

# SHRESHTA NETS Mathematics

## Sample Paper – 8

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.** Which property is illustrated by the following?

$$\frac{3}{5} + \frac{2}{7} = \frac{2}{7} + \frac{3}{5}$$

- (A) Associative property of addition
- (B) Commutative property of addition
- (C) Distributive property
- (D) Closure property of addition

**Q2.** Write  $\frac{-36}{48}$  in its standard form (lowest terms with positive denominator).

- (A)  $\frac{3}{4}$
- (B)  $\frac{-36}{48}$



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

(D)  $\frac{36}{48}$

**Q3.** A bag of coins contains only Rs 2 and Rs 5 coins. There are 30 coins in total worth Rs 99. How many Rs 2 coins are there?

(A) 17

(B) 13

(C) 15

(D) 20

**Q4.** Solve:  $\frac{x+3}{4} = \frac{2x-1}{6}$ .

(A)  $x = 7$

(B)  $x = 9$

(C)  $x = 5$

(D)  $x = 11$

**Q5.** A train travels 150 km in the same time as a car travels 100 km. If the car's speed is 20 km/h less than the train's speed, find the speed of the train.

(A) 50 km/h

(B) 60 km/h

(C) 40 km/h

(D) 80 km/h

**Q6.** Which of the following statements about a square is **FALSE**?

(A) All sides are equal

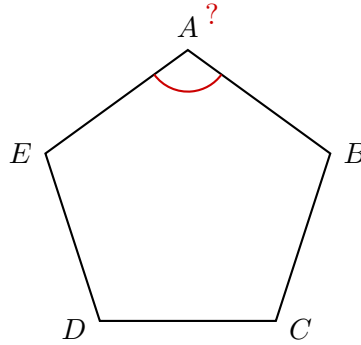
(B) All angles are  $90^\circ$

(C) Diagonals are unequal



(D) Diagonals bisect each other at right angles

**Q7.** The figure shows a regular pentagon  $ABCDE$ . What is the measure of each interior angle?



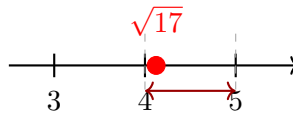
(A)  $108^\circ$

(B)  $120^\circ$

(C)  $135^\circ$

(D)  $90^\circ$

**Q8.** On the number line shown,  $\sqrt{17}$  lies between which two consecutive integers?



(A) 3 and 4

(B) 2 and 3

(C) 5 and 6

(D) 4 and 5

**Q9.** What is the smallest number by which 1800 must be **multiplied** to make it a perfect square?

(A) 3

(B) 2



(C) 5

(D) 6

**Q10.** What is the least perfect square that is divisible by each of 4, 6, and 10?

(A) 360

(B) 600

(C) 900

(D) 1200

**Q11.** What is the units digit of  $37^3$ ?

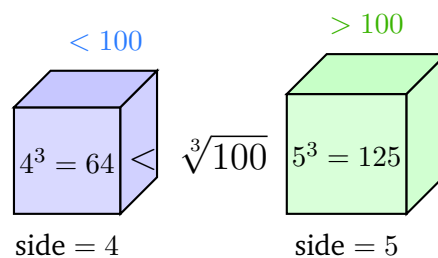
(A) 3

(B) 7

(C) 1

(D) 9

**Q12.** The diagram shows two cubes with their volumes. Between which two consecutive integers does  $\sqrt[3]{100}$  lie?



(A) 3 and 4

(B) 5 and 6

(C) 3 and 5

(D) 4 and 5

**Q13.** Partners A and B invest Rs 15,000 and Rs 25,000 respectively in a business. At the end of the year, the total profit is Rs 16,000. Find A's share of the profit.



- (A) Rs 8,000
- (B) Rs 6,000
- (C) Rs 10,000
- (D) Rs 4,000

**Q14.** An item is purchased on instalments: a down payment of Rs 1,200 followed by Rs 500 per month for 12 months. The cash price of the item is Rs 6,600. Find the extra amount paid above the cash price.

- (A) Rs 400
- (B) Rs 500
- (C) Rs 600
- (D) Rs 700

**Q15.** The price of petrol increased by 20% and then decreased by 20%. Find the net percentage change in the price.

- (A) Decrease of 4%
- (B) Increase of 4%
- (C) No change
- (D) Decrease of 2%

**Q16.** If  $x + \frac{1}{x} = 5$ , find the value of  $x^2 + \frac{1}{x^2}$ .

- (A) 21
- (B) 25
- (C) 27
- (D) 23

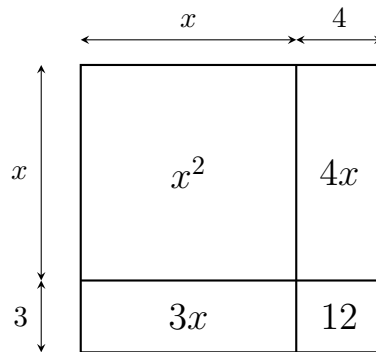
**Q17.** Simplify:  $(2a + 3b)^2 - (2a - 3b)^2$ .

- (A)  $12ab$
- (B)  $24ab$



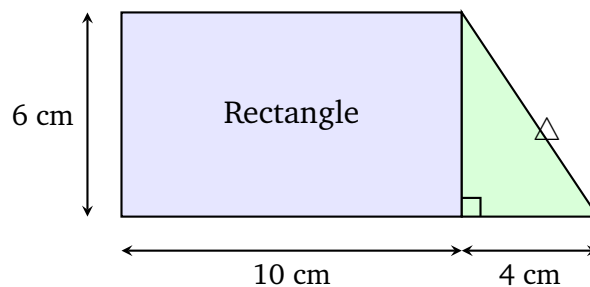
- (C)  $48ab$   
 (D)  $8a^2 + 18b^2$

**Q18.** The area diagram below shows the rectangle  $(x + 4) \times (x + 3)$  subdivided into four parts. What is the expanded form of  $(x + 4)(x + 3)$ ?



- (A)  $x^2 + 12$   
 (B)  $x^2 + 6x + 12$   
 (C)  $x^2 + 7x + 12$   
 (D)  $x^2 + 5x + 12$

**Q19.** The composite shape below consists of a rectangle and a right triangle (right angle at their shared corner). Find the total area of the shape.



- (A)  $72\text{ cm}^2$   
 (B)  $80\text{ cm}^2$   
 (C)  $84\text{ cm}^2$   
 (D)  $96\text{ cm}^2$

**Q20.** Find the total surface area of a cone with base radius  $5\text{ cm}$  and slant height  $13\text{ cm}$ . (Use  $\pi = 3.14$ )



- (A)  $251.2 \text{ cm}^2$
- (B)  $204.1 \text{ cm}^2$
- (C)  $314.0 \text{ cm}^2$
- (D)  $282.6 \text{ cm}^2$

**Q21.** A wooden box (open at the top) has dimensions  $50 \text{ cm} \times 40 \text{ cm} \times 30 \text{ cm}$  (length  $\times$  breadth  $\times$  height). Find the total area of wood needed to make it.

- (A)  $6,800 \text{ cm}^2$
- (B)  $7,400 \text{ cm}^2$
- (C)  $8,000 \text{ cm}^2$
- (D)  $9,400 \text{ cm}^2$

**Q22.** Express  $(3.2 \times 10^4) \times (2.5 \times 10^3)$  in standard form.

- (A)  $7.0 \times 10^7$
- (B)  $8.0 \times 10^{12}$
- (C)  $8.0 \times 10^7$
- (D)  $6.4 \times 10^7$

**Q23.** Which of the following is equal to  $\left(\frac{5}{4}\right)^{-3}$ ?

- (A)  $\frac{64}{125}$
- (B)  $\frac{125}{64}$
- (C)  $-\frac{64}{125}$
- (D)  $\frac{15}{12}$

**Q24.** A car travelling at  $80 \text{ km/h}$  takes 3 hours to reach a city. How long will it take to cover the same distance if the speed is increased to  $120 \text{ km/h}$ ?



- (A) 4 hours
- (B) 2.5 hours
- (C) 1.5 hours
- (D) 2 hours

**Q25.** On a map, 1 cm represents 5 km. Two cities are 18.5 cm apart on the map. What is the actual distance between them?

- (A) 90.5 km
- (B) 92.5 km
- (C) 95.0 km
- (D) 87.5 km

**Q26.** Factorise:  $15a^3b^2 - 20a^2b^3 + 25a^2b^2$ .

- (A)  $5a^2b(3a^2 - 4ab^2 + 5a)$
- (B)  $5ab^2(3a^2 - 4ab + 5a)$
- (C)  $5a^2b^2(3a - 4b + 5)$
- (D)  $5a^3b^3(3 - 4 + 5)$

**Q27.** Factorise:  $4x^2 + 12xy + 9y^2$ .

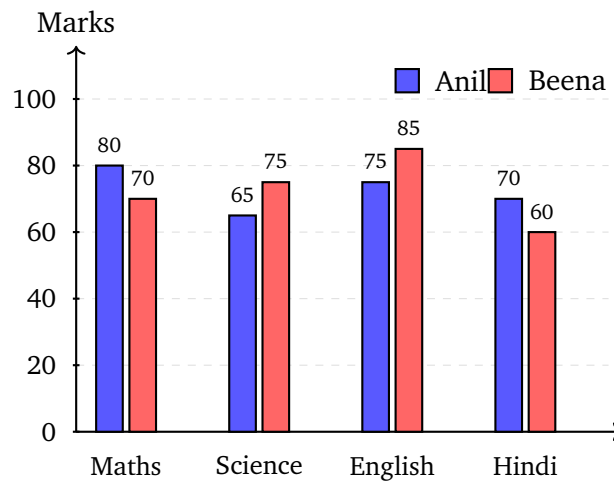
- (A)  $(2x + 3y)^2$
- (B)  $(2x - 3y)^2$
- (C)  $(4x + 9y)^2$
- (D)  $(2x + 3y)(2x - 3y)$

**Q28.** Divide  $(x^3 - 8)$  by  $(x - 2)$ . What is the quotient?

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



**Q29.** The double bar chart below shows the marks scored by Anil and Beena in four subjects. In which subject(s) did Beena score **more** than Anil?



- (A) Maths only
- (B) Science and English
- (C) English only
- (D) Hindi only

**Q30.** A bag contains 3 red, 5 blue, 7 green, and 5 yellow balls. A ball is drawn at random. What is the probability that it is **NOT** red?

- (A)  $\frac{3}{20}$
- (B)  $\frac{1}{4}$
- (C)  $\frac{17}{20}$
- (D)  $\frac{7}{20}$



## Detailed Solutions

Q1.

## Solution

**Concept — Rational Numbers: Commutative Property of Addition**

**Step 1 — Observe the equation:** The equation  $\frac{3}{5} + \frac{2}{7} = \frac{2}{7} + \frac{3}{5}$  shows the two addends swapping positions while the sum remains the same.

**Step 2 — Match to the property:** The **Commutative Property** of addition states: for any two numbers  $a$  and  $b$ ,  $a + b = b + a$ . Here  $a = \frac{3}{5}$  and  $b = \frac{2}{7}$ .

**Why other options are wrong:**

- Option (A): The **Associative Property** involves regrouping three numbers:  $(a + b) + c = a + (b + c)$ . No regrouping occurs here.
- Option (C): The **Distributive Property** involves multiplication over addition:  $a(b + c) = ab + ac$ . No multiplication is present.
- Option (D): The **Closure Property** states that the sum of two rationals is rational—it does not concern the order of addition.

**Final Answer:** Swapping the order of addends illustrates the Commutative Property  $\Rightarrow$  B

**Answer: (B)** [Go Back to Q1](#)

Q2.

## Solution

**Concept — Rational Numbers: Standard Form**

**Step 1 — Find the GCD of 36 and 48:**  $36 = 2^2 \times 3^2$ ,  $48 = 2^4 \times 3$ .  $\gcd(36, 48) = 2^2 \times 3 = 12$ .

**Step 2 — Simplify the fraction:**

$$\frac{-36}{48} = \frac{-36 \div 12}{48 \div 12} = \frac{-3}{4} = -\frac{3}{4}.$$

The denominator is positive and  $\gcd(3, 4) = 1$ , so  $-\frac{3}{4}$  is the standard form.

**Why other options are wrong:**

- Option (A):  $\frac{3}{4}$  is positive, but the original fraction is negative.



- Option (B):  $\frac{-36}{48}$  is not in lowest terms since  $\gcd(36, 48) = 12 \neq 1$ .
- Option (D):  $\frac{36}{48}$  is positive and not simplified.

**Final Answer:** Standard form is  $-\frac{3}{4} \Rightarrow \boxed{C}$

**Answer: (C)** [Go Back to Q2](#)

**Q3.**

### Solution

**Concept — Linear Equations in One Variable: Setting Up Equations from Word Problems**

**Step 1 — Define variables:** Let  $x$  = number of Rs 2 coins. Then  $(30 - x)$  = number of Rs 5 coins.

**Step 2 — Set up and solve the equation:**

$$2x + 5(30 - x) = 99$$

$$2x + 150 - 5x = 99$$

$$-3x = -51 \implies x = 17.$$

**Verification:** Rs 2 coins = 17, Rs 5 coins = 13. Total =  $2(17) + 5(13) = 34 + 65 = 99$  Rs. ✓

**Why other options are wrong:**

- Option (B):  $x = 13$  gives  $2(13) + 5(17) = 26 + 85 = 111 \neq 99$ .
- Option (C):  $x = 15$  gives  $2(15) + 5(15) = 30 + 75 = 105 \neq 99$ .
- Option (D):  $x = 20$  gives  $2(20) + 5(10) = 40 + 50 = 90 \neq 99$ .

**Final Answer:** 17 coins of Rs 2  $\Rightarrow \boxed{A}$

**Answer: (A)** [Go Back to Q3](#)



Q4.

**Solution****Concept — Linear Equations: Solving Fractional Equations by Cross-Multiplication****Step 1 — Cross-multiply to clear fractions:**

$$\frac{x+3}{4} = \frac{2x-1}{6} \implies 6(x+3) = 4(2x-1).$$

**Step 2 — Expand and simplify:**

$$6x + 18 = 8x - 4 \implies 18 + 4 = 8x - 6x \implies 22 = 2x \implies x = 11.$$

**Verification:** LHS =  $\frac{14}{4} = \frac{7}{2}$ . RHS =  $\frac{21}{6} = \frac{7}{2}$ . ✓

**Why other options are wrong:**

- Option (A):  $x = 7$  gives LHS =  $10/4 = 2.5$ , RHS =  $13/6 \approx 2.17$ . Not equal.
- Option (B):  $x = 9$  gives LHS =  $12/4 = 3$ , RHS =  $17/6 \approx 2.83$ . Not equal.
- Option (C):  $x = 5$  gives LHS =  $8/4 = 2$ , RHS =  $9/6 = 1.5$ . Not equal.

**Final Answer:**  $x = 11 \Rightarrow \boxed{D}$ **Answer: (D)** [Go Back to Q4](#)

Q5.

**Solution****Concept — Linear Equations: Problems on Speed, Time, and Distance****Step 1 — Set up the equation:** Let the speed of the train =  $v$  km/h and the car's speed =  $(v - 20)$  km/h.

Since they travel for the same time:  $\frac{150}{v} = \frac{100}{v-20}$ .

**Step 2 — Solve:**

$$150(v-20) = 100v \implies 150v - 3000 = 100v \implies 50v = 3000 \implies v = 60 \text{ km/h.}$$

**Verification:** Train time =  $150/60 = 2.5$  h. Car time =  $100/40 = 2.5$  h. ✓

**Why other options are wrong:**

- Option (A):  $v = 50 \text{ km/h} \Rightarrow \text{car speed} = 30$ ; times  $150/50 = 3 \neq 100/30$ .
- Option (C):  $v = 40 \text{ km/h} \Rightarrow \text{car speed} = 20$ ; times  $150/40 \neq 100/20$ .
- Option (D):  $v = 80 \text{ km/h} \Rightarrow \text{car speed} = 60$ ; times  $150/80 \neq 100/60$ .

**Final Answer:** Train speed = 60 km/h  $\Rightarrow$  B

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

Q6.

### Solution

**Concept — Understanding Quadrilaterals: Properties of a Square**

**Step 1 — Recall the properties of a square:**

- All four sides are **equal**.
- All four angles are  $90^\circ$ .
- Diagonals are **equal in length**.
- Diagonals **bisect each other at right angles**.

**Step 2 — Identify the FALSE statement:** Option (C) states “Diagonals are unequal.” This is **FALSE**—the diagonals of a square are always equal in length (both equal  $a\sqrt{2}$  where  $a$  is the side length).

**Why other options are wrong (i.e., they are TRUE):**

- Option (A): All sides equal—TRUE.
- Option (B): All angles =  $90^\circ$ —TRUE.
- Option (D): Diagonals bisect each other at right angles—TRUE.

**Final Answer:** The FALSE statement is “Diagonals are unequal”  $\Rightarrow$  C

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



Q7.

**Solution**

**Concept — Understanding Quadrilaterals: Interior Angles of Regular Polygons**

**Step 1 — Formula for sum of interior angles:** For an  $n$ -sided polygon: Sum  $= (n - 2) \times 180^\circ$ .

For a pentagon ( $n = 5$ ): Sum  $= (5 - 2) \times 180^\circ = 3 \times 180^\circ = 540^\circ$ .

**Step 2 — Divide equally (regular polygon):** Each interior angle  $= \frac{540^\circ}{5} = 108^\circ$ .

**Why other options are wrong:**

- Option (B):  $120^\circ$  is each angle of a regular *hexagon* ( $n = 6$ , sum  $= 720^\circ$ ).
- Option (C):  $135^\circ$  is each angle of a regular *octagon* ( $n = 8$ , sum  $= 1080^\circ$ ).
- Option (D):  $90^\circ$  is each angle of a regular *square* ( $n = 4$ , sum  $= 360^\circ$ ).

**Final Answer:** Each interior angle of a regular pentagon  $= 108^\circ \Rightarrow \boxed{A}$

**Answer: (A)** [Go Back to Q7](#)

Q8.

**Solution**

**Concept — Squares and Square Roots: Locating Irrational Numbers on the Number Line**

**Step 1 — Find the perfect squares on either side of 17:**  $4^2 = 16 < 17 < 25 = 5^2$ .

**Step 2 — Take square roots:**  $\sqrt{16} < \sqrt{17} < \sqrt{25}$ , i.e.,  $4 < \sqrt{17} < 5$ . (More precisely,  $\sqrt{17} \approx 4.123$ .)

**Why other options are wrong:**

- Option (A): Between 3 and 4 would require  $9 < 17 < 16$ —false.
- Option (B): Between 2 and 3 would require  $4 < 17 < 9$ —false.
- Option (C): Between 5 and 6 would require  $25 < 17 < 36$ —false.

**Final Answer:**  $\sqrt{17}$  lies between 4 and 5  $\Rightarrow \boxed{D}$

**Answer: (D)** [Go Back to Q8](#)



Q9.

**Solution****Concept — Squares and Square Roots: Making a Number a Perfect Square****Step 1 — Prime factorisation of 1800:**  $1800 = 2^3 \times 3^2 \times 5^2$ .**Step 2 — Identify unpaired prime factors:** For a perfect square every prime factor must appear an *even* number of times.

- $2^3$ : one factor of 2 is unpaired.
- $3^2$ : both paired. ✓
- $5^2$ : both paired. ✓

We need one more factor of 2.

**Step 3 — Verify:**  $1800 \times 2 = 3600 = 2^4 \times 3^2 \times 5^2 = (2^2 \times 3 \times 5)^2 = 60^2$ . ✓**Why other options are wrong:**

- Option (A):  $1800 \times 3 = 5400 = 2^3 \times 3^3 \times 5^2$ . Still has unpaired 2 and 3.
- Option (C):  $1800 \times 5 = 9000 = 2^3 \times 3^2 \times 5^3$ . Still has unpaired 2 and 5.
- Option (D):  $1800 \times 6 = 10800 = 2^4 \times 3^3 \times 5^2$ . Still has unpaired 3.

**Final Answer:** Smallest multiplier = 2  $\Rightarrow$  BAnswer: (B) [Go Back to Q9](#)

Q10.

**Solution****Concept — Squares and Square Roots: Least Perfect Square Divisible by Given Numbers****Step 1 — Find the LCM of 4, 6, and 10:**  $4 = 2^2$ ,  $6 = 2 \times 3$ ,  $10 = 2 \times 5$ .  
 $\text{LCM} = 2^2 \times 3 \times 5 = 60$ .**Step 2 — Make the LCM a perfect square:**  $60 = 2^2 \times 3^1 \times 5^1$ . The primes 3 and 5 appear an odd number of times. Multiply by  $3 \times 5 = 15$ :

$$60 \times 15 = 900 = 2^2 \times 3^2 \times 5^2 = (2 \times 3 \times 5)^2 = 30^2. \checkmark$$

**Why other options are wrong:**

- Option (A):  $360 = 2^3 \times 3^2 \times 5$  is divisible by 4, 6, 10 but is *not* a perfect



square.

- Option (B):  $600 = 2^3 \times 3 \times 5^2$  is divisible by all three but not a perfect square.
- Option (D):  $1200 = 2^4 \times 3 \times 5^2$  is divisible but not a perfect square.

**Final Answer:** Least perfect square = 900  $\Rightarrow$  C

**Answer: (C)** [Go Back to Q10](#)

**Q11.**

### Solution

**Concept — Cubes and Cube Roots: Units Digit of Cubes**

**Step 1 — Rule:** The units digit of  $n^3$  depends only on the units digit of  $n$ .

**Step 2 — Apply to  $37^3$ :** Units digit of 37 is 7.  $7^3 = 343$ . Units digit = 3.

**Reference table for units digits of cubes:**

|                |   |   |   |   |   |   |   |   |   |   |
|----------------|---|---|---|---|---|---|---|---|---|---|
| $n$ (units)    | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| units of $n^3$ | 0 | 1 | 8 | 7 | 4 | 5 | 6 | 3 | 2 | 9 |

**Why other options are wrong:**

- Option (B): 7 is the units digit of  $7^1$ , not  $7^3$ .
- Option (C): 1 is the units digit of  $7^4 = 2401$ , not  $7^3$ .
- Option (D): 9 is the units digit of  $9^3 = 729$  (units digit 9), not units digit 7.

**Final Answer:** Units digit of  $37^3$  is 3  $\Rightarrow$  A

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

**Q12.**

### Solution

**Concept — Cubes and Cube Roots: Estimating Cube Roots Between Consecutive Integers**

**Step 1 — Find perfect cubes surrounding 100:**  $4^3 = 64 < 100 < 125 = 5^3$ .

**Step 2 — Take cube roots:**  $\sqrt[3]{64} < \sqrt[3]{100} < \sqrt[3]{125}$ , i.e.,  $4 < \sqrt[3]{100} < 5$ . ( $\sqrt[3]{100} \approx 4.642$ .)

**Why other options are wrong:**



- Option (A): Between 3 and 4 requires  $27 < 100 < 64$ —false ( $100 > 64$ ).
- Option (B): Between 5 and 6 requires  $125 < 100 < 216$ —false ( $100 < 125$ ).
- Option (C): Between 3 and 5 is too broad; the precise pair is 4 and 5.

**Final Answer:**  $\sqrt[3]{100}$  lies between 4 and 5  $\Rightarrow$  D

**Answer: (D)** [Go Back to Q12](#)

**Q13.**

### Solution

**Concept — Comparing Quantities: Profit Sharing in Partnership**

**Step 1 — Find the investment ratio:** Ratio = 15,000 : 25,000 = 15 : 25 = 3 : 5.

**Step 2 — Calculate A's share:** Total parts = 3 + 5 = 8. A's share =  $\frac{3}{8} \times 16,000 = \frac{48,000}{8} = \text{Rs } 6,000$ .

**Why other options are wrong:**

- Option (A): Rs 8,000 =  $\frac{1}{2} \times 16,000$  assumes an equal split, ignoring the investment ratio.
- Option (C): Rs 10,000 would be B's share if the ratio were reversed (5:3).
- Option (D): Rs 4,000 =  $\frac{1}{4} \times 16,000$  uses an incorrect ratio of 1:3.

**Final Answer:** A's share = Rs 6,000  $\Rightarrow$  B

**Answer: (B)** [Go Back to Q13](#)

**Q14.**

### Solution

**Concept — Comparing Quantities: Instalment Scheme and Extra Cost**

**Step 1 — Calculate total amount paid:** Down payment = Rs 1,200. Monthly instalments =  $12 \times 500 = \text{Rs } 6,000$ . Total paid =  $1,200 + 6,000 = \text{Rs } 7,200$ .

**Step 2 — Extra amount above cash price:** Extra =  $7,200 - 6,600 = \text{Rs } 600$ .

**Why other options are wrong:**

- Option (A): Rs 400 results from counting only 10 months of instalments ( $1200 + 5000 - 6600 = 400$ ).
- Option (B): Rs 500 is the value of a single monthly instalment, not the total



extra.

- Option (D): Rs 700 overestimates by Rs 100 (arithmetic error).

**Final Answer:** Extra paid = Rs 600  $\Rightarrow$  C

**Answer: (C)** [Go Back to Q14](#)

**Q15.**

### Solution

**Concept — Comparing Quantities: Successive Percentage Changes**

**Step 1 — Net multiplier after successive changes:** Increase by 20% then decrease by 20%:  $1.20 \times 0.80 = 0.96$ .

**Step 2 — Interpret:** Net multiplier =  $0.96 = 1 - 0.04 \Rightarrow$  **decrease of 4%.**

**Shortcut formula:** Net % change =  $-\frac{p^2}{100} = -\frac{20^2}{100} = -4\%$  (decrease).

**Why other options are wrong:**

- Option (B): A gain is impossible when the same percentage is first added and then subtracted—the base increases after the first step.
- Option (C): +20% and -20% do not cancel exactly;  $1.2 \times 0.8 = 0.96 \neq 1$ .
- Option (D): -2% would arise if  $p = q \approx 10\%$ , not 20%.

**Final Answer:** Net change = decrease of 4%  $\Rightarrow$  A

**Answer: (A)** [Go Back to Q15](#)

**Q16.**

### Solution

**Concept — Algebraic Expressions and Identities: Using  $(a + b)^2 = a^2 + 2ab + b^2$**

**Step 1 — Square the given expression:** Given  $x + \frac{1}{x} = 5$ . Squaring both sides:

$$\left(x + \frac{1}{x}\right)^2 = 25.$$

**Step 2 — Expand and simplify:**

$$x^2 + 2 \cdot x \cdot \frac{1}{x} + \frac{1}{x^2} = 25 \implies x^2 + 2 + \frac{1}{x^2} = 25 \implies x^2 + \frac{1}{x^2} = 23.$$

**Why other options are wrong:**



- Option (A):  $21 = 25 - 4$  (subtracting 4 instead of 2).
- Option (B): 25 is the value of  $(x + \frac{1}{x})^2$ , not  $x^2 + \frac{1}{x^2}$ .
- Option (C):  $27 = 25 + 2$  (adding instead of subtracting the cross term).

**Final Answer:**  $x^2 + \frac{1}{x^2} = 23 \Rightarrow \boxed{D}$

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

**Q17.**

### Solution

**Concept — Algebraic Expressions: Identity**  $(a + b)^2 - (a - b)^2 = 4ab$

**Step 1 — Apply the identity directly:** With  $a = 2a$  and  $b = 3b$ :  $(2a + 3b)^2 - (2a - 3b)^2 = 4 \cdot (2a) \cdot (3b) = 24ab$ .

**Step 2 — Verify by expansion:**  $(2a + 3b)^2 = 4a^2 + 12ab + 9b^2$ ;  $(2a - 3b)^2 = 4a^2 - 12ab + 9b^2$ . Difference =  $24ab$ . ✓

**Why other options are wrong:**

- Option (A):  $12ab$  gives only half the correct answer (forgetting the factor of 2 from the identity).
- Option (C):  $48ab = 2 \times 24ab$  (doubling the correct result).
- Option (D):  $8a^2 + 18b^2 = 2[(2a)^2 + (3b)^2]$  is the value of  $(2a + 3b)^2 + (2a - 3b)^2$  (sum, not difference).

**Final Answer:**  $(2a + 3b)^2 - (2a - 3b)^2 = 24ab \Rightarrow \boxed{B}$

**Answer: (B)** [Go Back to Q17](#)

**Q18.**

### Solution

**Concept — Algebraic Expressions: Expanding Products Using the Area Model**

**Step 1 — Read the four regions:** The large rectangle  $(x + 4) \times (x + 3)$  is split into four sub-rectangles:

$$x \times x = x^2, \quad 4 \times x = 4x, \quad x \times 3 = 3x, \quad 4 \times 3 = 12.$$

**Step 2 — Sum all parts:**  $(x + 4)(x + 3) = x^2 + 4x + 3x + 12 = x^2 + 7x + 12$ .



Why other options are wrong:

- Option (A):  $x^2 + 12$  omits all cross terms ( $4x$  and  $3x$ ).
- Option (B):  $x^2 + 6x + 12$  uses  $3 + 3 = 6$  instead of the correct  $4 + 3 = 7$ .
- Option (D):  $x^2 + 5x + 12$  uses  $4 - 3 + 4 = 5x$  (arithmetic error in the cross terms).

**Final Answer:**  $(x + 4)(x + 3) = x^2 + 7x + 12 \Rightarrow \boxed{C}$

**Answer: (C)** [Go Back to Q18](#)

Q19.

### Solution

**Concept — Mensuration: Area of Composite Shapes**

**Step 1 — Area of the rectangle:**  $\text{Area}_{\text{rect}} = 10 \times 6 = 60 \text{ cm}^2$ .

**Step 2 — Area of the right triangle (legs 6 cm and 4 cm):**  $\text{Area}_{\Delta} = \frac{1}{2} \times 6 \times 4 = 12 \text{ cm}^2$ .

**Step 3 — Total area:**  $\text{Total} = 60 + 12 = 72 \text{ cm}^2$ .

Why other options are wrong:

- Option (B):  $80 \text{ cm}^2$  results from using an incorrect triangle height.
- Option (C):  $84 \text{ cm}^2$  results from treating the hypotenuse ( $\sqrt{52}$ ) as one of the legs.
- Option (D):  $96 \text{ cm}^2 = 10 \times 6 + \frac{1}{2} \times 6 \times 12$  (incorrect height 12 instead of 4).

**Final Answer:**  $\text{Total area} = 72 \text{ cm}^2 \Rightarrow \boxed{A}$

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

Q20.

### Solution

**Concept — Mensuration: Total Surface Area of a Cone**

**Step 1 — Formula:**  $\text{TSA} = \pi r(r + l)$ , where  $r$  = base radius and  $l$  = slant height.

**Step 2 — Substitute ( $r = 5 \text{ cm}$ ,  $l = 13 \text{ cm}$ ,  $\pi = 3.14$ ):**

$$\text{TSA} = 3.14 \times 5 \times (5 + 13) = 3.14 \times 5 \times 18 = 3.14 \times 90 = 282.6 \text{ cm}^2.$$



**Why other options are wrong:**

- Option (A):  $251.2 = 3.14 \times 5 \times 16$  (uses  $r + l = 16$  instead of 18).
- Option (B):  $204.1 \approx 3.14 \times 5 \times 13$  (uses only the lateral area  $\pi r l$  with an incorrect variant).
- Option (C):  $314.0 = 3.14 \times 100$  (confuses TSA with  $\pi r^2 \times$  a wrong factor).

**Final Answer:** TSA =  $282.6 \text{ cm}^2 \Rightarrow \boxed{D}$

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

**Q21.**

### Solution

**Concept — Mensuration: Surface Area of an Open-Top Box**

**Step 1 — Identify the five faces (no top):**

- Bottom:  $l \times b = 50 \times 40 = 2,000 \text{ cm}^2$ .
- Two long side faces:  $2 \times l \times h = 2 \times 50 \times 30 = 3,000 \text{ cm}^2$ .
- Two short side faces:  $2 \times b \times h = 2 \times 40 \times 30 = 2,400 \text{ cm}^2$ .

**Step 2 — Total area:** Area =  $2,000 + 3,000 + 2,400 = 7,400 \text{ cm}^2$ .

**Why other options are wrong:**

- Option (A):  $6,800 \text{ cm}^2$  omits one side face.
- Option (C):  $8,000 \text{ cm}^2$  is an overestimate that includes partial top area.
- Option (D):  $9,400 \text{ cm}^2 = 2(lb + lh + bh)$  is the *closed* box total surface area.

**Final Answer:** Area of wood needed =  $7,400 \text{ cm}^2 \Rightarrow \boxed{B}$

**Answer: (B)** [Go Back to Q21](#)

**Q22.**

### Solution

**Concept — Exponents and Powers: Multiplication in Scientific Notation**

**Step 1 — Multiply the coefficients:**  $3.2 \times 2.5 = 8.0$ .

**Step 2 — Multiply the powers of 10 (add exponents):**  $10^4 \times 10^3 = 10^{4+3} = 10^7$ .

**Step 3 — Combine:**  $(3.2 \times 10^4) \times (2.5 \times 10^3) = 8.0 \times 10^7$ .



**Why other options are wrong:**

- Option (A):  $7.0 \times 10^7$  results from adding coefficients ( $3.2 + 3.8 = 7$ ) instead of multiplying.
- Option (B):  $8.0 \times 10^{12}$  results from multiplying exponents ( $4 \times 3 = 12$ ) instead of adding.
- Option (D):  $6.4 \times 10^7$  results from  $3.2 \times 2.0$  (forgetting the 0.5).

**Final Answer:**  $8.0 \times 10^7 \Rightarrow \boxed{C}$

**Answer: (C)** [Go Back to Q22](#)

**Q23.**

### Solution

**Concept — Exponents and Powers: Negative Exponents**

**Step 1 — Apply the rule  $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$ :**

$$\left(\frac{5}{4}\right)^{-3} = \left(\frac{4}{5}\right)^3.$$

**Step 2 — Compute:**

$$\left(\frac{4}{5}\right)^3 = \frac{4^3}{5^3} = \frac{64}{125}.$$

**Why other options are wrong:**

- Option (B):  $\frac{125}{64} = \left(\frac{5}{4}\right)^3$  (positive exponent 3, not  $-3$ ).
- Option (C):  $-\frac{64}{125}$  is negative; raising a positive fraction to any integer power gives a positive result.
- Option (D):  $\frac{15}{12} = \frac{5}{4}$  (simply removes the exponent, incorrect).

**Final Answer:**  $\left(\frac{5}{4}\right)^{-3} = \frac{64}{125} \Rightarrow \boxed{A}$

**Answer: (A)** [Go Back to Q23](#)



Q24.

**Solution**

**Concept — Direct and Inverse Proportions: Inverse Proportion (Speed and Time)**

**Step 1 — Identify inverse proportion:** For a fixed distance, speed and time are inversely proportional:  $\text{speed} \times \text{time} = \text{constant}$ .

**Step 2 — Set up and solve:**  $80 \times 3 = 120 \times t \implies 240 = 120t \implies t = 2 \text{ hours}$ .

**Verification:** Distance =  $80 \times 3 = 240 \text{ km}$ . Time at  $120 \text{ km/h} = 240/120 = 2 \text{ h}$ . ✓

**Why other options are wrong:**

- Option (A): 4 hours would result if the speed *decreased* proportionally (direct proportion error).
- Option (B): 2.5 hours would require  $80 \times 3 = 120 \times 2.5 = 300$ ; but  $240 \neq 300$ .
- Option (C): 1.5 hours would require  $240/1.5 = 160 \text{ km/h}$ , not 120.

**Final Answer:** Time = 2 hours  $\Rightarrow$  D

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

Q25.

**Solution**

**Concept — Direct and Inverse Proportions: Map Scale (Direct Proportion)**

**Step 1 — Identify the scale:** 1 cm on map = 5 km in reality. Map distance and actual distance are in **direct proportion**.

**Step 2 — Calculate actual distance:** Actual distance =  $18.5 \times 5 = 92.5 \text{ km}$ .

**Why other options are wrong:**

- Option (A):  $90.5 = 18.1 \times 5$  (misread 18.1 instead of 18.5).
- Option (C):  $95.0 = 19.0 \times 5$  (rounds 18.5 up to 19).
- Option (D):  $87.5 = 17.5 \times 5$  (subtracts 1 from map distance before multiplying).

**Final Answer:** Actual distance =  $92.5 \text{ km} \Rightarrow$  B

**Answer: (B)** [Go Back to Q25](#)



Q26.

**Solution****Concept — Factorisation: Taking Out the Highest Common Factor**

**Step 1 — Find the HCF of all three terms:**  $15a^3b^2 = 5 \cdot 3 \cdot a^3b^2$ ;  $20a^2b^3 = 5 \cdot 4 \cdot a^2b^3$ ;  $25a^2b^2 = 5^2 \cdot a^2b^2$ .  $\text{HCF} = 5 \cdot a^2 \cdot b^2 = 5a^2b^2$ .

**Step 2 — Factorise:**

$$15a^3b^2 - 20a^2b^3 + 25a^2b^2 = 5a^2b^2 \left( \frac{15a^3b^2}{5a^2b^2} - \frac{20a^2b^3}{5a^2b^2} + \frac{25a^2b^2}{5a^2b^2} \right) = 5a^2b^2(3a - 4b + 5).$$

**Why other options are wrong:**

- Option (A):  $5a^2b$  is missing the  $b^2$  factor from the HCF.
- Option (B):  $5ab^2$  is missing the  $a^2$  factor from the HCF.
- Option (D):  $5a^3b^3$  is larger than the HCF and cannot divide all three terms evenly.

**Final Answer:**  $5a^2b^2(3a - 4b + 5) \Rightarrow \boxed{C}$

**Answer: (C)** [Go Back to Q26](#)

Q27.

**Solution**

**Concept — Factorisation: Perfect Square Trinomial Identity**  $a^2 + 2ab + b^2 = (a + b)^2$

**Step 1 — Identify the pattern:**  $4x^2 + 12xy + 9y^2 = (2x)^2 + 2 \cdot (2x) \cdot (3y) + (3y)^2$ .  
Here  $a = 2x$ ,  $b = 3y$ :  $a^2 = 4x^2$ ,  $b^2 = 9y^2$ ,  $2ab = 12xy$ . ✓

**Step 2 — Write factored form:**  $4x^2 + 12xy + 9y^2 = (2x + 3y)^2$ .

**Why other options are wrong:**

- Option (B):  $(2x - 3y)^2 = 4x^2 - 12xy + 9y^2$  (middle term has wrong sign).
- Option (C):  $(4x + 9y)^2 = 16x^2 + 72xy + 81y^2$  (completely different).
- Option (D):  $(2x + 3y)(2x - 3y) = 4x^2 - 9y^2$  (difference of squares—no  $xy$  term).

**Final Answer:**  $4x^2 + 12xy + 9y^2 = (2x + 3y)^2 \Rightarrow \boxed{A}$

**Answer: (A)** [Go Back to Q27](#)



Q28.

**Solution****Concept — Factorisation: Division Using the Difference of Cubes Identity****Step 1 — Apply the identity**  $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ :  $x^3 - 8 = x^3 - 2^3 = (x - 2)(x^2 + 2x + 4)$ .**Step 2 — Divide:**  $\frac{x^3 - 8}{x - 2} = \frac{(x - 2)(x^2 + 2x + 4)}{x - 2} = x^2 + 2x + 4 \quad (x \neq 2)$ .**Why other options are wrong:**

- Option (A):  $x^2 - 2x + 4$  results from applying the *sum* of cubes formula incorrectly.
- Option (B):  $x^2 + 4$  omits the  $2x$  middle term of the identity.
- Option (C):  $x^2 + 2x - 4$  has an incorrect sign in the constant term.

**Final Answer:** Quotient =  $x^2 + 2x + 4 \Rightarrow \boxed{D}$ **Answer: (D)** [Go Back to Q28](#)

Q29.

**Solution****Concept — Data Handling: Reading a Double Bar Chart****Step 1 — Read the bar heights from the chart:**

| Subject | Anil | Beena | Beena > Anil? |
|---------|------|-------|---------------|
| Maths   | 80   | 70    | No            |
| Science | 65   | 75    | Yes           |
| English | 75   | 85    | Yes           |
| Hindi   | 70   | 60    | No            |

**Step 2 — Identify subjects where Beena scored more:** Beena scored more than Anil in **Science** ( $75 > 65$ ) and **English** ( $85 > 75$ ).**Why other options are wrong:**

- Option (A): In Maths, Anil ( $80$ ) > Beena ( $70$ ). Beena did not score more.
- Option (C): English alone is incomplete; Beena also beat Anil in Science.
- Option (D): In Hindi, Anil ( $70$ ) > Beena ( $60$ ). Beena did not score more.



**Final Answer:** Beena scored more in Science and English  $\Rightarrow$  B

**Answer: (B)** [Go Back to Q29](#)

**Q30.**

### Solution

**Concept — Data Handling: Probability of Complementary Events**

**Step 1 — Total number of balls:**  $3 + 5 + 7 + 5 = 20$  balls.

**Step 2 — Probability of NOT red:** Non-red balls  $= 20 - 3 = 17$ .

$$P(\text{not red}) = \frac{17}{20}.$$

**Alternative:**  $P(\text{not red}) = 1 - P(\text{red}) = 1 - \frac{3}{20} = \frac{17}{20}.$

**Why other options are wrong:**

- Option (A):  $\frac{3}{20}$  is  $P(\text{red})$ , the complementary event.
- Option (B):  $\frac{1}{4} = \frac{5}{20}$  is  $P(\text{blue})$  or  $P(\text{yellow})$ , not  $P(\text{not red})$ .
- Option (D):  $\frac{7}{20}$  is  $P(\text{green})$ .

**Final Answer:**  $P(\text{not red}) = \frac{17}{20} \Rightarrow$  C

**Answer: (C)** [Go Back to Q30](#)



## Answer Key

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

