tan\alpha$ किसके तुल्य है ? **(CDS 2013 I)**
(A) 1/2 (B) 1/3 (C) 1/4
(D) None of these/ इनमें से कोई नहीं

34. If $\alpha = 30^0$, then what is the value of $\tan\beta$?
यदि $\alpha = 30^0$ है, तो $\tan\beta$ किसके तुल्य है ? **(CDS 2013 I)**
(A) 1 (B) 1/2 (C) 1/3
(D) None of these/ इनमें से कोई नहीं

35. If $\alpha = 30^0$ and h = 30 m, then what is the distance between the base of the building and the base of the tower?
यदि $\alpha = 30^0$ और h = 30 मी. है, तो भवन के आधार और मीनार के आधार के बीच की दूरी क्या है ? **(CDS 2013 I)**
(A) $\left(15+15\sqrt{3}\right)$ मी. (B) $\left(30+15\sqrt{3}\right)$ मी.
(C) $\left(45+15\sqrt{3}\right)$ मी. (D) None of these

36. If $\beta = 30^0$ and θ is the angle of depression of the foot of the tower as seen from the top of the building, then what is the value of $\tan\theta$?
यदि $\beta = 30^0$ है और भवन के शीर्ष से देखने पर मीनार के पाद का अवनमन कोण θ है, तो $\tan\theta$ किसके तुल्य है ? **(CDS 2013 I)**

(A) $\frac{(3-\sqrt{3})}{3\sqrt{3}}$ (B) $\frac{(3+\sqrt{3})}{3\sqrt{3}}$

(C) $\frac{(2-\sqrt{3})}{3\sqrt{3}}$ (D) None of these

37. On walking 120 m towards a chimney in a horizontal line through its base the angle of elevation of tip of the chimney changes from 30^0 to 45^0. The height of the chimney is
किसी चिमनी की ओर उसके आधार से होते हुए क्षैतिज रेखा में 120 मी. चलने पर चिमनी के शीर्ष का उन्नयन कोण 30° से बदलकर 45° हो जाता है। चिमनी की ऊँचाई क्या है ? **(CDS 2012 II)**

(A) 120 मी. (B) $60(\sqrt{3}-1)$ मी.

(C) $60(\sqrt{3}+1)$ मी. (D) None of these

38. A ladder 20 m long is placed anainst a wall, so that the foot of the ladder is 10 m from the wall. The angle of inclination of the ladder to the horizontal will be.
20 मी. लम्बी सीढ़ी दीवार से टिकाकर इस प्रकार रखी गई है कि सीढ़ी का पाद दीवार से 10 मी. पर है। सीढ़ी का क्षैतिज से नतिकोण कितना होगा ? **(CDS 2012 II)**

(A) 30° (B) 45°

(C) 60° (D) 75°

39. The angles of elevation of the top of the tower from two points which are at distances of 10 m and 5 m from the base of the tower and in the same straight line with it are complementary. The height of the tower is.
किसी मीनार के शीर्ष के, मीनार के आधार से 10 मी. और 5 मी. की दूरी पर और इसके साथ उसी सरल रेखा में स्थित दो बिन्दुओं से उन्नयन कोण कोटिपूरक है। मीनार की ऊँचाई क्या है ? **(CDS 2012 II)**

(A) 5 मी. (B) 15 मी.

(C) $\sqrt{50}$ मी. (D) $\sqrt{75}$ मी.

40. The angles of elevation of the top of an inaceessible tower from two points on the same straight line from the base of the tower are 30^0 and 60^0, respectively. If the points are separated at a distance of 100 m, then the height of the tower is close to.
किसी अगम्य मीनार के शीर्ष के, मीनार के आधार से उसी सरल रेखा पर दो बिन्दुओं के उन्नयन कोण क्रमशः 30° और 60° हैं। यदि वे बिन्दु 100 मी. दूरी पर पृथक हो जाएं, तो मीनार की ऊँचाई किसके सन्निकट होगी ? **(CDS 2012 II)**

(A) 86.6 मी. (B) 84.6 मी.

(C) 82.6 मी. (D) 80.6 मी.

41. Two poles of heights 6 m and 11 m stand on a plane ground. If the distance between their feet is 12 m, what is the distance between their tops.
6 मी. और 11 मी. ऊँचाई के दो खंभे एक समतल मैदान पर खड़े हैं। यदि उनके दोनों पादों के बीच की दूरी 11 मी. है तो दोनों के शीर्ष के बीच की दूरी कितनी होगी ? **(CDS 2012 II)**

(A) 13 (B) 17

(C) 18 (D) 23

42. From the top of a cliff 200 m high, the angles of depression of the top and bottom of a tower are observed to be 30^0 and 45^0, repectively. What is the height of the tower?
200 मी. ऊँची खड़ी चट्टान की चोटी से अवलोकन करने पर किसी मीनार के शिखर एवं तल के अवनमन कोण क्रमशः 30° और 45° प्राप्त होते हैं। उस मीनार की ऊँचाई क्या है ? **(CDS 2012 I)**

(A) 400 मी. (B) $400\sqrt{3}$ मी.

(C) $400/\sqrt{3}$ मी. (D) None of these

43. The angle of elevation of the top of a tower from a point on the ground is 45^0. Moving 21 m directly towerds the base of the tower, the angle of elevation changes to 60^0. What is the height of the tower, to the nearest metre? **(CDS 2012-I)**
जमीन पर किसी बिन्दु से एक मीनार के ऊपरी छोर का उन्नयन कोण 45^0 है। मीनार के आधार की ओर सीधे 21 मी. चलने पर उन्नयन कोण बदलकर 60^0 हो जाता है। मीनार की ऊँचाई (मी. में) क्या है ?

(A) 48 (B) 49

(C) 50 (D) 51

44. What is the angle of elevation fo the Sun when the shadow of a pole $\sqrt{3}$ is times the length of teh pole?
किसी खम्भे की छाया, उसकी लम्बाई का $\sqrt{3}$ गुना हो, तो सूर्य का उन्नयन कोण क्या है ? **(CDS 2012 I)**

(A) 30° (B) 45°

(C) 60° (D) None of these

45. The angles of elevation of the top of a tower from two points situated at distances 36 m and 64 m from its base and in the same stright line with it are complementary. What is the height of the tower?

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किसी टॉवर के आधार से 36 मी. और 64 मी. दूरी पर और उसी सरल रेखा में स्थित दो बिन्दुओं से उस टॉवर के शीर्ष के उन्नयन कोण परस्पर पूरक हैं। टॉवर की ऊँचाई क्या है ? **(CDS 2011 II)**

(A) 50 मी. (B) 48 मी.
(C) 25 मी. (D) 24 मी.

46. The angle of elevation of the top of an incomplete vertical pillar at a horizontal distance of 100 m from its base is 45^0. If the angle of elevation of the top of complete pillar at the same point is to be 60^0, then the height of the incomplete pillar is to be increased by

किसी अधूरे ऊर्ध्वाधर खम्भे के शीर्ष का उन्नयन कोण, आधार से 100 मी. क्षैतिज दूरी पर 45^0 है। यदि पूरे बने खम्भे के शीर्ष का उसी बिन्दु पर उन्नयन कोण 60^0 होना है, तो अधूरे बने खम्भे की ऊँचाई को कितना और बढ़ाना है ? **(CDS 2011 II)**

(A) $50\sqrt{2}$ मी. (B) 100 मी.
(C) $100\left(\sqrt{3}-1\right)$ मी. (D) $100\left(\sqrt{3}+1\right)$ मी.

47. The length of shadow of a tree is 16 m when the angle of elevation of the Sun is 60^0. What is the height of the tree?

किसी पेड़ की छाया की लम्बाई 16 मी. है जब सूर्य का उन्नयन कोण 60^0 होता है। पेड़ की ऊँचाई क्या है ? **(CDS 2011 II)**

(A) 8 मी. (B) 16 मी. (C) $16\sqrt{3}$ मी. (D) $\frac{16}{\sqrt{3}}$ मी.

48. From a lighthouse, the angle of depression of two ships on opposite sides of the lighhouse are observed to be 30^0 and 45^0. If the height of lighthouse is h, what is the distance between the ships?

किसी प्रकाश स्तम्भ से, प्रकाश स्तम्भ की विपरीत दिशाओं में स्थित दो जहाजों के अवनमन कोण क्रमशः 30° और 45° देखे जाते हैं। यदि प्रकाश स्तम्भ की ऊँचाई h है, तो जहाजों के बीच की दूरी क्या है ? **(CDS 2011 II)**

(A) $\left(\sqrt{3}+1\right)$h मी. (B) $\left(\sqrt{3}-1\right)$h मी.
(C) $\sqrt{3}$ h मी. (D) $\left(1+\frac{1}{\sqrt{3}}\right)$h मी.

49. The angle of elevation of the top of a tower at a point on level ground is 45^0. When moved 20 m towards the tower, the angle of elevation becomes 60. What is the height of the tower?

समतल भूमितल पर एक बिन्दु से मीनार की चोटी का उन्नयन कोण 45° है। मीनार की ओर 20 मी. जाने पर उन्नयन कोण 60° हो जाता है। मीनार की ऊँचाई क्या है ? **(CDS 2011 I)**

(A) $10\left(\sqrt{3}-1\right)$ मी. (B) $10\left(\sqrt{3}+1\right)$ मी.
(C) $10\left(3-\sqrt{3}\right)$ मी. (D) $10\left(3+\sqrt{3}\right)$ मी

50. A telegraph post gets broken at a point against a strom and its top touches the ground at a distance 20 m from the base of the post making an angle 30^0 with the ground. What is the height of the post? **(CDS 2011-I)**

टेलीग्राफ का खम्भा तूफान के कारण एक बिन्दु पर टूटता है और उसका शीर्ष धरातल को खम्भे के आधार से 20 मी. दूर, धरातल से 30° का कोण बनाते हुए स्पर्श करता है। खम्भे की ऊँचाई क्या है ?

(A) $40/\sqrt{3}$ मी. (B) $20\sqrt{3}$ मी.
(C) $40\sqrt{3}$ मी. (D) 30 मी.

51. The angle of elevation of the top of a tower from the bottom of a buildingis twice that from its top. What is the height of the building, if the height of the tower is 75 m and the angle of elevation of the top of the tower from bottom of the building is 60^0?

किसी भवन के पाद से किसी मीनार के शीर्ष का उन्नयन कोण, भवन के शीर्ष से मीनार के शीर्ष के उन्नयन कोण का दोगुना है। यदि मीनार की ऊँचाई 75 मी. है और भवन के पाद से मीनार के शीर्ष का उन्नयन कोण 60° है, तो भवन की ऊँचाई क्या है ? **(CDS 2010-II)**

(A) 25 मी. (B) 37.5 मी.
(C) 50 मी. (D) 60 मी.

52. The shadow of a tower is 15 m when the Sun's altitude is 30^0. What is the length of the shadow when the Sun's altitude is 60^0?

जब सूर्य की तुंगता 30° है, तो किसी मीनार की छाया 15 मी. है। यदि सूर्य की तुंगता 60° है, तो छाया की लम्बाई कितनी है ?

(CDS 2010 II)

(A) 3 मी. (B) 4 मी.
(C) 5 मी. (D) 6 मी.

53. A man is watching from the top of a tower a boat speeding away from the tower. The boat makes an angle of depression of 45^0 with the man's eye when at a distance of 60 m from the bottom of tower. After 5 s, the angle of depression becomes 30^0. What is the approximate speed of the boat assuming that it is running in still water?

एक व्यक्ति टॉवर के शिखर से टॉवर से दूर होती नाव का अवलोकन कर रहा है। टॉवर के तल से 60 मी. की दूरी पर नाव व्यक्ति की आँख से 45^0 का अवनमन कोण बनाती है। 5 सेकण्ड के बाद अवनमन कोण 30^0 हो जाता है। यह मानकर कि नाव स्थिर जल में गतिमान है, उसकी सन्निकट चाल क्या है ? **(CDS 2010 I)**

(A) 31.5 किमी./ घण्टा (B) 36.5 किमी./ घण्टा
(C) 38.5 किमी./ घण्टा (D) 40.5 किमी./ घण्टा

54. Suppose the angle of elevation of the top of a tree at a point E due East of the tree is 60° and taht at a point F due West of the tree is 30°. If the distance between the points E and F is 160 ft. then what is the height of the tree?
मान लीजिए कि किसी वृक्ष के शिखर का, वृक्ष के पूर्व में स्थित बिन्दु E पर उन्नयन कोण 60° है और वृक्ष के पश्चिम में स्थित F पर 30° है। यदि बिन्दुओं E और F के बीच की दूरी 160 फीट है, तो वृक्ष की ऊँचाई क्या है ? **(CDS 2010 I)**

(A) $40\sqrt{3}$ फीट (B) 60 फीट

(C) $40/\sqrt{3}$ फीट (D) 23 फीट

55. If from the top of a post a string twice the length of the post is stretched tight to a point on the ground, then what angle will the string make with the post?
यदि किसी खम्भे की लम्बाई से दोगुने लम्बे धागे को खम्भे के शिखर से धरातल के किसी बिन्दु पर कसकर खींचा जाए, तो धागा खम्भे के साथ कितना कोण बनाएगा ? **[CDS 2014 II]**

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{5\pi}{12}$ (D) $\frac{\pi}{3}$

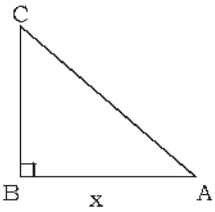
56. From a certain point on a straight road, a pserson observe a tower in the West direction at a distance of 200 m. He walks some distance along the road and finds that the same tower is 300 m South of him. What is the shortest distance of the tower from the road?
कोई व्यक्ति एक सीधी सड़क के किसी एक बिन्दु से किसी मीनार को पश्चिम दिशा में 200 मी. की दूरी पर देखता है। वह व्यक्ति उस सड़क पर कुछ दूर चलने पर पाता है कि वही मीनार उससे दक्षिण दिशा में 300 मी. की दूरी पर है। मीनार की सड़क से लघुत्तम दूरी क्या है ? **[CDS 2014 II]**

(A) $\frac{300}{\sqrt{13}}$ m (B) $\frac{500}{\sqrt{13}}$ m

(C) $\frac{600}{\sqrt{13}}$ m (D) $\frac{900}{\sqrt{13}}$ m

Solution

1. (B)

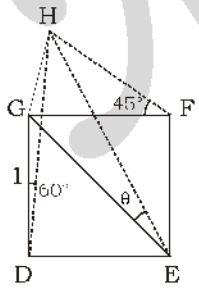


$\angle A = 60°$, $AB = x$

$\Rightarrow \quad \tan A = \tan 60° = \frac{\sqrt{3}x}{x}$

$\therefore$ length of pole $BC = \sqrt{3}\,x$

2. (C)



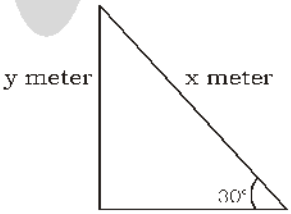
$\tan 60° = \frac{\sqrt{3}}{1} = \frac{GH}{GD}$

$\tan 45° = \frac{\sqrt{3}}{\sqrt{3}} = \frac{GH}{GF}$

$DG = 1$, $GH = \sqrt{3}$ and $GF = \sqrt{3}$

$\therefore \quad \cot\theta = \frac{GE}{GH} = \frac{\sqrt{1^2 + \left(\sqrt{3}\right)^2}}{\sqrt{3}} = \frac{2}{\sqrt{3}}$

3. (C)



$x + y = 15$ meter

$\sin 30° = \frac{y}{x}$

$x = 2y$

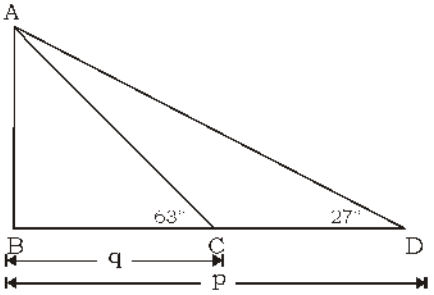
We get : $2y + y = 15$

$3y = 15$

$y = 5$ meter

Hence, height = 5 meter.

4. (B)



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Assume H is the height of the tower.

Then, AB = H, $\tan 63° = \frac{AB}{BC}$

$$\tan 27° = \frac{AB}{BD}$$

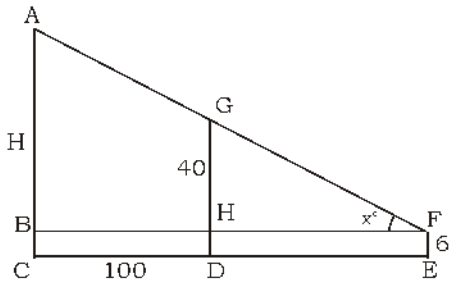
Then, $\tan 63° . \tan 27° = \frac{AB}{BC} \cdot \frac{AB}{BD}$

Here, $(\tan 90° - 63°) = \cot 27°$

Now, $AB^2 = BC . BD$

$AB = \sqrt{pq}$

5. (C)



In triangle FGH

GH = 40 – 6 = 34 feet

HF = DE = 75 feet

So, $\tan x = \frac{GH}{HF} = \frac{34}{75}$

In triangle ABF :

BF = CE = 100 + 75 = 175 feet

So, $\tan x = \frac{AB}{BF} = \frac{AB}{175}$

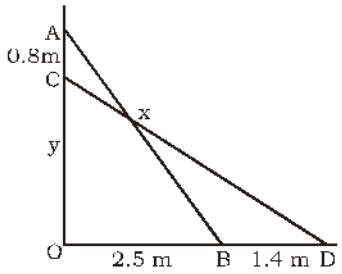
Hence,

$$\frac{34}{75} = \frac{AB}{175}$$

$$\Rightarrow \quad AB = \frac{7}{3} \times 34 = 79.33 \text{ feet}$$

$\therefore$ Height of taller tower = AC = 79.33 + 6
= 85.33 or 85 feet (approximately)

6. (B)



AB = CD = x = Length of ladder

Let OC = ym

$y^2 + 3.9^2 = x^2$

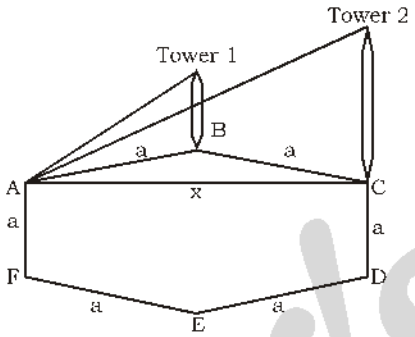
$(y + 0.8)^2 + 2.5^2 = x^2$

So $y^2 + 3.9^2 = (y + 0.8)^2 + 2.5^2$

y = 5.2m

$x = \sqrt{(5.2^2 + 3.9^2)} = 6.5\text{m}$

7.(B)



Let the side of regular hexagon be 'a'

Let height of the tower 1 be h_1 and tower 2 be h_2

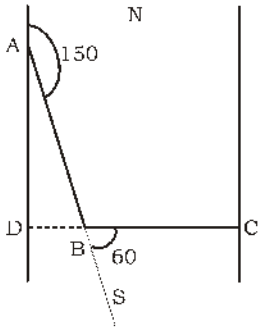
Height of tower 1 = h_1 = (distance between A and B) × $(\tan 30°) = a \cdot \frac{1}{\sqrt{3}}$

Distance between A and C = $2 \times \sqrt{3} \cdot \frac{a}{2} = \sqrt{3}\,a$

Height of tower 2 = h_2 = (distance between A and C) × $(\tan 45°) = \sqrt{3}\,a \cdot 1 = \sqrt{3}\,a$

Ratio of height of towers at B and C respectively = $\frac{\frac{a}{\sqrt{3}}}{\sqrt{3}a} = \frac{1}{3}$

8.(C)



Initially the person is travelling from south to north i.e. D to A

He takes 150° right turn and moves AB distance and then he takes 60° left turn travels BC

AB = 20km/hr × 15/60 hr = 5km

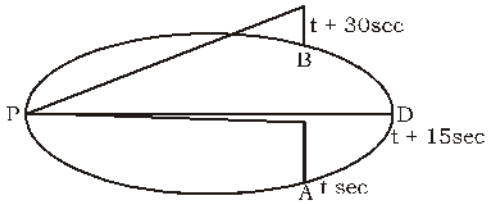
$BC = 30 \times \frac{20}{60}$ = 10 km

We know that distance between both the streets is DC = DB + BC

DB = AB cos 60° = 5. ½ = 2.5 km

So the distance between streets = 12.5 km

9. (C)



Let the plane be at point A at t seconds and at point B after t + 30 seconds

Since the motion is uniform, we can say that at time t + 15 seconds, the plane is above the point is diametrically opposite to the point P from where the angle is same.

Now since the time taken to cover the full circle is 3 minutes (180 seconds), the time taken by the plane to reach the diametrically opposite point will be 90 seconds.

So the time after which the plane reaches the point P will be = t + 15 + 90 seconds = (t + 105)seconds.

10.(C) Given that the angle of elevation from point P to the top of pole are complementary to each other and DP = x, BP = y.

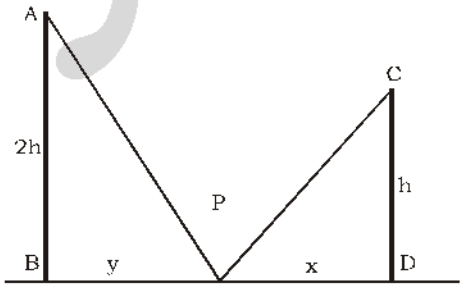
Let the

$\angle BPA = \theta \Rightarrow \angle DPA = 90° - \theta$

In the θAPB, $\tan\theta = \frac{AB}{PB} = \frac{2h}{y}$ .....(i)

And in the ΔCPD, $\tan(90° - \theta) = \frac{CD}{PD}$

$\Rightarrow \cot\theta = \frac{h}{x}$ .....(ii)

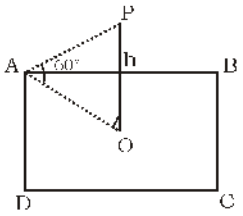


From equation (i) and (ii)

$\tan\theta \cdot \cot\theta = \frac{2h}{y} \cdot \frac{h}{x}$

$1 = \frac{2h^2}{xy} \Rightarrow 2h^2 = xy$

11.(C) Let ABCD be a square



Side of square = l (given)

Let O be its centre

Height of tower OP from centre = h (given)

∵ Hypotenuse of square

= $\sqrt{2}$ × side of square

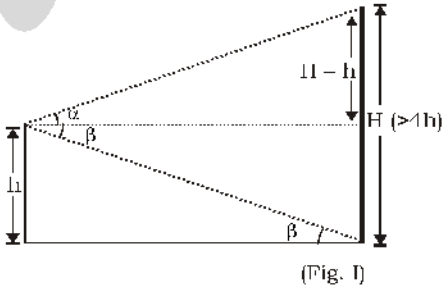
$\therefore \quad AO = \frac{l\sqrt{2}}{2} = \frac{l}{\sqrt{2}}$

Now, in ΔOAP $\tan 60° = \frac{h}{\frac{l}{\sqrt{2}}}$

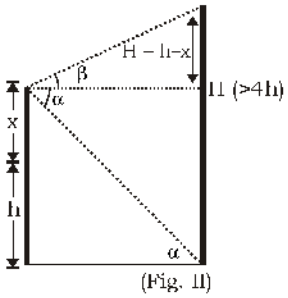
$\Rightarrow \quad \sqrt{3} = \frac{\sqrt{2}h}{l}$ or $3 = \frac{2h^2}{l^2}$

$h^2 = \frac{3l^2}{2}$

12.(B) Let the distance between two towers be 'a' units



(Fig. I)



(Fig. II)

And the man climbs 'x' units further from fig.

I $\tan\alpha = \frac{H - h}{a}$ ..... (i)

$\tan\beta = \frac{h}{a}$ ..... (ii)

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from fig. II $\tan\alpha = \frac{h+x}{a}$ ..... (iii)

$\tan\beta = \frac{H-h-x}{a}$ ..... (iv)

From eq. (i) and (ii)

$\frac{H-h}{a} = \frac{h+x}{a} \Rightarrow x = H - 2h$

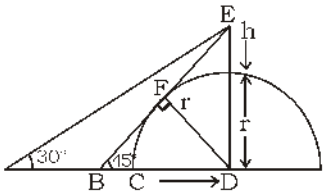
Hence, the man climbs H – 2h further.

13.(A) According to given information, we have the following figure.

In ΔBDE, we have $\tan45° = \frac{DE}{BD}$

$\Rightarrow$ BD = DE = h + r

$\Rightarrow$ BC + r = h + r



$\Rightarrow$ BC = h

Now, as $\angle EBD = 45°$, therefore $\angle BED = 45°$

Also, In ΔBFD $\tan45° = \frac{FD}{FB}$

$\Rightarrow$ FB = FD = r

Similarly, EF = r

Now, consider ΔBDE, then we have

$(BE)^2 = (BD)^2 + (DE)^2$

$\Rightarrow (2r)^2 = (h + r)^2 + (h + r)^2$

$\Rightarrow 4r^2 = 2(h + r)^2$

$\Rightarrow 2r^2 = (h + r)^2$

$\Rightarrow h + r = \sqrt{2}r$

$\Rightarrow h = (\sqrt{2} - 1)r$

$\Rightarrow \frac{h}{r} = \sqrt{2} - 1$

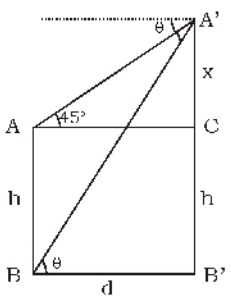
14.(C) We have, AB = h

A'B' = h + x

BB' = d

$\angle A'AC = 45°$

in $\Delta A'AC$



$\tan45° = \frac{A'C}{AC} \Rightarrow 1 = \frac{x}{AC}$

AC = x

AC = d [$\because$ AC = BB' = d]

Hence, h + x > d

In $\Delta A'BB'$

$\tan\theta = \frac{A'B'}{BB'}$, $\tan\theta = \frac{h+x}{d}$

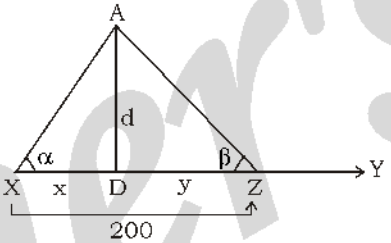
$\tan\theta > 1$ [$\because$ h + x > d]

$\therefore$ $\theta = 45°$

Hence angle of depression of B as seen form A'B greater than 45°

$\therefore$ Statement I is true statement II is false.

15.(C) Let



AD = breadth of river

In ΔAXD

$\tan\alpha = \frac{AD}{XD}$, $2 = \frac{d}{x} \Rightarrow x = \frac{d}{2}$

In ΔADZ

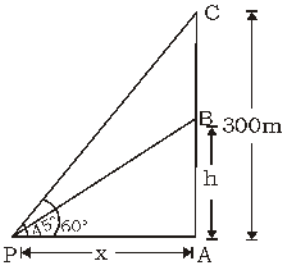
$\tan\beta = \frac{AD}{DZ}$, $0.5 = \frac{d}{y} \Rightarrow y = 2d$

We have x + y = 200 m

$\frac{d}{2} + 2d = 200m$

d = 80 m

16.(A) Let the height of the lower plance from the ground be h m and PA = x



Now, in ΔBAP,

$\tan45° = \frac{AB}{AP}$ $1 = \frac{h}{x}$

$h = x$ ..... (i)

Now, in ΔAPC,

$$\tan 60^\circ = \frac{AC}{AP} = \frac{300}{x}$$

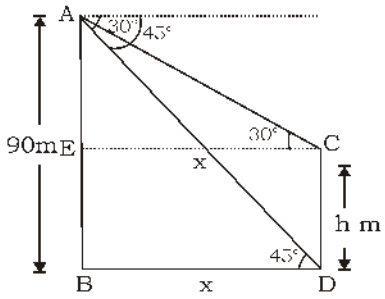
$$\Rightarrow \quad x = \frac{300}{\sqrt{3}} \quad \text{.....(ii)}$$

From eq. (i) and (ii) we get

$$\Rightarrow \quad h = x = \frac{300}{\sqrt{3}}$$

$$\Rightarrow \quad h = \frac{300}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{300\sqrt{3}}{3} = 100\sqrt{3}\ \text{m}$$

17.(B)



Let AB and CD be the building and tree respectively.

Now, in ΔABD

$$\tan 45^\circ = \frac{AB}{BD}$$

$$\Rightarrow 1 = \frac{90}{BD} \quad \Rightarrow \quad BD = 90\ \text{m} \quad \text{..... (i)}$$

Again, in ΔAEC

$$\tan 30^\circ = \frac{AE}{AC} \qquad [\because EC = BD = 90\ \text{m}]$$

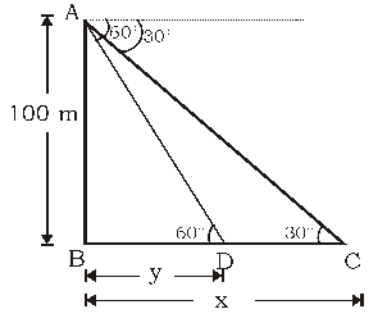
$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{AE}{90} \Rightarrow AE = \frac{90}{\sqrt{3}} = 30\sqrt{3}\ \text{m}$$

$\therefore$ Height of tree = CD = BE = AB – AE

$= (90 - 30\sqrt{3})\ \text{m}$

18.(B)

19.(B) Let AB be the tower of height is 100 m.



Now, in ΔABC,

$$\tan 30^\circ = \frac{AB}{BC} = \frac{100}{x}$$

$$x = 100\sqrt{3}\ \text{m}$$

Again, in ΔABD,

$$\tan 60^\circ = \frac{AB}{BD} = \frac{100}{y} \Rightarrow y = \frac{100}{\sqrt{3}}\ \text{m}$$

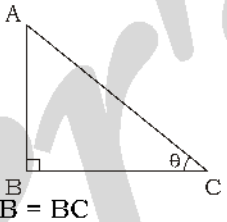
$\therefore$ Required distance travelled by car

$= CD = x - y$

$$= \left(100\sqrt{3} - \frac{100}{\sqrt{3}}\right) = \frac{300 - 100}{\sqrt{3}}$$

$$= \frac{200}{\sqrt{3}} = \frac{200}{3}\sqrt{3}\ \text{m}$$

20.(C) Let AB and BC be the height of tower and length of the shadow of a tower.



ATQ, $AB = BC$ ..... (i)

Now, in ΔABC

$$\tan\theta = \frac{AB}{BC} = \frac{AB}{AB} \qquad \text{[from Eq. (i)]}$$

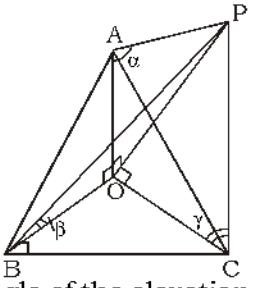
$\Rightarrow \tan\theta = 1$

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

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

Hence, the Sun's altitude is 45°

21.(B) Let OP be the pole inside the ΔABC.



Since, angle of the elevation of the top of the pole are same from each corner of ΔABC.

$\therefore$ In ΔAOP, $\quad \tan\alpha = \frac{OP}{OA}$ ..... (i)

In ΔBOP, $\quad \tan\beta = \frac{OP}{OB}$ ..... (ii)

In ΔCOP $\quad \tan\gamma = \frac{OP}{OC}$ ..... (iii)

$\because \quad \alpha = \beta = \gamma$

$\therefore \quad OA = OB = OC$

Hence, O is the circumcentre of ΔABC.

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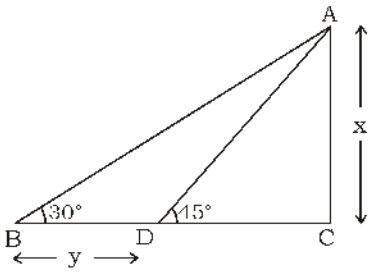
22.(C) In right angled ΔADC, $\tan 45° = \frac{AC}{AD}$

$$CD = \frac{AC}{\tan 45°} = x \text{ ..... (i)}$$

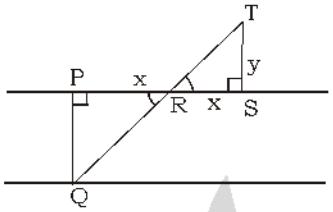


Now, in right angled ΔABC, $\tan 30° = \frac{x}{y + CD}$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{x}{x + y} \quad \text{[from Eq. (i)]}$$

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

23.(C) We can draw the figure on the basis of given statements, which is as follows,



In ΔPQR and ΔRST, $PR = RS = x$

$\angle P = \angle S = 90°$ [as PQ is perpendicular to PS]

and $\angle PRQ = \angle TRS$ [opposite angles]

$\therefore \Delta PQR$ and ΔRST are congruent.

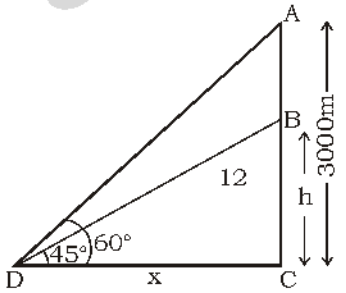
$\Rightarrow \quad PQ = TS = y$

Hence, the width of the road is y m.

24.(C) Let A and B be the position of two planes and D be a point.

In ΔBCD, $\tan 45° = \frac{h}{x} \quad \Rightarrow \quad h = x$

In ΔACD, $\tan 60° = \sqrt{3} = \frac{3000}{x}$

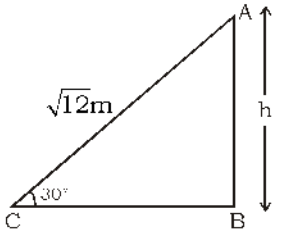


$$\because \quad x = \frac{3000}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 1000\sqrt{3} \text{ m}$$

$$\therefore \quad AB = 3000 - h$$

$$= 3000 - 1000\sqrt{3} = 1000(3 - \sqrt{3})\text{m}$$

25.(D) AB is a pole and AC is rope.

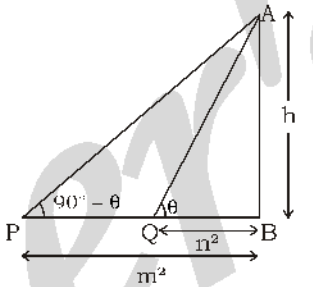


In ΔABC, $\sin 30° = \frac{AB}{AC} = \frac{h}{\sqrt{12}} \quad \Rightarrow \frac{h}{\sqrt{12}} = \frac{1}{2}$

$$\therefore \quad h = \frac{\sqrt{12}}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}\text{m}$$

26.(D) Let the height of the tower be h.

PB = m^2 and QB = n^2



In right angled ΔAQB, $\tan\theta = \frac{AB}{QB}$

$$\Rightarrow \quad \tan\theta = \frac{h}{n^2} \quad \text{..... (i)}$$

In right angled ΔAPB, $\tan(90° - \theta) = \frac{AB}{PB}$

$$\Rightarrow \quad \cot\theta = \frac{h}{m^2} \quad \text{..... (ii)}$$

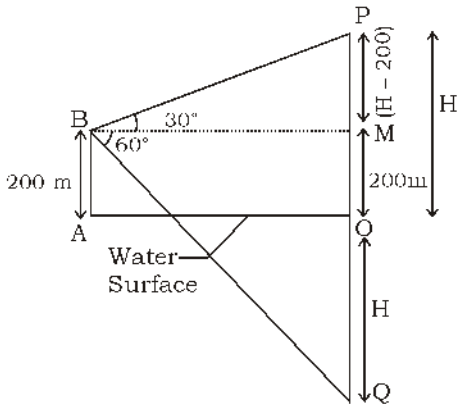
On multiplying Eqs. (i) and (ii), we get

$$\tan\theta.\cot\theta = \frac{h}{n^2} \times \frac{h}{m^2} \Rightarrow 1 = \frac{h^2}{m^2n^2}$$

$$\Rightarrow \quad h^2 = m^2n^2 \quad \Rightarrow \quad h = mn$$

Hence, the height of the tower is mn.

27.(C) Let P be the cloud at Height H above the level of the water in the lake and Q its image in the water.



$\therefore$ OQ = OP = H

Given, $\angle PBM = 30°$ and $\angle MBQ = 60°$

In right angled ΔPBM,

$$\tan 30° = \frac{PM}{BM} = \frac{H - 200}{BM}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{H - 200}{BM}$$

$$\Rightarrow \quad BM = \sqrt{3}(H - 200) \quad \text{..... (i)}$$

In right angled ΔQBM,

$$\tan 60° = \frac{MQ}{BM} = \frac{H + 200}{BM}$$

$$\Rightarrow \quad \sqrt{3} = \frac{(H + 200)}{\sqrt{3}(H - 200)} \quad \text{[from Eq. (i)]}$$

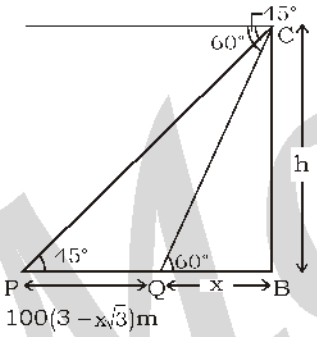
$\Rightarrow$ H + 200 = 3(H – 200)

$\Rightarrow$ H + 200 = 3H – 600 $\Rightarrow$ 2H = 800

$\therefore$ H = 400 m

Hence, the height of the cloud is 400 m.

28.(C) Let BC = h be height of tower and P and Q be the points, where the angle subtended are 45° and 60°



In right angled ΔBQC, $\tan 60° = \frac{BC}{BQ}$

$$\Rightarrow \quad \sqrt{3} = \frac{h}{x} \quad \Rightarrow \quad x = \frac{h}{\sqrt{3}} \quad \text{..... (i)}$$

In right angled ΔBPC, $\tan 45° = \frac{BC}{PB} = \frac{BC}{PQ + QB}$

$$\Rightarrow \quad 1 = \frac{h}{100\left(3 - \sqrt{3}\right) + x} \Rightarrow 100(3 - \sqrt{3}) + x = h$$

$$\Rightarrow \quad 100(3 - \sqrt{3}) + \frac{h}{\sqrt{3}} = h \quad \text{[from Eq. (i)]}$$

$$\Rightarrow h - \frac{h}{\sqrt{3}} = 100(3 - \sqrt{3})$$

$$\Rightarrow h\left(1 - \frac{1}{\sqrt{3}}\right) = 100\left(3 - \sqrt{3}\right)$$

$$\Rightarrow \quad \frac{h\left(\sqrt{3} - 1\right)}{3} = 100\left(3 - \sqrt{3}\right)$$

$$\Rightarrow \quad h = \frac{100\sqrt{3}\left(3 - \sqrt{3}\right)}{\left(\sqrt{3} - 1\right)}$$

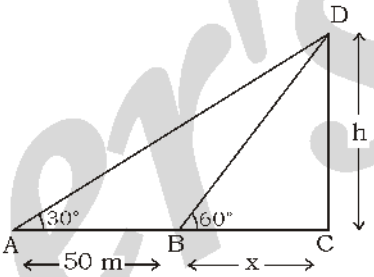
$$\Rightarrow \quad h = \frac{100\sqrt{3} \times \sqrt{3}\left(\sqrt{3} - 1\right)}{\left(\sqrt{3} - 1\right)}$$

$\therefore$ h = 300 m

29.(B) Let h be the height of the tower and BC be x m.

In ΔBCD, $\tan 60° = \frac{h}{x} \quad \Rightarrow \quad \sqrt{3} = \frac{h}{x}$

$$\Rightarrow \quad h = x\sqrt{3} \quad \text{..... (i)}$$



Now, in ΔACD, $\tan 30° = \frac{h}{50 + x}$

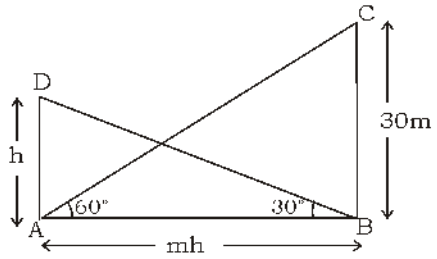
$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{x\sqrt{3}}{50 + x}$$

$\Rightarrow$ 50 + x = 3x

$\Rightarrow$ x = 25m

$\therefore$ $h = 25\sqrt{3}$ m [from Eq. (i)]

30.(B) Let h be the height of shorter tower, then the distance between the two towers is mh metre.



In ΔABD, $\tan 30° = \frac{h}{mh} \quad \Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{1}{m}$

$$\therefore \quad m = \sqrt{3}$$

31.(C) In ΔABO,

$$\sin 60° = \frac{OB}{AO} = \quad \Rightarrow \quad AO = \frac{OB}{\sin 60°} \quad \text{.... (i)}$$

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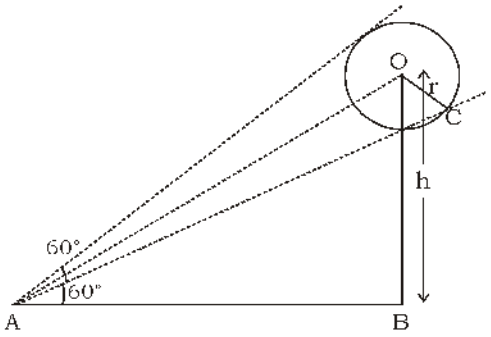


Now, in ΔAOC, $\sin\frac{60°}{2}° = \frac{OC}{AO}$

$\Rightarrow \quad AO = \frac{OC}{\sin 30°} \quad$ ..... (ii)

From Eq. (i) & (ii), $\frac{OB}{\sin 60°} = \frac{OC}{\sin 30°}$

$\Rightarrow \quad \frac{h}{\frac{\sqrt{3}}{2}} = \frac{r}{\frac{1}{2}} \quad \therefore \quad h = \sqrt{3}\,r$

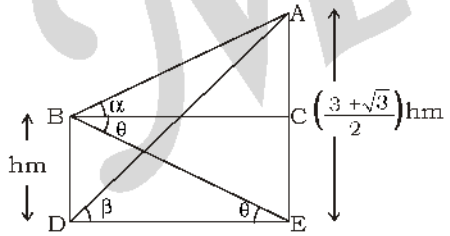
32.(C) Here, θ is the angle of elevation

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

$\Rightarrow \quad \frac{x}{\sqrt{3}} = \frac{\sqrt{3}x}{x} = \sqrt{3}$

Here $\tan\theta = \sqrt{3} \quad [\because \tan 60° = \sqrt{3}]$

$\therefore \quad \theta = 60°$



33.(B) Given that, $\beta = 30^0$

In ΔADE, $\tan\beta = \tan 30^0 = \frac{AE}{DE} = \frac{1}{\sqrt{3}}$

$DE = \sqrt{3}\,AE = \sqrt{3}\left(\frac{3+\sqrt{3}}{2}\right)h$

$\Rightarrow BC = DE = \frac{3}{2}\left(1+\sqrt{3}\right)h \quad [\because BC = DE] \quad$ .... (i)

Now, in ΔABC, $\tan\alpha = \frac{AC}{BC}$

$\Rightarrow BC\tan\alpha = (AE - CE) = (AE - BD) \quad [\because BD = CE]$

$\Rightarrow BC\tan\alpha = \left(\frac{3+\sqrt{3}}{2}\right)h - h = h\left(\frac{3+\sqrt{3}-2}{2}\right)$

$\Rightarrow \frac{3}{2}\left(1+\sqrt{3}\right)h\tan\alpha = \left(\frac{1+\sqrt{3}}{2}\right)h \quad$ [from Eq. (i)]

$\therefore \quad \tan\alpha = \frac{1}{3}$

34.(A) Given that, $\alpha = 30^0$

In ΔABC, $\tan\alpha = \tan 30^0 = \frac{AC}{BC} = \frac{1}{\sqrt{3}}$

$\Rightarrow \quad BC = \sqrt{3}\,AC = \sqrt{3}\,(AE - CE)$

$\Rightarrow \quad \sqrt{3}\,(AE - BD) \quad [\because BD = CE]$

$= \sqrt{3}\left(\frac{3+\sqrt{3}}{2} - 1\right)h = \frac{\sqrt{3}}{2}\left(1+\sqrt{3}\right)h \quad$ ..... (ii)

Now, in ΔADE

$\tan\beta = \frac{AE}{DE} \Rightarrow \tan\beta = \frac{AE}{BC} \quad [\because DE = BC]$

$= \frac{\left(\frac{3+\sqrt{3}}{2}\right)h}{\frac{\sqrt{3}}{2}\left(1+\sqrt{3}\right)h} = \frac{\frac{\sqrt{3}\left(1+\sqrt{3}\right)}{2}h}{\frac{\sqrt{3}\left(1+\sqrt{3}\right)}{2}h}$

$\therefore \quad \tan\beta = 1$

35.(C) Given that, $\alpha = 30^0$ and $h = 30$ m

In ΔABC, $\tan\alpha = \tan 30^0 = \frac{AC}{BC} = \frac{1}{\sqrt{3}}$

$\Rightarrow \frac{BC}{\sqrt{3}} = (AE - CE) = (AE - BD) \quad [\because BD = CE]$

$\Rightarrow BC = \sqrt{3}\left(\frac{3+\sqrt{3}}{2} - 1\right)h$

$\Rightarrow BC = \sqrt{3}\frac{\left(1+\sqrt{3}\right)}{2}.30 = \left(\sqrt{3}+3\right).15$

$\therefore DE = BC = (45 + 15\sqrt{3})$m $\quad [\because DE = BC]$

36.(A) Given that, $\tan\beta = 30^0$

In ΔADE, $\tan\beta = \frac{AE}{DE}$

$\Rightarrow \tan 30° = \frac{\left(\frac{3+\sqrt{3}}{2}\right)h}{DE} \Rightarrow \frac{1}{\sqrt{3}} = \frac{\sqrt{3}\left(\frac{1+\sqrt{3}}{2}\right)h}{DE}$

$\Rightarrow \quad DE = \frac{3}{2}(1+\sqrt{3})h$

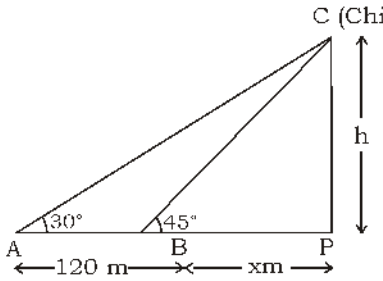
In ΔBDE, $\tan\theta = \frac{BD}{DE} = \frac{h}{DE}$

$\Rightarrow \quad \tan\theta = \frac{h}{\frac{3}{2}(1+\sqrt{3})h}$ [from Eq. (i)]

$= \frac{2}{3}\frac{(\sqrt{3}-1)}{(\sqrt{3}+1)(\sqrt{3}-1)} = \frac{2(\sqrt{3}-1)}{3.2}$

$= \frac{(\sqrt{3}-1)}{3}\cdot\frac{\sqrt{3}}{\sqrt{3}} = \frac{(3-\sqrt{3})}{3\sqrt{3}}$

37.(C) Let h be the height of the chimney



In ΔBPC, $\tan45° = \frac{h}{x} = 1 \quad \Rightarrow \quad h = x \quad$ .... (i)

Now, in ΔAPC, $\tan30° = \frac{h}{120+x} = \frac{1}{\sqrt{3}}$

$\Rightarrow \quad \frac{h}{120+h} = \frac{1}{\sqrt{3}}$ [from Eq. (i)]

$\Rightarrow \quad \sqrt{3}h = 120 + h$

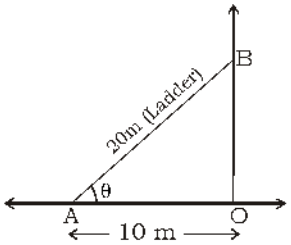
$\Rightarrow \quad \sqrt{3}h - h = 120 \quad \Rightarrow h(\sqrt{3}-1) = 120$

$\therefore \quad h = \frac{120}{\sqrt{3}-1}\times\frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{120(\sqrt{3}+1)}{2}$

$\therefore$ Required height of the chimney (h)

$= 60(\sqrt{3}+1)$ m

38.(C) Let θ be the inclination of the ladder to the horizontal



Now, in ΔAOB, $\cos\theta = \frac{AO}{AB} = \frac{10}{20} = \frac{1}{2}$

$\Rightarrow \quad \cos\theta = \cos60°$

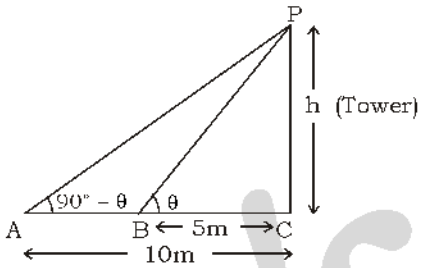
$\therefore \quad \theta = 60°$

39.(C) Given that, angles are complementary.

Let $\angle PBC = \theta$

$\therefore \quad \angle PAC = 90° - \theta$

Let h be the height of the tower.



Now, in ΔPBC, $\tan\theta = \frac{h}{5}$ ..... (i)

and in ΔPAC, $\tan(90° - \theta) = \frac{h}{10}$

$\cot\theta = \frac{h}{10}$ ..... (ii)

On multiplying Eqs. (i) and (ii) we get

$\Rightarrow \quad \tan\theta.\cot\theta = \frac{h}{5}.\frac{h}{10}$

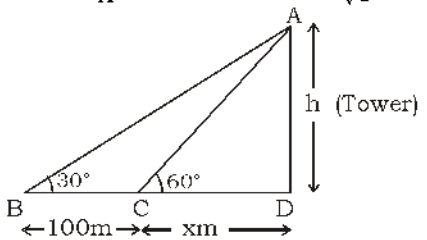
$\Rightarrow \quad \frac{h^2}{50} = 1 \quad \Rightarrow \quad h = \sqrt{50}$m

Which is the required height of the tower

40.(A) Let h be the height of inaccessible tower,

Now, in ΔACD,

$\tan60° = \frac{h}{x} = \sqrt{3} \qquad x = \frac{h}{\sqrt{3}}$ ..... (i)



and in ΔABD, $\tan30° = \frac{h}{100+x} = \frac{1}{\sqrt{3}}$

$\Rightarrow \sqrt{3}h = 100 + x = 100 + \frac{h}{\sqrt{3}}$ [from Eq.(i)]

$\Rightarrow \left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)h = 100 \quad \Rightarrow \frac{2}{\sqrt{3}}h = 100$

$\Rightarrow \quad h = 50\sqrt{3}$

$\therefore \quad h = 50 \times 1.732 = 86.6$ m

So, the required height is 86.6 m.

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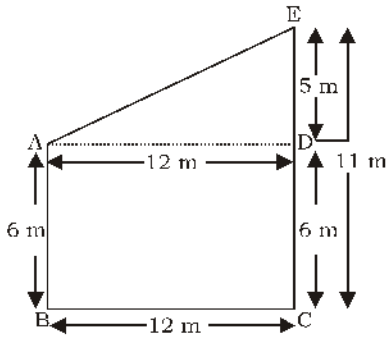
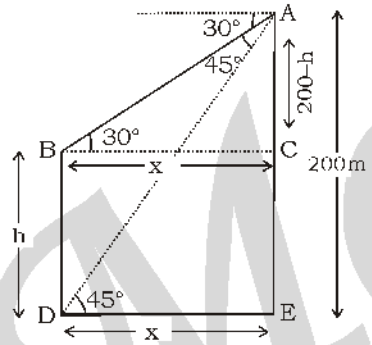
41.(A) 13 m



Given that AB = 6m and EC = 11 m
$\Rightarrow$ BC + 12m
$\because$ BC = AD = 12 m
and ED = ED – CD = EC – AB [$\because$ AB = CD]
= 11 – 6 = 5 m
in ΔAED, $(AE)^2 = (AD)^2 + (ED)^2$ (By Pythagoras)
$= (12)^2 + (5)^2 = 144 + 25 = 169 = (13)^2$
$\Rightarrow$ AE + 13m
$\therefore$ Distance between their tops = 13m

42.(D) Let AE = 200 m be the height of the cliff and BD = h m be the height of the tower.



In ΔABC,

$$\tan 30^\circ = \frac{200-h}{x} = \frac{1}{\sqrt{3}} = \frac{200-h}{x}$$

$$\Rightarrow \quad x = (200-h)\sqrt{3} \qquad \ldots\ldots (i)$$

And in ΔADE, $\tan 45^\circ = \frac{200}{x}$

$$\Rightarrow \quad 1 - \frac{200}{x} \quad \Rightarrow \quad x = 200 \text{ m}$$

From Eq. (i),

$$\Rightarrow \quad 200 = (200-h)\sqrt{3}$$

$$\Rightarrow \quad h = 200\left(\frac{\sqrt{3}-1}{\sqrt{3}}\right)\text{m}$$

43.(C) In ΔPBC, $\tan 60^\circ = \frac{h}{x} \quad \Rightarrow \quad \frac{h}{x} = \sqrt{3}$

$$\Rightarrow \quad x = \frac{h}{\sqrt{3}} \qquad \ldots\ldots\ldots (i)$$

In ΔPAC, $\tan 45^\circ = \frac{h}{21+x} = 1$

$$\Rightarrow \qquad h = 21 + x$$

$$\Rightarrow \qquad h = 21 + \frac{h}{\sqrt{3}} \qquad \text{[from Eq. (i)]}$$

$$\Rightarrow \qquad h\left(1 - \frac{1}{\sqrt{3}}\right) = 21$$

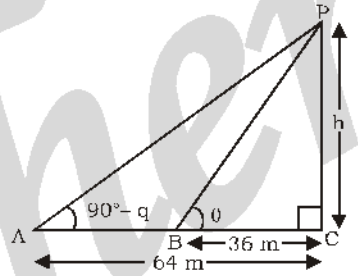
$$\therefore h = \frac{21\sqrt{3}}{\left(\sqrt{3}-1\right)} \cdot \frac{\left(\sqrt{3}+1\right)}{\left(\sqrt{3}+1\right)} = \frac{21\sqrt{3}\left(\sqrt{3}+1\right)}{2} = 49.68\,\text{m}$$

44.(A) $\because \tan\theta = \frac{AB}{AC}$

ATQ, $BC = \sqrt{3}\,AB \quad \Rightarrow \quad \frac{AB}{BC} = \frac{1}{\sqrt{3}}$

$\therefore \tan\theta = \frac{1}{\sqrt{3}} \quad \Rightarrow \theta = 30^\circ$

45.(B) 48 m



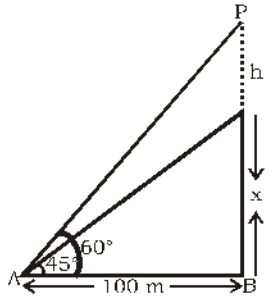
$\Delta PBC - \Delta PCA$

$$\frac{PC}{AC} = \frac{BC}{PC} \quad \Rightarrow PC^2 = AC \times BC$$

$\Rightarrow h^2 = 64 \times 36 \Rightarrow h = 8 \times 6 = 48$m
So, the height of the tower is 48 m.

46.(C) $100\left(\sqrt{3}-1\right)$ m

Let the height of the incomplete pillar be m and the increase height be PC = h



In ΔABC, $\tan 45^\circ = \frac{x}{100} \Rightarrow x = 100$m

and in ΔAPB, $\tan 60^\circ = \frac{x+h}{100} \Rightarrow x + h = 100\sqrt{3}$

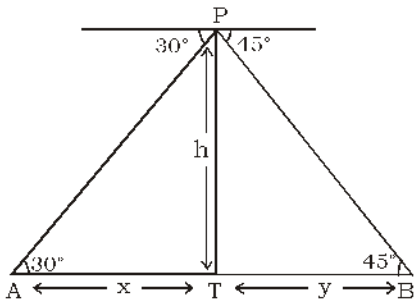
$\Rightarrow h = 100\sqrt{3} - x = 100\sqrt{3} - 100$

$\therefore h = 100\left(\sqrt{3}-1\right)$m

47.(C)

48.(B) In ΔPBT, $\tan 45° = \frac{h}{y} = 1$

$y = h$ ..... (i)

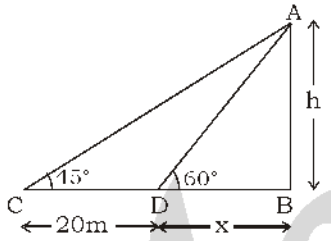


And in ΔPTA, $\tan 30° = \frac{h}{x}$ $x = \sqrt{3}h$ .... (ii)

$\therefore$ Required distance, $x + y = \sqrt{3}h + h$

$= h\left(\sqrt{3}+1\right)m$

49. (D) Let the height of tower be h m and BD = xm



In ΔACB, $\tan 45° = \frac{h}{20+x}$

$\Rightarrow$ $h = 20 + x$ ..... (i)

and in ΔABD, $\tan 60° = \frac{h}{x}$

$x = \frac{h}{\sqrt{3}}$ ..... (ii)

From Eq. (i), $h = 20 + \frac{h}{\sqrt{3}}$

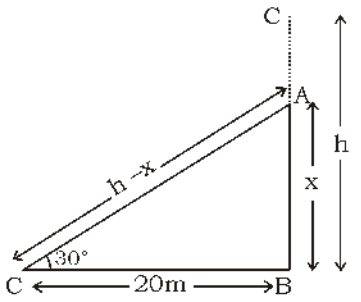
$\Rightarrow h - \frac{h}{\sqrt{3}} = 20 \Rightarrow h\left(1 - \frac{1}{\sqrt{3}}\right) = 20$

$\Rightarrow h\left(\frac{\sqrt{3}-1}{\sqrt{3}}\right) = 20$

$\therefore$ $h = \frac{20\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{20\sqrt{3}\left(\sqrt{3}+1\right)}{2} = 10\left(3+\sqrt{3}m\right)$

50.(B) Let the height of post BC be h m.



In ΔABC, $\tan 30° = \frac{x}{20} = \frac{1}{\sqrt{3}}$

$\Rightarrow$ $x = \frac{20}{\sqrt{3}}$ m ..... (i)

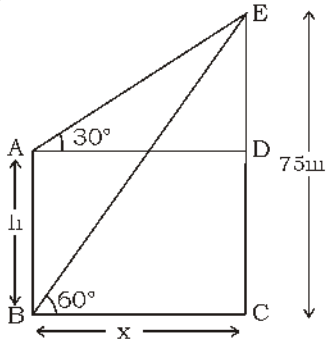
and $\cos 30° = \frac{20}{h-x}$ $\Rightarrow$ $\frac{\sqrt{3}}{2} = \frac{20}{h-x}$

$\Rightarrow$ $h - x = \frac{40}{\sqrt{3}}$

From Eq. (i), $h = \frac{40}{\sqrt{3}} + \frac{20}{\sqrt{3}} = \frac{60}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= 20\sqrt{3}$ m

51.(C) Let height of the building be h m and distance between building and tower be m.



In ΔADE, $\tan 30° = \frac{ED}{AD}$ $\Rightarrow$ $\frac{1}{\sqrt{3}} = \frac{75-h}{x}$

$\Rightarrow$ $x = 75\sqrt{3} - h\sqrt{3}$ ..... (i)

and in ΔBCE, $\tan 60° = \frac{CE}{BC}$ $\Rightarrow$ $\sqrt{3} = \frac{75}{x}$

$\Rightarrow$ $x\sqrt{3} = 75$ [From Eq. (i)]

$\Rightarrow (75\sqrt{3} - h\sqrt{3})\sqrt{3} = 75$

$\Rightarrow$ $75 \times 3 - 3h = 75$

$\Rightarrow$ $3h = 75 \times 3 - 75$

$\Rightarrow$ $h = \frac{75 \times 2}{3} = 50$ m

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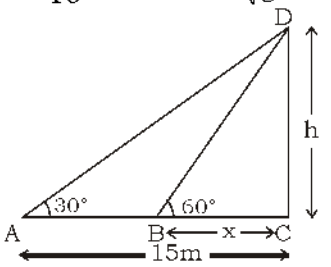
52.(C) In ΔACD, $\tan30° = \frac{CD}{AC}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{15} \Rightarrow h = \frac{15}{\sqrt{3}}$ ..... (i)

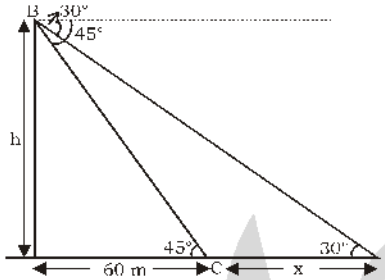


and in ΔBCD, $\tan60° = \frac{CD}{BC}$

$\Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow \frac{h}{\sqrt{3}} = x$

$\therefore x = \frac{15}{3} = 5$ m [from Eq. (i)]

53.(A) Let AB be a height of tower and CD = x cm



In ΔACB, $\tan45° = \frac{AB}{AC} \Rightarrow 1 = \frac{AB}{60}$

$\Rightarrow$ AB = 60 m

Now, in ΔADB, $\tan30° = \frac{60}{60+x}$

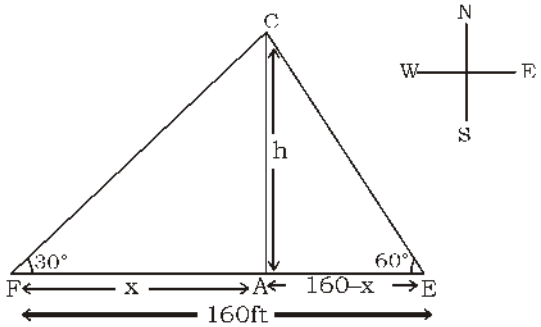
$\Rightarrow \frac{1}{\sqrt{3}} = \frac{60}{60+x} \Rightarrow 60 + x = 60\sqrt{3}$

$\Rightarrow x = 60(\sqrt{3} - 1) = 60(1.73 - 1)$

$\Rightarrow x = 60 \times 0.73 = 43.8$ m

$\therefore$ Speed of boat $= \frac{43.8}{5} \times \frac{18}{5} = 31.5$ km/h

54.(A) Let AC = h = height of a tower
and x = Distance between A and F
$\therefore$ AE = 160 – x



In ΔAFC, $\tan30° = \frac{h}{x} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x}$

$\Rightarrow x = \sqrt{3}h$ ..... (i)

and in ΔAEC, $\tan60° = \frac{h}{160-x}$

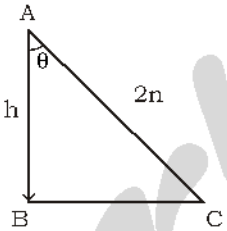
$\Rightarrow \sqrt{3}(160 - x) = h$

$\Rightarrow \sqrt{3}(160 - \sqrt{3}h) = h$ [from Eq. (i)]

$\Rightarrow 160\sqrt{3} - 3h = h$

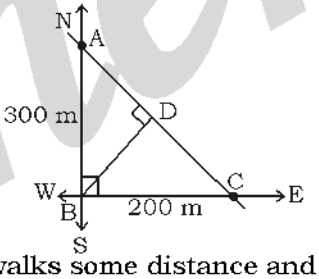
$\Rightarrow 4h = 160\sqrt{3} \Rightarrow h = 40\sqrt{3}$ ft

55.(D) Let AB be the height, AC be the string and the angle made by string with the post be θ.



Now, $\cos\theta = \frac{AB}{AC} = \frac{h}{2h} = \frac{1}{2} = \cos\frac{\pi}{3} \Rightarrow \theta = \frac{\pi}{3}$

56. (C) Let person be at point C and observes a tower in west direction B



$\therefore$ BC = 200 m

He walks some distance and reach at A,
Now, he observes tower to south direction at B.
$\therefore$ AB = 300 m
Let BD be the shortest distance of tower from the road, which
if $\angle ABC = \theta$, then
$\angle CBD = 90° - \theta$
[$\because$ angle between S and W = 90°]

In ΔADB, $\cos\theta = \frac{BD}{AB}$, $\Rightarrow \cos\theta = \frac{BD}{300}$

In ΔCDB, $\cos(90° - \theta) = \frac{BD}{BC} \Rightarrow \sin\theta = \frac{BD}{200}$

We know that, $\cos^2\theta + \sin^2\theta = 1$

$\Rightarrow \left(\frac{BD}{300}\right)^2 + \left(\frac{BD}{200}\right)^2 = 1$ [from eq. (i) & (ii)]

$\Rightarrow BD^2\left[\frac{40000+90000}{90000\times40000}\right] = 1 \Rightarrow BD^2\left[\frac{130000}{3600000000}\right] = 1$

$\Rightarrow BD^2 = \frac{360000}{13}$

$\therefore BD = \sqrt{\frac{360000}{13}} = \frac{600}{\sqrt{13}}$ m

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