

SHRESHTA NETS Mathematics

Sample Paper – 7

Duration: 54 Minutes

Maximum Marks: 120

Instructions

- This paper contains **30** Multiple Choice Questions (Single Correct Answer), modelled on the Mathematics portion of **SHRESHTA NETS** entrance.
- Each correct answer carries **+4 marks**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **NCERT Class 8 Mathematics (Ganita Prakash, 2024 edition)** — **all 13 chapters**.
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Mathematics — Questions

Q1. How many rational numbers can be found between $\frac{1}{3}$ and $\frac{1}{2}$?

- (A) None, because no fraction exists between them
- (B) Exactly one rational number
- (C) Infinitely many rational numbers
- (D) Exactly two rational numbers

Q2. Simplify: $\frac{-5}{6} \div \frac{10}{3}$

- (A) $-\frac{1}{4}$
- (B) $-\frac{5}{9}$
- (C) $-\frac{1}{2}$



(D) $-\frac{4}{5}$

Q3. The numerator of a fraction is 3 less than its denominator. If both the numerator and the denominator are increased by 2, the fraction becomes $\frac{4}{5}$. Find the **original fraction**.

(A) $\frac{7}{10}$

(B) $\frac{8}{11}$

(C) $\frac{9}{12}$

(D) $\frac{10}{13}$

Q4. The sum of the digits of a two-digit number is 9. When the digits are reversed, the new number is 27 more than the original number. Find the **original number**.

(A) 27

(B) 36

(C) 45

(D) 54

Q5. The ratio of Ravi's age to Meena's age is 3 : 2. Six years later, the ratio of their ages will be 4 : 3. Find Ravi's **present age**.

(A) 18 years

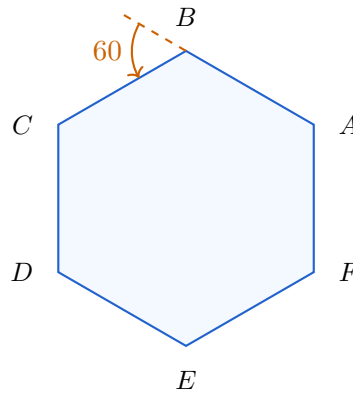
(B) 12 years

(C) 24 years

(D) 15 years

Q6. The regular hexagon below has all exterior angles marked. The sum of all exterior angles of **any** convex polygon is ____°.





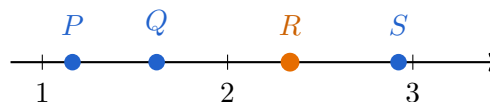
Each exterior angle = 60 ; sum = $6 \times 60 = ?$

- (A) 90
- (B) 180
- (C) 270
- (D) 360

Q7. In trapezium $ABCD$, $AB \parallel DC$. Given $\angle A = 65$ and $\angle B = 115$, find $\angle C$.

- (A) 75
- (B) 115
- (C) 65
- (D) 90

Q8. The number line below shows four points P , Q , R , S . Which point represents $\sqrt{5}$?



- (A) R
- (B) P
- (C) Q
- (D) S



Q9. Find $\sqrt{11025}$ by prime factorisation.

- (A) 100
- (B) 105
- (C) 110
- (D) 115

Q10. Which of the following is **NOT** a perfect square?

- (A) 196
- (B) 225
- (C) 256
- (D) 260

Q11. Find $\sqrt[3]{\frac{27}{125}}$.

- (A) $\frac{3}{5}$
- (B) $\frac{2}{5}$
- (C) $\frac{3}{7}$
- (D) $\frac{5}{3}$

Q12. What is the smallest positive integer by which 500 must be **divided** to make the result a perfect cube?

- (A) 2
- (B) 25
- (C) 4
- (D) 500

Q13. Two successive discounts of 30% and 20% are equivalent to a single discount of ____%.



- (A) 50%
- (B) 48%
- (C) 46%
- (D) 44%

Q14. Find the simple interest on Rs 5000 at 6% per annum for 3 years.

- (A) Rs 800
- (B) Rs 900
- (C) Rs 1000
- (D) Rs 1200

Q15. At what rate of compound interest per annum will Rs 8000 become Rs 9261 in 3 years?

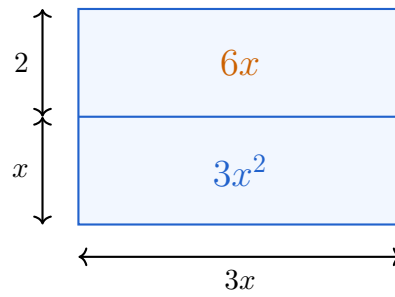
- (A) 5%
- (B) 6%
- (C) 8%
- (D) 10%

Q16. Expand: $(x + y + z)^2$

- (A) $x^2 + y^2 + z^2 + xy + yz + xz$
- (B) $x^2 + y^2 + z^2$
- (C) $x^2 + y^2 + z^2 + 2xy + 2yz$
- (D) $x^2 + y^2 + z^2 + 2xy + 2yz + 2xz$

Q17. The area model below represents a rectangle of dimensions $3x$ by $(x + 2)$. What is the **total area**?



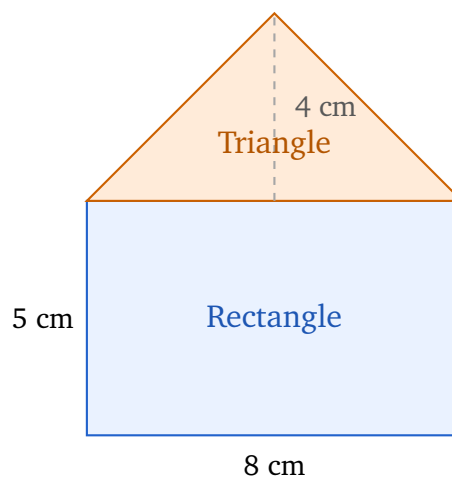


- (A) $3x^2 + 3x$
- (B) $3x^2 + 2x$
- (C) $3x^2 + 6x$
- (D) $6x^2 + 3x$

Q18. Using a suitable algebraic identity, evaluate 49×51 .

- (A) 2401
- (B) 2499
- (C) 2501
- (D) 2500

Q19. The composite figure below consists of a rectangle and a triangle. Find the **total area** of the figure.



- (A) 56 cm^2
- (B) 48 cm^2
- (C) 64 cm^2



(D) 72 cm^2

Q20. Find the volume of a cone with base radius 7 cm and height 6 cm. (Use $\pi = \frac{22}{7}$)

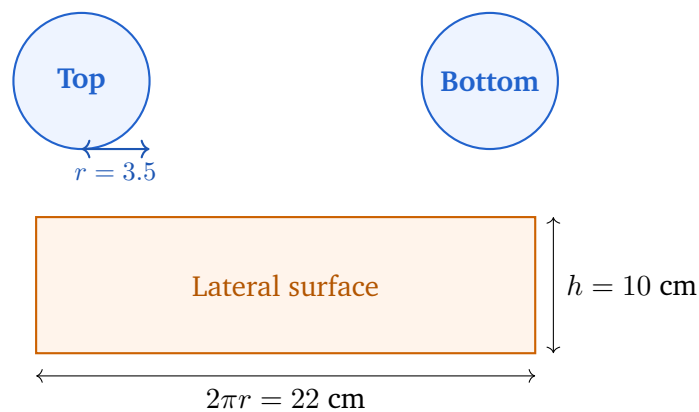
(A) 154 cm^3

(B) 231 cm^3

(C) 264 cm^3

(D) 308 cm^3

Q21. The net of a cylinder is shown below. If the radius is 3.5 cm and height is 10 cm, find the **total surface area**. (Use $\pi = \frac{22}{7}$)



(A) 231 cm^2

(B) 264 cm^2

(C) 297 cm^2

(D) 330 cm^2

Q22. Simplify: $\left(\frac{2}{3}\right)^{-3} \times \left(\frac{2}{3}\right)^2$

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

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

(C) $\frac{9}{4}$



(D) $\frac{4}{9}$

Q23. The mass of an electron is approximately 9.1×10^{-31} kg and the mass of a proton is approximately 1.67×10^{-27} kg. Approximately how many times heavier is a proton than an electron?

(A) 183

(B) 1836

(C) 18360

(D) 1836000

Q24. 15 workers can build a wall in 48 days. How many workers are needed to build the same wall in 30 days?

(A) 20

(B) 18

(C) 22

(D) 24

Q25. On a map, a distance of 2.5 cm represents 500 km. What distance on the map (in cm) represents 1400 km?

(A) 5 cm

(B) 6 cm

(C) 7 cm

(D) 8 cm

Q26. Factorise: $6p^2 - 17p + 12$

(A) $(3p - 4)(2p - 3)$

(B) $(6p - 1)(p - 12)$

(C) $(2p - 4)(3p - 3)$

(D) $(3p + 4)(2p - 3)$



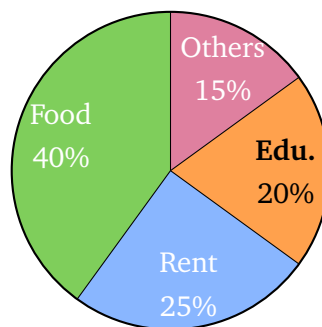
Q27. Divide: $(3x^2 + 11x + 10) \div (x + 2)$

- (A) $3x + 3$
- (B) $3x + 5$
- (C) $3x + 7$
- (D) $3x + 10$

Q28. Factorise: $8x^3 - 27y^3$

- (A) $(2x - 3y)^2(2x + 3y)$
- (B) $(2x + 3y)(4x^2 - 6xy + 9y^2)$
- (C) $(2x - 3y)^3$
- (D) $(2x - 3y)(4x^2 + 6xy + 9y^2)$

Q29. The pie chart below shows the monthly expense distribution of a family. If the total monthly expenses are Rs 12000, how much is spent on **Education**?



- (A) Rs 1800
- (B) Rs 3000
- (C) Rs 2400
- (D) Rs 4800

Q30. Two dice are thrown simultaneously. What is the probability that the **sum** of the numbers on the two dice is 8?

- (A) $\frac{1}{12}$



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

(C) $\frac{7}{36}$

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



Detailed Solutions

Q1.

Solution

Concept — Density of Rational Numbers: Between any two distinct rational numbers, there are infinitely many rational numbers. This is called the *density property* of rational numbers.

Step 1 — Verify that $\frac{1}{3}$ and $\frac{1}{2}$ are distinct:

$\frac{1}{3} \approx 0.333$ and $\frac{1}{2} = 0.5$. They are distinct, so infinitely many rationals lie between them.

Step 2 — Example of rationals between them:

$$\frac{1}{3} < \frac{5}{12} < \frac{1}{2}, \quad \frac{1}{3} < \frac{7}{18} < \frac{1}{2}, \quad \dots$$

One can always find a new rational by taking the average: $\frac{1}{3}, \frac{5}{12}, \frac{11}{24}, \dots$ never terminate.

Why other options are wrong:

- Option (A): Incorrect — fractions like $\frac{5}{12}$ clearly lie between $\frac{1}{3}$ and $\frac{1}{2}$.
- Option (B): Incorrect — there is no unique “one” rational between two distinct rationals.
- Option (D): Incorrect — you can find far more than two.

Final Answer: Infinitely many rational numbers exist between any two distinct rationals $\Rightarrow$

Answer: (C) [Go Back to Q1](#)

Q2.

Solution

Concept — Division of Rational Numbers: To divide by a fraction, multiply by its reciprocal.

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$$

Step 1 — Apply the rule:

$$\frac{-5}{6} \div \frac{10}{3} = \frac{-5}{6} \times \frac{3}{10}$$



Step 2 — Multiply and simplify:

$$= \frac{-5 \times 3}{6 \times 10} = \frac{-15}{60} = \frac{-1}{4}$$

Why other options are wrong:

- Option (B) $-\frac{5}{9}$: This results from adding denominators incorrectly.
- Option (C) $-\frac{1}{2}$: This confuses division with subtraction.
- Option (D) $-\frac{4}{5}$: This is the product of $-\frac{5}{6}$ and $\frac{3}{10}$ after wrong cancellation.

Final Answer: $\frac{-5}{6} \div \frac{10}{3} = -\frac{1}{4} \Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q2](#)

Q3.

Solution

Concept — Setting Up a Linear Equation: Translate the word problem into an algebraic equation by defining a variable.

Step 1 — Define variables:

Let the denominator = x . Then the numerator = $x - 3$.

Original fraction = $\frac{x-3}{x}$.

Step 2 — Form the equation (after adding 2 to both):

$$\frac{(x-3)+2}{x+2} = \frac{4}{5} \Rightarrow \frac{x-1}{x+2} = \frac{4}{5}$$

Step 3 — Cross-multiply and solve:

$$5(x-1) = 4(x+2) \Rightarrow 5x-5 = 4x+8 \Rightarrow x = 13$$

Step 4 — Find the original fraction:

$$\text{Numerator} = 13 - 3 = 10, \quad \text{Fraction} = \frac{10}{13}$$

Verification: $\frac{10+2}{13+2} = \frac{12}{15} = \frac{4}{5} \checkmark$

Why other options are wrong:



- Option (A) $\frac{7}{10} : \frac{7+2}{10+2} = \frac{9}{12} = \frac{3}{4} \neq \frac{4}{5}$.
- Option (B) $\frac{8}{11} : \frac{8+2}{11+2} = \frac{10}{13} \neq \frac{4}{5}$.
- Option (C) $\frac{9}{12}$: Denominator–numerator = 3 ✓, but $\frac{9+2}{12+2} = \frac{11}{14} \neq \frac{4}{5}$.

Final Answer: Original fraction = $\frac{10}{13} \Rightarrow \boxed{D}$

Answer: (D) [Go Back to Q3](#)

Q4.

Solution

Concept — Two-Digit Number Problems: Represent the tens digit and units digit as variables and use the given conditions to form a system of equations.

Step 1 — Define variables:

Let tens digit = a and units digit = b .

Then the original number = $10a + b$.

The reversed number = $10b + a$.

Step 2 — Set up equations from given conditions:

$$a + b = 9 \quad \dots (1)$$

$$(10b + a) - (10a + b) = 27 \Rightarrow 9b - 9a = 27 \Rightarrow b - a = 3 \quad \dots (2)$$

Step 3 — Solve the system:

Adding equations (1) and (2): $2b = 12 \Rightarrow b = 6$.

From (1): $a = 9 - 6 = 3$.

Step 4 — Original number:

$$10a + b = 10(3) + 6 = 36$$

Verification: $3 + 6 = 9$ ✓; reversed number = 63; $63 - 36 = 27$ ✓.

Why other options are wrong:

- Option (A) 27: Digits sum = 9 ✓ but reversed = 72; $72 - 27 = 45 \neq 27$.
- Option (C) 45: Reversed = 54; $54 - 45 = 9 \neq 27$.
- Option (D) 54: Reversed = 45; $45 - 54 = -9 \neq 27$.

Final Answer: Original number = 36 $\Rightarrow \boxed{B}$

Answer: (B) [Go Back to Q4](#)



Q5.

Solution

Concept — Age Problems Using Ratios: Express present ages in terms of a common variable using the given ratio, then use the future condition to form an equation.

Step 1 — Express present ages:

Present ratio = 3 : 2, so let Ravi = $3x$ and Meena = $2x$.

Step 2 — Form the equation using future condition:

$$\frac{3x + 6}{2x + 6} = \frac{4}{3}$$

Step 3 — Cross-multiply and solve:

$$3(3x + 6) = 4(2x + 6) \Rightarrow 9x + 18 = 8x + 24 \Rightarrow x = 6$$

Step 4 — Find Ravi's present age:

$$\text{Ravi} = 3x = 3 \times 6 = 18 \text{ years}$$

Verification: Meena = $2 \times 6 = 12$; ratio = $18 : 12 = 3 : 2$ ✓.

After 6 years: $24 : 18 = 4 : 3$ ✓.

Why other options are wrong:

- Option (B) 12 years: That is Meena's age, not Ravi's.
- Option (C) 24 years: $x = 8 \Rightarrow$ future ratio = $30 : 22 = 15 : 11 \neq 4 : 3$.
- Option (D) 15 years: Not a multiple of 3 in this setup; ratio check fails.

Final Answer: Ravi's present age = 18 years $\Rightarrow$ A

Answer: (A) [Go Back to Q5](#)



Q6.

Solution

Concept — Exterior Angles of a Convex Polygon: For any convex polygon, regardless of the number of sides, the sum of all exterior angles (one at each vertex) is always 360.

Step 1 — Recall the theorem:

When you traverse a convex polygon, at each vertex you turn through the exterior angle. After going all the way round, you have turned through one full revolution = 360.

Step 2 — Apply to a regular hexagon:

A regular hexagon has 6 equal exterior angles. Each = $360 \div 6 = 60$.

Sum = $6 \times 60 = 360$.

Step 3 — Verify using interior angles:

Interior angle of regular hexagon = $\frac{(6 - 2) \times 180}{6} = 120$.

Exterior angle = $180 - 120 = 60$.

Total = $6 \times 60 = 360$ ✓.

Why other options are wrong:

- Option (A) 90: Sum of exterior angles of a right triangle — not the general rule.
- Option (B) 180: Sum of interior angles of a triangle — different property.
- Option (C) 270: No standard polygon property gives this sum.

Final Answer: Sum of all exterior angles = 360 $\Rightarrow$ D

Answer: (D) [Go Back to Q6](#)

Q7.

Solution

Concept — Co-interior Angles in a Trapezium: In a trapezium with $AB \parallel DC$, the co-interior angles on the same transversal sum to 180.

- $\angle A + \angle D = 180$ (transversal AD)
- $\angle B + \angle C = 180$ (transversal BC)

Step 1 — Use $\angle B + \angle C = 180$:

Given $\angle B = 115$.

$$\angle C = 180 - \angle B = 180 - 115 = 65$$



Step 2 — Verify consistency:

$$\angle A + \angle D = 65 + \angle D = 180 \Rightarrow \angle D = 115.$$

$$\text{Sum of all angles} = 65 + 115 + 65 + 115 = 360 \checkmark.$$

Why other options are wrong:

- Option (A) 75: $\angle B + \angle C = 115 + 75 = 190 \neq 180$.
- Option (B) 115: Equals $\angle B$; only true for a parallelogram, not a general trapezium.
- Option (D) 90: $\angle B + \angle C = 115 + 90 = 205 \neq 180$.

Final Answer: $\angle C = 65 \Rightarrow \boxed{C}$

Answer: (C) [Go Back to Q7](#)

Q8.

Solution

Concept — Square Roots on the Number Line: The approximate decimal values allow us to locate irrational numbers on the number line.

Step 1 — Compute the decimal values:

$$\sqrt{2} \approx 1.414 \text{ (P)}, \quad \sqrt{3} \approx 1.732 \text{ (Q)}, \quad \sqrt{5} \approx 2.236 \text{ (R)}, \quad \sqrt{7} \approx 2.646 \text{ (S)}$$

Step 2 — Locate $\sqrt{5}$:

$\sqrt{5} \approx 2.236$, which lies between 2 and 3, closer to 2.

This corresponds to point R on the number line.

Bounding check: $2^2 = 4 < 5 < 9 = 3^2$, so $\sqrt{5}$ lies between 2 and 3. $\checkmark$

Why other options are wrong:

- Option (B) $P \approx 1.414$: This is $\sqrt{2}$, not $\sqrt{5}$.
- Option (C) $Q \approx 1.732$: This is $\sqrt{3}$, not $\sqrt{5}$.
- Option (D) $S \approx 2.646$: This is $\sqrt{7}$, not $\sqrt{5}$.

Final Answer: Point R represents $\sqrt{5} \Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q8](#)



Q9.

Solution

Concept — Square Root by Prime Factorisation: Express the number as a product of prime factors, pair them, and multiply one factor from each pair.

Step 1 — Prime factorise 11025:

$$11025 \div 3 = 3675, \quad 3675 \div 3 = 1225, \quad 1225 \div 5 = 245, \quad 245 \div 5 = 49, \quad 49 \div 7 = 7, \quad 7 \div 7 = 1$$

$$11025 = 3^2 \times 5^2 \times 7^2$$

Step 2 — Extract the square root:

$$\sqrt{11025} = \sqrt{3^2 \times 5^2 \times 7^2} = 3 \times 5 \times 7 = 105$$

Verification: $105^2 = (100 + 5)^2 = 10000 + 1000 + 25 = 11025 \checkmark$.

Why other options are wrong:

- Option (A) 100: $100^2 = 10000 \neq 11025$.
- Option (C) 110: $110^2 = 12100 \neq 11025$.
- Option (D) 115: $115^2 = 13225 \neq 11025$.

Final Answer: $\sqrt{11025} = 105 \Rightarrow \boxed{B}$

Answer: (B) [Go Back to Q9](#)

Q10.

Solution

Concept — Perfect Squares: A perfect square is a number that equals the square of an integer. Check each option.

Step 1 — Test each option:

- $196 = 14^2$ (perfect square $\checkmark$)
- $225 = 15^2$ (perfect square $\checkmark$)
- $256 = 16^2$ (perfect square $\checkmark$)
- 260: $16^2 = 256$ and $17^2 = 289$; since $256 < 260 < 289$, 260 is **not** a perfect square.

Step 2 — Confirm with factorisation:



$260 = 2^2 \times 5 \times 13$. The primes 5 and 13 each appear once (odd power), so 260 is not a perfect square.

Why other options are wrong:

- Options (A), (B), (C): All are perfect squares ($14^2, 15^2, 16^2$ respectively).

Final Answer: 260 is NOT a perfect square $\Rightarrow$ D

Answer: (D) [Go Back to Q10](#)

Q11.

Solution

Concept — Cube Root of a Fraction: The cube root of a fraction equals the cube root of the numerator divided by the cube root of the denominator.

$$\sqrt[3]{\frac{a}{b}} = \frac{\sqrt[3]{a}}{\sqrt[3]{b}}$$

Step 1 — Apply the rule:

$$\sqrt[3]{\frac{27}{125}} = \frac{\sqrt[3]{27}}{\sqrt[3]{125}}$$

Step 2 — Compute each cube root:

$$\sqrt[3]{27} = 3 \quad (3^3 = 27), \quad \sqrt[3]{125} = 5 \quad (5^3 = 125)$$

Step 3 — Combine:

$$\sqrt[3]{\frac{27}{125}} = \frac{3}{5}$$

Why other options are wrong:

- Option (B) $\frac{2}{5}$: $\left(\frac{2}{5}\right)^3 = \frac{8}{125} \neq \frac{27}{125}$.
- Option (C) $\frac{3}{7}$: $\left(\frac{3}{7}\right)^3 = \frac{27}{343} \neq \frac{27}{125}$.
- Option (D) $\frac{5}{3}$: This is the reciprocal; $\left(\frac{5}{3}\right)^3 = \frac{125}{27} \neq \frac{27}{125}$.

Final Answer: $\sqrt[3]{\frac{27}{125}} = \frac{3}{5} \Rightarrow$ A

Answer: (A) [Go Back to Q11](#)



Q12.

Solution

Concept — Making a Number a Perfect Cube: A number is a perfect cube if and only if every prime in its factorisation appears a multiple-of-3 number of times.

Step 1 — Prime factorise 500:

$$500 = 4 \times 125 = 2^2 \times 5^3$$

Step 2 — Identify ungroupable factors:

5^3 : already a perfect cube (group of 3). ✓

2^2 : only 2 twos, cannot form a complete triplet — this factor must be removed.

Step 3 — Find the divisor:

Divide by $2^2 = 4$:

$$500 \div 4 = 125 = 5^3 \quad \checkmark \text{ (perfect cube)}$$

Why other options are wrong:

- Option (A) 2: $500 \div 2 = 250 = 2 \times 5^3$; still has an unpaired 2 — not a perfect cube.
- Option (B) 25: $500 \div 25 = 20 = 2^2 \times 5$; not a perfect cube.
- Option (D) 500: $500 \div 500 = 1 = 1^3$ is a perfect cube, but 500 is not the *smallest* such divisor.

Final Answer: Divide by 4 $\Rightarrow$ C

Answer: (C) [Go Back to Q12](#)

Q13.

Solution

Concept — Successive Discounts: Two successive discounts of $x\%$ and $y\%$ are **not** simply added. The equivalent single discount is:

$$\text{Equivalent discount} = x + y - \frac{xy}{100}$$

Step 1 — Apply the formula:

$x = 30, y = 20$:

$$\text{Equivalent discount} = 30 + 20 - \frac{30 \times 20}{100} = 50 - 6 = 44\%$$



Alternative method (multiplier):

After first discount: multiplier = 0.70.

After second discount: multiplier = $0.70 \times 0.80 = 0.56$.

Equivalent discount = $1 - 0.56 = 0.44 = 44\%$. ✓

Why other options are wrong:

- Option (A) 50%: Simple addition $30 + 20$ — ignores compound effect.
- Option (B) 48%: Incorrect arithmetic.
- Option (C) 46%: Incorrect intermediate subtraction.

Final Answer: Equivalent single discount = $44\% \Rightarrow \boxed{D}$

Answer: (D) [Go Back to Q13](#)

Q14.

Solution**Concept — Simple Interest Formula:**

$$SI = \frac{P \times R \times T}{100}$$

where P = principal, R = rate per annum, T = time in years.

Step 1 — Substitute values:

$P = 5000$, $R = 6$, $T = 3$.

$$SI = \frac{5000 \times 6 \times 3}{100} = \frac{90000}{100} = 900$$

Why other options are wrong:

- Option (A) Rs 800: $\frac{5000 \times 6 \times 3}{100}$ does not give 800; possibly from $T = 2$ (gives 600) or wrong rate.
- Option (C) Rs 1000: Would require $\frac{5000 \times R \times 3}{100} = 1000 \Rightarrow R = 6.67\%$, not 6%.
- Option (D) Rs 1200: Corresponds to $T = 4$ years, not 3.

Final Answer: $SI = \text{Rs } 900 \Rightarrow \boxed{B}$

Answer: (B) [Go Back to Q14](#)



Q15.

Solution**Concept — Compound Interest:** For principal P , rate $R\%$, time n years:

$$A = P \left(1 + \frac{R}{100} \right)^n$$

Step 1 — Set up the equation: $P = 8000$, $A = 9261$, $n = 3$:

$$9261 = 8000 \left(1 + \frac{R}{100} \right)^3 \Rightarrow \left(1 + \frac{R}{100} \right)^3 = \frac{9261}{8000}$$

Step 2 — Recognise perfect cubes:

$$9261 = 21^3, \quad 8000 = 20^3 \Rightarrow \frac{9261}{8000} = \left(\frac{21}{20} \right)^3$$

Step 3 — Solve for R :

$$1 + \frac{R}{100} = \frac{21}{20} \Rightarrow \frac{R}{100} = \frac{1}{20} \Rightarrow R = 5\%$$

Why other options are wrong:

- Option (B) 6%: $8000 \times (1.06)^3 = 8000 \times 1.191 = 9528 \neq 9261$.
- Option (C) 8%: $8000 \times (1.08)^3 = 8000 \times 1.2597 \approx 10078 \neq 9261$.
- Option (D) 10%: $8000 \times (1.10)^3 = 8000 \times 1.331 = 10648 \neq 9261$.

Final Answer: $R = 5\% \Rightarrow \boxed{A}$ **Answer: (A)** [Go Back to Q15](#)

Q16.

Solution**Concept — Algebraic Identity:**

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

Step 1 — Expand $(x + y + z)^2$ using the identity:

Substitute $a = x, b = y, c = z$:

$$(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$$

Step 2 — Verify by direct expansion:

$$(x+y+z)(x+y+z) = x^2+xy+xz+xy+y^2+yz+xz+yz+z^2 = x^2+y^2+z^2+2xy+2yz+2xz \quad \checkmark$$

Why other options are wrong:

- Option (A): Missing the factor of 2 in cross-product terms.
- Option (B): Only squares — completely omits the cross terms.
- Option (C): Missing the cross term $2xz$ (or $2zx$).

Final Answer: $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2xz \Rightarrow \boxed{D}$

Answer: (D) [Go Back to Q16](#)

Q17.

Solution

Concept — Distributive Property (Area Model): The area of the large rectangle equals the sum of the areas of its two sub-rectangles.

Step 1 — Read the diagram:

The rectangle has width $3x$ and height $(x + 2)$.

A horizontal line divides it: lower portion has height x , upper portion has height 2 .

Step 2 — Compute each area:

$$\text{Lower rectangle} = 3x \times x = 3x^2$$

$$\text{Upper rectangle} = 3x \times 2 = 6x$$

Step 3 — Total area:

$$(3x)(x + 2) = 3x^2 + 6x$$

Why other options are wrong:

- Option (A) $3x^2 + 3x$: Would arise if $3x \times 1 = 3x$ instead of $3x \times 2 = 6x$.
- Option (B) $3x^2 + 2x$: Would arise if $x \times 2 = 2x$ instead of $3x \times 2 = 6x$.



- Option (D) $6x^2 + 3x$: Confuses width and height assignments.

Final Answer: $(3x)(x + 2) = 3x^2 + 6x \Rightarrow \boxed{C}$

Answer: (C) [Go Back to Q17](#)

Q18.

Solution

Concept — Difference of Squares Identity:

$$(a - b)(a + b) = a^2 - b^2$$

Step 1 — Rewrite 49×51 using the identity:

$$49 \times 51 = (50 - 1)(50 + 1) = 50^2 - 1^2$$

Step 2 — Compute:

$$50^2 - 1^2 = 2500 - 1 = 2499$$

Why other options are wrong:

- Option (A) $2401 = 49^2$: This is 49×49 , not 49×51 .
- Option (C) 2501 : Off by $+2$; incorrectly uses $50^2 + 1$.
- Option (D) $2500 = 50^2$: Forgets to subtract 1^2 .

Final Answer: $49 \times 51 = 2499 \Rightarrow \boxed{B}$

Answer: (B) [Go Back to Q18](#)

Q19.

Solution

Concept — Area of Composite Figures: Divide the figure into simpler shapes (rectangle and triangle), compute each area separately, then add.

Step 1 — Area of the rectangle:

$$A_{\text{rect}} = \text{length} \times \text{breadth} = 8 \times 5 = 40 \text{ cm}^2$$

Step 2 — Area of the triangle:



Base of triangle = 8 cm (same as rectangle width); height = 4 cm.

$$A_{\triangle} = \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 8 \times 4 = 16 \text{ cm}^2$$

Step 3 — Total area:

$$A_{\text{total}} = 40 + 16 = 56 \text{ cm}^2$$

Why other options are wrong:

- Option (B) 48 cm^2 : $8 \times 5 + \frac{1}{2} \times 8 \times 2 = 40 + 8 = 48$ — uses height 2 instead of 4.
- Option (C) 64 cm^2 : $8 \times (5 + 4) = 72 \neq 64$; no valid decomposition gives 64.
- Option (D) 72 cm^2 : $8 \times 9 = 72$ — treats the whole shape as a rectangle of height 9.

Final Answer: Total area = $56 \text{ cm}^2 \Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q19](#)

Q20.

Solution

Concept — Volume of a Cone:

$$V = \frac{1}{3} \pi r^2 h$$

Step 1 — Substitute values:

$$r = 7 \text{ cm}, h = 6 \text{ cm}, \pi = \frac{22}{7}.$$

$$V = \frac{1}{3} \times \frac{22}{7} \times 7^2 \times 6 = \frac{1}{3} \times \frac{22}{7} \times 49 \times 6$$

Step 2 — Simplify step by step:

$$= \frac{1}{3} \times 22 \times 7 \times 6 = \frac{1}{3} \times 22 \times 42 = \frac{924}{3} = 308 \text{ cm}^3$$

Verification: $\frac{1}{3} \times \frac{22}{7} \times 49 \times 6 = \frac{22 \times 49 \times 6}{21} = \frac{6468}{21} = 308 \checkmark.$

Why other options are wrong:

- Option (A) 154 cm^3 : $= \pi r^2 h / 2$; uses the wrong formula.



- Option (B) $231 \text{ cm}^3 = \frac{1}{3}\pi r^2 h$ with $h = \frac{3}{2} \times r$; incorrect height substitution.
- Option (C) $264 \text{ cm}^3 = \pi r^2 h \times \frac{1}{4}$; incorrect fractional formula.

Final Answer: Volume = $308 \text{ cm}^3 \Rightarrow \boxed{D}$

Answer: (D) [Go Back to Q20](#)

Q21.

Solution

Concept — Total Surface Area of a Cylinder:

$$\text{TSA} = 2\pi r(r + h)$$

(Two circular caps + lateral surface.)

Step 1 — Substitute values:

$$r = 3.5 = \frac{7}{2} \text{ cm}, h = 10 \text{ cm}, \pi = \frac{22}{7}.$$

$$\text{TSA} = 2 \times \frac{22}{7} \times \frac{7}{2} \times \left(\frac{7}{2} + 10 \right) = 2 \times \frac{22}{7} \times \frac{7}{2} \times \frac{27}{2}$$

Step 2 — Simplify:

$$= 2 \times 11 \times \frac{27}{2} = 11 \times 27 = 297 \text{ cm}^2$$

Verification:

$$2\pi r^2 + 2\pi r h = 2 \times \frac{22}{7} \times \frac{49}{4} + 2 \times \frac{22}{7} \times \frac{7}{2} \times 10 = \frac{22 \times 49 \times 2}{28} + 22 \times 10 = 77 + 220 = 297 \checkmark$$

Why other options are wrong:

- Option (A) 231 cm^2 : Only lateral surface = $2\pi r h = 220 \text{ cm}^2$; adding one cap gives $220 + 77/2$; neither matches 231.
- Option (B) 264 cm^2 : Uses $r + h = 3.5 + 10 = 13.5$ then calculates incorrectly.
- Option (D) 330 cm^2 : Uses $h = 12$ instead of 10.

Final Answer: TSA = $297 \text{ cm}^2 \Rightarrow \boxed{C}$

Answer: (C) [Go Back to Q21](#)



Q22.

Solution

Concept — Laws of Exponents: When bases are the same, multiply by adding exponents:

$$a^m \times a^n = a^{m+n}$$

Also, $a^{-m} = \frac{1}{a^m}$.

Step 1 — Add the exponents:

$$\left(\frac{2}{3}\right)^{-3} \times \left(\frac{2}{3}\right)^2 = \left(\frac{2}{3}\right)^{-3+2} = \left(\frac{2}{3}\right)^{-1}$$

Step 2 — Apply negative exponent rule:

$$\left(\frac{2}{3}\right)^{-1} = \frac{1}{\frac{2}{3}} = \frac{3}{2}$$

Why other options are wrong:

- Option (B) $\frac{2}{3}$: Equals $\left(\frac{2}{3}\right)^1$; confuses $-3 + 2 = -1$ with $+1$.
- Option (C) $\frac{9}{4}$: Equals $\left(\frac{3}{2}\right)^2$; incorrectly squares the result.
- Option (D) $\frac{4}{9}$: Equals $\left(\frac{2}{3}\right)^2$; ignores the -3 exponent term.

Final Answer: $\left(\frac{2}{3}\right)^{-3} \times \left(\frac{2}{3}\right)^2 = \frac{3}{2} \Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q22](#)

Q23.

Solution

Concept — Dividing Numbers in Scientific Notation:

$$\frac{a \times 10^m}{b \times 10^n} = \frac{a}{b} \times 10^{m-n}$$

Step 1 — Set up the ratio:

$$\frac{\text{mass of proton}}{\text{mass of electron}} = \frac{1.67 \times 10^{-27}}{9.1 \times 10^{-31}} = \frac{1.67}{9.1} \times 10^{-27-(-31)} = \frac{1.67}{9.1} \times 10^4$$



Step 2 — Evaluate the coefficient:

$$\frac{1.67}{9.1} \approx 0.1835$$

$$0.1835 \times 10^4 = 1835 \approx 1836$$

Note: The widely accepted value is ≈ 1836 , which is a well-known constant in physics.

Why other options are wrong:

- Option (A) 183: Off by a factor of 10; exponent error (10^3 instead of 10^4).
- Option (C) 18360: Off by a factor of 10; exponent error (10^5 instead of 10^4).
- Option (D) 1836000: Off by a factor of 1000; large exponent error.

Final Answer: Proton is ≈ 1836 times heavier than electron $\Rightarrow$ B

Answer: (B) [Go Back to Q23](#)

Q24.

Solution

Concept — Inverse Proportion: If more workers are employed, the time taken decreases. $\text{Workers} \times \text{Days} = \text{constant (total work)}$.

Step 1 — Set up the equation:

Total work = $15 \times 48 = 720$ worker-days.

Let N = number of workers needed to finish in 30 days.

$$N \times 30 = 720$$

Step 2 — Solve for N :

$$N = \frac{720}{30} = 24 \text{ workers}$$

Why other options are wrong:

- Option (A) 20: $20 \times 30 = 600 \neq 720$ worker-days.
- Option (B) 18: $18 \times 30 = 540 \neq 720$ worker-days.
- Option (C) 22: $22 \times 30 = 660 \neq 720$ worker-days.

Final Answer: 24 workers are needed $\Rightarrow$ D

Answer: (D) [Go Back to Q24](#)



Q25.

Solution

Concept — Direct Proportion (Map Scale): On a map, the map distance is directly proportional to the actual distance.

$$\frac{\text{Map distance}_1}{\text{Actual distance}_1} = \frac{\text{Map distance}_2}{\text{Actual distance}_2}$$

Step 1 — Set up the proportion:

$$\frac{2.5 \text{ cm}}{500 \text{ km}} = \frac{d \text{ cm}}{1400 \text{ km}}$$

Step 2 — Solve for d :

$$d = \frac{2.5 \times 1400}{500} = \frac{3500}{500} = 7 \text{ cm}$$

Why other options are wrong:

- Option (A) 5 cm: Represents $\frac{5}{2.5} \times 500 = 1000 \text{ km} \neq 1400 \text{ km}$.
- Option (B) 6 cm: Represents $\frac{6}{2.5} \times 500 = 1200 \text{ km} \neq 1400 \text{ km}$.
- Option (D) 8 cm: Represents $\frac{8}{2.5} \times 500 = 1600 \text{ km} \neq 1400 \text{ km}$.

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

Answer: (C) [Go Back to Q25](#)

Q26.

Solution

Concept — Factorisation by Splitting the Middle Term: For $ax^2 + bx + c$, find two numbers whose product is ac and sum is b , then split and factorise by grouping.

Step 1 — Identify values:

$$6p^2 - 17p + 12: a = 6, b = -17, c = 12.$$

$$ac = 6 \times 12 = 72.$$

Step 2 — Find two numbers with product 72 and sum -17 :

Both numbers must be negative (product positive, sum negative).

$$-8 \times -9 = 72 \text{ and } -8 + (-9) = -17. \checkmark$$



Step 3 — Split and factor by grouping:

$$6p^2 - 8p - 9p + 12 = 2p(3p - 4) - 3(3p - 4) = (3p - 4)(2p - 3)$$

Verification: $(3p - 4)(2p - 3) = 6p^2 - 9p - 8p + 12 = 6p^2 - 17p + 12 \checkmark$.

Why other options are wrong:

- Option (B) $(6p-1)(p-12)$: $= 6p^2 - 72p - p + 12 = 6p^2 - 73p + 12 \neq 6p^2 - 17p + 12$.
- Option (C) $(2p - 4)(3p - 3)$: $= 6p^2 - 6p - 12p + 12 = 6p^2 - 18p + 12 \neq 6p^2 - 17p + 12$.
- Option (D) $(3p+4)(2p-3)$: $= 6p^2 - 9p + 8p - 12 = 6p^2 - p - 12 \neq 6p^2 - 17p + 12$.

Final Answer: $6p^2 - 17p + 12 = (3p - 4)(2p - 3) \Rightarrow \boxed{A}$

Answer: (A) [Go Back to Q26](#)

Q27.

Solution

Concept — Division of a Polynomial by a Linear Factor: Factorise the dividend and cancel the common factor.

Step 1 — Factorise $3x^2 + 11x + 10$:

$a = 3, c = 10, ac = 30$. Find two numbers with product 30 and sum 11: 6 and 5.

$$3x^2 + 11x + 10 = 3x^2 + 6x + 5x + 10 = 3x(x + 2) + 5(x + 2) = (x + 2)(3x + 5)$$

Step 2 — Divide by $(x + 2)$:

$$\frac{3x^2 + 11x + 10}{x + 2} = \frac{(x + 2)(3x + 5)}{x + 2} = 3x + 5$$

Verification: $(x + 2)(3x + 5) = 3x^2 + 5x + 6x + 10 = 3x^2 + 11x + 10 \checkmark$.

Why other options are wrong:

- Option (A) $3x + 3$: $(x + 2)(3x + 3) = 3x^2 + 3x + 6x + 6 = 3x^2 + 9x + 6 \neq 3x^2 + 11x + 10$.
- Option (C) $3x + 7$: $(x + 2)(3x + 7) = 3x^2 + 7x + 6x + 14 = 3x^2 + 13x + 14 \neq 3x^2 + 11x + 10$.
- Option (D) $3x + 10$: $(x + 2)(3x + 10) = 3x^2 + 10x + 6x + 20 = 3x^2 + 16x + 20 \neq 3x^2 + 11x + 10$.



Final Answer: Quotient = $3x + 5 \Rightarrow \boxed{B}$

Answer: (B) [Go Back to Q27](#)

Q28.

Solution

Concept — Difference of Cubes Identity:

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Step 1 — Identify a and b :

$$8x^3 = (2x)^3, \text{ so } a = 2x.$$

$$27y^3 = (3y)^3, \text{ so } b = 3y.$$

Step 2 — Apply the identity:

$$8x^3 - 27y^3 = (2x)^3 - (3y)^3 = (2x - 3y)((2x)^2 + (2x)(3y) + (3y)^2) = (2x - 3y)(4x^2 + 6xy + 9y^2)$$

Verification (expand):

$$(2x - 3y)(4x^2 + 6xy + 9y^2) = 8x^3 + 12x^2y + 18xy^2 - 12x^2y - 18xy^2 - 27y^3 = 8x^3 - 27y^3$$

✓.

Why other options are wrong:

- Option (A) $(2x - 3y)^2(2x + 3y)$: Expands to $(4x^2 - 12xy + 9y^2)(2x + 3y) \neq 8x^3 - 27y^3$.
- Option (B) $(2x + 3y)(4x^2 - 6xy + 9y^2)$: This is the *sum* of cubes factorisation $(a + b)(a^2 - ab + b^2) = a^3 + b^3$.
- Option (C) $(2x - 3y)^3$: $= 8x^3 - 36x^2y + 54xy^2 - 27y^3 \neq 8x^3 - 27y^3$.

Final Answer: $8x^3 - 27y^3 = (2x - 3y)(4x^2 + 6xy + 9y^2) \Rightarrow \boxed{D}$

Answer: (D) [Go Back to Q28](#)



Q29.

Solution

Concept — Reading a Pie Chart: Each sector's percentage directly indicates its share of the total.

$$\text{Amount spent} = \frac{\text{Percentage}}{100} \times \text{Total}$$

Step 1 — Read the Education percentage from the pie chart:

Education sector = 20%.

Step 2 — Calculate the amount:

$$\text{Education} = \frac{20}{100} \times 12000 = 0.20 \times 12000 = \text{Rs } 2400$$

Cross-check all sectors:

Food: 40% = Rs 4800, Rent: 25% = Rs 3000, Education: 20% = Rs 2400, Others: 15% = Rs 1800

Total: 4800 + 3000 + 2400 + 1800 = 12000 ✓.

Why other options are wrong:

- Option (A) Rs 1800: Corresponds to Others (15%), not Education.
- Option (B) Rs 3000: Corresponds to Rent (25%), not Education.
- Option (D) Rs 4800: Corresponds to Food (40%), not Education.

Final Answer: Amount spent on Education = Rs 2400 $\Rightarrow$ C

Answer: (C) [Go Back to Q29](#)

Q30.

Solution

Concept — Classical Probability with Two Dice:

$$P(\text{event}) = \frac{\text{Number of favourable outcomes}}{\text{Total outcomes}}$$

When two dice are thrown, total outcomes = $6 \times 6 = 36$.

Step 1 — List all outcomes where sum = 8:



Die 1	Die 2
2	6
3	5
4	4
5	3
6	2

Total favourable outcomes = 5.

Step 2 — Compute probability:

$$P(\text{sum} = 8) = \frac{5}{36}$$

Why other options are wrong:

- Option (A) $\frac{1}{12} = \frac{3}{36}$: Only 3 favourable outcomes — undercounts by (2, 6) and (6, 2).
- Option (C) $\frac{7}{36}$: Would require 7 favourable outcomes; no such sum has 7 outcomes.
- Option (D) $\frac{1}{6} = \frac{6}{36}$: Would require 6 favourable outcomes; sum = 7 has 6, not sum = 8.

Final Answer: $P(\text{sum} = 8) = \frac{5}{36} \Rightarrow \boxed{B}$

Answer: (B) [Go Back to Q30](#)



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	A	9	B	10	D
11	A	12	C	13	D	14	B	15	A
16	D	17	C	18	B	19	A	20	D
21	C	22	A	23	B	24	D	25	C
26	A	27	B	28	D	29	C	30	B

