Date: 17/02/2026

Question Paper Code

30/1/1

SET-1

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot-13, Sector-18, Udyog Vihar, Gurugram, Haryana-122015

Time: 3 Hrs. **Max. Marks: 80**

MATHEMATICS (Standard)

CBSE Class-X (2026)

Answers & Solutions

GENERAL INSTRUCTIONS

Read the following instructions carefully and follow them:

(i) This question paper contains **38** questions. **All** questions are **compulsory**.

(ii) This question paper is divided into **FIVE** sections. Sections - **A, B, C, D** and **E**.

(iii) In **Section A**, Question numbers **1** to **18** are multiple choice questions (MCQs) and question numbers **19** and **20** are Assertion–Reason based questions of 1 mark each.

(iv) In **Section B**, Question numbers **21** to **25** are very short answer (VSA) type questions, carrying **2** marks each.

(v) In **Section C**, Question numbers **26** to **31** are short answer (SA) type questions, carrying **3** marks each.

(vi) In **Section D**, Question numbers **32** to **35** are long answer (LA) type questions carrying **5** marks each.

(vii) In **Section E**, Question numbers **36** to **38** are **case-based** questions, carrying **4** marks each. Internal choice is provided in **2** marks question in each case-study.

(viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section **B**, 2 questions in Section **C**, 2 questions in Section **D** and 3 questions of **2** marks in Section **E**.

(ix) Draw neat diagrams wherever required. Take π = 22/7 wherever required, if not stated.

(x) Use of calculators is **not allowed.**

SECTION-A

Question numbers 1 to 20 are multiple choice questions of 1 mark each.

1. The HCF of 960 and 432 is **[1]**

   (a) 48 (b) 54

   (c) 72 (d) 36

Answer (a) **[1]**

Sol. $960 = 2^6 \times 3 \times 5$

$432 = 2^4 \times 3^3$

$\therefore$ HCF of 960 and 732 is 48

Option (a) is correct.

2. The natural number 2 is **[1]**

   (a) a prime number (b) a composite number

   (c) prime as well as composite (d) neither prime nor composite

Answer (a) **[1]**

Sol. The natural number 2 is a prime number.

Option (a) is correct.

3. For any natural number n, 6^n ends with the digit **[1]**

   (a) 0 (b) 6

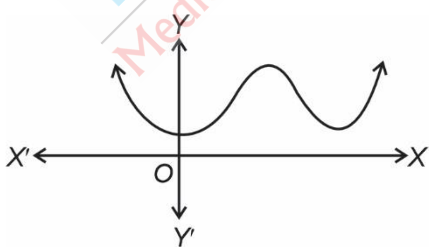
   (c) 3 (d) 2

Answer (b) **[1]**

Sol. 6^n always ends with the digit 6.

Option (b) is correct.

4. The graph of $y = f(x)$ is given. The number of zeroes of $f(x)$ is **[1]**



   (a) 0 (b) 1

   (c) 2 (d) 4

Answer (a) **[1]**

5. If a pair of linear equations in two variables is represented by two coincident lines, then the pair of equations has: **[1]**

   (a) a unique solution (b) two solutions

   (c) no solution (d) an infinite number of solutions

Answer (d) **[1]**

6. The common difference of the AP : $\sqrt{2}, 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, \ldots$ is **[1]**

(a) $\sqrt{2}$ (b) 1

(c) $2\sqrt{2}$ (d) $-\sqrt{2}$

Answer (a) **[1]**

Sol. Common difference $= 2\sqrt{2} - \sqrt{2}$

$= \sqrt{2}$

7. If ΔABC and ΔDEF are similar such that $2AB = DE$ and $BC = 8$ cm, then EF is equal to **[1]**

(a) 4 cm (b) 8 cm

(c) 12 cm (d) 16 cm

Answer (d) **[1]**

Sol. ΔABC and ΔDEF are similar

$$\frac{AB}{DE} = \frac{BC}{EF}$$

EF = 2 × 8

= 16 cm

8. The mid-point of the line segment joining the points (5, –4) and (6, 4) lies on **[1]**

(a) *x*-axis (b) *y*-axis

(c) origin (d) neither *x*-axis nor *y*-axis

Answer (a) **[1]**

Sol. Mid-point $= \left(\frac{5+6}{2}, \frac{-4+4}{2}\right)$

$= \left(\frac{11}{2}, 0\right)$

9. Given that $\sin\theta = \frac{a}{b}$, then $\cos\theta$ is equal to **[1]**

(a) $\frac{b}{\sqrt{b^2 - a^2}}$ (b) $\frac{b}{a}$

(c) $\frac{\sqrt{b^2 - a^2}}{b}$ (d) $\frac{a}{\sqrt{b^2 - a^2}}$

Answer (c) **[1]**

Sol. $\cos\theta = \sqrt{1 - \sin^2\theta}$

$= \sqrt{1 - \frac{a^2}{b^2}}$

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

10. If $\cos A = \frac{1}{2}$, then the value of $\sin^2 A + 2\cos^2 A$ is **[1]**

(a) $\frac{3}{2}$
(b) $\frac{5}{4}$
(c) –1
(d) $\frac{1}{2}$

Answer (b) **[1]**

Sol. $\sin^2 A + 2\cos^2 A = 1 - \cos^2 A + 2\cos^2 A$

$= 1 + \cos^2 A$

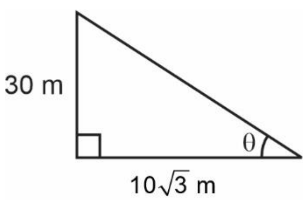
$= 1 + \left(\frac{1}{2}\right)^2 = \frac{5}{4}$

11. A car is moving away from the base of a 30 m high tower. The angle of elevation of the top of the tower from the car at an instant, when the car is $10\sqrt{3}$ m away from the base of the tower, is **[1]**

(a) 30°
(b) 45°
(c) 90°
(d) 60°

Answer (d) **[1]**

Sol.



$\tan\theta = \frac{30}{10\sqrt{3}} = \sqrt{3}$

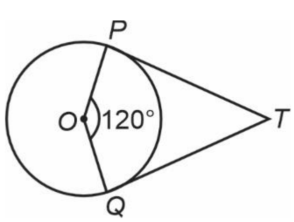
$\theta = 60°$

12. If *TP* and *TQ* are two tangents to a circle with centre *O* from an external point *T* so that $\angle POQ = 120°$, then $\angle PTQ$ is equal to **[1]**

(a) 60°
(b) 70°
(c) 80°
(d) 90°

Answer (a) **[1]**

Sol.

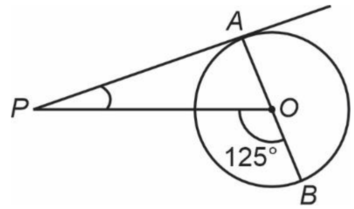


$\angle PTQ = 180° - \angle POQ$

$= 180° - 120°$

$= 60°$

13. In the given figure, PA is a tangent from an external point P to a circle with centre O. If $\angle POB = 125°$, then $\angle APO$ is equal to **[1]**



(a) 25° (b) 65°
(c) 90° (d) 35°

Answer (d) **[1]**

Sol. $\angle POB = \angle APO + \angle PAO$ (exterior angle)

$125° = \angle APO + 90°$

$\angle APO = 125° - 90° = 35°$

14. The length of the arc of the sector of a circle with radius 21 cm and of central angle 60°, is **[1]**

(a) 22 cm (b) 44 cm
(c) 88 cm (d) 11 cm

Answer (a) **[1]**

Sol. $\theta = 60°$ $r = 21$ cm

$$l = \frac{60°}{360°} \times 2\pi r$$

$$= \frac{1}{6} \times 2 \times \frac{22}{7} \times 21$$

= 22 cm

15. The hour hand of a clock is 7 cm long. The angle swept by it between 7:00 a.m. and 8:10 a.m. is **[1]**

(a) $\left(\frac{35}{4}\right)^{\circ}$ (b) $\left(\frac{35}{2}\right)^{\circ}$
(c) 35° (d) 70°

Answer (c) **[1]**

Sol. Duration = 1 hr 10 min = 70 min

Angle $= \frac{1°}{2} \times 70 = 35°$

16. The total surface area of a solid hemisphere of diameter '$2d$' is **[1]**

(a) $3\pi d^2$ (b) $2\pi d^2$
(c) $\frac{1}{2}\pi d^2$ (d) $\frac{3}{4}\pi d^2$

Answer (a) **[1]**

Sol. $3\pi d^2$

TSA = $3\pi r^2$

$2r = 2d$

$r = d$

$\therefore$ $\boxed{\text{TSA} = 3\pi d^2}$

17. If the mean and mode of a data are 12 and 21 respectively, then its median is **[1]**

(a) 6 (b) 13.5

(c) 15 (d) 14

Answer (c) **[1]**

Sol. Mode = 3median – 2mean

21 = 3 × median – 2 × 12

Median $= \frac{21+24}{3} = \frac{45}{3} = 15$

18. A die is thrown once. Probability of getting a number other than 3 is **[1]**

(a) $\frac{1}{6}$ (b) $\frac{3}{6}$

(c) $\frac{5}{6}$ (d) 1

Answer (c) **[1]**

Sol. Probability $= \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$

$= \frac{5}{6}$

(Assertion-Reason based questions)

Directions: Question numbers 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

(A) Both, Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Both, Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

19. **Assertion (A):** The probability that a leap year has 53 Mondays is $\frac{2}{7}$.

Reason (R): The probability that a non-leap year has 53 Mondays is $\frac{5}{7}$. **[1]**

Answer (c) **[1]**

Sol. A leap year has 366 days

366 = 52 weeks + 2 extra days

Probability $= \frac{2}{7}$

A non-leap year has 365 days

365 = 52 weeks + 1 extra day

Probability $= \frac{1}{7}$

20. **Assertion (A):** The polynomial $p(y) = y^2 + 4y + 3$ has two zeroes.

Reason (R): A quadratic polynomial can have at most two zeroes. **[1]**

Answer (b) **[1]**

Sol. $p(y) = y^2 + 4y + 3$

Zeroes are (–3, –1)

SECTION-B

Question numbers 21 to 25 are Very Short Answer (VSA) type questions, carrying 2 marks each.

21. If α, β are the zeroes of the polynomial $p(x) = x^2 - 3x - 1$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$. **[2]**

Sol. $p(x) = x^2 - 3x - 1$

Sum of zeroes, $\alpha + \beta = \frac{-b}{a} = 3$ **[½]**

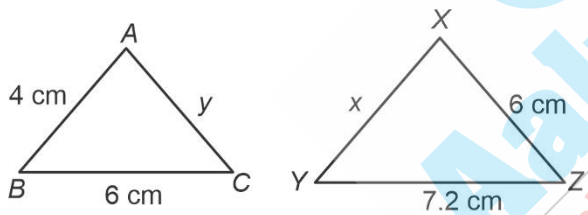
Product of zeroes, $\alpha\beta = \frac{c}{a} = -1$ **[½]**

$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta} = \frac{3}{-1} = -3$ **[1]**

22. (A) In ΔABC, $DE \parallel BC$. If $AD = x$, $DB = x - 2$, $AE = x + 2$ and $EC = x - 1$, then find the value of x. **[2]**

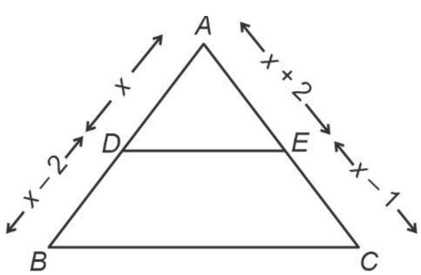
OR

(B)



In the figure given above, $\Delta ABC \sim \Delta XYZ$, then find the values of x and y.

Sol. (A)



According to question $DE \parallel BC$

So, $\frac{AD}{BD} = \frac{AE}{EC}$ [by BPT] **[½]**

$\Rightarrow \frac{x}{x-2} = \frac{x+2}{x-1}$ **[½]**

$\Rightarrow x^2 - x = x^2 - 4$ **[½]**

$\Rightarrow x = 4$ **[½]**

OR

(B) $\Delta ABC \sim \Delta XYZ$

$\Rightarrow \dfrac{AB}{XY} = \dfrac{AC}{XZ} = \dfrac{BC}{YZ}$ **[½]**

$\Rightarrow \dfrac{4}{x} = \dfrac{y}{6} = \dfrac{6}{7.2}$ **[½]**

$\Rightarrow x = \dfrac{7.2 \times 4}{6}$

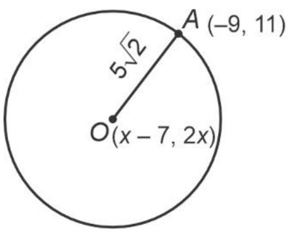
$= 4.8$ cm **[½]**

$\Rightarrow y = \dfrac{6 \times 6}{7.2}$

$= 5$ cm **[½]**

23. The coordinates of the centre of a circle are $(x - 7, 2x)$. Find the value(s) of 'x', if the circle passes through the point (–9, 11) and has radius $5\sqrt{2}$ units. **[2]**

Sol.



Let O be the centre of circle and $A(-9, 11)$

radius (r) = OA

$OA = \sqrt{(x - 7 + 9)^2 + (2x - 11)^2}$ **[½]**

$(5\sqrt{2})^2 = (x + 2)^2 + (2x - 11)^2$ **[½]**

$50 = x^2 + 4 + 4x + 4x^2 + 121 - 44x$

$5x^2 - 40x + 75 = 0$

Or $x^2 - 8x + 15 = 0$ **[½]**

$x^2 - 5x - 3x + 15 = 0$

$x(x - 5) - 3(x - 5) = 0$

$(x - 5)(x - 3) = 0$

$\boxed{x = 3, 5}$ **[½]**

24. (A) If $\tan\theta = \dfrac{24}{7}$, then find the value of $\sin\theta + \cos\theta$. **[2]**

OR

(B) If $\cot\theta = \dfrac{7}{8}$, then find the value of $\dfrac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$ **[2]**

Sol. (A) $\tan\theta = \dfrac{24}{7} = \dfrac{P}{B}$

$H^2 = P^2 + B^2$

Let, $H = \sqrt{(24)^2 + (7)^2}$ **[½]**

$= \sqrt{625}$

$= 25$ **[½]**

$\sin\theta + \cos\theta = \frac{24}{25} + \frac{7}{25}$ **[½]**

$= \frac{31}{25}$ **[½]**

OR

(B) $\cot\theta = \frac{7}{8}$

$\Rightarrow \quad \frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)+(1-\cos\theta)}$

$= \frac{1-\sin^2\theta}{1-\cos^2\theta}$ **[½]**

$= \frac{1-\sin^2\theta}{\sin^2\theta}$

$= \text{cosec}^2\theta - 1$ **[½]**

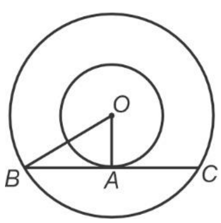
$= \cot^2\theta$

$= \left(\frac{7}{8}\right)^2$ **[½]**

$= \frac{49}{64}$ **[½]**

25. Two concentric circles are of radii 5 cm and 4 cm. Find the length of the chord of the larger circle which touches the smaller circle. **[2]**

Sol.



$OA = 4$ cm

$OB = 5$ cm

$OA \perp BC$ [$\because$ The tangent to a circle is perpendicular to the radius through the point of contact]

In ΔOAB

$OB^2 = OA^2 + AB^2$ **[½]**

$(5)^2 = (4)^2 + AB^2$

$\Rightarrow \quad AB = 25 - 16$ **[½]**

$AB = 3$ cm

$\therefore \quad BC = 2AB$ **[½]**

$BC = 2(3)$

$= 6$ cm **[½]**

Therefore, length of the chord of the larger circle which touches the smaller circle is 6 cm.

SECTION-C

Question numbers 26 to 31 are Short Answer (SA) type questions, carrying 3 marks each.

26. Prove that $\sqrt{3}$ is an irrational number. **[3]**

Sol. Let $\sqrt{3}$ be a rational number such that $\sqrt{3} = \frac{a}{b}$ where a, b are coprime.

$\left(\sqrt{3}\right)^2 = \frac{a^2}{b^2}$ …(i) **[½]**

$3b^2 = a^2$

$\Rightarrow$ $3 \mid a^2$

$\therefore$ $3 \mid a$ **[½]**

Let $a = 3k$ …(ii) where k is some rational number

Put (ii) in (i)

$3b^2 = (3k)^2$ **[½]**

$3b^2 = 9k^2$

$b^2 = 3k^2$ **[½]**

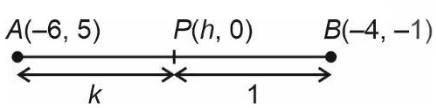
$\Rightarrow$ $3 \mid b^2$

Or $3 \mid b$ **[½]**

$\therefore$ 3 is a common factor of a and b. This contradicts the fact that a and b are co-prime. Therefore, by method of contradiction $\sqrt{3}$ is irrational. **[½]**

27. Find the ratio in which the x-axis divides the line segment joining the points (–6, 5) and (–4, –1). Also, find the point of intersection. **[3]**

Sol.



Let the required ratio be $k : 1$

$h = \frac{-6 + (-4)k}{k+1}$ **[½]**

$0 = \frac{5 \times 1 + (-1)k}{k+1}$ **[½]**

$0 = 5 - k$

$k = 5$

Required ratio = 5 : 1 **[½]**

Required point = $(h, 0)$

$= \left(\frac{-6 + (-4)5}{5+1}, 0\right)$ **[½]**

$= \left(\frac{-6 - 20}{6}, 0\right)$ **[½]**

$= \left(\frac{-26}{6}, 0\right)$

$= \left(\frac{-13}{3}, 0\right)$ **[½]**

28. (A) If $x = h + a\cos\theta$, $y = k + b\sin\theta$, then prove that :

$$\left(\frac{x-h}{a}\right)^2 + \left(\frac{y-k}{b}\right)^2 = 1$$ **[3]**

OR

(B) Prove that : $\frac{\tan A}{1+\sec A} - \frac{\tan A}{1-\sec A} = 2\,\text{cosec}\,A$ **[3]**

Sol. (A) $x = h + a\cos\theta$ ...(i)

$y = k + b\sin\theta$ ...(ii)

from (i)

$\frac{x-h}{a} = \cos\theta$ ...(iii) **[1]**

From (ii)

$\frac{y-k}{b} = \sin\theta$ ...(iv) **[1]**

Since $\cos^2\theta + \sin^2\theta = 1$ ...(v) **[½]**

$\therefore \left(\frac{x-h}{a}\right)^2 + \left(\frac{y-k}{b}\right)^2 = 1$ [from (iii), (iv) and (v)] **[½]**

OR

(B) L.H.S

$= \frac{\tan A}{1+\sec A} - \frac{\tan A}{1-\sec A}$

$= \frac{\frac{\sin A}{\cos A}}{1+\frac{1}{\cos A}} - \frac{\frac{\sin A}{\cos A}}{1-\frac{1}{\cos A}}$ **[½]**

$= \frac{\sin A}{\cos A+1} - \frac{\sin A}{\cos A-1}$ **[½]**

$= \sin A\left[\frac{1}{\cos A+1} - \frac{1}{\cos A-1}\right]$ **[½]**

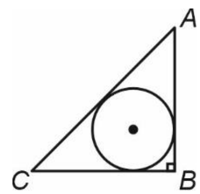
$= \sin A\left[\frac{\cos A-1-\cos A-1}{\cos^2 A-1}\right]$ **[½]**

$= \frac{(\sin A)(-2)}{-\sin^2 A}$ **[½]**

$= \frac{2}{\sin A}$

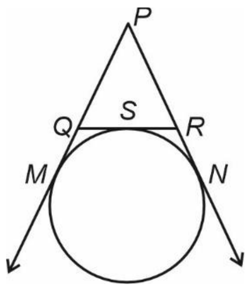
$= 2\,\text{cosec}\,A$ **[½]**

29. (A) In the given figure, ΔABC is a right triangle in which $\angle B = 90°$, $AB = 4$ cm and $BC = 3$ cm. Find the radius of the circle inscribed in the triangle ABC. **[3]**



OR

(B) In the given figure, if a circle touches the side QR of ΔPQR at S and extended sides PQ and PR at M and N respectively, then prove that : $PM = \frac{1}{2}(PQ + QR + PR)$



[3]

Sol. (A) $(AC)^2 = (BC)^2 + (AB)^2$

$(AC)^2 = (3)^2 + (4)^2$

$AC = \sqrt{25}$

$= 5$ cm

$\Rightarrow$ $AD = AO$

$\Rightarrow$ $BD = BE$

$\Rightarrow$ $CO = CE$ **[1]**

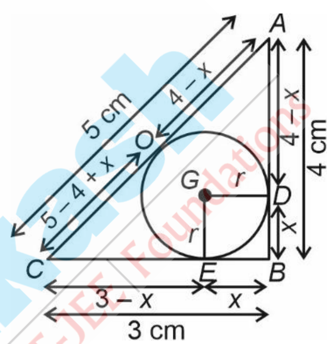
$3 - x = 5 - 4 + x$

$3 - x = 1 + x$

$x = 1$ **[1]**

$r = x$ [$\because$ $GDBE$ is square]

$r = 1$ **[1]**



(B) In the given figure

$QS = QM$

$RS = RN$ and $PM = PN$ (Tangents from same point) **[1]**

$PM = PQ + QM$

$= PQ + QS$ ...(i) **[½]**

$PN = PR + RN$

$= PR + RS$ ...(ii) **[½]**

Add (i) and (ii)

$PM + PN = PQ + QS + PR + RS$

$2PM = PQ + (QS + RS) + PR$ **[½]**

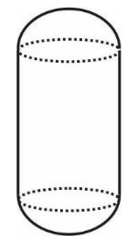
$2PM = PQ + QR + PR$

$PM = \frac{1}{2}(PQ + QR + PR)$ **[½]**

30. A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 20 cm and the diameter of the cylinder is 7 cm. Find the total volume of the solid. $\left(\text{Use } \pi = \frac{22}{7}\right)$ **[3]**

Sol. Total height of solid = 20 cm

Diameter = 7 cm



$\therefore$ radius = $\frac{7}{2}$ = 3.5 cm

Total height of solid = Height of cylinder + 2 (radii)

Height of cylinder = 20 − 2r **[½]**

= 20 − 7

= 13 cm

Volume of cylinder = $\pi r^2 h$ **[½]**

= $\pi(3.5)^2 \cdot (13)$

= 159.25 π

= 159.25 × $\frac{22}{7}$

= 500.5 cm^3 **[½]**

Volume of Two Hemispheres = $\frac{4}{3}\pi r^3$ **[½]**

= $\frac{4}{3}\pi(3.5)^3$

= $\frac{4}{3}\pi$ (42.875)

= $\frac{4}{3} \times \frac{22}{7}$ × 42.875

= 179.67 cm^3 **[½]**

Total volume = 500.5 + 179.67

= 680.17 cm^3 **[½]**

31. Two dice of different colours are thrown at the same time. Write down all the possible outcomes. What is the probability that : **[3]**

(i) Same number appears on both the dice?

(ii) Different number appears on both the dice?

Sol. All possible outcomes are

(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6),

(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6),

(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6),

(4, 1), (4, 2), (4, 3), (4, 4),(4, 5), (4, 6),

(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6),

(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6) **[1]**

(i) Favourable outcomes for same number on both dice are (1, 1), (2, 2), (3, 3) (4, 4), (5, 5) and (6, 6)

Required probability = $\frac{6}{36} = \frac{1}{6}$ **[1]**

(ii) P(different number on both dice)

= 1 – P(same number on both dice)

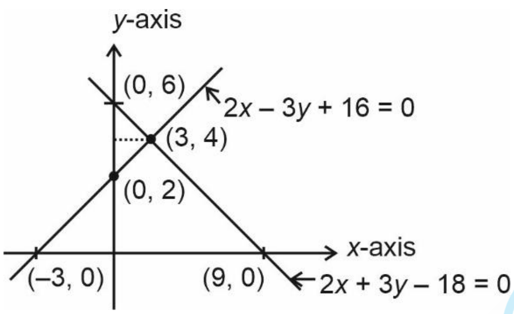
$= 1 - \frac{1}{6} = \frac{5}{6}$ **[1]**

SECTION-D

Question numbers 32 to 35 are Long Answer (LA) type questions, carrying 5 marks each.

32. Determine graphically, the coordinates of vertices of a triangle whose equations are $2x - 3y + 6 = 0$; $2x + 3y - 18 = 0$ and $x = 0$. Also, find the area of this triangle. **[5]**

Sol.



[2]

Point of intersections of given equations $2x - 3y + 6 = 0$ and $2x + 3y - 18 = 0$

$\Rightarrow$ $2x - 3y + 6 = 0$
$\underline{2x + 3y - 18 = 0}$
$4x - 12 = 0$

$x = \frac{12}{4}$

$x = 3$, $y = 4$

Required vertices of triangle are (0, 6), (0, 2) and (3, 4) **[1]**

Area of triangle = $\frac{1}{2}$ × Base × height

$= \frac{1}{2} \times (6 - 2) \times 3$ **[1]**

$= \frac{1}{2} \times 4 \times 3$

= 6 sq. units **[1]**

33. (A) A faster train takes one hour less than a slower train for a journey of 200 km. If the speed of the slower train is 10 km/hr less than that of the faster train, find the speeds of the two trains. **[5]**

OR

(B) The sum of the areas of two squares is 640 m^2. If the difference in their perimeters is 64 m, find the sides of the two squares. **[5]**

Sol. (A) Let speed of faster train = x km/hr

$\therefore$ Speed of slower train = $(x - 10)$ km/hr

According to the question,

$$\frac{200}{x-10} - \frac{200}{x} = 1$$ **[1]**

$$200\left[\frac{1}{x-10} - \frac{1}{x}\right] = 1$$ **[½]**

$$\frac{200(x - x + 10)}{x(x-10)} = 1$$ **[½]**

$$x^2 - 10x = 2000$$

$$x^2 - 10x - 2000 = 0$$ **[½]**

$$D = (-10)^2 - 4(1)(-2000)$$

$= 100 + 8000$

$= 8100$

$$x = \frac{10 \pm \sqrt{8100}}{2 \times 1}$$ **[½]**

$$x = \frac{10 \pm 90}{2}$$ **[½]**

$x = 50$ or $x = -40$ (not possible) **[½]**

$\therefore$ Speed of faster train = 50 km/hr **[½]**

Speed of slower train = 40 km/hr **[½]**

OR

(B) Let x and y be sides of two squares respectively. (Assuming $x > y$)

Perimeter of 1st square = $4x$ **[½]**

Perimeter of 2nd square = $4y$ **[½]**

$4x - 4y = 64$ **[½]**

Or $x - y = 16$ …(1) **[½]**

Also $x^2 + y^2 = 640$ …(2) **[½]**

From (2) and (1) we get

$(16 + y)^2 + y^2 = 640$ **[½]**

$256 + y^2 + 32y + y^2 = 640$ **[½]**

$2y^2 + 32y - 384 = 0$

Or $y^2 + 16y - 192 = 0$ **[½]**

$D = (16)^2 - 4(1)(-192)$

$= 256 + 768 = 1024$

$$y = \frac{-16 \pm \sqrt{1024}}{2} = \frac{-16 \pm 32}{2}$$ **[½]**

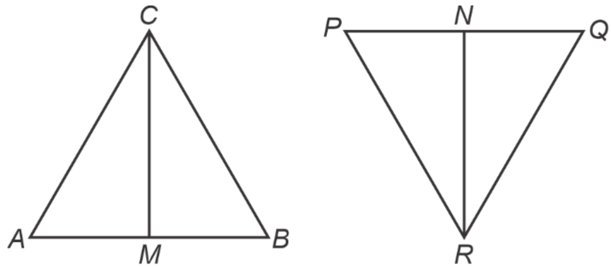
$y = 8$ or $y = -24$ (Not possible)

$\therefore$ Sides of square are 8 m and 24 m **[½]**

34. (A) State and prove Basic Proportionality Theorem. **[5]**

OR

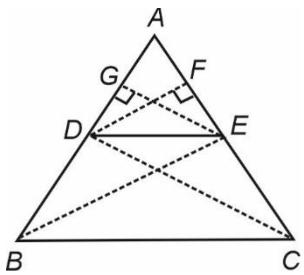
(B) In the given figure, CM and RN are respectively the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$, then prove that : **[5]**



(i) $\Delta AMC \sim \Delta PNR$

(ii) $\Delta CMB \sim \Delta RNQ$

Sol. (A)



Given : ΔABC, in which DE is drawn parallel to BC.

To Prove : $\dfrac{AD}{DB} = \dfrac{AE}{EC}$

Construction : Join CD and BE. Draw $DF \perp AE$ and $EG \perp AD$. **[½]**

Proof : ar(ΔADE) = $\dfrac{1}{2} \times AD \times EG$ …(i) **[½]**

ar(ΔBDE) = $\dfrac{1}{2} \times BD \times EG$ …(ii) **[½]**

Dividing (i) by (ii), we get

$$\frac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta BDE)} = \frac{\frac{1}{2} \times AD \times EG}{\frac{1}{2} \times BD \times EG} = \frac{AD}{BD} \quad \text{…(iii)}$$ **[½]**

Similarly,

$$\text{ar}(\Delta ADE) = \frac{1}{2} \times DF \times AE$$ **[½]**

and ar(ΔCDE) = $\dfrac{1}{2} \times CE \times DF$ **[½]**

$$\Rightarrow \frac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta CDE)} = \frac{\frac{1}{2} \times DF \times AE}{\frac{1}{2} \times DF \times CE} = \frac{AE}{CE} \quad \text{…(iv)}$$ **[½]**

Now, ar(ΔBDE) = ar(ΔCDE) $\left[\begin{array}{l}\because \text{ Triangles on the same base and between} \\ \text{ the same parallel lines are equal in area}\end{array}\right]$ **[½]**

$\Rightarrow \quad \dfrac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta BDE)} = \dfrac{\text{ar}(\Delta ADE)}{\text{ar}(\Delta CDE)}$ **[½]**

$\therefore$ From (iii) and (iv), we get

$$\frac{AD}{DB} = \frac{AE}{EC}$$ **[½]**

Hence proved.

(B) (i) $\Delta ABC \sim \Delta PQR$

$\dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{CA}{RP}$ ...(1) **[½]**

$\angle A = \angle P$, $\angle B = \angle Q$ and $\angle C = \angle R$

$AB = 2AM$ [$\because$ CM and RN are medians] **[½]**

$PQ = 2PN$

From (1)

$\dfrac{2AM}{2PN} = \dfrac{CA}{RP}$ **[½]**

$\Rightarrow \dfrac{AM}{PN} = \dfrac{CA}{RP}$

$\angle MAC = \angle NPR$ **[½]**

$\therefore \quad \Delta AMC \sim \Delta PNR$ [By SAS similarity criterion]

(ii) $\Delta ABC \sim \Delta PQR$

$\dfrac{AB}{PQ} = \dfrac{BC}{QR} = \dfrac{CA}{RP}$ **[½]**

$\therefore \quad \dfrac{CM}{RN} = \dfrac{CA}{RP}$ [$\Delta AMC \sim \Delta PNR$]

$\dfrac{CA}{RP} = \dfrac{AB}{PQ}$ [$\because$ $\Delta ABC \sim \Delta PQR$] **[½]**

$\therefore \quad \dfrac{CM}{RN} = \dfrac{AB}{PQ}$ **[½]**

$\dfrac{CM}{RN} = \dfrac{AB}{PQ} = \dfrac{2BM}{2QN}$ **[½]**

$\Rightarrow \dfrac{CM}{RN} = \dfrac{BM}{QN}$

$\Rightarrow \dfrac{CM}{RN} = \dfrac{BC}{QR} = \dfrac{BM}{QN}$ **[½]**

$\therefore \quad \Delta CMB \sim \Delta RNQ$ [By SSS similarity criterion] **[½]**

35. The mean of the following frequency distribution is 35. Find the values of x and y, if the sum of frequencies is 25 : **[5]**

Class	Frequency
0-10	1
10-20	x
20-30	5
30-40	7
40-50	y
50-60	3
60-70	1

Sol.

Class	x_i	f_i	$x_i f_i$
0-10	5	1	5
10-20	15	x	$15x$
20-30	25	5	125
30-40	35	7	245
40-50	45	y	$45y$
50-60	55	3	165
60-70	65	1	65
		$\sum f_i = 17 + x + y$	$\sum f_i x_i = 605 + 15x + 45y$

[2]

Given mean = 35, $\sum f_i = 25$

$17 + x + y = 25$

$x + y = 8$ ...(1) **[½]**

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i} = \frac{605 + 15x + 45y}{25} = 35$$ **[½]**

$605 + 15x + 45y = 875$ **[½]**

$15x + 45y = 270$

Or $x + 3y = 18$ ...(2) **[½]**

Subtract (1) and (2) we set

$y - 3y = -10$

$-2y = -10$

$\boxed{y = 5}$ **[½]**

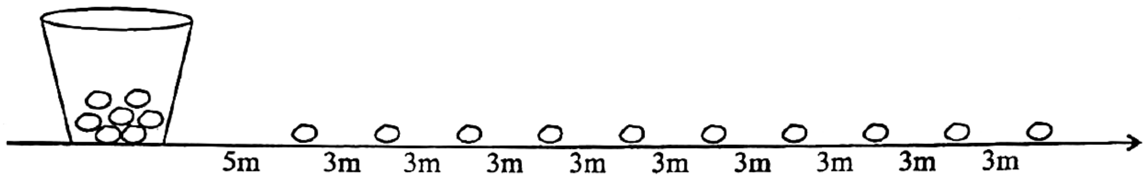
$\therefore$ $x = 8 - 5 = 3$

$\boxed{x = 3}$ **[½]**

SECTION-E

Question numbers 36 to 38 are Case Study Based questions, carrying 4 marks each.

36. In a potato race a bucket is placed at the starting point, which is 5 m from the first potato. The other potatoes are arranged 3 m apart in a straight line, with a total of 10 potatoes, as shown in the figure :



A competitor starts from the bucket, picks up the nearest potato, runs back to the bucket to drop it in, then returns to pick up the next potato. This process continues until all the potatoes are in the bucket.

Based on the above information, answer the following questions :

(i) What is the distance covered to pick up the first potato and drop it in bucket? **[1]**

(ii) What is the distance covered to pick up the second potato and drop it in bucket? **[1]**

(iii) (a) What is the total distance the competitor has to run? **[2]**

OR

(iii) (b) If average speed of competitor is 5 m/s, then find the average time taken by competitor to put all the potatoes in the bucket. **[2]**

Sol. (i) Required covered distance = 5 + 5

= 10 m **[1]**

(ii) Required covered distance = (5 + 3) + (3 + 5) + 10

= 8 + 8 + 10

= 26 m **[1]**

(iii) (a) Total distance covered

= 26 + 11 + 11 + 14 + 14 + 17 + 17 + 20 + 20 + 23 + 23 + 26 + 26 + 29 + 29 + 32 + 32

= 26 + 2 (11 + 14 + 17 + 20 + 23 + 26 + 29 + 32)

$= 26 + 2\left(\frac{8}{2}[2(11) + (8-1)3]\right)$

= 26 + 8 [22 + 21]

= 26 + 8[43]

= 26 + 344

= 370 m **[2]**

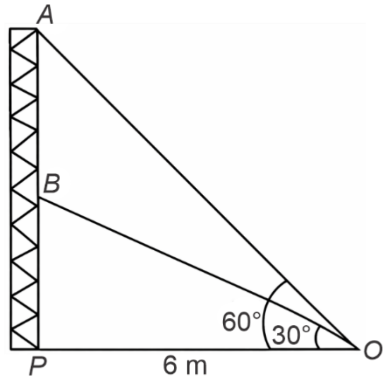
OR

(b) $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$

$= \frac{370}{5}$

= 74 sec **[2]**

37. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two sections '*A*' and '*B*'. Tower is supported by wires from a point '*O*' (as shown in figure).



Distance between the base of the tower and point '*O*' is 6 m. From point '*O*', the angle of elevation of the top of the section '*B*' is 30° and the angle of elevation of the top of section '*A*' is 60°.

Based on the above information, answer the following questions :

(i) Find the length of the wire from the point '*O*' to the top of section '*B*'. **[1]**

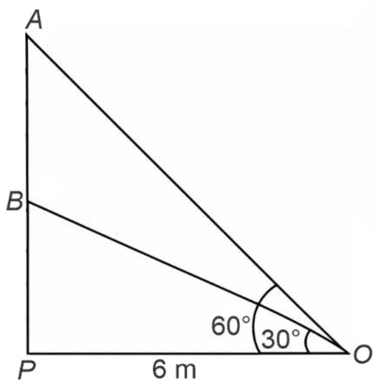
(ii) Find the length of the wire from the point '*O*' to the top of section '*A*'. **[1]**

(iii) (a) Find the distance *AB*. **[2]**

OR

(iii) (b) Find the area of ΔOPB. **[2]**

Sol. (i)



In ΔOBP

$$\frac{OP}{OB} = \cos 30°$$

$$OB = \frac{6}{\cos 30°} = \frac{6}{\frac{\sqrt{3}}{2}} = \frac{12}{\sqrt{3}} = 4\sqrt{3} \text{ m}$$ **[1]**

(ii) In ΔOAP

$$\frac{OP}{OA} = \cos 60°$$

$$OA = \frac{6}{\cos 60°} = \frac{6}{\left(\frac{1}{2}\right)} = 12 \text{ m}$$ **[1]**

(iii) (a) In ΔAPO

$$\frac{AP}{PO} = \tan 60° = \sqrt{3}$$

$AP = 6\sqrt{3}$ m **[½]**

Also, In ΔBPO

$$\frac{BP}{PO} = \tan 30° = \frac{1}{\sqrt{3}}$$

$BP = \frac{6}{\sqrt{3}} = 2\sqrt{3}$ m **[½]**

$\therefore \quad AB = AP - BP = 6\sqrt{3} - 2\sqrt{3} = 4\sqrt{3}$ m **[1]**

OR

(iii) (b) In ΔOPB

$\frac{PB}{OP} = \tan 30° = \frac{1}{\sqrt{3}}$ **[½]**

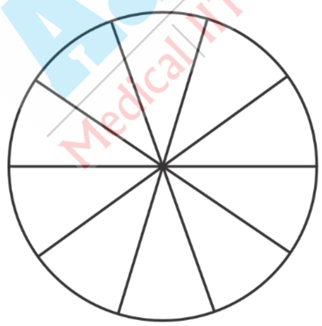
$PB = \frac{6}{\sqrt{3}} = 2\sqrt{3}$ m **[½]**

$\therefore \quad ar(\Delta OPB) = \frac{1}{2} \times BP \times OP$ **[½]**

$= \frac{1}{2} \times 2\sqrt{3} \times 6$

$= 6\sqrt{3}$ m^2 **[½]**

38. A brooch is crafted from silver wire in the shape of a circle with a diameter of 35 cm. The wire is also used to create 5 diameters, dividing the circle into 10 equal sectors as shown in figure.



Based on the above information, answer the following questions :

(i) What is the radius of circle? **[1]**

(ii) What is the circumference of the brooch? **[1]**

(iii) (a) What is the total length of silver wire required? **[2]**

OR

(iii) (b) What is the area of each sector of the brooch? **[2]**

Sol. (i) Radius = $\frac{35}{2}$

$= 17.5$ cm **[1]**

(ii) Circumference = $2\pi r$

$$= 2 \times \frac{22}{7} \times 17.5$$

= 110 cm **[1]**

(iii) (a) Total length of silver wire required = 110 + 5 (35) **[1]**

= 110 + 175

= 285 cm **[1]**

OR

(b) Total area of circle = $\pi\left(\frac{35}{2}\right)^2$

$$= \frac{22}{7} \times \frac{35}{4} \times 35$$

$$= \frac{110 \times 35}{4}$$

= 962.5 **[1]**

Area of each sector = $\frac{962.5}{10}$

= 96.25 cm^2 **[1]**

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