TALLENTEX Mathematics

Sample Paper – 2

Duration: 23 Minutes **Maximum Marks: 60**

Instructions

- This paper contains **15 Multiple Choice Questions (MCQs)** with a single correct answer, modelled on the Mathematics portion of TALLENTEX.
- Marking scheme: **+4** for correct answer, $-$**1** for incorrect answer, **0** for unattempted.
- Only **one** option is correct for each question.
- Syllabus: **NCERT Class 8 and Class 9 Mathematics**.
- Mobile phones, calculators, and all electronic gadgets are **strictly prohibited**.

Q1. Which of the following rational numbers is the **greatest**?

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

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

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

(D) $\frac{11}{20}$

Q2. Which of the following statements about the number 13824 is **correct**?

(A) 13824 is not a perfect cube.

(B) $\sqrt[3]{13824} = 22$

(C) $\sqrt[3]{13824} = 24$

(D) $\sqrt[3]{13824} = 26$

Q3. The sum of two numbers is 35 and their difference is 7. What is the **larger** number?

(A) 14

(B) 18

(C) 20

(D) 21

Q4. Find the **compound interest** on Rs. 8000 at 10% per annum for 2 years, compounded annually.

(A) Rs. 1680

(B) Rs. 1600

(C) Rs. 1800

(D) Rs. 1560

Q5. Using the **Remainder Theorem**, find the remainder when $p(x) = x^3 - 6x^2 + 11x - 6$ is divided by $(x - 3)$.

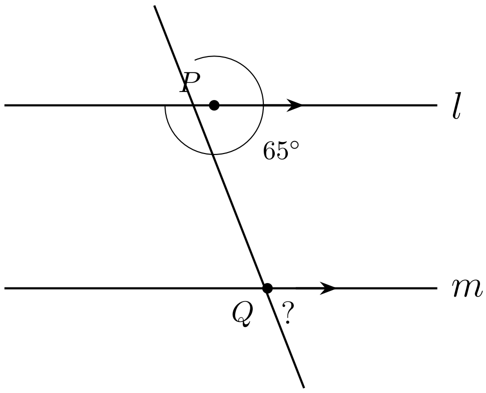
(A) 3

(B) 0

(C) -6

(D) 6

Q6. In the figure below, lines l and m are parallel, cut by a transversal t. One angle at the upper intersection is marked $65°$. What is the measure of the **alternate interior angle** at the lower intersection?



(A) $115°$

(B) $90°$

(C) $65°$

(D) $55°$

Q7. In a right-angled triangle, the two legs measure 8 cm and 15 cm. What is the length of the **hypotenuse**?

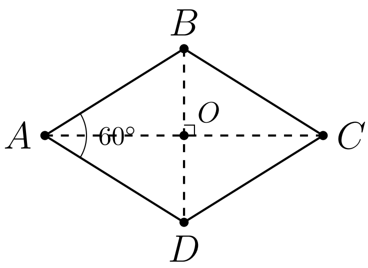
(A) 14 cm

(B) 16 cm

(C) 16.5 cm

(D) 17 cm

Q8. In rhombus $ABCD$ shown below, the angle at A is $60°$. The diagonals bisect both the vertex angles and each other at right angles. What is the measure of the **adjacent angle** of the rhombus (i.e., angle at B)?



(A) $120°$

(B) $60°$

(C) $90°$

(D) $150°$

Q9. Two equal chords PQ and RS are drawn in a circle. The perpendicular distance from the centre to chord PQ is 4 cm. What is the perpendicular distance from the centre to chord RS?

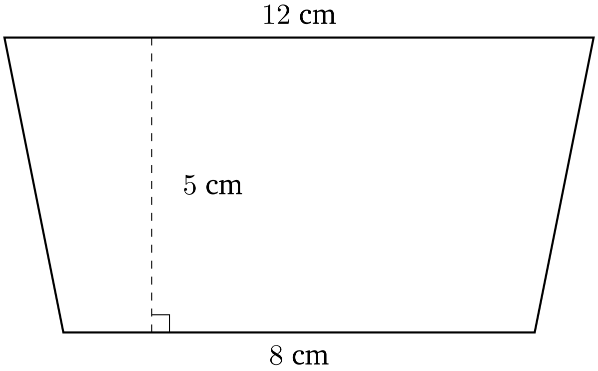
(A) 2 cm

(B) 4 cm

(C) 6 cm

(D) 8 cm

Q10. Find the **area** of the trapezium shown below, with parallel sides 12 cm (top) and 8 cm (bottom), and perpendicular height 5 cm.



(A) 40 cm^2

(B) 48 cm^2

(C) 50 cm^2

(D) 60 cm^2

Q11. Find the **total surface area** of a cone with base radius $r = 5$ cm and slant height $l = 13$ cm. (Use $\pi = 3.14$)

(A) 204.10 cm^2

(B) 251.20 cm^2

(C) 267.90 cm^2

(D) 282.60 cm^2

Q12. Nine observations are written in ascending order: $12, 15, 18, 21, x, 28, 31, 35, 40$. If the **median** is 24, find the value of x.

(A) 24

(B) 22

(C) 26

(D) 20

Q13. A bag contains 4 red balls, 3 blue balls, and 2 green balls. One ball is drawn at random. What is the **probability** of drawing a blue ball?

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

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

(C) $\frac{2}{9}$

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

Q14. In which **quadrant** of the Cartesian plane does the point $(-3,\ 5)$ lie?

(A) Quadrant I $(x > 0,\ y > 0)$

(B) Quadrant IV $(x > 0,\ y < 0)$

(C) Quadrant II $(x < 0,\ y > 0)$

(D) Quadrant III $(x < 0,\ y < 0)$

Q15. Rationalise the denominator of $\frac{1}{\sqrt{7}-\sqrt{2}}$ and simplify. Which of the following is the correct result?

(A) $\frac{\sqrt{7}-\sqrt{2}}{9}$

(B) $\frac{\sqrt{7}-\sqrt{2}}{5}$

(C) $\frac{\sqrt{7}+\sqrt{2}}{3}$

(D) $\frac{\sqrt{7}+\sqrt{2}}{5}$

Detailed Solutions

Q1.

Solution

Concept — Comparing Rational Numbers: Convert all fractions to decimals (or use a common denominator) to determine which is greatest.

Step 1 — Convert to decimals:

$$\frac{5}{8} = 0.625, \qquad \frac{7}{10} = 0.700, \qquad \frac{3}{5} = 0.600, \qquad \frac{11}{20} = 0.550$$

Step 2 — Compare:

$$0.700 > 0.625 > 0.600 > 0.550$$

The greatest value is $0.700 = \frac{7}{10}$.

Why other options are wrong:

- Option A: $\frac{5}{8} = 0.625 < 0.700$
- Option C: $\frac{3}{5} = 0.600 < 0.700$
- Option D: $\frac{11}{20} = 0.550 < 0.700$

Final Answer: $\frac{7}{10}$ **is the greatest rational number.** $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 1

Q2.

Solution

Concept — Perfect Cubes & Cube Roots: A number is a perfect cube if each prime factor appears a multiple of 3 times.

Step 1 — Prime factorisation of 13824:

$$\begin{aligned} 13824 &= 2^1 \times 6912 = 2^2 \times 3456 = 2^3 \times 1728 \\ &= 2^4 \times 864 = 2^5 \times 432 = 2^6 \times 216 \\ &= 2^7 \times 108 = 2^8 \times 54 = 2^9 \times 27 = 2^9 \times 3^3 \end{aligned}$$

Step 2 — Group in triples:

$$13824 = (2^3)^3 \times 3^3 = 8^3 \times 3^3 = (8 \times 3)^3 = 24^3$$

Step 3 — Conclude:

$$\sqrt[3]{13824} = 24$$

Why other options are wrong:

- Option A: $13824 = 24^3$ is a perfect cube, so this statement is false.
- Option B: $22^3 = 10648 \neq 13824$
- Option D: $26^3 = 17576 \neq 13824$

Final Answer: $\sqrt[3]{13824} = 24 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 2

Q3.

Solution

Concept — System of Linear Equations: Translate the word problem into two simultaneous equations, then solve by elimination.

Step 1 — Form equations: Let the larger number be x and the smaller be y.

$$x + y = 35 \quad \cdots (1) \qquad x - y = 7 \quad \cdots (2)$$

Step 2 — Add (1) and (2):

$$2x = 42 \implies x = 21$$

Step 3 — Find y (verification):

$$y = 35 - 21 = 14; \quad \text{Difference: } 21 - 14 = 7.\checkmark$$

Why other options are wrong:

- Option A: 14 is the *smaller* number.
- Option B: If $x = 18$, then $y = 17$; difference $= 1 \neq 7$.
- Option C: If $x = 20$, then $y = 15$; difference $= 5 \neq 7$.

Final Answer: The larger number is 21. $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 3

Q4.

Solution

Concept — Compound Interest Formula:

$$A = P\left(1 + \frac{r}{100}\right)^n, \qquad \text{CI} = A - P$$

Step 1 — Identify values: $P = \text{Rs.}\,8000$, $r = 10\%$, $n = 2$ years.

Step 2 — Calculate amount:

$$A = 8000 \times \left(1 + \frac{10}{100}\right)^2 = 8000 \times (1.1)^2 = 8000 \times 1.21 = \text{Rs.}\,9680$$

Step 3 — Calculate CI:

$$\text{CI} = 9680 - 8000 = \text{Rs.}\,1680$$

Why other options are wrong:

- Option B: Rs. 1600 is the Simple Interest $(8000 \times 10\% \times 2)$, not CI.
- Option C: Rs. 1800 does not match any standard formula with the given values.
- Option D: Rs. 1560 is less than the SI; impossible for compound interest at same rate.

Final Answer: CI $=$ Rs. 1680 $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q 4

Q5.

Solution

Concept — Remainder Theorem: When polynomial $p(x)$ is divided by $(x - a)$, the remainder equals $p(a)$.

Step 1 — Identify a: Divisor is $(x - 3)$, so $a = 3$.

Step 2 — Evaluate $p(3)$:

$$p(3) = (3)^3 - 6(3)^2 + 11(3) - 6 = 27 - 54 + 33 - 6 = 0$$

Interpretation: Remainder $= 0$ means $(x-3)$ is a factor of $p(x)$. Indeed, $p(x) = (x-1)(x-2)(x-3)$, confirming $x = 3$ is a root.

Why other options are wrong:

- Option A: Remainder $= 3$ would require $p(3) = 3$, but $p(3) = 0$.
- Option C: $-6 = p(0)$, the value at $x = 0$, not at $x = 3$.
- Option D: Remainder $= 6$ is not consistent with $p(3) = 0$.

Final Answer: Remainder $= 0 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 5

Q6.

Solution

Concept — Alternate Interior Angles Theorem: When two parallel lines are cut by a transversal, alternate interior angles are **equal**.

Step 1 — Identify the angle pair: The 65° angle at point P (between the parallel lines, on the left side of the transversal) and the unknown angle at point Q (between the parallel lines, on the right side of the transversal) are alternate interior angles.

Step 2 — Apply the theorem:

$$\text{Alternate interior angle at } Q = 65^\circ$$

Why other options are wrong:

- Option A: $115^\circ = 180^\circ - 65^\circ$ is the co-interior (same-side interior) angle at Q, not the alternate interior angle.
- Option B: 90° arises only if the transversal is perpendicular to the parallel lines.
- Option D: 55° has no geometric basis here.

Final Answer: Alternate interior angle $= 65^\circ \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 6

Q7.

Solution

Concept — Pythagoras Theorem: In a right-angled triangle,

$$\text{Hypotenuse}^2 = \text{Base}^2 + \text{Height}^2$$

Step 1 — Substitute:

$$h^2 = 8^2 + 15^2 = 64 + 225 = 289$$

Step 2 — Find hypotenuse:

$$h = \sqrt{289} = 17 \text{ cm}$$

Note: $(8, 15, 17)$ is a Pythagorean triple, as $8^2 + 15^2 = 17^2$.

Why other options are wrong:

- Option A: $14^2 = 196 \neq 289$
- Option B: $16^2 = 256 \neq 289$
- Option C: $16.5^2 = 272.25 \neq 289$

Final Answer: Hypotenuse $= 17$ **cm** $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 7

Q8.

Solution

Concept — Angles in a Rhombus: In a rhombus, opposite angles are equal, and consecutive (adjacent) angles are supplementary $(180°)$.

Step 1 — Given: Angle at $A = 60°$.

Step 2 — Find angle at B (adjacent to A):

$$\angle B = 180° - \angle A = 180° - 60° = 120°$$

Step 3 — Verify all four angles: $\angle A = \angle C = 60°$ (opposite), $\angle B = \angle D = 120°$ (opposite). Sum $= 60 + 120 + 60 + 120 = 360°$. ✓

Why other options are wrong:

- Option B: 60° is the given angle itself (opposite angle, not adjacent).
- Option C: 90° is the angle at which the diagonals intersect at O, not a vertex angle.
- Option D: 150° would give $60 + 150 = 210^\circ \neq 180^\circ$; impossible.

Final Answer: Adjacent angle (at B) $= 120^\circ \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 8

Q9.

Solution

Concept — Equal Chords Equidistant from Centre: In a circle, equal chords are equidistant from the centre. That is, if $PQ = RS$, then the perpendicular distances from the centre to PQ and RS are equal.

Application: Given $PQ = RS$ (equal chords) and perpendicular distance from centre to $PQ = 4$ cm.

$$\therefore \quad \text{Perpendicular distance from centre to } RS = 4 \text{ cm}$$

Why other options are wrong:

- Option A: 2 cm — halving the distance has no basis in the equal-chord theorem.
- Option C: 6 cm — equal chords cannot be at different distances from the centre.
- Option D: 8 cm — same reasoning; contradicts the theorem directly.

Final Answer: Distance $= 4$ cm $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 9

Q10.

Solution

Concept — Area of a Trapezium:

$$\text{Area} = \frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$$

Step 1 — Identify values: Parallel sides: $a = 12$ cm, $b = 8$ cm; height $h = 5$ cm.

Step 2 — Substitute:

$$\text{Area} = \frac{1}{2} \times (12+8) \times 5 = \frac{1}{2} \times 20 \times 5 = 50 \text{ cm}^2$$

Why other options are wrong:

- Option A: $40 = 8 \times 5$; uses only the bottom parallel side, ignoring the top.
- Option B: $48 = 12 \times 4$; uses an incorrect height and only the top side.
- Option D: $60 = 12 \times 5$; uses only the top side without the formula's $\frac{1}{2}$ factor and sum.

Final Answer: Area $= 50$ **cm**$^2 \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 10

Q11.

Solution

Concept — Total Surface Area of a Cone:

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

where r = base radius and l = slant height.

Step 1 — Identify values: $r = 5$ cm, $l = 13$ cm, $\pi = 3.14$.

Step 2 — Substitute:

$$\text{TSA} = 3.14 \times 5 \times (5+13) = 3.14 \times 5 \times 18 = 3.14 \times 90 = 282.60 \text{ cm}^2$$

Why other options are wrong:

- Option A: $204.10 = \pi rl = 3.14 \times 5 \times 13$ — this is only the *curved* surface area, missing the base (πr^2).
- Option B: $251.20 = \pi \times (5)^2 \times \frac{l}{r} \approx 3.14 \times 25 \times 3.2$ — incorrect formula.
- Option C: 267.90 results from an arithmetic error (e.g., using $r + l = 17$ instead of 18).

Final Answer: TSA $= 282.60$ **cm**$^2 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 11

Q12.

Solution

Concept — Median for Odd Number of Observations: For n observations in ascending order, the median is the $\left(\frac{n+1}{2}\right)^{\text{th}}$ term.

Step 1 — Find median position: $n = 9$, so median $=$ the $\frac{9+1}{2} = 5^{\text{th}}$ term.

Step 2 — Identify the 5th term: Data: $12,\ 15,\ 18,\ 21,\ \mathbf{x},\ 28,\ 31,\ 35,\ 40$. The 5th term is x.

Step 3 — Set equal to given median:

$$x = 24$$

Why other options are wrong:

- Option B: $x = 22$ gives median $= 22 \neq 24$.
- Option C: $x = 26$ gives median $= 26 \neq 24$.
- Option D: $x = 20$ breaks the ascending order $(21 > 20)$, making the list invalid.

Final Answer: $x = 24 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 12

Q13.

Solution

Concept — Classical Probability:

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

Step 1 — Count total balls:

$$\text{Total} = 4\ (\text{red}) + 3\ (\text{blue}) + 2\ (\text{green}) = 9$$

Step 2 — Favourable outcomes (blue balls): 3.

Step 3 — Calculate probability:

$$P(\text{blue}) = \frac{3}{9} = \frac{1}{3}$$

Why other options are wrong:

- Option A: $\frac{4}{9}$ is the probability of drawing a *red* ball.
- Option C: $\frac{2}{9}$ is the probability of drawing a *green* ball.
- Option D: $\frac{1}{2}$ implies 4.5 blue balls out of 9, which is not the case.

Final Answer: $P(\textbf{blue}) = \frac{1}{3} \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 13

Q14.

Solution

Concept — Quadrants of the Cartesian Plane:

- Quadrant I: $x > 0,\ y > 0$
- Quadrant II: $x < 0,\ y > 0$
- Quadrant III: $x < 0,\ y < 0$
- Quadrant IV: $x > 0,\ y < 0$

Step 1 — Signs of coordinates of $(-3,\ 5)$: $x = -3 < 0$ and $y = 5 > 0$.

Step 2 — Match to quadrant: $x < 0$ and $y > 0 \Rightarrow$ **Quadrant II.**

Why other options are wrong:

- Option A: Quadrant I needs $x > 0$; but $x = -3 < 0$.
- Option B: Quadrant IV needs $x > 0$ and $y < 0$; neither condition is satisfied.
- Option D: Quadrant III needs $y < 0$; but $y = 5 > 0$.

Final Answer: $(-3, 5)$ **lies in Quadrant II.** $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 14

Q15.

Solution

Concept — Rationalisation of Denominator: Multiply numerator and denominator by the *conjugate* of the denominator to eliminate surds from the denominator.

Step 1 — Identify the conjugate: Conjugate of $(\sqrt{7} - \sqrt{2})$ is $(\sqrt{7} + \sqrt{2})$.

Step 2 — Multiply:

$$\frac{1}{\sqrt{7} - \sqrt{2}} \times \frac{\sqrt{7} + \sqrt{2}}{\sqrt{7} + \sqrt{2}} = \frac{\sqrt{7} + \sqrt{2}}{(\sqrt{7})^2 - (\sqrt{2})^2}$$

Step 3 — Simplify the denominator (difference of squares):

$$(\sqrt{7})^2 - (\sqrt{2})^2 = 7 - 2 = 5$$

Step 4 — Final result:

$$\frac{1}{\sqrt{7} - \sqrt{2}} = \frac{\sqrt{7} + \sqrt{2}}{5}$$

Why other options are wrong:

- Option A: $\dfrac{\sqrt{7} - \sqrt{2}}{9}$ uses the wrong numerator and wrong denominator.
- Option B: $\dfrac{\sqrt{7} - \sqrt{2}}{5}$ keeps the unrealised (non-conjugate) numerator.
- Option C: $\dfrac{\sqrt{7} + \sqrt{2}}{3}$ uses denominator 3; but $7 - 2 = 5$, not 3.

Final Answer: $\dfrac{\sqrt{7} + \sqrt{2}}{5} \Rightarrow \boxed{\text{D}}$

Answer: (D) **Go Back to Q 15**

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	D	4	A	5	B
6	C	7	D	8	A	9	B	10	C
11	D	12	A	13	B	14	C	15	D