ATMA Quantitative Skills
Sample Paper – 1

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 portion of **ATMA** entrance.
- Each correct answer carries **+1 marks**. There is **a penalty of** 0.25 **mark** for incorrect answers, while unattempted questions score 0.
- 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 least number which when divided by 12, 15 and 20 leaves a remainder of 5 in each case is:

(A) 55

(B) 60

(C) 65

(D) 70

Q2. If a number is divisible by both 9 and 11, then it must necessarily be divisible by:

(A) 99

(B) 33

(C) 44

(D) 66

Q3. In an election between two candidates, the winner secured 58% of the votes and won by 2400 votes. The total number of votes polled was:

(A) 12000

(B) 13000

(C) 14000

(D) 15000

Q4. The price of a commodity is first increased by 20% and then decreased by 20%. The net change in the price is:

(A) No change

(B) A decrease of 4%

(C) An increase of 4%

(D) A decrease of 2%

Q5. A, B and C start a business with capitals in the ratio $4 : 6 : 9$. At the end of the year the total profit is Rs. 9500. B's share of the profit is:

(A) Rs. 3000

(B) Rs. 2000

(C) Rs. 4500

(D) Rs. 3500

Q6. The average age of 11 players of a cricket team is 25 years. If the age of the coach is included, the average becomes 26 years. The age of the coach is:

(A) 33 years

(B) 34 years

(C) 36 years

(D) 37 years

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

(A) 15%

(B) 12%

(C) 5%

(D) 10%

Q8. By selling an article for Rs. 450 a man loses 10%. To gain 20%, he must sell it for:

(A) Rs. 540

(B) Rs. 600

(C) Rs. 580

(D) Rs. 560

Q9. The compound interest on Rs. 8000 at 10% per annum for 2 years, compounded annually, is:

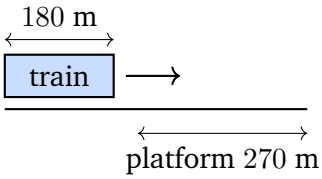
(A) Rs. 1680

(B) Rs. 1600

(C) Rs. 1720

(D) Rs. 1640

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



(A) 45

(B) 50

(C) 48

(D) 54

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

(A) 0.5

(B) 1

(C) 1.5

(D) 2

Q12. A can do a piece of work in 12 days and B in 18 days. Working together, they will finish the work in:

(A) 6.6 days

(B) 9 days

(C) 7.2 days

(D) 8 days

Q13. Two pipes A and B can fill a tank in 20 minutes and 30 minutes respectively. If both pipes are opened together, the time taken to fill the tank is:

(A) 12 minutes

(B) 10 minutes

(C) 15 minutes

(D) 25 minutes

Q14. If the roots of the equation $x^2 - 7x + k = 0$ differ by 3, then the value of k is:

(A) 6

(B) 8

(C) 12

(D) 10

Q15. The sum of two numbers is 25 and their difference is 7. The product of the two numbers is:

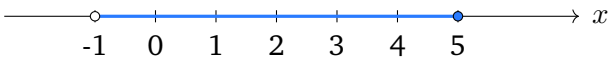
(A) 132

(B) 144

(C) 156

(D) 160

Q16. The number of integer values of x satisfying $-5 < 2x - 3 \leq 7$ is (the solution lies on the number line shown):



(A) 4

(B) 5

(C) 6

(D) 7

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

(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) 600

(D) 360

Q19. A committee of 3 members is to be formed from 5 men and 4 women. The number of committees with exactly 2 men and 1 woman is:

(A) 30

(B) 40

(C) 60

(D) 20

Q20. Two dice are thrown together. The probability that the sum of the numbers appearing on them is 9 is:

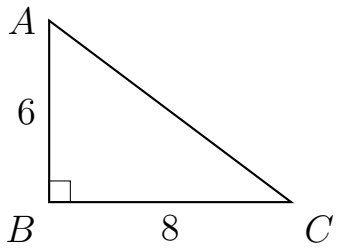
(A) $\frac{1}{6}$

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

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

(D) $\frac{1}{18}$

Q21. In the right-angled triangle shown below, $\angle B = 90^\circ$, $AB = 6$ cm and $BC = 8$ cm. The length of the hypotenuse AC is:



(A) 10 cm

(B) 12 cm

(C) 14 cm

(D) 9 cm

Q22. Two angles of a triangle are 50° and 60°. The exterior angle at the third vertex is:

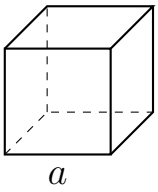
(A) 100°

(B) 110°

(C) 120°

(D) 130°

Q23. A cube has a total surface area of 150 cm^2. Its volume (in cm^3) is:



(A) 100

(B) 64

(C) 216

(D) 125

Q24. The area of a circle is 154 cm^2. Taking $\pi = \dfrac{22}{7}$, its circumference (in cm) is:

(A) 44

(B) 22

(C) 66

(D) 88

Q25. If $\log_2 x = 5$, then the value of x is:

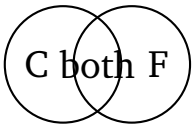
(A) 10

(B) 32

(C) 25

(D) 16

Q26. In a class of 40 students, 25 play cricket and 20 play football. If every student plays at least one of the two games, the number who play both is:



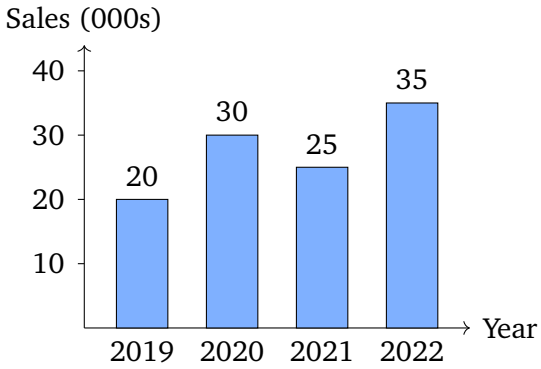
(A) 3

(B) 7

(C) 5

(D) 10

Q27. **Directions (Q27–Q29):** The bar graph shows the number of cars (in thousands) sold by a company over four years.



The total number of cars sold over the four years is:

(A) $110{,}000$

(B) $100{,}000$

(C) $120{,}000$

(D) $95{,}000$

Q28. (Refer to the bar graph above.) The percentage increase in sales from 2021 to 2022 is:

(A) 10%

(B) 25%

(C) 20%

(D) 40%

Q29. (Refer to the bar graph above.) The average number of cars sold per year over the four years is:

(A) $30{,}000$

(B) $27{,}500$

(C) $25{,}000$

(D) $28{,}000$

Q30. **Data Sufficiency:** A two-digit number N is to be uniquely determined.
Statement I: The sum of the digits of N is 8.
Statement II: N is a multiple of 11.
Which of the following is correct regarding sufficiency?

(A) Statement I alone is sufficient

(B) Statement II alone is sufficient

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

(D) Each statement alone is sufficient

Part II: Quantitative Skills

Q31. The unit digit in the product $7^{95} \times 3^{58}$ is:

(A) 1

(B) 3

(C) 7

(D) 9

Q32. The HCF of two numbers is 13 and their LCM is 455. If one of the numbers is 65, the other number is:

(A) 35

(B) 65

(C) 13

(D) 91

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

(A) 25%

(B) 20%

(C) 15%

(D) 30%

Q34. 45% of a number is 135. What is 80% of that same number?

(A) 200

(B) 220

(C) 240

(D) 260

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

(A) $2 : 3$

(B) $3 : 4$

(C) $4 : 9$

(D) $1 : 3$

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. 40 per kg?

(A) $2 : 3$

(B) $3 : 2$

(C) $1 : 1$

(D) $1 : 2$

Q37. A trader sells two articles at Rs. 960 each. On one he gains 20% and on the other he loses 20%. His overall result is:

(A) No profit no loss

(B) A loss of 4%

(C) A gain of 4%

(D) A loss of 2%

Q38. Two successive discounts of 10% and 20% 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. The rate of interest per annum is:

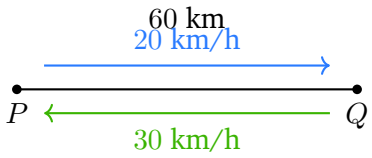
(A) 8%

(B) 10%

(C) 12.5%

(D) 15%

Q40. A man covers a distance of 60 km at 20 km/h and returns along the same road at 30 km/h. His average speed for the whole journey (in km/h) is:



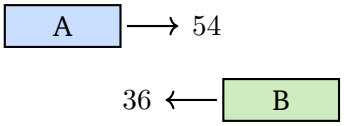
(A) 25

(B) 26

(C) 22

(D) 24

Q41. Two trains of equal length, running in opposite directions at 54 km/h and 36 km/h, cross each other in 12 seconds. The length of each train (in metres) is:



(A) 120

(B) 150

(C) 180

(D) 100

Q42. 15 men can complete a work in 24 days. After 4 days, 5 more men join them. The total number of days taken to finish the work (counted from the start) is:

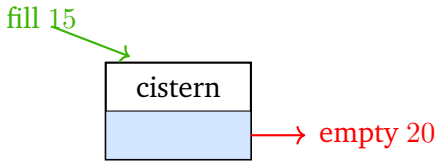
(A) 19 days

(B) 20 days

(C) 18 days

(D) 21 days

Q43. A pipe can fill a cistern in 15 minutes and another empties it in 20 minutes. If both are opened together when the cistern is empty, the time to fill it is:



(A) 30 minutes

(B) 45 minutes

(C) 50 minutes

(D) 60 minutes

Q44. The value of k for which the equation $x^2 - 6x + k = 0$ has equal roots is:

(A) 6

(B) 9

(C) 12

(D) 3

Q45. The cost of 3 pens and 2 pencils is Rs. 80, while the cost of 2 pens and 3 pencils is Rs. 70. The cost of one pen is:

(A) Rs. 15

(B) Rs. 18

(C) Rs. 20

(D) Rs. 22

Q46. If $x > 0$ and $x + \frac{1}{x} = 2$, then the value of $x^2 + \frac{1}{x^2}$ is:

(A) 2

(B) 4

(C) 0

(D) 1

Q47. The sum of the infinite geometric series $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\cdots$ is (each added term halves, as shown):

(A) 1

(B) $\frac{3}{2}$

(C) $\frac{4}{3}$

(D) 2

Q48. The number of ways in which 5 different books can be arranged on a shelf so that two particular books are always together is:

(A) 24

(B) 48

(C) 120

(D) 60

Q49. From a pack of 52 playing cards, the number of ways to choose 2 cards that are both kings is:

(A) 4

(B) 12

(C) 6

(D) 8

Q50. A bag contains 4 red and 6 black balls. One ball is drawn at random. The probability that it is red is:

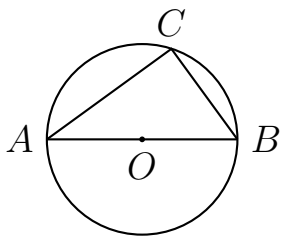
(A) $\frac{2}{5}$

(B) $\frac{3}{5}$

(C) $\frac{1}{2}$

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

Q51. In the circle with centre O shown below, AB is a diameter and C is a point on the circle. If $\angle CAB = 35^\circ$, then $\angle ABC$ is:



(A) 35°

(B) 45°

(C) 90°

(D) 55°

Q52. The angles of a quadrilateral are in the ratio $1 : 2 : 3 : 4$. The largest angle is:

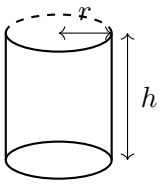
(A) 120°

(B) 144°

(C) 108°

(D) 160°

Q53. A cylinder has a base radius of 7 cm and height 10 cm. Taking $\pi = \frac{22}{7}$, its curved surface area (in cm^2) is:



(A) 660

(B) 880

(C) 440

(D) 220

Q54. The perimeter of a rectangle is 48 cm and its length is twice its breadth. The area of the rectangle (in cm^2) is:

(A) 128

(B) 144

(C) 96

(D) 160

Q55. The value of $\log_{10} 2 + \log_{10} 5$ is:

(A) 0

(B) 2

(C) 10

(D) 1

Q56. If $f(x) = 2x + 3$, then the value of $f(f(2))$ is:

(A) 14

(B) 17

(C) 7

(D) 21

Q57. **Directions (Q57–Q59):** The table shows the marks scored by four students in three subjects (each out of 100).

Student	Maths	Physics	English
Amit	80	70	60
Bina	60	90	75
Charu	90	60	90
Dev	70	80	45

The total marks scored by Charu across the three subjects is:

(A) 210

(B) 225

(C) 240

(D) 230

Q58. (Refer to the table above.) The average marks scored in Physics by the four students is:

(A) 75

(B) 70

(C) 80

(D) 65

Q59. (Refer to the table above.) Which student has the highest total marks across the three subjects?

(A) Amit

(B) Bina

(C) Dev

(D) Charu

Q60. **Data Sufficiency:** Is the positive integer n even?
Statement I: n^2 is even.
Statement II: $3n$ is even.
Which of the following is correct regarding sufficiency?

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

(B) Each statement alone is sufficient

(C) Both together are needed

(D) Neither statement is sufficient

Detailed Solutions

Q1.

Solution

Concept — LCM with common remainder: A number that leaves the same remainder r on division by several divisors equals (a multiple of the LCM of those divisors) plus r. The least such number is LCM $+ r$.

Step 1 — Find the LCM of 12, 15, 20: Prime factorise: $12 = 2^2 \cdot 3$, $15 = 3 \cdot 5$, $20 = 2^2 \cdot 5$.

Step 2 — Take highest powers: LCM $= 2^2 \cdot 3 \cdot 5 = 4 \cdot 3 \cdot 5 = 60$.

Step 3 — Add the remainder: Required least number $= 60 + 5 = 65$.

Why other options are wrong:

- 55 and 70: not of the form $60 + 5$.
- 60: leaves remainder 0, not 5.

Final Answer: $65 \Rightarrow$ C

Answer: (C) Go Back to Q 1

Q2.

Solution

Concept — Divisibility by coprime factors: If a number is divisible by two coprime numbers, it is divisible by their product.

Step 1 — Check coprimality: 9 and 11 have HCF $= 1$, so they are coprime.

Step 2 — Multiply: The number must be divisible by $9 \times 11 = 99$.

Why other options are wrong:

- $33 = 3 \times 11$, $44 = 4 \times 11$, $66 = 6 \times 11$: these do not guarantee divisibility by 9.

Final Answer: $99 \Rightarrow$ A

Answer: (A) Go Back to Q 2

Q3.

Solution

Concept — Two-candidate election: With only two candidates and no invalid votes, the loser gets $(100 - 58)\% = 42\%$. The winning margin is the difference of the two vote shares.

Step 1 — Express the margin: Margin $= 58\% - 42\% = 16\%$ of total votes.

Step 2 — Set up the equation: 16% of total $= 2400$, so $0.16 \times T = 2400$.

Step 3 — Solve for T: $T = \dfrac{2400}{0.16} = 15000$.

Why other options are wrong:

- $12000, 13000, 14000$: give margins of $1920, 2080, 2240$, not 2400.

Final Answer: 15000 votes $\Rightarrow$ D

Answer: (D) Go Back to Q 3

Q4.

Solution

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

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

Step 2 — Apply $+20\%$: New price $= 100 \times 1.20 = 120$.

Step 3 — Apply -20%: Final price $= 120 \times 0.80 = 96$.

Step 4 — Net change: $96 - 100 = -4$, i.e. a decrease of 4%.

Why other options are wrong:

- No change: equal-percent rise and fall never cancel exactly.
- Increase of 4% / decrease of 2%: incorrect sign or magnitude.

Final Answer: Decrease of 4% $\Rightarrow$ B

Answer: (B) Go Back to Q 4

Q5.

Solution

Concept — Partnership profit sharing: When capitals stay invested for the same time, profit divides in the ratio of the capitals.

Step 1 — Total ratio units: $4 + 6 + 9 = 19$ parts.

Step 2 — Value of one part: $\frac{9500}{19} = 500$.

Step 3 — B's share: B has 6 parts $= 6 \times 500 = 3000$.

Why other options are wrong:

- Rs. 2000 (A's share) and Rs. 4500 (C's share): belong to the other partners.
- Rs. 3500: not a multiple of the unit value 500 matching 6 parts.

Final Answer: Rs. $3000 \Rightarrow$ A

Answer: (A) Go Back to Q 5

Q6.

Solution

Concept — Average and total: Total = average $\times$ number of items. The coach's age equals the new total minus the old total.

Step 1 — Old total (11 players): $11 \times 25 = 275$.

Step 2 — New total (12 people): $12 \times 26 = 312$.

Step 3 — Coach's age: $312 - 275 = 37$ years.

Why other options are wrong:

- $33, 34, 36$: do not satisfy $275 +$ age $= 312$.

Final Answer: 37 years $\Rightarrow$ D

Answer: (D) Go Back to Q 6

Q7.

Solution

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

Step 1 — Take cost price $= 100$**:** Marked price $= 100 \times 1.40 = 140$.

Step 2 — Apply 25% **discount:** SP $= 140 \times 0.75 = 105$.

Step 3 — Profit percent: Profit $= 105 - 100 = 5$, so profit% $= 5\%$.

Why other options are wrong:

- $15\%, 12\%, 10\%$: arise from forgetting to apply the discount or mis-multiplying.

Final Answer: 5% profit $\Rightarrow$ C

Answer: (C) Go Back to Q 7

Q8.

Solution

Concept — Recovering cost from a loss: If selling at SP gives loss $L\%$, then SP $=$ CP $\times\ (1 - L/100)$. Find CP, then apply the desired gain.

Step 1 — Find CP: $450 =$ CP $\times\ 0.90$, so CP $= \dfrac{450}{0.90} = 500$.

Step 2 — Apply 20% **gain:** Required SP $= 500 \times 1.20 = 600$.

Why other options are wrong:

- $540, 560, 580$: do not equal 1.20×500.

Final Answer: Rs. $600 \Rightarrow$ B

Answer: (B) Go Back to Q 8

Q9.

Solution

Concept — Compound interest: $A = P\left(1 + \frac{r}{100}\right)^n$, and CI $= A - P$.

Step 1 — Amount after 2 years: $A = 8000\left(1 + \frac{10}{100}\right)^2 = 8000 \times (1.1)^2$.

Step 2 — Compute the power: $(1.1)^2 = 1.21$, so $A = 8000 \times 1.21 = 9680$.

Step 3 — Subtract principal: CI $= 9680 - 8000 = 1680$.

Why other options are wrong:

- Rs. 1600: that is the simple interest, ignoring compounding.
- Rs. $1640, 1720$: arithmetic slips.

Final Answer: Rs. $1680 \Rightarrow$ A

Answer: (A) Go Back to Q 9

Q10.

Solution

Concept — Train crossing a platform: The train covers (its own length + platform length) in the crossing time. Speed $= \frac{\text{distance}}{\text{time}}$.

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

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

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

Why other options are wrong:

- $45, 48, 50$: come from using only one length or wrong conversion.

Final Answer: 54 km/h $\Rightarrow$ D

Answer: (D) Go Back to Q 10

Q11.

Solution

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

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

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

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

Why other options are wrong:

- 0.5: forgot the factor; $1.5, 2$: arithmetic errors.

Final Answer: 1 km/h $\Rightarrow$ B

Answer: (B) Go Back to Q 11

Q12.

Solution

Concept — Combined work rate: Rates add. Together they do $\frac{1}{a} + \frac{1}{b}$ of the work per day; time $=$ reciprocal of the sum.

Step 1 — Individual rates: $\frac{1}{12}$ and $\frac{1}{18}$ per day.

Step 2 — Add the rates: $\frac{1}{12} + \frac{1}{18} = \frac{3}{36} + \frac{2}{36} = \frac{5}{36}$.

Step 3 — Time together: $\frac{36}{5} = 7.2$ days.

Why other options are wrong:

- $6.6, 8, 9$ days: do not equal $\frac{36}{5}$.

Final Answer: 7.2 days $\Rightarrow$ C

Answer: (C) Go Back to Q 12

Q13.

Solution

Concept — Two filling pipes: Their rates add. Combined rate $= \frac{1}{20} + \frac{1}{30}$; time = reciprocal.

Step 1 — Add the rates: $\frac{1}{20} + \frac{1}{30} = \frac{3}{60} + \frac{2}{60} = \frac{5}{60} = \frac{1}{12}$.

Step 2 — Time to fill: Reciprocal of $\frac{1}{12}$ is 12 minutes.

Why other options are wrong:

- $10, 15, 25$ minutes: do not match the combined rate $\frac{1}{12}$.

Final Answer: 12 minutes $\Rightarrow$ A

Answer: (A) Go Back to Q 13

Q14.

Solution

Concept — Roots from sum and difference: For $x^2 - 7x + k = 0$, sum of roots $= 7$ and product $= k$. Use the given difference to find each root.

Step 1 — Set up: Let roots be α, β with $\alpha + \beta = 7$ and $\alpha - \beta = 3$.

Step 2 — Solve: Adding: $2\alpha = 10 \Rightarrow \alpha = 5$; then $\beta = 2$.

Step 3 — Product gives k: $k = \alpha\beta = 5 \times 2 = 10$.

Why other options are wrong:

- $6, 8, 12$: correspond to roots that do not differ by exactly 3.

Final Answer: $k = 10 \Rightarrow$ D

Answer: (D) Go Back to Q 14

Q15.

Solution

Concept — Sum and difference of two numbers: Solve the two linear equations, then multiply.

Step 1 — Set up: $x + y = 25$ and $x - y = 7$.

Step 2 — Solve: Adding: $2x = 32 \Rightarrow x = 16$; then $y = 25 - 16 = 9$.

Step 3 — Product: $x \times y = 16 \times 9 = 144$.

Why other options are wrong:

- $132, 156, 160$: not equal to 16×9.

Final Answer: $144 \Rightarrow$ B

Answer: (B) Go Back to Q 15

Q16.

Solution

Concept — Solving a compound inequality: Operate on all three parts simultaneously to isolate x, then count integers.

Step 1 — Add 3 throughout: $-5 + 3 < 2x \leq 7 + 3$, i.e. $-2 < 2x \leq 10$.

Step 2 — Divide by 2: $-1 < x \leq 5$.

Step 3 — List integers: $x \in \{0, 1, 2, 3, 4, 5\}$, which is 6 values.

Why other options are wrong:

- $4, 5$: miss endpoints; 7: wrongly includes $x = -1$.

Final Answer: 6 integers $\Rightarrow$ C

Answer: (C) Go Back to Q 16

Q17.

Solution

Concept — Sum of an AP: $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$, with first term a and common difference d.

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

Step 2 — Substitute: $S_{20} = \frac{20}{2}\left[2(3) + 19(4)\right] = 10\,[6 + 76]$.

Step 3 — Compute: $10 \times 82 = 820$.

Why other options are wrong:

- $780, 800, 840$: come from using a wrong n or d.

Final Answer: $820 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 17

Q18.

Solution

Concept — Arrangements with repeated letters: For a word of n letters where a letter repeats p times, the number of distinct arrangements is $\frac{n!}{p!}$.

Step 1 — Count letters: LEADER has 6 letters with E repeated twice.

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

Why other options are wrong:

- 720: treats both E's as distinct.
- $120, 600$: not equal to $\frac{6!}{2!}$.

Final Answer: $360 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 18

Q19.

Solution

Concept — Selection by cases: Choose men and women separately with combinations, then multiply.

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

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

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

Why other options are wrong:

- $30, 60, 20$: arise from wrong combination counts.

Final Answer: $40 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 19

Q20.

Solution

Concept — Probability with two dice: Total outcomes $= 36$. Count the ordered pairs giving the target sum.

Step 1 — Favourable pairs for sum 9: $(3,6), (4,5), (5,4), (6,3)$, which is 4 outcomes.

Step 2 — Probability: $\dfrac{4}{36} = \dfrac{1}{9}$.

Why other options are wrong:

- $\dfrac{1}{6}$: that is for sum 7; $\dfrac{1}{12}, \dfrac{1}{18}$: wrong counts.

Final Answer: $\dfrac{1}{9} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 20

Q21.

Solution

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

Step 1 — Square the legs: $AB^2 + BC^2 = 6^2 + 8^2 = 36 + 64 = 100$.

Step 2 — Take the square root: $AC = \sqrt{100} = 10$ cm.

Why other options are wrong:

- $12, 14, 9$: do not satisfy $AC^2 = 100$.

Final Answer: 10 cm $\Rightarrow$ A

Answer: (A) Go Back to Q 21

Q22.

Solution

Concept — Exterior angle theorem: An exterior angle of a triangle equals the sum of the two non-adjacent interior angles.

Step 1 — Identify the two remote angles: They are $50°$ and $60°$.

Step 2 — Add them: Exterior angle $= 50° + 60° = 110°$.

Why other options are wrong:

- $100°, 120°, 130°$: do not equal the sum of the two given angles.

Final Answer: $110°$ $\Rightarrow$ B

Answer: (B) Go Back to Q 22

Q23.

Solution

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

Step 1 — Find the edge: $6a^2 = 150 \Rightarrow a^2 = 25 \Rightarrow a = 5$ cm.

Step 2 — Volume: $a^3 = 5^3 = 125$ cm^3.

Why other options are wrong:

- $64, 216$: cubes of 4 and 6, wrong edge; 100: not a perfect cube here.

Final Answer: 125 cm$^3 \Rightarrow$ D

Answer: (D) Go Back to Q 23

Q24.

Solution

Concept — Circle area and circumference: Area $= \pi r^2$ and circumference $= 2\pi r$. Find r from the area first.

Step 1 — Find the radius: $\frac{22}{7} r^2 = 154 \Rightarrow r^2 = 154 \times \frac{7}{22} = 49 \Rightarrow r = 7$ cm.

Step 2 — Circumference: $2 \times \frac{22}{7} \times 7 = 44$ cm.

Why other options are wrong:

- 22: that is πr, half the circumference; $66, 88$: wrong radius.

Final Answer: 44 cm $\Rightarrow$ A

Answer: (A) Go Back to Q 24

Q25.

Solution

Concept — Definition of a logarithm: $\log_b x = y$ means $x = b^y$.

Step 1 — Rewrite: $\log_2 x = 5$ means $x = 2^5$.

Step 2 — Evaluate: $2^5 = 32$.

Why other options are wrong:

- 10: confuses base and exponent; $25 = 5^2$ and $16 = 2^4$: wrong exponent.

Final Answer: $32 \Rightarrow$ B

Answer: (B) Go Back to Q 25

Q26.

Solution

Concept — Inclusion-exclusion: $|C \cup F| = |C| + |F| - |C \cap F|$. Here everyone plays at least one game, so $|C \cup F| = 40$.

Step 1 — Substitute: $40 = 25 + 20 - |C \cap F|$.

Step 2 — Solve: $|C \cap F| = 45 - 40 = 5$.

Why other options are wrong:

- $3, 7, 10$: do not satisfy the inclusion-exclusion balance.

Final Answer: 5 students $\Rightarrow$ C

Answer: (C) Go Back to Q 26

Q27.

Solution

Concept — Reading a bar graph total: Add the bar heights (in thousands).

Step 1 — List values: $2019 : 20, 2020 : 30, 2021 : 25, 2022 : 35$ (thousands).

Step 2 — Add: $20 + 30 + 25 + 35 = 110$ thousand $= 110{,}000$.

Why other options are wrong:

- $100{,}000, 95{,}000, 120{,}000$: misread one or more bars.

Final Answer: $110{,}000$ cars $\Rightarrow$ A

Answer: (A) Go Back to Q 27

Q28.

Solution

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

Step 1 — Values: $2021 = 25$, $2022 = 35$ (thousands).

Step 2 — Apply: $\dfrac{35 - 25}{25} \times 100 = \dfrac{10}{25} \times 100 = 40\%$.

Why other options are wrong:

- $10\%, 20\%, 25\%$: use the wrong base or difference.

Final Answer: $40\% \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 28

Q29.

Solution

Concept — Average: Total divided by number of years.

Step 1 — Total: 110 thousand over 4 years (from Q27).

Step 2 — Divide: $\frac{110}{4} = 27.5$ thousand $= 27{,}500$.

Why other options are wrong:

- $25{,}000, 28{,}000, 30{,}000$: do not equal $\frac{110}{4}$ thousand.

Final Answer: $27{,}500$ cars $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 29

Q30.

Solution

Concept — Data sufficiency: Test each statement alone, then together, to see whether N is uniquely fixed.

Step 1 — Statement I alone: Digit sum 8 allows $17, 26, 35, 44, 53, 62, 71, 80$ — many values, not sufficient.

Step 2 — Statement II alone: Two-digit multiples of 11 are $11, 22, 33, 44, 55, 66, 77, 88, 99$ — many values, not sufficient.

Step 3 — Both together: A two-digit multiple of 11 has equal digits $\overline{aa}$, giving digit sum $2a$. We need $2a = 8$, so $a = 4$, i.e. $N = 44$ — a single value.

Why other options are wrong:

- Each alone leaves many possibilities, so neither single statement is sufficient.

Final Answer: Both together (giving $N = 44$) $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 30

Q31.

Solution

Concept — Unit digit by cyclicity: Powers of 7 cycle $7, 9, 3, 1$ (period 4); powers of 3 cycle $3, 9, 7, 1$ (period 4). Use the exponent modulo 4.

Step 1 — Unit digit of 7^{95}: $95 \bmod 4 = 3$, so unit digit is the 3rd in $7, 9, 3, 1$, which is 3.

Step 2 — Unit digit of 3^{58}: $58 \bmod 4 = 2$, so unit digit is the 2nd in $3, 9, 7, 1$, which is 9.

Step 3 — Multiply unit digits: $3 \times 9 = 27$, unit digit 7.

Why other options are wrong:

- $1, 3, 9$: from mis-counting the cycle position.

Final Answer: $7 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 31

Q32.

Solution

Concept — HCF $\times$ LCM: For two numbers, HCF $\times$ LCM $=$ product of the numbers.

Step 1 — Apply: $13 \times 455 = 65 \times (\text{other})$.

Step 2 — Solve: $\text{other} = \dfrac{13 \times 455}{65} = \dfrac{5915}{65} = 91.$

Why other options are wrong:

- $35, 65, 13$: do not satisfy HCF $\times$ LCM $=$ product.

Final Answer: $91 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 32

Q33.

Solution

Concept — Reverse percentage: If A is $r\%$ more than B, then B is less than A by $\dfrac{r}{100+r} \times 100\%$.

Step 1 — Take $B = 100$: Then $A = 125$.

Step 2 — B relative to A: $\dfrac{125-100}{125} \times 100 = \dfrac{25}{125} \times 100 = 20\%$.

Why other options are wrong:

- 25%: uses B as base instead of A; $15\%, 30\%$: wrong computation.

Final Answer: $20\% \Rightarrow$ B

Answer: (B) Go Back to Q 33

Q34.

Solution

Concept — Find the whole, then a new percent: First recover the number from the given percentage, then take the required percentage.

Step 1 — Find the number: $0.45 \times x = 135 \Rightarrow x = \dfrac{135}{0.45} = 300$.

Step 2 — Take 80%: $0.80 \times 300 = 240$.

Why other options are wrong:

- $200, 220, 260$: arise from a wrong base number.

Final Answer: $240 \Rightarrow$ C

Answer: (C) Go Back to Q 34

Q35.

Solution

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

Step 1 — Multiply: $\dfrac{a}{c} = \dfrac{3}{4} \times \dfrac{8}{9} = \dfrac{24}{36}$.

Step 2 — Simplify: $\dfrac{24}{36} = \dfrac{2}{3}$, so $a : c = 2 : 3$.

Why other options are wrong:

- $3:4, 4:9, 1:3$: do not equal the simplified product.

Final Answer: $2:3 \Rightarrow$ A

Answer: (A) Go Back to Q 35

Q36.

Solution

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

Step 1 — Apply alligation: $\dfrac{45-40}{40-30} = \dfrac{5}{10} = \dfrac{1}{2}$.

Step 2 — Interpret: Cheaper (Rs. 30) to dearer (Rs. 45) $= 1:2$.

Why other options are wrong:

- $2:3, 3:2, 1:1$: do not match the alligation differences.

Final Answer: $1:2 \Rightarrow$ D

Answer: (D) Go Back to Q 36

Q37.

Solution

Concept — Equal SP, equal $\pm x\%$: Selling two items at the same price with gain $x\%$ on one and loss $x\%$ on the other always gives an overall loss of $\dfrac{x^2}{100}\%$.

Step 1 — Identify x: $x = 20$.

Step 2 — Apply formula: Loss $= \dfrac{20^2}{100} = \dfrac{400}{100} = 4\%$.

Why other options are wrong:

- No profit no loss: the loss is never zero in this setup; gain 4% / loss 2%: wrong sign or value.

Final Answer: Loss of $4\% \Rightarrow$ B

Answer: (B) Go Back to Q 37

Q38.

Solution

Concept — Successive discounts: Equivalent single discount $= [1-(1-d_1)(1-d_2)] \times 100\%$.

Step 1 — Compute the retained fraction: $(1-0.10)(1-0.20) = 0.90 \times 0.80 = 0.72$.

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

Why other options are wrong:

- 30%: just adds the two discounts; $25\%, 32\%$: wrong multiplication.

Final Answer: $28\% \Rightarrow$ A

Answer: (A) Go Back to Q 38

Q39.

Solution

Concept — Doubling under simple interest: Money doubles when the interest equals the principal, so SI $= P$ over the period.

Step 1 — Set up: $\dfrac{P \times r \times 8}{100} = P$.

Step 2 — Solve for r: $8r = 100 \Rightarrow r = 12.5\%$.

Why other options are wrong:

- $8\%, 10\%, 15\%$: do not satisfy $8r = 100$.

Final Answer: $12.5\% \Rightarrow$ C

Answer: (C) Go Back to Q 39

Q40.

Solution

Concept — Average speed for equal distances: For equal distances at speeds u and v, average speed $= \dfrac{2uv}{u+v}$ (harmonic mean).

Step 1 — Substitute: $\dfrac{2 \times 20 \times 30}{20+30} = \dfrac{1200}{50}$.

Step 2 — Simplify: $\dfrac{1200}{50} = 24$ km/h.

Why other options are wrong:

- 25: the plain average of 20 and 30, which is wrong here; $22, 26$: arithmetic slips.

Final Answer: 24 km/h $\Rightarrow$ D

Answer: (D) Go Back to Q 40

Q41.

Solution

Concept — Trains crossing each other: In opposite directions, relative speed = sum of speeds; total distance crossed = sum of the two lengths.

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

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

Step 3 — Each train: Two equal trains, so each $= \dfrac{300}{2} = 150$ m.

Why other options are wrong:

- $120, 180, 100$: do not halve 300 correctly.

Final Answer: 150 m $\Rightarrow$ B

Answer: (B) Go Back to Q 41

Q42.

Solution

Concept — Man-days: Total work = men $\times$ days. Track work done before and after the extra men join.

Step 1 — Total work: $15 \times 24 = 360$ man-days.

Step 2 — Work in first 4 days: $15 \times 4 = 60$ man-days, leaving $360 - 60 = 300$.

Step 3 — Remaining with 20 men: $\dfrac{300}{20} = 15$ days.

Step 4 — Total days from start: $4 + 15 = 19$ days.

Why other options are wrong:

- $20, 18, 21$: miscount the 4 initial days or the remaining work.

Final Answer: 19 days $\Rightarrow$ A

Answer: (A) Go Back to Q 42

Q43.

Solution

Concept — Filling against an emptying pipe: Net rate = fill rate − empty rate; time = reciprocal of the net rate.

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

Step 2 — Time to fill: reciprocal $= 60$ minutes.

Why other options are wrong:

- $30, 45, 50$ minutes: do not match the net rate $\frac{1}{60}$.

Final Answer: 60 minutes $\Rightarrow$ D

Answer: (D) Go Back to Q 43

Q44.

Solution

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

Step 1 — Set discriminant to zero: $(-6)^2 - 4(1)(k) = 0$.

Step 2 — Solve: $36 - 4k = 0 \Rightarrow k = 9$.

Why other options are wrong:

- $6, 12, 3$: give a nonzero discriminant, so roots are not equal.

Final Answer: $k = 9 \Rightarrow$ B

Answer: (B) Go Back to Q 44

Q45.

Solution

Concept — Two linear equations: Let pen $= p$, pencil $= q$; solve the system by elimination.

Step 1 — Equations: $3p + 2q = 80$ and $2p + 3q = 70$.

Step 2 — Eliminate q: Multiply first by 3 and second by 2: $9p + 6q = 240$ and $4p + 6q = 140$.

Step 3 — Subtract: $5p = 100 \Rightarrow p = 20$.

Why other options are wrong:

- Rs. $15, 18, 22$: do not satisfy both equations.

Final Answer: Rs. $20 \Rightarrow$ C

Answer: (C) Go Back to Q 45

Q46.

Solution

Concept — Squaring a sum of reciprocals: $\left(x + \frac{1}{x}\right)^2 = x^2 + 2 + \frac{1}{x^2}$.

Step 1 — Square the given: $\left(x + \frac{1}{x}\right)^2 = 2^2 = 4$.

Step 2 — Isolate the target: $x^2 + \frac{1}{x^2} = 4 - 2 = 2$.

Why other options are wrong:

- 4: forgot to subtract the middle term 2; $0, 1$: wrong algebra.

Final Answer: $2 \Rightarrow$ A

Answer: (A) Go Back to Q 46

Q47.

Solution

Concept — Infinite GP sum: For $|r| < 1$, $S_\infty = \dfrac{a}{1-r}$.

Step 1 — Identify: $a = 1$, $r = \dfrac{1}{2}$.

Step 2 — Apply: $S_\infty = \dfrac{1}{1-\frac{1}{2}} = \dfrac{1}{\frac{1}{2}} = 2$.

Why other options are wrong:

- $1, \dfrac{3}{2}, \dfrac{4}{3}$: partial sums or wrong ratio.

Final Answer: $2 \Rightarrow$ D

Answer: (D) Go Back to Q 47

Q48.

Solution

Concept — Items always together: Treat the two fixed-together books as a single block, arrange the blocks, then arrange within the block.

Step 1 — Treat as a block: 5 books become 4 units (block $+$ 3 singles), arranged in $4! = 24$ ways.

Step 2 — Internal arrangement: The two books inside the block swap in $2! = 2$ ways.

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

Why other options are wrong:

- 24: forgot the internal $2!$; 120: total without the together-condition; 60: not matching.

Final Answer: $48 \Rightarrow$ B

Answer: (B) Go Back to Q 48

Q49.

Solution

Concept — Combination of identical-type items: There are 4 kings; choose 2 using $\binom{4}{2}$.

Step 1 — Apply: $\binom{4}{2} = \dfrac{4 \times 3}{2 \times 1} = 6$.

Why other options are wrong:

- 4: count of kings, not pairs; 12: that is 4×3 ordered; 8: incorrect.

Final Answer: $6 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 49

Q50.

Solution

Concept — Simple probability: $P = \dfrac{\text{favourable}}{\text{total}}$.

Step 1 — Total balls: $4 + 6 = 10$.

Step 2 — Probability of red: $\dfrac{4}{10} = \dfrac{2}{5}$.

Why other options are wrong:

- $\dfrac{3}{5}$: probability of black; $\dfrac{1}{2}, \dfrac{1}{5}$: wrong counts.

Final Answer: $\dfrac{2}{5} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 50

Q51.

Solution

Concept — Angle in a semicircle: The angle subtended by a diameter at the circle is $90°$. The three angles of the triangle sum to $180°$.

Step 1 — Right angle at C: Since AB is a diameter, $\angle ACB = 90°$.

Step 2 — Use angle sum: $\angle ABC = 180° - 90° - 35° = 55°$.

Why other options are wrong:

- $35°$: equals $\angle CAB$, not $\angle ABC$; $90°$ is at C; $45°$ is incorrect.

Final Answer: $55° \Rightarrow$ D

Answer: (D) Go Back to Q 51

Q52.

Solution

Concept — Angles of a quadrilateral: They sum to $360°$; split in the given ratio.

Step 1 — Total ratio parts: $1 + 2 + 3 + 4 = 10$.

Step 2 — Value of one part: $\dfrac{360}{10} = 36°$.

Step 3 — Largest angle: $4 \times 36 = 144°$.

Why other options are wrong:

- $120°, 108°$: are the third/middle angles; $160°$: exceeds 4×36.

Final Answer: $144° \Rightarrow$ B

Answer: (B) Go Back to Q 52

Q53.

Solution

Concept — Curved surface area of a cylinder: CSA $= 2\pi rh$.

Step 1 — Substitute: $2 \times \dfrac{22}{7} \times 7 \times 10$.

Step 2 — Simplify: $\dfrac{22}{7} \times 7 = 22$, so CSA $= 2 \times 22 \times 10 = 440$ cm^2.

Why other options are wrong:

- $660, 880$: include or double extra factors; 220: forgot the factor 2.

Final Answer: 440 cm$^2 \Rightarrow$ C

Answer: (C) Go Back to Q 53

Q54.

Solution

Concept — Rectangle perimeter and area: Perimeter $= 2(l + b)$; here $l = 2b$.

Step 1 — Use the perimeter: $2(2b + b) = 48 \Rightarrow 6b = 48 \Rightarrow b = 8$.

Step 2 — Length: $l = 2 \times 8 = 16$.

Step 3 — Area: $l \times b = 16 \times 8 = 128$ cm^2.

Why other options are wrong:

- $144, 96, 160$: come from wrong b or ignoring $l = 2b$.

Final Answer: 128 cm$^2 \Rightarrow$ A

Answer: (A) Go Back to Q 54

Q55.

Solution

Concept — Product rule for logs: $\log a + \log b = \log(ab)$, with $\log_{10} 10 = 1$.

Step 1 — Combine: $\log_{10} 2 + \log_{10} 5 = \log_{10}(2 \times 5) = \log_{10} 10$.

Step 2 — Evaluate: $\log_{10} 10 = 1$.

Why other options are wrong:

- $0, 2, 10$: ignore the product rule or the base-10 value.

Final Answer: $1 \Rightarrow$ D

Answer: (D) Go Back to Q 55

Q56.

Solution

Concept — Composition of a function: Evaluate the inner value first, then feed it into f again.

Step 1 — Inner value: $f(2) = 2(2) + 3 = 7$.

Step 2 — Outer value: $f(7) = 2(7) + 3 = 17$.

Why other options are wrong:

- 7: only $f(2)$; $14, 21$: arithmetic slips.

Final Answer: $17 \Rightarrow$ B

Answer: (B) Go Back to Q 56

Q57.

Solution

Concept — Row total from a table: Add the three subject marks in Charu's row.

Step 1 — Charu's marks: Maths 90, Physics 60, English 90.

Step 2 — Add: $90 + 60 + 90 = 240$.

Why other options are wrong:

- 210 (Amit), 225 (Bina), 230: belong to other rows or are misadded.

Final Answer: $240 \Rightarrow$ C

Answer: (C) Go Back to Q 57

Q58.

Solution

Concept — Column average: Add the Physics column and divide by the number of students.

Step 1 — Physics marks: $70 + 90 + 60 + 80 = 300$.

Step 2 — Average: $\frac{300}{4} = 75$.

Why other options are wrong:

- $70, 80, 65$: do not equal $\frac{300}{4}$.

Final Answer: $75 \Rightarrow$ A

Answer: (A) Go Back to Q 58

Q59.

Solution

Concept — Compare row totals: Compute each student's total and pick the largest.

Step 1 — Totals: Amit $80 + 70 + 60 = 210$; Bina $60 + 90 + 75 = 225$; Charu $90 + 60 + 90 = 240$; Dev $70 + 80 + 45 = 195$.

Step 2 — Largest: 240 belongs to Charu.

Why other options are wrong:

- Amit 210, Bina 225, Dev 195: all below Charu's 240.

Final Answer: Charu $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q 59

Q60.

Solution

Concept — Data sufficiency on parity: Determine whether each statement alone fixes the parity of n.

Step 1 — Statement I: n^2 even $\Rightarrow$ n even (a square is even only if its root is even). Sufficient alone.

Step 2 — Statement II: $3n$ even $\Rightarrow$ n even (since 3 is odd, the product is even only when n is even). Sufficient alone.

Step 3 — Conclusion: Each statement alone is sufficient.

Why other options are wrong:

- "I only", "both needed", "neither": understate the power of each statement, which individually fixes parity.

Final Answer: Each alone is sufficient $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q 60

Answer Key

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