NMMS Gujarat Mathematics

Sample Paper – 6

Duration: 20 Minutes **Maximum Marks: 20**

Instructions

- This paper contains **20** Multiple Choice Questions (Single Correct Answer), modelled on the Mathematics portion of **NMMS Gujarat** (National Means-cum-Merit Scholarship).
- Each correct answer carries **+1 mark**. There is **no negative marking** for incorrect or unattempted answers.
- Only **one** option is correct per question.
- Syllabus level: **Class 7 & 8 Mathematics — NCERT / GSEB curriculum.**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited during the examination.

Q1. Find the LCM of 12, 18, and 24.

(A) 36

(B) 72

(C) 96

(D) 144

Q2. What is the smallest four-digit number that is a perfect square?

(A) 961

(B) 1000

(C) 1024

(D) 1089

Q3. Find the cube root of -3375.

(A) -21

(B) -20

(C) -18

(D) -15

Q4. Simplify: $2^{-3} \times 4^2$

(A) 2

(B) 4

(C) 8

(D) 16

Q5. Solve for x: $2x + 5 = 3x - 7$

(A) $x = 2$

(B) $x = 7$

(C) $x = 12$

(D) $x = 15$

Q6. If $a - b = 7$ and $ab = 12$, find the value of $a^2 + b^2$.

(A) 49

(B) 61

(C) 85

(D) 73

Q7. Factorize completely: $x^2 - 5x + 6$

(A) $(x - 2)(x - 3)$

(B) $(x + 2)(x - 3)$

(C) $(x - 1)(x - 6)$

(D) $(x + 1)(x - 6)$

Q8. Evaluate $3a^2 - 2b + c$ for $a = 2$, $b = 3$, $c = 1$.

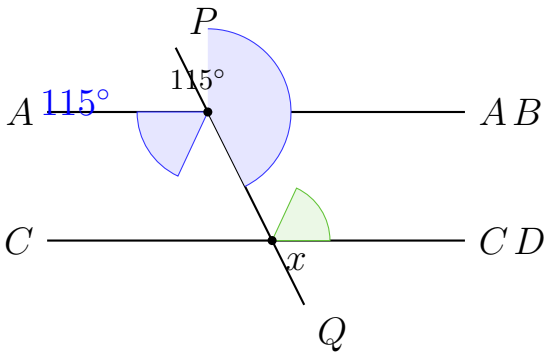
(A) 5

(B) 7

(C) 9

(D) 11

Q9. In the figure, lines $AB \parallel CD$ are cut by a transversal PQ. The angle marked $\angle APQ = 115^\circ$. Find the co-interior angle $\angle DQP$.



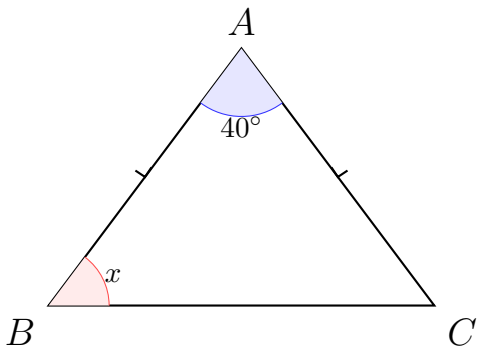
(A) 115°

(B) 75°

(C) 55°

(D) 65°

Q10. In isoceles triangle ABC, $AB = AC$ and $\angle BAC = 40^\circ$. Find $\angle ABC$.



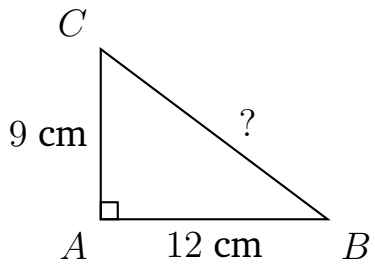
(A) 70°

(B) 60°

(C) 80°

(D) 55°

Q11. In a right-angled triangle, the two legs are 9 cm and 12 cm. Find the length of the hypotenuse.



(A) 13 cm

(B) 14 cm

(C) 15 cm

(D) 21 cm

Q12. The diagonals of a rhombus bisect each other at an angle of:

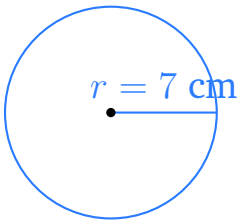
(A) 45°

(B) 90°

(C) 60°

(D) They do not bisect each other

Q13. Find the area of a circle with radius 7 cm. $\left(\pi = \frac{22}{7}\right)$



(A) 154 cm^2

(B) 44 cm^2

(C) 49 cm^2

(D) 176 cm^2

Q14. Find the total surface area of a cuboid with length 10 cm, breadth 8 cm, and height 6 cm.

(A) 188 cm^2

(B) 240 cm^2

(C) 320 cm^2

(D) 376 cm^2

Q15. Find the area of a rhombus whose diagonals are 16 cm and 12 cm.

(A) 48 cm^2

(B) 72 cm^2

(C) 96 cm^2

(D) 192 cm^2

Q16. A shirt marked at Rs. 800 is sold at a 15% discount. Find the selling price.

(A) Rs. 640

(B) Rs. 680

(C) Rs. 720

(D) Rs. 760

Q17. A trader sold an article for Rs. 1350, incurring a loss of 10%. Find the cost price.

(A) Rs. 1500

(B) Rs. 1215

(C) Rs. 1400

(D) Rs. 1485

Q18. Calculate the Amount (Principal $+$ Simple Interest) when the principal is Rs. 5000, rate is 10% p.a., and time is 2 years.

(A) Rs. 5500

(B) Rs. 5800

(C) Rs. 5900

(D) Rs. 6000

Q19. Find the median of the following data: 3, 7, 8, 11, 14

(A) 7

(B) 7.5

(C) 8

(D) 9

Q20. Find the range of the data set: 5, 12, 8, 20, 15, 3

(A) 15

(B) 17

(C) 20

(D) 5

Detailed Solutions

Q1.

Solution

Concept — Least Common Multiple (LCM): Express each number as a product of prime factors, then take the highest power of each prime factor.

Step 1 — Prime factorisation:

$$12 = 2^2 \times 3, \quad 18 = 2 \times 3^2, \quad 24 = 2^3 \times 3$$

Step 2 — Take highest powers:

$$\text{LCM} = 2^3 \times 3^2 = 8 \times 9 = 72$$

Why other options are wrong:

- Option A: $36 = 2^2 \times 3^2$ — not divisible by 24 ($36 \div 24 = 1.5$).
- Option C: $96 = 2^5 \times 3$ — divisible by all three, but not the *least* (LCM is 72).
- Option D: 144 — also divisible by all, but far larger than the LCM.

Final Answer: $\text{LCM}(12, 18, 24) = 72 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q1

Q2.

Solution

Concept — Perfect Squares and Four-Digit Numbers: A four-digit number starts from 1000. We need the smallest integer n such that $n^2 \geq 1000$.

Step 1 — Find the threshold:

$$31^2 = 961 \quad \text{(3-digit)}, \qquad 32^2 = 1024 \quad \text{(4-digit)}$$

Step 2 — Confirm minimality: $32^2 = 1024$ is the first perfect square with four digits.

Why other options are wrong:

- Option A: $961 = 31^2$ — a three-digit number.
- Option B: 1000 — not a perfect square ($\sqrt{1000} \approx 31.6$).

- Option D: $1089 = 33^2$ — a four-digit perfect square, but not the smallest.

Final Answer: Smallest four-digit perfect square $= 1024 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q2

Q3.

Solution

Concept — Cube Root of a Negative Number: $\sqrt[3]{-a} = -\sqrt[3]{a}$, since $(-n)^3 = -n^3$.

Step 1 — Find $\sqrt[3]{3375}$:

$$3375 = 15^3 \quad (\text{since } 15 \times 15 = 225,\ 225 \times 15 = 3375)$$

Step 2 — Apply the sign:

$$\sqrt[3]{-3375} = -15$$

Verification: $(-15)^3 = -3375$ ✓

Why other options are wrong:

- Option A: $(-21)^3 = -9261 \neq -3375$.
- Option B: $(-20)^3 = -8000 \neq -3375$.
- Option C: $(-18)^3 = -5832 \neq -3375$.

Final Answer: $\sqrt[3]{-3375} = -15 \Rightarrow \boxed{D}$

Answer: (D) Go Back to Q3

Q4.

Solution

Concept — Negative Exponents and Laws of Indices: $a^{-n} = \dfrac{1}{a^n}$. Also express $4^2 = (2^2)^2 = 2^4$.

Step 1 — Rewrite with base 2:

$$2^{-3} \times 4^2 = 2^{-3} \times (2^2)^2 = 2^{-3} \times 2^4$$

Step 2 — Apply product rule ($a^m \times a^n = a^{m+n}$):

$$2^{-3+4} = 2^1 = 2$$

Why other options are wrong:

- Option B: $4 = 2^2$ — this would require $2^{-3} \times 2^5$, i.e. $4^{2.5}$, not 4^2.
- Option C: $8 = 2^3$ — this would require $2^{-3} \times 2^6$.
- Option D: $16 = 2^4$ — this is 4^2 alone, ignoring 2^{-3}.

Final Answer: $2^{-3} \times 4^2 = 2 \Rightarrow \boxed{A}$

Answer: (A) Go Back to Q4

Q5.

Solution

Concept — Linear Equations in One Variable (Transposition): Collect x-terms on one side and constants on the other.

Step 1 — Transpose $2x$ to the right side:

$$2x + 5 = 3x - 7 \implies 5 + 7 = 3x - 2x \implies 12 = x$$

Step 2 — Verify: LHS: $2(12) + 5 = 29$; RHS: $3(12) - 7 = 29$ ✓

Why other options are wrong:

- Option A: $x = 2 \Rightarrow$ LHS$= 9$, RHS$= -1$. Not equal.
- Option B: $x = 7 \Rightarrow$ LHS$= 19$, RHS$= 14$. Not equal.
- Option D: $x = 15 \Rightarrow$ LHS$= 35$, RHS$= 38$. Not equal.

Final Answer: $x = 12 \Rightarrow \boxed{C}$

Answer: (C) Go Back to Q5

Q6.

Solution

Concept — Algebraic Identity $(a-b)^2 = a^2 - 2ab + b^2$: Rearrange: $a^2 + b^2 = (a-b)^2 + 2ab$.

Step 1 — Square $(a-b)$:

$$(a-b)^2 = a^2 - 2ab + b^2 \implies a^2 + b^2 = (a-b)^2 + 2ab$$

Step 2 — Substitute given values:

$$a^2 + b^2 = (7)^2 + 2(12) = 49 + 24 = 73$$

Why other options are wrong:

- Option A: $49 = (a - b)^2$ alone, forgetting to add $2ab$.
- Option B: $61 = 49 + 12$ — adds ab only once instead of $2ab$.
- Option C: $85 = 49 + 36$ — adds $3ab$ instead of $2ab$.

Final Answer: $a^2 + b^2 = 73 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Factorisation of a Quadratic Trinomial: Find two numbers whose product is c (constant term) and sum is $-b$ (coefficient of x).

Step 1 — Identify required pair: We need two numbers with product $= +6$ and sum $= -5$.

$$(-2) \times (-3) = 6 \quad \text{and} \quad (-2) + (-3) = -5 \quad \checkmark$$

Step 2 — Write the factored form:

$$x^2 - 5x + 6 = (x - 2)(x - 3)$$

Verification: $(x - 2)(x - 3) = x^2 - 3x - 2x + 6 = x^2 - 5x + 6$ ✓

Why other options are wrong:

- Option B: $(x + 2)(x - 3) = x^2 - x - 6$ — middle term and constant both wrong.
- Option C: $(x - 1)(x - 6) = x^2 - 7x + 6$ — middle term is $-7x$, not $-5x$.
- Option D: $(x + 1)(x - 6) = x^2 - 5x - 6$ — constant term is -6, not $+6$.

Final Answer: $(x - 2)(x - 3) \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept — Evaluating an Algebraic Expression by Substitution: Replace each variable with its given value and compute step by step.

Step 1 — Substitute $a = 2$, $b = 3$, $c = 1$:

$$3a^2 - 2b + c = 3(2)^2 - 2(3) + 1$$

Step 2 — Simplify:

$$= 3 \times 4 - 6 + 1 = 12 - 6 + 1 = 7$$

Why other options are wrong:

- Option A: 5 — error in computing $3a^2$ (using a instead of a^2).
- Option C: 9 — forgetting to subtract $2b$.
- Option D: 11 — using $c = 3$ instead of $c = 1$.

Final Answer: $3a^2 - 2b + c = 7 \Rightarrow$ B

Answer: (B) Go Back to Q8

Q9.

Solution

Concept — Co-interior (Same-Side Interior) Angles: When two parallel lines are cut by a transversal, co-interior angles (on the same side of the transversal, between the parallel lines) are supplementary — they add up to $180°$.

Step 1 — Identify the relationship: $\angle APQ$ (at the upper parallel line) and $\angle DQP$ (at the lower parallel line, same side) are co-interior angles.

Step 2 — Apply the co-interior angle theorem:

$$\angle APQ + \angle DQP = 180° \implies 115° + \angle DQP = 180° \implies \angle DQP = 65°$$

Why other options are wrong:

- Option A: $115°$ — this is the corresponding angle (or alternate exterior), not the co-interior.
- Option B: $75°$ — $115 + 75 = 190 \neq 180$.
- Option C: $55°$ — $115 + 55 = 170 \neq 180$.

Final Answer: $\angle DQP = 65^\circ \Rightarrow$ D

Answer: (D) Go Back to Q9

Q10.

Solution

Concept — Base Angles of an Isoceles Triangle: In an isoceles triangle, the two base angles (opposite the equal sides) are equal.

Step 1 — Set up the angle sum equation:

$$\angle BAC + \angle ABC + \angle ACB = 180^\circ$$

Since $AB = AC$, the base angles $\angle ABC = \angle ACB$. Let $\angle ABC = x$.

$$40^\circ + x + x = 180^\circ$$

Step 2 — Solve for x:

$$2x = 180^\circ - 40^\circ = 140^\circ \implies x = 70^\circ$$

Why other options are wrong:

- Option B: 60° — $40 + 60 + 60 = 160 \neq 180$.
- Option C: 80° — $40 + 80 + 80 = 200 \neq 180$.
- Option D: 55° — $40 + 55 + 55 = 150 \neq 180$.

Final Answer: $\angle ABC = 70^\circ \Rightarrow$ A

Answer: (A) Go Back to Q10

Q11.

Solution

Concept — Pythagoras' Theorem: In a right-angled triangle, hypotenuse^2 = leg$_1^2$ + leg$_2^2$.

Step 1 — Apply the theorem:

$$h^2 = 9^2 + 12^2 = 81 + 144 = 225$$

Step 2 — Take the square root:

$$h = \sqrt{225} = 15 \text{ cm}$$

Note: $(9, 12, 15) = 3 \times (3, 4, 5)$, a well-known Pythagorean triple.

Why other options are wrong:

- Option A: $13^2 = 169 \neq 225$.
- Option B: $14^2 = 196 \neq 225$.
- Option D: $21^2 = 441 \neq 225$.

Final Answer: Hypotenuse $= 15$ cm $\Rightarrow$ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Diagonals of a Rhombus: A rhombus has two key diagonal properties: (i) the diagonals bisect each other, and (ii) they intersect at right angles ($90°$).

Proof sketch: In rhombus $ABCD$ with diagonals meeting at O: triangles AOB and AOD are congruent (SSS, since $AB = AD$ and the shared side AO). Therefore $\angle AOB = \angle AOD$. Since they are supplementary, each $= 90°$.

Why other options are wrong:

- Option A: $45°$ — the diagonals bisect the vertex angles at $45°$ each in a square, but the crossing angle is $90°$.
- Option C: $60°$ — only in equilateral triangles.
- Option D: The diagonals of a rhombus always bisect each other.

Final Answer: The diagonals bisect each other at $90° \Rightarrow$ B

Answer: (B) Go Back to Q12

Q13.

Solution

Concept — Area of a Circle:

$$\text{Area} = \pi r^2$$

Step 1 — Substitute $r = 7$ cm and $\pi = \dfrac{22}{7}$:

$$\text{Area} = \frac{22}{7} \times 7^2 = \frac{22}{7} \times 49$$

Step 2 — Simplify:

$$= 22 \times 7 = 154 \text{ cm}^2$$

Why other options are wrong:

- Option B: 44 cm$^2 = 2\pi r$ — this is the circumference, not the area.
- Option C: 49 cm$^2 = r^2$ — forgets to multiply by π.
- Option D: 176 cm^2 — results from using $\pi \approx \frac{22}{7} \times 8 = \frac{22}{7} \times r^2$ with incorrect squaring.

Final Answer: Area $= 154$ cm$^2 \Rightarrow$ A

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — Total Surface Area of a Cuboid:

$$\text{TSA} = 2(lb + bh + hl)$$

Step 1 — Identify dimensions: $l = 10$ cm, $b = 8$ cm, $h = 6$ cm.

Step 2 — Compute each face pair:

$$lb = 10 \times 8 = 80 \text{ cm}^2, \quad bh = 8 \times 6 = 48 \text{ cm}^2, \quad hl = 6 \times 10 = 60 \text{ cm}^2$$

$$\text{TSA} = 2(80 + 48 + 60) = 2 \times 188 = 376 \text{ cm}^2$$

Why other options are wrong:

- Option A: 188 cm^2 — forgets to multiply by 2.

- Option B: 240 cm^2 — computes only two face pairs instead of three.
- Option C: 320 cm^2 — arithmetic error in summing face areas.

Final Answer: TSA $= 376$ cm^2 $\Rightarrow$ D

Answer: (D) Go Back to Q14

Q15.

Solution

Concept — Area of a Rhombus:

$$\text{Area} = \frac{d_1 \times d_2}{2}$$

where d_1 and d_2 are the lengths of the two diagonals.

Step 1 — Substitute $d_1 = 16$ cm and $d_2 = 12$ cm:

$$\text{Area} = \frac{16 \times 12}{2} = \frac{192}{2} = 96 \text{ cm}^2$$

Why other options are wrong:

- Option A: 48 cm$^2 = \frac{16 \times 12}{4}$ — divides by 4 instead of 2.
- Option B: 72 cm^2 — uses $\frac{(16+12)}{2} \times \frac{12}{2} = 14 \times 6$, incorrect formula.
- Option D: 192 cm$^2 = 16 \times 12$ — forgets to divide by 2.

Final Answer: Area of rhombus $= 96$ cm^2 $\Rightarrow$ C

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Selling Price after Discount:

$$\text{SP} = \text{Marked Price} \times \left(\frac{100 - \text{Discount}\%}{100}\right)$$

Step 1 — Calculate discount amount:

$$\text{Discount} = 15\% \times 800 = \frac{15 \times 800}{100} = \text{Rs. } 120$$

Step 2 — Find SP:

$$\text{SP} = 800 - 120 = \text{Rs. } 680$$

Why other options are wrong:

- Option A: Rs. $640 \Rightarrow$ discount $= 160 = 20\%$, not 15%.
- Option C: Rs. $720 \Rightarrow$ discount $= 80 = 10\%$, not 15%.
- Option D: Rs. $760 \Rightarrow$ discount $= 40 = 5\%$, not 15%.

Final Answer: SP $=$ Rs. $680 \Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q16

Q17.

Solution

Concept — Finding Cost Price from Selling Price and Loss%:

$$\text{CP} = \frac{\text{SP}}{1 - \frac{\text{Loss}\%}{100}} = \frac{\text{SP} \times 100}{100 - \text{Loss}\%}$$

Step 1 — Substitute given values:

$$\text{CP} = \frac{1350 \times 100}{100 - 10} = \frac{135000}{90} = \text{Rs. } 1500$$

Step 2 — Verify: Loss on CP Rs. 1500 at $10\% = 0.10 \times 1500 = \text{Rs. } 150$; SP $= 1500 - 150 = \text{Rs. } 1350$ ✓

Why other options are wrong:

- Option B: Rs. $1215 = 1350 \times 0.9$ — incorrectly multiplies instead of divides.
- Option C: Rs. 1400 — 10% of $1400 = 140$; SP would be $1260 \neq 1350$.
- Option D: Rs. $1485 = 1350 + 135$ — adds 10% of SP instead of finding CP.

Final Answer: CP $=$ Rs. $1500 \Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Amount = Principal + Simple Interest:

$$\text{SI} = \frac{P \times R \times T}{100}, \qquad \text{Amount} = P + \text{SI}$$

Step 1 — Compute SI: $P = 5000$, $R = 10\%$, $T = 2$ years.

$$\text{SI} = \frac{5000 \times 10 \times 2}{100} = \frac{100000}{100} = \text{Rs. } 1000$$

Step 2 — Find Amount:

$$\text{Amount} = 5000 + 1000 = \text{Rs. } 6000$$

Why other options are wrong:

- Option A: Rs. $5500 = 5000 + 500$ — SI computed for $T = 1$ year only.
- Option B: Rs. 5800 — SI of Rs. 800 would require $R = 8\%$, not 10%.
- Option C: Rs. 5900 — SI of Rs. 900 would need $T = 1.8$ years.

Final Answer: Amount $=$ Rs. $6000 \Rightarrow$ D

Answer: (D) Go Back to Q18

Q19.

Solution

Concept — Median of Ungrouped Data: Arrange data in ascending order; the median is the middle value for an odd number of observations.

Step 1 — Check if data is in order: $3,\ 7,\ 8,\ 11,\ 14$ — already in ascending order.

Step 2 — Locate the middle value: There are 5 values. The middle (3rd) value is 8.

$$\underbrace{3,\ 7,}\ \underbrace{8}_{\text{median}},\ \underbrace{11,\ 14}$$

Why other options are wrong:

- Option A: 7 — this is the 2nd value, not the middle.
- Option B: $7.5 = \frac{7+8}{2}$ — used for even number of values; here $n = 5$ (odd).

- Option D: 9 — this is the mean ($43/5 = 8.6$, not even 9).

Final Answer: Median $= 8 \Rightarrow$ C

Answer: (C) Go Back to Q19

Q20.

Solution

Concept — Range of a Data Set:

$$\text{Range} = \text{Maximum value} - \text{Minimum value}$$

Step 1 — Identify max and min: Data: $5,\ 12,\ 8,\ 20,\ 15,\ 3$.

$$\text{Maximum} = 20, \qquad \text{Minimum} = 3$$

Step 2 — Compute Range:

$$\text{Range} = 20 - 3 = 17$$

Why other options are wrong:

- Option A: 15 — the maximum minus the second lowest, not the minimum.
- Option C: 20 — this is the maximum value itself, not the range.
- Option D: 5 — one of the data values, not a range calculation.

Final Answer: Range $= 17 \Rightarrow$ B

Answer: (B) Go Back to Q20

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	D	4	A	5	C
6	D	7	A	8	B	9	D	10	A
11	C	12	B	13	A	14	D	15	C
16	B	17	A	18	D	19	C	20	B