Class X Session 2025-26
Subject - Mathematics (Basic)
Sample Question Paper - 02

Time Allowed: 3 hours **Maximum Marks: 80**

General Instructions:

1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1-18 are multiple choice questions (MCQs) and questions no. 19 and 20 are AssertionReason based questions of 1 mark each.
4. In Section B, Questions no. 21-25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26-31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32-35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36-38 are case study based questions carrying 4 marks each with sub parts of the values of 1, 1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Question of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E .
9. Draw neat and clean figures wherever required.
10. Take wherever required if not stated.
11. Use of calculators is not allowed.

Section A

1. The exponent of 3 in the prime factorization of 864 is: **[1]**

a) 8 b) 3

c) 4 d) 2

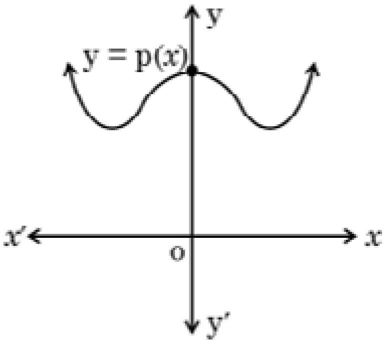
2. Which of the following is an irrational number? **[1]**

i. $\frac{22}{7}$
ii. 3.1416
iii. $3.\overline{1416}$
iv. 3.141141114...

a) Option (iii) b) Option (i)

c) Option (iv) d) Option (ii)

3. The graph of y = p(x) is shown in the figure for some polynomial p(x). The number of zeroes of p(x) is/are: **[1]**



a) 3
b) 0
c) 1
d) 2

4. If one zero of the polynomial $6x^2 + 37x - (k - 2)$ is reciprocal of the other, then what is the value of k? **[1]**

a) -6
b) 6
c) -4
d) 4

5. If the system of equations **[1]**

$3x + y = 1$ and

$(2k - 1) x + (k - 1) y = 2k + 1$

is inconsistent, then k =

a) 1
b) 0
c) -1
d) 2

6. If ∠A and ∠B are complementary angles and ∠A is x, then which equation can be used to find ∠B which is denoted by y? **[1]**

a) y = (180° - x)
b) y = (90° - x)
c) y = (x + 180°)
d) y = (90° + x)

7. A quadratic equation whose one root is 2 and the sum of whose roots is zero, is **[1]**

a) $x^2 + 4 = 0$
b) $4x^2 - 1 = 0$
c) $x^2 - 2 = 0$
d) $x^2 - 4 = 0$

8. $9x^2 + 12x + 4 = 0$ have **[1]**

a) No real roots
b) Real and Distinct roots
c) Real and Equal roots
d) Distinct roots

9. The common difference of the A.P $\frac{1}{2b}, \frac{1-6b}{2b}, \frac{1-12b}{2b}$ ....is **[1]**

a) -3
b) 3
c) -2b
d) 2b

10. If a, b, c form an A.P. with common difference d, then the value of a - 2b - c is equal to **[1]**

a) -2a - 3d
b) -2a - 4d
c) 0
d) 2a + 4d

11. In △ABC and △PQR, ∠B = ∠Q, ∠R = ∠C and AB = 2QR, then, the triangles are **[1]**

a) Neither congruent nor similar.
b) Congruent but not similar.

c) Congruent as well as similar.

d) Similar but not congruent.

12. XOYZ is a rectangle with vertices X(-3, 0), O(0, 0), Y(0, 4) and Z(x, y). The length of its each diagonal is **[1]**

a) 5 units

b) 4 units

c) $x^2 + y^2$ units

d) X

13. If θ is an acute angle such that $\cos\theta = \frac{3}{5}$, then $\frac{\sin\theta\tan\theta - 1}{2\tan^2\theta} =$ **[1]**

a) $\frac{160}{3}$

b) $\frac{16}{625}$

c) $\frac{3}{160}$

d) $\frac{1}{36}$

14. In a right triangle ABC, $\angle C = 90^\circ$. If AC = $\sqrt{3}$ BC and $\angle B = \phi$, then find its value **[1]**

a) 30°

b) 45°

c) 15^o

d) 60°

15. From a point P which is at a distance 13 cm from the centre O of a circle of radius 5 cm, the pair of tangents PQ and PR to the circle are drawn. Then the area of the quadrilateral PQOR is **[1]**

a) 32.5 cm^2

b) 30 cm^2

c) 65 cm^2

d) 60 cm^2

16. A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1cm and the height of the cone is equal to its radius. The volume of the solid is **[1]**

a) $\pi\ cm^3$

b) $4\pi\ cm^3$

c) $3\pi\ cm^3$

d) $2\pi\ cm^3$

17. The relationship between mean, median and mode for a moderately skewed distribution is: **[1]**

a) Mode = 2 Median - Mean

b) Mode = 3 Median - 2 mean

c) Mode = Median - 2 Mean

d) Mode = 2 Median - 3 Mean

18. The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is **[1]**

a) 21

b) 28

c) 14

d) 7

19. **Assertion (A):** Point (0, 3) has image (0, –3). **[1]**

Reason (R): Image of (0, k) is (0, –k) only.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

20. **Assertion (A):** If ratio of perimeters of two similar triangles is 6 : 11, then ratio of their corresponding medians is also 6 : 11. **[1]**

Reason (R): Converse of B.P.T. states that if two sides of a triangle are divided by a line in equal ratio then the line is parallel to the third side.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

Section B

21. Prove that $\sqrt{2}+\sqrt{3}$ is an irrational number. **[2]**

22. Find the value(s) of p in the pair of the equation: 2x + 3y – 5 = 0 and px – 6y – 8 = 0, if the pair of equations has a unique solution. **[2]**

23. Find the coordinates of the point where the diagonals of the parallelogram formed by joining the points (-2, -1), (1, 0), (4, 3) and (1, 2) meet. **[2]**

OR

Find the co-ordinates of the points which divide the line segment joining the points (–4, 0) and (0, 6) in four equal parts.

24. Prove that: $\sqrt{\frac{1+\sin A}{1-\sin A}}=\sec A+\tan A$ **[2]**

OR

Prove the trigonometric identity: $\frac{1}{1-\sin\theta}+\frac{1}{1+\sin\theta}=2\sec^2\theta$

25. From a well-shuffled pack of playing cards, black jacks, black kings and black aces are removed. A card is then drawn at random from the pack. Find the probability of getting **[2]**

 i. a red card
 ii. not a diamond card

Section C

26. Solve the pair of linear equations 3x + 4y = 10 and 2x – 2y = 2 by elimination and substitution method. **[3]**

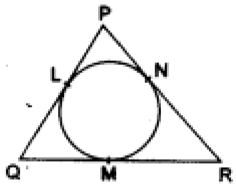
OR

A fraction becomes $\frac{4}{5}$, if 1 is added to both numerator and denominator. If however, 5 is subtracted from both numerator and denominator, the fraction becomes $\frac{1}{2}$. What is the fraction?

27. A point P divides the line segment joining the points A (3, - 5) and B (- 4, 8) such that $\frac{AP}{PB}=\frac{k}{1}$. If P lies on the line x + y = 0, then find the value of k. **[3]**

28. Prove that: sec A (1 - sin A) (sec A + tan A) = 1 **[3]**

29. In the given figure, a circle is inscribed in a triangle PQR. If PQ = 10 cm, QR = 8 cm and PR = 12 cm, find the lengths of QM, RN and PL. **[3]**



OR

If all the sides of a parallelogram touch a circle, show that the parallelogram is a rhombus.

30. Find the area of the corresponding major sector of a circle of radius 28 cm and the central angle 45^{o}. **[3]**

31. In the AP, ?, 13, ?, 3 find the missing terms? **[3]**

Section D

32. If the difference between the radii of the smaller circle and the larger circle is 7 cm and the difference between the areas of the two circles is 1078 sq. cm. Find the radius of the smaller circle. **[5]**

OR

The difference of two numbers is 5 and the difference of their reciprocals is $\frac{1}{10}$. Find the numbers.

33. In ΔABC, AD is the median to BC and in △PQR PM is the median to QR.If $\frac{AB}{PQ}=\frac{BC}{QR}=\frac{AD}{PM}$. Prove that $\Delta ABC\sim\Delta PQR$. **[5]**

34. From the top of a building, 60 m high, the angle of depression of the top of a tower is 45° and from the foot of the tower, the angle of elevation of the top of the building is 60°. Find the height of the tower and its distance from the building. **[5]**

OR

Two poles of equal heights are standing opposite each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60^o and 30^o respectively. Find the height of the poles and the distances of the point from the poles.

35. An incomplete distribution is given as follows: **[5]**

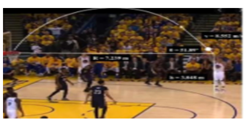
Variable	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	10	20	?	40	?	25	15

You are given that the median value is 35 and the sum of all the frequencies is 170. Using the median formula, fill up the missing frequencies.

Section E

36. **Read the following text carefully and answer the questions that follow:** **[4]**

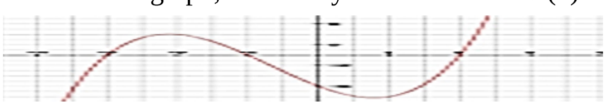
Basketball and soccer are played with a spherical ball. Even though an athlete dribbles the ball in both sports, a basketball player uses his hands and a soccer player uses his feet. Usually, soccer is played outdoors on a large field and basketball is played indoor on a court made out of wood. The projectile (path traced) of soccer ball and basketball are in the form of parabola representing quadratic polynomial.




i. Which type the shape of the path traced shown in given figure? (1)

ii. Why the graph of parabola opens upwards? (1)

iii. In the below graph, how many zeroes are there? (2)

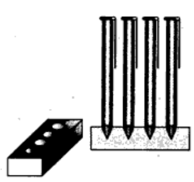


OR

What is the condition for the graph of parabola to open downwards? (2)

37. A carpenter in the small town of Bareilly used to make and sell different kinds of wood items like a rectangular box, cylindrical pen stand, and cuboidal pen stand. One day a student came to his shop and asked him to make a pen stand with the dimensions as follows: **[4]**

A pen stand should be in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid should be 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm.



By using the above-given information, find the following:

i. The volume of the cuboid.

ii. The volume of wood in the entire stand.

38. **Read the following text carefully and answer the questions that follow:** **[4]**

Ashok wanted to determine the height of a tree on the corner of his block. He knew that a certain fence by the tree was 4 feet tall. At 3 PM, he measured the shadow of the fence to be 2.5 feet tall. Then he measured the tree's shadow to be 11.3 feet.

i. What is the height of the tree? (1)

ii. What will be length of shadow of tree at 12:00 pm? (1)

iii. Write the name triangle formed for this situation. (2)

OR

What will be the length of wall at 12:00 pm? (2)

Solution

Section A

1.

(b) 3

Explanation:

Prime factorization of 864 = 32 × 27 = $2^5 \times 3^3$

Therefore the exponent of 3 in the prime factorization of 864 is 3

2.

(c) Option (iv)

Explanation:

3.141141114 is an irrational number because it is a non-repeating and non-terminating decimal.

3.

(b) 0

Explanation:

0

4.

(c) -4

Explanation:

Let one zero be x and other zero be $\frac{1}{x}$

$\therefore$ Product of zeroes = $\frac{c}{a}$

$\Rightarrow x \times \frac{1}{x} = \frac{-(k-2)}{6}$

$\Rightarrow 1 = \frac{2-k}{6}$

$\Rightarrow$ 6 = 2 - k

$\Rightarrow$ k = 2 - 6 = -4

5.

(d) 2

Explanation:

The given system of equations is inconsistent,

3x + y = 1

(2k - 1)x + (k - 1)y = 2k + 1

If the system of equations is inconsistent, we have

$\frac{3}{2k-1} = \frac{1}{k-1} = \frac{1}{2k+1}$

Take,

$\frac{3}{2k-1} = \frac{1}{k-1}$

$\Rightarrow 3k - 3 = 2k - 1$

$\Rightarrow k = 2$

6.

(b) y = (90° - x)

Explanation:

We have given, $\angle$A + $\angle$B = 90°

$\Rightarrow$ x + y = 90° $\Rightarrow$ y = (90° - x)

7.

(d) $x^2 - 4 = 0$

Explanation:

Given that, Sum of roots of a quadratic equation = 0

One root = 2

Second root = 0 - 2 = -2

and product of roots = 2 × (-2) = -4

Required Quadratic equation will be,

x^2 + (sum of roots) x + product of roots = 0

$x^2 + 0x + (-4) = 0$

$\Rightarrow x^2 - 4 = 0$

8.

(c) Real and Equal roots

Explanation:

Comparing the given equation to the below equation

$ax^2 + bx + c = 0$

a = 9, b = 12, c = 4

$D = b^2 - 4ac$

$D = 12^2 - 4 \times 9 \times 4$

D = 144 - 144

D = 0

If $b^2 - 4ac = 0$ then equation have equal and real roots.

9. **(a)** -3

Explanation:

Given A.P. is $\frac{1}{2b}, \frac{1-6b}{2b}, \frac{1-12b}{2b}, \ldots$

$\Rightarrow \frac{1}{2b}, \frac{1}{2b} - \frac{6b}{2b}, \frac{1}{2b} - \frac{12b}{2b}, \ldots$

$\Rightarrow \frac{1}{2b}, \frac{1}{2b} - 3, \frac{1}{2b} - 6, \ldots$

$\therefore d = \frac{1}{2b} - 3 - \frac{1}{2b} = -3$

10.

(b) -2a - 4d

Explanation:

b= a+d

c= a+2d

Now, a - 2b - c= a - 2(a+d) - (a+2d)

= a - 2a - 2d - a -2d

= (a - 2a - a) - (2d + 2d)

= -2a - 4d

So, the value of a - 2b - c in terms of the common difference d is -2a - 4d.

11.

(d) Similar but not congruent.

Explanation:

In $\triangle ABC$ and $\triangle PQR$ $\angle B = \angle Q$, $\angle R = \angle C$ and AB = 2QR

Then, the triangles are similar, by AA similarity rule, but not congruent because, for congruency, sides should also be equal.

12. **(a)** 5 units

Explanation:

X(-3, 0), O(0, 0), Y(0, 4), Z(x, y).
XOYZ is a rectangle,
So, diagonal xy = diagonal OZ

$xy = \sqrt{(-3-0)^2 + (0-4)^2}$

$= \sqrt{9+16}$

$= \sqrt{25}$

xy = 5 units

13.

(c) $\frac{3}{160}$

Explanation:

$\cos\theta = \frac{3}{5} = \frac{\text{Base}}{\text{Hypotenuse}}$

By Pythagoras Theorem, $(\text{Hypotenuse})^2 = (\text{Base})^2 + (\text{Alt.})^2$

$\Rightarrow (5)^2 = (3)^2 + (alt.)^2$

$\Rightarrow 25 = 9 + (alt)^2 \Rightarrow (alt)^2 = 25 - 9 = 16 = (4)^2$

Alt. = 4

Now, $\sin\theta = \frac{\text{Alt.}}{\text{Hypotenuse}} = \frac{4}{5}$

and $\tan\theta = \frac{\text{Alt.}}{\text{Base}} = \frac{4}{3}$

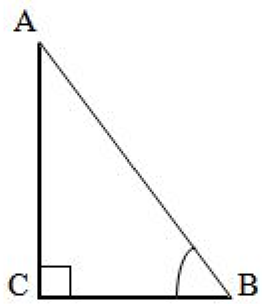
$\therefore \frac{\sin\theta\tan\theta - 1}{2\tan^2\theta} = \frac{\frac{4}{5}\times\frac{4}{3} - 1}{2\times\left(\frac{4}{3}\right)^2} = \frac{\frac{16}{15} - 1}{2\times\frac{16}{9}}$

$= \frac{\frac{1}{15}}{\frac{32}{9}} = \frac{1}{15} \times \frac{9}{32} = \frac{3}{160}$

14.

(d) 60°

Explanation:



Given: $\angle C = 90^\circ$. If AC = $\sqrt{3}$ BC and $\angle B = \phi$,

$\therefore \tan\phi = \frac{\text{AC}}{\text{BC}}$

$\Rightarrow \tan\phi = \frac{\sqrt{3}\text{BC}}{\text{BC}} = \sqrt{3}$

$\Rightarrow \tan\phi = \tan 60^\circ\ \phi$

$\Rightarrow \phi = 60^\circ$

15.

(d) 60 cm^2

Explanation:

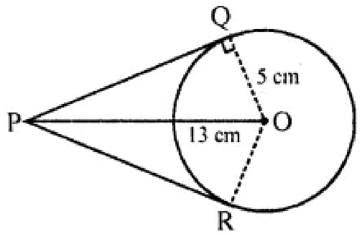
Firstly, draw a circle of radius 5 cm having centre O.
P is a point at a distance of 13 cm from O.
A pair of tangents PQ and PR are drawn.
Thus, quadrilateral PQOR is formed.
OQ $\perp$ QP [since, AP is a tangent line]
In right angled ΔPQO

$OP^2 = OQ^2 + QP^2$

$\Rightarrow 13^2 = 5^2 + QP^2$

$\Rightarrow QP^2 = 169 - 25 = 144 = 12^2$

$\Rightarrow QP = 12$ cm

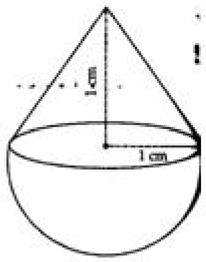


Now, area of $\Delta OQP = \frac{1}{2} \times \mathrm{QP} \times \mathrm{QO} = \frac{1}{2} \times 12 \times 5 = 30\mathrm{cm}^2$

Area of quadrilateral $\mathrm{QORP} = 2\Delta\mathrm{OQP} = 2 \times 30 = 60\mathrm{cm}^2$

16. **(a)** $\pi\ cm^3$

Explanation:



Radii of cone = r = 1 cm

Radius of hemisphere = r = 1 cm (h) = 1cm

Height of cone $(h) = 1$ h =1 cm

Volume of solid = Volume of cone + Volume of a hemisphere

$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3 = \frac{1}{3}\pi r^2 (h + 2r)$

$= \frac{1}{3} \times \pi \times (1)^2 (1 + 2 \times 1)$

$= \frac{1}{3} \times \pi \times 3 = \pi\ \mathrm{cm}^3$

17.

(b) Mode = 3 Median - 2 mean

Explanation:

In case of a moderately skewed distribution, the difference between mean and mode is almost equal to three times the difference between the mean and median. Thus, the empirical mean median mode relation is given as:

Mean – Mode = 3 (Mean – Median)

i.e, Mode = 3 Median - 2 Mean

18.

(c) 14

Explanation:

Probability of getting bad eggs = $\frac{\text{No. of bad eggs}}{\text{Total no. of eggs}}$

$\Rightarrow 0.035 = \frac{\text{No. of bad eggs}}{400}$

$\Rightarrow$ No. of bad eggs = $0.035 \times 400 = 14$

19. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Image of points of type (0, k) is (0, –k) only.

20.

(c) A is true but R is false.

Explanation:

A is true but R is false.

Section B

21. Let us assume that $\sqrt{2}+\sqrt{3}$ is a rational number

Let $\sqrt{2}+\sqrt{3}=\frac{\mathrm{a}}{\mathrm{b}}$ Where a and b are co-prime positive integers

On squaring both sides, we get

$(\sqrt{2}+\sqrt{3})^2=\frac{\mathrm{a}^2}{\mathrm{b}^2}$

$2+3+2\sqrt{6}=\frac{\mathrm{a}^2}{\mathrm{b}^2}$

$5+2\sqrt{6}=\frac{a^2}{b^2}$

$2\sqrt{6}=\frac{\mathrm{a}^2}{\mathrm{b}^2}-5$

$2\sqrt{6}=\frac{\mathrm{a}^2-5\mathrm{b}^2}{\mathrm{b}^2}$

$\sqrt{6}=\frac{\mathrm{a}^2-5\mathrm{b}^2}{2\mathrm{b}^2}$

Now $\frac{\mathrm{a}^2-5\mathrm{b}^2}{2\mathrm{b}^2}$ is a rational number.

This shows that $\sqrt{6}$ is a rational number.

But this contradicts the fact that $\sqrt{6}$ is an irrational number.

This contradiction has raised because we assume that $(\sqrt{2}+\sqrt{3})$ is a rational number.

Hence, our assumption is wrong and $(\sqrt{2}+\sqrt{3})$ is an irrational number.

22. Given, pair of linear equations is 2x + 3y - 5 = 0 and px - 6y - 8 = 0

On comparing with $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$, we get

a_1 = 2, b_1 = 3, c_1 = - 5;

And a_2 = p, b_2 = - 6, c_2 = - 8;

$a_1/a_2=\frac{2}{p}$

b_1/b_2 = - 3/6 = - 1/2

c_1/c_2 = 5/8

Since, the pair of linear equations has a unique solution.

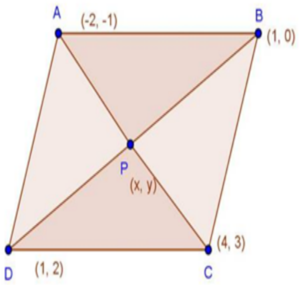
$a_1/a_2 \neq b_1/b_2$

so $\frac{2}{\mathrm{p}} \neq$ - 1/2

p $\neq$ - 4

Hence, the pair of linear equations has a unique solution for all values of p except - 4

i.e., p $\in \mathrm{R}-\{-4\}$

23. 

Let P(x, y) be the given points.

We know that diagonals of a parallelogram bisect each other.

$x=\frac{-2+4}{2}$

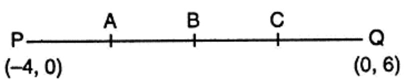
$\Rightarrow \quad x=\frac{2}{2}=1$

$y=\frac{-1+3}{2}=\frac{2}{2}=1$

$\therefore$ Coordinates of P are (1, 1)

OR

Let the given points be denoted by P and Q.



Co-ordinate of B(mid-point of PQ) are: $\left(\frac{-4+0}{2},\frac{0+6}{2}\right)$ i.e. (–2, 3)

Co-ordinates of A (mid-point of PB) are: $\left(\frac{-4-2}{2}, \frac{0+3}{2}\right)$ i.e. $\left(-3, \frac{3}{2}\right)$

Co-ordinates of C (mid-point of BQ) are: $\left(\frac{-2+0}{2}, \frac{6+3}{2}\right)$ i.e. $\left(-1, \frac{9}{2}\right)$.

Hence, the co-ordinates of the required mid-points are $\left(-1, \frac{9}{2}\right)$, (–2, 3) and $\left(-3, \frac{3}{2}\right)$

24. $= \sqrt{\frac{1+\sin A}{1-\sin A}} = \sqrt{\frac{(1+\sin A)(1+\sin A)}{(1-\sin A)(1+\sin A)}}$

$= \sqrt{\frac{(1+\sin A)^2}{1-\sin^2 A}} = \sqrt{\frac{(1+\sin A)^2}{\cos^2 A}}$

$= \frac{1+\sin A}{\cos A} = \frac{1}{\cos A} + \frac{\sin A}{\cos A}$

= sec A + tan A

= RHS

OR

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

L.H.S. $= \frac{1}{1-\sin\theta} + \frac{1}{1+\sin\theta}$

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

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

$= 2\sec^2\theta$ $[\because \sec(x) = \frac{1}{\cos(x)}]$

= R.H.S. Proved

25. Here black jacks, black kings and black aces are removed.

Total cards removed = 2 + 2 + 2 = 6

Remaining cards = 52 - 6 = 46

Total no. of outcomes = 46

i. Let A be the event of getting a red card.

Total no. of red cards = 13 + 13 = 26 (all hearts and diamonds)

Favouring outcomes = 26

P(A) = $\frac{26}{46} = \frac{13}{23}$

ii. Let B be the event of getting not a diamond card.

Total no. of diamond cards = 13

Favouring outcomes = 46 - 13 = 33

P(B) = $\frac{33}{46}$

Section C

26. 1. By Elimination method,

The given system of equation is :

3 x + 4 y = 10 ....(1)

2 x - 2 y = 2 ....(2)

Multiplying equation(2) by 2, we get

4 x - 4 y = 4 ....(2)

Adding equation (1) and equation (3), we get

7 x = 14

$\therefore \quad x = \frac{14}{7} = 2$

Substituting this value of x in equation (2), we get

2(2) - 2y = 2

$\Rightarrow \quad 4 - 2y = 2$

$\Rightarrow \quad 2y = 4 - 2$

$\Rightarrow \quad 2y = 2$

$\Rightarrow \quad y = \frac{2}{2} = 1$

So, the solution of the given system of equation is

x = 2, y = 1

2. By Substitution method,

The given system of equation is:

3 x + 4 y = 10.................(1)

2 x - 2 y = 2....................(2)

From equation(1)

$3x = 10 - 4y$

$x = \left(\frac{10-4y}{3}\right)$

Put value of x in equation (2),

$2x - 2y = 2$

$2\left(\frac{10-4y}{3}\right) - 2y = 2$

$\frac{2(10-4y)-2y(3)}{3} = 2$

$20 - 8y - 6y = 6$

$-14y = -14$

y = 1

Putting value of y = 1 in equation (2)

2x - 2 = 2

x = 2

Therefore, x = 2, y = 1 is the solution.

Verification: Substituting x = 2, y = 1, we find that both the equation(1) and (2) are satisfied shown below:

$3x + 4y = 3(2) + 4(1) = 6 + 4 = 10$

$2x - 2y = 2(2) - 2(1) = 4 - 2 = 2$

Hence, the solution is correct.

OR

Let numerator of fraction is x and denominator is y.

Let the fraction be $\frac{x}{y}$.

Then, according to the given conditions, we have

If 1 is added to both numerator and denominator then fraction becomes $\frac{4}{5}$.

$\frac{x+1}{y+1} = \frac{4}{5}$

$\Rightarrow$ 5x +5 =4y + 4

$\Rightarrow$ 5x - 4y + 1=0 ...... (i)

If 5 is subtracted from both numerator and denominator, the fraction becomes $\frac{1}{2}$.

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

$\Rightarrow$ 2x - 10 = y - 5

$\Rightarrow$ 2x - y - 5=0 .... (ii)

From (i) and (ii)

By using cross-multiplication, we have

$\frac{x}{-4\times-5-(-1)\times1} = \frac{-y}{5\times-5-2\times1} = \frac{1}{5\times-1-2\times-4}$

$\Rightarrow \quad \frac{x}{20+1} = \frac{y}{25+2} = \frac{1}{-5+8}$

$\Rightarrow \quad \frac{x}{21} = \frac{y}{27} = \frac{1}{3}$

$\Rightarrow x = \frac{21}{3} = 7$ and $y = \frac{27}{3} = 9$

Hence, the given fraction is 7/9.

27. Given points are A(3, -5) and B(-4, 8).

P divides AB in the ratio k:1

Using the section formula, we have:

Coordinate of point P are $\left\{\left(\frac{-4k+3}{k+1}\right)\left(\frac{8k-5}{k+1}\right)\right\}$

Now it is given, that P lies on the line x + y =0

Therefore,

$\frac{-4k+3}{k+1} + \frac{8k-5}{k+1} = 0$

$\Rightarrow$ -4k + 3 + 8k - 5 =0

$\Rightarrow$ -4k + 3 + 8k - 5 = 0

$\Rightarrow$ 4k - 2 = 0

$\Rightarrow k = \frac{2}{4}$

$\Rightarrow k = \frac{1}{2}$

Thus, the value of k is 1/2.

28. L.H.S.

= sec A(1 - sin A)(sec A + tan A)

$= \frac{1}{cos A}(1 - \sin A)(\frac{1}{cos A} + \frac{sin A}{cos A})$

$= \frac{(1 - sin A)}{cos A}(\frac{1 + sin A}{cos A})$

$= \frac{(1 - \sin A)(1 + \sin A)}{\cos A \times \cos A}$

$= \frac{(1^2 - \sin^2 A)}{\cos^2 A}$.[Since, (a - b) (a + b) = a^2 - b^2]

$= \frac{(1 - \sin^2 A)}{\cos^2 A}$

$= \frac{cos^2 A}{cos^2 A}$

= 1

=RHS

Hence, proved.

29. According to question we are given that PQ = 10 cm, QR = 8 cm and PR = 12 cm.

We know that the lengths of the tangents drawn from an external point to a circle are equal.

Let PL = PN = x;

QL = QM = y;

RM = RN =z.

Now,PL + QL = PQ

$\Rightarrow$ x+y = 10, ...(i)

QM + RM = QR

$\Rightarrow$ y + z = 8, ...(ii)

Subtracting (ii) from (iii), we get

x - y = 4. ...(iv)

Solving (i) and (iv), we get

x = 7, y = 3.

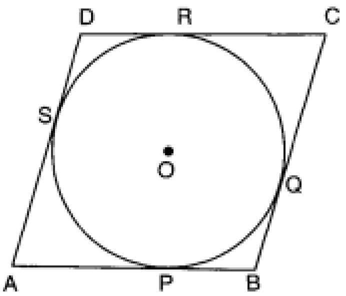
Substituting y = 3 in (ii), we get z = 5

$\therefore$ QM = y = 3 cm,

RN = z = 5 cm,

PL = x = 7 cm.

OR



Let ABCD be a parallelogram such that its sides touch a circle with centre O.

We know that the tangents to a circle from an exterior point are equal in length.

Therefore,AP = AS [From A] ...(i)

BP = BQ [FromB] ...(ii)

CR = CQ [From C] ...(iii)

and , DR = DS [From D] ...(iv)

Adding (i), (ii), (iii) and (iv), we get,

AP + BP + CR + DR = AS + BQ +CQ + DS

$\Rightarrow$ (AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)

$\Rightarrow$ AB + CD = AD + BC

$\Rightarrow$ 2 AB = 2 BC

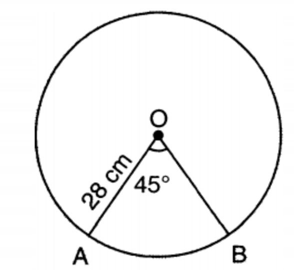
⇒ AB = BC

Therefore, AB = BC = CD = AD

Thus, ABCD is a rhombus.

30. Area of major sector = area of circle - area of minor sector

$= \pi r^2 - \left(\frac{\theta}{360}\pi r^2\right)$



$= \pi r^2\left(1 - \frac{\theta}{360}\right)$

$= \frac{22}{7} \times 28 \times 28\left(1 - \frac{45}{360}\right)$

$= \frac{22}{7} \times 28 \times 28\left(1 - \frac{1}{8}\right)$

$= \frac{22}{7} \times 28 \times 28 \times \frac{7}{8}$

$= 11 \times 14 \times 14$

= 2156 cm^2

31. Let the first term and the common difference of the given AP be a and d respectively.

Second term = 13

⇒ a + (2 - 1)d = 13

⇒ a + d = 13 .... (1)

Fourth term = 3

⇒ a + (4 - 1) d = 3

⇒ a + 3d = 3 .... (2)

Solving (1) and (2), we get

a = 18

d = -5

Therefore,

Third term = a + (3 - 1) d

= a + 2d

= 18 + 2(-5)

= 18 - 10

= 8

Hence, the missing terms are 18 and 8.

Section D

32. Let the lengths of the radii of the smaller and larger circles be r cm and R cm respectively.

It is given that,R - r = 7.....(i).

It is also given that the difference between the areas of two circles is 1078 cm^2

$\therefore \quad \pi R^2 - \pi r^2 = 1078$

$\Rightarrow \quad \pi\left(R^2 - r^2\right) = 1078$

$\Rightarrow \quad \frac{22}{7}(R + r)(R - r) = 1078$

$\Rightarrow \quad \frac{22}{7}(R + r) \times 7 = 1078$

⇒ R + r = 49 ....(ii)

Subtracting (i) from (ii), we get

2r = 42⇒r = 21

Hence, the radius of the smaller circle is of length 21 cm.

OR

Let the first number be x

∴ Second number = x + 5

Now according to the question

$\frac{1}{x} - \frac{1}{x+5} = \frac{1}{10}$

$\Rightarrow \quad \frac{x+5-x}{x(x+5)} = \frac{1}{10}$

$\Rightarrow \quad 50 = x^2 + 5x$

$\Rightarrow \quad x^2 + 5x - 50 = 0$

$\Rightarrow \quad x^2 + 10x - 5x - 50 = 0$

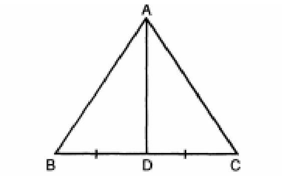
$\Rightarrow x(x+10) - 5(x+10) = 0$

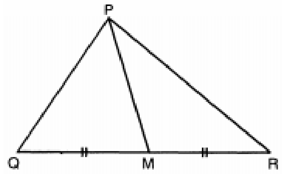
$\Rightarrow \quad (x+10)(x-5) = 0$

x = 5 ,- 10 rejected

The numbers = 5 and 10.

33. Proof: In $\Delta ABC \; BC = 2BD$





and In $\Delta PQR \; QR = 2QM$

Given, $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{AD}{PM}$

or, $\frac{AB}{PQ} = \frac{AD}{PM} = \frac{BC}{QR} = \frac{2BD}{2QM} = \frac{BD}{QM}$

So, in ΔABD and ΔPQM

$\frac{AB}{PQ} = \frac{AD}{PM} = \frac{BD}{QM}$

$\therefore \Delta ABD \sim \Delta PQM$

So $\angle B = \angle Q$ (By CPCT)

In ΔABC and ΔPQR

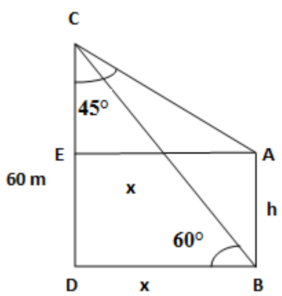
$\angle B = \angle Q$

and $\frac{AB}{PQ} = \frac{BC}{QR}$

Hence $\Delta ABC \sim \Delta PQR$

34. Let AB is the tower with height h and CD is the building with height CD = 60 m.

Let BD = x



ABDE is rectangle.

So AE = BD = x, and DE = AB = h

CE = CD - h = 60 - h

In $\triangle$ACE

$\tan 45 = \frac{\text{AE}}{\text{CE}} = \frac{\text{x}}{60-\text{h}}$

$1 = \frac{\text{x}}{60-\text{h}}$

x = 60 - h .... (1)

In $\triangle$ BCD

tan 60 = $\frac{\text{CD}}{\text{BD}} = \frac{60}{\text{x}} = \frac{60}{60-\text{h}}$

$\sqrt{3} = \frac{60}{60-\text{h}}$

$60 = 60\sqrt{3} - h\sqrt{3}$

$h\sqrt{3} = 60\sqrt{3} - 60$

$h = 60 - \frac{60}{\sqrt{3}} = 60 - 34.64 = 25.36$ m

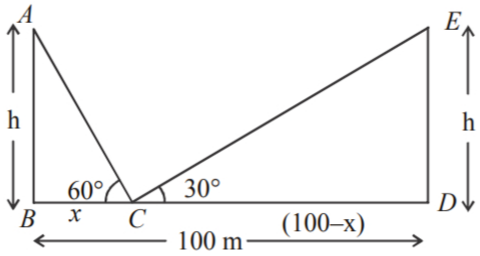
Hence height of tower = 25.36 m

From eqn(1),

x = 60 - h = 60 - 25.36 = 34.64

So the distance between building and tower = 34.64 m

OR



In $\triangle ABC$, $\frac{h}{x} = \tan 60^o$

$\therefore h = x\sqrt{3}$ ...(i)

In $\triangle CDE$, $\frac{h}{100-x} = \tan 30^o$

$\therefore h\sqrt{3} = 100 - x$

$x\sqrt{3} \times \sqrt{3} = 100 - x$

$\therefore x = 25$

From (i), $h = 25\sqrt{3}$

$\therefore$ Height of poles = $25\sqrt{3}$ m

and distances of point from poles are 25 m and 75 m.

35.

Class interval	**Frequency**	**Cumulative frequency**
0-10	10	10
10-20	20	30
20-30	f_1	$30 + f_1$(F)
30-40	40 (f)	$70 + f_1$
40-50	f_2	$70 + f_1 + f_2$
50-60	25	$95 + f_1 + f_2$
60-70	15	$110 + f_1 + f_2$
	N = 170	

According to the question ,

Given,

Median = 35

then median class = 30 - 40

$\therefore$ l = 30, h = 40 - 30 = 10, f = 40, F = $30 + f_1$

$\therefore$ Median = $l + \frac{\frac{N}{2} - F}{f} \times h$

$\Rightarrow 35 = 30 + \frac{85-(30+f_1)}{40} \times 10$

$\Rightarrow 35 - 30 = \frac{85-30-f_1}{40} \times 10$

$\Rightarrow 5 = \frac{55-f_1}{4}$

$\Rightarrow 20 = 55 - f_1$

$\Rightarrow f_1 = 55 - 20 = 35$

Given

Sum of frequencies = 170

$\Rightarrow 10 + 20 + f_1 + 40 + f_2 + 25 + 15 = 170$

$\Rightarrow 10 + 20 + 35 + 40 + f_2 + 25 + 15 = 170$

$\Rightarrow f_2 = 170 - 10 - 20 - 35 - 40 - 25 - 15$

$\Rightarrow f_2 = 25$

$\therefore f_1 = 35$ and $f_2 = 25$

Section E

36. i. Parabola

ii. $a > 0$

iii. $\because$ The graph cut the x-axis thrice

$\therefore$ No of zeroes = 3

OR

$a < 0$

37. i. Volume of the cuboid

$= 15 \times 10 \times 3.5 = 525\text{cm}^3$

ii. Volume of a conical depression

$= \frac{1}{3}\pi(0.5)^2(1.4)$

$= \frac{1}{3} \times \frac{22}{7} \times 0.25 \times \frac{14}{10} = \frac{11}{30}\text{cm}^3$

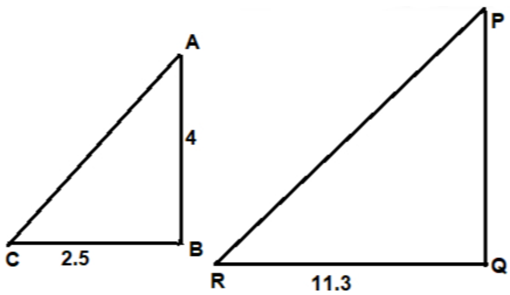
$\therefore$ Volume of four conical depressions

$= 4 \times \frac{11}{30}\text{cm}^3 = \frac{22}{15}\text{cm}^3 = 1.47\text{cm}^3$

$\therefore$ Volume of the wood in the entire stand

$= 525 - 1.47 = 523.53\text{cm}^3$

38. i.



Let AB be a wall and PQ is a tree

BC and QR are their shadow respectively at 3 p.m.

$\therefore \triangle ABC \sim \triangle PQR$

$\therefore \frac{AB}{PQ} = \frac{BC}{QR}$

$\frac{4}{PQ} = \frac{2.5}{11.3}$

$2.5 \times PQ = 4 \times 11.3$

PQ = 18.08

$\therefore$ height of tree = 18.08 feet

ii. 0

iii. Right triangle

OR

Zero