MATHEMATICS – SET 3 (QP Code 30/3/3) (Date:17/02/2026)
SECTION A – MCQs

Q1.
Number of multiples of 6 lying between 25 and 363:
First multiple >25 = 30
Last multiple <363 = 360

$$\frac{360 - 30}{6} + 1 = 56$$

✅ **Correct option: (A)**

Q2.
Two dice are rolled. Probability that the sum is divisible by 6.
Possible sums: 6, 12
Favourable outcomes = 6
Total outcomes = 36

$$P = \frac{6}{36} = \frac{1}{6}$$

✅ **Correct option: (B)**

Q3.
Equilateral triangle with A $\left(0, \frac{5\sqrt{3}}{2}\right)$, D(0,0)
Base points are symmetric about y-axis:
$$\left(-5,0\right), \qquad\qquad\qquad\qquad\qquad\qquad (5,0)$$

✅ **Correct option: (A)**

Q4.
Median = 25.2, Mode = 26.1

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

✅ **Correct option: (A)**

Q5.
ΔABC ~ ΔQRP, AB = 9, BC = 5, PR = 2
$$\frac{AB}{QR} = \frac{BC}{PR} \Rightarrow \frac{9}{QR} = \frac{5}{2} \Rightarrow QR = \frac{18}{5}$$

✅ **Correct option: (B)**

Q6.
Polynomial whose sum of zeroes = product of zeroes
Only quadratic of form:
$$x^2 - Sx + S$$

Matches:

$$x^2 - 3x + 2$$

✅ **Correct option: (D)**

Q7.
Tangents PQ and PR, radius = 3 cm, ∠QPR = 60°

$$\text{Tangent length} = 3\sqrt{3}$$

✅ **Correct option: (A)**

Q8.
Given OA × OB = OC × OD
By **Intersecting Chords Theorem**:

$$\triangle\, OAD \sim \triangle\, OBC$$

✅ **Correct option: (D)**

Q9.

$$\frac{1}{2}\tan{}^2\,45° - \cos{}^2\,60°$$

$$= \frac{1}{2}(1) - \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

✅ **Correct option: (C)**

Q10.
Cone of maximum size from cube:

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

✅ **Correct option: (A)**

Q11.

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

Composite number
✅ **Correct option: (C)**

Q12.
Given $\sin\,2x = \frac{\sqrt{3}}{2}$

$$2x = 60° \Rightarrow x = 30° \Rightarrow \sin\,3x = 1$$

✅ **Correct option: (C)**

Q13.
Shadow = $\sqrt{3}\times$ height

$$\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$$

✅ **Correct option: (B)**

Q14.
Coincident line with $2x - y = 3$
Multiply by 2:
$$4x - 2y = 6 \Rightarrow 5x - 4y - 6 = 0$$

✅ **Correct option: (D)**

Q15.
nth term of A.P. $-\frac{1}{3}, \frac{2}{3}, \frac{5}{3}, \ldots$
$$a_n = \frac{3n - 4}{3}$$

✅ **Correct option: (D)**

Q16.
PT tangent, ∠POT = 45°
$$OP = r\sqrt{2}$$

✅ **Correct option: (A)**

Q17.
Roots of $(x - 1)^2 = 16$
$$x = 5, \qquad\qquad\qquad -3$$

✅ **Correct option: (C)**

Q18.
Roots of $\sqrt{3}x^2 - kx + 2\sqrt{3} = 0$ real & equal
$$k^2 = 24 \Rightarrow k = \pm 2\sqrt{6}$$

✅ **Correct option: (A)**

Q19.
Assertion: tan 20 not defined at 45° ❌
Reason: sin 90 ≠ cos 90 ❌
Assertion false, Reason false
✅ **Correct option: (D)**

Q20.
Assertion true, Reason true & explains
✅ **Correct option: (A)**

Q21

A toy is in the form of a **cone mounted on a hemisphere** of radius 7 cm.
Total height = 31 cm.
Find the **Total Surface Area**.

Solution

Radius $r = 7$cm
Height of cone:

$$h = 31 - 7 = 24 \text{ cm}$$

Slant height:

$$l = \sqrt{h^2 + r^2} = \sqrt{576 + 49} = 25$$

TSA:

$$= \pi r l + 2\pi r^2$$
$$= \pi(7)(25) + 2\pi(49) = 175\pi + 98\pi = 273\pi$$

Using $\pi = \frac{22}{7}$:

$$= 858 \text{ cm}^2$$

✅ **Answer:**

$$\boxed{858 \text{ cm}^2}$$

Marking:
- Correct slant height & formula: 1
- Correct final value: 1

Q22

In the given figure, $\triangle ABE \cong \triangle ACD$.
Prove that $\triangle ADE \cong \triangle ABC$.

Solution

Given:

$$\triangle ABE \cong \triangle ACD$$

So,

$$AB = AC$$
$$AE = AD$$

In triangles ADE and ABC:

$$AD = AE$$
$$AB = AC$$
$$\angle DAE = \angle BAC$$

Therefore, by **SAS congruence**:

$$\triangle ADE \cong \triangle ABC$$

✅ **Proved**

Marking:
- Correct identification of equal parts: 1
- Correct congruence application: 1

Q23 (a)

In an A.P., first term = 4, last term = 31, sum = 175.

Find number of terms and common difference.

$$S_n = \frac{n}{2}(a + l)$$
$$175 = \frac{n}{2}(4 + 31)$$
$$175 = \frac{35n}{2}$$
$$n = 10$$

Now:

$$l = a + (n - 1)d$$
$$31 = 4 + 9d \Rightarrow d = 3$$

✅ **Answer:**

$$n = 10, d = 3$$

Q23 (b) OR

How many terms of A.P. 21, 18, 15, … must be added to get sum 270?

$$a = 21, d = -3$$
$$S_n = \frac{n}{2}[2a + (n - 1)d]$$
$$270 = \frac{n}{2}[42 - 3(n - 1)]$$
$$540 = n(45 - 3n)$$
$$3n^2 - 45n + 540 = 0$$
$$n = 12$$

✅ **Answer:**

$$\boxed{12}$$

Q24

Find the length of plank that measures

4 m 20 cm and 5 m 4 cm exactly (least time).

Convert to cm:

420,504

HCF(420,504) = 84

✅ **Answer:**

$$\boxed{84 \text{ cm}}$$

Q25 (a)

Diagonals AC and BD of square intersect at P.

B = (9, −2), D = (1, 6)

(i) Coordinates of P

Midpoint of BD:

$$P = (5,2)$$

(ii) Length of side

$$BD = 8\sqrt{2}$$
$$\text{Side} = \frac{BD}{\sqrt{2}} = 8$$

✅ **Answer:**

$$P(5,2), \text{Side} = 8$$

Q25 (b) OR

Find point on line $x + y = 5$ equidistant from (6,4) and (5,2).

Solving:

$$(x, y) = (1,4)$$

SECTION C

Q26

Prove that $\sqrt{2}$ is an irrational number.

Proof (Contradiction Method)

Assume $\sqrt{2}$ is rational.

$$\sqrt{2} = \frac{a}{b}$$

where a and b are coprime integers.

$$2b^2 = a^2$$

So, a^2 is even $\Rightarrow a$ is even.

Let $a = 2k$

$$2b^2 = 4k^2 \Rightarrow b^2 = 2k^2$$

So, b is also even.

This contradicts the assumption that a and b are coprime.

✓ Hence, $\sqrt{2}$ is **irrational**.

Marks:
Assumption – 1
Contradiction – 1
Conclusion – 1

Q27 (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
$$\angle OAP = \angle OBP = 90°$$

In quadrilateral OAPB:
$$\angle APB = 180° - (\angle OAP + \angle OBP)$$
$$= 180° - 2\angle OAB$$
$$\Rightarrow \angle APB = 2\angle OAB$$

✓ **Proved**

Q27 (b) OR
In the given figure, PA is a tangent to the circle with centre O such that
OA = 10 cm, AB = 8 cm and AB ⊥ OP.
Find the length of PB.
Solution
Using right triangle relations:
$$PB = \sqrt{OA^2 - AB^2} = \sqrt{100 - 64} = \sqrt{36} = 6 \text{ cm}$$

✓ **Answer: 6 cm**

Q28
Determine the ratio in which the line $3x + y - 9 = 0$ divides the line segment joining
A(1,3) and B(2,5). Find the point of intersection.
Let the point divide AB internally in the ratio $m:n$.
Using section formula:
$$\left(\frac{2m + 1n}{m + n}, \frac{5m + 3n}{m + n}\right)$$

Substitute in the line equation:
$$3\left(\frac{2m + n}{m + n}\right) + \left(\frac{5m + 3n}{m + n}\right) - 9 = 0$$
$$\frac{11m + 6n}{m + n} = 9$$
$$11m + 6n = 9m + 9n \Rightarrow 2m = 3n$$

✓ **Ratio:** $m:n = 3:2$
Coordinates:

$$\left(\frac{6+2}{5}, \frac{15+6}{5}\right) = \left(\frac{8}{5}, \frac{21}{5}\right)$$

✓ **Point:** $\left(\frac{8}{5}, \frac{21}{5}\right)$

Q29 (a)

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

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

Solution

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

✓ **Proved**

Q29 (b) OR

Prove:

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

Expanding LHS and simplifying using identities:
$$\sin^2 A + \cos^2 A + \sec^2 A + \operatorname{cosec}^2 A + 2(\tan A + \cot A)$$
$$= (1 + \sec A\operatorname{cosec} A)^2$$

✓ **Hence proved**

Q30

In the given figure, chord AB subtends an angle of **120°** at the centre of a circle of radius **7 cm**.
If area of ΔOAB = **21.2 cm²**, find:
(i) Perimeter of major sector
Major angle:

$$360° - 120° = 240°$$

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:

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

Segment area:

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

✓ Answers:
Perimeter ≈ **43.33 cm**
Area ≈ **30.13 cm²**

Q31
Find two consecutive negative integers whose sum of squares is **481**.
Let numbers be $-n$ and $-(n+1)$

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

✓ Required integers: −15 and −16

SECTION D

Q32 (a)
Solve the following system of equations **graphically**:

$$x - 2y = 3, 3x - 8y = 7$$

Solution
Convert into slope–intercept form:

1.

$$x - 2y = 3 \Rightarrow y = \frac{x - 3}{2}$$

2.

$$3x - 8y = 7 \Rightarrow y = \frac{3x - 7}{8}$$

Plot both equations on the same graph.
The two straight lines **intersect at a single point**.
Solving algebraically for verification:

$$x - 2\left(\frac{3x - 7}{8}\right) = 3$$

$$8x - 3x + 7 = 24 \Rightarrow 5x = 17 \Rightarrow x = \frac{17}{5}$$

$$y = \frac{\frac{17}{5} - 3}{2} = \frac{1}{5}$$

✅ **Solution Point:**

$$\left(\frac{17}{5}, \frac{1}{5}\right)$$

Consistency:
Lines intersect at one point → **consistent with unique solution**.

Q32 (b) OR

Five years ago, Adil was **thrice** as old as Bharat.
Ten years later, Adil will be **twice** as old as Bharat.
Let present ages be x and y.

$$x - 5 = 3(y - 5)$$
$$x + 10 = 2(y + 10)$$

Simplifying:

$$x - 3y = -10 \quad (1)$$
$$x - 2y = 10 \quad (2)$$

Subtract (1) from (2):

$$y = 20$$

Substitute in (2):

$$x = 50$$

✅ **Answer:**
Adil = **50 years**, Bharat = **20 years**

Q33
Find the **mean and mode** of the following frequency distribution:

Class	Frequency
0–15	9
15–30	15
30–45	35
45–60	20
60–75	11
75–90	13
90–105	17

Mean
Using assumed mean method,

$$\text{Mean} \approx 47.5$$

Mode
Modal class = **30–45**
Using formula:

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} h$$
$$= 30 + \frac{35 - 15}{70 - 15 - 20} \times 15$$
$$= 30 + \frac{20}{35} \times 15 \approx 38.6$$

✅ **Final Answer:**

Mean ≈ **47.5**
Mode ≈ **38.6**

Q34 (a)
Angle of elevation of the top of a building from a point on the ground is 30°.
On moving **24 m** towards the base, the angle becomes 60°.
Find the **height of the building** and **distance of the point from the base**.
(Take $\sqrt{3} = 1.73$)

Solution
Let initial distance = x
Height = h

$$\tan 30° = \frac{h}{x} \Rightarrow h = \frac{x}{\sqrt{3}}$$

After moving 24 m:

$$\tan 60° = \frac{h}{x - 24} \Rightarrow h = \sqrt{3}(x - 24)$$

Equating:

$$\frac{x}{\sqrt{3}} = \sqrt{3}(x - 24)$$
$$x = 3x - 72 \Rightarrow 2x = 72 \Rightarrow x = 36$$
$$h = \frac{36}{1.73} \approx 20.8 \text{ m}$$

✅ **Answer:**
Height ≈ **20.8 m**
Distance ≈ **36 m**

Q34 (b) OR
A tower stands vertically. A man at the top observes his friend at an angle of depression 30°.
After **30 seconds**, the angle becomes 60°.
Find the **time taken by the friend** to reach the foot of the tower.
Let height = h

$$\tan 30° = \frac{h}{x} \Rightarrow x = h\sqrt{3}$$
$$\tan 60° = \frac{h}{y} \Rightarrow y = \frac{h}{\sqrt{3}}$$

Distance travelled in 30 seconds:

$$x - y = \frac{2h}{\sqrt{3}}$$

Speed = constant ⇒ remaining time = **30 seconds**
✅ **Answer:**
Total time = 60 seconds

Q35

In ∆ABC, 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 ∆ABD:

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

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

Thus,

$$BX = 4XY$$

✓ Proved

Q36. Case Study – Mensuration (Leafy Ball Fountain)

Given:

- Diameter of spherical ball = 21 cm $\Rightarrow r = 10.5$cm
- Cylindrical pool: outer diameter = 50 cm $\Rightarrow R = 25$cm
- Inner diameter = 40 cm $\Rightarrow r_c = 20$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

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

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

Volume of annular cylinder:

$$\pi(R^2 - r_c^2) \times 7 = \pi(25^2 - 20^2) \times 7 = \pi(625 - 400) \times 7 = 1575\pi$$

Subtract submerged ball volume:

$$\frac{1}{3} \times 4851$$

$$\text{Water volume} \approx \boxed{4950 \text{ cm}^3}$$

OR

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

OCSA of cylinder:

$$2\pi Rh = 2\pi(25)(14)$$

Surface area of ball:

$$4\pi(10.5)^2$$
$$\text{Total} \approx \boxed{3740 \text{ cm}^2}$$

Q37. Case Study – Quadratic Equation (Backdrop Arch)
Given:
$$p(x) = -x^2 + 2x + 8$$

(i) Height of the arch
Vertex at:
$$x = -\frac{b}{2a} = 1$$
$$p(1) = -1 + 2 + 8 = \boxed{9}$$

(ii) (a) Zeroes and graph points
$$-x^2 + 2x + 8 = 0 \Rightarrow x^2 - 2x - 8 = 0$$
$$(x - 4)(x + 2) = 0$$
$$\boxed{-2, 4}$$

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

OR
(ii) (b) Span of the arch
$$4 - (-2) = \boxed{6}$$

(iii) Point of intersection with y-axis
$$x = 0 \Rightarrow y = 8$$
$$\boxed{(0, 8)}$$

Q38. Case Study – Probability (Playing Cards)
Two identical packs used (104 cards).
Dropped cards: Queen of Hearts, Ten of Spades, Ace of Clubs.
Remaining cards = 101.

(i) Probability of face card
Remaining face cards:
12 originally – 1 dropped = 11
$$\boxed{\frac{11}{101}}$$

(ii) Probability of king or queen

Kings = 8
Queens = 7

$$\boxed{\dfrac{15}{101}}$$

(iii) (a) Was probability of queen higher if none dropped?
Without dropping:

$$\dfrac{8}{104}$$

After dropping:

$$\dfrac{7}{101}$$
$$\boxed{\text{Yes}}$$

OR
(iii) (b) Probability of jack comparison
After dropping:

$$\dfrac{8}{101}$$

Without dropping:

$$\dfrac{8}{104}$$
$$\boxed{\text{Higher after dropping}}$$