

SHRESHTA NETS Mathematics

Sample Paper – 6

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. What is the value of $\frac{2}{3} \times \left(\frac{1}{4} + \frac{3}{4}\right)$? (This illustrates the **distributive property** of multiplication over addition for rational numbers.)

- (A) $\frac{2}{3}$
(B) $\frac{5}{12}$
(C) $\frac{1}{12}$
(D) $\frac{1}{3}$

Q2. A tank is $\frac{3}{8}$ full. After adding $\frac{1}{4}$ of its total capacity more water, what **fraction** of the tank is now full?

- (A) $\frac{1}{2}$



- (B) $\frac{7}{8}$
- (C) $\frac{3}{4}$
- (D) $\frac{5}{8}$

Q3. Solve for x : $\frac{3x - 2}{4} = \frac{x + 3}{2}$

- (A) 2
- (B) 4
- (C) 8
- (D) 14

Q4. The sum of two numbers is 56. The larger number is 3 times the smaller. Find the **smaller** number.

- (A) 10
- (B) 14
- (C) 18
- (D) 42

Q5. In a triangle, one angle is twice the smallest angle and the third angle is 30 more than the smallest angle. The angles sum to 180. Find the **smallest** angle.

- (A) 30
- (B) 35
- (C) 37.5
- (D) 45

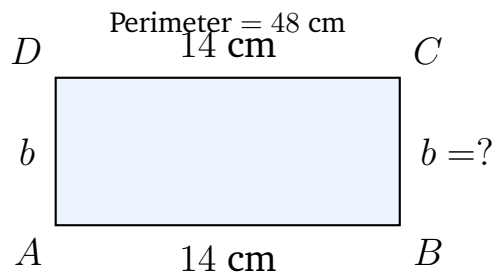
Q6. The diagonals of a square are equal and bisect each other at right angles. What is the length of each diagonal of a square with side 8 cm?

- (A) $8\sqrt{2}$ cm



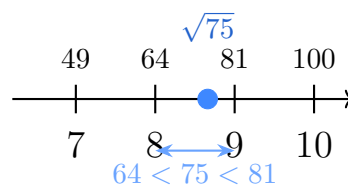
- (B) 16 cm
- (C) $4\sqrt{2}$ cm
- (D) 8 cm

Q7. In the rectangle $ABCD$ shown below, the **perimeter** is 48 cm and the **length** $AB = 14$ cm. Find the **breadth** BC .



- (A) 8 cm
- (B) 12 cm
- (C) 14 cm
- (D) 10 cm

Q8. The number line below shows the positions of some perfect squares. Between which two **consecutive integers** does $\sqrt{75}$ lie?



- (A) 7 and 8
- (B) 8 and 9
- (C) 9 and 10
- (D) 6 and 7

Q9. Find $\sqrt{3969}$ by prime factorisation or the long-division method.

- (A) 61



- (B) 62
- (C) 63
- (D) 64

Q10. What is the least positive integer that must be **added to 80** to obtain a perfect square **greater than 81**?

- (A) 20
- (B) 1
- (C) 4
- (D) 16

Q11. Which of the following numbers is a **perfect cube**?

- (A) 128
- (B) 250
- (C) 500
- (D) 343

Q12. Find $\sqrt[3]{32768}$.

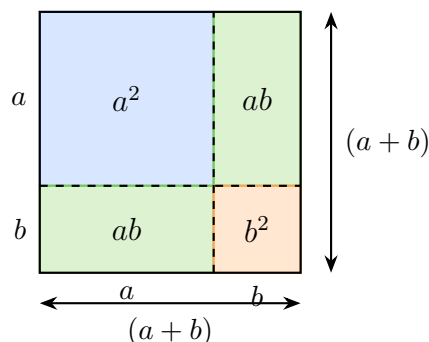
- (A) 28
- (B) 32
- (C) 36
- (D) 40

Q13. A shopkeeper sells an article for **Rs 910** making a **30% profit**. Find the **cost price**.

- (A) Rs 620
- (B) Rs 650
- (C) Rs 700
- (D) Rs 750



- Q14.** Find the **compound interest** on Rs 10000 at 8% per annum for 2 years, compounded annually.
- (A) Rs 1664
(B) Rs 1600
(C) Rs 1728
(D) Rs 1800
- Q15.** A shopkeeper offers **two successive discounts** of 20% and 10% on an article with MRP Rs 2000. Find the final **selling price**.
- (A) Rs 1400
(B) Rs 1420
(C) Rs 1350
(D) Rs 1440
- Q16.** Multiply: $(2x + 3)(x - 4)$
- (A) $2x^2 + 5x - 12$
(B) $2x^2 - 5x - 12$
(C) $2x^2 - 5x + 12$
(D) $2x^2 + 5x + 12$
- Q17.** The diagram below shows a square of side $(a + b)$ divided into **four rectangles** with labelled areas. By reading these areas, which algebraic identity is being **verified geometrically**?

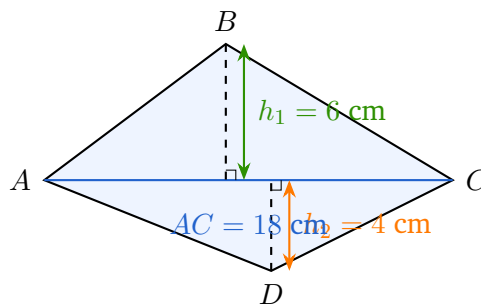


- (A) $(a - b)^2 = a^2 - 2ab + b^2$
(B) $(a + b)(a - b) = a^2 - b^2$
(C) $(a + b)^2 = a^2 + 2ab + b^2$
(D) $(a + b)^2 = a^2 + b^2$

Q18. Using the identity $(a - b)^2 = a^2 - 2ab + b^2$, find the value of $(96)^2$.

- (A) 9216
(B) 9200
(C) 9180
(D) 9100

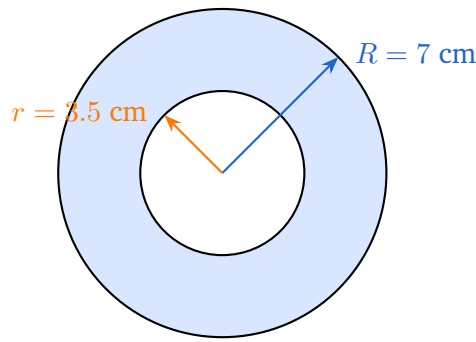
Q19. Find the **area** of quadrilateral $ABCD$ shown below, where diagonal $AC = 18$ cm and the perpendicular lengths from B and D to AC are 6 cm and 4 cm respectively.



- (A) 72 cm^2
(B) 81 cm^2
(C) 84 cm^2
(D) 90 cm^2

Q20. The figure below shows the **cross-section** of a hollow cylinder with outer radius $R = 7$ cm, inner radius $r = 3.5$ cm, and height $h = 20$ cm. Find the **volume of material** used. (Use $\pi = \frac{22}{7}$)





(Cross-section, top view)
 $h = 20 \text{ cm}$

- (A) 1540 cm^3
- (B) 2310 cm^3
- (C) 3080 cm^3
- (D) 4620 cm^3

Q21. Find the **lateral (curved) surface area** of a cone with base radius 7 cm and slant height 25 cm. (Use $\pi = \frac{22}{7}$)

- (A) 440 cm^2
- (B) 484 cm^2
- (C) 550 cm^2
- (D) 616 cm^2

Q22. Simplify: $(2^3 \times 4^2) \div (2^5)$

- (A) 4
- (B) 8
- (C) 16
- (D) 2

Q23. The distance from the Earth to the Sun is approximately 150,000,000 km. Express this in **standard (scientific) notation**.

- (A) 15×10^7
- (B) 1.5×10^7



(C) 150×10^6

(D) 1.5×10^8

Q24. A gear with 40 teeth rotates at 30 rpm. A second gear meshed with it has 24 teeth. Find the speed of the second gear. (Inverse proportion: teeth $\times$ speed = constant)

(A) 30 rpm

(B) 50 rpm

(C) 60 rpm

(D) 40 rpm

Q25. A car uses 9 litres of petrol to travel 135 km. How much petrol is needed to travel 225 km? (Direct proportion)

(A) 10 litres

(B) 12 litres

(C) 15 litres

(D) 18 litres

Q26. Factorise by grouping: $2ab + 2b + a + 1$

(A) $(a + 1)(2b + 1)$

(B) $(a + 2)(b + 1)$

(C) $(2a + 1)(b + 1)$

(D) $(a + 1)(b + 2)$

Q27. Factorise: $9m^2 - 49n^2$

(A) $(3m + 7n)^2$

(B) $(3m - 7n)^2$

(C) $(9m - 49n)(m + n)$

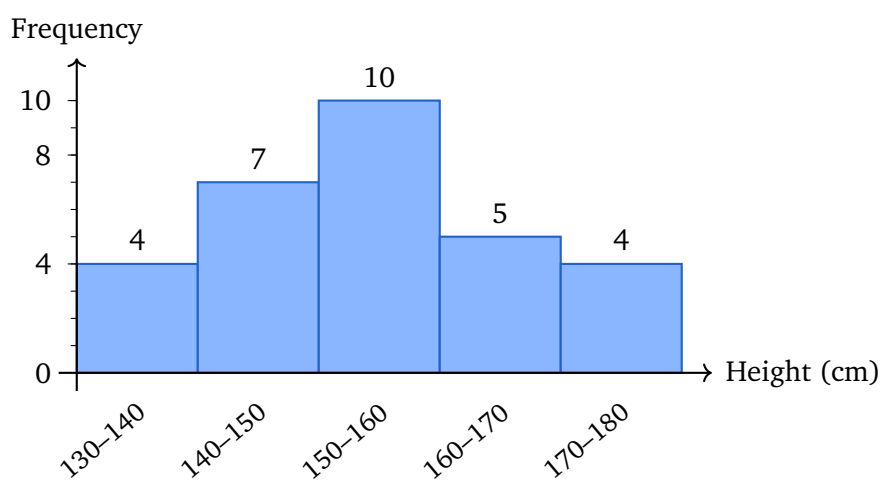
(D) $(3m - 7n)(3m + 7n)$



Q28. Divide: $(2x^2 + x - 6) \div (x + 2)$. What is the **quotient**?

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

Q29. The histogram below shows the height distribution of students in a school. In which height range are the **most students**?



- (A) 130–140 cm
- (B) 140–150 cm
- (C) 150–160 cm
- (D) 160–170 cm

Q30. A card is drawn at random from a well-shuffled deck of 52 playing cards. What is the **probability** that it is a **king**?

- (A) $\frac{1}{52}$
- (B) $\frac{1}{26}$
- (C) $\frac{4}{13}$
- (D) $\frac{1}{13}$



Detailed Solutions

Q1.

Solution

Concept — Distributive Property of Multiplication over Addition: For rational numbers a, b, c : $a \times (b + c) = a \times b + a \times c$.

Step 1 — Add the fractions inside the brackets:

$$\frac{1}{4} + \frac{3}{4} = \frac{1+3}{4} = \frac{4}{4} = 1$$

Step 2 — Multiply by $\frac{2}{3}$:

$$\frac{2}{3} \times 1 = \frac{2}{3}$$

Verification using distributive property:

$$\frac{2}{3} \times \frac{1}{4} + \frac{2}{3} \times \frac{3}{4} = \frac{2}{12} + \frac{6}{12} = \frac{8}{12} = \frac{2}{3} \quad \checkmark$$

Why other options are wrong:

- Option (B) $\frac{5}{12}$: Results from mistakenly computing $\frac{2}{3} \times \frac{1}{4} + \frac{3}{4}$ (forgetting the second multiplication).
- Option (C) $\frac{1}{12}$: Results from multiplying $\frac{2}{3} \times \frac{1}{4}$ alone, ignoring the $\frac{3}{4}$ term.
- Option (D) $\frac{1}{3}$: Incorrect arithmetic on the sum $\frac{1}{4} + \frac{3}{4}$.

Final Answer: $\frac{2}{3} \times 1 = \frac{2}{3} \Rightarrow \boxed{A}$

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

Q2.

Solution

Concept — Addition of Rational Numbers: To find the new fraction of a tank filled, add the two rational numbers using a common denominator.

Step 1 — Find a common denominator for $\frac{3}{8}$ and $\frac{1}{4}$:

LCD of 8 and 4 is 8.

$$\frac{1}{4} = \frac{2}{8}$$



Step 2 — Add the fractions:

$$\frac{3}{8} + \frac{2}{8} = \frac{3+2}{8} = \frac{5}{8}$$

Why other options are wrong:

- Option (A) $\frac{1}{2} = \frac{4}{8}$: Adding $\frac{3}{8} + \frac{1}{8}$ — uses $\frac{1}{8}$ instead of $\frac{1}{4}$.
- Option (B) $\frac{7}{8}$: Confuses $\frac{1}{4}$ with $\frac{4}{8}$ and adds $3 + 4 = 7$ (incorrect conversion).
- Option (C) $\frac{3}{4}$: Incorrect simplification of the sum.

Final Answer: The tank is now $\frac{5}{8}$ full $\Rightarrow$ D

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

Q3.

Solution

Concept — Linear Equations with Fractions: Cross-multiply to eliminate denominators, then isolate x .

Step 1 — Cross-multiply:

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

$$6x - 4 = 4x + 12$$

Step 2 — Isolate x :

$$6x - 4x = 12 + 4 \Rightarrow 2x = 16 \Rightarrow x = 8$$

Step 3 — Verification:

$$\text{LHS} = \frac{3(8)-2}{4} = \frac{22}{4} = \frac{11}{2}, \quad \text{RHS} = \frac{8+3}{2} = \frac{11}{2} \quad \checkmark$$

Why other options are wrong:

- Option (A) $x = 2$: LHS = $\frac{4}{4} = 1$, RHS = $\frac{5}{2} = 2.5$ — not equal.
- Option (B) $x = 4$: LHS = $\frac{10}{4} = 2.5$, RHS = $\frac{7}{2} = 3.5$ — not equal.



- Option (D) $x = 14$: LHS = $\frac{40}{4} = 10$, RHS = $\frac{17}{2} = 8.5$ — not equal.

Final Answer: $x = 8 \Rightarrow \boxed{C}$

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

Q4.

Solution

Concept — Word Problems on Linear Equations: Assign a variable to the unknown and form an equation from the given conditions.

Step 1 — Set up the equation:

Let the smaller number be x . Then the larger number = $3x$.

$$x + 3x = 56 \Rightarrow 4x = 56 \Rightarrow x = 14$$

Step 2 — Verify:

Smaller = 14, larger = 42. Sum = $14 + 42 = 56$ ✓, and $42 = 3 \times 14$ ✓.

Why other options are wrong:

- Option (A) 10: Then larger = 30, sum = $40 \neq 56$.
- Option (C) 18: Then larger = 54, sum = $72 \neq 56$.
- Option (D) 42: This is the *larger* number, not the smaller.

Final Answer: Smaller number = 14 $\Rightarrow \boxed{B}$

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

Q5.

Solution

Concept — Angle-Sum Property of a Triangle: The sum of the three interior angles of a triangle is 180.

Step 1 — Assign variable and form equation:

Let the smallest angle = x . Then the three angles are x , $2x$, and $(x + 30)$.

$$x + 2x + (x + 30) = 180 \Rightarrow 4x + 30 = 180$$



Step 2 — Solve for x :

$$4x = 180 - 30 = 150 \Rightarrow x = 37.5$$

Step 3 — Check: Angles are 37.5, 75, 67.5. Sum = $37.5 + 75 + 67.5 = 180 \checkmark$.

Why other options are wrong:

- Option (A) 30: Angles would be 30, 60, 60 — sum = $150 \neq 180$.
- Option (B) 35: Angles would be 35, 70, 65 — sum = $170 \neq 180$.
- Option (D) 45: Angles would be 45, 90, 75 — sum = $210 \neq 180$.

Final Answer: Smallest angle = $37.5 \Rightarrow \boxed{C}$

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

Q6.

Solution

Concept — Diagonals of a Square: In a square of side a , the diagonal d is found by the Pythagorean theorem: $d = \sqrt{a^2 + a^2} = a\sqrt{2}$.

Step 1 — Apply the formula with $a = 8$ cm:

$$d = 8\sqrt{2} \text{ cm}$$

Step 2 — Confirm key properties: Both diagonals are equal ($= 8\sqrt{2}$ cm), bisect each other at right angles, and bisect the vertex angles.

Why other options are wrong:

- Option (B) 16 cm: This is 2×8 — doubling the side, not applying $\sqrt{2}$.
- Option (C) $4\sqrt{2}$ cm: Uses half the side (4) instead of the full side (8).
- Option (D) 8 cm: The diagonal equals the side only in a rhombus with 60 angles, not a square.

Final Answer: Diagonal = $8\sqrt{2}$ cm $\Rightarrow \boxed{A}$

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



Q7.

Solution**Concept — Perimeter of a Rectangle:** Perimeter = $2(\text{length} + \text{breadth})$.**Step 1 — Set up the equation:**Let breadth = b . Then:

$$2(14 + b) = 48$$

Step 2 — Solve for b :

$$14 + b = 24 \Rightarrow b = 24 - 14 = 10 \text{ cm}$$

Step 3 — Verify: $2(14 + 10) = 2 \times 24 = 48 \text{ cm} \checkmark$ **Why other options are wrong:**

- Option (A) 8 cm: $2(14 + 8) = 44 \neq 48$.
- Option (B) 12 cm: $2(14 + 12) = 52 \neq 48$.
- Option (C) 14 cm: $2(14 + 14) = 56 \neq 48$.

Final Answer: Breadth $BC = 10 \text{ cm} \Rightarrow \boxed{D}$ **Answer: (D)** [Go Back to Q7](#)

Q8.

Solution**Concept — Estimating Square Roots:** To find between which two consecutive integers $\sqrt{n}$ lies, find the two perfect squares that bound n : $k^2 < n < (k + 1)^2$.**Step 1 — Identify bounding perfect squares:**

$$8^2 = 64, \quad 9^2 = 81$$

$$64 < 75 < 81$$

Step 2 — Conclude the interval:

$$\sqrt{64} < \sqrt{75} < \sqrt{81} \Rightarrow 8 < \sqrt{75} < 9$$

So $\sqrt{75}$ lies between 8 and 9 ($\sqrt{75} \approx 8.66$).**Why other options are wrong:**

- Option (A) 7 and 8: $7^2 = 49$, $8^2 = 64$; range is 49–64, but $75 > 64$.
- Option (C) 9 and 10: $9^2 = 81$, $10^2 = 100$; but $75 < 81$.
- Option (D) 6 and 7: $6^2 = 36$, $7^2 = 49$; but $75 > 49$.

Final Answer: $\sqrt{75}$ lies between 8 and 9 $\Rightarrow$ B

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

Q9.

Solution

Concept — Finding Square Root by Prime Factorisation: Express the number as a product of prime pairs; each pair contributes one factor to the square root.

Step 1 — Prime factorisation of 3969:

$$3969 = 3 \times 1323 = 3 \times 3 \times 441 = 9 \times 441 = 9 \times 9 \times 49 = 3^2 \times 3^2 \times 7^2$$

Step 2 — Take square root:

$$\sqrt{3969} = \sqrt{3^2 \times 3^2 \times 7^2} = 3 \times 3 \times 7 = 63$$

Verification: $63^2 = (60 + 3)^2 = 3600 + 360 + 9 = 3969 \checkmark$

Why other options are wrong:

- Option (A) 61: $61^2 = 3721 \neq 3969$.
- Option (B) 62: $62^2 = 3844 \neq 3969$.
- Option (D) 64: $64^2 = 4096 \neq 3969$.

Final Answer: $\sqrt{3969} = 63 \Rightarrow$ C

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



Q10.

Solution

Concept — Next Perfect Square: The next perfect square after $81 = 9^2$ is $100 = 10^2$. We need to find what must be added to 80 to reach 100.

Step 1 — Identify the target perfect square:

Perfect squares near 80: $81 = 9^2$, $100 = 10^2$.

We need a perfect square *greater than* 81, so the target is 100.

Step 2 — Find the required addition:

$$100 - 80 = 20$$

Why other options are wrong:

- Option (B) 1: $80 + 1 = 81 = 9^2$, which equals 81 (not greater than 81).
- Option (C) 4: $80 + 4 = 84$; $\sqrt{84}$ is not an integer.
- Option (D) 16: $80 + 16 = 96$; $\sqrt{96}$ is not an integer.

Final Answer: 20 must be added $\Rightarrow$ A

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

Q11.

Solution

Concept — Perfect Cubes: A number is a perfect cube if its prime factorisation has every prime appearing as a multiple of 3.

Step 1 — Check each option:

- $128 = 2^7$: exponent 7 is not a multiple of 3 — NOT a perfect cube.
- $250 = 2 \times 5^3$: 2^1 has exponent 1, not a multiple of 3 — NOT a perfect cube.
- $500 = 2^2 \times 5^3$: 2^2 has exponent 2, not a multiple of 3 — NOT a perfect cube.
- $343 = 7^3$: exponent 3 is a multiple of 3 — **IS a perfect cube.** $\sqrt[3]{343} = 7$.

Why other options are wrong:

- Option (A) 128: 2^7 : $\sqrt[3]{128} = 2^{7/3}$, not an integer.
- Option (B) 250: $\sqrt[3]{250} \approx 6.3$, not an integer.
- Option (C) 500: $\sqrt[3]{500} \approx 7.94$, not an integer.

Final Answer: $343 = 7^3$ is a perfect cube $\Rightarrow$ D



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

Q12.

Solution

Concept — Cube Root by Prime Factorisation: Express the number as a perfect cube and identify the base.

Step 1 — Prime factorisation of 32768:

$$32768 = 2^{15}$$

(Since $2^{10} = 1024$, $2^{15} = 2^{10} \times 2^5 = 1024 \times 32 = 32768$.)

Step 2 — Take the cube root:

$$\sqrt[3]{32768} = \sqrt[3]{2^{15}} = 2^{15/3} = 2^5 = 32$$

Verification: $32^3 = 32 \times 32 \times 32 = 1024 \times 32 = 32768 \checkmark$

Why other options are wrong:

- Option (A) 28: $28^3 = 21952 \neq 32768$.
- Option (C) 36: $36^3 = 46656 \neq 32768$.
- Option (D) 40: $40^3 = 64000 \neq 32768$.

Final Answer: $\sqrt[3]{32768} = 32 \Rightarrow \boxed{B}$

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

Q13.

Solution

Concept — Profit and Cost Price: When selling at a profit, $SP = CP \times \left(1 + \frac{\text{profit}\%}{100}\right)$.

Step 1 — Set up the equation:

$$SP = CP \times \frac{130}{100} = CP \times 1.30$$



Step 2 — Solve for CP:

$$CP = \frac{SP}{1.30} = \frac{910}{1.30} = \frac{9100}{13} = 700$$

Verification: Profit = 30% of 700 = 210. SP = 700 + 210 = 910 ✓

Why other options are wrong:

- Option (A) Rs 620: SP would be $620 \times 1.30 = 806 \neq 910$.
- Option (B) Rs 650: SP would be $650 \times 1.30 = 845 \neq 910$.
- Option (D) Rs 750: SP would be $750 \times 1.30 = 975 \neq 910$.

Final Answer: Cost price = Rs 700 $\Rightarrow$ C

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

Q14.

Solution

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

Step 1 — Compute amount after 2 years:

$$A = 10000 \times \left(1 + \frac{8}{100}\right)^2 = 10000 \times (1.08)^2 = 10000 \times 1.1664 = 11664$$

Step 2 — Calculate compound interest:

$$CI = A - P = 11664 - 10000 = \text{Rs } 1664$$

Why other options are wrong:

- Option (B) Rs 1600: This is the simple interest ($= 10000 \times 8\% \times 2$), not compound interest.
- Option (C) Rs 1728: Would correspond to $P = 10000$ at $r \approx 8.27\%$; incorrect.
- Option (D) Rs 1800: Would be SI at 9% per annum for 2 years; incorrect rate.

Final Answer: CI = Rs 1664 $\Rightarrow$ A

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



Q15.

Solution

Concept — Successive Discounts: Apply each discount one after the other to the running price, not both to the original MRP.

Step 1 — Apply the first discount of 20%:

$$\text{Price after 1st discount} = 2000 \times \left(1 - \frac{20}{100}\right) = 2000 \times 0.80 = \text{Rs } 1600$$

Step 2 — Apply the second discount of 10% on Rs 1600:

$$\text{Final SP} = 1600 \times \left(1 - \frac{10}{100}\right) = 1600 \times 0.90 = \text{Rs } 1440$$

Why other options are wrong:

- Option (A) Rs 1400: Applies a combined discount of 30% directly ($2000 \times 0.70 = 1400$), ignoring the compounding effect.
- Option (B) Rs 1420: Arithmetic error in applying successive discounts.
- Option (C) Rs 1350: Applies an incorrect combined rate.

Final Answer: Final SP = Rs 1440 $\Rightarrow$ D

Answer: (D) [Go Back to Q15](#)

Q16.

Solution

Concept — Multiplication of Binomials (FOIL): $(p+q)(r+s) = pr + ps + qr + qs$.

Step 1 — Expand $(2x + 3)(x - 4)$:

$$2x \cdot x + 2x \cdot (-4) + 3 \cdot x + 3 \cdot (-4) = 2x^2 - 8x + 3x - 12$$

Step 2 — Collect like terms:

$$= 2x^2 + (-8 + 3)x - 12 = 2x^2 - 5x - 12$$

Why other options are wrong:

- Option (A) $2x^2 + 5x - 12$: Sign error — adds $8x$ and $3x$ instead of subtracting.



- Option (C) $2x^2 - 5x + 12$: Sign error on the constant term ($-4 \times 3 = -12$, not $+12$).
- Option (D) $2x^2 + 5x + 12$: Both coefficient and constant have wrong signs.

Final Answer: $(2x + 3)(x - 4) = 2x^2 - 5x - 12 \Rightarrow \boxed{B}$

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

Q17.

Solution

Concept — Geometric Proof of Algebraic Identity: When a square of side $(a + b)$ is divided into four rectangles by two cuts, the total area is the sum of the four rectangle areas.

Step 1 — Read the four areas from the diagram:

- Top-left rectangle: $a \times a = a^2$
- Top-right rectangle: $b \times a = ab$
- Bottom-left rectangle: $a \times b = ab$
- Bottom-right rectangle: $b \times b = b^2$

Step 2 — Sum all areas:

$$\text{Total area} = a^2 + ab + ab + b^2 = a^2 + 2ab + b^2$$

Step 3 — Equate to square area:

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

Why other options are wrong:

- Option (A) $(a - b)^2$: Would involve subtraction; the diagram shows addition of all parts.
- Option (B) $(a + b)(a - b) = a^2 - b^2$: The difference-of-squares identity; does not produce two ab terms.
- Option (D) $(a + b)^2 = a^2 + b^2$: Omits the cross-product terms $2ab$; this is a common error.

Final Answer: $(a + b)^2 = a^2 + 2ab + b^2 \Rightarrow \boxed{C}$

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



Q18.

Solution

Concept — Using the Identity $(a - b)^2 = a^2 - 2ab + b^2$: Express the number as a difference of two convenient values.

Step 1 — Write $96 = 100 - 4$, **so** $a = 100$, $b = 4$:

$$(96)^2 = (100 - 4)^2 = 100^2 - 2 \times 100 \times 4 + 4^2$$

Step 2 — Evaluate each term:

$$= 10000 - 800 + 16 = 9216$$

Why other options are wrong:

- Option (B) 9200: Forgets to add $b^2 = 16$; stops at $10000 - 800 = 9200$.
- Option (C) 9180: Arithmetic error; possibly subtracts an extra 20.
- Option (D) 9100: Uses $2ab = 900$ instead of 800.

Final Answer: $(96)^2 = 9216 \Rightarrow \boxed{A}$

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

Q19.

Solution

Concept — Area of a Quadrilateral with One Diagonal: The area of quadrilateral $ABCD$ equals the sum of the areas of triangles ABC and ACD :

$$\text{Area} = \frac{1}{2} \times d \times (h_1 + h_2)$$

where d is the diagonal and h_1 , h_2 are the perpendicular heights from the other two vertices.

Step 1 — Identify values: $d = AC = 18$ cm, $h_1 = 6$ cm (from B), $h_2 = 4$ cm (from D).

Step 2 — Calculate area:

$$\text{Area} = \frac{1}{2} \times 18 \times (6 + 4) = \frac{1}{2} \times 18 \times 10 = 90 \text{ cm}^2$$

Why other options are wrong:



- Option (A) 72 cm²: Uses $(h_1 + h_2) = 8$ (adds 4 + 4 instead of 6 + 4).
- Option (B) 81 cm²: Arithmetic error in the multiplication.
- Option (C) 84 cm²: Uses $\frac{1}{2} \times 18 \times \frac{(6+4)}{?}$ with wrong grouping.

Final Answer: Area = 90 cm² $\Rightarrow$ D

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

Q20.

Solution

Concept — Volume of a Hollow Cylinder: The volume of material = $\pi h(R^2 - r^2)$, where R is the outer radius, r is the inner radius, and h is the height.

Step 1 — Identify values: $R = 7$ cm, $r = 3.5$ cm, $h = 20$ cm, $\pi = \frac{22}{7}$.

Step 2 — Compute $R^2 - r^2$:

$$R^2 - r^2 = 7^2 - 3.5^2 = 49 - 12.25 = 36.75$$

Step 3 — Calculate volume:

$$V = \frac{22}{7} \times 20 \times 36.75 = \frac{22}{7} \times 735 = 22 \times 105 = 2310 \text{ cm}^3$$

Why other options are wrong:

- Option (A) 1540 cm³: Uses only the inner cylinder volume ($\pi r^2 h = \frac{22}{7} \times 3.5^2 \times 20$), ignoring the solid material.
- Option (C) 3080 cm³: Uses only the outer cylinder volume ($\pi R^2 h$), ignoring the hollow core.
- Option (D) 4620 cm³: Doubles the outer cylinder volume erroneously.

Final Answer: Volume of material = 2310 cm³ $\Rightarrow$ B

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



Q21.

Solution

Concept — Lateral Surface Area of a Cone: $LSA = \pi rl$, where r is the base radius and l is the slant height.

Step 1 — Identify values: $r = 7$ cm, $l = 25$ cm, $\pi = \frac{22}{7}$.

Step 2 — Compute LSA:

$$LSA = \frac{22}{7} \times 7 \times 25 = 22 \times 25 = 550 \text{ cm}^2$$

Why other options are wrong:

- Option (A) 440 cm^2 : Uses $l = 20$ instead of $l = 25$ (confuses with height).
- Option (B) 484 cm^2 : Uses $r = 7$ and $l = 22$ (wrong slant height).
- Option (D) 616 cm^2 : Computes total surface area $\pi r(l+r) = \frac{22}{7} \times 7 \times (25+7) = 22 \times 28 = 616$, not just the lateral surface.

Final Answer: LSA of cone $= 550 \text{ cm}^2 \Rightarrow \boxed{C}$

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

Q22.

Solution

Concept — Laws of Exponents: $a^m \times a^n = a^{m+n}$ and $a^m \div a^n = a^{m-n}$.

Step 1 — Convert 4^2 to a power of 2:

$$4^2 = (2^2)^2 = 2^4$$

Step 2 — Apply exponent laws:

$$\frac{2^3 \times 2^4}{2^5} = \frac{2^{3+4}}{2^5} = \frac{2^7}{2^5} = 2^{7-5} = 2^2 = 4$$

Why other options are wrong:

- Option (B) $8 = 2^3$: Incorrect exponent arithmetic ($7 - 5 = 3$ error).
- Option (C) $16 = 2^4$: Does not correctly convert 4^2 to 2^4 ; treats $4^2 = 2^2$.
- Option (D) $2 = 2^1$: Under-counts the combined exponent.

Final Answer: $(2^3 \times 4^2) \div 2^5 = 4 \Rightarrow \boxed{A}$



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

Q23.

Solution

Concept — Standard (Scientific) Notation: Write the number as $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.

Step 1 — Write out the number:

$$150,000,000 = 1.5 \times 10^8$$

(Move the decimal point 8 places to the left to get 1.5.)

Step 2 — Verify: $1.5 \times 10^8 = 150,000,000$ ✓

Why other options are wrong:

- Option (A) 15×10^7 : Correct value but $15 \geq 10$, so it does not satisfy $1 \leq a < 10$ — not standard form.
- Option (B) $1.5 \times 10^7 = 15,000,000$: Only 7 zeros; one zero short.
- Option (C) 150×10^6 : Correct value but $a = 150 \geq 10$ — not standard form.

Final Answer: $150,000,000 = 1.5 \times 10^8 \Rightarrow \boxed{D}$

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

Q24.

Solution

Concept — Inverse Proportion (Gears): For meshed gears, speed and number of teeth are inversely proportional: $T_1 \times N_1 = T_2 \times N_2$.

Step 1 — Set up the equation:

$$T_1 \times N_1 = T_2 \times N_2 \Rightarrow 40 \times 30 = 24 \times N_2$$

Step 2 — Solve for N_2 :

$$N_2 = \frac{40 \times 30}{24} = \frac{1200}{24} = 50 \text{ rpm}$$

Why other options are wrong:



- Option (A) 30 rpm: The same speed as the first gear; only true if both gears have equal teeth.
- Option (C) 60 rpm: Treats as direct proportion; divides by teeth ratio instead of multiplying.
- Option (D) 40 rpm: Incorrect; uses the tooth count of the first gear as the speed.

Final Answer: Speed of second gear = 50 rpm $\Rightarrow$ B

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

Q25.

Solution

Concept — Direct Proportion: If petrol consumed is directly proportional to distance, $\frac{x_1}{y_1} = \frac{x_2}{y_2}$.

Step 1 — Set up the proportion:

$$\frac{9 \text{ litres}}{135 \text{ km}} = \frac{x \text{ litres}}{225 \text{ km}}$$

Step 2 — Solve for x :

$$x = \frac{9 \times 225}{135} = \frac{2025}{135} = 15 \text{ litres}$$

Why other options are wrong:

- Option (A) 10 litres: $\frac{10}{225} = \frac{2}{45} \neq \frac{9}{135} = \frac{1}{15}$.
- Option (B) 12 litres: $\frac{12}{225} = \frac{4}{75} \neq \frac{1}{15}$.
- Option (D) 18 litres: Corresponds to 270 km, not 225 km.

Final Answer: Petrol needed = 15 litres $\Rightarrow$ C

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



Q26.

Solution

Concept — Factorisation by Grouping: Rearrange and group terms so that a common binomial factor appears.

Step 1 — Group the four terms:

$$2ab + 2b + a + 1 = (2ab + 2b) + (a + 1)$$

Step 2 — Factor each group:

$$= 2b(a + 1) + 1(a + 1)$$

Step 3 — Factor out the common binomial:

$$= (a + 1)(2b + 1)$$

Verification: $(a + 1)(2b + 1) = 2ab + a + 2b + 1 = 2ab + 2b + a + 1 \checkmark$

Why other options are wrong:

- Option (B) $(a + 2)(b + 1) = ab + a + 2b + 2$: Expansion does not match the original.
- Option (C) $(2a + 1)(b + 1) = 2ab + 2a + b + 1$: Middle terms do not match.
- Option (D) $(a + 1)(b + 2) = ab + 2a + b + 2$: Does not reproduce $2ab$.

Final Answer: $2ab + 2b + a + 1 = (a + 1)(2b + 1) \Rightarrow \boxed{A}$

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

Q27.

Solution

Concept — Difference of Two Squares: $a^2 - b^2 = (a - b)(a + b)$.

Step 1 — Recognise the form:

$$9m^2 - 49n^2 = (3m)^2 - (7n)^2$$



Step 2 — Apply the identity:

$$= (3m - 7n)(3m + 7n)$$

Verification: $(3m - 7n)(3m + 7n) = 9m^2 + 21mn - 21mn - 49n^2 = 9m^2 - 49n^2 \checkmark$

Why other options are wrong:

- Option (A) $(3m + 7n)^2 = 9m^2 + 42mn + 49n^2$: Uses $(a + b)^2$, not $a^2 - b^2$.
- Option (B) $(3m - 7n)^2 = 9m^2 - 42mn + 49n^2$: Uses $(a - b)^2$; the $-49n^2$ sign is wrong.
- Option (C) $(9m - 49n)(m + n)$: Incorrect factorisation; product $= 9m^2 + 9mn - 49mn - 49n^2$.

Final Answer: $9m^2 - 49n^2 = (3m - 7n)(3m + 7n) \Rightarrow \boxed{D}$

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

Q28.

Solution

Concept — Polynomial Division by Factorisation: Factorise the dividend and cancel the common factor with the divisor.

Step 1 — Factorise $2x^2 + x - 6$:

Find two numbers whose product is $2 \times (-6) = -12$ and sum is 1: they are 4 and -3 .

$$2x^2 + x - 6 = 2x^2 + 4x - 3x - 6 = 2x(x + 2) - 3(x + 2) = (x + 2)(2x - 3)$$

Step 2 — Divide by $(x + 2)$:

$$\frac{(x + 2)(2x - 3)}{x + 2} = 2x - 3$$

Verification: $(x + 2)(2x - 3) = 2x^2 - 3x + 4x - 6 = 2x^2 + x - 6 \checkmark$

Why other options are wrong:

- Option (A) $2x + 3$: $(x + 2)(2x + 3) = 2x^2 + 3x + 4x + 6 = 2x^2 + 7x + 6 \neq 2x^2 + x - 6$.
- Option (C) $x - 3$: $(x + 2)(x - 3) = x^2 - x - 6 \neq 2x^2 + x - 6$ (leading coefficient wrong).
- Option (D) $x + 3$: $(x + 2)(x + 3) = x^2 + 5x + 6 \neq 2x^2 + x - 6$.



Final Answer: Quotient = $2x - 3 \Rightarrow \boxed{B}$

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

Q29.

Solution

Concept — Reading a Histogram: The bar with the greatest height represents the class interval with the highest frequency.

Step 1 — Read the frequencies from the histogram:

Height range (cm)	Frequency
130–140	4
140–150	7
150–160	10
160–170	5
170–180	4

Step 2 — Identify the tallest bar:

The bar for 150–160 cm has frequency 10, which is the highest.

Why other options are wrong:

- Option (A) 130–140 cm: Frequency is only 4 (tied for lowest).
- Option (B) 140–150 cm: Frequency is 7 (second highest, but less than 10).
- Option (D) 160–170 cm: Frequency is 5 (below the modal class).

Final Answer: Most students are in the 150–160 cm range $\Rightarrow \boxed{C}$

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

Q30.

Solution

Concept — Classical Probability: $P(\text{event}) = \frac{\text{Number of favourable outcomes}}{\text{Total number of equally likely outcomes}}$

Step 1 — Identify the sample space:

A standard deck has 52 cards. Total outcomes = 52.

Step 2 — Count favourable outcomes:

There are 4 kings in a deck (one per suit). Favourable outcomes = 4.



Step 3 — Compute probability:

$$P(\text{king}) = \frac{4}{52} = \frac{1}{13}$$

Why other options are wrong:

- Option (A) $\frac{1}{52}$: Probability of drawing one specific card (e.g., king of spades only).
- Option (B) $\frac{1}{26}$: Would require 2 favourable outcomes ($52 \div 26 = 2$); incorrect count.
- Option (C) $\frac{4}{13}$: Results from using total = 13 instead of 52 (one suit, not the full deck).

Final Answer: $P(\text{king}) = \frac{1}{13} \Rightarrow \boxed{D}$

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



Answer Key

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

