TALLENTEX Mathematics

Sample Paper – 7

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**.
- **No** mobile phones, calculators, or electronic gadgets are allowed in the examination hall.

Q1. Rationalise the denominator of $\dfrac{1}{\sqrt{5}-\sqrt{3}}$.

(A) $\dfrac{\sqrt{5}-\sqrt{3}}{2}$

(B) $\dfrac{\sqrt{5}+\sqrt{3}}{4}$

(C) $\dfrac{\sqrt{5}+\sqrt{3}}{2}$

(D) $\dfrac{\sqrt{5}-\sqrt{3}}{4}$

Q2. Simplify: $\left(\dfrac{2^{-2}}{3^{-3}}\right)^{-1}$

(A) $\dfrac{27}{4}$

(B) $\dfrac{9}{4}$

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

(D) $\dfrac{4}{27}$

Q3. The 5-digit number 28_43 is divisible by 9. What digit replaces the blank?

(A) 1

(B) 3

(C) 5

(D) 7

Q4. A television is sold for Rs. 18,000 at a loss of 10%. What was the cost price?

(A) Rs. 19,000

(B) Rs. 20,000

(C) Rs. 21,000

(D) Rs. 22,000

Q5. If α and β are the zeroes of $p(x) = 2x^2 - 7x + 3$, find $\alpha + \beta$.

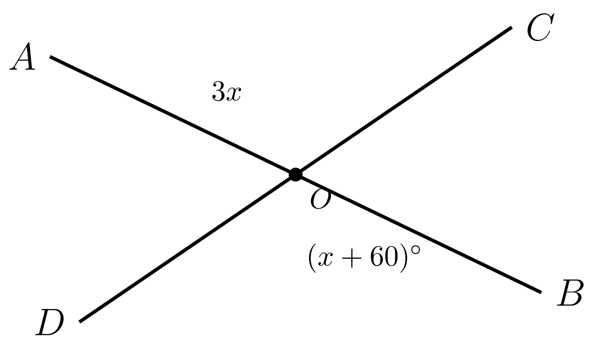
(A) $\frac{3}{2}$

(B) 2

(C) $\frac{7}{2}$

(D) 5

Q6. In the figure, two straight lines AB and CD intersect at O. If $\angle AOC = 3x$ and $\angle BOD = (x + 60)^\circ$, find x.



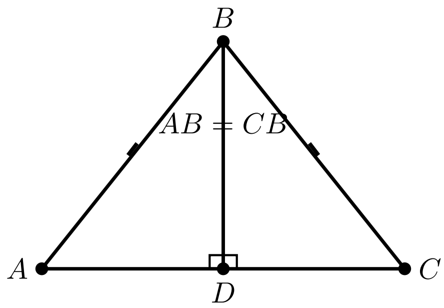
(A) 15°

(B) 20°

(C) 25°

(D) 30°

Q7. In the figure, BD is common to both $\triangle ABD$ and $\triangle CBD$. Given $AB = CB$ and $\angle ADB = \angle CDB = 90°$, which congruence criterion proves $\triangle ABD \cong \triangle CBD$?



(A) RHS

(B) SAS

(C) ASA

(D) SSS

Q8. In parallelogram $ABCD$, diagonals AC and BD bisect each other at O. If $AC = 12$ cm and $BD = 10$ cm, find $AO + BO$.

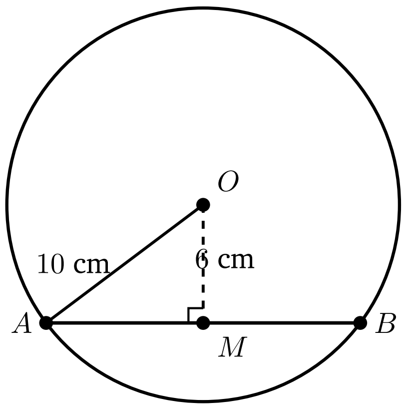
(A) 10 cm

(B) 11 cm

(C) 12 cm

(D) 13 cm

Q9. In a circle of radius 10 cm, the perpendicular distance from the centre to a chord is 6 cm. Find the length of the chord.



(A) 12 cm

(B) 14 cm

(C) 16 cm

(D) 18 cm

Q10. Find the area of a triangle with sides 9 cm, 10 cm, and 11 cm.

(A) $25\sqrt{2}$ cm^2

(B) $28\sqrt{2}$ cm^2

(C) $29\sqrt{2}$ cm^2

(D) $30\sqrt{2}$ cm^2

Q11. Find the total surface area of a cuboid with dimensions 8 cm $\times$ 5 cm $\times$ 3 cm.

(A) 158 cm^2

(B) 168 cm^2

(C) 178 cm^2

(D) 188 cm^2

Q12. The weights (in kg) of six students are: $42,\ 38,\ 55,\ 60,\ 45,\ 51$. Find the range.

(A) 18

(B) 22

(C) 25

(D) 28

Q13. A bag contains 4 red, 6 blue, and 5 green balls. A ball is drawn at random. What is the probability of drawing a blue ball?

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

(B) $\frac{4}{15}$

(C) $\frac{2}{5}$

(D) $\frac{7}{15}$

Q14. Which of the following points lies in the third quadrant?

(A) $(3, -4)$

(B) $(-2, 5)$

(C) $(1, 7)$

(D) $(-3, -6)$

Q15. If $x + \frac{1}{x} = 4$, find the value of $x^2 + \frac{1}{x^2}$.

(A) 14

(B) 15

(C) 16

(D) 18

Detailed Solutions

Q1.

Solution

Concept — Number Systems (Rationalisation): Rationalisation of the denominator means multiplying numerator and denominator by the conjugate of the denominator.

Step 1 — Identify the conjugate. The conjugate of $(\sqrt{5}-\sqrt{3})$ is $(\sqrt{5}+\sqrt{3})$.

Step 2 — Multiply numerator and denominator by the conjugate.

$$\frac{1}{\sqrt{5}-\sqrt{3}} \times \frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}} = \frac{\sqrt{5}+\sqrt{3}}{(\sqrt{5})^2-(\sqrt{3})^2} = \frac{\sqrt{5}+\sqrt{3}}{5-3} = \frac{\sqrt{5}+\sqrt{3}}{2}.$$

Why other options are wrong:

- Option A: $\dfrac{\sqrt{5}-\sqrt{3}}{2}$ has $-\sqrt{3}$ in the numerator (uses wrong conjugate).
- Option B: $\dfrac{\sqrt{5}+\sqrt{3}}{4}$ has denominator 4 (incorrect difference of squares).
- Option D: $\dfrac{\sqrt{5}-\sqrt{3}}{4}$ has both wrong sign and wrong denominator.

Final Answer: $\dfrac{\sqrt{5}+\sqrt{3}}{2} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 1

Q2.

Solution

Concept — Exponents: $\left(\frac{a}{b}\right)^{-1} = \frac{b}{a}$ and $a^{-n} = \frac{1}{a^n}$.

Step 1 — Apply the negative exponent to flip the fraction.

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

Step 2 — Convert negative exponents.

$$\frac{3^{-3}}{2^{-2}} = \frac{1/3^3}{1/2^2} = \frac{2^2}{3^3} = \frac{4}{27}.$$

Why other options are wrong:

- Option A: $\frac{27}{4}$ is the reciprocal of the correct answer (forgetting the outer $^{-1}$).
- Option B: $\frac{9}{4}$ uses 3^2 instead of 3^3 in the denominator.
- Option C: $\frac{4}{9}$ uses 3^2 instead of 3^3.

Final Answer: $\frac{4}{27} \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 2

Q3.

Solution

Concept — Playing with Numbers (Divisibility by 9): A number is divisible by 9 if and only if the sum of its digits is divisible by 9.

Step 1 — Find the known digit sum. Known digits of 28_43: $2 + 8 + 4 + 3 = 17$.

Step 2 — Find the missing digit d. Total sum $= 17 + d$. For divisibility by 9: $17 + d = 18 \Rightarrow d = 1$. (The next multiple, 27, would need $d = 10$, which is impossible for a single digit.)

Verify: $28143 \div 9 = 3127$. ✓

Why other options are wrong:

- Option B: $d = 3$ gives digit sum 20 (not divisible by 9).
- Option C: $d = 5$ gives digit sum 22 (not divisible by 9).
- Option D: $d = 7$ gives digit sum 24 (not divisible by 9).

Final Answer: Missing digit $= 1 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 3

Q4.

Solution

Concept — Comparing Quantities (Loss%): When an article is sold at a loss, $\text{SP} = \text{CP} \times \left(1 - \frac{\text{Loss\%}}{100}\right)$.

Step 1 — Set up the equation.

$$18000 = \text{CP} \times \left(1 - \frac{10}{100}\right) = \text{CP} \times 0.9.$$

Step 2 — Solve for CP.

$$\text{CP} = \frac{18000}{0.9} = 20000.$$

Verify: Loss $= 20000 - 18000 = 2000$; Loss% $= \frac{2000}{20000} \times 100 = 10\%$. ✓

Why other options are wrong:

- Option A: Rs. 19,000: $19000 \times 0.9 = 17100 \neq 18000$.
- Option C: Rs. 21,000: $21000 \times 0.9 = 18900 \neq 18000$.
- Option D: Rs. 22,000: $22000 \times 0.9 = 19800 \neq 18000$.

Final Answer: Cost price = Rs. 20,000 $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 4

Q5.

Solution

Concept — Polynomials (Zeroes and Coefficients): For a quadratic $p(x) = ax^2 + bx + c$ with zeroes α and β, the sum of zeroes is $\alpha + \beta = -\frac{b}{a}$.

Step 1 — Identify the coefficients. $p(x) = 2x^2 - 7x + 3$: here $a = 2$, $b = -7$, $c = 3$.

Step 2 — Apply the formula.

$$\alpha + \beta = -\frac{b}{a} = -\frac{-7}{2} = \frac{7}{2}.$$

Verify by factoring: $2x^2 - 7x + 3 = (2x - 1)(x - 3)$, zeroes $\frac{1}{2}$ and 3; sum $= \frac{1}{2} + 3 = \frac{7}{2}$. ✓

Why other options are wrong:

- Option A: $\frac{3}{2} = \frac{c}{a}$ is the product of zeroes, not the sum.
- Option B: 2 has no basis from the formula.
- Option D: 5 is incorrect.

Final Answer: $\alpha + \beta = \frac{7}{2} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 5

Q6.

Solution

Concept — Lines and Angles (Vertically Opposite Angles): Vertically opposite angles formed at the intersection of two straight lines are equal.

Step 1 — Identify the vertically opposite angles. $\angle AOC$ and $\angle BOD$ are vertically opposite angles, so $\angle AOC = \angle BOD$.

Step 2 — Set up and solve the equation.

$$3x = x + 60^\circ \implies 2x = 60^\circ \implies x = 30^\circ.$$

Verify: $\angle AOC = 3(30) = 90^\circ$; $\angle BOD = 30 + 60 = 90^\circ$. ✓

Why other options are wrong:

- Option A: $x = 15$: $3(15) = 45^\circ \neq 15 + 60 = 75^\circ$.
- Option B: $x = 20$: $3(20) = 60^\circ \neq 20 + 60 = 80^\circ$.
- Option C: $x = 25$: $3(25) = 75^\circ \neq 25 + 60 = 85^\circ$.

Final Answer: $x = 30^\circ \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 6

Q7.

Solution

Concept — Triangles (RHS Congruence): Two right-angled triangles are congruent by RHS (Right angle – Hypotenuse – Side) if the hypotenuse and one side of one triangle equal the hypotenuse and the corresponding side of the other.

Step 1 — List the matching parts in $\triangle ABD$ and $\triangle CBD$.

- $\angle ADB = \angle CDB = 90^\circ$ (right angles at D).
- $AB = CB$ (equal hypotenuses, given).
- $BD = BD$ (common side).

Step 2 — Conclude. All three conditions of RHS are satisfied $\Rightarrow$ $\triangle ABD \cong$

$\triangle CBD$ by **RHS**.

Why other options are wrong:

- Option B (SAS): requires two sides and the *included* angle; the right angle at D is not between the given sides BD and AB.
- Option C (ASA): requires two angles and the included side; the third pair of angles is not given.
- Option D (SSS): requires all three sides equal; side $AD = CD$ is not given.

Final Answer: RHS (Right angle – Hypotenuse – Side) $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 7

Q8.

Solution

Concept — Quadrilaterals (Parallelogram Diagonals): The diagonals of a parallelogram bisect each other, so each diagonal is divided into two equal halves at the point of intersection.

Step 1 — Find AO.

$$AO = \frac{AC}{2} = \frac{12}{2} = 6 \text{ cm}.$$

Step 2 — Find BO.

$$BO = \frac{BD}{2} = \frac{10}{2} = 5 \text{ cm}.$$

Step 3 — Add.

$$AO + BO = 6 + 5 = 11 \text{ cm}.$$

Why other options are wrong:

- Option A: $10 = BD$ (the full diagonal, not BO).
- Option C: $12 = AC$ (the full diagonal, not AO).
- Option D: 13 has no basis.

Final Answer: $AO + BO = 11$ cm $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 8

Q9.

Solution

Concept — Circles (Perpendicular from Centre to Chord): The perpendicular from the centre of a circle to a chord bisects the chord. Use Pythagoras in the resulting right triangle.

Step 1 — Set up the right triangle. Let M be the foot of the perpendicular from O to chord AB. Then $OM = 6$ cm and $OA = 10$ cm (radius).

Step 2 — Apply the Pythagorean theorem.

$$AM = \sqrt{OA^2 - OM^2} = \sqrt{100 - 36} = \sqrt{64} = 8 \text{ cm}.$$

Step 3 — Find the chord length. Since OM bisects AB: $AB = 2 \times AM = 2 \times 8 = 16$ cm.

Why other options are wrong:

- Option A: $12 = 2 \times 6$ (uses only the perpendicular distance, not Pythagoras).
- Option B: 14 has no arithmetical basis.
- Option D: 18 arises from arithmetic error.

Final Answer: Length of chord $= 16$ cm $\Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 9

Q10.

Solution

Concept — Heron's Formula: For a triangle with sides a, b, c and semi-perimeter $s = \dfrac{a+b+c}{2}$:

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}.$$

Step 1 — Compute the semi-perimeter. $s = \dfrac{9+10+11}{2} = \dfrac{30}{2} = 15.$

Step 2 — Apply Heron's formula.

$$\text{Area} = \sqrt{15(15-9)(15-10)(15-11)} = \sqrt{15 \times 6 \times 5 \times 4}.$$

Step 3 — Simplify. $15 \times 6 = 90$; $5 \times 4 = 20$; $90 \times 20 = 1800$; $\sqrt{1800} = \sqrt{900 \times 2} = 30\sqrt{2}$ cm^2.

Why other options are wrong:

- Option A: $25\sqrt{2}$: $(25)^2 \times 2 = 1250 \neq 1800$.
- Option B: $28\sqrt{2}$: $(28)^2 \times 2 = 1568 \neq 1800$.
- Option C: $29\sqrt{2}$: $(29)^2 \times 2 = 1682 \neq 1800$.

Final Answer: Area $= 30\sqrt{2}$ cm$^2 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 10

Q11.

Solution

Concept — Surface Areas and Volumes (Cuboid): Total Surface Area of a cuboid $= 2(lb + bh + hl)$.

Step 1 — Identify the dimensions. $l = 8$ cm, $b = 5$ cm, $h = 3$ cm.

Step 2 — Substitute and compute.

$$\text{TSA} = 2(8 \times 5 + 5 \times 3 + 3 \times 8) = 2(40 + 15 + 24) = 2 \times 79 = 158 \text{ cm}^2.$$

Why other options are wrong:

- Option B: 168 would require the sum of products to equal 84, but $(40 + 15 + 24) = 79$.
- Option C: 178 would require the sum of products to equal 89.
- Option D: 188 would require the sum of products to equal 94.

Final Answer: TSA $= 158$ cm$^2 \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q 11

Q12.

Solution

Concept — Statistics (Range): Range $=$ Maximum value $-$ Minimum value.

Step 1 — Identify the maximum and minimum. Data: $42, 38, 55, 60, 45, 51$. Maximum $= 60$, Minimum $= 38$.

Step 2 — Compute the range.

$$\text{Range} = 60 - 38 = 22.$$

Why other options are wrong:

- Option A: $18 = 60 - 42$ (uses 42 as the minimum instead of 38).
- Option C: 25 has no basis from this data.
- Option D: 28 has no basis from this data.

Final Answer: Range $= 22 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q 12

Q13.

Solution

Concept — Probability: $P(\text{event}) = \dfrac{\text{Favourable outcomes}}{\text{Total outcomes}}$.

Step 1 — Count total balls and favourable outcomes. Total balls $= 4+6+5 = 15$. Blue balls $= 6$.

Step 2 — Calculate probability.

$$P(\text{blue}) = \frac{6}{15} = \frac{2}{5}.$$

Why other options are wrong:

- Option A: $\frac{1}{3} = \frac{5}{15}$ corresponds to green balls, not blue.
- Option B: $\frac{4}{15}$ corresponds to red balls.
- Option D: $\frac{7}{15}$ — there are only 6 blue balls, not 7.

Final Answer: $P(\text{blue}) = \frac{2}{5} \Rightarrow \boxed{\text{C}}$

Answer: (C) Go Back to Q 13

Q14.

Solution

Concept — Coordinate Geometry (Quadrants): In the Cartesian plane, the third quadrant contains points where both x and y are negative ($x < 0$, $y < 0$).

Step 1 — Check each option.

- Option A: $(3, -4)$: $x > 0$, $y < 0 \Rightarrow$ fourth quadrant.
- Option B: $(-2, 5)$: $x < 0$, $y > 0 \Rightarrow$ second quadrant.
- Option C: $(1, 7)$: $x > 0$, $y > 0 \Rightarrow$ first quadrant.
- Option D: $(-3, -6)$: $x < 0$, $y < 0 \Rightarrow$ **third quadrant**. ✓

Why other options are wrong: Options A, B, and C lie in the fourth, second, and first quadrants respectively.

Final Answer: $(-3, -6)$ lies in the third quadrant $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q 14

Q15.

Solution

Concept — Algebraic Expressions: Use the identity $\left(x + \frac{1}{x}\right)^2 = x^2 + 2 + \frac{1}{x^2}$.

Step 1 — Square both sides of the given equation. Given $x + \frac{1}{x} = 4$. Squaring:

$$\left(x + \frac{1}{x}\right)^2 = 16.$$

Step 2 — Apply the identity and solve.

$$x^2 + 2 + \frac{1}{x^2} = 16 \implies x^2 + \frac{1}{x^2} = 16 - 2 = 14.$$

Why other options are wrong:

- Option B: 15 would need $\left(x + \frac{1}{x}\right)^2 = 17$, but $4^2 = 16$.
- Option C: 16 forgets to subtract the 2 from the identity.
- Option D: 18 would need $\left(x + \frac{1}{x}\right)^2 = 20$.

Final Answer: $x^2 + \frac{1}{x^2} = 14 \Rightarrow \boxed{\text{A}}$

$\boxed{\textbf{Answer: (A)}}$ **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