



DEPARTMENT OF EMPLOYMENT AND TRAINING

TNPSC GROUP II A MAINS - UNIT II

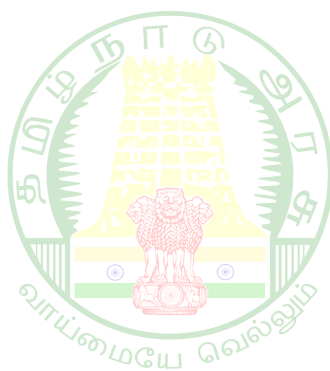
Course : TNPSC Group II A Mains Material

Subject : General Intelligence and Reasoning

Topic : Arithmetic Reasoning

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**Director,
Department of Employment and Training.**

INTRODUCTION

Arithmetic Reasoning is a vital aspect of problem-solving that combines mathematical principles with logical thinking to solve real-life problems. It involves applying basic arithmetic operations—addition, subtraction, multiplication, and division—within the context of word problems or abstract scenarios. Unlike straightforward calculations, arithmetic reasoning requires critical thinking, interpretation of data, and the ability to work with percentages, averages, ratios, age-related problems, and other arithmetic-based concepts.

In competitive exams, Arithmetic Reasoning questions are designed to assess your ability to think logically and apply basic arithmetic techniques in varied situations. These problems typically test how quickly and accurately you can make connections between numbers, find relationships between quantities, and interpret mathematical information presented in a word problem format.

Key Areas of Arithmetic Reasoning

1. Age Problems

Age-related problems are common in arithmetic reasoning, where you are given the ages of two or more people and are asked to find their current or future ages based on the given conditions. These problems typically involve simple algebraic equations where you can express the relationship between ages and solve for unknown variables.

- o Example:

The sum of the ages of A and B is 50 years. If A is 10 years older than B, find their ages.

2. Ratio Problems

In ratio problems, you are given a relationship between two or more quantities and asked to find one of the quantities. These problems often involve proportions, where you use the concept of equivalent ratios to determine unknown values.

- o Example:

The ratio of the ages of A and B is 4:5. If A is 8 years younger than B, find their ages.

3. Percentage Problems

Percentage problems test your ability to understand the concept of a percentage, which is a fraction of 100. These problems often involve calculating discounts, interest rates, profit, loss, or finding a percentage of a given quantity.

- o Example:

A person buys an item for Rs. 800 and sells it at a profit of 25%. What is the selling price?

4. Average Problems

Average-related questions require you to calculate the mean of a set of numbers. The average is the sum of all the values divided by the number of values. These problems might involve finding missing values based on the given average or finding the average of a group of numbers.

o Example:

The average of five numbers is 20. If four of the numbers are 15, 18, 22, and 25, what is the fifth number?

Type of Question:

1. Questions based on Age
2. Questions based on Ratio
3. Questions based on Percentage
4. Questions based on Average
5. Miscellaneous

1. Questions Based on Age

Introduction:

Questions on age generally focus on determining the relationship between the ages of different individuals at a given point in time. These problems involve working with simple linear equations based on age differences, sums, or ratios. The aim is to identify the current or future age of a person by using algebraic expressions or logical deductions. For example, the relationship between the ages of two people may be given, and you may be asked to find their current ages or their ages after a specific number of years.

Example

The sum of the ages of A and B is 50 years. If A is 10 years older than B, what are their ages?

- a) A is 30 years, B is 20 years
- b) A is 25 years, B is 15 years
- c) A is 35 years, B is 15 years
- d) A is 40 years, B is 10 years

Solution Explanation: Let the age of B be xxx.

Since A is 10 years older than B, A's age will be $x+10$.

The sum of their ages is 50:

$$x + (x + 10) = 50$$

$$2x + 10 = 50$$

$$2x = 40 \text{ (Subtract 10 from both sides)}$$

$$x = 20 \text{ (Divide by 2)}$$

So, B's age is 20, and A's age is $20 + 10 = 30$.

Answer: a) A is 30 years, B is 20 years.

2. Questions Based on Ratio

Introduction:

Ratio questions deal with comparing quantities and finding the proportional relationship between them. A ratio expresses the relationship between two or more numbers in terms of their relative sizes. Problems based on ratios often involve determining the part-to-whole relationship or comparing different quantities that maintain a constant proportion.

These questions require an understanding of how to solve problems using direct or inverse variation and sometimes involve using algebraic methods.

Example

The ratio of the ages of A and B is 4:5. If A is 8 years younger than B, find their ages.

- a) A is 32 years, B is 40 years
- b) A is 36 years, B is 44 years
- c) A is 28 years, B is 36 years
- d) A is 24 years, B is 32 years

Solution Explanation: Let the ages of A and B be $4x$ and $5x$, respectively.

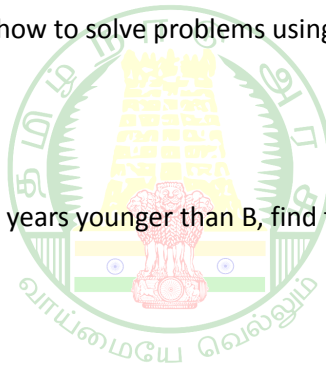
We know that A is 8 years younger than B:

$$5x - 4x = 8$$

Now, substitute $x=8$ to find their ages:

- A's age = $4x = 4 \times 8 = 32 \text{ years}$
- B's age = $5x = 5 \times 8 = 40 \text{ years}$

Answer: a) A is 32 years, B is 40 years.



3. Questions Based on Percentage

Introduction:

Percentage questions involve calculating a part of a whole or determining how one quantity compares to another as a percentage. This type of problem may involve finding a percentage increase or decrease, computing discounts, or determining profit or loss in business transactions. The ability to convert between fractions, decimals, and percentages is key to solving these problems effectively.

Example

A person buys an item for Rs. 800 and sells it at a profit of 25%. What is the selling price?

- a) Rs. 1000
- b) Rs. 950
- c) Rs. 1200
- d) Rs. 1050

Solution Explanation: The cost price (CP) is Rs. 800, and the profit percentage is 25%.

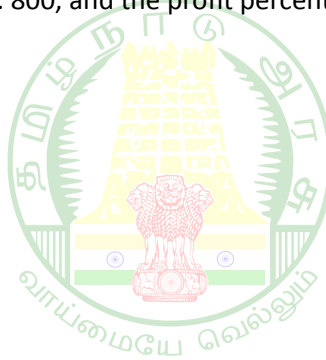
The formula for selling price (SP) is:

$$SP = CP + \frac{\text{Profit Percentage} \times CP}{100}$$

$$SP = 800 + \left(\frac{25}{100} \times 800\right)$$

$$SP = 800 + 200 = 1000$$

Answer: a) Rs. 1000



4. Questions Based on Average

Introduction:

Average-related questions focus on determining the mean value of a set of numbers. An average is simply the sum of values divided by the number of values. These questions typically test your ability to compute and interpret averages from given data sets, or find missing numbers when the average is provided. The average formula is widely used in problems related to exam scores, ages, prices, or any other group-related data.

Example

The average of five numbers is 20. If four of the numbers are 15, 18, 22, and 25, what is the fifth number?

- a) 20
- b) 32

- c) 40
d) 35

Solution Explanation: The formula for the average is:

$$\text{Average} = \frac{\text{Sum of all numbers}}{\text{Number of items}}$$

The average is given as 20, and there are 5 numbers. So, the sum of all numbers is:

$$\text{Sum} = \text{Average} \times \text{Number of items} = 20 \times 5 = 100$$

The sum of the first four numbers is:

$$15 + 18 + 22 + 25 = 80$$

Now, subtract the sum of the first four numbers from the total sum to find the fifth number:

$$\text{Fifth number} = 100 - 80 = 20$$

Answer: a) 20

5. Miscellaneous

Three friends A, B and C have different amount. If B takes `7 from A, Then B will have an amount equal no C. B and C together have `157. How much rupees does C have?

- (a) 83
(b) 82
(c) 80
(d) 81

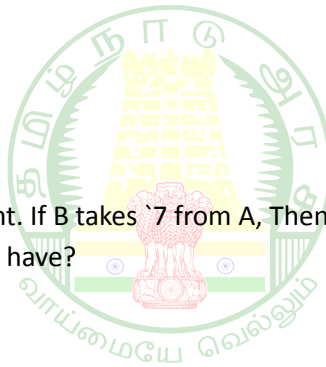
Solution:

According to the question, B takes 7 from A.

$$\text{Then } B + 7 = C \Rightarrow C - B = 7 \dots\dots\dots (i)$$

Total amount of B and C = 157

$$B + C = 157 \dots\dots\dots (ii)$$



On adding equations (i) and (ii)

$$B + C = 157$$

$$C - B = 7$$

$$2C = 164 \Rightarrow C = 82$$

Hence it is clear that C has `82.

Variety of Questions:

1. Arun is celebrating his birthday today. On his next birthday, he will be twice his age that was 12 years ago. How old is Arun today?

a) 25 years

b) 24 years

c) 27 years

d) 26 years

Solution (a) : Let the present age of Arun = x years

According to the question,

$$(x - 12) \times 2 = x + 1$$

$$2x - 24 = x + 1 \Rightarrow x = 25 \text{ years}$$

2. The sum of the ages of A and B is 48 years. If A is 4 years older than B, what are their ages?

a) A = 26, B = 22

b) A = 28, B = 20

c) A = 30, B = 18

d) A = 32, B = 16

Solution:

Let A's age be x and B's age be y .

$$x + y = 48$$

$$x = y + 4$$



Substitute $x = y + 4$ into $x + y = 48$

$$(y + 4) + y = 48 \Rightarrow 2y + 4 = 48 \Rightarrow 2y = 44 \Rightarrow y = 22$$

So, $A's\ age = y + 4 = 26$.

Answer: a) $A = 26$, $B = 22$

2. Ratio Problems

Question 3:

The ratio of the ages of A and B is 5:7. The sum of their ages is 72. What are their ages?

- a) $A = 30$, $B = 42$
- b) $A = 32$, $B = 40$
- c) $A = 34$, $B = 38$
- d) $A = 36$, $B = 36$

Solution:

Let $A's\ age = 5x$ and $B's\ age = 7x$.

$$5x + 7x = 72 \Rightarrow 12x = 72 \Rightarrow x = 6$$

$$A's\ age = 5x = 5 \times 6 = 30 \quad B's\ age = 7x = 7 \times 6 = 42$$

Answer: a) $A = 30$, $B = 42$

Question 4:

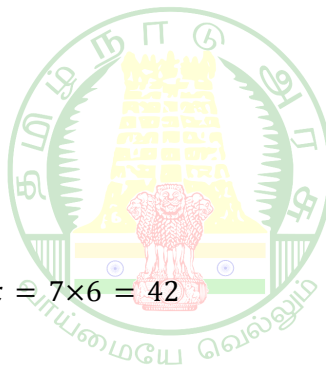
The ratio of the ages of A and B is 3:4. The sum of their ages is 84 years. What are their ages?

- a) $A = 36$, $B = 48$
- b) $A = 30$, $B = 54$
- c) $A = 35$, $B = 49$
- d) $A = 40$, $B = 44$

Solution:

Let $A's\ age = 3x$ and $B's\ age = 4x$

$$3x + 4x = 84 \Rightarrow 7x = 84 \Rightarrow x = 12$$



$$A's\ age = 3x = 3 \times 12 = 36 \quad B's\ age = 4x = 4 \times 12 = 48$$

Answer: a) A = 36, B = 48

3. Percentage Problems

Question 5:

A person buys an item for Rs. 500 and sells it at a profit of 25%. What is the selling price?

- a) Rs. 550
- b) Rs. 620
- c) Rs. 520
- d) Rs. 525

Solution:

$$\text{Profit} = 25\% \text{ of Rs. } 500 = \text{Rs. } 125$$

$$\text{Selling price} = \text{Cost price} + \text{Profit} = \text{Rs. } 500 + \text{Rs. } 125 = \text{Rs. } 625$$

Answer: b) Rs. 625

Question 6:

The price of an article is increased by 20%. If the original price is Rs. 200, what is the new price?

- a) Rs. 240
- b) Rs. 250
- c) Rs. 280
- d) Rs. 260

Solution:

$$\text{Increase} = 20\% \text{ of Rs. } 200 = \text{Rs. } 40$$

$$\text{New price} = \text{Rs. } 200 + \text{Rs. } 40 = \text{Rs. } 240$$

Answer: a) Rs. 240

Question 7:

A student scored 60 marks in a test. If the maximum possible marks are 80, what is the percentage score?

- a) 70%
- b) 75%
- c) 80%
- d) 85%

Solution:

$$\text{Percentage} = \left(\frac{\text{Obtained marks}}{\text{Total marks}} \right) \times 100$$
$$= \left(\frac{60}{80} \right) \times 100 = 75\%$$

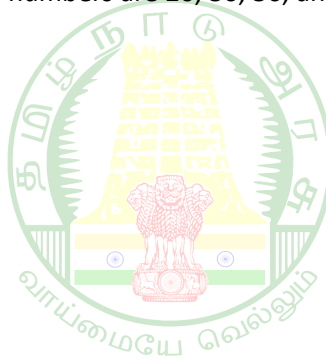
Answer: b) 75%

4. Average Problems

Question 8:

The average of five numbers is 24. Four of the numbers are 20, 30, 36, and 18. What is the fifth number?

- a) 30
- b) 32
- c) 35
- d) 40



Solution:

$$\text{Sum of five numbers} = 24 \times 5 = 120$$

$$\text{Sum of the first four numbers} = 20 + 30 + 36 + 18 = 104$$

$$\text{Fifth number} = 120 - 104 = 16$$

Answer: d) 16

Question 9:

The average age of a group of 8 people is 30 years. If the age of one person is increased by 5 years, what will be the new average age?

- a) 30.5 years
- b) 31 years
- c) 32 years
- d) 32.5 years

Solution:

$$\text{Total age of 8 people} = 30 \times 8 = 240$$

Increase in age = 5 years.

$$\text{New total age} = 240 + 5 = 245$$

$$\text{New average} = \frac{245}{8} = 30.625 \approx 31$$

Answer: b) 31 years

Question 10:

The average of five consecutive numbers is 50. What is the smallest number?

- a) 46
- b) 47
- c) 48
- d) 49

Solution:

Let the five numbers be $x, x + 1, x + 2, x + 3, x + 4$

The average is 50, so the sum of the numbers is $50 \times 5 = 250$.

$$x + (x + 1) + (x + 2) + (x + 3) + (x + 4) = (250 \times 5x) + 10 = 250 \Rightarrow 5x = 240 \Rightarrow x = 48$$

So, the smallest number is 48.

Answer: c) 48

5. Combined Arithmetic Problems

Question 11:

A train travels 180 km in 3 hours. How much time will it take to cover 300 km at the same speed?

- a) 4 hours
- b) 5 hours
- c) 6 hours
- d) 7 hours

Solution:

$$\text{Speed of the train} = \frac{180}{3} = 60 \frac{\text{km}}{\text{hr}}.$$

$$\text{Time to cover 300 km} = \frac{300}{60} = 5 \text{ hours}.$$

Answer: b) 5 hours

Question 12:

A shopkeeper bought a shirt for Rs. 600 and sold it for Rs. 720. What was the percentage profit?

- a) 10%
- b) 15%
- c) 20%
- d) 25%

Solution:

$$\text{Profit} = \text{Selling price} - \text{Cost price} = 720 - 600 = 120$$

$$\text{Percentage profit} = \frac{120}{600} \times 100 = 20\%$$

Answer: c) 20%

Question 13: The sum of three consecutive even numbers is 72. What are the numbers?

- a) 22, 24, 26
- b) 24, 26, 28
- c) 30, 32, 34
- d) 28, 30, 32

Solution:

Let the three consecutive even numbers be $x, x+2, x+4$

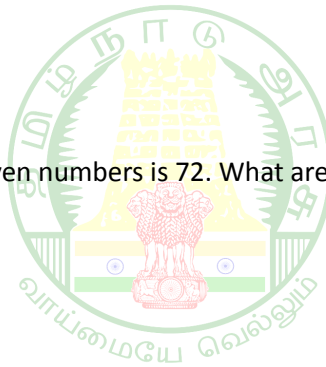
$$\text{The sum is } x + (x + 2) + (x + 4) = 72.$$

$$3x + 6 = 72 \Rightarrow 3x = 66 \Rightarrow x = 22$$

So, the numbers are 22, 24, and 26.

Answer: a) 22, 24, 26

Question 14: The average of 7 numbers is 34. If one of the numbers is removed, the average of the remaining numbers becomes 36. What is the number that was removed?



- a) 28
- b) 30
- c) 32
- d) 34

Solution:

Sum of the 7 numbers = $34 \times 7 = 238$

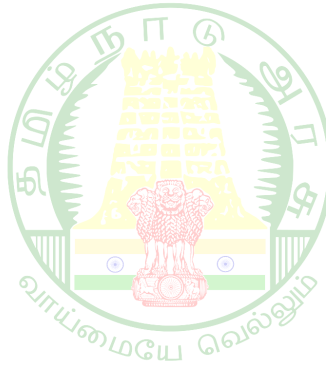
Sum of the remaining 6 numbers = $36 \times 6 = 216$

The removed number = $238 - 216 = 22$

Answer: a) 28

Question 15: A product was marked for sale with a label price, which is at 20% discount on the printed price. At the time of sale, the shopkeeper gave an additional 10% discount on the label price. If a customer bought the product at ₹468, then what is the printed price of the product?

- a) 700
- b) 650
- c) 600
- d) 520



Solution:

Let the marked price of product = x

$$x \times \frac{80}{100} \times \frac{90}{100} = 468$$

$$x = \frac{468 \times 100}{8 \times 9} = 650$$

Practice Question

1. The current age of Savan is four times the age of Akshan. After 10 years from now, Savan's age will be twice the age of Akshan. What is savan's current age?
(a) 20 years (b) 30 years (c) 5 years (d) 10 years
2. The sum of the current ages of Natasha and Krishna is 50 years. 10 years ago, Krishna was twice as old as Natasha. What is Krishna's current age?
(a) 15 years (b) 30 years (c) 20 years (d) 10 years
3. A father is twice the age of his son. Five years ago, the father's age was three times that of the son's age at that time. How old is the son now?
(a) 20 Years (b) 12 Years (c) 15 Years (d) 10 Years
4. Kritika had ₹21450 with her. She spent 16% of this amount on conveyance. Then, she spent 50% of the remaining amount on ration. Then, she spent ₹991 on internet expenses. How many rupees is left with her now?
(a) ₹8,018 (b) ₹4,520 (c) ₹4,640 (d) ₹9,852
5. The average marks of eight students in the mathematics exam are 75. If the highest and lowest marks are removed, then the average marks become 80. If the ratio of the highest marks to the lowest marks is 3 : 1, then the highest marks are what percentage of the sum of the all the marks obtained by the eight students in the mathematics exam?
(a) 18% (b) 15% (c) 12% (d) 20%
6. Sunita appeared for a test consisting of 260 questions and answered 40% of the first 130 questions correctly. What percentage of the rest 130 questions must she answer correctly so as to score 60% in the entire test?
(a) 70% (b) 84% (c) 75% (d) 80%
7. An online entrance exam was conducted in 250 centres all over a country. The average number of applicants per centre was found to be 1250. However, it was later realised that in one centre, the number of

applicants was counted as 1758 instead of 1658. What was the correct average number of applicants per centre?

(a) 1492.6 (b) 1249.6 (c) 1429.6 (d) 1294.6

8. Ranjan in his ODI Cricket career, scored 15 runs on an average in 10 matches. If he scored 14 runs on an average in the first 4 matches and 12 runs on an average in the last 4 matches, then find the average of the runs scored by him in the remaining 2 matches.

(a) 24 (b) 23 (c) 22 (d) 25

9. 2 train tickets from Mohali to Delhi and 3 tickets from Mohali to Jammu cost ₹800. But 3 tickets from Mohali to Delhi and 2 tickets from Mohali to Jammu cost ₹700. What are the ticket prices for Delhi and Jammu, respectively, from Mohali?

(a) 100, 200 (b) 200, 200 (c) 200, 100 (d) 100, 150

10. The total sum of 209 is distributed among the three friends A, B and C in such a way that A's money is six times that of B's money and C's money is four times that of B's money. How many rupees did A get?

(a) 115 (b) 113 (c) 112 (d) 114

Answer Key:

1. b 2. b 3. d 4. a 5. b 6. d 7. b 8. b 9. a 10. d