ATMA Quantitative Skills
Sample Paper – 2

Duration: 60 Minutes **Maximum Marks: 60**

Instructions

- This paper contains **60** Multiple Choice Questions (Single Correct Answer) arranged in **two parts (Part I and Part II)**, modelled on the Quantitative Skills section of the **ATMA** (AIMS Test for Management Admissions) entrance.
- Each correct answer carries **+1 mark**. Each incorrect answer carries **a penalty of** 0.25 **mark**; unattempted questions carry **0** marks.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Quantitative aptitude (arithmetic, algebra, geometry, modern maths, data interpretation)**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Part I: Quantitative Skills

Q1. The number $\overline{53x2}$, where x is a single digit, is divisible by 9. What is the value of x?

(A) 6

(B) 7

(C) 8

(D) 9

Q2. The HCF of two numbers is 11 and their LCM is 7700. If one of the numbers is 275, what is the other number?

(A) 264

(B) 308

(C) 352

(D) 396

Q3. The price of a commodity rose by 25%. By what percentage must a household cut its consumption so that the total expenditure on it remains unchanged?

(A) 25%

(B) 15%

(C) 20%

(D) 30%

Q4. In an election between two candidates, the winner secured 58% of the valid votes and won by $4{,}800$ votes. What was the total number of valid votes?

(A) $30{,}000$

(B) $28{,}000$

(C) $32{,}000$

(D) $24{,}000$

Q5. A started a business with Rs. $45{,}000$. After 4 months B joined with Rs. $60{,}000$. At the end of the year, the total profit was Rs. $34{,}000$. What is B's share of the profit?

(A) Rs. $18{,}000$

(B) Rs. $16{,}000$

(C) Rs. $14{,}000$

(D) Rs. $20{,}000$

Q6. The average age of a class of 30 students is 14 years. When the teacher's age is included, the average rises by 1 year. What is the teacher's age (in years)?

(A) 40

(B) 44

(C) 45

(D) 46

Q7. A shopkeeper marks his goods 40% above cost price and then allows a discount of 25% on the marked price. What is his profit percentage?

(A) 8%

(B) 5%

(C) 10%

(D) 15%

Q8. By selling an article for Rs. 960, a man incurs a loss of 20%. At what price should he sell it to gain 20%?

(A) Rs. $1{,}152$

(B) Rs. $1{,}200$

(C) Rs. $1{,}380$

(D) Rs. $1{,}440$

Q9. What is the compound interest on Rs. $8{,}000$ at 10% per annum for 2 years, compounded annually?

(A) Rs. $1{,}600$

(B) Rs. $1{,}640$

(C) Rs. $1{,}680$

(D) Rs. $1{,}720$

Q10. A train 180 m long crosses a platform 270 m long in 30 seconds. What is the speed of the train (in km/h)?

(A) 48

(B) 54

(C) 60

(D) 45

Q11. A boat goes 24 km downstream in 3 hours and the same distance upstream in 4 hours. What is the speed of the stream (in km/h)?

(A) 1

(B) 2

(C) 3

(D) 1.5

Q12. A can do a piece of work in 12 days and B in 18 days. They work together for 3 days, after which A leaves. In how many more days will B finish the remaining work?

(A) 8.5

(B) 9

(C) 10.5

(D) 11

Q13. Two pipes A and B can fill a tank in 20 minutes and 30 minutes respectively. If both pipes are opened together, how long (in minutes) will it take to fill the tank?

(A) 10

(B) 12

(C) 15

(D) 25

Q14. The sum of the roots of a quadratic equation is 7 and the product of its roots is 12. Which of the following is that equation?

(A) $x^2 + 7x + 12 = 0$

(B) $x^2 - 7x - 12 = 0$

(C) $x^2 + 7x - 12 = 0$

(D) $x^2 - 7x + 12 = 0$

Q15. Solve for x and y: $2x + 3y = 14$ and $4x - 3y = 10$. What is the value of $x + y$?

(A) 4

(B) 5

(C) 6

(D) 7

Q16. Find the number of positive integer values of x that satisfy the inequality $3x - 7 < 2x + 5$.

(A) 11

(B) 12

(C) 10

(D) 13

Q17. The 5th term of an arithmetic progression is 17 and the 9th term is 33. What is the sum of the first 10 terms?

(A) 190

(B) 200

(C) 210

(D) 180

Q18. In how many ways can the letters of the word “LEADER” be arranged?

(A) 720

(B) 120

(C) 360

(D) 240

Q19. A committee of 3 members is to be chosen from 5 men and 4 women so that the committee has at least one woman. In how many ways can this be done?

(A) 64

(B) 74

(C) 84

(D) 60

Q20. Two dice are thrown together. What is the probability that the sum of the numbers appearing on them is 8?

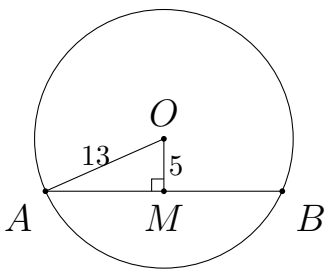
(A) $\frac{1}{6}$

(B) $\frac{1}{9}$

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

(D) $\frac{5}{36}$

Q21. In the figure, O is the centre of the circle and AB is a chord. The radius $OA = 13$ cm and the perpendicular distance OM from the centre to the chord is 5 cm. What is the length of the chord AB?



(A) 20 cm

(B) 26 cm

(C) 24 cm

(D) 12 cm

Q22. The angles of a triangle are in the ratio $2 : 3 : 4$. What is the measure of the largest angle?

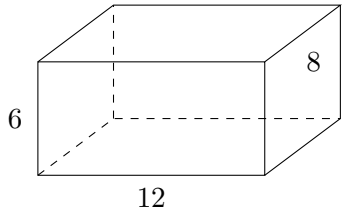
(A) 90°

(B) 80°

(C) 70°

(D) 60°

Q23. A solid cuboidal box has length 12 cm, breadth 8 cm and height 6 cm, as shown. What is its total surface area?



(A) 376 cm^2

(B) 396 cm^2

(C) 412 cm^2

(D) 432 cm^2

Q24. The circumference of a circle is 44 cm. What is its area? (Take $\pi = \frac{22}{7}$.)

(A) 154 cm^2

(B) 144 cm^2

(C) 616 cm^2

(D) 176 cm^2

Q25. If $\log_2 x + \log_2 8 = 5$, what is the value of x?

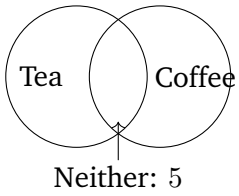
(A) 2

(B) 4

(C) 8

(D) 16

Q26. In a group of 60 people, 35 like tea and 30 like coffee, while 5 like neither. How many people like both tea and coffee?



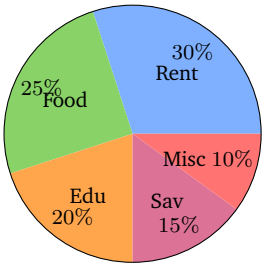
(A) 5

(B) 8

(C) 10

(D) 12

Q27. **Directions (Q27–Q29):** The pie chart shows how a family with a monthly income of Rs. 48,000 distributes its spending across five heads. Study the chart and answer the questions.



Q27. How much does the family spend on Rent each month?

(A) Rs. 14,400

(B) Rs. 12,000

(C) Rs. 9,600

(D) Rs. $7{,}200$

Q28. (Refer to the pie chart above.) By how much does the monthly expenditure on Food exceed that on Savings?

(A) Rs. $2{,}400$

(B) Rs. $3{,}600$

(C) Rs. $5{,}600$

(D) Rs. $4{,}800$

Q29. (Refer to the pie chart above.) The central angle of the sector representing Education is:

(A) 54°

(B) 72°

(C) 90°

(D) 36°

Q30. **Data Sufficiency:** What is the two-digit number?

Statement I: The sum of its digits is 9.

Statement II: The number is divisible by 9 and the difference between its digits is 5.

Choose the correct option about which statement(s) suffice to determine the number uniquely.

(A) Statement I alone is sufficient.

(B) Statement II alone is sufficient.

(C) Both statements together are needed, but neither alone suffices.

(D) The number cannot be uniquely determined even using both.

Part II: Quantitative Skills

Q31. What is the remainder when 7^{83} is divided by 5?

(A) 1

(B) 3

(C) 2

(D) 4

Q32. The product of two consecutive even integers is 168. What is the larger of the two integers?

(A) 12

(B) 16

(C) 10

(D) 14

Q33. A's salary is 20% less than B's salary. By what percentage is B's salary more than A's salary?

(A) 25%

(B) 20%

(C) 30%

(D) 15%

Q34. A number is first increased by 10% and then the result is decreased by 10%. The net change in the original number is:

(A) no change

(B) a 1% increase

(C) a 1% decrease

(D) a 2% decrease

Q35. If $\frac{a}{b} = \frac{3}{4}$ and $\frac{b}{c} = \frac{8}{9}$, then what is $a : c$?

(A) $1 : 2$

(B) $2 : 3$

(C) $3 : 4$

(D) $4 : 5$

Q36. In what ratio must rice costing Rs. 30 per kg be mixed with rice costing Rs. 45 per kg so that the mixture is worth Rs. 35 per kg?

(A) $2 : 1$

(B) $1 : 2$

(C) $3 : 2$

(D) $1 : 1$

Q37. A trader sells two articles at Rs. $1{,}200$ each. On one he gains 20% and on the other he loses 20%. What is his overall result on the two transactions?

(A) no profit, no loss

(B) a profit of Rs. 100

(C) a loss of Rs. 100

(D) a loss of Rs. 50

Q38. Two successive discounts of 10% and 20% are equivalent to a single discount of:

(A) 30%

(B) 28%

(C) 25%

(D) 32%

Q39. A sum of money becomes Rs. $7{,}200$ in 2 years and Rs. $8{,}640$ in 3 years at compound interest, compounded annually. What is the annual rate of interest?

(A) 25%

(B) 15%

(C) 10%

(D) 20%

Q40. A man covers a certain distance at 40 km/h and returns along the same route at 60 km/h. What is his average speed for the whole journey (in km/h)?

(A) 48

(B) 50

(C) 52

(D) 45

Q41. Two trains running in opposite directions at 54 km/h and 36 km/h cross each other in 12 seconds. If the length of one train is 180 m, what is the length of the other train (in m)?

(A) 100

(B) 110

(C) 120

(D) 90

Q42. 12 men can complete a piece of work in 18 days. How many days will 9 men take to complete the same work?

(A) 20

(B) 24

(C) 27

(D) 16

Q43. A cistern can be filled by a tap in 4 hours and emptied by a drain pipe in 6 hours. If both are opened together, how long (in hours) will it take to fill the empty cistern?

(A) 8

(B) 10

(C) 24

(D) 12

Q44. If one root of the quadratic equation $x^2 - 6x + k = 0$ is 2, what is the value of k?

(A) 8

(B) 6

(C) 10

(D) 12

Q45. The present age of a father is three times that of his son. After 12 years, the father's age will be twice that of his son. What is the son's present age (in years)?

(A) 10

(B) 14

(C) 12

(D) 16

Q46. For how many integers x does the inequality $-3 \leq 2x - 1 < 7$ hold?

(A) 4

(B) 5

(C) 6

(D) 3

Q47. The first term of a geometric progression is 3 and the common ratio is 2. What is the sum of its first 5 terms?

(A) 63

(B) 96

(C) 48

(D) 93

Q48. How many three-digit numbers can be formed using the digits $1, 2, 3, 4, 5$ if no digit is repeated?

(A) 60

(B) 125

(C) 120

(D) 20

Q49. In how many ways can 5 different books be arranged on a shelf if two particular books must always remain together?

(A) 24

(B) 120

(C) 48

(D) 60

Q50. A bag contains 4 red and 6 blue balls. Two balls are drawn at random together. What is the probability that both are red?

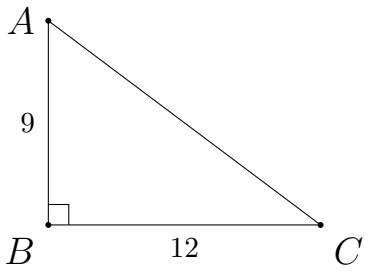
(A) $\frac{1}{5}$

(B) $\frac{2}{15}$

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

(D) $\frac{1}{15}$

Q51. In the right-angled triangle ABC shown, the right angle is at B, with $AB = 9$ cm and $BC = 12$ cm. What is the length of the hypotenuse AC?



(A) 13 cm

(B) 14 cm

(C) 16 cm

(D) 15 cm

Q52. Two parallel lines are cut by a transversal. If one of the interior angles on the same side of the transversal is 70°, what is the measure of the other co-interior angle?

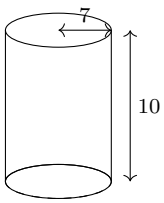
(A) 110°

(B) 70°

(C) 90°

(D) 120°

Q53. A right circular cylinder has base radius 7 cm and height 10 cm, as shown. What is its volume? (Take $\pi = \frac{22}{7}$.)



(A) 1,320 cm^3

(B) 1,450 cm^3

(C) 1,540 cm^3

(D) 1,760 cm^3

Q54. The area of a square is 144 cm^2. What is the length of its diagonal?

(A) 12 cm

(B) $12\sqrt{2}$ cm

(C) 24 cm

(D) $6\sqrt{2}$ cm

Q55. If $2^x = 8^{y+1}$ and $9^y = 3^{x-9}$, what is the value of x?

(A) 18

(B) 24

(C) 27

(D) 21

Q56. If $f(x) = 2x^2 - 3x + 1$, what is the value of $f(3) - f(1)$?

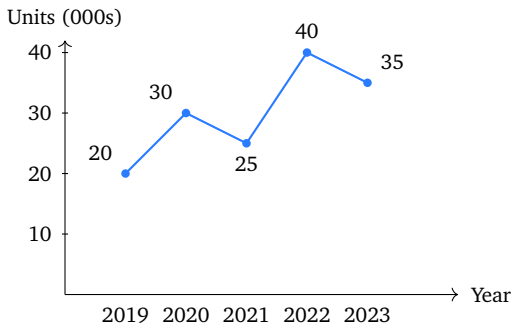
(A) 10

(B) 8

(C) 12

(D) 6

Q57. Directions (Q57–Q59): The line graph shows the number of units (in thousands) sold by a company over five years. Study the graph and answer the questions.



Q57. What was the total number of units sold over the five years (in thousands)?

(A) 140

(B) 145

(C) 150

(D) 155

Q58. (Refer to the line graph above.) The percentage increase in units sold from 2021 to 2022 was:

(A) 50%

(B) 60%

(C) 40%

(D) 75%

Q59. (Refer to the line graph above.) What was the average number of units sold per year over the five years (in thousands)?

(A) 30

(B) 32

(C) 28

(D) 35

Q60. **Data Sufficiency:** What is the speed of the train?

Statement I: The train crosses a pole in 9 seconds.

Statement II: The train is 150 metres long.

Choose the correct option about which statement(s) suffice to determine the train's speed.

(A) Statement I alone is sufficient.

(B) Statement II alone is sufficient.

(C) Either statement alone is sufficient.

(D) Both statements together are needed, but neither alone suffices.

Detailed Solutions

Q1.

Solution

Concept — Divisibility by 9: A number is divisible by 9 when the sum of its digits is divisible by 9.

Step 1 — Add the known digits: The digits are $5, 3, x, 2$.

So the digit sum is $5 + 3 + x + 2 = 10 + x$.

Step 2 — Make the sum a multiple of 9: We need $10 + x$ to be a multiple of 9.

The next multiple of 9 at or above 10 is 18.

So $10 + x = 18$.

Therefore $x = 18 - 10 = 8$.

Step 3 — Check the single-digit limit: The previous multiple, 9, would give $x = -1$, which is not a digit, and the next, 27, gives $x = 17$, also impossible. So $x = 8$ is the only valid digit.

Why other options are wrong:

- $x = 6$ gives digit sum 16, not divisible by 9.
- $x = 7$ gives 17; $x = 9$ gives 19. Neither is a multiple of 9.

Final Answer: $x = 8 \Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — HCF×LCM rule: For two numbers, (first number)×(second number) = HCF × LCM.

Step 1 — Write the relation: Let the other number be N.

Then $275 \times N = \text{HCF} \times \text{LCM} = 11 \times 7700$.

Step 2 — Compute the product on the right: $11 \times 7700 = 84700$.

Step 3 — Solve for N: $N = \dfrac{84700}{275}$.

Divide: $84700 \div 275 = 308$.

Why other options are wrong:

- $264,\ 352,\ 396$ do not satisfy $275 \times N = 84700$.

Final Answer: The other number is $308 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Fixed-expenditure rule: If price rises by r, consumption must fall by $\dfrac{r}{100+r} \times 100\%$ to keep expenditure unchanged.

Step 1 — Set up with numbers: Let the original price be 100 and consumption 100 units, so expenditure $= 100 \times 100 = 10000$.

Step 2 — New price after 25% rise: New price $= 100 + 25 = 125$.

Step 3 — Find the new consumption: To keep expenditure 10000, new consumption $= \dfrac{10000}{125} = 80$ units.

Step 4 — Percentage cut: Reduction $= 100 - 80 = 20$ units, which is $\dfrac{20}{100} \times 100\% = 20\%$.

Why other options are wrong:

- 25% is the price rise, not the required cut.
- 15% and 30% do not restore the original expenditure.

Final Answer: A 20% cut is needed $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q3

Q4.

Solution

Concept — Margin of victory: With two candidates, the loser gets the remaining share, and the gap between the two shares equals the winning margin.

Step 1 — Find both shares: Winner $= 58\%$, so loser $= 100\% - 58\% = 42\%$.

Step 2 — Express the margin as a percentage: Margin $= 58\% - 42\% = 16\%$ of the valid votes.

Step 3 — Equate to the given margin: 16% of total $= 4800$.

So total $= \dfrac{4800}{16} \times 100 = 300 \times 100 = 30000$.

Why other options are wrong:

- 16% of $28000,\ 32000,\ 24000$ gives $4480,\ 5120,\ 3840$, none equal to 4800.

Final Answer: Total valid votes $= 30000 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q4

Q5.

Solution

Concept — Profit by capital×time: In a partnership, profit is shared in the ratio of (capital $\times$ months invested).

Step 1 — Compute each partner's investment-months:

A: $45000 \times 12 = 540000$.

B joined after 4 months, so B invests for 8 months: $60000 \times 8 = 480000$.

Step 2 — Form the ratio: $A : B = 540000 : 480000 = 54 : 48 = 9 : 8$.

Step 3 — Find the value of one part: Total ratio parts $= 9 + 8 = 17$.

One part $= \dfrac{34000}{17} = 2000$.

Step 4 — B's share: B has 8 parts: $8 \times 2000 = 16000$.

Why other options are wrong:

- Rs. $18{,}000$ is A's share (9 parts), not B's.
- Rs. $14{,}000$ and Rs. $20{,}000$ do not match 8 parts of Rs. $2{,}000$.

Final Answer: B's share $=$ Rs. $16{,}000 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q5

Q6.

Solution

Concept — Average and total: Total = average × number of items. A new member's value equals new total minus old total.

Step 1 — Old total age of students: $30 \times 14 = 420$ years.

Step 2 — New average and new count: Including the teacher, count $= 31$ and average $= 14 + 1 = 15$.

New total $= 31 \times 15 = 465$ years.

Step 3 — Teacher's age: Teacher = new total − old total $= 465 - 420 = 45$ years.

Why other options are wrong:

- 44 or 46 would shift the new average away from exactly 15.
- 40 corresponds to no rise in average.

Final Answer: Teacher's age $= 45$ years $\Rightarrow$ C

Answer: (C) Go Back to Q6

Q7.

Solution

Concept — Mark-up then discount: Selling price = marked price $\times(1-$discount$)$; profit% is measured on cost.

Step 1 — Take cost $= 100$: Marked price $= 100 + 40\% = 140$.

Step 2 — Apply 25% discount: Selling price $= 140 \times (1 - 0.25) = 140 \times 0.75 = 105$.

Step 3 — Profit percentage: Profit $= 105 - 100 = 5$ on a cost of 100, i.e. 5%.

Why other options are wrong:

- $8\%, 10\%, 15\%$ would require a smaller discount or larger mark-up.

Final Answer: Profit $= 5\%$ $\Rightarrow$ B

Answer: (B) Go Back to Q7

Q8.

Solution

Concept — Recover cost, then apply target profit: $\text{Cost} = \dfrac{\text{SP}}{1 \pm \text{profit/loss}}$.

Step 1 — Find the cost price: A 20% loss means SP $= 80\%$ of cost.

So $960 = 0.80 \times \text{CP}$, giving $\text{CP} = \dfrac{960}{0.80} = 1200$.

Step 2 — Apply a 20% gain: New SP $= 1200 \times (1 + 0.20) = 1200 \times 1.20 = 1440$.

Why other options are wrong:

- Rs. 1200 is the cost price (zero profit).
- Rs. 1152 and Rs. 1380 do not give exactly 20% gain on Rs. 1200.

Final Answer: Sell at Rs. $1{,}440 \Rightarrow$ D

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Compound interest: $\text{Amount} = P\left(1 + \dfrac{r}{100}\right)^n$; $\text{CI} = \text{Amount} - P$.

Step 1 — Compute the amount: $A = 8000\left(1 + \dfrac{10}{100}\right)^2 = 8000 \times (1.1)^2$.

$(1.1)^2 = 1.21$.

$A = 8000 \times 1.21 = 9680$.

Step 2 — Compound interest: $\text{CI} = 9680 - 8000 = 1680$.

Why other options are wrong:

- Rs. 1600 is the simple interest for 2 years.
- Rs. $1640, 1720$ do not match 8000×0.21.

Final Answer: $\text{CI} =$ Rs. $1{,}680 \Rightarrow$ C

Answer: (C) Go Back to Q9

Q10.

Solution

Concept — Train crossing a platform: The train covers (train length + platform length) in the crossing time. Speed = distance ÷ time.

Step 1 — Total distance covered: $180 + 270 = 450$ m.

Step 2 — Speed in m/s: Speed $= \dfrac{450}{30} = 15$ m/s.

Step 3 — Convert to km/h: Multiply by $\frac{18}{5}$: $15 \times \dfrac{18}{5} = 15 \times 3.6 = 54$ km/h.

Why other options are wrong:

- $48, 60, 45$ km/h give $13.\overline{3}, 16.\overline{6}, 12.5$ m/s, none equal to 15.

Final Answer: Speed $= 54$ km/h $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Boats and streams: Downstream speed $= b + s$, upstream speed $= b - s$; stream speed $= \frac{1}{2}(\text{down} - \text{up})$.

Step 1 — Downstream speed: $\dfrac{24}{3} = 8$ km/h.

Step 2 — Upstream speed: $\dfrac{24}{4} = 6$ km/h.

Step 3 — Stream speed: $s = \dfrac{8-6}{2} = \dfrac{2}{2} = 1$ km/h.

Why other options are wrong:

- 2 km/h would need a down−up gap of 4; 3 and 1.5 do not fit 8 and 6.

Final Answer: Stream speed $= 1$ km/h $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Combined work rates: Add per-day rates; remaining work ÷ rate gives the time left.

Step 1 — Daily rates: $A = \frac{1}{12}$, $B = \frac{1}{18}$ per day.

Combined $= \frac{1}{12} + \frac{1}{18} = \frac{3}{36} + \frac{2}{36} = \frac{5}{36}$ per day.

Step 2 — Work done in 3 days together: $3 \times \frac{5}{36} = \frac{15}{36} = \frac{5}{12}$.

Step 3 — Remaining work: $1 - \frac{5}{12} = \frac{7}{12}$.

Step 4 — Time for B alone: B's rate is $\frac{1}{18}$ per day, so time $= \frac{7/12}{1/18} = \frac{7}{12} \times 18 = \frac{126}{12} = 10.5$ days.

Why other options are wrong:

- 9 days clears only $\frac{1}{2}$; 8.5 and 11 do not match $\frac{7}{12}$.

Final Answer: B needs 10.5 more days $\Rightarrow$ C

Answer: (C) Go Back to Q12

Q13.

Solution

Concept — Pipes filling together: Add the filling rates; total time is the reciprocal of the combined rate.

Step 1 — Individual rates: $A = \frac{1}{20}$, $B = \frac{1}{30}$ per minute.

Step 2 — Combined rate: $\frac{1}{20} + \frac{1}{30} = \frac{3}{60} + \frac{2}{60} = \frac{5}{60} = \frac{1}{12}$ per minute.

Step 3 — Time to fill: Time $= \frac{1}{1/12} = 12$ minutes.

Why other options are wrong:

- 10, 15, 25 minutes do not give a combined rate of $\frac{1}{12}$.

Final Answer: Tank fills in 12 minutes $\Rightarrow$ B

Answer: (B) Go Back to Q13

Q14.

Solution

Concept — Roots of a quadratic: For $x^2-(\text{sum})x+(\text{product})=0$, the coefficients come directly from the sum and product of the roots.

Step 1 — Write the standard form: $x^2-(\text{sum})x+(\text{product})=0$.

Step 2 — Substitute the given values: Sum $=7$, product $=12$.

So the equation is $x^2-7x+12=0$.

Step 3 — Verify: $x^2-7x+12=(x-3)(x-4)$; roots 3 and 4 have sum 7 and product 12. Correct.

Why other options are wrong:

- Options with $+7x$ give root sum -7; options with -12 give product -12.

Final Answer: $x^2-7x+12=0 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q14

Q15.

Solution

Concept — Elimination method: Add or subtract the equations to remove one variable.

Step 1 — Add the two equations: $(2x+3y)+(4x-3y)=14+10$.

The $+3y$ and $-3y$ cancel: $6x=24$, so $x=4$.

Step 2 — Find y: Substitute $x=4$ into $2x+3y=14$: $8+3y=14$.

So $3y=6$, giving $y=2$.

Step 3 — Verify: Check the second equation: $4(4)-3(2)=16-6=10$. Correct.

Step 4 — Compute $x+y$: $x+y=4+2=6$.

Why other options are wrong:

- $4, 5, 7$ do not match the solution $x=4,\ y=2$.

Final Answer: $x+y=6 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Solving a linear inequality: Collect the variable on one side; the solution is a range, then count the qualifying positive integers.

Step 1 — Simplify: $3x - 7 < 2x + 5$.

Subtract $2x$: $x - 7 < 5$.

Add 7: $x < 12$.

Step 2 — Count positive integers: Positive integers with $x < 12$ are $1, 2, 3, \ldots, 11$.

That is 11 values.

Why other options are wrong:

- 12 would wrongly include $x = 12$ (not allowed, strict $<$).
- 10 and 13 miscount the range 1 to 11.

Final Answer: 11 positive integers $\Rightarrow$ A

Answer: (A) Go Back to Q16

Q17.

Solution

Concept — Arithmetic progression: $T_n = a+(n-1)d$; sum $S_n = \frac{n}{2}[2a+(n-1)d]$.

Step 1 — Set up from the given terms: $T_5 = a + 4d = 17$ and $T_9 = a + 8d = 33$.

Step 2 — Find d and a: Subtract: $(a + 8d) - (a + 4d) = 33 - 17$, so $4d = 16$, $d = 4$.

Then $a + 4(4) = 17$, so $a = 17 - 16 = 1$.

Step 3 — Sum of first 10 terms: $S_{10} = \frac{10}{2}[2(1) + (10 - 1)(4)] = 5\,[2 + 36] = 5 \times 38 = 190$.

Why other options are wrong:

- 200, 210, 180 do not match 5×38.

Final Answer: $S_{10} = 190 \Rightarrow$ A

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Arrangements with a repeated letter: For n letters with a letter repeating p times, arrangements $= \dfrac{n!}{p!}$.

Step 1 — Count the letters: "LEADER" has 6 letters: L, E, A, D, E, R.

The letter E appears twice; all others are distinct.

Step 2 — Apply the formula: Arrangements $= \dfrac{6!}{2!} = \dfrac{720}{2} = 360$.

Why other options are wrong:

- $720 = 6!$ ignores the repeated E.
- 120 and 240 do not equal $\frac{6!}{2!}$.

Final Answer: 360 arrangements $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q18

Q19.

Solution

Concept — "At least one" by complement: (committees with at least one woman) $=$ (all committees) $-$ (committees with no woman).

Step 1 — Total committees of 3 from 9 people: $\binom{9}{3} = \dfrac{9 \times 8 \times 7}{3 \times 2 \times 1} = 84$.

Step 2 — Committees with no woman (all men): Choose 3 from 5 men: $\binom{5}{3} = 10$.

Step 3 — Subtract: At least one woman $= 84 - 10 = 74$.

Why other options are wrong:

- 84 is the total, not the restricted count.
- 64 and 60 subtract incorrectly.

Final Answer: 74 ways $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q19

Q20.

Solution

Concept — Two-dice probability: Total outcomes $= 36$; count the favourable ordered pairs.

Step 1 — List pairs summing to 8: $(2,6), (3,5), (4,4), (5,3), (6,2)$.

That is 5 favourable outcomes.

Step 2 — Probability: $P = \dfrac{5}{36}$.

Why other options are wrong:

- $\frac{1}{6} = \frac{6}{36}$ (a sum of 7 has 6 pairs, not 8).
- $\frac{1}{9} = \frac{4}{36}$ and $\frac{1}{12} = \frac{3}{36}$ undercount.

Final Answer: $P = \dfrac{5}{36} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Perpendicular from centre bisects the chord: The foot M is the midpoint of AB, and $\triangle OMA$ is right-angled at M.

Step 1 — Apply Pythagoras in $\triangle OMA$: $OA^2 = OM^2 + AM^2$.

$13^2 = 5^2 + AM^2$.

$169 = 25 + AM^2$, so $AM^2 = 144$, giving $AM = 12$ cm.

Step 2 — Full chord length: Since M bisects AB, $AB = 2 \times AM = 2 \times 12 = 24$ cm.

Why other options are wrong:

- 12 cm is only half the chord (AM).
- 20 and 26 cm do not satisfy the Pythagorean relation.

Final Answer: $AB = 24$ cm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q21

Q22.

Solution

Concept — Angle-sum in a triangle: The three angles add to $180°$; split this in the given ratio.

Step 1 — Total ratio parts: $2 + 3 + 4 = 9$ parts.

Step 2 — Value of one part: $\dfrac{180°}{9} = 20°$ per part.

Step 3 — Largest angle: The largest share is 4 parts: $4 \times 20° = 80°$.

Why other options are wrong:

- $60°$ and $70°$ are the other two angles (3 and... actually $3 \times 20 = 60$, $2 \times 20 = 40$).
- $90°$ would not fit the ratio sum of $180°$.

Final Answer: Largest angle $= 80° \Rightarrow$ B

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Total surface area of a cuboid: TSA $= 2(lb + bh + hl)$.

Step 1 — Compute each face product: $lb = 12 \times 8 = 96$; $bh = 8 \times 6 = 48$; $hl = 6 \times 12 = 72$.

Step 2 — Add and double: Sum $= 96 + 48 + 72 = 216$.

TSA $= 2 \times 216 = 432$ cm^2.

Why other options are wrong:

- $376, 396, 412$ cm^2 come from dropping or mis-adding a face pair.

Final Answer: TSA $= 432$ cm$^2 \Rightarrow$ D

Answer: (D) Go Back to Q23

Q24.

Solution

Concept — Circle from circumference: Find r from $C = 2\pi r$, then area $= \pi r^2$.

Step 1 — Find the radius: $2\pi r = 44$, so $r = \dfrac{44}{2\pi} = \dfrac{44}{2 \times \frac{22}{7}} = \dfrac{44 \times 7}{44} = 7$ cm.

Step 2 — Compute the area: Area $= \pi r^2 = \dfrac{22}{7} \times 7^2 = \dfrac{22}{7} \times 49 = 22 \times 7 = 154$ cm^2.

Why other options are wrong:

- 616 cm^2 uses $r = 14$ (diameter as radius).
- 144 and 176 cm^2 do not equal $\frac{22}{7} \times 49$.

Final Answer: Area $= 154$ cm^2 $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q24

Q25.

Solution

Concept — Logarithm rules: $\log_b m + \log_b n = \log_b(mn)$, and $\log_b x = k \Leftrightarrow x = b^k$.

Step 1 — Evaluate the known log: $\log_2 8 = 3$ since $2^3 = 8$.

Step 2 — Substitute: $\log_2 x + 3 = 5$, so $\log_2 x = 2$.

Step 3 — Solve for x: $x = 2^2 = 4$.

Why other options are wrong:

- $x = 8$ gives $\log_2 8 + 3 = 6 \neq 5$.
- $x = 2$ gives 4; $x = 16$ gives 7.

Final Answer: $x = 4 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q25

Q26.

Solution

Concept — Two-set inclusion–exclusion: $|T \cup C| = |T| + |C| - |T \cap C|$, where those liking at least one = total − neither.

Step 1 — People liking at least one drink: $60 - 5 = 55$.

Step 2 — Apply inclusion–exclusion: $55 = 35 + 30 - |T \cap C|$.

So $|T \cap C| = 65 - 55 = 10$.

Why other options are wrong:

- 5 is the "neither" count, not the overlap.
- 8 and 12 do not satisfy $35 + 30 - x = 55$.

Final Answer: Both tea and coffee $= 10 \Rightarrow$ C

Answer: (C) Go Back to Q26

Q27.

Solution

Concept — Pie chart share: A percentage of the chart corresponds to the same percentage of the total income.

Step 1 — Identify the Rent share: Rent $= 30\%$ of income.

Step 2 — Apply to the income: 30% of $48000 = 0.30 \times 48000 = 14400$.

Why other options are wrong:

- Rs. 12000 is 25% (Food), Rs. 9600 is 20% (Education), Rs. 7200 is 15% (Savings).

Final Answer: Rent $=$ Rs. $14{,}400 \Rightarrow$ A

Answer: (A) Go Back to Q27

Q28.

Solution

Concept — Difference of two pie shares: Convert each percentage to rupees, then subtract.

Step 1 — Food expenditure: 25% of $48000 = 0.25 \times 48000 = 12000$.

Step 2 — Savings expenditure: 15% of $48000 = 0.15 \times 48000 = 7200$.

Step 3 — Difference: $12000 - 7200 = 4800$.

Why other options are wrong:

- Rs. 2400 is 5% of income; Rs. 3600 and Rs. 5600 do not match the 10% gap.

Final Answer: Food exceeds Savings by Rs. $4{,}800 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q28

Q29.

Solution

Concept — Percentage to central angle: A sector's angle = (its percentage) $\times 360^\circ \div 100$.

Step 1 — Education share: Education $= 20\%$.

Step 2 — Convert to degrees: Angle $= \dfrac{20}{100} \times 360^\circ = 0.20 \times 360^\circ = 72^\circ$.

Why other options are wrong:

- 54° is 15% (Savings), 90° is 25% (Food), 36° is 10% (Misc).

Final Answer: Education angle $= 72^\circ \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q29

Q30.

Solution

Concept — Data sufficiency: Test each statement separately for a unique answer, then both together.

Step 1 — Statement I alone: Digit sum $= 9$ gives many two-digit numbers: $18, 27, 36, 45, 54, 63, 72, 81, 90$. Not unique. Insufficient.

Step 2 — Statement II alone: Divisible by 9 means digit sum is 9 (for these two-digit numbers), and digit difference $= 5$. From the list, differences are: $18 \to 7$, $27 \to 5$, $36 \to 3$, $45 \to 1$, $54 \to 1$, $63 \to 3$, $72 \to 5$, $81 \to 7$, $90 \to 9$. Difference 5 occurs for 27 and 72. Two numbers, so not unique. Insufficient alone.

Step 3 — Both together: Statement I (sum 9) adds nothing new beyond Statement II's "divisible by 9". Even combined, both 27 and 72 qualify. The number is still not uniquely determined.

Why other options are wrong:

- Neither statement alone, nor both together, pins down a single number.

Final Answer: Not uniquely determined even using both $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q30

Q31.

Solution

Concept — Cyclicity of units digit: Powers of 7 have units digits cycling $7, 9, 3, 1$ with period 4; the remainder mod 5 follows the units digit.

Step 1 — Units-digit cycle of 7^n: $7^1 = 7,\ 7^2 = 49\,(9),\ 7^3 = 343\,(3),\ 7^4 = 2401\,(1)$, period 4.

Step 2 — Locate exponent 83: $83 = 4 \times 20 + 3$, so 7^{83} ends in the same digit as 7^3, which is 3.

Step 3 — Remainder on division by 5: A number ending in 3 leaves remainder 3 when divided by 5.

Why other options are wrong:

- $1, 2, 4$ correspond to units digits $1/6, 2/7, 4/9$, not matching position 3 of the cycle.

Final Answer: Remainder $= 3 \Rightarrow$ B

Answer: (B) Go Back to Q31

Q32.

Solution

Concept — Consecutive even integers: Write them as n and $n+2$; solve the product equation.

Step 1 — Set up: $n(n+2) = 168$, i.e. $n^2 + 2n - 168 = 0$.

Step 2 — Factor: We need two numbers with product -168 and sum 2: that is 14 and -12.

$n^2 + 14n - 12n - 168 = (n+14)(n-12) = 0$.

Step 3 — Take the positive even root: $n = 12$ (rejecting $n = -14$).

The two integers are 12 and 14; the larger is 14.

Quick check: $12 \times 14 = 168$. Correct.

Why other options are wrong:

- 12 is the smaller integer, not the larger.
- 16 and 10 do not give product 168 with their even neighbour.

Final Answer: Larger integer $= 14 \Rightarrow$ D

Answer: (D) Go Back to Q32

Q33.

Solution

Concept — Asymmetry of percentage change: If A is $x\%$ less than B, B is more than A by $\dfrac{x}{100-x} \times 100\%$.

Step 1 — Take B $= 100$: A is 20% less, so A $= 100 - 20 = 80$.

Step 2 — B relative to A: B exceeds A by $100 - 80 = 20$, measured on A: $\dfrac{20}{80} \times 100\% = 25\%$.

Why other options are wrong:

- 20% wrongly uses B as the base instead of A.
- 30% and 15% do not equal $\frac{20}{80} \times 100$.

Final Answer: B is 25% more than A $\Rightarrow$ A

Answer: (A) Go Back to Q33

Q34.

Solution

Concept — Successive percentage changes: Multiply the factors; net change = product -1.

Step 1 — Take the number $= 100$: After $+10\%$: $100 \times 1.10 = 110$.

Step 2 — Then -10%: $110 \times 0.90 = 99$.

Step 3 — Net change: $99 - 100 = -1$, i.e. a 1% decrease.

Why other options are wrong:

- "No change" wrongly assumes the two 10% changes cancel.
- A 1% increase or 2% decrease misapplies the factors.

Final Answer: Net $= 1\%$ decrease $\Rightarrow$ C

Answer: (C) Go Back to Q34

Q35.

Solution

Concept — Chaining ratios: $\frac{a}{c} = \frac{a}{b} \times \frac{b}{c}$.

Step 1 — Multiply the fractions: $\frac{a}{c} = \frac{3}{4} \times \frac{8}{9}$.

Step 2 — Simplify: $\frac{3 \times 8}{4 \times 9} = \frac{24}{36} = \frac{2}{3}$.

So $a : c = 2 : 3$.

Why other options are wrong:

- $1 : 2,\ 3 : 4,\ 4 : 5$ do not equal $\frac{24}{36}$ in lowest terms.

Final Answer: $a : c = 2 : 3 \Rightarrow$ B

Answer: (B) Go Back to Q35

Q36.

Solution

Concept — Alligation: Ratio of cheaper to dearer = (dearer price − mean) : (mean − cheaper price).

Step 1 — Identify the three prices: Cheaper $= 30$, dearer $= 45$, mean $= 35$.

Step 2 — Apply alligation: Ratio $= (45 - 35) : (35 - 30) = 10 : 5 = 2 : 1$.

Step 3 — Interpret: Rice at Rs. 30 to rice at Rs. 45 is mixed in ratio $2 : 1$.

Why other options are wrong:

- $1 : 2$ reverses the alligation arms.
- $3 : 2$ and $1 : 1$ do not give a mean of 35.

Final Answer: Ratio $= 2 : 1 \Rightarrow$ A

Answer: (A) Go Back to Q36

Q37.

Solution

Concept — Equal SP, equal opposite percentages: Selling two items at the same price with $+x\%$ and $-x\%$ always gives an overall loss of $\left(\frac{x}{10}\right)^2\%$.

Step 1 — Cost of the gain item: SP $= 1200$ at $+20\%$, so CP $= \dfrac{1200}{1.20} = 1000$.

Step 2 — Cost of the loss item: SP $= 1200$ at -20%, so CP $= \dfrac{1200}{0.80} = 1500$.

Step 3 — Compare totals: Total CP $= 1000 + 1500 = 2500$; total SP $= 1200 + 1200 = 2400$.

Net $= 2400 - 2500 = -100$, a loss of Rs. 100.

Why other options are wrong:

- "No profit, no loss" ignores the unequal cost prices.
- A profit of Rs. 100 or loss of Rs. 50 misadds the costs.

Final Answer: Loss of Rs. $100 \Rightarrow$ C

Answer: (C) Go Back to Q37

Q38.

Solution

Concept — Successive discounts: Single equivalent factor $= (1-d_1)(1-d_2)$; equivalent discount $= 1-$ that product.

Step 1 — Multiply the surviving fractions: $(1-0.10)(1-0.20) = 0.90 \times 0.80 = 0.72$.

Step 2 — Equivalent single discount: $1 - 0.72 = 0.28 = 28\%$.

Why other options are wrong:

- 30% just adds $10+20$, ignoring the overlap.
- 25% and 32% do not equal $1-0.72$.

Final Answer: Single discount $= 28\% \Rightarrow$ B

Answer: (B) Go Back to Q38

Q39.

Solution

Concept — Ratio of successive CI amounts: Under annual compounding, $\dfrac{A_{n+1}}{A_n} = 1 + \dfrac{r}{100}$.

Step 1 — Form the ratio: $\dfrac{8640}{7200} = 1.2$.

Step 2 — Read off the rate: $1 + \dfrac{r}{100} = 1.2$, so $\dfrac{r}{100} = 0.2$, giving $r = 20\%$.

Why other options are wrong:

- $25\%, 15\%, 10\%$ give ratios $1.25, 1.15, 1.10$, not 1.2.

Final Answer: Rate $= 20\% \Rightarrow$ D

Answer: (D) Go Back to Q39

Q40.

Solution

Concept — Average speed for equal distances: For the same distance each way, average speed $= \dfrac{2uv}{u+v}$ (harmonic mean).

Step 1 — Substitute $u = 40,\ v = 60$**:** Average $= \dfrac{2 \times 40 \times 60}{40 + 60}$.

Step 2 — Compute: Numerator $= 2 \times 40 \times 60 = 4800$; denominator $= 100$.

Average $= \dfrac{4800}{100} = 48$ km/h.

Why other options are wrong:

- 50 km/h is the simple mean $\frac{40+60}{2}$, which is incorrect here.
- 52 and 45 km/h do not equal the harmonic mean.

Final Answer: Average speed $= 48$ km/h $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q40

Q41.

Solution

Concept — Opposite-direction crossing: Relative speed = sum of speeds; total distance = sum of train lengths.

Step 1 — Relative speed: $54 + 36 = 90$ km/h $= 90 \times \dfrac{5}{18} = 25$ m/s.

Step 2 — Total length covered: Distance = speed $\times$ time $= 25 \times 12 = 300$ m.

Step 3 — Other train's length: $300 = 180 + L$, so $L = 300 - 180 = 120$ m.

Why other options are wrong:

- $100, 110, 90$ m do not add with 180 to give 300.

Final Answer: Other train $= 120$ m $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q41

Q42.

Solution

Concept — Men and days are inversely proportional: $M_1D_1 = M_2D_2$ for the same work.

Step 1 — Total work in man-days: $12 \times 18 = 216$ man-days.

Step 2 — Days for 9 men: $D = \dfrac{216}{9} = 24$ days.

Why other options are wrong:

- $20, 27, 16$ days do not satisfy $9 \times D = 216$.

Final Answer: 9 men take 24 days $\Rightarrow$ B

Answer: (B) Go Back to Q42

Q43.

Solution

Concept — Fill and drain together: Net rate = filling rate − emptying rate; time = reciprocal of net rate.

Step 1 — Individual rates: Tap $= \dfrac{1}{4}$ per hour (fill); drain $= \dfrac{1}{6}$ per hour (empty).

Step 2 — Net rate: $\dfrac{1}{4} - \dfrac{1}{6} = \dfrac{3}{12} - \dfrac{2}{12} = \dfrac{1}{12}$ per hour.

Step 3 — Time to fill: Time $= \dfrac{1}{1/12} = 12$ hours.

Why other options are wrong:

- 24 hours would be the net rate $\frac{1}{24}$; 8 and 10 hours overstate the net rate.

Final Answer: Cistern fills in 12 hours $\Rightarrow$ D

Answer: (D) Go Back to Q43

Q44.

Solution

Concept — A root satisfies the equation: Substitute the known root and solve for the unknown coefficient.

Step 1 — Substitute $x = 2$: $2^2 - 6(2) + k = 0$.

Step 2 — Simplify: $4 - 12 + k = 0$, so $-8 + k = 0$.

Therefore $k = 8$.

Step 3 — Check: $x^2 - 6x + 8 = (x - 2)(x - 4)$; roots 2 and 4. Correct.

Why other options are wrong:

- $k = 6, 10, 12$ do not make $x = 2$ a root.

Final Answer: $k = 8 \Rightarrow$ A

Answer: (A) Go Back to Q44

Q45.

Solution

Concept — Age word problem: Express both ages with one variable, then use the future condition.

Step 1 — Set variables: Let the son's present age be s. Father $= 3s$.

Step 2 — Future condition (after 12 years): Father $+12 = 2(\text{son} + 12)$.

$3s + 12 = 2(s + 12)$.

Step 3 — Solve: $3s + 12 = 2s + 24$.

$3s - 2s = 24 - 12$, so $s = 12$.

Check: Now son 12, father 36. After 12 years: son 24, father $48 = 2 \times 24$. Correct.

Why other options are wrong:

- $10, 14, 16$ do not satisfy $3s + 12 = 2(s + 12)$.

Final Answer: Son's age $= 12$ years $\Rightarrow$ C

Answer: (C) Go Back to Q45

Q46.

Solution

Concept — Compound inequality: Solve the two-sided inequality, then count integer solutions.

Step 1 — Add 1 throughout: $-3 \leq 2x - 1 < 7$ becomes $-3 + 1 \leq 2x < 7 + 1$, i.e. $-2 \leq 2x < 8$.

Step 2 — Divide by 2: $-1 \leq x < 4$.

Step 3 — Count integers: Integers from -1 up to (but not including) 4: $-1, 0, 1, 2, 3$. That is 5 integers.

Why other options are wrong:

- 4 drops one endpoint; 6 wrongly includes $x = 4$; 3 omits $x = -1$.

Final Answer: 5 integers $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q46

Q47.

Solution

Concept — Geometric progression sum: $S_n = a\,\dfrac{r^n - 1}{r - 1}$ for $r \neq 1$.

Step 1 — Substitute $a = 3,\ r = 2,\ n = 5$**:** $S_5 = 3 \times \dfrac{2^5 - 1}{2 - 1}$.

Step 2 — Compute: $2^5 = 32$, so $\dfrac{32 - 1}{1} = 31$.

$S_5 = 3 \times 31 = 93$.

Quick check: Terms are $3, 6, 12, 24, 48$; sum $= 3 + 6 + 12 + 24 + 48 = 93$. Correct.

Why other options are wrong:

- $63, 96, 48$ do not equal 3×31.

Final Answer: $S_5 = 93 \Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q47

Q48.

Solution

Concept — Arrangements without repetition: Choosing and ordering r from n distinct items is $\frac{n!}{(n-r)!}$.

Step 1 — Fill the three places: Hundreds: 5 choices; tens: 4 remaining; units: 3 remaining.

Step 2 — Multiply: $5 \times 4 \times 3 = 60$.

Why other options are wrong:

- $125 = 5^3$ allows repetition, which is not permitted.
- $120 = 5!$ uses all five digits; 20 undercounts.

Final Answer: 60 three-digit numbers $\Rightarrow$ A

Answer: (A) Go Back to Q48

Q49.

Solution

Concept — "Always together" grouping: Tie the two books into one block, arrange the blocks, then arrange within the block.

Step 1 — Treat the pair as one unit: Then there are 4 units (the block plus the other 3 books).

Arrange 4 units: $4! = 24$ ways.

Step 2 — Internal arrangement of the pair: The two tied books can switch: $2! = 2$ ways.

Step 3 — Multiply: Total $= 24 \times 2 = 48$.

Why other options are wrong:

- $120 = 5!$ ignores the togetherness condition.
- 24 forgets the internal $2!$; 60 does not arise.

Final Answer: 48 arrangements $\Rightarrow$ C

Answer: (C) Go Back to Q49

Q50.

Solution

Concept — Probability with combinations: $P = \dfrac{\text{favourable selections}}{\text{total selections}}$, using $\binom{n}{r}$.

Step 1 — Total ways to draw 2 from 10: $\binom{10}{2} = \dfrac{10 \times 9}{2} = 45$.

Step 2 — Favourable (both red, from 4): $\binom{4}{2} = \dfrac{4 \times 3}{2} = 6$.

Step 3 — Probability: $P = \dfrac{6}{45} = \dfrac{2}{15}$.

Why other options are wrong:

- $\frac{1}{5} = \frac{9}{45}$ and $\frac{1}{3} = \frac{15}{45}$ overstate the count.
- $\frac{1}{15} = \frac{3}{45}$ understates it.

Final Answer: $P = \dfrac{2}{15} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q50

Q51.

Solution

Concept — Pythagoras theorem: In a right triangle, hypotenuse^2 = sum of squares of the two legs.

Step 1 — Apply the theorem: $AC^2 = AB^2 + BC^2 = 9^2 + 12^2$.

Step 2 — Compute: $81 + 144 = 225$.

$AC = \sqrt{225} = 15$ cm.

Why other options are wrong:

- 13 cm is the 5–12–13 triple, not 9–12.
- 14 and 16 cm do not give $AC^2 = 225$.

Final Answer: $AC = 15$ cm $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q51

Q52.

Solution

Concept — Co-interior angles: Interior angles on the same side of a transversal between parallel lines are supplementary (sum $= 180°$).

Step 1 — Use the supplementary rule: The two co-interior angles add to $180°$.

Step 2 — Find the unknown angle: Other angle $= 180° - 70° = 110°$.

Why other options are wrong:

- $70°$ would be a corresponding or alternate angle, not co-interior.
- $90°$ and $120°$ do not sum to $180°$ with $70°$.

Final Answer: Co-interior angle $= 110° \Rightarrow$ A

Answer: (A) Go Back to Q52

Q53.

Solution

Concept — Volume of a cylinder: $V = \pi r^2 h$.

Step 1 — Substitute $r = 7,\ h = 10$**:** $V = \dfrac{22}{7} \times 7^2 \times 10$.

Step 2 — Simplify: $7^2 = 49$; $\dfrac{22}{7} \times 49 = 22 \times 7 = 154$.

Then $V = 154 \times 10 = 1540$ cm^3.

Why other options are wrong:

- $1320, 1450, 1760$ cm^3 do not equal 154×10.

Final Answer: Volume $= 1{,}540$ cm$^3 \Rightarrow$ C

Answer: (C) Go Back to Q53

Q54.

Solution

Concept — Square diagonal: If side $= s$, diagonal $= s\sqrt{2}$; and area $= s^2$.

Step 1 — Find the side: $s^2 = 144$, so $s = 12$ cm.

Step 2 — Compute the diagonal: Diagonal $= s\sqrt{2} = 12\sqrt{2}$ cm.

Why other options are wrong:

- 12 cm is the side, not the diagonal.
- 24 cm and $6\sqrt{2}$ cm do not equal $12\sqrt{2}$.

Final Answer: Diagonal $= 12\sqrt{2}$ cm $\Rightarrow$ B

Answer: (B) Go Back to Q54

Q55.

Solution

Concept — Equating exponents with a common base: Write both sides as powers of the same base and equate the exponents.

Step 1 — First equation: $2^x = 8^{y+1} = (2^3)^{y+1} = 2^{3y+3}$.

So $x = 3y + 3$.

Step 2 — Second equation: $9^y = 3^{x-9}$ means $(3^2)^y = 3^{x-9}$, i.e. $3^{2y} = 3^{x-9}$.

So $2y = x - 9$.

Step 3 — Solve the system: Substitute $x = 3y + 3$ into $2y = x - 9$:

$2y = (3y + 3) - 9 = 3y - 6$.

$2y - 3y = -6$, so $-y = -6$, giving $y = 6$.

Then $x = 3(6) + 3 = 18 + 3 = 21$.

Check: $2y = 12$ and $x - 9 = 21 - 9 = 12$. Correct.

Why other options are wrong:

- $18, 24, 27$ fail at least one of the two exponent equations.

Final Answer: $x = 21 \Rightarrow$ D

Answer: (D) Go Back to Q55

Q56.

Solution

Concept — Function evaluation: Substitute each input into $f(x)$, then subtract.

Step 1 — Compute $f(3)$: $f(3) = 2(3)^2 - 3(3) + 1 = 2 \times 9 - 9 + 1 = 18 - 9 + 1 = 10$.

Step 2 — Compute $f(1)$: $f(1) = 2(1)^2 - 3(1) + 1 = 2 - 3 + 1 = 0$.

Step 3 — Subtract: $f(3) - f(1) = 10 - 0 = 10$.

Why other options are wrong:

- $8, 12, 6$ result from arithmetic slips in $f(3)$ or $f(1)$.

Final Answer: $f(3) - f(1) = 10 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q56

Q57.

Solution

Concept — Reading a line graph: Read each year's value, then total them.

Step 1 — List the yearly values (in thousands): $2019 = 20,\ 2020 = 30,\ 2021 = 25,\ 2022 = 40,\ 2023 = 35$.

Step 2 — Add: $20 + 30 + 25 + 40 + 35 = 150$ thousand.

Why other options are wrong:

- $140, 145, 155$ result from misreading one data point.

Final Answer: Total $= 150$ thousand $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q57

Q58.

Solution

Concept — Percentage increase: $\dfrac{\text{new} - \text{old}}{\text{old}} \times 100\%$.

Step 1 — Read the two values: $2021 = 25$ thousand, $2022 = 40$ thousand.

Step 2 — Increase: $40 - 25 = 15$ thousand.

Step 3 — As a percentage of 2021: $\frac{15}{25} \times 100\% = 0.6 \times 100\% = 60\%$.

Why other options are wrong:

- 50% would need a rise to 37.5; 40% and 75% misuse the base 25.

Final Answer: Increase $= 60\% \Rightarrow$ B

Answer: (B) Go Back to Q58

Q59.

Solution

Concept — Average of a data set: Average $= \frac{\text{sum of values}}{\text{number of values}}$.

Step 1 — Sum over five years: From Q57, total $= 150$ thousand.

Step 2 — Divide by 5: Average $= \frac{150}{5} = 30$ thousand per year.

Why other options are wrong:

- $32, 28, 35$ do not equal $150 \div 5$.

Final Answer: Average $= 30$ thousand $\Rightarrow$ A

Answer: (A) Go Back to Q59

Q60.

Solution

Concept — Data sufficiency for speed: Speed $= \frac{\text{distance}}{\text{time}}$; a pole has negligible length, so distance $=$ train length.

Step 1 — Statement I alone: Crosses a pole in 9 s gives the time but no distance (train length unknown). Cannot find speed. Insufficient.

Step 2 — Statement II alone: Train length $= 150$ m gives distance but no time. Cannot find speed. Insufficient.

Step 3 — Both together: Distance $= 150$ m and time $= 9$ s give speed $= \frac{150}{9} \approx 16.67$ m/s, a unique value. Both together are sufficient, but neither alone.

Why other options are wrong:

- Neither statement alone provides both distance and time, so options stating

a single statement suffices are wrong.

Final Answer: Both statements together are needed $\Rightarrow$ D

Answer: (D) Go Back to Q60

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	C	2	B	3	C	4	A	5	B
6	C	7	B	8	D	9	C	10	B
11	A	12	C	13	B	14	D	15	C
16	A	17	A	18	C	19	B	20	D
21	C	22	B	23	D	24	A	25	B
26	C	27	A	28	D	29	B	30	D
31	B	32	D	33	A	34	C	35	B
36	A	37	C	38	B	39	D	40	A
41	C	42	B	43	D	44	A	45	C
46	B	47	D	48	A	49	C	50	B
51	D	52	A	53	C	54	B	55	D
56	A	57	C	58	B	59	A	60	D