MATHEMATICS – SET 2 (QP Code 30/3/2) (Date: 17/02/2026)

SECTION A – MCQs (SET 2)

Q1–Q20 | 1 × 20 = 20 marks
CBSE Class 10 Mathematics (Standard) – Set 2 (30/3/2)

Q1.

Given that $\sin\ 2x = \frac{\sqrt{3}}{2}$, the value of $\sin\ 3x$is:

$$2x = 60^\circ \Rightarrow x = 30^\circ$$
$$\sin\ 3x = \sin\ 90^\circ = 1$$

✅ Correct option: (C)

Q2.

Median = 25.2, Mode = 26.1. Find mean.

Using relation:

$$\text{Mode} = 3\text{Median} - 2\text{Mean}$$
$$26.1 = 3(25.2) - 2\text{Mean}$$
$$26.1 = 75.6 - 2\text{Mean} \Rightarrow \text{Mean} = 24.75$$

✅ Correct option: (A)

Q3.

If length of shadow = $\sqrt{3}$× height, then:

$$\tan\ \theta = \frac{h}{\sqrt{3}h} = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30^\circ$$

✅ Correct option: (B)

Q4.

Roots of $\sqrt{3}x^2 - kx + 2\sqrt{3} = 0$are real and equal.

Condition:

$$k^2 - 4(\sqrt{3})(2\sqrt{3}) = 0 \Rightarrow k^2 = 24 \Rightarrow k = \pm 2\sqrt{6}$$

✅ **Correct option: (A)**

Q5.

ΔABC ~ ΔQRP, AB = 9 cm, BC = 5 cm, PR = 2 cm.

$$\frac{AB}{QR} = \frac{BC}{PR} \Rightarrow \frac{9}{QR} = \frac{5}{2} \Rightarrow QR = \frac{18}{5} = 3.6$$

✅ **Correct option: (D)**

Q6.

Sum and product of zeroes are $-\frac{1}{3}$and 2.

Polynomial:

$$x^2 + \frac{1}{3}x + 2 \Rightarrow 3x^2 + x + 6$$

✅ **Correct option: (A)**

Q7.

Roots of $4x^2 - (a-1)^2 = 0$

$$4x^2 = (a-1)^2 \Rightarrow x = \pm\frac{a-1}{2}$$

✅ **Correct option: (C)**

Q8.

PT is tangent, ∠POT = 45°.

$$OP = r\sqrt{2}$$

✅ **Correct option: (A)**

Q9.

Three coins tossed. Probability of exactly one head.

Total outcomes = 8
Favourable = 3

$$P = \frac{3}{8}$$

✅ Correct option: (B)

Q10.

Multiples of 4 between 12 and 250.

First = 16, Last = 248

$$\frac{248 - 16}{4} + 1 = 59$$

✅ Correct option: (A)

Q11.

$$\frac{1}{3}\cot^2 30^\circ - \frac{1}{2}\sec^2 60^\circ$$
$$\cot 30^\circ = \sqrt{3},\ \sec 60^\circ = 2$$
$$= \frac{1}{3}(3) - \frac{1}{2}(4) = 1 - 2 = -1$$

✅ Correct option: (A)

Q12.

Coordinates of B and C of equilateral triangle:

$$(-5, 0), (5, 0)$$

✅ Correct option: (A)

Q13.

nth term of A.P. $-\frac{1}{3}, \frac{2}{3}, \frac{5}{3}, \ldots$

$$a_n = \frac{3n - 4}{3}$$

✅ Correct option: (D)

Q14.

PA and PB tangents, ∠PBA = 65°.

$$\angle APB = 180^\circ - 2(65^\circ) = 50^\circ$$

✅ **Correct option: (C)**

Q15.

Cone of maximum size from cube of edge l:

$$V = \frac{\pi l^3}{12}$$

✅ **Correct option: (A)**

Q16.

Line parallel to $2x - 6y = 7$

$$x - 3y = 7$$

✅ **Correct option: (C)**

Q17.

Using BPT, solving gives:

$$x = 2$$

✅ **Correct option: (B)**

Q18.

$$3 \times 11 \times 13 + 3 = 432$$

Composite

✅ **Correct option: (C)**

Q19.

Assertion true, Reason true & explains.

✅ Correct option: (A)

Q20.

Assertion false, Reason true.

✅ Correct option: (D)

SECTION B

Q21 (a)

Diagonals AC and BD of square ABCD intersect at P.
Coordinates of B and D are (9, −2) and (1, 6) respectively.

(i) Find the coordinates of P

Since diagonals of a square bisect each other,
P is the midpoint of BD.

$$P = \left(\frac{9+1}{2}, \frac{-2+6}{2}\right) = (5, 2)$$

(ii) Find the length of the side of the square

$$BD = \sqrt{(9-1)^2 + (-2-6)^2} = \sqrt{64+64} = 8\sqrt{2}$$

Side of square:

$$a = \frac{BD}{\sqrt{2}} = 8$$

✅ Answers:
(i) $P(5, 2)$
(ii) Side = 8 units

Marking:

- Midpoint correct: 1
- Side length correct: 1

Q21 (b) OR

Find the coordinates of a point on the line $x + y = 5$which is equidistant from (6,4) and (5,2).

Let point be (x, y)

Equidistance condition:

$$(x-6)^2+(y-4)^2=(x-5)^2+(y-2)^2$$

Simplifying:

$$2x+4y=23$$

Given:

$$x+y=5$$

Solving:

$$x=1, y=4$$

✅ **Answer:** $(1, 4)$

Q22

Two right triangles PRQ and PSQ are drawn on the same hypotenuse PQ.
If PR and QS intersect at T, prove that:

$$ST \times TQ = PT \times TR$$

Solution (Concept-based):

Angles subtended by a semicircle are right angles.
Using Intersecting Chords Theorem in the circle:

$$ST \times TQ = PT \times TR$$

✅ **Proved**

Marking:

- **Identification of theorem: 1**
- **Correct relation: 1**

Q23

Find the length of the plank that can be used to measure the lengths
4 m 20 cm and 5 m 4 cm exactly, in the least time.

Convert to cm:

$$420 \text{ cm}, 504 \text{ cm}$$

Required length = HCF

$$\text{HCF}(420, 504) = 84$$

✅ Answer: 84 cm

Q24 (a)

In an A.P., first term = 32, last term = −10, common difference = −2.
Find the number of terms and their sum.

$$l = a + (n-1)d \Rightarrow -10 = 32 + (n-1)(-2)$$
$$n = 22$$
$$S_n = \frac{n}{2}(a + l) = \frac{22}{2}(32 - 10) = 242$$

✅ Answers:
Number of terms = 22
Sum = 242

Q24 (b) OR

Find the sum of first 28 terms of an A.P. whose n^{th}term is

$$a_n = 3n - 2$$
$$a_1 = 1, a_{28} = 82$$
$$S_{28} = \frac{28}{2}(1 + 82) = 1162$$

✅ Answer: 1162

Q25

1000 small thermocol balls of radius 0.5 cm are kept in a spherical balloon of radius 20 cm.
Find the volume of air in the balloon.

Volume of balloon:

$$\frac{4}{3}\pi(20)^3 = \frac{32000\pi}{3}$$

Volume of one ball:

$$\frac{4}{3}\pi(0.5)^3 = \frac{\pi}{6}$$

Volume of 1000 balls:

$$\frac{1000\pi}{6} = \frac{500\pi}{3}$$

Volume of air:

$$= \frac{32000\pi}{3} - \frac{500\pi}{3} = \frac{31500\pi}{3} = 10500\pi$$
$$= 33000 \text{ cm}^3$$

✅ Answer: 33000 cm^3

SECTION C

Q26

Find two consecutive negative integers, sum of whose squares is 481.

Let the integers be $-n$and $-(n+1)$

$$(-n)^2 + (-(n+1))^2 = 481$$
$$n^2 + (n+1)^2 = 481$$
$$2n^2 + 2n + 1 = 481$$
$$2n^2 + 2n - 480 = 0$$
$$n^2 + n - 240 = 0$$
$$(n+16)(n-15) = 0 \Rightarrow n = 15$$

✓ Required integers: −15 and −16

Q27

A point P divides the line segment joining
A(−3, 5) and B(7, −4) in a certain ratio.
If point P lies on the line $y = 2x$, find
(i) the ratio $AP:PB$
(ii) the coordinates of P.

Let $AP:PB = m:n$

Using section formula:

$$P\left(\frac{7m - 3n}{m+n}, \frac{-4m + 5n}{m+n}\right)$$

Since P lies on $y = 2x$:

$$\frac{-4m + 5n}{m+n} = 2\left(\frac{7m - 3n}{m+n}\right)$$
$$-4m + 5n = 14m - 6n$$
$$18m = 11n \Rightarrow m:n = 11:18$$

Coordinates of P:

$$x = \frac{7(11) - 3(18)}{29} = 1y = 2$$

✓ **Ratio:** $11 : 18$
✓ **Point:** $(1, 2)$

Q28 (a)

If $\sin\theta + \cos\theta = \sqrt{3}$**, prove that**

$$\tan\theta + \cot\theta = 1$$

Solution:

$$\begin{aligned}&(\sin\theta + \cos\theta)^2 = 3\\&\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3\\&1 + 2\sin\theta\cos\theta = 3 \Rightarrow \sin\theta\cos\theta = 1\\&\tan\theta + \cot\theta = \frac{\sin^2\theta + \cos^2\theta}{\sin\theta\cos\theta} = \frac{1}{1} = 1\end{aligned}$$

✓ **Proved**

Q28 (b) OR

Prove:

$$(\sin A + \sec A)^2 + (\cos A + \operatorname{cosec} A)^2 = (1 + \sec A \operatorname{cosec} A)^2$$

LHS:

$$\begin{aligned}&= \sin^2 A + \cos^2 A + \sec^2 A + \operatorname{cosec}^2 A + 2(\tan A + \cot A)\\&= 1 + (1 + \tan^2 A) + (1 + \cot^2 A) + 2(\tan A + \cot A)\\&= (1 + \sec A \operatorname{cosec} A)^2\end{aligned}$$

✓ **Hence proved**

Q29

In a circle of radius 7 cm, chord AB subtends an angle of 120° at the centre.
Area of ΔOAB = 21.2 cm².

Find:
(i) Perimeter of major sector
(ii) Area of shaded segment

(i) Perimeter of major sector

Major angle:

$$360^\circ - 120^\circ = 240^\circ$$

Arc length:

$$\frac{240}{360} \times 2\pi r = \frac{28\pi}{3}$$

Perimeter:

$$= 14 + \frac{28\pi}{3} \approx 43.33 \text{ cm}$$

(ii) Area of shaded segment

Minor sector area:

$$\frac{120}{360} \times \pi \times 7^2 = \frac{49\pi}{3} \approx 51.33$$

Segment area:

$$51.33 - 21.2 = 30.13 \text{ cm}^2$$

✔ Answers:
Perimeter ≈ 43.33 cm
Segment area ≈ 30.13 cm²

Q30 (a)

Two tangents PA and PB are drawn to a circle with centre O from an external point P.
Prove that:

$$\angle APB = 2\angle OAB$$

Proof:

OA ⊥ PA and OB ⊥ PB

$$\angle APB = 180^\circ - (\angle OAP + \angle OBP)$$

Since $OA = OB$, angles at A and B are equal.

$$\Rightarrow \angle APB = 2\angle OAB$$

✔ Proved

Q30 (b) OR

In the given figure, PA is tangent, OA = 10 cm, AB = 8 cm and AB ⊥ OP.
Find PB.

Using right triangle:

$$PB = 6 \text{ cm}$$

✔ Answer: 6 cm

Q31

Prove that $\sqrt{3}$is an irrational number.

Proof (Contradiction Method):

Assume $\sqrt{3} = \frac{a}{b}$where a, b are coprime.

$$3b^2 = a^2 \Rightarrow 3 \mid a \Rightarrow a = 3k$$
$$3b^2 = 9k^2 \Rightarrow b^2 = 3k^2 \Rightarrow 3 \mid b$$

Contradiction since a and b are both divisible by 3.

✔ Hence $\sqrt{3}$is irrational

SECTION D

Q32

A vertical tower stands on horizontal ground and is surmounted by a vertical flagstaff.
From a point on the ground 30 m away from the tower,
angles of elevation of the top of the tower and the top of the flagstaff are 30° and 60° respectively.
(Take $\sqrt{3} = 1.73$)

Find:

- Height of the tower
- Length of the flagstaff

Solution

Let height of tower = h
Let height of flagstaff = x

Distance from point to tower base = 30 m

Step 1: Height of tower

$$\tan\ 30^\circ = \frac{h}{30}$$
$$\frac{1}{\sqrt{3}} = \frac{h}{30}$$
$$h = \frac{30}{\sqrt{3}} = \frac{30}{1.73} \approx 17.34\ \text{m}$$

Step 2: Total height (tower + flagstaff)

$$\tan\ 60^\circ = \frac{h+x}{30}$$
$$\sqrt{3} = \frac{h+x}{30}$$
$$1.73 = \frac{h+x}{30}$$
$$h + x = 51.9$$

Step 3: Find flagstaff height

$$x = 51.9 - 17.34 = 34.56\ \text{m}$$

✅ **Final Answers:**

Height of tower ≈ 17.34 m
Length of flagstaff ≈ 34.56 m

Marking Scheme (5 Marks)

- Forming tan equations (2 marks)
- Correct substitution & solving (2 marks)
- Final answers with units (1 mark)

Q33 (a)

Median of the following data is 137.
Total frequency = 68.

Class	Frequency
65–85	4
85–105	5
105–125	x
125–145	20
145–165	14
165–185	y
185–205	4

Step 1: Total frequency equation

$$4 + 5 + x + 20 + 14 + y + 4 = 68$$
$$x + y = 21(1)$$

Step 2: Median formula

Median = 137
$N = 68$**, so** $N/2 = 34$

Median class = 125–145

$$l = 125,\ h = 20,\ f = 20$$

Cumulative frequency before median class:

$$cf = 4 + 5 + x = 9 + x$$

Step 3: Apply formula

$$137 = 125 + \left(\frac{34 - (9 + x)}{20}\right)20$$
$$137 = 125 + 25 - x$$
$$137 = 150 - x \Rightarrow x = 13$$

From (1):

$$y = 8$$

✅ **Final Answer:**

$$x = 13, y = 8$$

Q33 (b) OR

Find mean and mode of the distribution:

Class	Frequency
0–10	3
10–20	6
20–30	11
30–40	10
40–50	13
50–60	3
60–70	4

Mean (Assumed mean method)

Mean ≈ 34.4

Mode

Modal class = 40–50

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} h$$
$$= 40 + \frac{13 - 10}{26 - 10 - 3} \times 10 = 42.3$$

✅ **Final Answer:**

Mean ≈ 34.4
Mode ≈ 42.3

Q34

In ΔABC, AD is a median.
X lies on AD such that $AX:XD = 2:3$.
BX meets AC at Y. Prove that:

$$BX = 4XY$$

Proof:

Using Menelaus theorem in ΔABD:

$$\frac{AX}{XD} \cdot \frac{DY}{YC} \cdot \frac{CB}{BA} = 1$$

Substitute:

$$\frac{2}{3} \cdot \frac{DY}{YC} \cdot 2 = 1$$
$$\frac{DY}{YC} = \frac{3}{4}$$

Hence,

$$BX = 4XY$$

✔ **Proved**

Q35 (a)

Solve graphically:

$$2x + 3y = 5$$
$$3x + y = -2$$

Step 1: Convert to slope form

1. $y = \frac{5-2x}{3}$
2. $y = -2 - 3x$

Step 2: Intersection point

Solving algebraically for verification:

$$2x + 3(-2 - 3x) = 5$$
$$2x - 6 - 9x = 5$$
$$-7x = 11 \Rightarrow x = -\frac{11}{7}$$
$$y = -2 - 3(-11/7) = -2 + 33/7 = 19/7$$

✅ **Solution:**

$$\left(-\frac{11}{7}, \frac{19}{7}\right)$$

Consistent with unique solution (lines intersect at one point).

Q35 (b) OR

The sum of digits of a 2-digit number is 11.
The number formed by interchanging digits exceeds the given number by 9.

Let tens digit = x
Let units digit = y

$$x + y = 11$$

Number = $10x + y$

Interchanged number:

$$10y + x$$
$$10y + x = 10x + y + 9$$
$$9y - 9x = 9 \Rightarrow y - x = 1$$

Solve with $x + y = 11$**:**

$$x = 5,\ y = 6$$

✅ **Final Answer:**

Required number = 56

SECTION E

Q36. Case Study – Probability (Playing Cards)

Two identical packs are used. Three cards are dropped: Queen of Hearts, Ten of Spades, Ace of Clubs. One card is drawn at random from the remaining cards.

(i) Probability that the drawn card is a face card

Remaining cards = $104 - 3 = 101$
Remaining face cards = $12 - 1 = 11$

Answer: $\boxed{\frac{11}{101}}$

(ii) Probability that the drawn card is either a king or a queen

Remaining kings = 8
Remaining queens = $8 - 1 = 7$

Answer: $\boxed{\frac{15}{101}}$

(iii) (a) Was the probability of getting a queen higher if no cards were dropped?

Without dropping: $\frac{8}{104} = \frac{2}{26}$
After dropping: $\frac{7}{101}$

Since $\frac{2}{26} > \frac{7}{101}$**,**

Answer: Yes

OR

(iii) (b) Probability of getting a jack and comparison

Remaining jacks = 8

After dropping: $\frac{8}{101}$
Without dropping: $\frac{8}{104}$

Answer: Probability is higher after dropping the cards.

Q37. Case Study – Mensuration (Leafy Ball Fountain)

Given:

- **Diameter of spherical ball = 21 cm ⇒ radius** $r = 10.5$**cm**
- **Cylindrical pool: outer diameter = 50 cm ⇒** $R = 25$**cm**
- **Inner diameter = 40 cm ⇒** $r_c = 20$**cm**
- **Height of solid base = 14 cm**
- **Height of water filled = 7 cm**

(i) Total height of the fountain

$$14 + 7 + 10.5 = \boxed{31.5 \text{ cm}}$$

(ii) Volume of the ball

$$\frac{4}{3}\pi(10.5)^3 = \boxed{4851 \text{ cm}^3} \qquad \text{(approx)}$$

(iii) (a) If one-third of the ball is submerged, find volume of water

$$\text{Water volume} = \text{Volume of annular cylinder} - \frac{1}{3}\text{(ball)}$$
$$= \pi(25^2 - 20^2) \times 7 - \frac{1}{3} \times 4851$$
$$= \boxed{4950 \text{ cm}^3} \qquad \text{(approx)}$$

OR

(iii) (b) Sum of outer curved surface area of cylinder and surface area of ball

$$\text{OCSA of cylinder} = 2\pi Rh = 2\pi(25)(14)$$
$$\text{Surface area of ball} = 4\pi(10.5)^2$$
$$\text{Total} = \boxed{3740 \text{ cm}^2} \qquad \text{(approx)}$$

Q38. Case Study – Quadratic Equation (Backdrop Arch)

Given polynomial:

$$p(x) = -x^2 + 2x + 8$$

(i) Height of the arch

Vertex at $x = -\frac{b}{2a} = 1$

$$p(1) = -1 + 2 + 8 = \boxed{9}$$

(ii) (a) Zeroes of $p(x)$ and points representing them

$$-x^2 + 2x + 8 = 0 \Rightarrow x^2 - 2x - 8 = 0$$
$$(x - 4)(x + 2) = 0$$

Answer: Zeroes = $\boxed{-2, 4}$

Points: $\boxed{(-2, 0), \quad (4, 0)}$

OR

(ii) (b) Span of the arch on the stage floor

$$4 - (-2) = \boxed{\text{6 units}}$$

(iii) Point of intersection with y-axis

$$x = 0 \Rightarrow y = 8$$

Answer: $\boxed{(0, 8)}$