ATMA Quantitative Skills

Sample Paper – 3

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

Instructions

- This paper contains **60** Multiple Choice Questions (Single Correct Answer) across two parts — **Part I (Q1–Q30)** and **Part II (Q31–Q60)** — modelled on the Quantitative Skills portion of **ATMA** entrance.
- Each correct answer carries **+1 mark**. There is **a penalty of** 0.25 **mark** for each incorrect answer. Unattempted questions receive **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 I

Q1. The HCF of two numbers is 12 and their LCM is 924. If one of the numbers is 84, find the other number.

(A) 108

(B) 120

(C) 132

(D) 144

Q2. Find the remainder when 7^{82} is divided by 5.

(A) 2

(B) 4

(C) 3

(D) 1

Q3. The price of an article is first increased by 20% and then decreased by 20%. The net change in the price is:

(A) a decrease of 4%

(B) an increase of 4%

(C) no change

(D) a decrease of 2%

Q4. In an examination, 52% candidates failed in English and 42% failed in Mathematics. If 17% failed in both subjects, what percentage of candidates passed in both subjects?

(A) 25%

(B) 19%

(C) 77%

(D) 23%

Q5. Three partners A, B and C invest Rs. 24,000, Rs. 32,000 and Rs. 40,000 respectively in a business. If the total annual profit is Rs. 18,000, find C's share of the profit.

(A) Rs. 4,500

(B) Rs. 6,000

(C) Rs. 7,500

(D) Rs. 8,000

Q6. The average age of 11 players of a cricket team is 28 years. If the age of the coach is included, the average increases by 1 year. Find the age of the coach.

(A) 39 years

(B) 40 years

(C) 41 years

(D) 38 years

Q7. A shopkeeper marks his goods 40% above the cost price and then allows a discount of 25% on the marked price. Find his profit or loss percent.

(A) loss of 5%

(B) profit of 15%

(C) profit of 5%

(D) profit of 10%

Q8. By selling an article for Rs. 450, a man loses 10%. At what price should he sell it to gain 20%?

(A) Rs. 600

(B) Rs. 540

(C) Rs. 575

(D) Rs. 560

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

(A) Rs. $2{,}000$

(B) Rs. $1{,}900$

(C) Rs. $2{,}200$

(D) Rs. $2{,}100$

Q10. A train 180 m long is running at a speed of 54 km/h. How long will it take to cross a platform 270 m long?

(A) 25 seconds

(B) 30 seconds

(C) 35 seconds

(D) 20 seconds

Q11. A boat travels 30 km downstream in 2 hours and the same distance upstream in 3 hours. Find the speed of the stream.

(A) 1 km/h

(B) 3 km/h

(C) 2.5 km/h

(D) 2 km/h

Q12. A can do a piece of work in 12 days and B in 18 days. Working together, in how many days will they complete the work?

(A) 7.2 days

(B) 7.5 days

(C) 8 days

(D) 6.5 days

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 will they take to fill the tank?

(A) 10 minutes

(B) 12 minutes

(C) 15 minutes

(D) 25 minutes

Q14. The sum of two numbers is 25 and their difference is 9. Find the product of the two numbers.

(A) 130

(B) 144

(C) 150

(D) 136

Q15. If the roots of the quadratic equation $x^2 - 7x + k = 0$ are real and equal, find the value of k.

(A) $\frac{49}{2}$

(B) 7

(C) $\frac{49}{4}$

(D) 14

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

(A) 4

(B) 5

(C) 6

(D) 7

Q17. Find the sum of the first 20 terms of the arithmetic progression $3,\ 7,\ 11,\ 15,\ \ldots$

(A) 820

(B) 800

(C) 840

(D) 780

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

(A) 720

(B) 120

(C) 240

(D) 360

Q19. A committee of 3 people is to be formed from 5 men and 4 women. In how many ways can this be done if the committee must contain exactly 2 men and 1 woman?

(A) 30

(B) 40

(C) 60

(D) 20

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

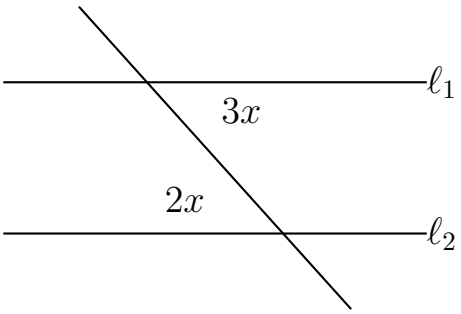
(A) $\frac{1}{6}$

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

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

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

Q21. In the figure, two parallel lines are cut by a transversal. If one angle is $3x$ and the co-interior (allied) angle on the same side is $2x$, find the value of x.



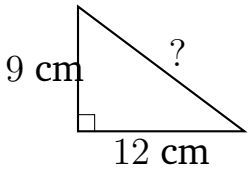
(A) 36°

(B) 40°

(C) 45°

(D) 30°

Q22. In a right-angled triangle, the two legs measure 9 cm and 12 cm. Find the length of the hypotenuse.



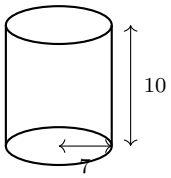
(A) 13 cm

(B) 14 cm

(C) 21 cm

(D) 15 cm

Q23. A solid right circular cylinder has radius 7 cm and height 10 cm. Find its total surface area. (Take $\pi = \frac{22}{7}$.)



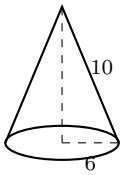
(A) 704 cm^2

(B) 748 cm^2

(C) 440 cm^2

(D) 880 cm^2

Q24. A right circular cone has a base radius of 6 cm and a slant height of 10 cm. Find its volume. (Take $\pi = 3.14$.)



(A) 288π cm^3

(B) 96π cm^3

(C) 301.44 cm^3

(D) 314 cm^3

Q25. If $\log_2 x = 5$, find the value of x.

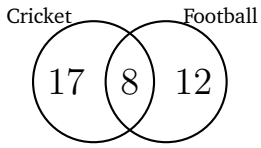
(A) 32

(B) 25

(C) 10

(D) 16

Q26. In a class of 40 students, 25 play cricket, 20 play football and 8 play both games. How many students play neither game?



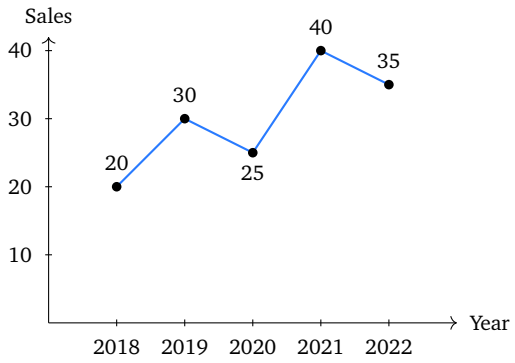
(A) 5

(B) 3

(C) 7

(D) 2

Q27. **Directions (Q27–Q29):** The line graph shows the sales (in thousands of units) of a company over five years.



What is the total sales (in thousands of units) over the five years?

(A) 140

(B) 145

(C) 150

(D) 155

Q28. (Refer to the line graph in Q27.) The percentage increase in sales from 2020 to 2021 is:

(A) 60%

(B) 50%

(C) 40%

(D) 62.5%

Q29. (Refer to the line graph in Q27.) The average sales per year (in thousands of units) over the five years is:

(A) 32

(B) 28

(C) 35

(D) 30

Q30. **Data Sufficiency:** Each question is followed by two statements. Mark the correct option.

Question: What is the two-digit number?

Statement I: The sum of its digits is 9.
Statement II: The number is 4 times the sum of its digits.

(A) Statement I alone is sufficient, but Statement II alone is not.

(B) Both statements together are sufficient, but neither alone is sufficient.

(C) Statement II alone is sufficient, but Statement I alone is not.

(D) Each statement alone is sufficient.

Part II — Quantitative Skills II

Q31. Find the unit digit of 3^{64}.

(A) 3

(B) 9

(C) 7

(D) 1

Q32. How many positive factors does the number 72 have?

(A) 8

(B) 10

(C) 12

(D) 6

Q33. If A's salary is 25% more than B's salary, then by what percent is B's salary less than A's salary?

(A) 25%

(B) 20%

(C) 15%

(D) $\frac{100}{6}\%$

Q34. A number is increased by 10% and the result is then increased by 20%. What is the overall percentage increase in the original number?

(A) 32%

(B) 30%

(C) 28%

(D) 35%

Q35. An amount of Rs. $2{,}100$ is to be divided among A, B and C in the ratio $2 : 3 : 5$. Find the share of B.

(A) Rs. 420

(B) Rs. $1{,}050$

(C) Rs. 700

(D) Rs. 630

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

(A) $1 : 2$

(B) $3 : 2$

(C) $2 : 1$

(D) $1 : 1$

Q37. A man buys 12 oranges for Rs. 10 and sells 10 oranges for Rs. 12. Find his profit percent.

(A) 20%

(B) 44%

(C) 40%

(D) 24%

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

(A) 28%

(B) 30%

(C) 25%

(D) 32%

Q39. A sum of money doubles itself in 8 years at simple interest. What is the rate of interest per annum?

(A) 10%

(B) 8%

(C) 12.5%

(D) 15%

Q40. A man covers a distance of 600 km. If he travels the first half at 40 km/h and the second half at 60 km/h, find his average speed for the whole journey.

(A) 50 km/h

(B) 52 km/h

(C) 45 km/h

(D) 48 km/h

Q41. Two trains, 120 m and 130 m long, run on parallel tracks towards each other at 40 km/h and 50 km/h respectively. How long will they take to cross each other?

(A) 9 seconds

(B) 10 seconds

(C) 12 seconds

(D) 11 seconds

Q42. 6 men can complete a piece of work in 12 days. How many days will 9 men take to complete the same work?

(A) 8 days

(B) 9 days

(C) 10 days

(D) 7 days

Q43. A pipe can fill a tank in 15 minutes and a waste pipe can empty it in 20 minutes. If both are opened together, how long will it take to fill the empty tank?

(A) 45 minutes

(B) 35 minutes

(C) 60 minutes

(D) 50 minutes

Q44. A father is three times as old as his son. After 12 years, the father will be twice as old as his son. Find the present age of the son.

(A) 14 years

(B) 10 years

(C) 16 years

(D) 12 years

Q45. If α and β are the roots of $x^2 - 5x + 6 = 0$, find the value of $\alpha^2 + \beta^2$.

(A) 11

(B) 13

(C) 25

(D) 12

Q46. If x is a real number, find the solution set of $x^2 - 5x + 6 < 0$.

(A) $2 < x < 3$

(B) $x < 2$ or $x > 3$

(C) $-3 < x < -2$

(D) $x > 3$

Q47. Find the sum of the infinite geometric progression $8 + 4 + 2 + 1 + \ldots$

(A) 14

(B) 15

(C) 16

(D) 32

Q48. How many different 3-digit numbers can be formed using the digits $1, 2, 3, 4, 5$ without repetition?

(A) 125

(B) 120

(C) 10

(D) 60

Q49. From a group of 7 players, in how many ways can a team of 4 players be selected?

(A) 28

(B) 35

(C) 210

(D) 24

Q50. A card is drawn at random from a well-shuffled pack of 52 cards. What is the probability that it is a king or a queen?

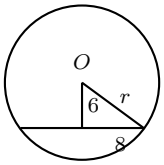
(A) $\frac{2}{13}$

(B) $\frac{1}{13}$

(C) $\frac{4}{13}$

(D) $\frac{1}{26}$

Q51. In a circle, a chord of length 16 cm is at a distance of 6 cm from the centre. Find the radius of the circle.



(A) 8 cm

(B) 12 cm

(C) 10 cm

(D) 14 cm

Q52. The areas of two similar triangles are in the ratio $9 : 16$. Find the ratio of their corresponding sides.

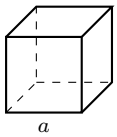
(A) $9 : 16$

(B) $3 : 4$

(C) $81 : 256$

(D) $4 : 3$

Q53. The total surface area of a cube is 150 cm^2. Find the volume of the cube.



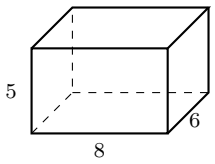
(A) 125 cm^3

(B) 100 cm^3

(C) 150 cm^3

(D) 216 cm^3

Q54. A cuboidal tank has dimensions 8 m $\times$ 6 m $\times$ 5 m. Find its volume in litres. (1 m$^3 = 1000$ litres.)



(A) $1{,}80{,}000$ litres

(B) $2{,}10{,}000$ litres

(C) $2{,}00{,}000$ litres

(D) $2{,}40{,}000$ litres

Q55. Simplify: $\dfrac{1}{\sqrt{3}-\sqrt{2}}$ by rationalising the denominator.

(A) $\sqrt{3}-\sqrt{2}$

(B) $\sqrt{2}-\sqrt{3}$

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

(D) 5

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

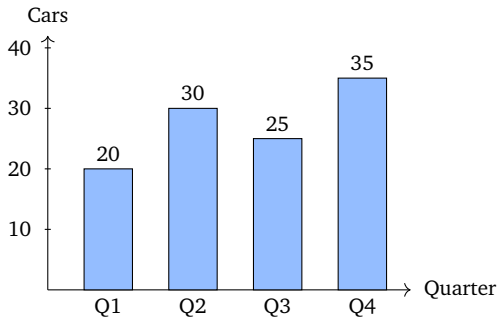
(A) 5

(B) 3

(C) 7

(D) 2

Q57. Directions (Q57–Q59): The bar graph shows the number of cars (in hundreds) sold by a dealer in four quarters of a year.



How many cars were sold in total during the year?

(A) 11,000

(B) 1,100

(C) 110

(D) 10,000

Q58. (Refer to the bar graph in Q57.) The number of cars sold in Q4 is what percent of the cars sold in Q1?

(A) 150%

(B) 160%

(C) 170%

(D) 175%

Q59. (Refer to the bar graph in Q57.) The average number of cars (in hundreds) sold per quarter is:

(A) 26

(B) 27.5

(C) 28

(D) 30

Q60. **Data Sufficiency:** Each question is followed by two statements. Mark the correct option.

Question: What is the speed of the train?

Statement I: The train crosses a pole in 9 seconds.
Statement II: The length of the train is 180 metres.

(A) Statement I alone is sufficient, but Statement II alone is not.

(B) Statement II alone is sufficient, but Statement I alone is not.

(C) Both statements together are sufficient, but neither alone is sufficient.

(D) Each statement alone is sufficient.

Detailed Solutions

Q1.

Solution

Concept — HCF and LCM: For any two numbers, the product of the two numbers equals the product of their HCF and LCM.

Step 1 — Write the relation: First number $\times$ Second number $=$ HCF $\times$ LCM.

Step 2 — Substitute the known values: $84 \times (\text{other}) = 12 \times 924$.

Step 3 — Compute the right side: $12 \times 924 = 11088$.

Step 4 — Solve for the other number: $\text{Other} = \dfrac{11088}{84} = 132$.

Why other options are wrong:

- (A) 108, (B) 120 and (D) 144 do not satisfy $84 \times \text{other} = 11088$.

Final Answer: The other number is $132 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 1

Q2.

Solution

Concept — Cyclicity of remainders: Powers of a number leave remainders that repeat in a fixed cycle when divided by a divisor.

Step 1 — Reduce the base: 7 leaves remainder 2 when divided by 5, so 7^{82} and 2^{82} leave the same remainder.

Step 2 — Find the cycle of $2^n \bmod 5$: The remainders are $2,\ 4,\ 3,\ 1$ and then repeat, a cycle of length 4.

Step 3 — Locate the power: $82 \div 4$ leaves remainder 2, so 2^{82} matches the 2nd term of the cycle.

Step 4 — Read off the remainder: The 2nd term of the cycle is 4.

Why other options are wrong:

- (A) 2 is the 1st term, (C) 3 is the 3rd term, (D) 1 is the 4th term of the cycle, not the 2nd.

Final Answer: Remainder is $4 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 2

Q3.

Solution

Concept — Successive percentage change: A rise of $a\%$ followed by a fall of $b\%$ gives a net change of $\left(a - b - \frac{ab}{100}\right)\%$.

Step 1 — Take a convenient base: Let the original price be Rs. 100.

Step 2 — Apply the 20% increase: New price $= 100 + 20\%$ of $100 = 120$.

Step 3 — Apply the 20% decrease: 20% of $120 = 24$, so price $= 120 - 24 = 96$.

Step 4 — Find the net change: Price fell from 100 to 96, a decrease of 4, i.e. 4%.

Why other options are wrong:

- (B) An increase contradicts the calculation.
- (C) "No change" ignores the cross term $-\frac{20 \times 20}{100} = -4$.
- (D) 2% is not supported by the arithmetic.

Final Answer: A net decrease of $4\% \Rightarrow$ A

Answer: (A) Go Back to Q 3

Q4.

Solution

Concept — Set theory (inclusion-exclusion): The percentage failing in at least one subject is $n(A) + n(B) - n(A \cap B)$.

Step 1 — Failed in at least one subject: $52\% + 42\% - 17\% = 77\%$.

Step 2 — Passed in both subjects: Passing both means failing in neither, so $100\% - 77\% = 23\%$.

Why other options are wrong:

- (A) 25% and (B) 19% come from arithmetic slips.
- (C) 77% is the percentage that failed in at least one subject, not the percentage that passed both.

Final Answer: 23% passed both subjects $\Rightarrow$ D

Answer: (D) Go Back to Q 4

Q5.

Solution

Concept — Partnership (profit sharing): When capitals stay invested for the same time, profit is divided in the ratio of the capitals.

Step 1 — Write the capital ratio: $24000 : 32000 : 40000$, which simplifies to $3 : 4 : 5$.

Step 2 — Find the total ratio units: $3 + 4 + 5 = 12$ units.

Step 3 — Value of one unit: $\frac{18000}{12} = 1500$ per unit.

Step 4 — C's share: C has 5 units, so $5 \times 1500 = \text{Rs. } 7500$.

Why other options are wrong:

- (A) Rs. 4500 is A's share (3 units).
- (B) Rs. 6000 is B's share (4 units).
- (D) Rs. 8000 does not match any whole-unit share.

Final Answer: C's share is Rs. $7500 \Rightarrow$ C

Answer: (C) Go Back to Q 5

Q6.

Solution

Concept — Averages: Total = Average $\times$ Number of items. Use totals before and after adding the new member.

Step 1 — Total age of 11 players: $11 \times 28 = 308$ years.

Step 2 — New average with the coach: The average becomes $28 + 1 = 29$ for 12 people.

Step 3 — New total age: $12 \times 29 = 348$ years.

Step 4 — Age of the coach: $348 - 308 = 40$ years.

Why other options are wrong:

- (A) 39, (C) 41 and (D) 38 do not satisfy the difference of totals $348 - 308$.

Final Answer: The coach is 40 years old $\Rightarrow$ B

Answer: (B) Go Back to Q 6

Q7.

Solution

Concept — Mark-up and discount: Take the cost price as 100, mark it up, then apply the discount on the marked price.

Step 1 — Let CP $= 100$: Marked price $= 100 + 40\% = 140$.

Step 2 — Apply the discount: 25% of $140 = 35$, so selling price $= 140 - 35 = 105$.

Step 3 — Compare SP with CP: SP $= 105$ and CP $= 100$, so profit $= 5$ on 100.

Step 4 — Profit percent: $\dfrac{5}{100} \times 100 = 5\%$.

Why other options are wrong:

- (A) A loss is wrong since SP exceeds CP.
- (B) 15% and (D) 10% overstate the profit.

Final Answer: Profit of 5% $\Rightarrow$ C

Answer: (C) Go Back to Q 7

Q8.

Solution

Concept — Loss and gain on cost price: First recover the cost price from the loss, then mark up for the required gain.

Step 1 — Use the loss to find CP: A 10% loss means SP $= 90\%$ of CP, so $0.90 \times$ CP $= 450$.

Step 2 — Solve for CP: CP $= \dfrac{450}{0.90} = 500$.

Step 3 — Apply the 20% gain: Required SP $= 500 + 20\%$ of $500 = 500 + 100 = 600$.

Why other options are wrong:

- (B) Rs. 540 is only 8% above CP.
- (C) Rs. 575 and (D) Rs. 560 do not give exactly 20% gain on Rs. 500.

Final Answer: Selling price for 20% gain is Rs. 600 $\Rightarrow$ A

Answer: (A) Go Back to Q 8

Q9.

Solution

Concept — Compound interest: Amount $= P\left(1+\dfrac{R}{100}\right)^n$, and CI = Amount − Principal.

Step 1 — Write the growth factor: $1+\dfrac{10}{100}=1.1$.

Step 2 — Compute the amount: $A = 10000\times(1.1)^2 = 10000\times 1.21 = 12100$.

Step 3 — Subtract the principal: CI $= 12100 - 10000 = 2100$.

Why other options are wrong:

- (A) Rs. 2000 is the simple interest, which ignores interest on interest.
- (B) Rs. 1900 and (C) Rs. 2200 do not match $(1.1)^2$.

Final Answer: Compound interest is Rs. 2100 $\Rightarrow$ D

Answer: (D) Go Back to Q 9

Q10.

Solution

Concept — Train crossing a platform: The train must cover its own length plus the platform length; convert speed to metres per second.

Step 1 — Convert the speed: 54 km/h $= 54\times\dfrac{5}{18} = 15$ m/s.

Step 2 — Total distance to cover: Length of train + length of platform $= 180 + 270 = 450$ m.

Step 3 — Time taken: Time $=\dfrac{\text{distance}}{\text{speed}}=\dfrac{450}{15}=30$ seconds.

Why other options are wrong:

- (A) 25 s uses too short a distance.
- (C) 35 s and (D) 20 s do not match $450\div 15$.

Final Answer: The train takes 30 seconds $\Rightarrow$ B

Answer: (B) Go Back to Q 10

Q11.

Solution

Concept — Boats and streams: Downstream speed $= b + s$ and upstream speed $= b - s$, so the stream speed $= \dfrac{\text{downstream} - \text{upstream}}{2}$.

Step 1 — Downstream speed: $\dfrac{30}{2} = 15$ km/h.

Step 2 — Upstream speed: $\dfrac{30}{3} = 10$ km/h.

Step 3 — Speed of the stream: $\dfrac{15 - 10}{2} = \dfrac{5}{2} = 2.5$ km/h.

Why other options are wrong:

- (A) 1 km/h and (D) 2 km/h come from wrong halving.
- (B) 3 km/h would need a downstream-upstream gap of 6, but the gap is 5.

Final Answer: Speed of the stream is 2.5 km/h $\Rightarrow$ C

Answer: (C) Go Back to Q 11

Q12.

Solution

Concept — Time and work: Each worker's one-day work is the reciprocal of the days taken; add the rates to get the combined rate.

Step 1 — One-day work of A: $\dfrac{1}{12}$.

Step 2 — One-day work of B: $\dfrac{1}{18}$.

Step 3 — Combined one-day work: $\dfrac{1}{12} + \dfrac{1}{18} = \dfrac{3}{36} + \dfrac{2}{36} = \dfrac{5}{36}$.

Step 4 — Days together: Time $= \dfrac{1}{5/36} = \dfrac{36}{5} = 7.2$ days.

Why other options are wrong:

- (B) 7.5, (C) 8 and (D) 6.5 do not equal $\dfrac{36}{5}$.

Final Answer: Together they finish in 7.2 days $\Rightarrow$ A

Answer: (A) Go Back to Q 12

Q13.

Solution

Concept — Pipes filling a tank: Treat each pipe's filling rate as a fraction of the tank per minute and add them.

Step 1 — Rate of pipe A: $\frac{1}{20}$ tank per minute.

Step 2 — Rate of pipe B: $\frac{1}{30}$ tank per minute.

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

Step 4 — Time to fill: $\frac{1}{1/12} = 12$ minutes.

Why other options are wrong:

- (A) 10 and (C) 15 minutes do not match $\frac{1}{12}$.
- (D) 25 minutes is larger than either pipe's individual time, which is impossible when both work together.

Final Answer: Both pipes fill the tank in 12 minutes $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q 13

Q14.

Solution

Concept — Linear equations (sum and difference): Add and subtract the two equations to find each number.

Step 1 — Write the equations: $x + y = 25$ and $x - y = 9$.

Step 2 — Add them: $2x = 34$, so $x = 17$.

Step 3 — Find the second number: $y = 25 - 17 = 8$.

Step 4 — Product of the numbers: $17 \times 8 = 136$.

Why other options are wrong:

- (A) 130, (B) 144 and (C) 150 do not equal 17×8.

Final Answer: The product is 136 $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q 14

Q15.

Solution

Concept — Equal roots: A quadratic $ax^2 + bx + c = 0$ has real and equal roots when its discriminant $b^2 - 4ac = 0$.

Step 1 — Identify the coefficients: $a = 1$, $b = -7$, $c = k$.

Step 2 — Set the discriminant to zero: $(-7)^2 - 4(1)(k) = 0$.

Step 3 — Simplify: $49 - 4k = 0$.

Step 4 — Solve for k: $4k = 49$, so $k = \dfrac{49}{4}$.

Why other options are wrong:

- (A) $\dfrac{49}{2}$ and (D) 14 make the discriminant negative.
- (B) 7 does not satisfy $49 - 4k = 0$.

Final Answer: $k = \dfrac{49}{4} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 15

Q16.

Solution

Concept — Compound inequality: Solve the double inequality by isolating x in the middle, keeping the inequality signs.

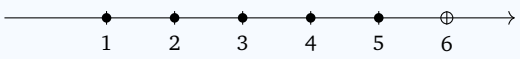
Step 1 — Add 5 throughout: $-3 + 5 \leq 2x < 7 + 5$, giving $2 \leq 2x < 12$.

Step 2 — Divide throughout by 2: $1 \leq x < 6$.

Step 3 — List the integers: $x = 1, 2, 3, 4, 5$ (note 6 is excluded).

Step 4 — Count them: There are 5 integer values.

Number line:



Why other options are wrong:

- (A) 4 misses one value; (C) 6 and (D) 7 wrongly include 6 or 0.

Final Answer: There are 5 integer values $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 16

Q17.

Solution

Concept — Arithmetic progression: The sum of n terms is $S_n = \frac{n}{2}\left[2a+(n-1)d\right]$.

Step 1 — Identify a, d and n: $a = 3$, $d = 7 - 3 = 4$, $n = 20$.

Step 2 — Substitute into the formula: $S_{20} = \frac{20}{2}\left[2(3) + (20-1)(4)\right]$.

Step 3 — Simplify the bracket: $2(3) + 19(4) = 6 + 76 = 82$.

Step 4 — Multiply: $S_{20} = 10 \times 82 = 820$.

Why other options are wrong:

- (B) 800, (C) 840 and (D) 780 come from using a wrong value of d or n.

Final Answer: The sum of 20 terms is $820 \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q 17

Q18.

Solution

Concept — Permutations with repeated letters: The number of arrangements of n letters with a letter repeated p times is $\frac{n!}{p!}$.

Step 1 — Count the letters: LEADER has 6 letters.

Step 2 — Spot the repetition: The letter E appears 2 times; all others are distinct.

Step 3 — Apply the formula: Arrangements $= \frac{6!}{2!} = \frac{720}{2} = 360$.

Why other options are wrong:

- (A) 720 forgets to divide by $2!$ for the repeated E.
- (B) 120 and (C) 240 use a wrong factorial.

Final Answer: Number of arrangements is $360 \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q 18

Q19.

Solution

Concept — Combinations: Order does not matter in a committee, so use $\binom{n}{r}$, and multiply independent choices.

Step 1 — Choose 2 men from 5: $\binom{5}{2} = \dfrac{5 \times 4}{2 \times 1} = 10.$

Step 2 — Choose 1 woman from 4: $\binom{4}{1} = 4.$

Step 3 — Multiply the choices: $10 \times 4 = 40.$

Why other options are wrong:

- (A) 30, (C) 60 and (D) 20 use wrong combination values.

Final Answer: The committee can be formed in 40 ways $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q 19

Q20.

Solution

Concept — Probability with two dice: Probability $= \dfrac{\text{favourable outcomes}}{\text{total outcomes}}$; two dice give $6 \times 6 = 36$ outcomes.

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

Step 2 — Count favourable outcomes: There are 5 such pairs.

Step 3 — Compute the probability: $\dfrac{5}{36}.$

Why other options are wrong:

- (A) $\dfrac{1}{6} = \dfrac{6}{36}$ counts one pair too many.
- (B) $\dfrac{1}{9} = \dfrac{4}{36}$ misses one pair; (D) $\dfrac{1}{12} = \dfrac{3}{36}$ misses two pairs.

Final Answer: Probability is $\dfrac{5}{36} \Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q 20

Q21.

Solution

Concept — Parallel lines and a transversal: Co-interior (allied) angles on the same side of the transversal are supplementary, so they add to $180°$.

Step 1 — Write the supplementary relation: $3x + 2x = 180°$.

Step 2 — Combine like terms: $5x = 180°$.

Step 3 — Solve for x: $x = \dfrac{180}{5} = 36°$.

Why other options are wrong:

- (B) $40°$, (C) $45°$ and (D) $30°$ do not satisfy $5x = 180°$.

Final Answer: $x = 36° \Rightarrow$ A

Answer: (A) Go Back to Q 21

Q22.

Solution

Concept — Pythagoras theorem: In a right triangle, hypotenuse^2 = leg$_1^2$ + leg$_2^2$.

Step 1 — Square the legs: $9^2 = 81$ and $12^2 = 144$.

Step 2 — Add the squares: $81 + 144 = 225$.

Step 3 — Take the square root: Hypotenuse $= \sqrt{225} = 15$ cm.

Why other options are wrong:

- (A) 13 cm fits legs $5, 12$, not $9, 12$.
- (B) 14 cm and (C) 21 cm are not $\sqrt{225}$.

Final Answer: The hypotenuse is 15 cm $\Rightarrow$ D

Answer: (D) Go Back to Q 22

Q23.

Solution

Concept — Cylinder surface area: Total surface area of a solid cylinder $= 2\pi r(r+h)$.

Step 1 — Note the values: $r = 7$ cm, $h = 10$ cm, $\pi = \dfrac{22}{7}$.

Step 2 — Add radius and height: $r + h = 7 + 10 = 17$.

Step 3 — Substitute: $2 \times \dfrac{22}{7} \times 7 \times 17$.

Step 4 — Simplify: The 7 cancels, giving $2 \times 22 \times 17 = 748$ cm^2.

Why other options are wrong:

- (A) 704 uses $r + h = 16$.
- (C) 440 is only the curved surface area $2\pi rh$.
- (D) 880 doubles the curved area incorrectly.

Final Answer: Total surface area is 748 cm^2 $\Rightarrow$ B

Answer: (B) Go Back to Q 23

Q24.

Solution

Concept — Cone volume: First find the height from $h = \sqrt{l^2 - r^2}$, then use volume $= \dfrac{1}{3}\pi r^2 h$.

Step 1 — Find the height: $h = \sqrt{10^2 - 6^2} = \sqrt{100 - 36} = \sqrt{64} = 8$ cm.

Step 2 — Apply the volume formula: $V = \dfrac{1}{3} \times 3.14 \times 6^2 \times 8$.

Step 3 — Simplify the powers: $6^2 = 36$, so $V = \dfrac{1}{3} \times 3.14 \times 36 \times 8$.

Step 4 — Compute: $\dfrac{1}{3} \times 36 = 12$, so $V = 3.14 \times 12 \times 8 = 3.14 \times 96 = 301.44$ cm^3.

Why other options are wrong:

- (A) 288π and (B) 96π are unsimplified or use a wrong factor; with $\pi = 3.14$ the value is 301.44.
- (D) 314 uses $r = 5, h = 12$, the wrong dimensions.

Final Answer: Volume is 301.44 cm^3 $\Rightarrow$ C

Answer: (C) Go Back to Q 24

Q25.

Solution

Concept — Logarithms: $\log_b x = n$ means $x = b^n$.

Step 1 — Rewrite in exponential form: $\log_2 x = 5 \Rightarrow x = 2^5$.

Step 2 — Evaluate the power: $2^5 = 32$.

Why other options are wrong:

- (B) 25 confuses 2^5 with 5^2.
- (C) 10 and (D) $16 = 2^4$ are not 2^5.

Final Answer: $x = 32 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 25

Q26.

Solution

Concept — Venn diagram (two sets): Those playing at least one game $= n(C) + n(F) - n(C \cap F)$; the rest play neither.

Step 1 — Play at least one game: $25 + 20 - 8 = 37$.

Step 2 — Play neither game: $40 - 37 = 3$.

Why other options are wrong:

- (A) 5 forgets to subtract the overlap.
- (C) 7 and (D) 2 come from arithmetic slips.

Final Answer: 3 students play neither game $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 26

Q27.

Solution

Concept — Reading a line graph: Read each year's value from the plotted points and add them.

Step 1 — List the sales: $2018 = 20$, $2019 = 30$, $2020 = 25$, $2021 = 40$, $2022 = 35$ (thousand units).

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

Why other options are wrong:

- (A) 140, (B) 145 and (D) 155 result from misreading one data point.

Final Answer: Total sales is 150 thousand units $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 27

Q28.

Solution

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

Step 1 — Read the two values: $2020 = 25$ and $2021 = 40$.

Step 2 — Find the increase: $40 - 25 = 15$.

Step 3 — Compute the percentage: $\dfrac{15}{25} \times 100 = 60\%$.

Why other options are wrong:

- (B) 50% and (C) 40% divide by the wrong base.
- (D) 62.5% wrongly takes 40 as the base.

Final Answer: The increase is $60\% \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 28

Q29.

Solution

Concept — Average: Average $= \dfrac{\text{sum of values}}{\text{number of values}}$.

Step 1 — Use the total from Q27: Sum $= 150$ thousand units.

Step 2 — Divide by the number of years: $\dfrac{150}{5} = 30$.

Why other options are wrong:

- (A) 32 and (B) 28 use a wrong total.
- (C) 35 divides by the wrong count.

Final Answer: Average sales is 30 thousand units $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 29

Q30.

Solution

Concept — Data sufficiency: Test each statement alone, then together, and stop as soon as the answer is unique.

Step 1 — Statement I alone: Sum of digits $= 9$ allows $18, 27, 36, 45, \ldots$, many numbers. Not sufficient.

Step 2 — Statement II alone: Number $= 4 \times$ (sum of digits) gives $10a + b = 4(a + b)$, i.e. $6a = 3b$, so $b = 2a$. This allows $12, 24, 36, 48$. Not unique, so not sufficient.

Step 3 — Both together: From II, $b = 2a$; from I, $a + b = 9$, so $a + 2a = 9$, giving $a = 3, b = 6$, the number 36. Unique.

Why other options are wrong:

- (A), (C) and (D) claim a single statement suffices, but each alone leaves several possible numbers.

Final Answer: Both statements together are sufficient $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 30

Q31.

Solution

Concept — Unit digit cyclicity: The unit digit of powers of 3 repeats in the cycle $3, 9, 7, 1$ with period 4.

Step 1 — Find the position in the cycle: Divide the exponent by 4: $64 \div 4$ leaves remainder 0.

Step 2 — Interpret remainder 0: A remainder of 0 corresponds to the last term of the cycle, which is 1.

Why other options are wrong:

- (A) 3, (B) 9 and (C) 7 are the 1st, 2nd and 3rd terms, not the term for remainder 0.

Final Answer: The unit digit of 3^{64} is $1 \Rightarrow$ D

Answer: (D) Go Back to Q 31

Q32.

Solution

Concept — Number of factors: If $N = p^a q^b \ldots$, the number of positive factors is $(a+1)(b+1)\ldots$

Step 1 — Prime factorise 72: $72 = 2^3 \times 3^2$.

Step 2 — Apply the formula: Number of factors $= (3+1)(2+1) = 4 \times 3 = 12$.

Why other options are wrong:

- (A) 8, (B) 10 and (D) 6 use wrong exponents in the formula.

Final Answer: 72 has 12 factors $\Rightarrow$ C

Answer: (C) Go Back to Q 32

Q33.

Solution

Concept — Percentage comparison: "Less than" uses the larger quantity as the base, so the reference value changes.

Step 1 — Take B's salary as 100**:** Then A's salary $= 100 + 25\% = 125$.

Step 2 — Find how much less B is than A: Difference $= 125 - 100 = 25$.

Step 3 — Use A as the base: $\frac{25}{125} \times 100 = 20\%$.

Why other options are wrong:

- (A) 25% wrongly keeps B's salary as the base.
- (C) 15% and (D) $\frac{100}{6}\%$ do not match $\frac{25}{125}$.

Final Answer: B's salary is 20% less than A's $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 33

Q34.

Solution

Concept — Successive percentage increase: Multiply the growth factors, since each increase acts on the previous result.

Step 1 — Write the growth factors: 10% increase $= 1.1$ and 20% increase $= 1.2$.

Step 2 — Multiply them: $1.1 \times 1.2 = 1.32$.

Step 3 — Convert to a percentage increase: 1.32 means 132% of the original, i.e. a 32% increase.

Why other options are wrong:

- (B) 30% just adds $10 + 20$ and ignores the cross term.
- (C) 28% and (D) 35% are not 1.1×1.2.

Final Answer: Overall increase is $32\% \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 34

Q35.

Solution

Concept — Dividing in a ratio: Each share equals its ratio part divided by the total parts, times the whole amount.

Step 1 — Total ratio parts: $2 + 3 + 5 = 10$.

Step 2 — Value of one part: $\frac{2100}{10} = 210$.

Step 3 — B's share: B has 3 parts, so $3 \times 210 = \text{Rs. } 630$.

Why other options are wrong:

- (A) Rs. 420 is A's share (2 parts).
- (B) Rs. 1050 is C's share (5 parts).
- (C) Rs. 700 does not correspond to a whole number of parts.

Final Answer: B's share is Rs. $630 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 35

Q36.

Solution

Concept — Alligation: Ratio of cheaper to dearer $= \dfrac{\text{dearer price} - \text{mean}}{\text{mean} - \text{cheaper price}}$.

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

Step 2 — Compute the differences: Dearer $-$ mean $= 45 - 35 = 10$; mean $-$ cheaper $= 35 - 30 = 5$.

Step 3 — Form the ratio: $\frac{10}{5} = \frac{2}{1}$, so the ratio of cheaper to dearer is $2 : 1$.

Why other options are wrong:

- (A) $1 : 2$ inverts the alligation ratio.
- (B) $3 : 2$ and (D) $1 : 1$ do not match the differences 10 and 5.

Final Answer: They must be mixed in $2 : 1 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 36

Q37.

Solution

Concept — Profit on unit cost: Find the cost price and selling price of one orange, then apply $\text{profit}\% = \dfrac{\text{SP} - \text{CP}}{\text{CP}} \times 100$.

Step 1 — Cost price of one orange: $\dfrac{10}{12} = \dfrac{5}{6}$ rupees.

Step 2 — Selling price of one orange: $\dfrac{12}{10} = \dfrac{6}{5}$ rupees.

Step 3 — Profit per orange: $\dfrac{6}{5} - \dfrac{5}{6} = \dfrac{36 - 25}{30} = \dfrac{11}{30}$.

Step 4 — Profit percent: $\dfrac{11/30}{5/6} \times 100 = \dfrac{11}{30} \times \dfrac{6}{5} \times 100 = \dfrac{11}{25} \times 100 = 44\%$.

Why other options are wrong:

- (A) 20%, (C) 40% and (D) 24% come from comparing prices without a common base.

Final Answer: Profit is $44\% \Rightarrow$ B

Answer: (B) Go Back to Q 37

Q38.

Solution

Concept — Successive discounts: Multiply the remaining-price factors; the single equivalent discount is 100% minus the final factor.

Step 1 — Write the factors: A 20% discount leaves 0.80; a 10% discount leaves 0.90.

Step 2 — Multiply: $0.80 \times 0.90 = 0.72$, so 72% of the price remains.

Step 3 — Find the single discount: $100\% - 72\% = 28\%$.

Why other options are wrong:

- (B) 30% just adds $20 + 10$ and ignores the cross term.
- (C) 25% and (D) 32% are not $1 - 0.72$.

Final Answer: Single equivalent discount is $28\% \Rightarrow$ A

Answer: (A) Go Back to Q 38

Q39.

Solution

Concept — Simple interest (doubling): When a sum doubles, the interest earned equals the principal itself.

Step 1 — Interest equals principal: If P doubles, SI $= P$.

Step 2 — Apply the SI formula: SI $= \dfrac{P \times R \times T}{100}$, so $P = \dfrac{P \times R \times 8}{100}$.

Step 3 — Cancel P and solve: $1 = \dfrac{8R}{100}$, giving $R = \dfrac{100}{8} = 12.5\%$.

Why other options are wrong:

- (A) 10% and (B) 8% are too low to double in 8 years.
- (D) 15% would double the sum in less than 8 years.

Final Answer: The rate is 12.5% per annum $\Rightarrow$ C

Answer: (C) Go Back to Q 39

Q40.

Solution

Concept — Average speed: Average speed $= \dfrac{\text{total distance}}{\text{total time}}$, not the simple mean of the two speeds.

Step 1 — Split the journey: Each half is $\dfrac{600}{2} = 300$ km.

Step 2 — Time for each half: $\dfrac{300}{40} = 7.5$ h and $\dfrac{300}{60} = 5$ h.

Step 3 — Total time: $7.5 + 5 = 12.5$ hours.

Step 4 — Average speed: $\dfrac{600}{12.5} = 48$ km/h.

Why other options are wrong:

- (A) 50 km/h is the plain average of 40 and 60, which is wrong here.
- (B) 52 and (C) 45 do not equal $\dfrac{600}{12.5}$.

Final Answer: Average speed is 48 km/h $\Rightarrow$ D

Answer: (D) Go Back to Q 40

Q41.

Solution

Concept — Trains crossing each other (opposite directions): Add the speeds for relative speed and add the lengths for the distance to cover.

Step 1 — Relative speed: $40 + 50 = 90$ km/h $= 90 \times \dfrac{5}{18} = 25$ m/s.

Step 2 — Total length to cover: $120 + 130 = 250$ m.

Step 3 — Time to cross: $\dfrac{250}{25} = 10$ seconds.

Why other options are wrong:

- (A) 9, (C) 12 and (D) 11 seconds do not equal $\dfrac{250}{25}$.

Final Answer: They cross in 10 seconds $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q 41

Q42.

Solution

Concept — Work and men (inverse proportion): The total work in man-days is constant, so more men means proportionally fewer days.

Step 1 — Total man-days of work: $6 \times 12 = 72$ man-days.

Step 2 — Days for 9 men: $\dfrac{72}{9} = 8$ days.

Why other options are wrong:

- (B) 9, (C) 10 and (D) 7 days do not give $9 \times$ days $= 72$.

Final Answer: 9 men finish in 8 days $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q 42

Q43.

Solution

Concept — Filling against a leak: The net filling rate = filling rate − emptying rate.

Step 1 — Filling rate: $\frac{1}{15}$ tank per minute.

Step 2 — Emptying rate: $\frac{1}{20}$ tank per minute.

Step 3 — Net rate: $\frac{1}{15} - \frac{1}{20} = \frac{4-3}{60} = \frac{1}{60}$.

Step 4 — Time to fill: $\frac{1}{1/60} = 60$ minutes.

Why other options are wrong:

- (A) 45, (B) 35 and (D) 50 minutes do not match the net rate $\frac{1}{60}$.

Final Answer: The tank fills in 60 minutes $\Rightarrow$ C

Answer: (C) Go Back to Q 43

Q44.

Solution

Concept — Ages (linear equations): Set up the present ages with a variable and translate the future condition into an equation.

Step 1 — Define the variable: Let the son's age be S; the father's age is $3S$.

Step 2 — After 12 years: Father $= 3S + 12$, son $= S + 12$, with father twice the son.

Step 3 — Form the equation: $3S + 12 = 2(S + 12)$.

Step 4 — Solve: $3S + 12 = 2S + 24 \Rightarrow S = 12$ years.

Why other options are wrong:

- (A) 14, (B) 10 and (C) 16 do not satisfy $3S + 12 = 2(S + 12)$.

Final Answer: The son is 12 years old $\Rightarrow$ D

Answer: (D) Go Back to Q 44

Q45.

Solution

Concept — Sum and product of roots: For $x^2-5x+6=0$, $\alpha+\beta=5$ and $\alpha\beta=6$; also $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$.

Step 1 — Read off the sum and product: $\alpha+\beta=5$, $\alpha\beta=6$.

Step 2 — Apply the identity: $\alpha^2+\beta^2=5^2-2(6)$.

Step 3 — Compute: $25-12=13$.

Why other options are wrong:

- (A) 11 wrongly uses $\alpha\beta$ with the wrong sign.
- (C) 25 forgets the $-2\alpha\beta$ term; (D) 12 is the product term alone doubled.

Final Answer: $\alpha^2+\beta^2=13 \Rightarrow$ B

Answer: (B) Go Back to Q 45

Q46.

Solution

Concept — Quadratic inequality: Factorise, find the roots, and choose the interval where the product is negative.

Step 1 — Factorise: $x^2-5x+6=(x-2)(x-3)$.

Step 2 — Find the roots: $x=2$ and $x=3$.

Step 3 — Choose the interval: The product $(x-2)(x-3)$ is negative only between the roots, so $2<x<3$.

Why other options are wrong:

- (B) $x<2$ or $x>3$ is where the expression is positive.
- (C) $-3<x<-2$ uses the wrong roots; (D) $x>3$ gives a positive product.

Final Answer: The solution set is $2<x<3 \Rightarrow$ A

Answer: (A) Go Back to Q 46

Q47.

Solution

Concept — Infinite geometric series: If $|r| < 1$, the sum to infinity is $S = \dfrac{a}{1-r}$.

Step 1 — Identify a and r: First term $a = 8$; common ratio $r = \dfrac{4}{8} = \dfrac{1}{2}$.

Step 2 — Apply the formula: $S = \dfrac{8}{1-\frac{1}{2}} = \dfrac{8}{\frac{1}{2}}$.

Step 3 — Simplify: $\dfrac{8}{1/2} = 16$.

Why other options are wrong:

- (A) 14 and (B) 15 are partial sums, not the infinite sum.
- (D) 32 uses $\dfrac{a}{r}$ instead of $\dfrac{a}{1-r}$.

Final Answer: The infinite sum is $16 \Rightarrow$ C

Answer: (C) Go Back to Q 47

Q48.

Solution

Concept — Permutations without repetition: Fill the places one by one, reducing the available digits each time.

Step 1 — Hundreds place: 5 choices.

Step 2 — Tens place: 4 remaining choices.

Step 3 — Units place: 3 remaining choices.

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

Why other options are wrong:

- (A) $125 = 5^3$ allows repetition, which is not permitted.
- (B) $120 = 5!$ uses all five digits; (C) 10 is far too small.

Final Answer: 60 different 3-digit numbers $\Rightarrow$ D

Answer: (D) Go Back to Q 48

Q49.

Solution

Concept — Combinations: Selecting a team ignores order, so use $\binom{n}{r} = \dfrac{n!}{r!(n-r)!}$.

Step 1 — Write the combination: $\binom{7}{4} = \dfrac{7!}{4!\,3!}$.

Step 2 — Simplify: $\dfrac{7 \times 6 \times 5}{3 \times 2 \times 1} = \dfrac{210}{6} = 35$.

Why other options are wrong:

- (A) $28 = \binom{8}{2}$ uses the wrong values.
- (C) 210 is a permutation $\binom{7}{4} \times 3!$; (D) 24 is unrelated.

Final Answer: The team can be chosen in 35 ways $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q 49

Q50.

Solution

Concept — Probability (mutually exclusive events): The events "king" and "queen" cannot occur together, so add their favourable counts.

Step 1 — Count favourable cards: 4 kings $+4$ queens $= 8$ cards.

Step 2 — Total cards: 52.

Step 3 — Probability: $\dfrac{8}{52} = \dfrac{2}{13}$.

Why other options are wrong:

- (B) $\dfrac{1}{13} = \dfrac{4}{52}$ counts only one rank.
- (C) $\dfrac{4}{13}$ overcounts; (D) $\dfrac{1}{26} = \dfrac{2}{52}$ is too small.

Final Answer: Probability is $\dfrac{2}{13} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 50

Q51.

Solution

Concept — Chord and radius: The perpendicular from the centre bisects the chord, forming a right triangle with legs (half-chord, distance) and hypotenuse (radius).

Step 1 — Half the chord: $\frac{16}{2} = 8$ cm.

Step 2 — Apply Pythagoras: $r^2 = 8^2 + 6^2 = 64 + 36 = 100$.

Step 3 — Take the root: $r = \sqrt{100} = 10$ cm.

Why other options are wrong:

- (A) 8 cm is only the half-chord.
- (B) 12 cm and (D) 14 cm are not $\sqrt{100}$.

Final Answer: The radius is 10 cm $\Rightarrow$ C

Answer: (C) Go Back to Q 51

Q52.

Solution

Concept — Similar triangles: The ratio of areas equals the square of the ratio of corresponding sides, so take the square root to compare sides.

Step 1 — Write the relation: $\frac{\text{area}_1}{\text{area}_2} = \left(\frac{\text{side}_1}{\text{side}_2}\right)^2 = \frac{9}{16}$.

Step 2 — Take the square root: $\frac{\text{side}_1}{\text{side}_2} = \sqrt{\frac{9}{16}} = \frac{3}{4}$.

Why other options are wrong:

- (A) $9 : 16$ is the area ratio, not the side ratio.
- (C) $81 : 256$ squares the area ratio; (D) $4 : 3$ inverts the answer.

Final Answer: The side ratio is $3 : 4$ $\Rightarrow$ B

Answer: (B) Go Back to Q 52

Q53.

Solution

Concept — Cube: Total surface area $= 6a^2$ and volume $= a^3$, where a is the edge.

Step 1 — Find a^2 from the surface area: $6a^2 = 150 \Rightarrow a^2 = 25$.

Step 2 — Find the edge: $a = \sqrt{25} = 5$ cm.

Step 3 — Find the volume: $a^3 = 5^3 = 125$ cm^3.

Why other options are wrong:

- (B) 100 and (C) 150 do not equal 5^3.
- (D) $216 = 6^3$ uses the wrong edge.

Final Answer: The volume is 125 cm^3 $\Rightarrow$ A

Answer: (A) Go Back to Q 53

Q54.

Solution

Concept — Cuboid volume: Volume = length $\times$ breadth $\times$ height; then convert cubic metres to litres.

Step 1 — Multiply the dimensions: $8 \times 6 \times 5 = 240$ m^3.

Step 2 — Convert to litres: $240 \times 1000 = 2{,}40{,}000$ litres.

Why other options are wrong:

- (A) $1{,}80{,}000$ and (B) $2{,}10{,}000$ use wrong products.
- (C) $2{,}00{,}000$ does not equal 240×1000.

Final Answer: The volume is $2{,}40{,}000$ litres $\Rightarrow$ D

Answer: (D) Go Back to Q 54

Q55.

Solution

Concept — Rationalising the denominator: Multiply numerator and denominator by the conjugate of the denominator.

Step 1 — Multiply by the conjugate: $\dfrac{1}{\sqrt{3}-\sqrt{2}} \times \dfrac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$.

Step 2 — Use $(a-b)(a+b) = a^2 - b^2$**:** Denominator $= (\sqrt{3})^2 - (\sqrt{2})^2 = 3 - 2 = 1$.

Step 3 — Simplify: $\dfrac{\sqrt{3}+\sqrt{2}}{1} = \sqrt{3}+\sqrt{2}$.

Why other options are wrong:

- (A) $\sqrt{3}-\sqrt{2}$ would result from the wrong conjugate.
- (B) $\sqrt{2}-\sqrt{3}$ is negative; (D) 5 ignores the radicals.

Final Answer: The value is $\sqrt{3}+\sqrt{2} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 55

Q56.

Solution

Concept — Evaluating a function: Substitute the given input for x and simplify.

Step 1 — Substitute $x = 2$**:** $f(2) = 2(2)^2 - 3(2) + 1$.

Step 2 — Evaluate the square term: $2 \times 4 = 8$.

Step 3 — Combine all terms: $8 - 6 + 1 = 3$.

Why other options are wrong:

- (A) 5, (C) 7 and (D) 2 come from arithmetic slips in substitution.

Final Answer: $f(2) = 3 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 56

Q57.

Solution

Concept — Reading a bar graph: Each bar gives the cars in hundreds; add the bars and convert to actual cars.

Step 1 — Read the bars (in hundreds): Q1 $= 20$, Q2 $= 30$, Q3 $= 25$, Q4 $= 35$.

Step 2 — Add them: $20 + 30 + 25 + 35 = 110$ hundreds.

Step 3 — Convert to actual cars: $110 \times 100 = 11{,}000$ cars.

Why other options are wrong:

- (B) $1{,}100$ and (C) 110 forget the "in hundreds" scaling.
- (D) $10{,}000$ misreads one bar.

Final Answer: Total cars sold is $11{,}000 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 57

Q58.

Solution

Concept — One value as a percent of another: Required percent $= \dfrac{\text{Q4}}{\text{Q1}} \times 100$.

Step 1 — Read the values (in hundreds): Q4 $= 35$, Q1 $= 20$.

Step 2 — Form the ratio: $\dfrac{35}{20} = 1.75$.

Step 3 — Convert to a percentage: $1.75 \times 100 = 175\%$.

Why other options are wrong:

- (A) 150%, (B) 160% and (C) 170% do not equal $\dfrac{35}{20} \times 100$.

Final Answer: Q4 sales is 175% of Q1 $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 58

Q59.

Solution

Concept — Average: Average $= \dfrac{\text{sum of the four quarters}}{4}$.

Step 1 — Use the total from Q57: Sum $= 110$ (in hundreds).

Step 2 — Divide by 4: $\dfrac{110}{4} = 27.5$.

Why other options are wrong:

- (A) 26, (C) 28 and (D) 30 do not equal $\dfrac{110}{4}$.

Final Answer: Average is 27.5 hundreds per quarter $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q 59

Q60.

Solution

Concept — Data sufficiency: Speed needs both a distance and a time; check whether each statement supplies what is missing.

Step 1 — Statement I alone: Time to cross a pole $= 9$ s gives the time, but the train's length (the distance) is unknown. Not sufficient.

Step 2 — Statement II alone: Length $= 180$ m gives the distance, but no time is given. Not sufficient.

Step 3 — Both together: Speed $= \dfrac{\text{length}}{\text{time}} = \dfrac{180}{9} = 20$ m/s. Unique value.

Why other options are wrong:

- (A), (B) and (D) claim one statement alone is enough, but speed requires both length and time.

Final Answer: Both statements together are sufficient $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q 60

Answer Key

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