SSC PUBLIC EXAMINATIONS 2024-25

MATHEMATICS (SCERT Modal paper III)

(ENGLISH VERSION)

Time: 3 Hours 15 Minutes **Max. Marks: 100**

Instructions:

1. In the duration of 3hours 15 minutes, 15 minutes of time is allotted to read the question paper.
2. All answers shall be written in the answer booklet only.
3. Question paper consists of 4 Sections and 33 questions.
4. Internal choice is available in section - IV only.
5. Answers shall be written neatly and legibly.

SECTION-I

12 x 1 = 12 M

Note: i) Answer all the questions in one word or phrase.

ii) Each question carries 1 mark.

1. **Express the number 156 as a product of its prime factors.**

Sol: $156 = 2 \times 2 \times 3 \times 13 = 2^2 \times 3 \times 13$

2. **Asserton (A): The zeroes of the polynomial p(x)=(x-1)(x-2)(x-3) are 1,2,3.**

Reason (R): The zeroes of a polynomial are the X-co-ordinates of the points where the graph of the polynomial intersects or touches X-axis

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

B) Both A and R are true and R is the not correct explanation of A

C) A is True but R is False

D) A is False but R is True

Sol: **A**

3. **Form a pair of linear equation for the given information:**

"The coach of a cricket team buys 7 bats and 6 balls for ₹3800. Later, she buys 3 bats and 5 balls for 1750".

Sol: let the cost of each bat = ₹x and ball = ₹y

$7x + 6y = 3800 \rightarrow (1)$

$3x + 5y = 1750 \rightarrow (2)$

4. **Match the following**

Group – A		**Group - B**
(i) Common Difference of the A.P: 3, 1,-1,-3,..	**[ ]**	**(p)-4**
(ii) Common Difference of the A.P 5, 1, -3, -7,..	**[ ]**	**(q) 4**
(iii) Common Difference of the A.P-10,6,2,2,..	**[ ]**	**(r)-2**

(A)i→ p,ii→r,iii→q (B) i→r, ii→q, iii→ p (C) i→ r,ii→p, iii →q (D) i→ q,ii→r, iii→ p

Sol: C

5. **Statement I: Two circles are always similar**

Statement II: $\Delta ABC \sim \Delta XYZ$, then AB:XY=AC: XZ

A) Both Statements I & II are true

B) Statement I is true but Statement II is false

C) Statement I is False but Statement II is true

D) Both Statements I & II are False

Sol: **A**

6. **The height of a tower is 10 m. What is the length of its shadow when Sun's altitude is 45°**

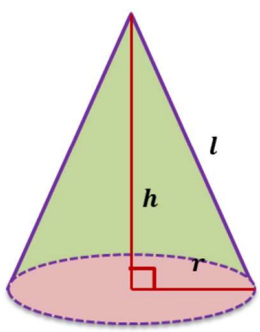
Sol: **10 m**

7. **A circle can have parallel tangents at the most.**

Sol: **Two(2)**

8. Draw a rough figure of cone with height h cm, base radius r cm and slant height is l cm.

Sol:



9. **If the probability of winning a game is 0.4 then the probability of losing it is**

Sol: the probability of losing a game=1-0.4=0.6

10. **Zero of the polynomial 3x-2 is**

A) 2/3 B) 3/2 C)-2/3 D)-3/2

Sol: **A)** 2/3

11. **If sin A=3/5, find the value of cos A**

(A) 5/4 (B)3/5 (C) 4/5 D) ¾

Sol: **C**

12. **The sum of two numbers is 27 and product is 182. The numbers are**

(A) 12 and 13 (B) 13 and 14 (C) 12 and 15 (D) 13 and 24

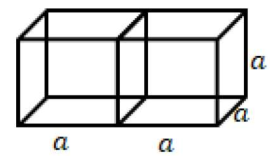
Sol: **B**

SECTION-II

Note: 1) Answer all the questions

2) Each question carries 2 marks

13. 2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid.



Sol: Volume of cube=64 cm^3

$a^3 = 64 = 4^3$

side of the cube(a) = 4 cm

For the resulting cuboid:

$l = 2a = 8\ cm; b = a = 4\ cm; h = a = 4\ cm$

The surface area of the resulting cuboid

$= 2(lh + bh + lb)$

$= 2(8 \times 4 + 4 \times 4 + 4 \times 8)$

$= 2 \times (32 + 16 + 32)$

$= 2 \times 80$

$= 160\ cm^2$

14. Find a quadratic polynomial whose sum and product of its zeroes are -1 and ¼ respectively

Sol: $\alpha + \beta = -1$

$\alpha\beta = \frac{1}{4}$

The quadratic polynomial $P(x) = k[x^2 - (\alpha + \beta)x + \alpha\beta]$

$= k\left[x^2 - (-1)x + \left(\frac{1}{4}\right)\right]$

$= k[\,x^2 + x + \frac{1}{4}]$

When k = 4 ,

$P(x) = 4 \times \left[\,x^2 + x + \frac{1}{4}\right]$

$= 4x^2 + 4x + 1$

15. Check whether $(x - 2)^2 + 1 = 2x - 3$is a quadratic Equation or not?

Sol: $(x - 2)^2 + 1 = 2x - 3$

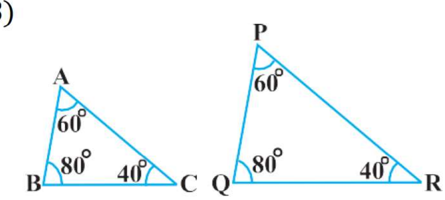
$\Rightarrow x^2 - 4x + 4 + 1 - 2x + 3 = 0$

$\Rightarrow x^2 - 6x + 8 = 0$

It is of the form $ax^2 + bx + c = 0\ (a = 1, b = -6, c = 8)$

The given equation is a quadratic equation.

16. Write the similarity criterion for the following similar triangles and write in symbolic form



Sol: $\angle A = \angle P = 60^0$

$\angle B = \angle Q = 80^0$

$\angle C = \angle R = 40^0$

$\Delta ABC \sim \Delta PQR(\ AAA\ similarity)$

17. Find the distance between points A(Sin90°, Cos Oº) and B(Cosec 30°, Sec 60°)

Sol: A(Sin90°, Cos Oº)=(1,1) and B(Cosec 30°, Sec 60°)=(2,2)

$Distance\ between\ A\ and\ B = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$= \sqrt{(2-1)^2 + (2-1)^2} = \sqrt{1+1} = \sqrt{2}\ units$

18. Given tan A=$\frac{4}{3}$ fnd the values of Sin A and Cos A

Sol: $\tan A = \frac{4}{3} = \frac{BC}{AB}$

BC=4k, AB=3k

In ΔABC, $\angle B = 90^0$

$AC^2 = AB^2 + BC^2$(From Pythagoras theorem)

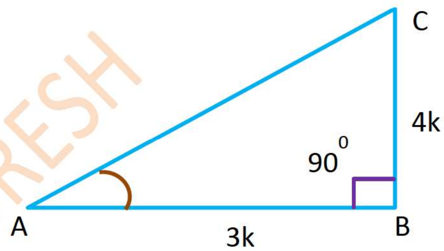
$AC^2 = (3k)^2 + (4k)^2$

$AC^2 = 9k^2 + 16k^2 = 25k^2$

$AC = \sqrt{25k^2} \Rightarrow AC = 5k$

$Sin\ A = \frac{BC}{AC} = \frac{4k}{5k} = \frac{4}{5},$

$cos\ A = \frac{AB}{AC} = \frac{3k}{5k} = \frac{3}{5}$



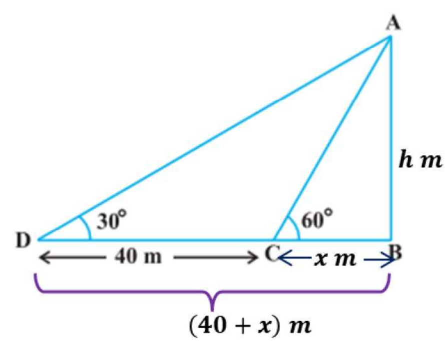
19. Draw a diagram for the following situation:

The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it is 60°. Find the height of the tower.

Sol: Height of the tower=AB=h m

Length of the shadow when the Sun's altitude is 60°=BC=x m

Length of the shadow when the Sun's altitude is 30°=BD

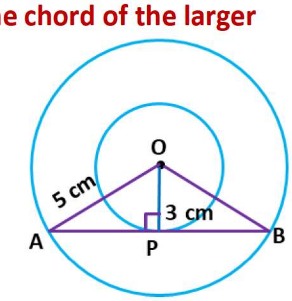


20. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

Sol: Let O is the centre of circles and AB is chord of larger circle touches smaller circle at P.

Radii of concentric circle OP=3 cm , OA=5 cm

In ΔAPO, $\angle P = 90^0(Angle\ between\ radii\ and\ tangents)$



$AP^2 + OP^2 = OA^2$

$AP^2 + 3^2 = 5^2$

$AP^2 + 9 = 25$

$AP^2 = 25 - 9 = 16 = 4^2$

$AP = 4\ cm$

Similarly BP=4 cm

AB=4+4=8 cm

SECTION-III

Note:

1) Answer all the questions

2) Each question carries 4 marks

21. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find he probability that it bears (i) a two-digit number(ii) a perfect square number

Sol: S={1,2,3,4,.....,89,90}, n(S)=90

$$P(E) = \frac{\text{Number of outcomes favourable to E}}{\text{Number of all possible outcomes}} = \frac{n(E)}{n(S)}$$

(i) A= The event "getting a two digit number"

Favourable outcomes to A are 10,11,12,....,90.

n(A)=81

$$\text{P(A)} = \frac{81}{90} = \frac{9}{10}$$

(ii) B=The event "getting a perfect square number"

Favourable outcomes to B are 1, 4, 9,16, 25, 36, 49, 64, 81.

n(B)=9

$$\text{P(B)} = \frac{9}{90} = \frac{1}{10}$$

22. Write the formula to find the Mode of grouped data and explain its terms.

Sol: $$Mode = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

Where $l = lower\ limit\ of\ the\ modal\ class$

$f_1 = frequency\ of\ the\ modal\ class$

$f_0 = frequency\ of\ the\ class\ preceding\ the\ modal\ class$

$f_2 = frequency\ of\ the\ class\ succeeding\ the\ modal\ class$

$h = size\ of\ the\ modal\ class$

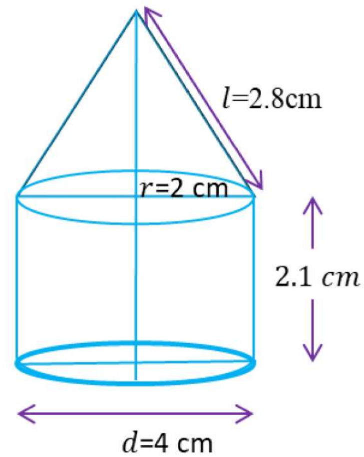
23. **A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 mand 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent.**

Sol: Cylindrical part:

$d = 4m; r = 2\ m; h = 2.1m$

Conical part:

$d = 4m; r = 2\ m; l = 2.8m$



Area of the canvas used

$= $ CSA of the cylindrical part $+$ CSA of the conical part

$= 2\pi rh + \pi rl$

$= \pi r(2h + l)$

$= \frac{22}{7} \times 2 \times (2 \times 2.1 + 2.8)$

$= \frac{44}{7} \times 7 = 44m^2$

Cost of the canvas per 1 m^2=₹500

The cost of the canvas of the tent $=$ ₹$500 \times 44 =$ ₹22000

24. **The product of two consecutive positive integers is 306. Find the integers**

Sol: Let the two consecutive positive integers be $x, x+1$

Given the product of two consecutive positive integers $= 306$

$x \times (x+1) = 306$

$x^2 + x - 306 = 0$

$(x+18)(x-17) = 0$

$x + 18 = 0$ or $x - 17 = 0$

$x = -18$ or $x = 17$

$\therefore x = 17$ (x is a positive integer)

The integers are 17 and 18

25. **Prove that $\sqrt{\frac{1+\sin A}{1-\sin A}}$= sec A+tan A**

sol: $\sqrt{\frac{1+\sin A}{1-\sin A}}$

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

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

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

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

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

$$= \sec A + \tan A$$

26. Determine the AP whose 3rd term is 5 and the 7th term is 9

Sol: 3^{rd} term of AP=5⇒ $a + 2d = 5 \rightarrow (1)$

7^{th} term of AP=9 ⇒ $a + 6d = 9 \rightarrow (2)$

$(2) - (1) \Rightarrow\ a + 6d = 9$

$$\begin{array}{l} a + 2d = 5 \\ (-)\,(-)\ \ (-) \\ \hline \quad 4d = 4 \\ \hline d = 1 \end{array}$$

Substitute d=1 value in (1)

$a + 2 \times 1 = 5$

$a = 5 - 2$

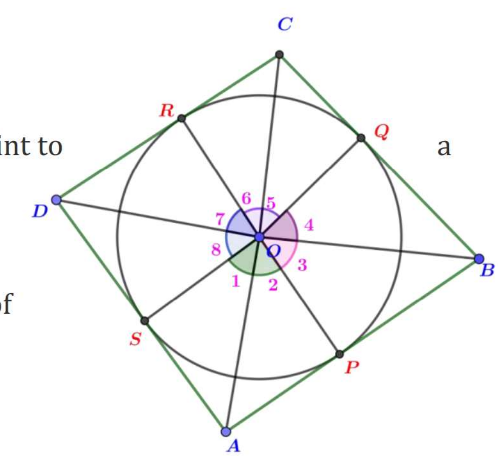
$a = 3$

Hence, the required AP is 3,4,5,6,……

27. Prove that opposite sides of a quadrilateral circumscribing a circle subtend supple- mentary angles at the centre of the circle.

Sol: Let quadrilateral ABCD circumscribe a circle with its centre O and it touches the circle at points P, Q, R, and S.

RTP: ∠AOD+ ∠BOC = 180° and ∠AOB+ ∠COD=180^0



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

∴AS = AP

∠AOS = ∠AOP (Tangents drawn from a point outside of the circle, subtend equal angles at the centre)

⇒ ∠1 = ∠2

Similarly,

∠3 = ∠4, ∠5 = ∠6, ∠7 = ∠8

∠1 + ∠2 + ∠3 + ∠4 + ∠5 + ∠6 + ∠7 + ∠8 = 360°(complete angle)

2 (∠1 + ∠4 + ∠5 + ∠8) = 360°

∠1 + ∠8 + ∠4 + ∠5 = 180°

(∠1 + ∠8) + (∠4 + ∠5) = 180°

$\angle AOD + \angle BOC = 180° \rightarrow (1)$

$\angle AOD + \angle BOC + \angle AOB + \angle COD = 360°$ (complete angle)

$180° + \angle AOB + \angle COD = 360°$

$\angle AOB + \angle COD = 360° - 180^0$

$\angle AOB + \angle COD = 180^0 \rightarrow (2)$

From (1) and (2)

$\angle AOD + \angle BOC = 180°$ and $\angle AOB + \angle COD = 180^0$

Hence , proved.

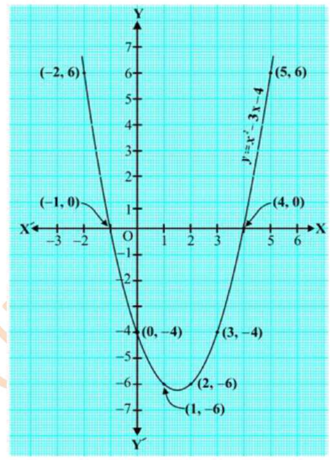
28.Answer the following questions by observing the graph.

(a) Name the shape of the graph.

(b) How many zeroes are there for this shape.

(c) The zeroes of Polynomial

(d) Product of zeroes of Polynomial.



Sol: (a) Parabola

(b) Two

(c) -1 *and* 4

(d) $-1 \times 4 = -4$

SECTION - IV

Note:

1) Answer all the questions

2) Each question carries 8 marks

3) There is an internal choice of each question.

29.(a) Prove that √3 is irrational

Proof: Let us assume $\sqrt{3}$ is rational.

Then $\sqrt{3} = \frac{a}{b}$ $(a, b \text{ are coprimes})$

Squaring on both sides we get

$$3 = \frac{a^2}{b^2} \Rightarrow 3b^2 = a^2 \rightarrow (1)$$

$\Rightarrow b^2 = \frac{a^2}{3}$

$\Rightarrow 3 \text{ divides } a^2$

$\Rightarrow 3 \text{ divides } a$

p *be a prime number* .
If p *divides* a^2 *then* p *divides* a

We can write $a = 3c$ *for some integer* c

$\Rightarrow a^2 = 9c^2$

$\Rightarrow 3b^2 = 9c^2$ (from (1))

$\Rightarrow\ b^2 = 3c^2$

$\Rightarrow\ c^2 = \dfrac{b^2}{3}$

$\Rightarrow 3\ divides\ b^2$

$\Rightarrow\ 3\ divides\ b$

Therefore, both $a\ and\ b$ have 3 as a common factor.

But this contradicts the fact that $a\ and\ b$ are co-prime.

Thus our assumption is false.

So, we conclude that $\sqrt{3}$ is irrational.

(OR)

(b) A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.

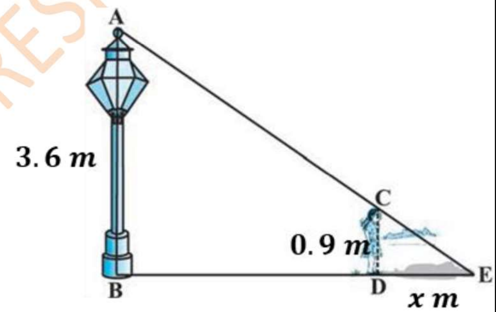
Solution : Lamp post (AB)=3.6 m

Height of girl (CD)=90cm=0.9 m

Length of shadow=DE=$x\ m$

Distance from pole to girl(BD)=$speed \times time$

$= 1.2 \times 4 = 4.8\ m$



In ΔABE and ΔCDE

∠E = ∠E (commom)

$\angle D = \angle B = 90^0$(lamp − post as well as the girl are standing vertical to the ground)

ΔABE ~ ΔCDE($AA\ similarity$)

$\dfrac{BE}{DE} = \dfrac{AB}{CD}$

$\dfrac{BD + DE}{DE} = \dfrac{AB}{CD}$

$\dfrac{4.8 + x}{x} = \dfrac{3.6}{0.9} = \dfrac{36}{9} = 4$

$4x = 4.8 + x$

$3x = 4.8$

$x = \dfrac{4.8}{3} = 1.6$

The length of shadow of girl after 4 seconds=1.6 m

30.

(a) If A and B are (-2,-2) and (2,-4), respectively, find the coordinates of P such that AP=3/7 AB and P lies on the line segment AB.

Sol: Given points $A\ (-2, -2) = (x_1, y_1)$, $B\ (2, -4) = (x_2, y_2)$

$AP = \frac{3}{7}AB$

$\Rightarrow \frac{AP}{AB} = \frac{3}{7}$

$\Longrightarrow \frac{AP}{AB - AP} = \frac{3}{7-3}$

$\Longrightarrow \frac{AP}{PB} = \frac{3}{4}$

$\therefore$ P divides AB in the ratio =3:4= $m_1 : m_2$

$$P(x,y) = \left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$$

$$= \left(\frac{3 \times 2 + 4(-2)}{3+4}, \frac{3 \times (-4) + 4 \times (-2)}{3+4}\right)$$

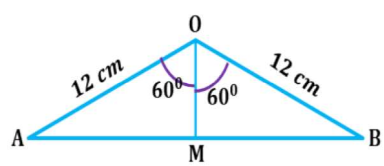
$$= \left(\frac{6-8}{7}, \frac{-12-8}{7}\right)$$

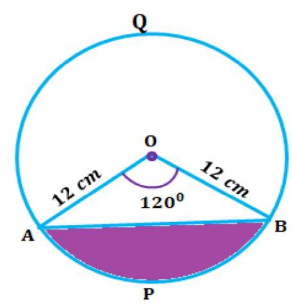
$$= \left(\frac{-2}{7}, \frac{-20}{7}\right)$$

The required point P $= \left(\frac{-2}{7}, \frac{-20}{7}\right)$

OR

(b) A chord of a circle of radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle. (Use, = 3.14 and √3=1.73)





Sol: Radius of the circle(r) =OA=OB=12 cm

Let $OM \perp AB$

$\angle AMO = \angle BMO = 90^0$

$\Delta AMO \cong \Delta BMO$(R. H. S rule)

$\angle AOM = \angle BOM = \frac{120^0}{2} = 60^0$

From ΔAMO

$\sin 60^0 = \frac{AM}{OA}$

$\Rightarrow \frac{\sqrt{3}}{2} = \frac{AM}{12}$

$\Rightarrow AM = \frac{12 \times \sqrt{3}}{2} = 6\sqrt{3}\ cm$

$\cos 60^0 = \frac{OM}{OA}$

$\Rightarrow \frac{1}{2} = \frac{OM}{12}$

$\Rightarrow OM = \frac{12}{2} = 6\ cm$

$AB = 2 \times AM = 2 \times 6\sqrt{3}cm = 12\sqrt{3}cm$

Area of the sector OAYB $= \frac{\theta}{360} \times \pi r^2$

$$= \frac{120^0}{360^0} \times 3.14 \times 12 \times 12$$

$$= 150.72\ cm^2$$

Area of triangle OAB $= \frac{1}{2} \times AB \times OM$

$= \frac{1}{2} \times 12\sqrt{3} \times 6$

$= 36\sqrt{3}cm^2$

$= 36 \times 1.73 = 62.28\ cm^2$

Area of the segment AYB$=$ $Area\ of\ the\ sector\ OAYB - Area\ of\ triangle\ OAB$

$= 150.72 - 62.28$

$= 88.44\ cm^2$

31.(a) Two dice, one blue and one grey, are thrown at the same time. Write down all the possible outcomes. What is the probability that the sum of the two numbers appearing on the top of the dice is (i) 8 (ii)13

Sol: When two dice are drawn then

All possible outcomes

S={(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)}

n(S)=36

(i) A=The event "getting the sum of the two numbers is 8"

Favourable outcomes to A are (2,6),(3,5),(4,4),(5,3),(6,2)

n(A)=5

$P(A) = \frac{5}{36}$

(ii) **B**=The event "getting the sum of the two numbers is 13"

B is impossible event

n(B)=0

$P(B) = 0$

$(\boldsymbol{OR})$

(b) From a point P on the ground the angle of elevation of the top of a 10 m tall building is 30°. A flag s hoisted at the top of the building and the angle of elevation of the top of the flag staff from P is 45°.Find the length of the flagstaff find the distance of the building from the point P

Solution : Height of the building=AB=10m, flagstaff=BD=h m

AD=(10+h) m

Observer Point=P

The distance of the building from the point P=AP= x m

From ΔPAB

$\tan 30^0 = \frac{AB}{AP}$

$\frac{1}{\sqrt{3}} = \frac{10}{x}$

$x = 10\sqrt{3}\, m$

From ΔPAD

$\tan 45^0 = \frac{AD}{AP}$

$1 = \frac{10 + h}{10\sqrt{3}}$

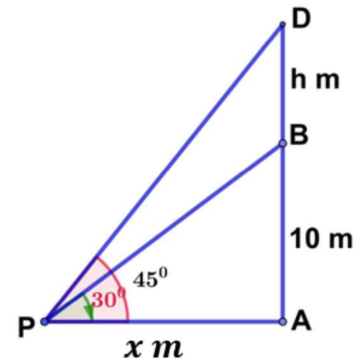
$10 + h = 10\sqrt{3}$

$h = 10\sqrt{3} - 10$

$h = 10(\sqrt{3} - 1)$

$= 10(1.732 - 1)$

$= 10 \times 0.732 = 7.32m$



∴ The length of the flagstaff is 7.32 m.

32.

(a) The following distribution shows the daily pocket allowance of children of a locality. Find the Median of the data

Daily pocket allowance (in ₹)	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Number of children	7	6	9	13	20	5	4

Sol:

Class interval	Number of children (f_i)	Cumulative frequency
11-13	7	7
13-15	6	13
15-17	9	22→ cf
l ←17-19	13→ f	35
19-21	20	55
21-23	5	60
23-25	4	64
	n = 64	

$n = 64, \frac{n}{2} = \frac{64}{2} = 32.$ So median class is $17 - 19$

$l = 17, \quad cf = 22, \; f = 13, \; h = 2$

$$\text{Median} = l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$$

$$= 17 + \left(\frac{32 - 22}{13}\right) \times 2$$

$$= 17 + \frac{10 \times 2}{13}$$

$$= 17 + \frac{20}{13}$$

$$= 17 + 1.54$$

$$= 18.54$$

The Median of the data=₹18.54

(OR)

(b) How many terms of the AP: 9, 17, 25,... must be taken to give a sum of 636?

Sol: $a = 9; d = 17 - 9 = 8$

$S_n = 636$

$\frac{n}{2}[2a + (n-1)d] = 636$

$\frac{n}{2}[2 \times 9 + (n-1) \times 8] = 636$

$n[18 + 8n - 8] = 636 \times 2$

$18n + 8n^2 - 8n - 1272 = 0$

$8n^2 + 10n - 1272 = 0$

$4n^2 + 5n - 636 = 0$

$4n^2 + 53n - 48n - 636 = 0$

$n(4n + 53) - 12(4n + 53) = 0$

$(4n + 53)(n - 12) = 0$

$n = \frac{-53}{4} \; or \; n = 12$

$n = 12 (\; n \; is \; natural \; number)$

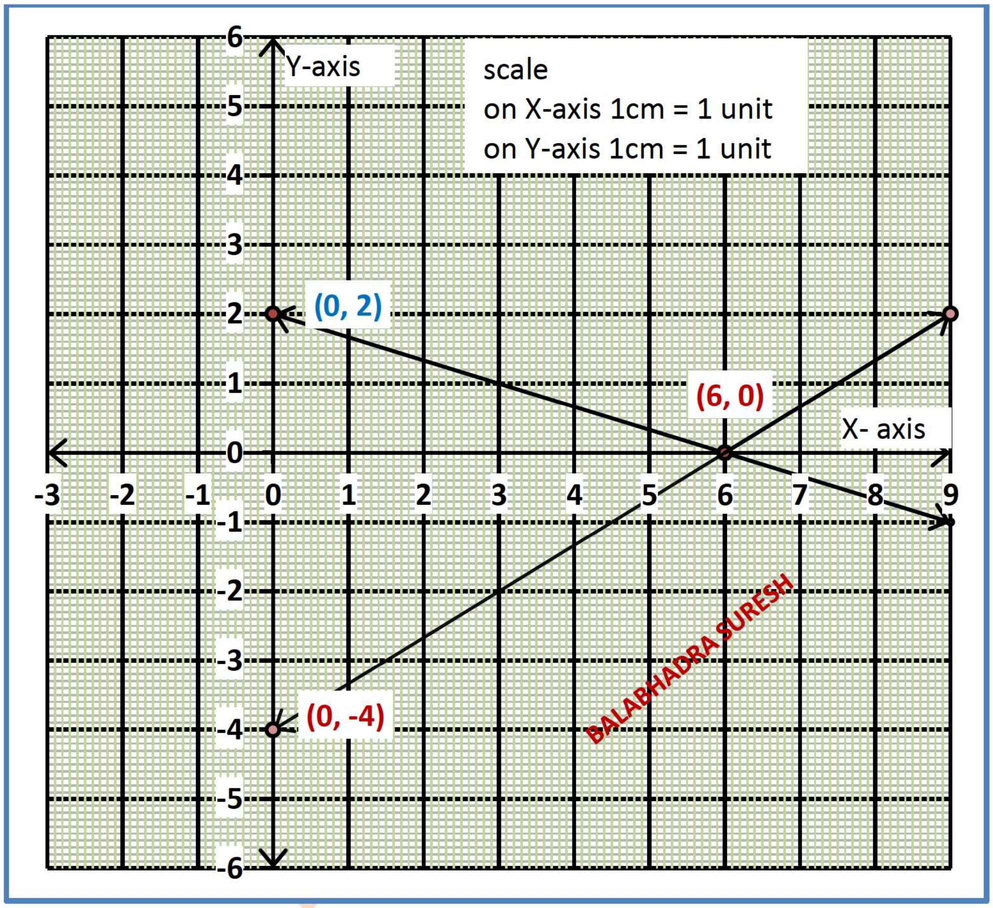
33.

(a) Check graphically whether the pair of equations x+ 3y =6 and 2x-3y =12 is consistent. If so, solve them graphically

Sol:

Equ(1)	$x+3y=6$	(x,y)
$x=0$	$3y=6$ $y=\frac{6}{3}=2$	$(0,2)$
$y=0$	$x=6$	$(6,0)$

Equ(2)	$2x-3y=12$	(x,y)
$x=0$	$-3y=12$ $y=\frac{12}{-3}=-4$	$(0,-4)$
$y=0$	$2x=12$ $x=\frac{12}{2}=6$	$(6,0)$



Both the lines intersect at (6,0)

Solution: x = 6 and y = 0

i.e., the given pair of equations is consistent.

OR

(b) Form the pair of linear equations in the following problem, and fid their solitons graphically.

The difference between two numbers is 26 and one number is three times the other. Find them.

Sol: Let the two numbers are x and y(x>y)

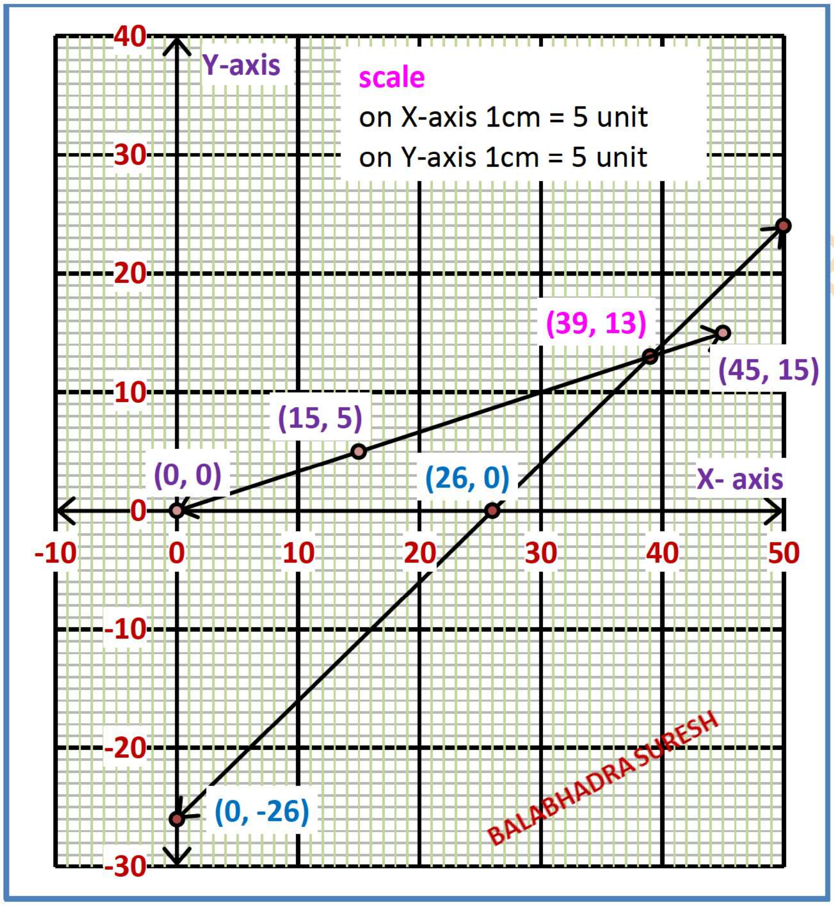
From problem

$x-y=26 \rightarrow (1)$

$x=3y \rightarrow (2)$

$Equ(1)$	$x - y = 26$	(x, y)
$x = 0$	$-y = 26$ $y = -26$	$(0, -26)$
$y = 0$	$x = 26$	$(26,0)$
$x = 39$	$39 - y = 26$ $y = 13$	$(39,13)$

$Equ(2)$	$x = 3y$	(x, y)
$x = 0$	$0 = 3y$ $y = 0$	$(0,0)$
$y = 5$	$x = 3 \times 5$ $x = 15$	$(15,5)$
$y = 15$	$x = 3 \times 15$ $x = 45$	$(45,15)$



Intersecting point=(39,13)

Required two numbers are 39 and 13

https://sureshmathsmaterial.com/