TALLENTEX Mathematics

Sample Paper – 3

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

Instructions

- This paper contains **15 MCQ** questions 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 electronic gadgets are **NOT** allowed.

Q1. How many rational numbers exist between $\frac{1}{4}$ and $\frac{1}{2}$?

(A) Zero

(B) Exactly one

(C) Infinitely many

(D) Finitely many but more than one

Q2. Simplify $\frac{2^3 \times 3^2}{6 \times 2}$ and express the result as a power of a single number.

(A) 2^2

(B) 3^1

(C) 6^1

(D) $6^0 \times 6 = 6^1$, i.e., **6**, and the simplified value is 6

Q3. If 12 workers can complete a job in 15 days, how many days will 20 workers take to complete the same job, assuming all workers work at the same rate?

(A) 9 days

(B) 10 days

(C) 18 days

(D) 25 days

Q4. Find the Simple Interest on a principal of Rs. 5000 at a rate of 8% per annum for 3 years.

(A) Rs. 1000

(B) Rs. 1200

(C) Rs. 1500

(D) Rs. 1600

Q5. The zeroes of the polynomial $p(x) = x^2 - 5x + 6$ are:

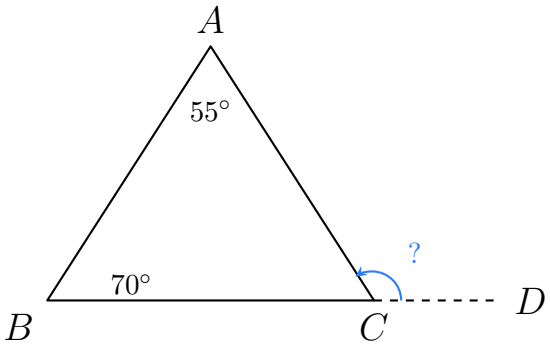
(A) 1 and 6

(B) -2 and -3

(C) 2 and 3

(D) 1 and -6

Q6. In the figure below, triangle ABC has interior angle $\angle BAC = 55^\circ$ and interior angle $\angle ABC = 70^\circ$. Side BC is extended to a point D. What is the measure of the exterior angle $\angle ACD$?



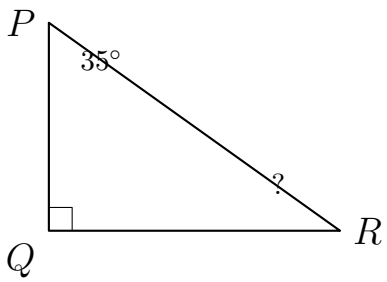
(A) 55°

(B) 70°

(C) 110°

(D) 125°

Q7. In the right triangle PQR shown below, the right angle is at Q and $\angle QPR = 35^\circ$. Find the measure of $\angle PRQ$.



(A) 55°

(B) 35°

(C) 45°

(D) 90°

Q8. In parallelogram $ABCD$, $\angle A = 110^\circ$. Find $\angle C$ and $\angle B$.

(A) $\angle C = 70^\circ$, $\angle B = 110^\circ$

(B) $\angle C = 110^\circ$, $\angle B = 70^\circ$

(C) $\angle C = 110^\circ$, $\angle B = 110^\circ$

(D) $\angle C = 70^\circ$, $\angle B = 70^\circ$

Q9. The angle subtended by a diameter at **any** point on the circle (other than the endpoints of the diameter) is always:

(A) 45°

(B) 60°

(C) 90°

(D) 180°

Q10. Find the area of a circle whose diameter is 14 cm. (Use $\pi = \frac{22}{7}$)

(A) 44 cm^2

(B) 88 cm^2

(C) 132 cm^2

(D) 154 cm^2

Q11. Find the total surface area of a sphere of radius 7 cm. (Use $\pi = \frac{22}{7}$)

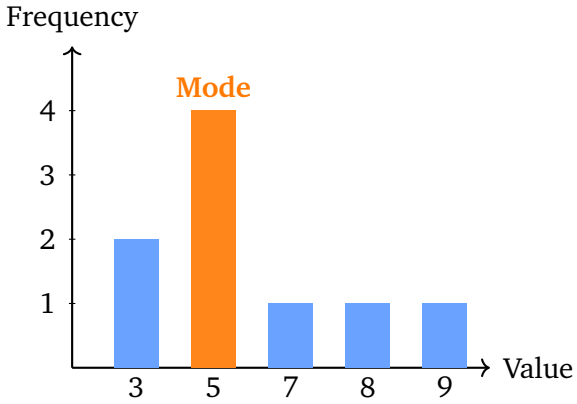
(A) 616 cm^2

(B) 308 cm^2

(C) 154 cm^2

(D) 1232 cm^2

Q12. The following bar chart shows the frequency of each value in the data set: $3, 5, 7, 5, 3, 5, 8, 3, 5, 9$. What is the **mode** of this data?



(A) 3

(B) 5

(C) 7

(D) 8

Q13. Two fair coins are tossed simultaneously. What is the probability of getting **exactly one head**?

(A) $\frac{1}{4}$

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

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

(D) 1

Q14. In which quadrant does the point $(-2, -3)$ lie?

(A) Quadrant I

(B) Quadrant II

(C) Quadrant IV

(D) Quadrant III

Q15. Express $0.\overline{3}$ (i.e., $0.333\ldots$) as a fraction in its lowest terms.

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

(B) $\frac{3}{9}$

(C) $\frac{1}{9}$

(D) $\frac{3}{10}$

Detailed Solutions

Q1.

Solution

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

Step 1 — Identify the two numbers: We are looking between $\frac{1}{4} = 0.25$ and $\frac{1}{2} = 0.5$.

Step 2 — Apply density property: We can always find a new rational number by computing their mean: $\frac{\frac{1}{4} + \frac{1}{2}}{2} = \frac{3}{8}$. This process can be repeated without end, so there are **infinitely many** rational numbers between them.

Why other options are wrong:

- Option A: Zero — Incorrect; rational numbers are dense, so there is never "zero" between two distinct ones.
- Option B: Exactly one — Incorrect; one can always find more by the mean method.
- Option D: Finitely many — Incorrect; the count is genuinely infinite.

Final Answer: Infinitely many $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q 1

Q2.

Solution

Concept — Exponents and Powers: Simplify using prime factorisation and laws of exponents.

Step 1 — Write numerator and denominator in prime form:

$$\frac{2^3 \times 3^2}{6 \times 2} = \frac{8 \times 9}{6 \times 2} = \frac{72}{12} = 6$$

Step 2 — Express as a power: $6 = 6^1$.

Why other options are wrong:

- Option A: $2^2 = 4$ — Incorrect.

- Option B: $3^1 = 3$ — Incorrect.
- Option C: Written as 6^1 but option C states just 6^1 without clarification — Option D provides the complete correct working and result.

Final Answer: 6 (i.e., 6^1) $\Rightarrow$ D

Answer: (D) Go Back to Q 2

Q3.

Solution

Concept — Inverse Proportion: More workers $\Rightarrow$ fewer days. Workers and days are inversely proportional.

Step 1 — Use inverse proportion formula:

$$\text{Workers}_1 \times \text{Days}_1 = \text{Workers}_2 \times \text{Days}_2$$

$$12 \times 15 = 20 \times d \implies d = \frac{180}{20} = 9 \text{ days}$$

Why other options are wrong:

- Option B: 10 days — Incorrect calculation.
- Option C: 18 days — This would result from direct proportion (wrong relationship).
- Option D: 25 days — Incorrect; more workers should reduce time, not increase it.

Final Answer: 9 days $\Rightarrow$ A

Answer: (A) Go Back to Q 3

Q4.

Solution

Concept — Simple Interest: $\text{SI} = \dfrac{P \times R \times T}{100}$

Step 1 — Substitute values:

$$\text{SI} = \frac{5000 \times 8 \times 3}{100} = \frac{1{,}20{,}000}{100} = \text{Rs. } 1200$$

Why other options are wrong:

- Option A: Rs. 1000 — Would correspond to $T = 2.5$ years or a lower rate.
- Option C: Rs. 1500 — Incorrect computation.
- Option D: Rs. 1600 — Would require a higher rate or longer duration.

Final Answer: Rs. 1200 $\Rightarrow$ B

Answer: (B) Go Back to Q 4

Q5.

Solution

Concept — Zeroes of a Polynomial: The zeroes of $p(x) = x^2 - 5x + 6$ are values of x for which $p(x) = 0$.

Step 1 — Factorise:

$$x^2 - 5x + 6 = (x - 2)(x - 3) = 0 \implies x = 2 \text{ or } x = 3$$

Step 2 — Verify: $p(2) = 4 - 10 + 6 = 0$ ✓; $p(3) = 9 - 15 + 6 = 0$ ✓

Why other options are wrong:

- Option A: 1 and 6 — $p(1) = 1 - 5 + 6 = 2 \neq 0$.
- Option B: -2 and -3 — These are zeroes of $x^2 + 5x + 6$, not the given polynomial.
- Option D: 1 and -6 — $p(-6) \neq 0$.

Final Answer: 2 and 3 $\Rightarrow$ C

Answer: (C) Go Back to Q 5

Q6.

Solution

Concept — Exterior Angle Theorem: An exterior angle of a triangle equals the sum of the two non-adjacent interior angles.

Step 1 — Identify interior angles: $\angle BAC = 55°$, $\angle ABC = 70°$.

Step 2 — Apply the theorem:

$$\angle ACD = \angle BAC + \angle ABC = 55° + 70° = 125°$$

Verification: Third interior angle $\angle ACB = 180^\circ - 55^\circ - 70^\circ = 55^\circ$. Exterior angle $= 180^\circ - 55^\circ = 125^\circ$ ✓

Why other options are wrong:

- Option A: 55° — This is just one interior angle.
- Option B: 70° — This is just the other interior angle.
- Option C: 110° — Incorrect sum.

Final Answer: $125^\circ \Rightarrow$ D

Answer: (D) Go Back to Q 6

Q7.

Solution

Concept — Angle Sum Property of a Triangle: The sum of all angles of a triangle is 180°.

Step 1 — Write known angles: $\angle Q = 90^\circ$ (right angle), $\angle P = 35^\circ$.

Step 2 — Find the third angle:

$$\angle P + \angle Q + \angle R = 180^\circ$$

$$35^\circ + 90^\circ + \angle R = 180^\circ \implies \angle R = 180^\circ - 125^\circ = 55^\circ$$

Why other options are wrong:

- Option B: 35° — That is $\angle P$, not $\angle R$.
- Option C: 45° — Would require both acute angles to be 45° (only true in an isosceles right triangle).
- Option D: 90° — A triangle can have only one right angle.

Final Answer: $55^\circ \Rightarrow$ A

Answer: (A) Go Back to Q 7

Q8.

Solution

Concept — Properties of a Parallelogram:

- Opposite angles are equal: $\angle A = \angle C$.
- Consecutive angles are supplementary: $\angle A + \angle B = 180^\circ$.

Step 1 — Find $\angle C$:

$$\angle C = \angle A = 110^\circ \quad \text{(opposite angles)}$$

Step 2 — Find $\angle B$:

$$\angle B = 180^\circ - \angle A = 180^\circ - 110^\circ = 70^\circ$$

Why other options are wrong:

- Option A: $\angle C = 70^\circ$ — Wrong; opposite angles in a parallelogram are equal, not supplementary.
- Option C: $\angle B = 110^\circ$ — Consecutive angles cannot both be 110° (they must sum to 180°).
- Option D: $\angle C = \angle B = 70^\circ$ — $\angle C$ must equal $\angle A = 110^\circ$.

Final Answer: $\angle C = 110^\circ$, $\angle B = 70^\circ \Rightarrow$ B

Answer: (B) Go Back to Q 8

Q9.

Solution

Concept — Angle in a Semicircle (Thales' Theorem): The angle subtended by a diameter at any point on the circle is always 90°.

Explanation: If AB is a diameter and P is any point on the circle (other than A and B), then $\angle APB = 90^\circ$. This follows from the theorem that the angle at the centre is twice the angle at the circumference, and the angle at the centre subtended by a diameter is 180°.

Why other options are wrong:

- Option A: 45° — Incorrect; this would only be true for a chord subtending 90° at the centre.

- Option B: 60° — Incorrect.
- Option D: 180° — That is the angle at the centre, not at the circumference.

Final Answer: $90^\circ \Rightarrow$ C

Answer: (C) Go Back to Q 9

Q10.

Solution

Concept — Area of a Circle: $A = \pi r^2$

Step 1 — Find the radius: Diameter $= 14$ cm $\Rightarrow r = 7$ cm.

Step 2 — Calculate the area:

$$A = \pi r^2 = \frac{22}{7} \times 7^2 = \frac{22}{7} \times 49 = 22 \times 7 = 154 \text{ cm}^2$$

Why other options are wrong:

- Option A: 44 cm^2 — This is the circumference ($2\pi r$), not the area.
- Option B: 88 cm^2 — Incorrect computation.
- Option C: 132 cm^2 — Incorrect computation.

Final Answer: 154 cm^2 $\Rightarrow$ D

Answer: (D) Go Back to Q 10

Q11.

Solution

Concept — Surface Area of a Sphere: SA $= 4\pi r^2$

Step 1 — Substitute values:

$$\text{SA} = 4 \times \frac{22}{7} \times 7^2 = 4 \times \frac{22}{7} \times 49 = 4 \times 22 \times 7 = 4 \times 154 = 616 \text{ cm}^2$$

Why other options are wrong:

- Option B: 308 cm^2 — This equals $2\pi r^2$ (half the surface area, i.e., one hemisphere's curved surface area).
- Option C: 154 cm^2 — This is πr^2 (area of a circle with $r = 7$).

- Option D: 1232 cm^2 — Twice the correct answer; likely from forgetting πr^2 not πr^3.

Final Answer: 616 cm^2 $\Rightarrow$ A

Answer: (A) Go Back to Q 11

Q12.

Solution

Concept — Mode: The mode is the value that appears most frequently in a data set.

Step 1 — Count frequencies:

Data: $3, 5, 7, 5, 3, 5, 8, 3, 5, 9$

Value	Frequency
3	3
5	4
7	1
8	1
9	1

Step 2 — Identify maximum frequency: Value 5 appears 4 times — the highest frequency. So Mode $= 5$.

Note: The bar chart in the question clearly shows the tallest bar at value 5.

Why other options are wrong:

- Option A: 3 — Appears 3 times, less than 5.
- Option C: 7 — Appears only once.
- Option D: 8 — Appears only once.

Final Answer: 5 $\Rightarrow$ B

Answer: (B) Go Back to Q 12

Q13.

Solution

Concept — Probability: $P(\text{event}) = \dfrac{\text{Number of favourable outcomes}}{\text{Total outcomes}}$

Step 1 — Sample space when two coins are tossed:

$$S = \{HH,\ HT,\ TH,\ TT\} \quad \Rightarrow \quad |S| = 4$$

Step 2 — Favourable outcomes (exactly one head): HT and $TH \Rightarrow 2$ outcomes.

Step 3 — Compute probability:

$$P(\text{exactly one head}) = \frac{2}{4} = \frac{1}{2}$$

Why other options are wrong:

- Option A: $\frac{1}{4}$ — This is the probability of getting exactly 2 heads (HH only).
- Option B: $\frac{3}{4}$ — This is the probability of getting *at least one* head.
- Option D: 1 — Would mean the event is certain, which it is not.

Final Answer: $\frac{1}{2} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 13

Q14.

Solution

Concept — Quadrants in the Coordinate Plane:

- Quadrant I: $(+, +)$
- Quadrant II: $(-, +)$
- Quadrant III: $(-, -)$
- Quadrant IV: $(+, -)$

Step 1 — Check signs of $(-2, -3)$**:** $x = -2 < 0$, $y = -3 < 0$. Both negative $\Rightarrow$ **Quadrant III**.

Why other options are wrong:

- Option A: Quadrant I — Requires both coordinates positive.
- Option B: Quadrant II — Requires $x < 0$, $y > 0$.

- Option C: Quadrant IV — Requires $x > 0$, $y < 0$.

Final Answer: Quadrant III $\Rightarrow$ D

Answer: (D) Go Back to Q 14

Q15.

Solution

Concept — Converting Recurring Decimals to Fractions:

Step 1 — Let $x = 0.\overline{3} = 0.333\ldots$

Step 2 — Multiply both sides by 10:

$$10x = 3.333\ldots$$

Step 3 — Subtract:

$$10x - x = 3.333\ldots - 0.333\ldots \implies 9x = 3 \implies x = \frac{3}{9} = \frac{1}{3}$$

Why other options are wrong:

- Option B: $\frac{3}{9}$ — Correct value but not in lowest terms (not simplified); $\frac{1}{3}$ is the fully reduced form.
- Option C: $\frac{1}{9}$ — This equals $0.\overline{1} = 0.111\ldots$, not $0.\overline{3}$.
- Option D: $\frac{3}{10}$ — This equals 0.3 (terminating), not $0.\overline{3}$.

Final Answer: $\frac{1}{3}$ $\Rightarrow$ A

Answer: (A) Go Back to Q 15

Answer Key

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