

**STRAIGHT LINES TEST-T1**

1. The straight lines  $x + y = 0$ ,  $3x + y - 4 = 0$  and  $x + 3y - 4 = 0$  form a triangle which is  
 (a) right angled (b) equilateral  
 (c) isosceles (d) None of these

**Ans. (c)**

2. Three straight lines  $ax + by = c$ ,  $bx + cy = a$  and  $cx + ay = b$  are concurrent, if  
 (a)  $a + b = c$  (b)  $b + c = a$   
 (c)  $c + a = b$  (d)  $a + b + c = 0$

**Ans. (d)**

3. If PM is the perpendicular from P(2, 3) on the line  $x + y = 3$ , then the coordinates of M are  
 (a) (2, 1) (b) (-1, 4) (c) (1, 2) (d) (4, -1)

**Ans. (c)**

4. If the points (1, 2) and (3, 4) were to be on the same side of the line  $3x - 5y + a = 0$ , then  
 (a)  $7 < a < 11$  (b)  $a = 7$   
 (c)  $a = 1$  (d)  $a < 7$  or  $a > 11$

**Ans. (d)**

5. The coordinates of the image of the origin O with respect to the line  $x + y + 1 = 0$  are  
 (a)  $(-1/2, -1/2)$  (b)  $(-2, -2)$   
 (c) (1, 1) (d)  $(-1, -1)$

**Ans. (d)**

6. The value of k for which the lines  $2x - 3y + k = 0$ ,  $3x - 4y - 13 = 0$  and  $8x - 11y - 33 = 0$  are concurrent, is  
 (a) 20 (b) -7 (c) 7 (d) -20

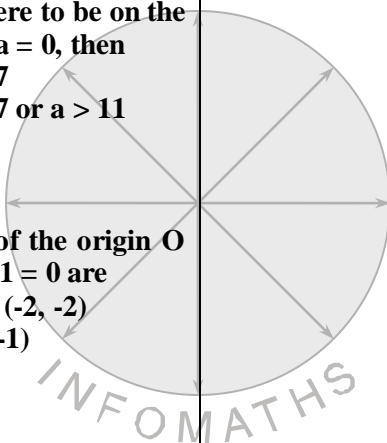
**Ans. (b)**

7. The distance between the lines  $5x - 12y + 65 = 0$  and  $5x - 12y - 39 = 0$ , is  
 (a) 4 (b) 16 (c) 2 (d) 8

**Ans. (d)**

8. The area of the triangle with vertices at the points  $(a, b + c)$ ,  $(b, c + a)$ ,  $(c, a + b)$  is  
 (a) 0 (b)  $a + b + c$   
 (c)  $ab + bc + ca$  (d) None of these

**Ans. (a)**



9. If  $p$  and  $p'$  be perpendicular from the origin upon the straight lines  $x \sec \theta + y \operatorname{cosec} \theta = a$  and  $x \cos \theta - y \sin \theta = a \cos 2 \theta$ , then the value of the expression  $4p^2 + p'^2$  is  
 (a)  $a^2$  (b)  $3a^2$  (c)  $2a^2$  (d)  $4a^2$

**Ans. (a)**

10. The lines  $x + (a - 1)y + 1 = 0$  and  $2x + a^2y - 1 = 0$  are perpendicular if  
 (a)  $|a| = 2$  (b)  $0 < a < 1$   
 (c)  $-1 < a < 0$  (d)  $a = -1$

**Ans.(d)**

11. The equations of the sides of a triangle are  $x + y - 5 = 0$ ,  $x - y + 1 = 0$ , and  $y - 1 = 0$ , then the co-ordinates of the circumcentre are  
 (a) (2, 1) (b) (1, 2) (c) (2, -2) (d) (1, -2)

**Ans. (a)**

12. The gradient of one of the lines  $x^2 + hxy + 2y^2 = 0$  is twice that of the other, then  $h =$   
 (a)  $\pm 3$  (b)  $\pm \frac{3}{2}$  (c)  $\pm 2$  (d)  $\pm 1$

**Ans. (a)**

13. The value of  $\lambda$  for which the equation  $x^2 - \lambda xy + 2y^2 + 3x - 5y + 2 = 0$  may represent a pair of st. lines is  
 (a) 2 (b) 3 (c) 4 (d) 1

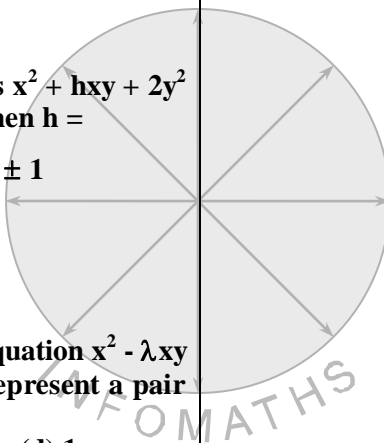
**Ans. (b)**

14. If  $P(1, 0)$ ,  $Q(-1, 0)$  and  $R(2, 0)$  are three given points, then the locus of  $S$  satisfying the relation  $SQ^2 + SR^2 = 2SP^2$  is  
 (a) a st. line  $\parallel$  to x-axis  
 (b) a circle thro' the origin  
 (c) a circle with centre at the origin  
 (d) a st. line  $\parallel$  to y-axis.

**Ans. (d)**

15. The sum of the slopes of the lines represented by  $4x^2 + 2hxy - 7y^2 = 0$  is equal to the product of the slopes, then  $h$  is  
 (a) -4 (b) 4 (c) -6 (d) -2

15. **Ans. (d)**



16. If the equation  $x^2 + y^2 + 2gx + 2fy + 1 = 0$  represents a pair of lines, then

- (a)  $f^2 - g^2 = 1$                       (b)  $f^2 + g^2 = 1$   
 (c)  $g^2 - f^2 = 1$                       (d)  $f^2 + g^2 = \frac{1}{2}$

**Ans. (b)**

17. The gradient of one of the lines  $ax^2 + 2hxy + by^2 = 0$  is twice that of the other, then

- (a)  $h^2 = ab$                               (b)  $h = a + b$   
 (c)  $8h^2 = 9ab$                         (d)  $9h^2 = 8ab$

**Ans. (c)**

18. The angle between the st. lines  $x^2 + 4xy + y^2 = 0$  is

- (a)  $30^\circ$                                       (b)  $45^\circ$   
 (c)  $60^\circ$                                       (d) None of these

**Ans. (c)**

19. If the sum of the slopes of the lines given by  $x^2 - 2cxy - 7y^2 = 0$  is four times their product, then c has the value

- (a) 2    (b) -1  
 (c) 1    (d) -2

**Ans. (a)**

20. If one of the lines given by  $6x^2 - xy + 4cy^2 = 0$  is  $3x + 4y = 0$ , then c equals

- (a) 3                      (b) -1                      (c) 1                      (d) -3

**Ans. (d)**

21. The distance between the pair of parallel lines  $x^2 + 4xy + 4y^2 + 3x + 6y - 4 = 0$  is

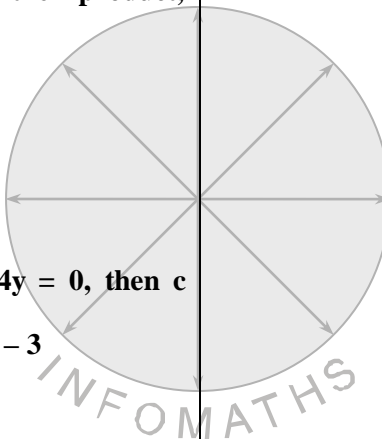
- (a)  $\sqrt{5}$                       (b)  $\frac{2}{\sqrt{5}}$                       (c)  $\sqrt{\frac{5}{2}}$                       (d)  $\frac{\sqrt{5}}{2}$

**Ans. (a)**

22. If P(1, 2), Q(4, 6), R(5, 7) and S (a, b) are the vertices of a parallelogram PQRS, then

- (a)  $a = 2, b = 4$                               (b)  $a = 3, b = 4$   
 (c)  $a = 2, b = 3$                               (d)  $a = 3, b = 5$

**Ans. (c)**



23. Area of parallelogram formed by the lines  $y = mx$ ,  $y = mx + 1$ ,  $y = nx$  and  $y = nx + 1$  equals.

- (a)  $\frac{|m+n|}{(m-n)^2}$                       (b)  $\frac{2}{|m+n|}$   
 (c)  $\frac{1}{|m+n|}$                               (d)  $\frac{1}{|m-n|}$

**Ans. (d)**

24. Out of two st. lines represented by an equation  $ax^2 + 2hxy + by^2 = 0$  if one will be  $y = mx$ , then

- (a)  $a + 2hm + bm^2 = 0$     (b)  $b + 2hm + am^2 = 0$   
 (c)  $h + 2am + bm^2 = 0$     (d)  $h + 2hm + am^2 = 0$

**Ans. (a)**

25. A point moves so that its distance from the x-axis is half its distance from the y-axis, then the equation of its locus is

- (a)  $x = 2y$                                       (b)  $y = 2x$   
 (c)  $x + y = 3$                                 (d) N.O.T

**Ans. (a)**

26. The polar coordinates of the vertices of a triangle are  $(0, 0)$ ,  $(3, \pi/2)$  and  $(3, \pi/6)$ . Then the triangle is

- (a) right angled                                (b) isosceles  
 (c) equilateral                                (d) none of these

**Ans. (c)**

27. Area of triangle is 5. Its two vertices are  $(2, 1)$  and  $(3, -2)$ . Third vertex is on line  $y = x + 3$ . That vertex will be

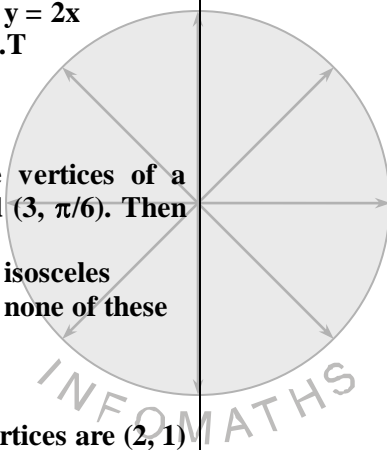
- (a)  $\left(\frac{7}{2}, \frac{13}{2}\right)$     (b)  $(8, 14)$     (c)  $\left(\frac{8}{3}, \frac{5}{3}\right)$     (d)  $\left(\frac{7}{3}, \frac{9}{7}\right)$

**Ans. (a)**

28. The number of integer values of  $m$ , for which the x co-ordinate of the point of intersection of the lines  $3x + 4y = 9$  and  $y = mx + 1$  is also an integer, is

- (a) 2            (b) 0            (c) 4            (d) 1

**Ans. (a)**



29. If the point  $(x_1 + t(x_2 - x_1), y_1 + t(y_2 - y_1))$  divides the join of  $(x_1, y_1)$  and  $(x_2, y_2)$  internally, then

- (a)  $t < 0$  (b)  $0 < t < 1$  (c)  $t > 1$  (d)  $t = 1$

**Ans. (b)**

30. The centroid of a triangle formed by the points  $(0, 0)$ ,  $(\cos \theta, \sin \theta)$  and  $(\sin \theta, -\cos \theta)$  lies on the line  $y = 2x$ . Then,  $\theta$  is

- (a)  $\tan^{-1}2$  (b)  $\tan^{-1}\frac{1}{3}$   
 (c)  $\tan^{-1}\frac{1}{2}$  (d)  $\tan^{-1}(-3)$

**Ans. (d)**

**STRAIGHT LINES T2**

31. The centroid of the triangle formed by the pair of straight lines  $12x^2 - 20xy + 7y^2 = 0$  and the line  $2x - 3y + 4 = 0$  is

- (a)  $(-\frac{7}{3}, \frac{7}{3})$  (b)  $(-\frac{8}{3}, \frac{8}{3})$   
 (c)  $(\frac{8}{3}, \frac{8}{3})$  (d)  $(\frac{4}{3}, \frac{4}{3})$

**Ans. (c)**

32. If  $(-2, 6)$  is the image of the point  $(4, 2)$  with respect to the line  $L = 0$ , then  $L =$

- (a)  $3x - 2y + 5$  (b)  $3x - 2y + 10$   
 (c)  $2x + 3y - 5$  (d)  $6x - 4y - 7$

**Ans. (a)**

33. Locus of the centroid of triangle whose vertices are  $(a \cos t, a \sin t)$ ,  $(b \sin t, -b \cos t)$  and  $(1, 0)$ , where  $t$  is a parameter, is

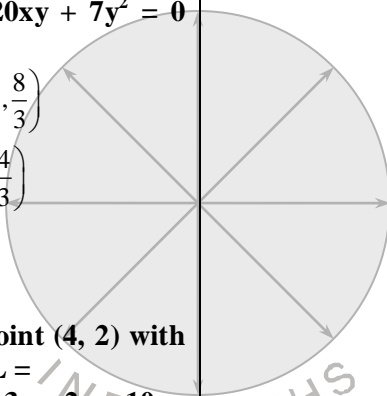
- (a)  $(3x - 1)^2 + (3y)^2 = a^2 - b^2$   
 (b)  $(3x - 1)^2 + (3y)^2 = a^2 + b^2$   
 (c)  $(3x + 1)^2 + (3y)^2 = a^2 + b^2$   
 (d)  $(3x + 1)^2 + (3y)^2 = a^2 - b^2$

**Ans. (c)**

34. A straight rod of length 9 units slides with its ends A, B always on the X and Y axis respectively. Then, the locus of the centroid of  $\Delta OAB$  is

- (a)  $x^2 + y^2 = 3$  (b)  $x^2 + y^2 = 9$   
 (c)  $x^2 + y^2 = 1$  (d)  $x^2 + y^2 = 81$

**Ans. (b)**



35. The equation of the straight lines passing through the points (4, 3) and making intercepts on the coordinate axes whose sum is -1, is

(a)  $\frac{x}{2} - \frac{y}{3} = 1$  and  $\frac{x}{-2} + \frac{y}{1} = 1$

(b)  $\frac{x}{2} - \frac{y}{3} = -1$  and  $\frac{x}{-2} + \frac{y}{1} = -1$

(c)  $\frac{x}{2} + \frac{y}{3} = 1$  and  $\frac{x}{2} + \frac{y}{1} = 1$

(d)  $\frac{x}{2} + \frac{y}{3} = -1$  and  $\frac{x}{-2} + \frac{y}{1} = -1$

**Ans. (a)**

36. The line parallel to the x-axis and passing through the intersection of the lines  $ax + 2by + 3b = 0$  and  $bx - 2ay - 3a = 0$ , where  $(a, b) \neq (0, 0)$ , is

(a) above the x-axis at a distance of  $2/3$  from it.

(b) above the x-axis at a distance of  $3/2$  from it.

(c) below the x-axis at a distance of  $2/3$  from it.

(d) below the x-axis at a distance of  $3/2$  from it.

**Ans. (a)**

37. If the point  $(a, a)$  falls between the lines  $|x + y| = 2$ , then

(a)  $|a| = 2$       (b)  $|a| = 1$

(c)  $|a| < 1$       (d)  $|a| < \frac{1}{2}$

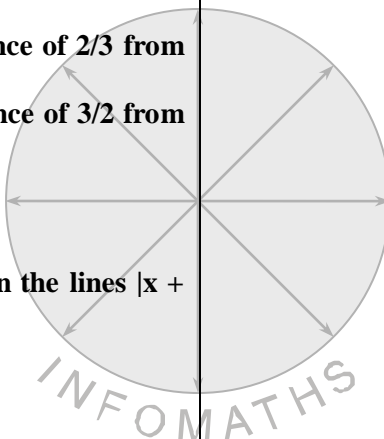
**Ans. (c)**

38. If non-zero numbers  $a, b, c$  are in HP., then the straight line  $\frac{x}{a} + \frac{y}{b} + \frac{1}{c} = 0$  always passes through a fixed point. That point is

(a) (1, -1/2)                      (b) (1, -2)

(c) (-1, -2)                        (d) (-1, 2)

**Ans. (b)**



39. The lines  $p(p^2 + 1)x - y + q = 0$  and  $(p^2 + 1)^2x + (p^2 + 1)y + 2q = 0$  are perpendicular to a common line for
- (a) no value of  $p$
  - (b) exactly one value of  $p$
  - (c) exactly two values of  $p$
  - (d) more than two values of  $p$

**Ans. (b)**

40. Point  $Q$  is symmetric to  $P(4, -1)$  with respect to the bisector of the first quadrant. Then, length of  $PQ$ , is
- (a)  $3\sqrt{2}$
  - (b)  $5\sqrt{2}$
  - (c)  $7\sqrt{2}$
  - (d)  $9\sqrt{2}$

**Ans. (b)**

41. The distance of the line  $2x - 3y = 4$  from the point  $(1, 1)$  measured parallel to the line  $x + y = 1$  is
- (a)  $\sqrt{2}$
  - (b)  $\frac{5}{\sqrt{2}}$
  - (c)  $\frac{1}{\sqrt{2}}$
  - (d) 6

**Ans. (a)**

42. Let  $A(2, -3)$  and  $B(-2, 1)$  be vertices of a triangle  $ABC$ . If the centroid of this triangle moves on the line  $2x + 3y = 1$ , then the locus of the vertex  $C$  is the line
- (a)  $3x - 2y = 3$
  - (b)  $2x - 3y = 7$
  - (c)  $3x + 2y = 5$
  - (d)  $2x + 3y = 9$

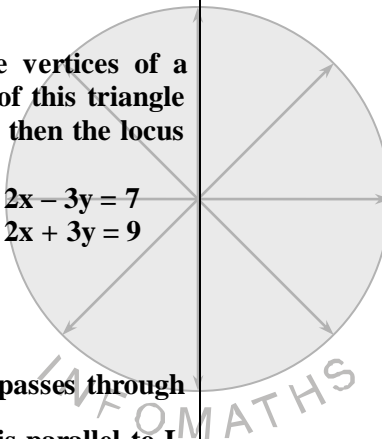
**Ans. (d)**

43. The line  $L$  given by  $\frac{x}{5} + \frac{y}{b} = 1$  passes through the point  $(13, 32)$ . The line  $K$  is parallel to  $L$  and has the equation  $\frac{x}{c} + \frac{y}{3} = 1$ . Then the distance between  $L$  and  $K$  is
- (a)  $17/\sqrt{15}$
  - (b)  $23/\sqrt{17}$
  - (c)  $23/\sqrt{15}$
  - (d)  $\sqrt{17}$

**Ans. (b)**

44. A line  $L$  is equally inclined to both the axes. If its distance from the origin is  $\sqrt{2}$ , then a possible equation for  $L$  is
- (a)  $y = x + \sqrt{2}$
  - (b)  $y = x\sqrt{2} + 2$
  - (c)  $y = x + 1$
  - (d)  $y = x - 2$

**Ans. (d)**



45. The lines  $y = mx$ ,  $y + 2x = 0$ ,  $y = 2x + K$  and  $y + mx = K$  form a rhombus if  $m$  equals :

- (a) -1    (b)  $\frac{1}{2}$     (c) 1    (d) 2

**Ans. (d)**

46. A stick of length  $l$  rests against the floor and a wall of a room. If the stick begins to slide on the floor, then the locus of its middle point is

- (a) a st. line                      (b) a circle  
(c) a parabola                    (d) an ellipse

**Ans. (b)**

47. If the vertices P, Q, R are rational points, which of the following points of the triangle PQR is (are) always rational point(s)?

- (a) centroid                      (b) incentre  
(c) circumcentre                (d) orthocentre

**Ans. (a)**

48. The equation of a st. line passing thro' the point  $(-5, 4)$  and which cuts off an intercept of  $\sqrt{2}$  units between the lines  $x + y + 1 = 0$  and  $x + y - 1 = 0$  is

- (a)  $x - 2y + 13 = 0$             (b)  $2x - y + 14 = 0$   
(c)  $x - y + 9 = 0$               (d)  $x - y + 10 = 0$

**Ans. (c)**

49. The parametric equation of a line is given by

$$x = -2 + \frac{r}{\sqrt{10}} \quad \text{and} \quad y = 1 + 3\frac{r}{\sqrt{10}}$$

Then, for the line

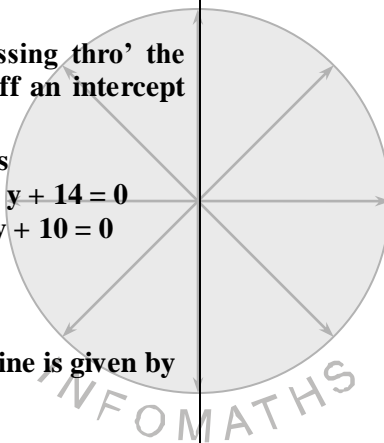
- (a) intercept on the x-axis =  $\frac{7}{3}$   
(b) intercept on the y-axis = - 7  
(c) slope of the line =  $\tan^{-1} \frac{1}{3}$   
(d) slope of the line =  $\tan^{-1} 3$

**Ans. (d)**

50. The medians of a triangle meet at  $(0, - 3)$ . While its two vertices are  $(-1, 4)$  and  $(5, 2)$ , the third vertex is at

- (a)  $(4, 5)$   
(b)  $(-1, 2)$   
(c)  $(7, 13)$   
(d)  $(-4, -15)$

50. **Ans. (d)**



$x - y + 1 = 0$  are  $\perp$

$\therefore$  right angle is at A

$\therefore$  circumcentre =  $\left(\frac{4+0}{2}, \frac{1+1}{2}\right) = (2,1)$

12. **Ans. (a)** Let  $m_1, m_2$  be the slopes of the lines  $x^2 + hxy + 2y^2 = 0$

$\therefore m_1 + m_2 = -\frac{h}{2} \quad m_1 m_2 = \frac{1}{2}$

But  $m_1 = 2m_2$  (given)

$\therefore 3m_2 = -\frac{h}{2}$  and  $2m_2^2 = \frac{1}{2}$

i.e.  $m_2^2 = \frac{1}{4}$  Also  $m_2 = -\frac{h}{6}$

$\therefore \frac{h^2}{36} = \frac{1}{4} \therefore h^2 = 9 \therefore h = \pm 3$

8. **Ans. (a)** Use Area formula for triangle.

9. **Ans. (a)**  $p = \frac{a}{\sqrt{\sec^2 \theta + \cos^2 \theta}} = a \sin \theta \cos \theta$   
 $= \frac{a \sin 2\theta}{2}$  i.e.  $2p = a \sin 2\theta$

$p' = a \cos 2\theta \therefore 4p^2 + p'^2 = a^2$

10. **Ans. (d)** Slope of these lines are  $-\frac{1}{(a-1)}$  and

$-\frac{2}{a^2}$

Since the lines are  $\perp$

$\therefore -\frac{1}{a-1} \cdot -\frac{2}{a^2} = -1$

$\frac{2}{(a-1)a^2} = 1 \Rightarrow 2 + a^2(a-1) = 0$

$\Rightarrow a^3 - a^2 + 2 = 0 \Rightarrow a = -1$

11. **Ans. (a)**  $x + y - 5 = 0$

$x - y + 1 = 0$

$\Rightarrow 2x - 4 = 0 \therefore x = 2$

$\therefore y = 2 + 1 = 3$

Again  $x + y - 5 = 0$

$y = 1$  and  $x = 4$

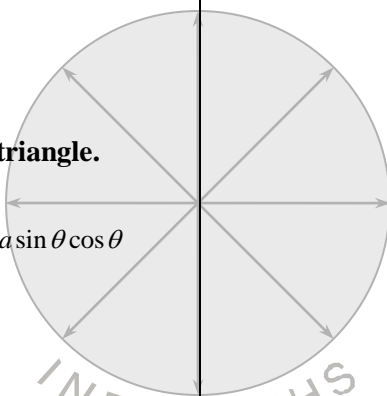
Again  $x - y + 1 = 0$

$y = 1$  and  $x = 0$

$\therefore$  vertices of the given  $\Delta$  are

A(2, 3), B(4, 1), C(0, 1)

Since  $x + y - 5 = 0$ ,



$$\Rightarrow \frac{9c}{4} + \frac{3}{4} + 6 = 0 \Rightarrow 9c + 3 + 24 = 0 \Rightarrow c = -3.$$

13. **Ans. (b)** Reqd. value is given by

$$(1)(2)(2) + 2\left(\frac{2}{3}\right)\left(-\frac{5}{2}\right)\left(-\frac{\lambda}{2}\right)$$

$$-1\left(-\frac{5}{2}\right)^2 - 2\left(\frac{3}{2}\right)^2 - \left(-\frac{\lambda}{2}\right)^2 = 0$$

$$\text{or } 4 + \frac{15\lambda}{4} - \frac{25}{4} - \frac{9}{2} - \frac{\lambda^2}{2} = 0$$

$$\text{or } 16 + 15\lambda - 25 - 18 - 2\lambda^2 = 0$$

$$\text{or } 2\lambda^2 - 15\lambda + 27 = 0$$

$$2\lambda^2 - 9\lambda - 6\lambda + 27 = 0$$

$$\text{or } \lambda(2\lambda - 9) - 3(2\lambda - 9) = 0$$

$$\therefore (\lambda - 3)(2\lambda - 9) = 0$$

$$\therefore \lambda = 3, \frac{9}{2}$$

Reqd. value is  $\lambda = 3$

14. **Ans. (d)** Let S be a pt. (x, y). Then  $SQ^2 + SR^2$

$$= 2SP^2 \Rightarrow (x+1)^2 + y^2 + (x-2)^2 + y^2$$

$$= 2[(x-1)^2 + y^2]$$

$$\Rightarrow 2x + 3 = 0, \text{ a st. line } \parallel \text{ to } y\text{-axis.}$$

16. **Ans. (b)** Let  $m_1, m_2$  be the slopes of the lines represented by  $4x^2 + 2hxy - 7y^2 = 0$

$$\therefore m_1 + m_2 = -\frac{2h}{b} \Rightarrow m_1 + m_2 = -\frac{2h}{-7} = \frac{2h}{7}$$

$$\therefore \frac{2h}{7} = -\frac{4}{7} \Rightarrow h = -2$$

17. **Ans. (c)** Let  $m_1, m_2$  be the gradient of st. lines given by  $ax^2 + 2hxy + by^2 = 0$

$$\therefore m_1 + m_2 = -\frac{2h}{b}; m_1 m_2 = \frac{a}{b}$$

Since  $m_1 = 2m_2$  (given)

$$\therefore 3m_2 = -\frac{2h}{b} \text{ and } 2m_2^2 = \frac{a}{b}$$

$$\text{i.e. } m_2 = -\frac{2h}{3b} \text{ and } 2m_2^2 = \frac{a}{b}$$

$$\therefore 2 \cdot \frac{4}{9} \cdot \frac{h^2}{b^2} = \frac{a}{b} = \frac{8}{9} \cdot \frac{h^2}{b} = a \Rightarrow 8h^2 = 9ab$$

18. **Ans. (c)** Reqd. angle  $\theta$  is given by

$$\tan \theta = \frac{2\sqrt{h^2 - ab}}{a+b} = \frac{2\sqrt{4-1}}{1+1} = \sqrt{3}$$

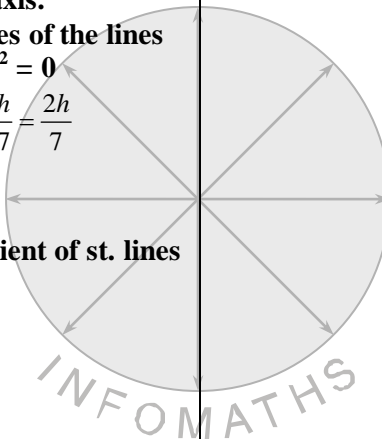
$$\therefore \theta = 60^\circ \quad [\because \text{Here } a = 1, b = 1, h = 2]$$

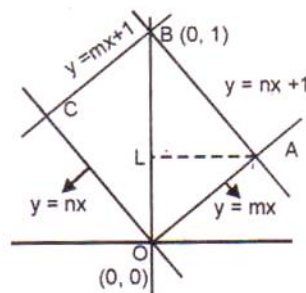
20. **Ans. (d)** Since  $3x + 4y = 0 \Rightarrow y = -\frac{3}{4}x = mx$

$$\text{where } m = -\frac{3}{4}$$

$$\text{Since } 6x^2 - xy + 4cy^2 = 0$$

$$\Rightarrow 4cm^2 - m + 6 = 0 \Rightarrow 4c\left(\frac{9}{16}\right) + \frac{3}{4} + 6 = 0$$





∴ A is  $\left(\frac{1}{m-n}, \frac{m}{m-n}\right)$

Solve (2) and (4)

(2) - (4) gives  $0 = (m - n)x$  ∴  $x = 0$

∴  $y = 1$  ∴ B is (0, 1)

Solve (2) and (3)

(2) - (3) gives  $0 = (m - n)x + 1$

∴  $x = \frac{1}{n-m}$  ∴  $y = \frac{n}{n-m}$

20. **Ans. (d)**  $m_1 + m_2 = 4m_1m_2$   
 $\Rightarrow -\frac{2h}{b} = \frac{4a}{b} \Rightarrow -\frac{2(-c)}{-7} = \frac{4.1}{-7} \Rightarrow 2c = 4$   
 $\Rightarrow c = 2$

21. **Ans. (a)** Given lines are  
 $(x + 2y)^2 + 3(x + 2y) - 4 = 0$   
 $\therefore x + 2y = \frac{-3 \pm \sqrt{9+16}}{2}$   
 $= \frac{-3 \pm 5}{2} = -4.1$   
 $\therefore$  lines are  $x + 2y + 4 = 0$   
 $x + 2y - 1 = 0$

Required distance =  $\frac{|4 - (-1)|}{\sqrt{1+4}}$   
 $= \frac{5}{\sqrt{5}} = \sqrt{5}$ .

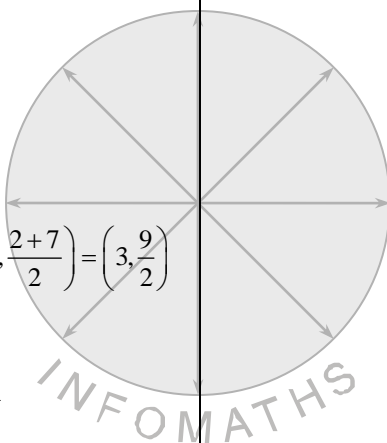
22. **Ans. (c)** Mid. Pt. of PR =  $\left(\frac{1+5}{2}, \frac{2+7}{2}\right) = \left(3, \frac{9}{2}\right)$

Mid. Pt. of QS =  $\left(\frac{a+4}{2}, \frac{b+6}{2}\right)$

Since PQRS is a parallelogram  
 Mid. Pt. of PR = Mid pt. of QS

∴  $3 = \frac{a+4}{2}, \frac{9}{2} = \frac{b+6}{2}$   
 $\therefore a = 2, b = 3$

23. **Ans. (d)**  
 $y = mx$  ... (1)       $y = mx + 1$  ... (2)  
 $y = nx$  ... (3)       $y = nx + 1$  ... (4)  
 are OA, BC, OC, AB respectively  
 (1) and (3) meet at O (0, 0)  
 Solve (1) and (4)  
 (4) - (1) gives  
 $0 = (n - m)x + 1 = 0$   
 $\therefore x = \frac{1}{m-n}$        $\therefore y = \frac{m}{m-n}$



$\therefore C$  is  $\left(\frac{1}{n-m}, \frac{n}{n-m}\right)$

Area of parallelogram formed = 2 Area of  $\Delta$  OAB

=  $2 \cdot \frac{1}{2} \cdot (OB)(AL)$  where  $AL \perp OB$  so that  $AL$  is x co-ordinate of A.

=  $(1)\left(\frac{1}{m-n}\right)$  in magnitude.

$\therefore$  Reqd. area =  $\frac{1}{|m-n|}$

24. **Ans. (a)**  $ax^2 + 2hxy + by^2 = 0$

i.e.  $b\left(\frac{y}{x}\right)^2 + 2h\left(\frac{y}{x}\right) + a = 0$

Since  $y = mx \therefore m = \frac{y}{x}$

$\therefore bm^2 + 2hm + a = 0$

25. **Ans. (a)** By the given condition  $y = \frac{1}{2}x \Rightarrow x = 2, y$ .

26. **Ans. (c)** The relation between polar coordinates and Cartesian coordinates are  $x = r \cos \theta, y = r \sin \theta$ . So, the Cartesian coordinates of the points are  $(0, 0), (0, 3)$  and  $\left(\frac{3\sqrt{3}}{2}, \frac{3}{2}\right)$  respectively. Hence the sides are equal.

28. **Ans. (a)**

The coordinates of the point of intersection of the given lines are  $\left(\frac{5}{3+4m}, \frac{3+9m}{3+4m}\right)$

It is given that the x-coordinates of this point is an integer.

$\therefore \frac{5}{3+4m}$  is an integer

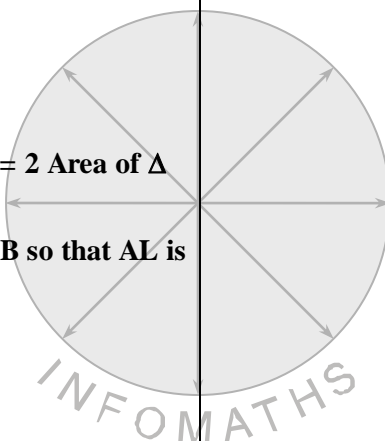
$\Rightarrow 3 + 4m$  is a divisor of 5

$\Rightarrow 3 + 4m = 1, 3 + 4m = -1, 3 + 4m = 5, 3 + 4m = -5$

$\Rightarrow m = -1, -2$

[ $\because 3 + 4m = 1, 3 + 4m = 5$  do not given integral values of m]

Hence, there are two values of m.



Solving these equations, we get

$(a = -2, b = 1)$  or  $(a = 2, b = -3)$

Substituting the values of  $a$  and  $b$  in (i), we get

$$\frac{x}{-2} + \frac{y}{a} = 1 \quad \text{and} \quad \frac{x}{2} + \frac{y}{-3} = 1$$

Aliter Clearly, lines in option (a) pass through  $(4, 3)$  and the sum of their intercepts on the coordinates axes is  $-1$ . Hence, option (a) is correct.

36. Ans. (d) The equation of a line passing through the intersection of given lines is  $(ax + 2by + 3b) + \lambda(bx - 2ay - 3a) = 0$  or  $(a + \lambda b)x + y(2b - 2\lambda a) + (3b - 3\lambda a) = 0$  ... (i)

This is parallel to x-axis.

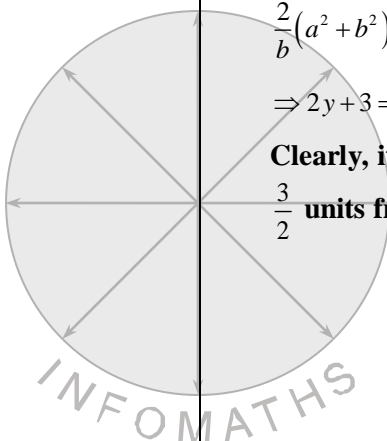
$$\therefore \text{Slope} = 0 \Rightarrow a + \lambda b = 0 \Rightarrow \lambda = -\frac{a}{b}$$

Putting  $\lambda = -\frac{a}{b}$  in (i), we obtain

$$\frac{2}{b}(a^2 + b^2)y + \frac{3}{b}(a^2 + b^2) = 0$$

$$\Rightarrow 2y + 3 = 0 \Rightarrow y = -\frac{3}{2}$$

Clearly, it is below the x-axis at a distance of  $\frac{3}{2}$  units from x-axis.



33. Ans. (c)

Let  $(h, k)$  be the coordinates of the centroid. Then,

$$h = \frac{a \cos t + b \sin t + 1}{3} \quad \text{and} \quad k = \frac{a \sin t - b \cos t + 0}{3}$$

$$\Rightarrow 3h - 1 = a \cos t + b \sin t \quad \text{and} \quad 3k = a \sin t - b \cos t$$

$$\Rightarrow (3h - 1)^2 + (3k)^2 = (a \cos t + b \sin t)^2 + (a \sin t - b \cos t)^2$$

$$\Rightarrow (3h - 1)^2 + (3k)^2 = a^2 + b^2$$

Hence, the locus of  $(h, k)$  is  $(3x - 1)^2 + (3y)^2 = a^2 + b^2$

35. Ans. (a) Let the equation of the line be

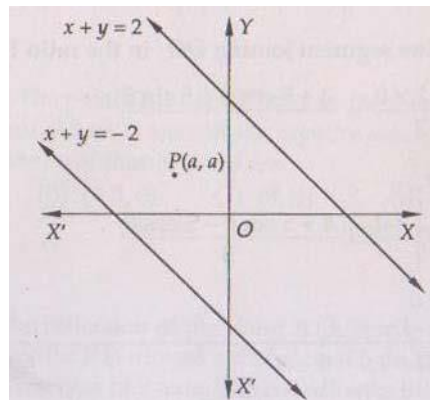
$$\frac{x}{a} + \frac{y}{b} = 1 \quad \dots(i)$$

It passes through  $(4, 3)$ .

$$\therefore \frac{4}{a} + \frac{3}{b} = 1 \quad \dots(ii)$$

It is given that  $a + b = -1$

$$\dots(iii)$$



37. Ans. (c) The equations of the lines are  $x + y = 2$  and  $x + y = -2$ . If the point  $(a, a)$  falls between these two lines, then  $(a + a - 2)(a + a + 2) < 0$   
 $\Rightarrow 4a^2 - 4 < 0 \Rightarrow a^2 - 1 < 0 \Rightarrow |a| < 1$

38. Ans. (b) It is given that  $a, b, c$  are in H.P.

$$\therefore \frac{2}{b} = \frac{1}{a} + \frac{1}{c}$$

$$\Rightarrow \frac{1}{a} + \frac{(-2)}{b} + \frac{1}{c} = 0$$

$\Rightarrow \frac{x}{a} + \frac{y}{b} + \frac{1}{c} = 0$  passes through the fixed point  $(1, -2)$ .

39. Ans. (b) Given lines are perpendicular to a common line. So, they are parallel. Therefore, their slopes are equal.

$$\text{i.e. } p(p^2 + 1) = -(p^2 + 1) \Rightarrow p = -1 \quad [\because p^2 + 1 \neq 0]$$

Hence, given lines are perpendicular to a common line for exactly one value of  $p$ .

40. Ans. (b) It is given that the point  $Q$  is symmetric to  $p(4, -1)$  with respect to  $y = x$ . So, coordinates of  $Q$  are  $(-1, 4)$ .

$$\therefore PQ = \sqrt{(4 - (-1))^2 + (-1 - 4)^2} = 5\sqrt{2}$$

41. Ans. (a) The equation of the line through the point  $P(1,1)$  parallel to the line  $x + y = 1$  is

$$\frac{x-1}{\cos \frac{3\pi}{2}} = \frac{y-1}{\sin \frac{3\pi}{4}}$$

Suppose it meets the line  $2x - 3y = 4$  at

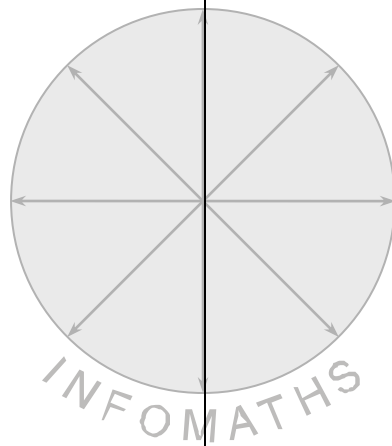
$$Q\left(1 + r \cos \frac{3\pi}{4}, 1 + r \sin \frac{3\pi}{4}\right), \text{ where } PQ = |r|.$$

As  $Q$  lies on the line  $2x - 3y = 4$ .

$$\therefore 2\left(1 - \frac{r}{\sqrt{2}}\right) - 3\left(1 + \frac{r}{\sqrt{2}}\right) = 4$$

$$\Rightarrow -1 - \frac{5r}{\sqrt{2}} = 4 \Rightarrow \frac{5r}{\sqrt{2}} = -5 \Rightarrow r = -\sqrt{2}$$

Hence,  $PQ = \sqrt{2}$



42. **Ans. (d)** Let  $(h, k)$  be the coordinates of the third vertex C.

Then, the coordinates of the centroid G are

$$G\left(\frac{h+2-2}{3}, \frac{k-3+1}{3}\right) \equiv G\left(\frac{h}{3}, \frac{k-2}{3}\right)$$

It lies on  $2x + 3y = 1$ .

$$\therefore \frac{2h}{3} + 3\left(\frac{k-2}{3}\right) = 1$$

$$\Rightarrow 2h + 3k - 6 = 3 \Rightarrow 2h + 3k = 9$$

Hence, the locus of  $G(h, k)$  is  $2x + 3y = 9$

43. **Ans. (b)** Let  $m_1$  and  $m_2$  be the slopes of lines

L and K respectively. Then,  $m_1 = -\frac{b}{5}$  and

$$m_2 = -\frac{3}{c}$$

$$\Rightarrow -\frac{b}{5} = -\frac{3}{c} \Rightarrow bc = 15$$

Line L passes through the point  $(13, 32)$ .

$$\therefore \frac{13}{5} + \frac{32}{b} = 1 \Rightarrow b = -20$$

$$\therefore bc = 15 \Rightarrow c = -\frac{3}{4}$$

Hence, the equation of lines L and K are  $4x - y - 20 = 0$  and  $4x - y + 3 = 0$ .

$$\therefore \text{Distance between L and K} = \frac{23}{\sqrt{16+1}} = \frac{23}{\sqrt{17}}$$

44. **Ans. (d)**  $y = x - 2$  is possible equation for L  
[ $\because$  length of the  $\perp$  from the origin

$$= \frac{2}{\sqrt{1+1}} = \sqrt{2}]$$

45. **Ans. (d)** Clearly  $m = 2$  ( $y + 2x = 0$  and  $y + 2x = K$  are parallel and  $y = 2x$  and  $y = 2x + K$  are parallel)

46. **Ans. (b)** Let OX denote the floor and OY denote wall and AB be the stick such that  $AB = l$

Let  $OA = x_1$ ,  $OB = y_1$

$\therefore$  locus of mid. pt. of AB is

$$x^2 + y^2 = \frac{l^2}{4}, \text{ which is a circle.}$$

$$\therefore x_1^2 + y_1^2 = l^2$$

Again A is  $(x_1, 0)$ , B is  $(0, y_1)$

Mid. pt. of AB is  $\left(\frac{x_1}{2}, \frac{y_1}{2}\right)$

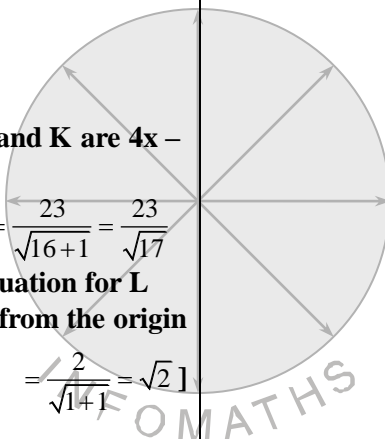
$$\text{By (1)} \left(\frac{x_1}{2}\right)^2 + \left(\frac{y_1}{2}\right)^2 = \frac{l^2}{4}$$

47. **Ans. (a)** Since P, Q, R are  $(x_1, y_1)$ ,  $(x_2, y_2)$ ,  $(x_3, y_3)$ . All of these are rational points

$\therefore x_1 + x_2 + x_3, y_1 + y_2 + y_3$  are also rational

$\therefore$  centroid  $\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$  is a

rational point.



49. Ans. (d) Clearly  $m = 2$  ( $y + 2x = 0$  and  $y + 2x = K$  are parallel and  $y = 2x$  and  $y = 2x + K$  are parallel)

