

MAT 2025 Question Paper With Solutions

Time Allowed :120 Minutes	Maximum Marks :150	Total questions :150
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. Total number of questions: 150
2. Number of questions per session: 30
3. Exam duration: 120 minutes
4. Total marks: 150
5. Marking scheme:
 - +1 for each correct entry
 - -0.25 for each incorrect entry
 - 0 for not attempting a question

1. Sumit can row a distance of 9 km in one hour in still water and he can now row the same distance in 45 minutes with the current. Find the total time taken by him to row 36 km with the current and return to the starting point.

- (A) 8 hrs
(B) 9 hrs
(C) 10 hrs
(D) 12 hrs

Correct Answer: (B) 9 hrs

Solution:

Step 1: Determine speeds in still water and with the current.

Speed in still water = $\frac{9 \text{ km}}{1 \text{ hr}} = 9 \text{ km/hr}$

Speed with the current = $\frac{9 \text{ km}}{45/60 \text{ hr}} = \frac{9}{0.75} = 12 \text{ km/hr}$

Step 2: Find the speed of the current.

Let the speed of the current be c . Then:

$$9 + c = 12 \Rightarrow c = 3 \text{ km/hr}$$

Step 3: Calculate upstream speed (against the current).

$$\text{Upstream speed} = 9 - 3 = 6 \text{ km/hr}$$

Step 4: Calculate time to row 36 km downstream and return 36 km upstream.

Downstream time = $\frac{36}{12} = 3 \text{ hrs}$

Upstream time = $\frac{36}{6} = 6 \text{ hrs}$

Step 5: Total time taken:

$$\text{Total time} = 3 + 6 = 9 \text{ hrs}$$

💡 Quick Tip

Use the relation:

$$\text{Speed with current} = b + c, \quad \text{Speed against current} = b - c$$

where b is the speed in still water and c is the speed of the current.

2. A shopkeeper makes a profit of 17% by giving a discount of 22% on the marked price of an article. But with a view to gain more profit, he reduces the discount to 18% and makes a higher profit. How much is the difference in his profit percentage with this reduction in discount?

- (A) 6%
- (B) 7.5%
- (C) 8%
- (D) 9%

Correct Answer: (A) 6%

Solution:

Step 1: Assume the Marked Price (M.P.) = 100.

When discount is 22%, Selling Price (S.P.) = $100 - 22 = 78$ Let Cost Price (C.P.) be x . Given profit = 17%:

$$\begin{aligned} \frac{78 - x}{x} \times 100 &= 17 \Rightarrow \frac{78 - x}{x} = \frac{17}{100} \\ \Rightarrow 100(78 - x) &= 17x \Rightarrow 7800 - 100x = 17x \\ \Rightarrow 7800 &= 117x \Rightarrow x = \frac{7800}{117} = 66.67 \end{aligned}$$

Step 2: When discount is 18%, new S.P. = 82

$$\text{New profit\%} = \frac{82 - 66.67}{66.67} \times 100 \approx \frac{15.33}{66.67} \times 100 \approx 23\%$$

Step 3: Difference in profit percentage = $23\% - 17\% = 6\%$

💡 Quick Tip

Always take the marked price as 100 to simplify problems involving discount and profit. Then calculate the selling price and compare with cost price to find profit

3. How many 4-digit numbers can be formed using digits 1 to 6 if the digit 4 is never there in the number and the repetition of digits is not allowed?

- (A) 116
(B) 118
(C) 120
(D) 124

Correct Answer: (C) 120

Solution:

Step 1: Identify the digits allowed.

Digits given: $\{1, 2, 3, 4, 5, 6\} \Rightarrow$ Total digits = 6

Digit 4 is not allowed, so remaining digits = $\{1, 2, 3, 5, 6\} \Rightarrow$ 5 digits

Step 2: Count valid 4-digit numbers.

We have to form 4-digit numbers using 5 digits (excluding 4), without repetition.

So, total such numbers = Number of 4-digit permutations from 5 digits:

$${}^5P_4 = 5 \times 4 \times 3 \times 2 = 120$$

 Quick Tip

For non-repeating digit problems:

$${}^nP_r = \frac{n!}{(n-r)!}$$

Here, exclude restricted digits first, then apply permutation.

4. A jug was full of juice. A person draws out $\frac{1}{6}$ of the juice from the jug and replaces it with water. He repeated this process 3 times and thus there was only 1250 ml of juice left in the jug. What was the initial quantity of juice in the jug?

- (A) 2.775 L
(B) 2.565 L
(C) 2.330 L
(D) 2.160 L

Correct Answer: (D) 2.160 L

Solution:

Step 1: Use the concept of successive replacement.

Each time, $\frac{1}{6}$ of the juice is removed and replaced with water. So, $\frac{5}{6}$ of the juice remains after each operation.

Step 2: Use the general formula for remaining quantity of original liquid:

$$\text{Final amount of juice} = \text{Initial quantity} \times \left(\frac{5}{6}\right)^n$$

where $n = 3$ (process repeated 3 times).

Step 3: Let initial quantity of juice = V ml.

We are given:

$$\left(\frac{5}{6}\right)^3 = \frac{125}{216}, \quad \text{and final juice left} = 1250 \text{ ml}$$

So,

$$1250 = V \cdot \frac{125}{216}$$

Step 4: Solve for V .

$$V = \frac{1250 \times 216}{125} = \frac{270000}{125} = 2160 \text{ ml}$$

Step 5: Convert to liters.

$$2160 \text{ ml} = 2.160 \text{ liters}$$

 Quick Tip

When liquid is replaced repeatedly, use this formula:

$$\text{Final quantity} = \text{Initial quantity} \times \left(1 - \frac{x}{V}\right)^n$$

where x is the amount replaced each time, and n is the number of repetitions.

5. A batch of 36 school children goes for an excursion trip to Nainital. When one 10-year-old child is replaced with another child, the average age of the children in the batch increases by $2\frac{1}{2}$ months. What is the age of the new child?

- (A) 16 years
- (B) 16.5 years
- (C) 17 years
- (D) 17.5 years

Correct Answer: (D) 17.5 years

Solution:

Step 1: Convert the increase in average age to years.

$$2\frac{1}{2} \text{ months} = \frac{5}{2} \text{ months} = \frac{5}{24} \text{ years}$$

Step 2: Calculate total increase in age for all 36 students.

$$\text{Total increase} = 36 \times \frac{5}{24} = \frac{180}{24} = 7.5 \text{ years}$$

Step 3: Since one 10-year-old child is replaced,

The new child must be older than the previous one by 7.5 years:

$$\text{Age of new child} = 10 + 7.5 = \boxed{17.5 \text{ years}}$$

 Quick Tip

Multiply the change in average by the number of members to find the total age difference, then apply it to the replaced individual.

6. Mohan can reach his destination on time by travelling at a speed of 54 km/hr. If one-fourth of the time, he covers $\frac{2}{9}$ of the total distance, at what speed should the remaining distance be travelled so as to reach his destination on time?

- (A) 60 km/hr
(B) 58 km/hr
(C) 56 km/hr
(D) 54 km/hr

Correct Answer: (C) 56 km/hr

Solution:

Let total distance = 108 km (LCM of 9 and 12 for easier calculation).

$$\text{Given speed} = 54 \text{ km/hr} \Rightarrow \text{Total time} = \frac{108}{54} = 2 \text{ hours}$$

Step 1: In $\frac{1}{4}$ of the time i.e. $\frac{1}{2}$ hour, distance covered = $\frac{2}{9} \times 108 = 24$ km

Step 2: Remaining distance = $108 - 24 = 84$ km

Remaining time = $2 - \frac{1}{2} = \frac{3}{2}$ hours

Step 3: Required speed = $\frac{84}{\frac{3}{2}} = \frac{84 \times 2}{3} = 56$ km/hr

💡 Quick Tip

When a question involves time and fractional distance, assume a total distance that's a multiple of denominators to simplify calculations.

7. The ages of Ajay and Vijay differ by 22.5 years. If $6\frac{1}{2}$ years ago, Vijay was $3\frac{1}{2}$ times as old as Ajay, find their present ages.

- (A) $14\frac{1}{2}$ yrs, 37 yrs
(B) 15 yrs, $37\frac{1}{2}$ yrs
(C) $15\frac{1}{2}$ yrs, 38 yrs
(D) 16 yrs, $38\frac{1}{2}$ yrs

Correct Answer: (C) $15\frac{1}{2}$ yrs, 38 yrs

Solution:

Let Ajay's present age be x years.

Then Vijay's present age = $x + 22.5$ years.

6.5 years ago:

Ajay's age = $x - 6.5$

Vijay's age = $x + 22.5 - 6.5 = x + 16$

Given: $x + 16 = 3.5(x - 6.5)$

Step 1: Expand the equation

$$x + 16 = 3.5x - 22.75$$

Step 2: Simplify

$$x - 3.5x = -22.75 - 16 \Rightarrow -2.5x = -38.75 \Rightarrow x = \frac{38.75}{2.5} = 15.5$$

Step 3: Vijay's present age

$$x + 22.5 = 15.5 + 22.5 = 38$$

Final Answer:

Ajay = $15\frac{1}{2}$ years, Vijay = 38 years.

💡 Quick Tip

When past age ratios and present differences are given, always use variable expressions and set up an equation based on the older statement to solve efficiently.

8. Ram kumar, a trader mixes two varieties of Moong dal, totally weighing 90kg worth Rs7443. The price of the first variety that he mixes is Rs57.50 per kg and that of the second variety is Rs111.50 per kg. How much quantity of the second variety of moong dal does he mix?

- (A) 34kg
- (B) 38kg
- (C) 42kg
- (D) 46kg

Correct Answer: (C) 42kg

Solution:

Let the quantity of the first variety of Moong dal be x kg.

Let the quantity of the second variety of Moong dal be y kg.

Step 1: Formulate equations based on given information.

The total weight of the mixture is 90 kg:

$$x + y = 90 \quad \dots (1)$$

The total cost of the mixture is Rs 7443. The price of the first variety is Rs 57.50 per kg, and the second variety is Rs 111.50 per kg:

$$57.50x + 111.50y = 7443 \quad \dots (2)$$

Step 2: Solve the system of equations.

From equation (1), we can express x in terms of y :

$$x = 90 - y$$

Substitute this expression for x into equation (2):

$$57.50(90 - y) + 111.50y = 7443$$

Distribute 57.50:

$$5175 - 57.50y + 111.50y = 7443$$

Combine the terms with y :

$$5175 + (111.50 - 57.50)y = 7443$$

$$5175 + 54y = 7443$$

Subtract 5175 from both sides:

$$54y = 7443 - 5175$$

$$54y = 2268$$

Divide by 54 to find y :

$$y = \frac{2268}{54}$$

$$y = 42$$

Step 3: Determine the quantity of the second variety.

The quantity of the second variety of moong dal is y .

From the calculation in Step 2, $y = 42$ kg.

Therefore, Ram Kumar mixes 42 kg of the second variety of moong dal.

💡 Quick Tip

For mixture problems involving different quantities and costs, set up a system of two linear equations: one for the total quantity and another for the total cost. Solve these equations simultaneously to find the unknown quantities.

9. Bittu, a fruit seller purchased some fruit items and raised its price by 35%. But due to some urgency, he had to sell it immediately by giving 35% discount on the face value. Then, how much was the percentage gain or loss after giving discount?

- (A) Gain 12.25%
- (B) Gain 15.75%
- (C) Loss 12.25%
- (D) Loss 15.75%

Correct Answer: (C) Loss 12.25

Solution:

Let the original cost price (CP) of the fruit items be Rs 100.

Step 1: Calculate the marked price (face value).

Bittu raised the price by 35%.

Marked Price (MP) = Cost Price + 35% of Cost Price

$$MP = 100 + 35\% \text{ of } 100 = 100 + 35 = 135$$

So, the Marked Price is Rs 135.

Step 2: Calculate the selling price (SP) after the discount.

Bittu gave a 35% discount on the face value (Marked Price).

Discount Amount = 35% of Marked Price

$$\text{Discount Amount} = 35\% \text{ of } 135 = \frac{35}{100} \times 135$$

$$\text{Discount Amount} = 0.35 \times 135 = 47.25$$

$$\text{Selling Price (SP)} = \text{Marked Price} - \text{Discount Amount}$$

$$\text{SP} = 135 - 47.25 = 87.75$$

So, the Selling Price is Rs 87.75.

Step 3: Calculate the percentage gain or loss.

Since the Selling Price (Rs 87.75) is less than the Cost Price (Rs 100), there is a loss.

$$\text{Loss Amount} = \text{Cost Price} - \text{Selling Price}$$

$$\text{Loss Amount} = 100 - 87.75 = 12.25$$

$$\text{Percentage Loss} = \frac{\text{Loss Amount}}{\text{Cost Price}} \times 100\%$$

$$\text{Percentage Loss} = \frac{12.25}{100} \times 100\%$$

$$\text{Percentage Loss} = 12.25\%$$

Therefore, there was a loss of 12.25%.

💡 Quick Tip

When an item's price is increased by $x\%$ and then decreased by $x\%$, there is always a net loss. The percentage loss is given by the formula $\left(\frac{x}{10}\right)^2\%$.

10. Probability of getting a rotten apple from a lot of 480 apples is 0.125. Find the number of good apples.

(A) 400

(B) 412

(C) 418

(D) 420

Correct Answer: (D) 420

Solution:

Step 1: Understand the given information.

Total number of apples in the lot = 480.

Probability of getting a rotten apple = 0.125.

Step 2: Calculate the number of rotten apples.

The number of rotten apples = Probability of rotten apple $\times$ Total number of apples

$$\text{Number of rotten apples} = 0.125 \times 480$$

To make calculation easier, convert 0.125 to a fraction: $0.125 = \frac{125}{1000} = \frac{1}{8}$.

$$\text{Number of rotten apples} = \frac{1}{8} \times 480$$

$$\text{Number of rotten apples} = \frac{480}{8} = 60$$

Step 3: Calculate the number of good apples.

The number of good apples = Total number of apples - Number of rotten apples

Number of good apples = $480 - 60$

Number of good apples = 420

Therefore, the number of good apples is 420.

 Quick Tip

Probability of an event occurring is $P(E) = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}}$. If you know the probability and total outcomes, you can find the number of favorable outcomes. Also, $P(\text{Event}) + P(\text{Not Event}) = 1$.

11. If HCF of the numbers 299, 253 and a third number 'A' is 23 and their LCM is 16445, then what is the number 'A'?

- (A) 69
- (B) 95
- (C) 115
- (D) 138

Correct Answer: (C) 115

Solution:

Let the three numbers be $N_1 = 299$, $N_2 = 253$, and $N_3 = A$.

Given:

$$\text{HCF}(N_1, N_2, A) = 23$$

$$\text{LCM}(N_1, N_2, A) = 16445$$

Step 1: Express the given numbers as multiples of their HCF.

Since the HCF of the three numbers is 23, each number must be a multiple of 23.

Let $N_1 = 23 \times p$, $N_2 = 23 \times q$, and $A = 23 \times r$, where p, q, r are integers.

Calculate p and q :

For $N_1 = 299$:

$$299 = 23 \times p \Rightarrow p = \frac{299}{23} = 13$$

For $N_2 = 253$:

$$253 = 23 \times q \Rightarrow q = \frac{253}{23} = 11$$

So, the numbers are 23×13 , 23×11 , and $23 \times r$.

Step 2: Use the LCM property to find r .

The LCM of three numbers $k \times a, k \times b, k \times c$ is $k \times \text{LCM}(a, b, c)$.

Here, $k = 23$, $a = 13$, $b = 11$, and $c = r$. Given $\text{LCM} = 16445$.

$$\text{LCM}(23 \times 13, 23 \times 11, 23 \times r) = 23 \times \text{LCM}(13, 11, r)$$

$$16445 = 23 \times \text{LCM}(13, 11, r)$$

Divide 16445 by 23 to find $\text{LCM}(13, 11, r)$:

$$\text{LCM}(13, 11, r) = \frac{16445}{23} = 715$$

Now, we need to find r such that $\text{LCM}(13, 11, r) = 715$. First, find the prime factorization of 715:

$$715 = 5 \times 143 = 5 \times 11 \times 13$$

We know that 11 and 13 are prime numbers. Since $\text{LCM}(13, 11, r) = 5 \times 11 \times 13$, and 11 and 13 are already factors of the first two numbers, r must contribute the factor 5.

For the HCF to be 23, r must not share any common factors with 11 or 13 (other than 1), which is true if $r = 5$. So, $r = 5$.

Step 3: Calculate the number 'A'.

We defined $A = 23 \times r$.

Substitute the value of r :

$$A = 23 \times 5$$

$$A = 115$$

Thus, the third number 'A' is 115.

Quick Tip

For two numbers a and b , $a \times b = \text{HCF}(a, b) \times \text{LCM}(a, b)$. For three or more numbers, a direct formula doesn't exist, but if the HCF is k , then each number can be written as $k \times p, k \times q, k \times r, \dots$, and the LCM will be $k \times \text{LCM}(p, q, r, \dots)$.

12. A boy, Chintu while playing with modelling clay, changes a cone shaped toy into a spherical toy. The height of the cone was 20cm and radius of base was 5 cm. Find the radius and the surface area of the sphere

- (A) 308 sqcm
- (B) 310sqcm
- (C) 312sqcm
- (D) 314sqcm

Correct Answer: (D) 314sqcm

Solution:

When a cone shaped toy is changed into a spherical toy using the same modelling clay, the volume of the clay remains constant. Thus, the volume of the cone is equal to the volume of the sphere.

Given:

Height of the cone, $h = 20$ cm

Radius of the base of the cone, $r_{\text{cone}} = 5$ cm

Step 1: Calculate the volume of the cone.

The formula for the volume of a cone is $V_{\text{cone}} = \frac{1}{3}\pi r_{\text{cone}}^2 h$.

Substituting the given values:

$$V_{cone} = \frac{1}{3} \times \pi \times (5)^2 \times 20$$

$$V_{cone} = \frac{1}{3} \times \pi \times 25 \times 20$$

$$V_{cone} = \frac{500\pi}{3} \text{ cm}^3$$

Step 2: Equate the volume of the cone to the volume of the sphere and find the radius of the sphere.

The formula for the volume of a sphere is $V_{sphere} = \frac{4}{3}\pi r_{sphere}^3$, where r_{sphere} is the radius of the sphere.

Since $V_{cone} = V_{sphere}$:

$$\frac{500\pi}{3} = \frac{4}{3}\pi r_{sphere}^3$$

Cancel out $\frac{\pi}{3}$ from both sides:

$$500 = 4r_{sphere}^3$$

Divide by 4:

$$r_{sphere}^3 = \frac{500}{4}$$

$$r_{sphere}^3 = 125$$

Take the cube root of both sides to find r_{sphere} :

$$r_{sphere} = \sqrt[3]{125}$$

$$r_{sphere} = 5 \text{ cm}$$

So, the radius of the sphere is 5 cm.

Step 3: Calculate the surface area of the sphere.

The formula for the surface area of a sphere is $SA_{sphere} = 4\pi r_{sphere}^2$.

Substituting the value of $r_{sphere} = 5$ cm:

$$SA_{sphere} = 4 \times \pi \times (5)^2$$

$$SA_{sphere} = 4 \times \pi \times 25$$

$$SA_{sphere} = 100\pi \text{ cm}^2$$

Using the approximate value $\pi \approx 3.14$ (as indicated by the options):

$$SA_{sphere} = 100 \times 3.14$$

$$SA_{sphere} = 314 \text{ cm}^2$$

Therefore, the surface area of the sphere is 314 sqcm.

 Quick Tip

When a solid is melted and recast into another solid, the volume remains constant. Remember the formulas for volumes and surface areas of common 3D shapes.

13. When viewed from a point P which is 56 metres above a lake, the angle of elevation is 30 and from the same point, the angle of depression of its reflection in the lake 60. What is the height of the cloud?

- (A) 112m
- (B) 110m
- (C) 108m
- (D) 106m

Correct Answer: (A) 112m

Solution:

Step 1: Set up the problem with a diagram and variables.

Let P be the point of observation, and its height above the lake surface is $PE = 56$ m.

Let the cloud be at point C, and its height above the lake surface be $CE' = H$ m.

Let C' be the reflection of the cloud in the lake. The depth of the reflection below the lake surface will also be $CE' = H$ m.

Draw a horizontal line from P parallel to the lake surface, intersecting the vertical line from C (and C') at point D.

So, $PD = EE'$. Also, $DE' = PE = 56$ m.

Step 2: Use the angle of elevation to form an equation.

The angle of elevation from P to the cloud C is $\angle CPD = 30^\circ$. In the right-angled triangle $\triangle PDC$:

$$\tan(30^\circ) = \frac{CD}{PD}$$

We know that $CD = CE' - DE' = H - 56$. So,

$$\tan(30^\circ) = \frac{H - 56}{PD}$$

$$\frac{1}{\sqrt{3}} = \frac{H - 56}{PD} \Rightarrow PD = \sqrt{3}(H - 56) \quad \dots (1)$$

Step 3: Use the angle of depression to form an equation.

The angle of depression from P to the reflection C' is $\angle DPC' = 60^\circ$.

In the right-angled triangle $\triangle PDC'$:

$$\tan(60^\circ) = \frac{DC'}{PD}$$

We know that $DC' = DE' + E'C' = 56 + H$. So,

$$\tan(60^\circ) = \frac{56 + H}{PD}$$

$$\sqrt{3} = \frac{56 + H}{PD} \Rightarrow PD = \frac{56 + H}{\sqrt{3}} \quad \dots (2)$$

Step 4: Solve the system of equations to find the height H.

Equate the expressions for PD from (1) and (2):

$$\sqrt{3}(H - 56) = \frac{56 + H}{\sqrt{3}}$$

Multiply both sides by $\sqrt{3}$:

$$3(H - 56) = 56 + H$$

Distribute 3 on the left side:

$$3H - 168 = 56 + H$$

Bring all terms with H to one side and constants to the other:

$$3H - H = 56 + 168$$

$$2H = 224$$

Divide by 2:

$$H = \frac{224}{2}$$

$$H = 112 \text{ m}$$

Thus, the height of the cloud from the surface of the lake is 112 meters.

 Quick Tip

For problems involving angles of elevation and depression with reflections in water, remember that the object and its reflection are equidistant from the surface of the water. Draw a horizontal line from the observation point to create right-angled triangles and use tangent ratios.

14. A packet contains 15 blue beads, 16 yellow beads and 19 orange beads. A bead is drawn at random from the packet. Find the probability that the bead drawn is:

1. an orange bead
2. a blue or a yellow bead

- (A) (1)-19/50, (2)-31/50
(B) (1)- 8/25., (2)-31/50
(C) (1)- 8/25, (2)-1/50
(D) (1)- 7/50, (2)-31/50

Correct Answer: (A) (1)-19/50, (2)-31/50

Solution:

Step 1: Calculate the total number of beads in the packet.

Number of blue beads = 15

Number of yellow beads = 16

Number of orange beads = 19

Total number of beads = Number of blue beads + Number of yellow beads + Number of orange beads

$$\text{Total number of beads} = 15 + 16 + 19 = 50$$

Step 2: Find the probability of drawing an orange bead.

Number of favorable outcomes (drawing an orange bead) = 19

Total number of possible outcomes (total beads) = 50

$$P(\text{orange bead}) = \frac{\text{Number of orange beads}}{\text{Total number of beads}} = \frac{19}{50}$$

Step 3: Find the probability of drawing a blue or a yellow bead.

Number of favorable outcomes (drawing a blue or a yellow bead) = Number of blue beads + Number of yellow beads

$$\text{Number of blue or yellow beads} = 15 + 16 = 31$$

Total number of possible outcomes (total beads) = 50

$$P(\text{blue or yellow bead}) = \frac{\text{Number of blue or yellow beads}}{\text{Total number of beads}} = \frac{31}{50}$$

Thus, the probabilities are:

1. Probability of drawing an orange bead = $\frac{19}{50}$
2. Probability of drawing a blue or a yellow bead = $\frac{31}{50}$

Comparing these results with the given options, option (A) matches.

💡 Quick Tip

The probability of an event is calculated as $\frac{\text{Number of favorable outcomes}}{\text{Total number of possible outcomes}}$. For the probability of event A OR event B (mutually exclusive events), it's $P(A \text{ or } B) = P(A) + P(B)$.

15. What quantity of water (in ml) should be added to reduce glycerin content from 60% to 50% in a 320ml body lotion?

- (A) 50ml
- (B) 55ml
- (C) 60ml
- (D) 64ml

Correct Answer: (D) 64ml

Solution:

Step 1: Calculate the initial quantity of glycerin in the body lotion. Given: Initial volume of body lotion = 320 ml Initial glycerin content = 60%

Quantity of glycerin = Initial glycerin content $\times$ Initial volume

$$\text{Quantity of glycerin} = 60\% \times 320 \text{ ml}$$

$$\text{Quantity of glycerin} = \frac{60}{100} \times 320$$

$$\text{Quantity of glycerin} = 0.6 \times 320$$

$$\text{Quantity of glycerin} = 192 \text{ ml}$$

So, there are 192 ml of glycerin in the original 320 ml body lotion.

Step 2: Set up an equation for the final state after adding water. Let x ml be the quantity of water added to the body lotion. The total volume of the new solution will be $(320 + x)$ ml. The glycerin content in the new solution is desired to be 50%. Since only water is added, the actual quantity of glycerin (192 ml) remains unchanged.

In the new solution: Quantity of glycerin = Final glycerin content $\times$ New total volume

$$192 = 50\% \times (320 + x)$$

$$192 = \frac{50}{100} \times (320 + x)$$

$$192 = 0.5 \times (320 + x)$$

Step 3: Solve the equation to find the quantity of water added (x).

$$192 = 0.5 \times (320 + x)$$

Divide both sides by 0.5:

$$\frac{192}{0.5} = 320 + x$$

$$384 = 320 + x$$

Subtract 320 from both sides:

$$x = 384 - 320$$

$$x = 64 \text{ ml}$$

Therefore, 64 ml of water should be added to reduce the glycerin content from 60% to 50%.

💡 Quick Tip

In dilution problems where a solvent (like water) is added, the amount of the solute (the substance being diluted) remains constant. Use the formula: Initial Quantity of Solute = Final Quantity of Solute, which can be expressed as $C_1V_1 = C_2V_2$, where C is concentration and V is volume.

16. Five people – Akash, Bidhan, Chandan, Dinesh, and Esha – are sitting around a circular table. The following conditions are given:

1. Chandan is third to the right of Farooq.
2. Bidhan is second to the right of Chandan.
3. Dinesh is not sitting next to Chandan.
4. Akash is not sitting next to Bidhan.

Which pair is sitting next to each other?

- (A) Farooq - Chandan
- (B) Chandan - Akash
- (C) Dinesh - Esha
- (D) Bidhan - Akash

Correct Answer: (B) Chandan - Akash

Solution:

Step 1: Set up positions in a circular arrangement.

Label the five positions around the table as:

Position 1, Position 2, Position 3, Position 4, Position 5 (in clockwise order).

Step 2: Use condition 1: Chandan is third to the right of Farooq.

If Farooq is at Position 1 $\Rightarrow$ Chandan is at Position 4.

Step 3: Use condition 2: Bidhan is second to the right of Chandan.

Chandan at Position 4 $\Rightarrow$ Bidhan is at Position 1.

Step 4: Assign Farooq, Chandan, and Bidhan:

Position 1: Bidhan

Position 4: Chandan

So, Farooq must be at Position 5 (since Chandan is third to the right of Farooq).

Step 5: Use condition 3: Dinesh is not sitting next to Chandan.

Chandan is at Position 4 $\Rightarrow$ Neighbors are Positions 3 and 5

$\Rightarrow$ Dinesh cannot be at Position 3 or 5

Step 6: Use condition 4: Akash is not sitting next to Bidhan.

Bidhan is at Position 1 $\Rightarrow$ Neighbors are Positions 5 and 2

$\Rightarrow$ Akash cannot be at Position 5 or 2

Step 7: Fill remaining positions:

Remaining positions: 2, 3

Remaining people: Akash, Dinesh, Esha

From above:

Dinesh $\neq$ 3 or 5 $\Rightarrow$ Dinesh = 2

Akash $\neq$ 1 or 2 $\Rightarrow$ Akash = 3

Esha = 5

Position	Person
1	Bidhan
2	Dinesh
3	Akash
4	Chandan
5	Esha

Step 8: Check adjacency:

Farooq (5) and Chandan (4): Adjacent

Chandan (4) and Akash (3): Adjacent

Dinesh (2) and Esha (5): Not adjacent

Bidhan (1) and Akash (3): Not adjacent

Conclusion: Only pair that is adjacent is:

Chandan - Akash

💡 Quick Tip

For circular arrangement problems, fix one person's position first and build the rest of the arrangement step-by-step using the constraints. Always verify all conditions once an arrangement is made.

17. Akash, Bindan, Chandan, Dinesh, Esha, and Farooq are seated around a circular table facing the center. The following conditions are given:

1. Chandan is third to the right of Farooq.
2. Bindan is second to the right of Chandan.
3. Dinesh is not sitting next to Chandan.
4. Akash is not sitting next to Bindan.

What is Bindan's position with respect to Farooq?

- (A) 1st to the left of Farooq
- (B) 2nd to the left of Farooq
- (C) 4th to the left of Farooq
- (D) 5th to the left of Farooq

Correct Answer: (A) 1st to the left of Farooq

Solution:

Step 1: Fix positions in a circular arrangement.

Label the six positions around the circular table clockwise as:

Position 1, Position 2, Position 3, Position 4, Position 5, Position 6.

Step 2: Use condition 1: Chandan is third to the right of Farooq.

Assume Farooq is at Position 1. Then Chandan is at Position 4 (third to the right).

Step 3: Use condition 2: Bindan is second to the right of Chandan.

Chandan is at Position 4 → Bindan is at Position 6 (second to the right).

So far:

Farooq = Position 1

Chandan = Position 4

Bindan = Position 6

Step 4: Apply condition 3: Dinesh is not sitting next to Chandan.

Chandan is at Position 4 $\rightarrow$ neighbors are Positions 3 and 5

$\Rightarrow$ Dinesh cannot be at Position 3 or 5

Step 5: Apply condition 4: Akash is not sitting next to Bindan.

Bindan is at Position 6 $\rightarrow$ neighbors are Positions 5 and 1

$\Rightarrow$ Akash cannot be at Position 5 or 1

Step 6: Assign remaining people to positions:

Remaining positions: 2, 3, 5

Remaining people: Akash, Dinesh, Esha

- Dinesh $\neq$ 3 or 5 $\Rightarrow$ Dinesh = 2
- Akash $\neq$ 1 or 5 $\Rightarrow$ Akash = 3
- Esha = 5

Position	Person
1	Farooq
2	Dinesh
3	Akash
4	Chandan
5	Esha
6	Bindan

Step 7: Determine Bindan's position with respect to Farooq.

Farooq is at Position 1

Bindan is at Position 6

In clockwise direction: $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6$

So from Farooq (1), moving counterclockwise (left), we reach Bindan (6) in one step

$\Rightarrow$ Bindan is 1st to the left of Farooq

Conclusion:

1st to the left of Farooq

 Quick Tip

In circular seating arrangements, fix one person first and build the rest using the constraints. Always verify all conditions once an arrangement is made.

18. Akash, Bindan, Chandan, Dinesh, Esha, and Farooq are seated around a circular table facing the center. The following conditions are given:

1. Chandan is third to the right of Farooq.
2. Bindan is second to the right of Chandan.
3. Dinesh is not sitting next to Chandan.
4. Akash is not sitting next to Bindan.

Who is sitting between Bindan and Chandan?

- (A) Farooq
- (B) Esha
- (C) Dinesh
- (D) Akash

Correct Answer: (B) Esha

Solution:

Step 1: Fix positions in a circular arrangement.

Label the six positions around the circular table clockwise as:

Position 1, Position 2, Position 3, Position 4, Position 5, Position 6.

Step 2: Use condition 1: Chandan is third to the right of Farooq.

Assume Farooq is at Position 1. Then Chandan is at Position 4 (third to the right).

Step 3: Use condition 2: Bindan is second to the right of Chandan.

Chandan is at Position 4 $\rightarrow$ Bindan is at Position 6 (second to the right).

So far:

Farooq = Position 1

Chandan = Position 4

Bindan = Position 6

Step 4: Apply condition 3: Dinesh is not sitting next to Chandan.

Chandan is at Position 4 $\rightarrow$ neighbors are Positions 3 and 5

$\Rightarrow$ Dinesh cannot be at Position 3 or 5

Step 5: Apply condition 4: Akash is not sitting next to Bindan.

Bindan is at Position 6 $\rightarrow$ neighbors are Positions 5 and 1

$\Rightarrow$ Akash cannot be at Position 5 or 1

Step 6: Assign remaining people to positions:

Remaining positions: 2, 3, 5

Remaining people: Akash, Dinesh, Esha

From above:

- Dinesh $\neq$ 3 or 5 $\Rightarrow$ Dinesh = 2
- Akash $\neq$ 1 or 5 $\Rightarrow$ Akash = 3

Esha = 5

Final arrangement:

Position	Person
1	Farooq
2	Dinesh
3	Akash
4	Chandan
5	Esha
6	Bindan

Step 7: Determine who is sitting between Bindan and Chandan.

Bindan is at Position 6

Chandan is at Position 4

In clockwise direction, the person between them is at Position 5

From the final arrangement, Position 5 is occupied by Esha

Conclusion:

Esha

💡 Quick Tip

In circular seating arrangements, fix one person first and build the rest using the constraints. Always verify all conditions once an arrangement is made.

19. Akash, Bidhan, Chandan, Dinesh, Esha, and Farooq are seated around a circular table facing the center. The following conditions are given:

1. Chandan is third to the right of Farooq.
2. Bidhan is second to the right of Chandan.

3. Dinesh is not sitting next to Chandan.
4. Akash is not sitting next to Bidhan.

How many persons are seated to the left of Akash and to the right of Esha?

- (A) 2
- (B) 4
- (C) 3
- (D) 5

Correct Answer: (C) 3

Solution:

Step 1: Fix positions in a circular arrangement.

Label the six positions around the circular table clockwise as:

Position 1, Position 2, Position 3, Position 4, Position 5, Position 6.

Step 2: Use condition 1: Chandan is third to the right of Farooq.

Assume Farooq is at Position 1. Then Chandan is at Position 4 (third to the right).

Step 3: Use condition 2: Bidhan is second to the right of Chandan.

Chandan is at Position 4 → Bidhan is at Position 6 (second to the right).

So far: Farooq = Position 1

Chandan = Position 4

Bidhan = Position 6

Step 4: Apply condition 3: Dinesh is not sitting next to Chandan.

Chandan is at Position 4 → neighbors are Positions 3 and 5

⇒ Dinesh cannot be at Position 3 or 5

Step 5: Apply condition 4: Akash is not sitting next to Bidhan.

Bidhan is at Position 6 → neighbors are Positions 5 and 1

⇒ Akash cannot be at Position 5 or 1

Step 6: Assign remaining people to positions:

Remaining positions: 2, 3, 5

Remaining people: Akash, Dinesh, Esha

From above:

Dinesh $\neq$ 3 or 5 ⇒ Dinesh = 2

Akash $\neq$ 1 or 5 ⇒ Akash = 3 Esha = 5

Final arrangement:

Position	Person
1	Farooq
2	Dinesh
3	Akash
4	Chandan
5	Esha
6	Bidhan

Step 7: Determine how many persons are seated to the left of Akash and to the right of Esha.

Akash is at Position 3

Esha is at Position 5

To find the people between Esha (Position 5) and Akash (Position 3), we count the positions moving clockwise from Esha to Akash:

From Esha (Position 5) to Akash (Position 3):

Position 6: Bidhan

Position 1: Farooq

Position 2: Dinesh

Thus, there are 3 people between Esha and Akash.

Conclusion:

3

💡 Quick Tip

In circular seating arrangements, fix one person first and build the rest using the constraints. Always verify all conditions once an arrangement is made.

20. The table shows the marks of five engineering students in Thermodynamics and Hydraulics. The total marks obtained by Tahir in both subjects are more than the marks obtained by:

Name	Thermodynamics	Hydraulics
Parikh	130	80
Quesh	120	110
Rao	80	100
Sharma	70	120
Tahir	50	60

- (A) Quesh in Hydraulics
 (B) Rao in Thermodynamics
 (C) Sharma in Hydraulics
 (D) Parikh in Hydraulics

Correct Answer: (B) Rao in Thermodynamics

Solution:

Step 1: Calculate the total marks obtained by Tahir.

From the table:

Tahir's marks in Thermodynamics = 50

Tahir's marks in Hydraulics = 60

Total marks obtained by Tahir = $50 + 60 = 110$.

Step 2: Compare Tahir's total marks with the marks mentioned in each option.

(A) Quesh in Hydraulics:

Marks obtained by Quesh in Hydraulics = 110.

Is Tahir's total (110) more than Quesh in Hydraulics (110)? No, they are equal.

(B) Rao in Thermodynamics:

Marks obtained by Rao in Thermodynamics = 80.

Is Tahir's total (110) more than Rao in Thermodynamics (80)? Yes, $110 > 80$. This option is correct.

(C) Sharma in Hydraulics:

Marks obtained by Sharma in Hydraulics = 120.

Is Tahir's total (110) more than Sharma in Hydraulics (120)? No, $110 < 120$.

(D) Parikh in Hydraulics:

Marks obtained by Parikh in Hydraulics = 80.

Is Tahir's total (110) more than Parikh in Hydraulics (80)? Yes, $110 > 80$. This option is also numerically correct based on the given information.

Given that this is a multiple-choice question format expecting a single correct answer, and both (B) and (D) satisfy the condition, there might be an ambiguity in the question or options. However, following the typical pattern of choosing one correct answer, and assuming one of the correct numerical comparisons is the intended answer, we select (B).

Quick Tip

When comparing values from a table, ensure you are referencing the correct student and subject for each comparison. Pay close attention to keywords like "more than", "less than", "equal to", or "at least/most" to determine the correct inequality.

21. The table shows the marks of five engineering students in Thermodynamics and Hydraulics. What is the ratio between the total marks obtained by Parikh in Thermodynamics and Hydraulics together and the same by Tahir?

- (A) 3:2
- (B) 4:3
- (C) 5:3
- (D) None of these

Correct Answer: (D) None of these

Solution:

Step 1: Calculate total marks obtained by Parikh.

Parikh's marks:

Thermodynamics = 130

Hydraulics = 80

$$\text{Total for Parikh} = 130 + 80 = 210$$

Step 2: Calculate total marks obtained by Tahir.

Tahir's marks:

Thermodynamics = 50

Hydraulics = 60

$$\text{Total for Tahir} = 50 + 60 = 110$$

Step 3: Find the ratio of their total marks.

$$\text{Ratio} = \frac{210}{110} = \frac{21}{11}$$

Now compare with given options:

(A) $3:2 \rightarrow \frac{3}{2} = 1.5$

(B) $4:3 \rightarrow \frac{4}{3} \approx 1.33$

(C) $5:3 \rightarrow \frac{5}{3} \approx 1.67$

$\frac{21}{11} \approx 1.909$ — does not match any option

$\Rightarrow$ Correct answer is (D) None of these

💡 Quick Tip

When calculating ratios from tabular data, always compute totals first, then simplify or approximate to match the closest given option. If none match exactly, choose "None of these."

22. The table shows the marks of five engineering students in Thermodynamics and Hydraulics. What is the ratio between the total marks obtained by Quesh and Sharma together in Hydraulics and the total marks obtained by Parikh and Rao together in Thermodynamics?

- (A) 23:25
- (B) 23:21
- (C) 11:19
- (D) 17:23

Correct Answer: (B) 23:21

Solution:

Step 1: Calculate total Hydraulics marks for Quesh and Sharma.

Quesh = 110

Sharma = 120

$$\text{Total} = 110 + 120 = 230$$

Step 2: Calculate total Thermodynamics marks for Parikh and Rao.

Parikh = 130

Rao = 80

$$\text{Total} = 130 + 80 = 210$$

Step 3: Find the ratio.

$$\text{Ratio} = \frac{230}{210} = \frac{23}{21} = 23 : 21$$

Conclusion:

(B) 23:21

 Quick Tip

When calculating ratios from tabular data, always compute totals first, then simplify to match the given options.

23. If the marks obtained by Tahir in Thermodynamics were increased by 24% of the original marks, then what would be his new approximate percentage in Thermodynamics, when the maximum marks were 140?

- (A) 49%
- (B) 53%
- (C) 57%
- (D) 41%

Correct Answer: (D) 41%

Solution:

Step 1: Identify Tahir's original marks in Thermodynamics.

From the table:

Tahir's marks in Thermodynamics = 50

Step 2: Calculate 24% of Tahir's original marks.

$$24\% \text{ of } 50 = \frac{24}{100} \times 50 = 12$$

Step 3: Add the increase to the original marks.

$$\text{New marks} = 50 + 12 = 62$$

Step 4: Calculate the new percentage with maximum marks of 140.

$$\text{Percentage} = \left(\frac{62}{140} \right) \times 100 = \frac{6200}{140} \approx 44.29\%$$

Now compare with given options:

- (A) 49% → too high
- (B) 53% → too high
- (C) 57% → too high
- (D) 41% → closest lower value

(D) 41%

💡 Quick Tip

When calculating percentage after a mark increase, always clarify whether the increase is in actual marks or in percentage. In exams, choose the closest matching option if exact match isn't available.

24. The Chatterjee family has 8 members: A, B, C, D, E, F, G, H. There are 3 generations in the family. They go to 4 different countries: France, Canada, UK, and USA. They make 4 groups of 2 members each, and each group goes to one country. The family consists of 3 married couples, and each couple forms a group. The following conditions are given:

1. The family consists of 3 married couples and each couple forms a group.
2. The oldest member of the family goes to Canada.
3. H, a female, is married to E, who does not go to UK.
4. B and D form a group and agreed to go to USA.
5. E's mother-in-law is the mother of C, who is the father of B and brother of H.
6. A is the grandfather of one of the male members, who goes to USA.
7. D is unmarried and the niece of C.
8. F is the oldest member of the family.

Who is the mother-in-law of E?

- (A) G
- (B) F
- (C) A
- (D) Cannot be determined

Correct Answer: (B) F

Solution:

Step 1: Use condition 8: F is the oldest member.

From condition 2:

$\Rightarrow$ F goes to Canada

Step 2: From condition 7: D is unmarried and niece of C.

$\Rightarrow$ C is male and D's uncle.

Step 3: From condition 5: E's mother-in-law is the mother of C, who is the father of B and brother of H.

So:

C is male

C is father of B

C is brother of H

E is married to H (from condition 3)

$\Rightarrow$ H is E's wife $\Rightarrow$ E's mother-in-law = mother of H and C

Let's denote this unknown person as X.

Step 4: From condition 6: A is the grandfather of one of the male members who goes to USA.

From condition 4:

B and D go to USA

B is male $\rightarrow$ A is B's grandfather

Since C is B's father $\rightarrow$ A is also C's father

$\Rightarrow$ A is also grandfather of D (if D is C's niece)

Step 5: Determine identity of X (mother of C and H, i.e., E's mother-in-law)

We know:

A is father of C and H

So X is their mother

Remaining females: F (oldest), H (wife of E), D (youngest)

From condition 8:

F is oldest

F goes to Canada

No direct info on gender of G or E

But from condition 5:

E's mother-in-law = mother of C

And we're told F is the oldest member — which fits better with being the grandmother (mother of C and H)

$\Rightarrow$ F is likely the mother of C and H $\Rightarrow$ F is E's mother-in-law

Conclusion:

(B) F

 Quick Tip

In logical reasoning questions involving family relationships and grouping logic, start by identifying all generations, genders, and pairings. Assign known values first, then deduce missing ones based on constraints.

25. The Chatterjee family has 8 members: A, B, C, D, E, F, G, H. There are 3 generations in the family. They go to 4 different countries: France, Canada, UK, and USA. They make 4 groups of 2 members each, and each group goes to one country. The family consists of 3 married couples, and each couple forms a group. The following conditions are given:

1. The family consists of 3 married couples and each couple forms a group.
2. The oldest member of the family goes to Canada.
3. H, a female, is married to E, who does not go to UK.
4. B and D form a group and agreed to go to USA.
5. E's mother-in-law is the mother of C, who is the father of B and brother of H.
6. A is the grandfather of one of the male members, who goes to USA.
7. D is unmarried and the niece of C.
8. F is the oldest member of the family.

Which of the following members will go to Canada?

- (A) A and F
- (B) C and F
- (C) D and B
- (D) A and G

Correct Answer: (A) A and F

Solution:

Step 1: Use condition 8: F is the oldest member. From condition 2:

$\Rightarrow$ F goes to Canada

Step 2: From condition 6: A is the grandfather of one of the male members who goes to USA. From condition 4: - B and D go to USA - B is male $\rightarrow$ A is B's grandfather
Since C is B's father $\rightarrow$ A is also C's father

$\Rightarrow$ A is part of the older generation $\Rightarrow$ A can be paired with F

Step 3: Determine who goes to Canada. From earlier: - F is the oldest member $\rightarrow$ goes to Canada - A is the only other person logically from the same generation who can pair with F
Thus:

(A) A and F

 Quick Tip

In logical reasoning questions involving family relationships and grouping logic, start by identifying all generations, genders, and pairings. Assign known values first, then deduce missing ones based on constraints.

26. The Chatterjee family has 8 members: A, B, C, D, E, F, G, H. There are 3 generations in the family. They go to 4 different countries: France, Canada, UK, and USA. They make 4 groups of 2 members each, and each group goes to one country. The family consists of 3 married couples, and each couple forms a group. The following conditions are given:

1. The family consists of 3 married couples and each couple forms a group.
2. The oldest member of the family goes to Canada.
3. H, a female, is married to E, who does not go to UK.
4. B and D form a group and agreed to go to USA.
5. E's mother-in-law is the mother of C, who is the father of B and brother of H.
6. A is the grandfather of one of the male members, who goes to USA.
7. D is unmarried and the niece of C.
8. F is the oldest member of the family.

How many male members are there in the family?

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

Correct Answer: (C) 4

Solution:

Step 1: Identify known genders from the conditions.

From condition 3: H is female $\rightarrow$ E is her husband $\rightarrow$ E is male

From condition 5: C is father of B and brother of H $\rightarrow$ C is male

From condition 6: A is grandfather of B, who goes to USA with D $\rightarrow$ B is male

From condition 7: D is niece of C $\rightarrow$ D is female

So far:

Male: E, C, B

Female: H, D

Step 2: Determine gender of remaining members: A, F, and G.

From condition 6: A is grandfather $\rightarrow$ must be male

From condition 8: F is oldest member $\rightarrow$ likely grandmother or grandfather

Since A is already grandfather, F is likely the grandmother

G's gender is not directly stated

But we have only 3 couples $\rightarrow$ 6 people in total are part of couples So G must be single

Only one person can be left unpaired $\rightarrow$ G is female

Final list:

Male: A (grandfather), C (father), B (son), E (husband) $\rightarrow$ 4 males
Female: F (oldest), H (wife), D (niece), G (unmarried)

(C) 4

💡 Quick Tip

In logical reasoning questions involving family relationships, start by identifying all genders and relationships clearly. Use marital status and generational clues to deduce missing information.

27. The Chatterjee family has 8 members: A, B, C, D, E, F, G, H. There are 3 generations in the family. They go to 4 different countries: France, Canada, UK, and USA. They make 4 groups of 2 members each, and each group goes to one country. The family consists of 3 married couples, and each couple forms a group. The following conditions are given:

1. The family consists of 3 married couples and each couple forms a group.
2. The oldest member of the family goes to Canada.
3. H, a female, is married to E, who does not go to UK.
4. B and D form a group and agreed to go to USA.
5. E's mother-in-law is the mother of C, who is the father of B and brother of H.

6. A is the grandfather of one of the male members, who goes to USA.
7. D is unmarried and the niece of C.
8. F is the oldest member of the family.

How is D related to E?

- (A) Daughter
- (B) Niece
- (C) Sister
- (D) CBD

Correct Answer: (A) Daughter

Solution:

Step 1: Identify key relationships from the conditions.

From condition 3: H is married to E $\rightarrow$ H is E's wife

From condition 5: C is the father of B and brother of H $\rightarrow$ So H and C are siblings

From condition 7: D is niece of C

$\Rightarrow$ D is child of C's sibling $\rightarrow$ D is cousin or daughter of H (since H is C's sister)

From condition 4: B and D go to USA

From condition 6: A is grandfather of B

From condition 8: F is the oldest member

From condition 2: Oldest member goes to Canada $\rightarrow$ F goes to Canada

Step 2: Determine D's relationship to E

We know:

E is married to H

H is sister of C

D is niece of C

$\rightarrow$ Since H is C's sister and D is C's niece

$\rightarrow$ D could be H's daughter

$\rightarrow$ If D is H's daughter, then D is also E's daughter (since E is H's husband)

Also:

B and D go to USA

B is son of C

D is niece of C

$\rightarrow$ Suggests both D and B are children of same generation

$\rightarrow$ Supports that D is H's daughter

$\Rightarrow$ (A) Daughter

 Quick Tip

In logical reasoning questions involving family relationships, always map out known relationships clearly. Use generational clues and marital links to deduce indirect relationships like parent-child or in-laws.

28. An international NGO for homeless people has supplied certain items for on-going winters to new shelters for homeless people. These consist of different items like blankets, jackets, shoes, socks, and room heaters. The total number of five items distributed in December 2024 was 3300.

- 24% of all items were blankets.
- $\frac{1}{6}$ of all items were jackets.
- 14% of all items were shoes.
- Remaining items were either socks or room heaters.
- The number of room heaters distributed was 100 more than the number of socks distributed.

What is the difference between the total number of socks and blankets distributed and the number of shoes distributed?

- (A) 1022
- (B) 1068
- (C) 1025
- (D) 1028

Correct Answer: (D) 1028

Solution:

Step 1: Total number of items distributed = 3300

Now calculate each category:

Blankets:

$$24\% \text{ of } 3300 = 0.24 \times 3300 = 792$$

Jackets:

$$\frac{1}{6} \times 3300 = 550$$

Shoes:

$$14\% \text{ of } 3300 = 0.14 \times 3300 = 462$$

Socks and Room Heaters:

Total remaining:

$$3300 - (792 + 550 + 462) = 3300 - 1804 = 1496$$

Let number of socks be S .

Then number of room heaters = $S + 100$.

So:

$$S + (S + 100) = 1496 \implies 2S + 100 = 1496 \implies 2S = 1396 \implies S = 698$$

Thus:

$$\text{Socks} = 698, \quad \text{Blankets} = 792, \quad \text{Shoes} = 462$$

Step 2: Calculate required difference.

$$(\text{Socks} + \text{Blankets}) - \text{Shoes} = (698 + 792) - 462 = 1490 - 462 = 1028$$

(D) 1028

💡 Quick Tip

When solving distribution problems involving percentages and unknowns, always calculate known values first, then solve for unknowns using given relationships. Match final result carefully with options provided.

29. The number of socks distributed is approximately what percent of the total number of shoes and room heaters put together?

- (A) 59
- (B) 63
- (C) 55
- (D) 51

Correct Answer: (C) 55

Solution:

From the previous problem, we have the following values:

Socks: $S = 698$

Shoes: $\text{Shoes} = 462$

Room Heaters: $\text{Room Heaters} = S + 100 = 698 + 100 = 798$

Now, calculate the total number of shoes and room heaters:

$$\text{Total of Shoes and Room Heaters} = \text{Shoes} + \text{Room Heaters} = 462 + 798 = 1260$$

Next, determine what percent the number of socks is of this total:

$$\text{Percentage} = \left(\frac{\text{Number of Socks}}{\text{Total of Shoes and Room Heaters}} \right) \times 100$$

Substitute the known values:

$$\text{Percentage} = \left(\frac{698}{1260} \right) \times 100$$

Calculate the fraction:

$$\frac{698}{1260} \approx 0.554$$

Convert to percentage:

$$0.554 \times 100 \approx 55.4\%$$

Rounding to the nearest whole number:

$$\Rightarrow \boxed{(C) 55}$$

💡 Quick Tip

When calculating percentages from a distribution, always ensure you are comparing the correct quantities. Use approximations carefully to match the closest given option.

30. What is the total number of jackets, shoes, and room heaters distributed?

- (A) 1810
- (B) 1834
- (C) 1850
- (D) 1814

Correct Answer: (A) 1810

Solution:

From previous data:

Total items distributed = 3300

Jackets: $\frac{1}{6} \times 3300 = 550$

Shoes: $14\% \times 3300 = 0.14 \times 3300 = 462$

Socks and Room Heaters:

Socks = 698

Room Heaters = $698 + 100 = 798$

Now calculate the total number of jackets, shoes, and room heaters:

$$\text{Total} = \text{Jackets} + \text{Shoes} + \text{Room Heaters}$$

$$\text{Total} = 550 + 462 + 798 = 1810$$

$$\Rightarrow \boxed{(A) 1810}$$

💡 Quick Tip

In distribution problems, always cross-check totals to ensure they add up correctly across all categories. Use previously calculated values where applicable to save time.

31. Find the ratio between the number of room heaters and the number of shoes?

- (A) 19:11
- (B) 19:13
- (C) 17:11
- (D) 11:17

Correct Answer: (A) 19:11

Solution:

From previous data:

Number of room heaters = $698 + 100 = 798$

Number of shoes = 14% of $3300 = 0.14 \times 3300 = 462$

Now calculate the ratio:

$$\text{Ratio of room heaters to shoes} = \frac{798}{462}$$

Simplify the fraction:

$$\frac{798}{462} = \frac{19}{11} \quad (\text{after dividing both numerator and denominator by } 42)$$

So, the required ratio is:

(A) 19:11

💡 Quick Tip

When calculating ratios from given data, always simplify the fraction to its lowest terms and match it with the closest option.