Kerala NMMS Mathematics

Sample Paper – 2

Duration: 30 Minutes **Maximum Marks: 30**

Instructions

- This paper contains **30** Multiple Choice Questions (Single Correct Answer), modelled on the Mathematics portion of **Kerala NMMS** (SAT).
- Each correct answer carries **+1 mark**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Class 7–8 (SCERT Kerala) — Number System, Algebra, Mensuration, Geometry, Comparing Quantities, Ratio & Proportion, Data Handling, Exponents.**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited. Rough work may be done in the space provided.

Mathematics — 30 Questions (SAT Section)

Q1. Which of the following is **NOT** a rational number?

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

(B) $-\frac{7}{2}$

(C) $\sqrt{5}$

(D) 0

Q2. The multiplicative inverse (reciprocal) of $-\frac{5}{8}$ is:

(A) $-\frac{8}{5}$

(B) $\frac{8}{5}$

(C) $\frac{5}{8}$

(D) $-\frac{5}{8}$

Q3. Simplify: $\left(-\frac{3}{5}\right) \div \left(\frac{9}{10}\right)$

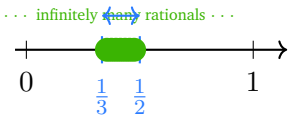
(A) $-\frac{3}{4}$

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

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

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

Q4. How many rational numbers lie between $\frac{1}{3}$ and $\frac{1}{2}$?



(A) 0 — there are none

(B) Exactly 1

(C) Exactly 10

(D) Infinitely many

Q5. Using the identity $(a-b)^2 = a^2 - 2ab + b^2$, expand $(3p-2q)^2$:

(A) $9p^2 + 12pq + 4q^2$

(B) $9p^2 - 12pq - 4q^2$

(C) $9p^2 - 12pq + 4q^2$

(D) $6p^2 - 12pq + 4q^2$

Q6. Factorize $12m^2 - 18mn$ by taking out the highest common factor:

(A) $6m(2m - 3n)$

(B) $6m(2m + 3n)$

(C) $6mn(2m - 3)$

(D) $6m(2m - 9n)$

Q7. Solve: $3(y-4) = 2(y+5)$. Find y.

(A) $y = 18$
(B) $y = 22$
(C) $y = 26$
(D) $y = 10$

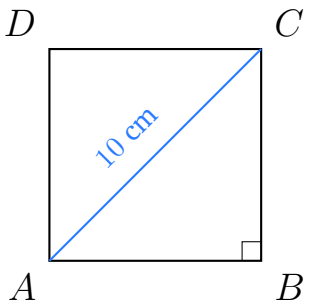
Q8. A number is 5 more than twice another number. Their sum is 29. Find the **smaller** number.

(A) 4
(B) 6
(C) 10
(D) 8

Q9. Expand $(x+4)(x+7)$:

(A) $x^2 + 28x + 11$
(B) $x^2 + 11x + 11$
(C) $x^2 + 11x + 28$
(D) $x^2 + 4x + 28$

Q10. Find the area of a square whose diagonal measures 10 cm.

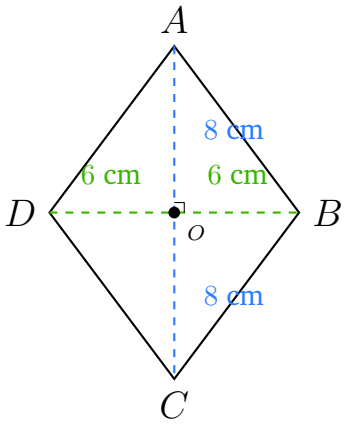


(A) 50 cm^2
(B) 40 cm^2
(C) 25 cm^2
(D) 100 cm^2

Q11. Find the volume of a cube with side 9 cm.

(A) 243 cm^3
(B) 729 cm^3
(C) 81 cm^3
(D) 512 cm^3

Q12. The diagonals of a rhombus are 16 cm and 12 cm. Find the perimeter of the rhombus.

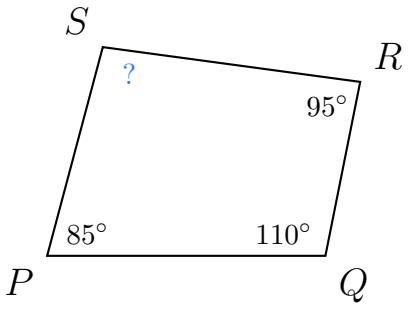


(A) 20 cm
(B) 28 cm
(C) 36 cm
(D) 40 cm

Q13. Find the curved surface area of a cylinder with radius 5 cm and height 14 cm. (Use $\pi = \frac{22}{7}$)

(A) 220 cm^2
(B) 380 cm^2
(C) 440 cm^2
(D) 480 cm^2

Q14. In quadrilateral $PQRS$, $\angle P = 85^\circ$, $\angle Q = 110^\circ$, $\angle R = 95^\circ$. Find $\angle S$.



(A) $70°$
(B) $80°$
(C) $75°$
(D) $60°$

Q15. In a kite $ABCD$, $AB = AD$ and $CB = CD$. Which pair of angles is **always equal**?

(A) $\angle A$ and $\angle C$
(B) $\angle B$ and $\angle D$
(C) $\angle A$ and $\angle B$
(D) $\angle C$ and $\angle D$

Q16. Each exterior angle of a regular polygon is $45°$. How many sides does the polygon have?

(A) 6
(B) 5
(C) 10
(D) 8

Q17. In isosceles triangle ABC, $AB = AC$ and $\angle A = 40°$. Find $\angle B$.

(A) $40°$
(B) $60°$
(C) $70°$
(D) $80°$

Q18. A student scored 270 marks out of 360. Find the percentage scored.

(A) 75%
(B) 70%
(C) 80%
(D) 65%

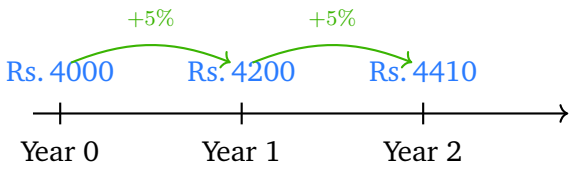
Q19. A shopkeeper buys an article for Rs. 480 and sells it for Rs. 408. Find the loss percentage.

(A) 10%
(B) 15%
(C) 20%
(D) 12%

Q20. Find the Simple Interest on a principal of Rs. 8000 at 7.5% per annum for 2 years.

(A) Rs. 600
(B) Rs. 960
(C) Rs. 1440
(D) Rs. 1200

Q21. Find the Compound Interest on Rs. 4000 at 5% per annum for 2 years, compounded annually.



(A) Rs. 400
(B) Rs. 800
(C) Rs. 410
(D) Rs. 420

Q22. Successive discounts of 10% and 5% are offered on a marked price of Rs. 2000. Find the net selling price.

(A) Rs. 1710
(B) Rs. 1720
(C) Rs. 1700
(D) Rs. 1500

Q23. If 12 metres of cloth cost Rs. 540, what is the cost of 18 metres of the same cloth?

(A) Rs. 720
(B) Rs. 810
(C) Rs. 900
(D) Rs. 630

Q24. 6 pipes can fill a tank in 8 hours. In how many hours will 4 pipes fill the same tank?

(A) 6 hours
(B) 10 hours
(C) 16 hours
(D) 12 hours

Q25. If $A : B = 4 : 5$ and $B : C = 3 : 2$, find $A : C$.

(A) $8 : 5$
(B) $4 : 3$
(C) $6 : 5$
(D) $12 : 5$

Q26. Find the median of the following data: $7,\ 3,\ 14,\ 9,\ 5,\ 11,\ 2$

(A) 7
(B) 9

(C) 5

(D) 11

Q27. A fair die is rolled once. What is the probability of getting a number **greater than 4**?

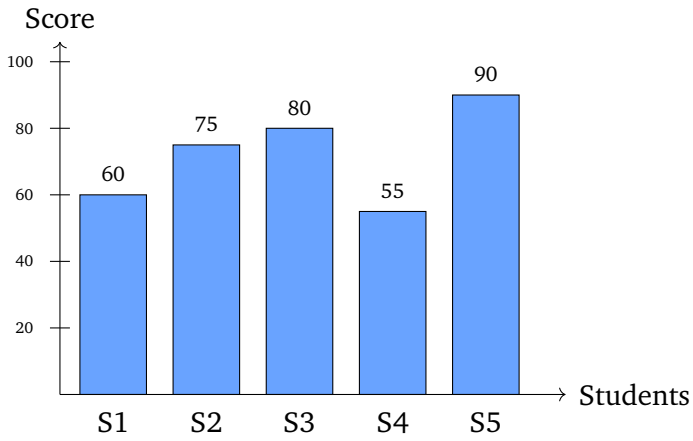
(A) $\frac{1}{6}$

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

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

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

Q28. The bar chart shows test scores of five students. Find the **range** of the scores.



(A) 90

(B) 72

(C) 30

(D) 35

Q29. Simplify: $\left(5^3\right)^2 \div 5^4$

(A) 5^4

(B) 5^3

(C) 5^2

(D) 5^0

Q30. Write 6.02×10^4 as a standard decimal number.

(A) 60200
(B) 6020
(C) 602000
(D) 602

Detailed Solutions

Q1. *[Rational Numbers — Classification]*

Solution

Concept: A rational number can be expressed as $\frac{p}{q}$ where p and q are integers and $q \neq 0$. Numbers whose decimal expansion is non-terminating and non-repeating are *irrational*.

Step 1: Examine each option.

- (A) $\frac{3}{4}$: $p = 3,\ q = 4$ — rational.
- (B) $-\frac{7}{2}$: $p = -7,\ q = 2$ — rational.
- (C) $\sqrt{5} \approx 2.2360679\ldots$ — non-terminating, non-repeating, so **irrational (NOT rational)**.
- (D) $0 = \frac{0}{1}$ — rational.

Step 2: Since 5 is not a perfect square, $\sqrt{5}$ cannot be expressed as a ratio of two integers.

Why other options are wrong:

- (A) and (B) are directly written as integer fractions, so they are rational.
- (D) Zero is rational: $0 = \frac{0}{1}$.

Final Answer: $\sqrt{5}$ is **NOT** a rational number.

Answer: (C)

Go Back to Q1

Q2. *[Rational Numbers — Multiplicative Inverse]*

Solution

Concept: The multiplicative inverse (reciprocal) of $\frac{a}{b}$ is $\frac{b}{a}$. Their product equals 1.

Step 1: The number is $-\frac{5}{8}$.

Step 2: Flip numerator and denominator, keeping the sign:

$$\text{Reciprocal} = -\frac{8}{5}.$$

Verification: $\left(-\frac{5}{8}\right) \times \left(-\frac{8}{5}\right) = +\frac{40}{40} = 1$ ✓

Why other options are wrong:

- (B) $\frac{8}{5}$: reciprocal of $\frac{5}{8}$ (positive), not $-\frac{5}{8}$.

- (C) $\frac{5}{8}$: the original number with sign removed, not its reciprocal.
- (D) $-\frac{5}{8}$: this is the original number itself.

Final Answer: $-\frac{8}{5}$.

Answer: (A)

Go Back to Q2

Q3. *[Rational Numbers — Division]*

Solution

Concept: Dividing by a fraction is the same as multiplying by its reciprocal: $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$.

Step 1: $\left(-\frac{3}{5}\right) \div \left(\frac{9}{10}\right) = \left(-\frac{3}{5}\right) \times \left(\frac{10}{9}\right)$.

Step 2: $= \frac{-3 \times 10}{5 \times 9} = \frac{-30}{45} = -\frac{2}{3}$.

Why other options are wrong:

- (A) $-\frac{3}{4}$: comes from incorrect cancellation.
- (C) $\frac{2}{3}$: correct magnitude but wrong sign (negative divided by positive is negative).
- (D) $\frac{3}{4}$: wrong sign and wrong value.

Final Answer: $-\frac{2}{3}$.

Answer: (B)

Go Back to Q3

Q4. *[Rational Numbers — Density Property]*

Solution

Concept: The *density property* of rational numbers: between any two distinct rational numbers there exist **infinitely many** rational numbers.

Step 1: We can always find a rational number between $\frac{1}{3}$ and $\frac{1}{2}$ by averaging:

$$\frac{1}{2}\left(\frac{1}{3} + \frac{1}{2}\right) = \frac{1}{2} \cdot \frac{5}{6} = \frac{5}{12}.$$

Step 2: This averaging process can be repeated indefinitely. For example: $\frac{7}{24}, \frac{5}{12}, \frac{11}{24}$ all lie between $\frac{1}{3}$ and $\frac{1}{2}$, and we can always find more.

Why other options are wrong:

- (A) 0: incorrect — we found $\frac{5}{12}$ immediately.
- (B) Exactly 1: incorrect — we can find more by averaging further.
- (C) Exactly 10: incorrect — there is no upper limit to the count.

Final Answer: There are **infinitely many** rational numbers between $\frac{1}{3}$ and $\frac{1}{2}$.

Answer: (D)

Go Back to Q4

Q5. *[Algebra — Algebraic Identity]*

Solution

Concept: $(a-b)^2 = a^2 - 2ab + b^2$.

Step 1: Identify $a = 3p$ and $b = 2q$.

Step 2: Substitute into the identity:

$$(3p-2q)^2 = (3p)^2 - 2(3p)(2q) + (2q)^2 = 9p^2 - 12pq + 4q^2.$$

Why other options are wrong:

- (A) $9p^2 + 12pq + 4q^2$: this is $(3p+2q)^2$; the middle term sign is wrong.
- (B) $9p^2 - 12pq - 4q^2$: $(2q)^2 = +4q^2$, not $-4q^2$.
- (D) $6p^2 - 12pq + 4q^2$: $(3p)^2 = 9p^2$, not $6p^2$.

Final Answer: $9p^2 - 12pq + 4q^2$.

Answer: (C)

Go Back to Q5

Q6. *[Algebra — Factorization]*

Solution

Concept: Find the Highest Common Factor (HCF) of all terms and factor it out.

Step 1: Find HCF of $12m^2$ and $18mn$:

- HCF of coefficients: $\text{HCF}(12, 18) = 6$.
- Common variable: m (appears in both terms, lowest power m^1).

- Therefore HCF $= 6m$.

Step 2: Factor out $6m$:

$$12m^2 - 18mn = 6m \cdot 2m - 6m \cdot 3n = 6m(2m - 3n).$$

Verification: $6m(2m - 3n) = 12m^2 - 18mn$ ✓

Why other options are wrong:

- (B) $6m(2m + 3n)$: wrong sign; expands to $12m^2 + 18mn$.
- (C) $6mn(2m - 3)$: wrong; $6mn \cdot 2m = 12m^2n \neq 12m^2$.
- (D) $6m(2m - 9n)$: wrong; $6m \cdot 9n = 54mn \neq 18mn$.

Final Answer: $6m(2m - 3n)$.

Answer: (A)

Go Back to Q6

Q7. *[Algebra — Linear Equation]*

Solution

Concept: Expand brackets, collect like terms, isolate the variable.

Step 1: Expand both sides:

$$3(y - 4) = 2(y + 5) \implies 3y - 12 = 2y + 10.$$

Step 2: Bring variable terms to one side:

$$3y - 2y = 10 + 12 \implies y = 22.$$

Verification: LHS $= 3(22 - 4) = 3 \times 18 = 54$. RHS $= 2(22 + 5) = 2 \times 27 = 54$. ✓

Why other options are wrong:

- (A) $y = 18$: sign error when transposing -12 to the right.
- (C) $y = 26$: error in expansion of brackets.
- (D) $y = 10$: the -12 was not moved correctly.

Final Answer: $y = 22$.

Answer: (B)

Go Back to Q7

Q8. *[Algebra — Word Problem]*

Solution

Concept: Define variables, write equations from the word problem, and solve.

Step 1: Let the smaller number be x. Then the larger number $= 2x + 5$ ("5 more than twice the smaller").

Step 2: Their sum is 29:

$$x + (2x + 5) = 29 \implies 3x + 5 = 29 \implies 3x = 24 \implies x = 8.$$

Verification: Smaller $= 8$, Larger $= 2(8) + 5 = 21$. Sum $= 8 + 21 = 29$. ✓

Why other options are wrong:

- (A) $x = 4$: Sum $= 4 + (2 \times 4 + 5) = 4 + 13 = 17 \neq 29$.
- (B) $x = 6$: Sum $= 6 + (2 \times 6 + 5) = 6 + 17 = 23 \neq 29$.
- (C) $x = 10$: Sum $= 10 + (2 \times 10 + 5) = 10 + 25 = 35 \neq 29$.

Final Answer: The smaller number is **8**.

Answer: (D)

Go Back to Q8

Q9. *[Algebra — Expansion of Binomials]*

Solution

Concept: Use $(x + a)(x + b) = x^2 + (a + b)x + ab$.

Step 1: Here $a = 4$ and $b = 7$.

Step 2:

$$(x + 4)(x + 7) = x^2 + (4 + 7)x + (4 \times 7) = x^2 + 11x + 28.$$

Why other options are wrong:

- (A) $x^2 + 28x + 11$: the coefficients of x and the constant are swapped.
- (B) $x^2 + 11x + 11$: last term should be $4 \times 7 = 28$, not 11.
- (D) $x^2 + 4x + 28$: middle coefficient should be $4 + 7 = 11$, not 4.

Final Answer: $x^2 + 11x + 28$.

Answer: (C)

Go Back to Q9

Q10. *[Mensuration — Area of Square from Diagonal]*

Solution

Concept: For a square with diagonal d: Area $= \dfrac{d^2}{2}$.

Derivation: If side $= s$, then $d = s\sqrt{2}$, so $s = \dfrac{d}{\sqrt{2}}$, giving Area $= s^2 = \dfrac{d^2}{2}$.

Step 1: $d = 10$ cm.

Step 2:

$$\text{Area} = \frac{10^2}{2} = \frac{100}{2} = 50 \text{ cm}^2.$$

Why other options are wrong:

- (B) 40 cm^2: no standard formula yields this value.
- (C) 25 cm^2: error of using half-diagonal $(5)^2 = 25$ as the area.
- (D) 100 cm^2: error of treating the diagonal as the side ($10^2 = 100$).

Final Answer: Area $=$ **50** cm^2.

Answer: (A)

Go Back to Q10

Q11. *[Mensuration — Volume of a Cube]*

Solution

Concept: Volume of a cube with side a is $V = a^3$.

Step 1: $a = 9$ cm.

Step 2:

$$V = 9^3 = 9 \times 9 \times 9 = 81 \times 9 = 729 \text{ cm}^3.$$

Why other options are wrong:

- (A) 243 cm$^3 = 3^5$: no relation to a cube of side 9.
- (C) 81 cm$^3 = 9^2$: this is the area of a face, not the volume.
- (D) 512 cm$^3 = 8^3$: volume of a cube with side 8, not 9.

Final Answer: $V = 729$ cm^3.

Answer: (B)

Go Back to Q11

Q12. *[Mensuration — Perimeter of a Rhombus]*

Solution

Concept: In a rhombus, the diagonals bisect each other at right angles. Each side is the hypotenuse of the right triangle formed by the half-diagonals.

Step 1: Half-diagonals: $\frac{16}{2} = 8$ cm and $\frac{12}{2} = 6$ cm.

Step 2: By Pythagoras' theorem:

$$\text{Side} = \sqrt{8^2 + 6^2} = \sqrt{64 + 36} = \sqrt{100} = 10 \text{ cm}.$$

Step 3: Perimeter $= 4 \times 10 = 40$ cm.

Why other options are wrong:

- (A) 20 cm: only $2\times$ side; not the full perimeter.
- (B) 28 cm: this is $16 + 12$, the sum of the diagonals.
- (C) 36 cm: no valid derivation from given data.

Final Answer: Perimeter $= 40$ cm.

Answer: (D)

Go Back to Q12

Q13. *[Mensuration — Curved Surface Area of a Cylinder]*

Solution

Concept: Curved Surface Area of a cylinder $= 2\pi rh$.

Step 1: $r = 5$ cm, $h = 14$ cm, $\pi = \frac{22}{7}$.

Step 2:

$$\text{CSA} = 2 \times \frac{22}{7} \times 5 \times 14 = 2 \times 22 \times 5 \times \frac{14}{7} = 2 \times 22 \times 5 \times 2 = 2 \times 220 = 440 \text{ cm}^2.$$

(The factor $\frac{14}{7} = 2$ cancels cleanly.)

Why other options are wrong:

- (A) 220 cm^2: missed the factor of 2; computed only πrh.
- (B) 380 cm^2: no valid derivation.
- (D) 480 cm^2: likely used $r = 6$ or another arithmetic error.

Final Answer: CSA $= 440$ cm^2.

Answer: (C)

Go Back to Q13

Q14. *[Geometry — Angle Sum of a Quadrilateral]*

Solution

Concept: The sum of interior angles of any quadrilateral $= 360°$.

Step 1: $\angle P + \angle Q + \angle R + \angle S = 360°$.

Step 2:

$$85° + 110° + 95° + \angle S = 360° \implies 290° + \angle S = 360° \implies \angle S = 70°.$$

Why other options are wrong:

- (B) $80°$: total would be $370°$, exceeding $360°$.
- (C) $75°$: total would be $365°$, exceeding $360°$.
- (D) $60°$: total would be $350°$, less than $360°$.

Final Answer: $\angle S = \mathbf{70°}$.

Answer: (A)

Go Back to Q14

Q15. *[Geometry — Properties of a Kite]*

Solution

Concept: In a kite with $AB = AD$ and $CB = CD$, the diagonal AC is the axis of symmetry. The two angles at the "wing tips" B and D are **always equal**.

Step 1: In kite $ABCD$: A is the "top vertex" (equal long sides meet) and C is the "bottom vertex" (equal short sides meet). B and D are the two "wing" vertices.

Step 2: Reflecting the kite about diagonal AC maps $B \leftrightarrow D$, proving $\angle B = \angle D$.

Why other options are wrong:

- (A) $\angle A$ and $\angle C$: the two vertex angles are generally *unequal* in a kite.
- (C) $\angle A$ and $\angle B$: these are not related by the symmetry axis.
- (D) $\angle C$ and $\angle D$: these are not necessarily equal.

Final Answer: $\angle B$ and $\angle D$ are always equal.

Answer: (B)

Go Back to Q15

Q16. *[Geometry — Regular Polygon and Exterior Angles]*

Solution

Concept: For a regular polygon with n sides, each exterior angle $= \dfrac{360^\circ}{n}$.

Step 1: Each exterior angle $= 45^\circ$.

Step 2:

$$n = \frac{360^\circ}{45^\circ} = 8.$$

The polygon is a regular **octagon**.

Why other options are wrong:

- (A) 6: exterior angle would be $\dfrac{360}{6} = 60^\circ$ (regular hexagon).
- (B) 5: exterior angle would be $\dfrac{360}{5} = 72^\circ$ (regular pentagon).
- (C) 10: exterior angle would be $\dfrac{360}{10} = 36^\circ$ (regular decagon).

Final Answer: The polygon has **8** sides.

Answer: (D)

Go Back to Q16

Q17. *[Geometry — Isosceles Triangle]*

Solution

Concept: In an isosceles triangle, the base angles (angles opposite the equal sides) are equal. Sum of angles in a triangle $= 180^\circ$.

Step 1: In $\triangle ABC$, $AB = AC$, so $\angle B = \angle C$.

Step 2:

$$\angle A + \angle B + \angle C = 180^\circ \implies 40^\circ + 2\angle B = 180^\circ \implies 2\angle B = 140^\circ \implies \angle B = 70^\circ.$$

Why other options are wrong:

- (A) 40°: that is $\angle A$, not the base angle.
- (B) 60°: total $= 40 + 60 + 60 = 160^\circ \neq 180^\circ$.
- (D) 80°: total $= 40 + 80 + 80 = 200^\circ \neq 180^\circ$.

Final Answer: $\angle B = \mathbf{70^\circ}$.

Answer: (C)

Go Back to Q17

Q18. *[Comparing Quantities — Percentage]*

Solution

Concept: Percentage $= \dfrac{\text{Marks obtained}}{\text{Total marks}} \times 100$.

Step 1: Marks obtained $= 270$, Total $= 360$.

Step 2:

$$\text{Percentage} = \frac{270}{360} \times 100 = \frac{3}{4} \times 100 = 75\%.$$

Why other options are wrong:

- (B) 70%: $\dfrac{70 \times 360}{100} = 252 \neq 270$.
- (C) 80%: $\dfrac{80 \times 360}{100} = 288 \neq 270$.
- (D) 65%: $\dfrac{65 \times 360}{100} = 234 \neq 270$.

Final Answer: $\mathbf{75\%}$.

Answer: (A)

Go Back to Q18

Q19. *[Comparing Quantities — Loss Percentage]*

Solution

Concept: Loss $=$ CP $-$ SP (when SP $<$ CP). Loss% $= \dfrac{\text{Loss}}{\text{CP}} \times 100$.

Step 1: CP $=$ Rs. 480, SP $=$ Rs. 408.

$$\text{Loss} = 480 - 408 = \text{Rs. } 72.$$

Step 2:

$$\text{Loss\%} = \frac{72}{480} \times 100 = \frac{72}{4.8} = 15\%.$$

Why other options are wrong:

- (A) 10%: implies loss of $0.10 \times 480 = \text{Rs. } 48 \neq \text{Rs. } 72$.
- (C) 20%: implies loss of $0.20 \times 480 = \text{Rs. } 96 \neq \text{Rs. } 72$.
- (D) 12%: implies loss of $0.12 \times 480 = \text{Rs. } 57.6 \neq \text{Rs. } 72$.

Final Answer: Loss $= \mathbf{15\%}$.

Answer: (B)

Go Back to Q19

Q20. *[Comparing Quantities — Simple Interest]*

Solution

Concept: $\text{SI} = \dfrac{P \times R \times T}{100}$.

Step 1: $P = 8000$, $R = 7.5\%$, $T = 2$ years.

Step 2:

$$\text{SI} = \frac{8000 \times 7.5 \times 2}{100} = \frac{8000 \times 15}{100} = 80 \times 15 = \text{Rs. } 1200.$$

Why other options are wrong:

- (A) Rs. 600: result for $T = 1$ year only (half the time).
- (B) Rs. 960: corresponds to $P \times R \times T/100 = 8000 \times 6 \times 2/100 = 960$, using wrong rate.
- (C) Rs. 1440: corresponds to $R = 9\%$ instead of 7.5%.

Final Answer: SI = Rs. **1200**.

Answer: (D)

Go Back to Q20

Q21. *[Comparing Quantities — Compound Interest]*

Solution

Concept: $A = P\left(1 + \dfrac{R}{100}\right)^n$ and $\text{CI} = A - P$.

Step 1: $P = 4000$, $R = 5\%$, $n = 2$ years.

Step 2:

$$A = 4000 \times \left(\frac{105}{100}\right)^2 = 4000 \times \frac{11025}{10000} = \frac{44100000}{10000} = 4410.$$

Step 3: $\text{CI} = 4410 - 4000 = \text{Rs. } 410$.

Year-by-year verification:

- Year 1 interest: $5\% \times 4000 = 200$. Amount after Year 1 $= 4200$.
- Year 2 interest: $5\% \times 4200 = 210$. Amount after Year 2 $= 4410$.
- Total CI $= 200 + 210 = 410$ ✓

Why other options are wrong:

- (A) Rs. 400: this is SI for 2 years (2×200), not CI.
- (B) Rs. 800: far too large.
- (D) Rs. 420: only the Year 2 interest, not the total.

Final Answer: CI = Rs. **410**.

Answer: (C)

Go Back to Q21

Q22. *[Comparing Quantities — Successive Discounts]*

Solution

Concept: Apply successive discounts one after the other, each on the price from the previous step.

Step 1: Marked Price $=$ Rs. 2000. Apply 10% discount:

$$\text{Price after first discount} = 2000 \times \frac{90}{100} = \text{Rs. } 1800.$$

Step 2: Apply 5% discount on Rs. 1800:

$$\text{Net Selling Price} = 1800 \times \frac{95}{100} = 1800 \times 0.95 = \text{Rs. } 1710.$$

Why other options are wrong:

- (B) Rs. 1720: arithmetic error in the second step.
- (C) Rs. 1700: applies a combined 15% discount ($2000 \times 0.85 = 1700$), which is incorrect. Successive discounts are not additive.
- (D) Rs. 1500: applies a combined 25% discount, incorrect.

Final Answer: Net Selling Price $=$ Rs. **1710**.

Answer: (A)

Go Back to Q22

Q23. *[Ratio & Proportion — Direct Proportion]*

Solution

Concept: Cost is directly proportional to length. More metres $\Rightarrow$ proportionally more cost.

Step 1: Rate per metre $= \frac{540}{12} =$ Rs. 45 per metre.

Step 2: Cost of 18 metres $= 45 \times 18 =$ Rs. 810.

Alternatively (unitary method): $\frac{12 \text{ m}}{540} = \frac{18 \text{ m}}{x}$, so $x = \frac{18 \times 540}{12} = 18 \times 45 = 810$.

Why other options are wrong:

- (A) Rs. 720: cost of 16 metres (45×16).
- (C) Rs. 900: cost of 20 metres (45×20).
- (D) Rs. 630: cost of 14 metres (45×14).

Final Answer: Cost of 18 metres $=$ Rs. **810**.

Answer: (B)

Go Back to Q23

Q24. *[Ratio & Proportion — Inverse Proportion]*

Solution

Concept: More pipes $\Rightarrow$ less time. This is inverse proportion: (Pipes)$\times$(Time) $=$ constant (total work).

Step 1: Total work $= 6$ pipes $\times$ 8 hours $= 48$ pipe-hours.

Step 2: With 4 pipes:

$$4 \times t = 48 \implies t = \frac{48}{4} = 12 \text{ hours.}$$

Why other options are wrong:

- (A) 6 hours: $4 \times 6 = 24 \neq 48$.
- (B) 10 hours: $4 \times 10 = 40 \neq 48$.
- (C) 16 hours: corresponds to 3 pipes ($3 \times 16 = 48$), not 4.

Final Answer: 4 pipes fill the tank in **12** hours.

Answer: (D)

Go Back to Q24

Q25. *[Ratio & Proportion — Combined Ratio]*

Solution

Concept: To find $A : C$ from $A : B$ and $B : C$, make the value of B the same in both ratios by finding LCM.

Step 1: $A : B = 4 : 5$ and $B : C = 3 : 2$. Values of B are 5 and 3. LCM$(5, 3) = 15$.

Step 2: Scale both ratios so $B = 15$:

- $A : B = 4 : 5 \xrightarrow{\times 3} 12 : 15$
- $B : C = 3 : 2 \xrightarrow{\times 5} 15 : 10$

Step 3: Combined: $A : B : C = 12 : 15 : 10$, so $A : C = 12 : 10 = 6 : 5$.

Why other options are wrong:

- (A) $8 : 5$: incorrect scaling of ratios.
- (B) $4 : 3$: no valid derivation from the given ratios.
- (D) $12 : 5$: uses A's scaled value and C's unscaled value directly.

Final Answer: $A : C = \mathbf{6 : 5}$.

Answer: (C)

Go Back to Q25

Q26. *[Data Handling — Median]*

Solution

Concept: The median is the middle value when data is arranged in ascending order.

Step 1: Data: $7, 3, 14, 9, 5, 11, 2$. Arranged in ascending order:

$$2,\ 3,\ 5,\ \mathbf{7},\ 9,\ 11,\ 14.$$

Step 2: $n = 7$ (odd). The median is the $\left(\frac{n+1}{2}\right)^{\text{th}} = 4^{\text{th}}$ value $= \mathbf{7}$.

Why other options are wrong:

- (B) 9: this is the 5^{th} value, one past the middle.
- (C) 5: this is the 3^{rd} value, one before the middle.
- (D) 11: this is the 6^{th} value.

Final Answer: Median $= \mathbf{7}$.

Answer: (A)

Go Back to Q26

Q27. *[Data Handling — Basic Probability]*

Solution

Concept: $P(\text{event}) = \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}}$.

Step 1: A fair die has 6 equally likely outcomes: $\{1, 2, 3, 4, 5, 6\}$. Total $= 6$.

Step 2: Numbers greater than 4: $\{5, 6\}$. Favourable outcomes $= 2$.

$$P(\text{number} > 4) = \frac{2}{6} = \frac{1}{3}.$$

Why other options are wrong:

- (A) $\frac{1}{6}$: probability of getting one specific outcome (e.g., only 5 or only 6).
- (C) $\frac{1}{2}$: probability of number > 3 (outcomes $\{4, 5, 6\}$), not > 4.
- (D) $\frac{2}{3}$: probability of number ≤ 4 (complement of the event).

Final Answer: $P = \frac{1}{3}$.

Answer: (B)

Go Back to Q27

Q28. *[Data Handling — Range from a Bar Chart]*

Solution

Concept: Range = Maximum value − Minimum value.

Step 1: Read scores from the bar chart: 60 (S1), 75 (S2), 80 (S3), 55 (S4), 90 (S5).

Step 2:

- Maximum = 90 (Student S5).
- Minimum = 55 (Student S4).

Step 3: Range = $90 - 55 = \mathbf{35}$.

Why other options are wrong:

- (A) 90: this is the maximum score alone, not the range.
- (B) 72: this is the mean score $\left(\frac{60+75+80+55+90}{5} = \frac{360}{5} = 72\right)$, not the range.
- (C) 30: no valid derivation.

Final Answer: Range = **35**.

Answer: (D)

Go Back to Q28

Q29. *[Exponents — Laws of Exponents]*

Solution

Concept: Two laws used here: $(a^m)^n = a^{mn}$ and $a^m \div a^n = a^{m-n}$.

Step 1: Apply the power-of-a-power rule:

$$(5^3)^2 = 5^{3\times 2} = 5^6.$$

Step 2: Apply the division rule:

$$5^6 \div 5^4 = 5^{6-4} = 5^2.$$

Note: $5^2 = 25$.

Why other options are wrong:

- (A) 5^4: error of adding exponents in step 1 ($5^{3+2} = 5^5$) then subtracting wrongly.
- (B) 5^3: error in applying the power rule.
- (D) $5^0 = 1$: error of computing 5^{6-6} instead of 5^{6-4}.

Final Answer: $5^2 = 25$.

Answer: (C)

Go Back to Q29

Q30. *[Exponents — Scientific Notation to Standard Form]*

Solution

Concept: To convert $a \times 10^n$ to a decimal, move the decimal point n places to the **right** (for positive n).

Step 1: 6.02×10^4. Move decimal 4 places to the right.

Step 2:

$$6.02 \xrightarrow{+1} 60.2 \xrightarrow{+2} 602 \xrightarrow{+3} 6020 \xrightarrow{+4} 60200.$$

Therefore $6.02 \times 10^4 = 60200$.

Why other options are wrong:

- (B) 6020: decimal moved only 3 places; equals 6.02×10^3.
- (C) 602000: decimal moved 5 places; equals 6.02×10^5.
- (D) 602: decimal moved only 2 places; equals 6.02×10^2.

Final Answer: $6.02 \times 10^4 = \mathbf{60200}$.

Answer: (A)

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Answer Key

Q.	Ans	Q.	Ans	Q.	Ans	Q.	Ans	Q.	Ans
1	C	2	A	3	B	4	D	5	C
6	A	7	B	8	D	9	C	10	A
11	B	12	D	13	C	14	A	15	B
16	D	17	C	18	A	19	B	20	D
21	C	22	A	23	B	24	D	25	C
26	A	27	B	28	D	29	C	30	A

*Each answer is a hyperlink to its detailed solution. Use the **Go Back** link in each solution to return to the question.*

Distribution: A — Q2, Q6, Q10, Q14, Q18, Q22, Q26, Q30 (8 questions) B — Q3, Q7, Q11, Q15, Q19, Q23, Q27 (7 questions) C — Q1, Q5, Q9, Q13, Q17, Q21, Q25, Q29 (8 questions) D — Q4, Q8, Q12, Q16, Q20, Q24, Q28 (7 questions).