PRACTICE SHEET

1. The lines (p + 2q) x + (p – 3q) y = p – q for different values of p and q pass through the fixed point given by which one of the following?

(a) $\left(\frac{3}{2},\frac{5}{2}\right)$ (b) $\left(\frac{2}{5},\frac{2}{5}\right)$

(c) $\left(\frac{3}{5},\frac{3}{5}\right)$ (d) $\left(\frac{2}{5},\frac{2}{5}\right)$

2. What is the angle between the two straight lines $y=(2-\sqrt{3})x+5$ and $y=(2+\sqrt{3})x-7$?

(a) 60° (b) 45°
(c) 30° (d) 15°

3. What is the image of the point (2, 3) in the line y = –x?

(a) (–3, –2) (b) (–3, 2)
(c) (–3, –2) (d) (3, 2)

4. The middle point of A(1,2) and B(x,y) is C(2, 4). If BD is perpendicular to AB such that CD = 3 unit, then what is the length BD?

(a) $2\sqrt{2}$ unit (b) 2 unit
(c) 3 unit (d) $3\sqrt{2}$ unit

5. If the point A (1, 2), B(2, 4) and C(3,a) are collinear, what is the length BC?

(a) $\sqrt{2}$ unit (b) $\sqrt{3}$ unit
(c) $\sqrt{5}$ unit (d) 5 unit

6. What is the acute angle between the lines Ax + By = A + B and A (x – y) + B (x + y) = 2B?

(a) 45° (b) $\tan^{-1}\left(\frac{A}{\sqrt{A^2+B^2}}\right)$
(c) 30° (d) 60°

7. If p be the length of the perpendicular from the origin on the straight line x + 2 by + 2p = 0, then what is the value of b?

(a) $\frac{1}{p}$ (b) p

(c) $\frac{1}{2}$ (d) $\frac{\sqrt{3}}{2}$

8. In what ratio does the lien y – x + 2 = 0 cut the line joining (3, –1) and (8, 9)

(a) 2 : 3 (b) 3 : 2
(c) 3 : –2 (d) 1 : 2

9. The points (2, –2), (8, 4), (4, 6) and (–1, 1) in order are the vertices of which one of the following quadrilaterals?

(a) Square
(b) Rhombus
(c) Rectangle (but not square)
(d) Trapezium

10. If p be the length of the perpendicular from the origin on the straight line ax + by = p and b = $\frac{\sqrt{3}}{2}$, then what is the angle between the perpendicular and the positive direction of x – axis?

(a) 30° (b) 45°
(c) 60° (d) 90°

11. The straight line ax + by + c = 0 and the coordinate axes form an isosceles triangle under which one of the following conditions?

(a) |a| = |b| (b) |a| = |c|
(c) |b| = |c| (d) None of these

12. The coordinates of P and Q are (–3, 4) and (2, 1), respectively, If PQ is extended to R such that PR = 2QR, then what are the coordinates of R?

(a) (3, 7) (b) (2, 4)
(c) $\left(-\frac{1}{2},\frac{5}{2}\right)$ (d) (7, –2)

13. Which one of the following points on the line 2*x* – 3y = 5 is equidistant from (1, 2) and (3, 4)?

(a) (7, 3) (b) (4, 1)
(c) (1, –1) (d) (–2, –3)

14. The following question consists of two statements, one labeled as the 'Assertion (A)' and the other as 'Reason (R)'. You are to examine these two statements carefully and select the answer.

Assertion (A): If two triangles with vertices (x_1, y_1), (x_2, y_2), (x_3,y_3) and (a_1, b_1), (a_2, b_2), (a_3,b_3) satisfy the relation

$$\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & 1 \\ a_2 & b_2 & 1 \\ a_3 & b_3 & 1 \end{vmatrix}$$

, then the triangles are congruent.

Reason (R): For the given triangles satisfying the above relation implies that the triangles have equal area.

(a)Both A and R are individually true, and R is the correct explanation of A.
(b)Both A and R are individually 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

15. If A (2, 3), B (1, 4), C (0 –2) and D (x, y) are the vertices of a parallelogram, then what is the value of (x, y)?

(a) (1, –3) (b) (2, 4)
(c) (1, 1) (d) (0, 0)

16. If O be the origin and A (x_1, y_1), B(x_2, y_2) are two points, then what is (OA) (OB) cos ∠AOB?

(a) $x_1^2+x_2^2$ (b) $y_1^2+y_2^2$
(c) $x_1x_2 + y_1y_2$ (d) $x_1y_1+x_2y_2$

17. The numerical value of the perimeter of a square exceeds that of its area by 4. What is the side of the square?

(a) 1 unit (b) 2 unit
(c) 3 unit (d) 4 unit

18. If (a, b), (c, d) and (a – c, b – d) are collinear, then which one of the following is correct?

(a) bc – ad = 0 (b) ab – cd = 0
(c) bc + ad = 0 (d) ab + cd = 0

19. What is the locus of a point which is equidistant from the point (m+n, n–m) and the point (m–n, n+m)?

(a) mx=ny (b) nx=–my
(c) nx=my (d) mx= –ny

20. What is the product of the perpendicular from the two points $\left(\pm\sqrt{b^2-a^2},0\right)$ to the line ax cosϕ + by sinϕ = ab?

(a) a^2 (b) b^2
(c) ab (d) a/b

21. The middle point of the segment of the straight line joining the points (p,q) and (q,–p) is (r/2, s/2). What is the length of the segment?

(a) $[(s^2 + r+2)^{1/2}]/2$ (b) $[(s^2 + r^2)^{1/2}]/4$
(c) $(s^2 + r^2)1/2$ (d) s + r

22. What is the area of the triangle formed by the lines y – x = 0, y + x = 0, x = c?

(a) c / 2 (b) c^2
(c) 2c2 (d) c2/2

23. What does an equation of the first degree containing one arbitrary parameter passing through a fixed point represent?

(a) Circle (b) Straight line
(c) Parabola (d) Ellipse

24. If x cosθ + y sinθ=2 is perpendicular to the line x–y = 3, then what is one of the value of θ?

(a) π/6 (b) π/4
(c) π/2 (d) π/3

25. What is the foot of the perpendicular from the point (2,3) on the line x + y – 11 = 0?

(a) (1,10) (b) (5,6)
(c) (6,5) (d) (7,4)

26. If the area of a triangle with vertices (–3, 0), (3,0) and (0,k) is 9 sq. unit, then what is the value of k?

(a) 3 (b) 6
(c) 9 (d) 12

27. If the straight lines x – 2y = 0 and kx + y = 1 intersect at the point $\left(1,\frac{1}{2}\right)$,then what is the value of k?

(a) 1 (b) 2
(c) 1/2 (d) –1/2

28. What is the slope of the line perpendicular to the line $\frac{x}{4}+\frac{y}{3}=1$?

(a) 3/4 (b) –3/4
(c) –4/3 (d) 4/3

29. What is the equation to the straight line joining the origin to the point of intersection of the lines $\frac{x}{y}+\frac{y}{b}$ =1 and $\frac{x}{b}+\frac{y}{a}=1$?

(a) x + y = 0 (b) x + y + 1 = 0
(c) x – y = 0 (d) x + y + 2 = 0

30. If the lines 3y + 4x = 1, y = x + 5 and 5y + bx=3 are concurrent, then what is the value of b?

(a) 1 (b) 3
(c) 6 (d) 0

31. If (–5, 4) divides the line segment between the coordinate axes in the ratio 1:2, then what is its equation?

(a) 8x+5y+20 = 0 (b) 5x+8y–7 = 0
(c) 8x–5y+60 = 0 (d) 5x–8y+57 = 0

32. What is the image of the point (1,2) on the line 3x+4y–1 = 0?

(a) $\left(-\frac{7}{5},\frac{6}{5}\right)$ (b) $\left(\frac{7}{8},\frac{1}{2}\right)$
(c) $\left(\frac{7}{8},-\frac{1}{2}\right)$ (d) $\left(-\frac{7}{5},\frac{1}{2}\right)$

ANSWER KEYS																			
1.	d	**2.**	a	**3.**	a	**4.**	b	**5.**	c	**6.**	a	**7.**	d	**8.**	a	**9.**	d	**10.**	c
11.	a	**12.**	d	**13.**	b	**14.**	a	**15.**	a	**16.**	c	**17.**	b	**18.**	a	**19.**	c	**20.**	a
21.	c	**22.**	b	**23.**	b	**24.**	b	**25.**	b	**26.**	a	**27.**	c	**28.**	d	**29.**	c	**30.**	c
31.	c	**32.**	a																

Solutions

Sol. 1. (d)
As given, (p + 2q) x + (p – 3q)
y = p –q
$\Rightarrow$ px + 2qx + py – 3qy = p – q
$\Rightarrow$ p(x + y) – q (3y – 2x) = p – q
Equation co – efficient of p and q
$\Rightarrow$ x + y = 1 and 3y – 2x = 1
Solving these, we get
$x = \frac{2}{5}, y = \frac{3}{5}$
So, line passes through $\left(\frac{2}{5}, \frac{3}{5}\right)$

Sol. 2. (a)
The given lines are
y = (2 – $\sqrt{3}$) x + 5 and
y = (2 + $\sqrt{3}$) x – 7
Therefore, slope of first line
m_1 = 2 – $\sqrt{3}$ and
$\therefore tan\,\theta = \left|\frac{m_2 - m_1}{1 + m_1 + m_2}\right| + \left|\frac{2+\sqrt{3}-2+\sqrt{3}}{1+(4-3)}\right|$
$= \left|\frac{2\sqrt{3}}{2}\right| = \sqrt{3} = \tan\frac{\pi}{3} \Rightarrow 60$

Sol. 3. (a)
Let there be a point P (2, 3) on Cartesian plane. Image f this point in the lien y = – x will lie on a line which is perpendicular to this line and distance of this point from y = – x will be equal to distance of the image from this line.
Let Q be the image of p and let the co – ordinate of Q be (h, k)
Slope of line y = – x is – 1
Line joining P, Q will be perpendicular to y = – x so, its slope = 1.
Let the equation of the line by y = x + c since this passes through point (2, 3)
3 = 2 + c $\Rightarrow$ c = 1
and the equation y = x + 1
The point of intersection R lies in the middle of P & Q.
Point of intersection R lies in the middle of P & Q.
Point of intersection of line y = – x and y = x + 1 is
2y=1$\Rightarrow$y=1/2 and x = – ½
Hence, $\frac{h+2}{2} = -\frac{1}{2}$ and $\frac{k+3}{2} = \frac{1}{2}$
$\Rightarrow$ h = –3 and k = – 2
So, the image of the point (2, 3) in the line y = – x is (–3, –2).

Sol. 4. (b)
Given that mid-point of A (1, 2) and B (x, y) is C (2, 4)
$\frac{1+x}{2} = 2$ and $\frac{2+y}{2} = 4$
$\Rightarrow$ x = 3 and y = 6
So, coordinates of B are (3, 6).
Given that
BD $\perp$ AB and CD = 3 unit
$BC = \sqrt{(2-3)^2 + (4-6)^2} = \sqrt{1+4} = \sqrt{5}$
In right angled Δ BCD, $CD^2 = BC^2 + BD^2$
$\Rightarrow 9 = 5 + BD^2 \Rightarrow BD^2 = 4 \Rightarrow$ BD = 2 unit

Sol. 5. (c)
Since the points are collinear.
$$\begin{vmatrix} 1 & 2 & 1 \\ 2 & 4 & 1 \\ 3 & a & 1 \end{vmatrix} = 0$$
Expanding the determinant
$$\Rightarrow 1\begin{vmatrix} 4 & 1 \\ a & 1 \end{vmatrix} - 2\begin{vmatrix} 2 & 1 \\ 3 & 1 \end{vmatrix} + 1\begin{vmatrix} 2 & 4 \\ 3 & a \end{vmatrix} = 0$$
$\Rightarrow$ (4 – a) – 2(2–3) +1 (2a –12) = 0
$\Rightarrow$ 4 – a + 2 + 2a – 12 = 0
$\Rightarrow$ a – 6 = 0
$\Rightarrow$ a = 6
Thus, Coordinates of C are (3, 6)
Thus, BC = $\sqrt{(3-2)^2 + (6-4)}$
= $\sqrt{1+4} = \sqrt{5}$ unit

Sol. 6. (a)
Lines are $L_1 \equiv$ Ax + By = A + B and
$L_2 \equiv$ A (x – y) + B (x + y) = 2B
Slope of L_1 is $-\frac{A}{B}$
$m_1 = -\frac{A}{B}$ [m_1 is the side of line L_1]
For line L_2:
Ax – Ay + Bx + By = 2B
(A + B)x – (A – B) y = 2B.
Slope of line L_2 in $\frac{(A+B)}{A-B}$
$m_2 = \frac{(A+B)}{(A-B)}$ [m_2 is the side of line L_2]
If angle between line L_1 and L_2 is θ then
$\tan\theta = \frac{m_1 - m_2}{1 + m_1 m_2}$
$$= \frac{-\frac{A}{B} - \frac{A+B}{A-B}}{1+\left(-\frac{A}{B}\right)\times\left(\frac{A+B}{A-B}\right)} = \frac{\frac{-A(A-B)-B(A+B)}{B(A-B)}}{\frac{B(A-B)-A(A+B)}{B(A-B)}}$$
$$= \frac{-A^2 + AB - AB - B^2}{AB - B^2 - A^2 - AB} = \frac{-B^2 - A^2}{-B^2 - A^2} = 1$$
So, θ=π/4

Sol. 7. (d)
Length of perpendicular from the origin on the straight line x + 2by – 2p = 0 is
$$\left|\frac{0 + 2b\times 0 - 2p}{\sqrt{1^2 + (2b)^2}}\right| = P$$
Or P= $\left|\frac{-2p}{\sqrt{1^2 + 4b^2}}\right|$
Or $P^2 = \frac{4p^2}{1+4b^2}$
$\frac{4}{1+ab^2} = 1$
$\Rightarrow 1+4b^2 = 4$ or $4b^2 = 3$
$\Rightarrow b^2 = 3/4 \Rightarrow b = \pm\ \frac{\sqrt{3}}{2} \Rightarrow b\frac{\sqrt{3}}{2}$
Matches with the given option.

Sol. 8. (a)
Let the point of intersection divide the line segment joining points, (3, –1) and (8, 9) in k : 1 ratio then:
The point is $\left(\frac{8k+3}{k+1}, \frac{9k-1}{k+1}\right)$
Since this point lies on the line y – x + 2 = 0
We have, $\frac{9k-1}{k+1} - \frac{8k+3}{k+1} + 2 = 0$
$= \frac{9k-1-8k-3}{k+1} + 2 = 0 = \frac{k-4}{k+1} + 2 = 0$
$= k - 4 + 2k + 2 = 0 = 3k - 2 = 0$
$k = \frac{2}{3} : 1$ i.e. $2:3$

Sol. 9. (d)
Let points be A(2, –2), B(8, 4), C(4,6) and D(–1, 1) in order and are vertices of a quadrilateral.
$AB^2 = (8–2)^2 + (4 + 2)^2 = 36 + 36 = 72$
$BC^2 = (4–8)^2 + (6– 4)^2 = 16 + 4 = 20$
$CD^2 = (4 + 1)^2 + (6–1)^2 = 25 + 25 = 50$
$AD^2 = (2 + 1)^2 + (–2 –1)^2 = 9 + 9 = 18$
Thus AB $\neq$ BC $\neq$ CD $\neq$ AD
Hence, quadrilateral is a trapezium.

Sol. 10. (c)
Equation of line is ax + by – p = 0, then
Length of perpendicular, from the origin.
p= $\left|\frac{a\times 0 + b\times 0 - p}{\sqrt{a^2+b^2}}\right|$ or $p = \left|\frac{-p}{\sqrt{a^2+b^2}}\right|$
or $\left|\frac{1}{\sqrt{a^2+b^2}}\right|$ =1 or $a^2 + b^2$ =1
b= $\frac{\sqrt{3}}{2}$ or $b^2 = \frac{3}{4}$
$a^2 = \frac{3}{4}$ =1
$a^2 = \frac{1}{4} \Rightarrow a = \frac{1}{2}$
[a= – ½ not taken since angle is with + ve directions of x-axis]
Equation is ½ x + $\frac{\sqrt{3}}{2}$
y= p or x cos 60° + y sin 60° = p angle = 60°

Sol. 11. (a)
Co–ordinate axes and straight line
ax + by + c = 0
From an isosceles triangle. This is possible when, the line makes equal intercept on both the axis.
Expressing ax + by + c = 0 in intercept form:
$ax + by = -c$ or $\frac{x}{-\frac{c}{a}} + \frac{y}{-\frac{c}{b}} = 1$
So, x – intercept = –c/a and y – intercept = –c/b

Since, $-\frac{c}{a}=-\frac{c}{b}$

Hence, a = b

Intercepts can be on both the sides of axis.

So, |a| = |b|

Sol. 12. (d)

As given Coordinates of P and Q are (–3, 4) and (2, 1) respectively.

Let coordinates of R be (x, y).

As given: PR = 2 QR

$\Rightarrow$ PR – QR = QR $\Rightarrow$ PQ = QR

So, Q is the mid-point of P and R

$\Rightarrow 2=\frac{-3+x}{2}$ and $1=\frac{4+y}{2}$

$\Rightarrow$ x = 7 and y = – 2

$\therefore$ Coordinates of R $\equiv$ (7, –2)

Sol. 13. (b)

Let point $P(x_1, y_1)$ be equidistant from point A(1, 2) and B (3, 4).

$\therefore$ PA = PB

$\Rightarrow PA^2 = PB^2$

$\Rightarrow (1+x_1)^2 + (2-y_1)^2 = (2-x_1)^2 + (4-y_1)^2$

$\Rightarrow 1+x_1^2-2x_1+4+y_1^2-8y_1$

$\Rightarrow 9+x_1^2-6x_1+16+y_1^2-8y_1$

$\Rightarrow 4x_1 + 4y_1 = 5$

$\Rightarrow x_1 + y_1 = 5$

As $p(x_1, y_1)$ lies on 2x–3y = 5

$\therefore 2x_1 - 3y_1 = 5$

On solving eqs. (1) and (2), we get

$x_1 = 4$ and $y_1 = 1$

$\therefore$ Coordinates of P are (4, 1).

Sol. 14. (a)

(A) and (R) are true and (R) is correct explanation of A.

Sol. 15. (a)

As given: A (2, 3), B (1, 4), C (0, –2) and D (x, y) are the vertices of a parallelogram. Diagonals of a parallelogram bisect each other.

So, mid–point are same for both diagonals AC and BD.

$\frac{2+0}{2}=\frac{1+x}{2}$ and $\frac{3-2}{2}=\frac{4+y}{2}$

$\Rightarrow$ x = 1 and y = – 3

$\Rightarrow$ D (x, y) = (1, –3)

Sol. 16. (c)

Let O (0, 0), A (x_1, y_1) and $B(x_2, y_2)$ be three points

$OA=\sqrt{x_1^2+y_1^2}, OB=\sqrt{x_2^2+y_2^2}$

$AB=\sqrt{(x_2+x_1)^2+(y_2-y_1)^2}$

In Δ AOB,

$\cos\angle AOB=\frac{OA^2+OB^2-AB}{2.OA.OB}$

$\Rightarrow OA.OB\cos\angle AOB=\frac{OA^2+OB^2-AB}{2}$

$=\frac{x_1^2+y_1^2+x_2^2-\{(x_2-x_1)^2+(y_2-y_1)^2\}}{2}$

$\Rightarrow$OA.OB.cos$\angle$AOB

$=\frac{x_1^2+y_1^2+x_2^2+y_2^2-\{(x_2^2+x_1^2-2x_1x_2+y_2^2+y_1^2-2y_1y_2)\}}{2}$

$=\frac{2(x_1x_2+y_1y_2)}{2}=x_1x_2+y_1y_2$

Sol. 17. (b)

Let the side of the square = x units

Area of square = x^2 unit

And perimeter of square = 4x unit

According to question.

$x^2 + 4 = 4x$

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

$\Rightarrow (x-2)^2 = 0$

$\Rightarrow$ x = 2

$\therefore$ Side of square = 2 unit

Sol. 18. (a)

Let A, B and C having co – ordinates (a, b), (c, d) and {(a–c), (b –d)} respectively be the points If these points are collinear then

$$\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ a-c & b-d & 1 \end{vmatrix}=0$$

$R_2 \to R_2 \to R_1$ gives

$$\begin{vmatrix} a & b & 1 \\ c-a & d-b & 0 \\ a-c & b-d & 1 \end{vmatrix}=0$$

$R_3 \to R_2+R_3$ gives

$$\begin{vmatrix} a & b & 1 \\ c-a & d-b & 0 \\ 0 & 0 & 1 \end{vmatrix}=0$$

$\Rightarrow$ 1. {a (d– b) – b (c –a)} = 0

$\Rightarrow$ ad – ab – bc + ab = 0

$\Rightarrow$ bc – ad = 0

Sol. 19. (c)

let that point is (h,k)

$\sqrt{(h-(m+n))^2+(k-(n-m))^2}=\sqrt{(h-(m-n))^2+(k-(m+n))^2}$

after solving it put

h = x and k = y nx = my

Sol. 20. (a)

Given,

ax cosϕ + by sinϕ – ab = 0

At point $\left(+\sqrt{b^2-a^2},0\right)$

$d_1 = \frac{a\sqrt{b^2-a^2}\cos\phi-ab}{\sqrt{a^2\cos^2\phi+b^2\sin^2\phi}}$

At point $\left(\sqrt{b^2-a^2},0\right)$

$d_2 = \frac{-a\sqrt{b^2-a^2}\cos\phi-ab}{\sqrt{a^2\cos^2\phi+b^2\sin^2\phi}}$

$\therefore d_1d_2=\frac{\left[a^2\left(b^2-a^2\right)\cos^2\phi a^2b^2\right]}{a^2\cos^2\phi+b^2\sin^2\phi}$

$=-\frac{a^2\left(-b^2\sin^2\phi-a^2\cos^2\phi\right)}{a^2\cos^2\phi+b^2\sin^2\phi}=a^2$

Sol. 21. (c)

Mid-point of (p,q) and (q,–p) is $\left(\frac{p+q}{2},\frac{q-p}{2}\right)$

which is given $\left(\frac{r}{2},\frac{s}{2}\right)$

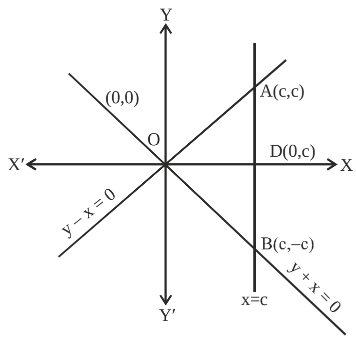
$\therefore \frac{p+q}{2}=\frac{r}{2}$ and $\frac{q-p}{2}=\frac{s}{2}$

Now, length of segment

$=\sqrt{(p-q)^2+(q+p)^2}$

$=\sqrt{s^2+r^2}$

Sol. 22. (b)



Required area = 2 area (ΔAOD)

= 2 × 1 / 2 × OD × AD = c×c = c^2

Sol. 23. (b)

Sol. 24. (b)

Since, slope of line xcosθ + ysinθ = 2is – cotθ

and slope of line x–y = 3 is 1.

Also, these lines are perpendicular to each other.

$\therefore(-\cot\theta)(1) = -1 \Rightarrow \cot\theta=1=\cot \pi/2$

$\Rightarrow \theta = \pi/4$

Sol. 25. (b)

The equation of line perpendicular to given line is:

x+y – 11 …(i)

and –x+y+λ = 0 …(ii)

This equation passes through (2,3)

$\therefore -2+3+\lambda = 0 \Rightarrow \lambda = -1$

From Eq.(ii), –x+y–1 = 0 $\Rightarrow$ y = x + 1

From Eq. (i), x+x+1–11 = 0 $\Rightarrow$2x = 10

$\Rightarrow$x = 5

Hence, coordinates of foot of perpendicular from (2,3) to given line is (5,6).

Sol. 26. (a)

$$\text{area}=\frac{1}{2}\begin{vmatrix} -3 & 0 & 1 \\ 3 & 0 & 1 \\ 0 & k & 1 \end{vmatrix}=9\Rightarrow k=3$$

Sol. 27. (c)

Given point will satisfy both equations then k=½

Sol. 28. (d)

slope of given line is −3/4

and slope of line perpendicular to it is 4/3.

Sol. 29. (c)

We know that, the equation of straight line passing through the intersection point of two lines $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x}{b}+\frac{y}{a}$ is

$\left(\frac{x}{a}+\frac{y}{b}-1\right)+\lambda\left(\frac{x}{b}+\frac{y}{a}-1\right)=0$ …(i)

Since, this line passes through the origin

$\therefore$(0-1) + λ (0-1) = 0 $\Rightarrow \lambda = -1$

On putting the value of λ in Eq. (i), we get

$\left(\frac{x}{a}+\frac{y}{b}-1\right)-1\left(\frac{x}{a}+\frac{y}{b}-1\right)=0$

$\Rightarrow\frac{x}{a}+\frac{y}{b}-1-\frac{x}{b}-\frac{y}{a}+1=0$

$\Rightarrow x\left(\frac{1}{a}-\frac{1}{b}\right)-y\left(\frac{1}{a}-\frac{1}{b}\right)=0$

$\therefore$ x – y = 0

Sol. 30. (c)

The equation of given lines are

3y + 4x = 1 …(i)

y = x + 5 …(ii)

and 5y + bx = 3 …(iii)

On solving Eqs. (i) and (ii), we get
$x = -2$ and $y = 3$
If these lines are concurrent, then their values must satisfy the third equation
$15 - 2b = 3 \Rightarrow 2b = 12 \Rightarrow b = 6$

Sol. 31. (c)
Let A (a,0) and B (0,b) are two points on respective coordinate axes and (–5, 4) divides AB in the ratio 1:2.

$\therefore -5 = \frac{1\times 0 + 2\times a}{3} \Rightarrow a = \frac{-15}{2}$

and $4 = \frac{1\times b + 2\times 0}{3} \Rightarrow b = 12$

Hence, equation of line joining $\left(-\frac{15}{2}, 0\right)$ and (0,12) is

$(y - 0) = \frac{12-0}{0+\frac{15}{2}} \cdot \left(x + \frac{15}{2}\right)$

$\Rightarrow y = \frac{4}{5}(2x+15)$

$\Rightarrow 5y = (8x + 60)$
$\Rightarrow 8x - 5y + 60 = 0$

Sol. 32. (a)
Let (α,β) be the image of point (1, 2) w.r.t. line $3x+4y-1 = 0$

$\therefore \left(\frac{\alpha+1}{2}, \frac{\beta+2}{2}\right)$ will be on the line
$3x + 4y - 1 = 1$

$\Rightarrow 3\left(\frac{\alpha+1}{2}\right) + 4\left(\frac{\beta+1}{2}\right) - 1 = 0$

$\Rightarrow 3\alpha + 3 + 4\beta + 8 - 2 = 0$
$\Rightarrow 3\alpha + 4\beta + 9 = 0$

Which is satisfied by $\left(-\frac{7}{5}, -\frac{6}{5}\right)$

Thus, the image of point (1,2) is $\left(-\frac{7}{5}, -\frac{6}{5}\right)$

NDA PYQ

1. What is the locus of a point which moves equidistant from the coordinate axes?
(a) $x \pm y = 0$ (b) $x + 2y = 0$
(c) $2x + y = 0$ (d) None of these
[NDA – (I) - 2011]

2. The line mx + ny = 1 passes through the points (1,2) and (2,1). What is the value of m?
(a) 1 (b) 3
(c) $\frac{1}{2}$ (d) $\frac{1}{3}$
[NDA – (I) - 2011]

3. If the sum of the squares of the distance of the point (x,y) from the point (a,0) and (–a,0) is $2b^2$, then which one of the following is correct?
(a) $x^2 + a^2 = b^2 + y^2$ (b) $x^2 + a^2 = 2b^2 - y^2$
(c) $x^2 - a^2 = b^2 + y^2$ (d) $x^2 + a^2 = b^2 - y^2$
[NDA – (I) - 2011]

4. What is the equation of the line joining the origin with the point of intersection of the lines 4x + 3y = 12 and 3x + 4y = 12?
(a) x+y=1 (b) x–y=1
(c) 3y = 4x (d) x = y
[NDA (I) - 2011]

5. What is the equation of the line passing through (2,–3) and parallel to Y-axis?
(a) y= –3 (b) y = 2
(c) x = 2 (d) x = – 3
[NDA – (I) - 2011]

6. What is the locus of the point which is at a distance 8 units to the left of Y-axis?
(a) x=8 (b)y=8
(c) x = – 8 (d) y = – 8
[NDA – (I) - 2011]

7. If (a, 0), (0, b) and (1, 1) are collinear, what is (a + b − ab) equal to?
(a) 2 (b) 1
(c) 0 (d) –1
[NDA – (I) - 2011]

8. Two straight lines x–3y–2=0 and 2x – 6y – 6 = 0
(a) Never intersect
(b) Intersect at a single point
(c) Interest at infinite number of points
(d)Interest at more than one point (but finite number of points)
[NDA – (I) - 2011]

9. For what value of k, are the lines x + 2y – 9 = 0 and kx + 4y + 5 = 0 parallel?
(a) 2 (b) –1
(c) 1 (d) 0
[NDA – (II) - 2011]

10. What are the coordinates of the foot of the perpendicular from the point (2, 3) on the line x + y – 11 = 0?
(a) (2, 9) (b) (5, 6)
(c) (–5, 6) (d) (6, 5)
[NDA – (II) - 2011]

11. If (p,q) is the point on the axis equidistant from the point (1,2) and (2,3), then which one of the following is correct?
(a) p = 0, q = 4 (b) p = 4, q = 0
(c) $p=\frac{3}{2}$,q=0 (d) p= 1, q = 0
[NDA – (II) - 2011]

12. If p is the length of the perpendicular drawn from the origin to the line $\frac{x}{a}+\frac{y}{b}=1$, then which one of the following is correct?
(a) $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$ (b) $\frac{1}{p^2}=\frac{1}{a^2}-\frac{1}{b^2}$
(c) $\frac{1}{p}=\frac{1}{a}+\frac{1}{b}$ (d) $\frac{1}{p}=\frac{1}{a}-\frac{1}{b}$
[NDA-2011(2)]

13. What is the equation of a line parallel to x-axis at a distance of 5 units below x-axis?
(a) x=5 (b) x= –5
(c) y=5 (d) y= –5
[NDA-2011(2)]

14. What is the distance between the lines 3x + 4y = 9 and 6x + 8y = 18?
(a) 0 (b) 3 units
(c) 9 units (d) 18 units
[NDA - (I) - 2012]

15. What is the equation of line passing through (0, 1) and making an angle with Y-axis equal to the inclination of the line x – y = 4 with X-axis?
(a) y = x +1 (b) x = y + 1
(c) 2x = y + 2 (d) None of these
[NDA - (I) - 2012]

16. What is the perpendicular distance of the point (x, y) from X-axis?
(a) x (b) y
(c) |x| (d) |y|
[NDA - (I) - 2012]

17. What is the perimeter of the triangle with vertices A(–4,2), B(0,–1) and C(3,3)?
(a) $7+3\sqrt{2}$ (b) $10+5\sqrt{2}$
(c) $11+6\sqrt{2}$ (d) $5+\sqrt{2}$
[NDA-2012(1)]

18. If the midpoint between the points (a+b, a–b) and (–a, b) lies on the line ax + by = k, what is k equal to?
(a) a/b (b) a+b
(c) ab (d) a–b
[NDA-2012(1)]

19. The acute angle which the perpendicular from origin on the line 7x–3y=4 makes with the x-axis is:
(a) zero (b) positive but not $\pi/4$
(c) negative (d) $\pi/4$
[NDA-2012(1)]

20. The equation of a straight line which makes an angle 45° with X-axis with y-intercept 101 units is
(a) 10x +101y = 1 (b) 101x + y = 1
(c) x + y – 101 = 0 (d) x – y + 101 = 0
[NDA - (I) - 2012]

21. The line x = 0 divides the line joining the points (3, –5) and (–4, 7) in the ratio
(a) 3 : 4 (b) 4 : 5
(c) 5 : 7 (d) 7 : 9
[NDA - (II) - 2012]

22. What is the value of λ, if the straight line $(2x + 3y + 4) + \lambda (6x - y + 12) = 0$ is parallel to Y-axis?

(a) 3 (b) –6
(c) 4 (d) –3

[NDA - (II) -2012]

23. From the point (4, 3) a perpendicular is dropped on the X-axis as well as on the Y-axis. If the lengths of perpendiculars are p and q respectively, then which one of the following is correct?

(a) p = q (b) 3p = 4q
(c) 4p = 3q (d) p + q = 5

[NDA (II) 2012]

24. What is the perpendicular distance between the parallel lines $3x + 4y = 9$ and $9x + 12y + 28 = 0$?

(a) 7/3 units (b) 8/3 units
(c) 10/3 units (d) 11/3 units

[NDA (II) 2012]

25. The points (5, 1), (1, –1) and (11, 4) are

(a) Collinear
(b) Vertices of right angled triangle
(c) Vertices of equilateral triangle
(d) Vertices of an isosceles

[NDA (II) 2012]

26. The equation to the locus of a point which is always equidistant from the points (1, 0) and (0, –2) is

(a) $2x + 4y + 3 = 0$ (b) $4x + 2y + 3 = 0$
(c) $2x + 4y - 3 = 0$ (d) $4x + 2y - 3 = 0$

[NDA – (II) - 2012]

27. The locus of a point equidistant from three collinear points is

(a) A straight line (b) A pair of points
(c) A point (d) The null set

[NDA – (II) - 2012]

28. Let p, q, r, s be the distances from origin of the points (2,6), (3,4), (4,5) and (–2,5) respectively. Which one of the following is a whole number?

(a) p (b) q
(c) r (d) s

[NDA-2012(2)]

29. If the points (2,4), (2,6) and $(2+\sqrt{3},k)$ are the vertices of an equilateral triangle, then what is the value of k?

(a) 6 (b) 5
(c) –3 (d) 1

[NDA-2012(2)]

30. What is the equation of a straight line which passes through (3, 4) and the sum of whose x and y-intercepts is 14?

(a) $4x + 3y = 24$ (b) $x + y = 7$
(c) $4x - 3y = 0$ (d) $3x + 4y = 25$

[NDA - (I) - 2013]

31. A straight line passes through the points (5, 0) and (0, 3). The length of the perpendicular from the point (4, 4) on the line is

(a) $\frac{\sqrt{17}}{2}$ (b) $\sqrt{\frac{17}{2}}$

(c) $\frac{15}{\sqrt{34}}$ (d) $\frac{17}{2}$

[NDA - (I) - 2013]

32. What is the inclination of the line $\sqrt{3}x - y - 1 = 0$?

(a) 30° (b) 60°
(c) 135° (d) 150°

[NDA (I) - 2013]

33. Two straight line paths are represented by the equations $2x - y = 2$ and $-4x + 2y = 6$. Then, the paths will

(a) Cross each other at one point
(b) Not cross each other
(c) Cross each other at two points
(d) Cross each other at infinitely many points

[NDA - (I) - 2013]

34. The point whose abscissa is equal to its ordinate and which is equidistant from A(–1,0) and B(0,5) is:

(a) (1,1) (b) (2,2)
(c) (–2,–2) (d) (3,3)

[NDA-2013(1)]

35. What is the area of the triangle whose vertices are (3,0), (0,4) and (3,4)?

(a) 6 square unit (b) 7.5 square unit
(c) 9 square unit (d) 12 square unit

[NDA-2013(1)]

36. What is the angle between the line $x + y = 1$ and $x - y = 1$?

(a) $\pi/6$ (b) $\pi/4$
(c) $\pi/3$ (d) $\pi/2$

[NDA - (II) - 2013]

37. What is the equation of the straight line passing through (5, –2) and (–4, 7)?

(a) $5x - 2y = 4$ (b) $-4x + 7y = 9$
(c) $x + y = 3$ (d) $x - y = -1$

[NDA - (II) - 2013]

38. The equation of the line, the reciprocals of whose intercepts on the axes are m and n, is given by

(a) $nx + my = mn$ (b) $mx + ny = 1$
(c) $mx + ny = mn$ (d) $mx - ny = 1$

[NDA - (II) - 2013]

39. The equation of the locus of a point which is equidistant from the axes is

(a) $y = 2x$ (b) $x = 2y$
(c) $y = \pm x$ (d) $2y + x = 0$

[NDA - (II) - 2013]

40. A points P moves such that its distances from (1, 2) and (–2, 3) are equal. Then the locus of P is

(a) Straight line (b) Parabola
(c) Ellipse (d) Hyperbola

[NDA - (II) - 2013]

41. What angle does the line segment joining (5, 2) and (6, –15) subtend at (0, 0)?

(a) $\pi/6$ (b) $\pi/4$
(c) $\pi/2$ (d) $3\pi/4$

[NDA - (II) - 2013]

42. What is the equation of the line which passes through (4, –5) and is perpendicular to $3x + 4y + 5 = 0$?

(a) $4x - 3y - 31 = 0$ (b) $3x - 4y - 41 = 0$
(c) $4x + 3y - 1 = 0$ (d) $3x + 4y + 8 = 0$

[NDA - (II) - 2013]

43. For what value of k are the two straight lines $3x + 4y = 1$ and $4x + 3y + 2k = 0$, equidistant from the point (1,1)?

(a) 1/2 (b) 2
(c) –2 (d) –1/2

[NDA - (II) - 2013]

44. If the three vertices of the parallelogram ABCD are $A(1, \alpha)$, $B(3, \alpha)$, C (2, b) then D is equal to?

(a) (3, b) (b) (0, b)
(c) (4, b) (d) (5, b)

[NDA - (II) - 2013]

45. The value of k for which the lines $2x+3y+a=0$ and $5x+ky+a=0$ represent family of parallel lines is:

(a) 3 (b) 4.5
(c) 7.5 (d) 15

[NDA-2013(2)]

46. The centroid of the triangle with vertices (2, 3), (–2, –2) and (3,5) is at :
(a) (1,1) (b) (2,–1)
(c) (1,–1) (d) (1,2)
[NDA-2013(2)]

47. What is the equation of straight line passing through the point (4, 3) and making equal intercepts on the coordinate axe?
(a) x + y = 7 (b) 3x + 4y = 7
(c) x – y = 1 (d) None of these
[NDA (I) - 2014]

48. What is the equation of the line midway between the lines 3x – 4y + 12 = 0 and 3x – 4y = 6?
(a) 3x – 4y – 9 = 0 (b) 3x – 4y + 9 = 0
(c) 3x – 4y –3 = 0 (d) 3x – 4y + 3 = 0
[NDA (I) - 2014]

49. Consider the following points:
I. (0, 5) II. (2, –1)
III. (3, –4)
Which of the above lie on the line 3x + y = 5 and at distance $\sqrt{10}$ from (1, 2)?
(a) Only I (b) Only II
(c) I and II (d) I, II and III
[NDA (I) - 2014]

50. What is the equation of the line through (1,2) so that the segment of the line intercepted between the axes is bisected at this point?
(a) 2x–y=4 (b) 2x–y+4=0
(c) 2x+y=4 (d) 2x+y+4=0
[NDA-2014(1)]

51. Which one of the following is correct is respect of the equations $\frac{x-1}{2}=\frac{y-2}{3}$ and 2x + 3y = 5?
(a)They represent two lines which are parallel
(b)The represent two lines which are perpendicular
(c)They represent two lines which are neither parallel nor perpendicular
(d) The first equation does not represent a line.
[NDA (II) - 2014]

52. A (3, 4) and B (5, –2) are two points and P is a point such that PA = PB. If the area of ΔPAB is 10 sq units, then what are the coordinates of P?
(a) Only (1, 0) (b) Only (7, 2)
(c) Either (1, 0) or (7, 2) (d) Neither (1, 0) nor (7, 2)
[NDA (II) - 2014]

53. What is the product of the perpendiculars drawn from the points $(\pm\sqrt{a^2-b^2}, 0)$ upon the line bx cos α + ay sin α = ab?
(a) a^2 (b) b^2
(c) $a^2 + b^2$ (d) a + b
[NDA (II) - 2014]

Direction (for next three)
Consider the ΔABC with vertices A (–2, 3), B (2, 1) and C (1, 2).

54. What is the Circum-centre of the ΔABC?
(a) (–2, –2) (b) (2, 2)
(c) (–2, 2) (d) (2, –2)
[NDA (I) - 2015]

55. What is the centroid of the ΔABC?
(a) $\left(\frac{1}{3},1\right)$ (b) $\left(\frac{1}{3},2\right)$
(c) $\left(1,\frac{2}{3}\right)$ (d) $\left(\frac{1}{2},3\right)$
[NDA (I) - 2015]

56. What is the foot of the altitude from the vertex A of ΔABC?
(a) (1, 4) (b) (–1, 3)
(c) (–2, 4) (d) (–1, 4)
[NDA (I) - 2015]

57. The perpendicular distance between the straight lines 6x + 8y + 15 = 0 and 3x + 4y + 9 = 0 is
(a) 3/2 units (b) 3/10 unit
(c) 3/4 unit (d) 2/7 unit
[NDA (I) - 2015]

58. A line passes through (2, 2) and is perpendicular to the line 3x + y = 3, its y-intercept is
(a) 3/4 (b) 4/3
(c) 1/3 (d) 3
[NDA (I) - 2015]

59. The area of a triangle, whose vertices are (3, 4), (5, 2) and the point of intersection of the lines x = a and y = 5, is 3 square units. What is the value of a?
(a) 2 (b) 3
(c) 4 (d) 5
[NDA (I) - 2015]

60. The length of perpendicular from the origin to a line is 5 units and the line makes an angle 120° with the positive direction of X-axis. Then equation of the line is
(a) $x+\sqrt{3}y=5$ (b) $\sqrt{3}x+y=10$
(c) $\sqrt{3}x-y=10$ (d) None of these
[NDA (II) - 2015]

61. The equation of the line joining the origin to the point intersection of the lines $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x}{b}+\frac{y}{a}=1$ is
(a) x – y = 0 (b) x + y = 0
(c) x = 0 (d) y = 0
[NDA (II) - 2015]

62. The three lines 4x + 4y = 1, 8x – 3y = 2, y = 0 are
(a) The sides of an isosceles triangle
(b) Concurrent
(c) Mutually perpendicular
(d) The sides of an equilateral triangle
[NDA (II) - 2015]

63. The line 3x + 4y – 24 = 0 intersects the X-axis at A and Y–axis at B. Then, the Circum-centre of the ΔOAB, where O is the origin, is
(a) (2, 3) (b) (3, 3)
(c) (4, 3) (d) None of these
[NDA (II) - 2015]

64. The product of the perpendiculars from the two points (± 4, 0) to the line 3x cos ϕ + 5y sin ϕ = 15 is
(a) 25 (b) 16
(c) 9 (d) 8
[NDA (II) - 2015]

65. Two straight lines passing through the point A(3, 2) cut the line 2y = x + 3 and X-axis perpendicularly at P and Q, respectively. The equation of the line PQ is
(a) 7x + y – 21 = 0 (b) x + 7y + 21 = 0
(c) 2x + y – 8 = 0 (d) x + 2y + 8 = 0
Where, n ∈ Z
[NDA (II) - 2015]

66. The area of the figure formed by the lines ax + by + c = 0, ax – by + c = 0, ax + by – c = 0 and ax – by – c = 0 is:

(a) $\frac{c^2}{ab}$ (b) $\frac{2c^2}{ab}$

(c) $\frac{c^2}{2ab}$ (d) $\frac{c^2}{4ab}$

[NDA-2015(2)]

67. If a line is perpendicular to the line 5x–y=0 and forms a triangle of area 5 square units with co-ordinate axes, then its equation is:

(a) $x + 5y \pm 5\sqrt{2}=0$ (b) $x - 5y \pm 5\sqrt{2}=0$

(c) $5x + y \pm 5\sqrt{2}=0$ (d) $5x - y \pm 5\sqrt{2}=0$

[NDA-2015(2)]

Directions: (for next two)

Consider the lines y = 3x, y = 6x, y = 9

68. What is the area of the triangle formed by these lines?

(a) $\frac{27}{4}$ sq units (b) $\frac{27}{9}$ ssq units

(c) $\frac{19}{4}$ sq units (d) $\frac{19}{2}$ sq units

[NDA (I) - 2016]

69. The centroid of triangle is at which one of the following points?

(a) (3, 6) (b) $\left(\frac{3}{2},6\right)$

(c) (3, 3) (d) $\left(\frac{3}{2},9\right)$

[NDA (I) - 2016]

Directions (for next two)

Consider a parallelogram, whose vertices are A(1, 2), B (4, y), C(x, 6) and D(3, 5) taken in order.

70. What is the value of $AC^2 - BD^2$?

(a) 25 (b) 30

(c) 36 (d) 40

[NDA (I) - 2016]

71. What is the point of intersection of the diagonals?

(a) $\left(\frac{7}{2},4\right)$ (b) (3, 4)

(c) $\left(\frac{7}{2},5\right)$ (d) (3, 5)

[NDA (I) - 2016]

72. What is the area of the parallelogram?

(a) $\frac{7}{2}$ sq units (b) 4 sq units

(c) $\frac{11}{2}$ sq units (d) 7 sq units

[NDA (I) - 2016]

73. A straight line intersects X and Y-axes at P and Q, respectively. If (3, 5) is the middle point o PQ, then what is the area of the ΔOPQ?

(a) 12 sq unit (b) 15 sq units

(c) 20 sq units (d) 30 sq units

[NDA (I) - 2016]

Directions (for next two)

Consider the two lines x + y + 1 = 0 and 3x + 2y + 1 = 0.

74. What is the equation of the line passing through the point of intersection of the given lines and parallel to x-axis?

(a) y + 1 = 0 (b) y – 1 = 0

(c) y – 2 = 0 (d) y + 2 = 0

[NDA (I) - 2016]

75. What is the equation of the line passing through the point of intersection of the given lines and parallel to Y-axis?

(a) x + 1 = 0 (b) x – 1 = 0

(c) x – 2 = 0 (d) x + 2 = 0

[NDA (I) - 2016]

76. (a, 2b) is the mid-point of the line segment joining the points (10, –6) and (k, 4). If a – 2b = 7, then what is the value of k?

(a) 2 (b) 3

(c) 4 (d) 5

[NDA (I) - 2016]

77. What is the acute angle between the lines represented by the equations $y-\sqrt{3}x-5=0$ and $\sqrt{3}y-x+6=0$?

(a) 30° (b) 45°

(c) 60° (d) 75°

[NDA (I) - 2016]

78. An equilateral triangle has one vertex at (0,0) and another at $(3,\sqrt{3})$. What are the coordinates of the third vertex?

(a) $(0,2\sqrt{3})$ only (b) $(3,-\sqrt{3})$ only

(c) $(0,2\sqrt{3})$ and $(3,-\sqrt{3})$ (d) Neither $(0,2\sqrt{3})$ nor $(3,-\sqrt{3})$

[NDA (II) - 2016]

79. What is the equation of right bisector of the line segment joining (1,1) and (2,3) ?

(a) 2x + 4y −11 = 0 (b) 2x − 4y −5 = 0

(c) 2x − 4y −11 = 0 (d) x − y + 1 = 0

[NDA (II) - 2016]

80. If the point (a, a) lies between the lines |x + y| = 2, then which one of the following is correct ?

(a) |a| < 2 (b) $|a| < \sqrt{2}$

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

[NDA (II) - 2016]

81. What is the equation of the straight line which passes through the point of intersection of the straight lines x + 2y = 5 and 3x + 7y = 17 and is perpendicular to straight line 3x + 4y = 10?

(a) 4x + 3y + 2 = 0 (b) 4x − y + 2 = 0

(c) 4x −3y − 2 = 0 (d) 4x − 3y + 2 = 0

[NDA (II) - 2016]

82. If (a,b) is at unit distance from the line 8x + 6y + 1 = 0, then which of the following conditions are correct

1. 3a −4b −4 = 0 2. 8a + 6b + 11 = 0

3. 8a + 6b −9 = 0

Select the correct answer using the code given below

(a) 1 and 2 only (b) 2 and 3 only

(c) 1 and 3 only (d) 1,2 and 3

[NDA (II) - 2016]

83. A straight line cuts off an intercept of 2 units on the positive direction of x-axis and passes through the point (–3,5). What is the foot of the perpendicular drawn from the point (3,3) on this line?

(a) (1,3) (b) (2,0)

(c) (0, 2) (d) (1,1)

[NDA-2016(2)]

84. If vertex of a triangle is (1,1) and the midpoints of two sides of the triangle through this vertex are (–1, 2) and (3, 2), then the centroid of the triangle is:

(a) $\left(-\frac{1}{3},\frac{7}{3}\right)$ (b) $\left(-1,\frac{7}{3}\right)$

(c) $\left(\frac{1}{3},\frac{7}{3}\right)$ (d) $\left(1,\frac{7}{3}\right)$

[NDA (I) - 2017]

85. The in-centre of the triangle with vertices A $(1, \sqrt{3})$, B (0,0) and C (2,0) is:

(a) $\left(1, \frac{\sqrt{3}}{2}\right)$ (b) $\left(\frac{2}{3}, \frac{1}{\sqrt{3}}\right)$

(c) $\left(\frac{2}{3}, \frac{\sqrt{3}}{2}\right)$ (d) $\left(1, \frac{1}{\sqrt{3}}\right)$

[NDA (I) - 2017]

86. What is the ratio in which the point C $\left(-\frac{2}{7}, -\frac{20}{7}\right)$ divides the line joining the points A (–2, –2) and B (2, – 4)?

(a) 1:3 (b) 3:4
(c) 1:2 (d) 2:3

[NDA (I) - 2017]

87. What is the equation of the straight line parallel to 2x + 3y + 1 = 0, and passes through the point (–1, 2)?

(a) 2x + 3y – 4 = 0 (b) 2x + 3y – 5 = 0
(c) x + y – 1 = 0 (d) 3x – 2y + 7 = 0

[NDA (I) - 2017]

88. What is the acute angle between the pair of straight line $\sqrt{2}x + \sqrt{3}y = 1$ and $\sqrt{3}x + \sqrt{2}y = 2$?

(a) $\tan^{-1}\left(\frac{1}{2\sqrt{6}}\right)$ (b) $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

(c) $\tan^{-1}(3)$ (d) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

[NDA (I) - 2017]

89. If the Centroid of a triangle formed by (7, x), (y, –6) and (9, 10) is (6, 3), then the values of x and y are respectively:

(a) 5, 2 (b) 2, 5
(c) 1, 0 (d) 0, 0

[NDA (I) - 2017]

90. If the three consecutive vertices of a parallelogram are (–2, –1), (1, 0) and (4, 3), then what are the coordinates of the fourth vertex?

(a) (1, 2) (b) (1, 0)
(c) (0, 0) (d) 1, –1)

[NDA-2017(1)]

91. The points (a, b), (0, 0), (–a, –b) and (ab, b^2) are:

(a) The vertices of a parallelogram
(b) The vertices of a rectangular
(c) The vertices of a square
(d) Collinear

[NDA (II) - 2017]

92. The angle between the lines x + y –3 = 0 and x – y + 3 = 0 is α and the acute angle between the lines $x - \sqrt{3}y + 2\sqrt{3} = 0$ and $\sqrt{3}x - y + 1 = 0$ is β. Which one of the following is correct?

(a) α =β (b) α > β
(c) α < β (d) α = 2β

[NDA (II) - 2017]

93. The equation of a straight line which cuts off an intercept of 5 units on negative direction of y-axis and makes an angle 120° with positive direction of x-axis is:

(a) $y + \sqrt{3}x + 5 = 0$ (b) $y - \sqrt{3}x + 5 = 0$

(c) $y + \sqrt{3}x - 5 = 0$ (d) $y - \sqrt{3}x - 5 = 0$

[NDA (II) - 2017]

94. The distance of the point (1,3) from the line 2x + 3y = 6, measured parallel to the line 4x + y = 4, is:

(a) $\frac{5}{\sqrt{13}}$ units (b) $\frac{3}{\sqrt{17}}$ units

(c) $\sqrt{17}$ units (d) $\frac{\sqrt{17}}{2}$ units

[NDA (II) - 2017]

95. The equation of the line passing through the point (2,3) and the point of intersection of lines 2x – 3y + 7 = 0 and 7x +4y + 2 = 0 is:

(a) 21x + 46y –180 = 0 (b) 21x – 46y + 96 = 0
(c) 46x + 21y – 155 = 0 (d) 46x + 21y – 29 = 0

[NDA (II) - 2017]

96. What is the distance between the straight lines 3x + 4y = 9 and 6x + 8y = 15?

(a) 3/2 (b) 3/10
(c) 6 (d) 5

[NDA (I) - 2018]

97. The equation of the line, when the portion of it intercepted between the axes is divided by the point (2,3) in the ratio of 3:2, is:

(a) Either x + y = 4 or 9x + y = 12
(b) Either x + y = 5 or 4x + 9y = 30
(c) Either x + y = 4 or x + 9y = 12
(d) Either x + y = 5 or 9x + 4y = 30

[NDA (I) - 2018]

98. The perpendicular that fall from any point of the straight line 2x + 11y = 5 upon the two straight lines 24x + 7y = 20 and 4x – 3y = 2 are:

(a) 12 and 4 respectively (b) 11 and 5 respectively
(c) Equal to each other (d) Not equal to each other

[NDA (I) - 2018]

99. What is the equation of the straight line passing through the point (2,3) and making an intercept on the positive y-axis equal to twice its intercept on the positive x-axis?

(a) 2x + y = 5 (b) 2x + y = 7
(c) x + 2y = 7 (d) 2x – y = 1

[NDA (I) - 2018]

100. Consider the following statements:

I. The length p of the perpendicular from the origin to the line ax + by = c satisfies the relation $p^2 = \frac{c^2}{a^2 + b^2}$.

II. The length p of the perpendicular from the origin to the line $\frac{x}{a} + \frac{y}{b} = 1$ satisfies the relation $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

III.The length p of the perpendicular from the origin to the line y = mx + c satisfies the relation $\frac{1}{p^2} = \frac{1 + m^2 + c^2}{c^2}$

Which of the above is/are correct?

(a) I, II and III (b) I only
(c) I and II only (d) II only

[NDA (I) - 2018]

101. What is the equation of the line passing through the point of intersection of the lines x + 2y – 3 = 0 and 2x – y + 5 = 0 and parallel to the line y – x + 10 = 0?

(a) 7x – 7y + 18 = 0 (b) 5x – 7y + 18 = 0
(c) 5x – 5y + 18 = 0 (d) x – y + 5 = 0

[NDA (I) - 2018]

102. What is the equation of the straight line cutting off an intercept 2 from the negative direction of y-axis and inclined at 30° with the positive direction of x-axis?

(a) $x - 2\sqrt{3}y - 3\sqrt{2} = 0$ (b) $x + 2\sqrt{3}y - 3\sqrt{2} = 0$

(c) $x + \sqrt{3}y - 2\sqrt{3} = 0$ (d) $x - \sqrt{3}y - 2\sqrt{3} = 0$

[NDA (I) - 2018]

103. What is the angle between the straight lines $(m^2 - mn)\, y = (mn + n^2)\, x + n^3$ and $(mn + m^2)\, y = (mn - n^2)\, x + m^3$, where $m > n$?

(a) $\tan^{-1}\left(\frac{2mn}{m^2+n^2}\right)$ (b) $\tan^{-1}\left(\frac{4m^2n^2}{m^4-n^4}\right)$

(c) $\tan^{-1}\left(\frac{4m^2n^2}{m^4+n^4}\right)$ (d) $45°$

[NDA (I) - 2018]

104. What is the distance between the points which divide the line segment joining (4,3) and (5,7) internally and externally in the ratio 2:3?

(a) $\frac{12\sqrt{17}}{5}$ (b) $\frac{13\sqrt{17}}{5}$

(c) $\frac{\sqrt{17}}{5}$ (d) $\frac{6\sqrt{17}}{5}$

[NDA (I) - 2018]

105. What is the area of the triangle with vertices $\left(x_1, \frac{1}{x_1}\right), \left(x_2, \frac{1}{x_2}\right), \left(x_3, \frac{1}{x_3}\right)$?

(a) $|(x_1 - x_2)(x_2 - x_3)(x_3 - x_1)|$

(b) 0

(c) $\left|\frac{(x_1-x_2)(x_2-x_3)(x_3-x_1)}{x_1x_2x_3}\right|$

(d) $\left|\frac{(x_1-x_2)(x_2-x_3)(x_3-x_1)}{2x_1x_2x_3}\right|$

[NDA (II) - 2018]

106. Consider the following statement:

Statement I

If the line segment joining the points P(m,n) and Q(r,s) subtends an angle α at the origin, then $\cos\alpha = \frac{ms - nr}{\sqrt{(m^2+n^2)(r^2+s^2)}}$.

Statement II

If any triangle ABC, it is true that

$a^2 = b^2 + c^2 - 2bc \cos A$.

What of the following is correct in respect of the above two statements?

(a)Both Statement I and Statement II are true and Statement II is the correct explanation of Statement I.

(b)Both Statement I and Statement II are true, but Statement II is not the correct explanation of Statement I.

(c)Statement I is true, but Statement II is false

(d)Statement I is false, but Statement II is true

[NDA (II) - 2018]

107. What is the equation of straight line pass through the point of intersection of the line $\frac{x}{2} + \frac{y}{3} = 1$ and $\frac{x}{3} + \frac{y}{2} = 1$, and parallel the line $4x + 5y - 6 = 0$?

(a) $20x + 25y - 54 = 0$ (b) $25x + 20y - 54 = 0$

(c) $4x + 5y - 54 = 0$ (d) $4x + 5y - 45 = 0$

[NDA (II) - 2018]

108. Consider the following statements:

I. The distance between the lines $y = mx + c_1$ and $y = mx + c_2$ is $\frac{|c_1 - c_2|}{\sqrt{1-m^2}}$.

II. The distance between the lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$ is $\frac{|c_1 - c_2|}{\sqrt{a^2+b^2}}$

III. The distance between the lines $x = c$ and $x = c_2$ is $|c_1 - c_2|$.

Which of the above statements are correct?

(a) I and II only (b) II and III only

(c) I and III only (d) I, II and III only

[NDA (II) - 2018]

109. The angle between the two lines $lx + my + n = 0$ and $l'x + m'y + n' = 0$ is given by $\tan^{-1}\theta$. What θ equal to?

(a) $\left|\frac{lm' - l'm}{ll' - mm'}\right|$ (b) $\left|\frac{lm' + l'm}{ll' + mm'}\right|$

(c) $\left|\frac{lm' - l'm}{ll' + mm'}\right|$ (d) $\left|\frac{lm' + l'm}{ll' - mm'}\right|$

[NDA (II) - 2018]

110. The second degree equation $x^2 + 4y^2 - 2x - 4y + 2 = 0$ represents

(a) A point

(b) An ellipse of semi-major axis 1

(c) An ellipse with eccentricity $\frac{\sqrt{3}}{2}$

(d) None of the above

[NDA (II) - 2018]

111. The straight lines $x + y - 4 = 0$, $3x + y - 4 = 0$, $x + 3y - 4 = 0$form a triangle, which is

(a) isosceles (b) right - angled

(c) equilateral (d) scalene

[NDA (I) - 2019]

112. What is the equation of straight line which is perpendicular to $y = x$ and passes through (3,2)?

(a) $x - y = 5$ (b) $x + y = 5$

(c) $x + y = 1$ (d) $x - y = 1$

[NDA (I) - 2019]

113. If the lines $3y + 4x = 1$, $y = x + 5$ and $5y + bx = 3$ are concurrent, then what is the value of b?

(a) 1 (b) 3

(c) 6 (d) ½

[NDA (I) - 2019]

114. The points (1,3) and (5,1) are two opposite vertices of a rectangle. The other vertices lie on the line $y = 2x + c$, what is the value of c?

(a) 2 (b) – 2

(c) 4 (d) – 4

[NDA (I) - 2019]

115. Consider the following statements:

1.For an equation of a line, $x\cos q + y\sin q = p$, in normal form the length of the perpendicular from the point (a,b) to the line is $|a\cos q + b\sin q + p|$

2.The length of the perpendicular from the point(α,β) to the line $\frac{x}{a} + \frac{y}{b} = 1$ is $\left|\frac{a\alpha + b\beta - ab}{\sqrt{a^2+b^2}}\right|$

Which of the above statements is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

[NDA (I) - 2019]

116. The equation $ax + by + c = 0$, represents a straight line

(a) for all real numbers a, b and c

(b) only when $a \neq 0$

(c) only when $b \neq 0$

(d) only when at least one of a and b is non-zero

[NDA (II) - 2019]

117. What is the angle between the lines $x\cos\alpha + y\sin\alpha = a$ and $x\sin\beta - y\cos\beta = a$?

(a) $\beta - \alpha$ (b) $\pi + \beta - \alpha$

(c) $\frac{(\pi + 2\beta + 2\alpha)}{2}$ (d) $\frac{(\pi - 2\beta + 2\alpha)}{2}$

[NDA (II) - 2019]

118. What is the distance between the points $P(m\cos2\alpha, m\sin2\alpha)$ and $Q(m\cos2\beta, m\sin2\beta)$?

(a) $|2m\sin(\alpha - \beta)|$ (b) $|2m\cos(\alpha - \beta)|$

(c) $|m\sin(2\alpha - 2\beta)|$ (d) $|m\sin(2\alpha - 2\beta)|$

[NDA (II) - 2019]

119. An equilateral triangle has one vertex at $(-1, -1)$ and another vertex at $(-\sqrt{3}, \sqrt{3})$. the third vertex may lie on

(a) $(-\sqrt{2}, \sqrt{2})$ (b) $(\sqrt{2}, -\sqrt{2})$

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

[NDA (II) - 2019]

120. The point $(1,-1)$ is one of the vertices of a square. If $3x + 2y = 5$ is the equation of one diagonal of the square, then what is the equation of the other diagonal?

(a) $3x - 2y = 5$ (b) $2x - 3y = 1$

(c) $2x - 3y = 5$ (d) $2x + 3y = -1$

[NDA 2020]

121. If the circum-centre of the triangle formed by the lines $x + 2 = 0$, $y + 2 = 0$, $kx + y + 2 = 0$ is $(-1,1)$, then what is the value of k ?.

(a) -1 (b) -2

(c) 1 (d) 2

[NDA 2020]

122. Under which condition, are the points (a,b), (c,d) and (a−c,b−d) collinear ?

(a) ab = cd (b) ac = bd

(c) ad = bc (d) abc = d

[NDA 2020]

123. Let ABC ba a triangle. If D(2,5) and E(5,9) are the mid points of the sides AB and AC respectively, then what is the length of the side BC?

(a) 8 (b) 10

(c) 12 (d) 14

[NDA 2020]

124. If the foot of the perpendicular drawn from the point (0, k) to the line $3x - 4y - 5 = 0$ is (3,1), then what is the value of k ?

(a) 3 (b) 4

(c) 5 (d) 6

[NDA 2020]

125. What is the obtuse angle between the lines whose slopes are $2-\sqrt{3}$ and $2 + \sqrt{3}$?

(a) 105° (b) 120°

(c) 135° (d) 150°

[NDA 2020]

126. If $3x-4y-5 = 0$ and $3x-4y + 15 = 0$ are the equations of a pair of opposite sides of a square, then what is the area of the square?

(a) 4 sq units (b) 9 sq units

(c) 16 sq units (d) 25 sq units

[NDA 2020]

127. A parallelogram has three consecutive vertices $(-3, 4)$, $(0, -4)$ and $(5, 2)$. The forth vertex is:

(a) (2, 10) (b) (2, 9)

(c) (3, 9) (d) (4, 10)

[NDA (I) 2021]

128. If the lines $y + px = 1$ and $y - qx = 2$ are perpendicular, then which one of the following is correct?

(a) $pq + 1 = 0$ (b) $p + q = 1$

(c) $pq - 1 = 0$ (d) $p - q = 1$

[NDA (I) 2021]

129. If A, B and C are in AP, then the straight line $Ax + 2By + c = 0$ will always pass through a fixed point. The fixed point is

(a) (0, 0) (b) $(-1, 1)$

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

[NDA (I) 2021]

130. If the image of the point $(-4, 2)$ by a line mirror is $(4, -2)$, then what is the equation of the line mirror?

(a) $y = x$ (b) $y = 2x$

(c) $4y = x$ (d) $y = 4x$

[NDA (I) 2021]

131. Consider the following statements in respect of the points (p, q–3), (q + 3, q) and (6, 3):

1.The points lie on a straight line

2.The points always lie in the first quadrant only for any value of p and q.

Which of the above statements is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

[NDA (I) 2021]

132. What is the acute angle between the lines $x - 2 = 0$ and $\sqrt{3}x - y - 2 = 0$?

(a) 0° (b) 30°

(c) 45° (d) 60°

[NDA (I) 2021]

133. The point of intersection of diagonals of a square ABCD is at the origin and one of its vertices is at A(4,2). What is the equation of the diagonal BD?

(a) $2x + y = 0$ (b) $2x - y = 0$

(c) $x + 2y = 0$ (d) $x - 2y = 0$

[NDA (I) 2021]

Directions: Consider the following for the next two (02) items that follow:

The two vertices of an equilateral triangle are (0, 0) and (2, 2).

134. Consider the following statements:

1.The third vertex has at least one irrational coordinate

2.The area is irrational

Which of the above statements is/are correct?

(a) 1 only (b) 2 only

(c) Both 1 and 2 (d) Neither 1 nor 2

[NDA (II) 2021]

135. The difference of coordinates of the third vertex is:

(a) 0 (b) $\sqrt{3}$

(c) $2\sqrt{2}$ (d) $2\sqrt{3}$

[NDA (II) 2021]

Directions: Consider the following for the next two (02) items that follow:

The coordinates of three consecutive vertices of a parallelogram ABCD are A(1,3), B(–1,2) and C(3, 5)

136. What is the equation of the diagonal BD?

(a) $2x - 3y + 2 = 0$ (b) $3x - 2y + 5 = 0$

(c) $2x - 3y + 8 = 0$ (d) $3x - 2y - 5 = 0$

[NDA (II) 2021]

137. What is the area of the parallelogram?

(a) 1 square unit (b) $\frac{3}{2}$ square units

(c) 2 square units (d) $\frac{5}{2}$ square units

[NDA (II) 2021]

Directions: Consider the following for the next two (02) items that follow:

The equations of the sides AB, BC and CA of a triangle ABC are $x-2 = 0$, $y + 1 = 0$ and $x + 2y - 4 = 0$ respectively.

138. What is the equation of the altitude through B on AC?
(a) $x - 3y + 1 = 0$ (b) $x - 3y + 4 = 0$
(c) $2x - y + 4 = 0$ (d) $2x - y - 5 = 0$

[NDA (II) 2021]

139. What are the coordinates of circum-centre of the triangle?
(a) (4, 0) (b) (2, 1)
(c) (0, 2) (d) (2, –1)

[NDA (II) 2021]

140. If the points with coordinates (–5, 0), $(5p^2, 10p)$ and $(5q^2, 10q)$ are collinear, then what is the value of pq where $p \neq q$?
(a) –2 (b) –1
(c) 1 (d) 2

[NDA (I) 2022]

141. What is the equation of the straight line which passes through the point (1,–2) and cuts off equal intercepts from the axes?
(a) $x + y - 1 = 0$ (b) $x - y - 1 = 0$
(c) $x + y + 1 = 0$ (d) $x - y - 2 = 0$

[NDA (I) 2022]

142. A straight line passes through the point of intersection of $x + 2y + 2 = 0$ and $2x - 3y - 3 = 0$. It cuts equal intercepts in the fourth quadrant. What is the sum of the absolute values of the intercept?
(a) 2 (b) 3
(c) 4 (d) 6

[NDA (I) 2022]

143. Under which one of the following conditions are the lines $ax + by + c = 0$ and $bx + ay + c = 0$ parallel ($a \neq 0, b \neq 0$)?
(a) $a - b = 0$ only (b) $a + b = 0$ only
(c) $a^2 - b^2 = 0$ (d) $ab + 1 = 0$

[NDA (I) 2022]

144. What is the equation of the locus of the mid point of the line segment obtained by cutting the line $x + y = p$ (where p is a real number) by the coordinate axes?
(a) $x - y = 0$ (b) $x + y = 0$
(c) $x - y = p$ (d) $x + y = p$

[NDA (I) 2022]

145. If the point (x, y) is equidistant from the points (2a, 0) and (0, 3a) where $a > 0$, then which one of the following is correct?
(a) $2x - 3y = 0$ (b) $3x - 2y = 0$
(c) $4x - 6y + 5a = 0$ (d) $4x - 6y - 5a = 0$

[NDA (I) 2022]

146. Consider the following statements in respect of the line passing through origin and inclining at an angle of 75° with the positive direction of x-axis:
1.The line passes through the point $\left(1, \frac{1}{2-\sqrt{3}}\right)$.
2.The line entirely lies in first and third quadrants.
Which of the statements given above is/are correct?
(a) 1 only (b) 2 only
(c) Both 1 and 2 (d) Neither 1 nor 2

[NDA 2022 (II)]

147. If P(3,4) is the mid-point of a line segment between the axes, then what is the equation of the line?
(a) $3x + 4y - 25 = 0$ (b) $4x + 3y - 24 = 0$
(c) $4x - 3y = 0$ (d) $3x - 4y + 7 = 0$

[NDA 2022 (II)]

148. The base AB of an equilateral triangle ABC with side 8cm lies along the y-axis such that the mid point of AB is at the origin and B lies above the origin. What is the equation of line passing through (8, 0) and parallel to the side AC?
(a) $x - \sqrt{3}y - 8 = 0$ (b) $x + \sqrt{3}y - 8 = 0$
(c) $\sqrt{3}x + y - 8\sqrt{3} = 0$ (d) $\sqrt{3}x - y - 8\sqrt{3} = 0$

[NDA 2022 (II)]

Consider the following for the next two (02) items that follow:
A quadrilateral is formed by the lines $x = 0$, $y = 0$, $x + y = 1$ and $6x + y = 3$.

149. What is the equation of diagonal through origin?
(a) $3x + y = 0$ (b) $2x + 3y = 0$
(c) $3x - 2y = 0$ (d) $3x + 2y = 0$

[NDA – 2023 (1)]

150. What is the equation of other diagonal?
(a) $x + 2y - 1 = 0$ (b) $x - 2y - 1 = 0$
(c) $2x + y + 1 = 0$ (d) $2x + y - 1 = 0$

[NDA – 2023 (1)]

151. The points (–a, –b), (0, 0), (a, b) and (a^2, ab) are:
(a) lying on the same circle
(b) vertices of a square
(c) vertices of a parallelogram that is not a square
(d) collinear

[NDA-2023 (2)]

152. Given that $16p^2 + 49q^2 - 4r^2 - 56pq = 0$. Which one of the following is a point on a pair of straight lines $(px + qy + r)(px + qy - r) = 0$?
(a) $\left(2, \frac{7}{2}\right)$ (b) $\left(2, -\frac{7}{2}\right)$
(c) (4, -7) (d) (4, 7)

[NDA-2023 (2)]

153. For what values of k is the line $(k-3)x - (5-k^2)y + k^2 - 7k + 6 = 0$ parallel to the line $x + y = 1$
(a) –1, 1 (b) –1,2
(c) 1, –2 (d) 2, –2

[NDA-2023 (2)]

154. The line $x + y = 4$ cuts the line joining P(–1,1) and Q(5, 7) at R. What is PR:RQ equal to?
(a) 1:1 (b) 1:2
(c) 2:1 (d) 1:3

[NDA-2023 (2)]

155. What is the sum of the intercepts of the line whose perpendicular distance from origin is 4 units and the angle which the normal makes with positive direction of x-axis is 15°?
(a) 8 (b) $4\sqrt{6}$
(c) $8\sqrt{6}$ (d) 16

[NDA-2023 (2)]

156. The number of points represented by the equation $x = 5$ on the xy-plane is
(a) Zero (b) One
(c) Two (d) Infinitely many

[NDA-2024 (1)]

157. If a variable line passes through the pont of intersection of the lines $x + 2y - 1 = 0$ and $2x - y - 1 = 0$ and meets the coordinate axes in A and B, then what is the locus of the mid-point of AB?
(a) $3x + y = 10yx$ (b) $x + 3y = 10xy$
(c) $3x + y = 10$ (d) $x + 3y = 10$

[NDA-2024 (1)]

158. What is the equation to the straight line passing through the point $(-\sin\theta, \cos\theta)$ and perpendicular to the line $x\cos\theta + y\sin\theta = 9$?
(a) $x\sin\theta - y\cos\theta - 1 = 0$ (b) $x\sin\theta - y\cos\theta + 1 = 0$
(c) $x\sin\theta - y\cos\theta = 0$ (d) $x\cos\theta - y\sin\theta + 1 = 0$

[NDA-2024 (1)]

159. Two points P and Q lie on line $y = 2x + 3$. These two points P and Q are at a distance 2 units from another point R(1, 5). What are the coordinates of the points P and Q?

(a) $\left(1+\frac{2}{\sqrt{5}},5+\frac{4}{\sqrt{5}}\right),\left(1-\frac{2}{\sqrt{5}},5-\frac{4}{\sqrt{5}}\right)$

(b) $\left(3+\frac{2}{\sqrt{5}},5+\frac{4}{\sqrt{5}}\right),\left(-1-\frac{2}{\sqrt{5}},5-\frac{4}{\sqrt{5}}\right)$

(c) $\left(1-\frac{2}{\sqrt{5}},5+\frac{4}{\sqrt{5}}\right),\left(1+\frac{2}{\sqrt{5}},5-\frac{4}{\sqrt{5}}\right)$

(d) $\left(3-\frac{2}{\sqrt{5}},5+\frac{4}{\sqrt{5}}\right),\left(-1+\frac{2}{\sqrt{5}},5-\frac{4}{\sqrt{5}}\right)$

[NDA-2024 (1)]

160. If two sides of a square lie on the lines 2x + y – 3= 0 and 4x + 2y + 5 = 0, then what is the area of the square in squre units ?

(a) 6.05 (b) 6.15
(c) 6.25 (d) 6.35

[NDA-2024 (1)]

161. ABC is a triangle with A(3, 5). The mid-points of sides AB, AC are at (–1, 2), (6, 4), respectively. What are the coordinates of centroid of the triangle ABC?

(a) $\left(\frac{8}{3},\frac{11}{3}\right)$ (b) $\left(\frac{7}{3},\frac{7}{3}\right)$

(c) $\left(2,\frac{8}{3}\right)$ (d) $\left(\frac{8}{3},2\right)$

[NDA-2024 (1)]

162. ABC is an acute angled isosceles triangle. Two equal sides AB and AC lie on the lines 7x – y – 3= 0 and x + y – 5 = 0. If θ is one of the equal angles, then what is cotθ equal to?

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$

(c) $\frac{2}{3}$ (d) 2

[NDA-2024 (1)]

Direction: Consider the following for the **two items** given below

ABCD is an isosceles trapezium and AB is parallel to DC. Let A(2,3), B(4,3) C(5,1) be the vertices.

163. What are the coordinates of vertex D ?

(a) (2,1) (b) (1, 2)
(c) (1, 1) (d) (3,1)

[NDA-2024 (2)]

164. What is the point of intersection of the diagonals of the trapezium ?

(a) (3, 7/2) (b) (3, 7/3)
(c) (7/2, 2) (d) (5/2, 2)

[NDA-2024 (2)]

165. The diagonals of quadrilateral ABCD are along the lines x – 2y = 1 and 4x + 2y = 3. The quadrilateral ABCD may be a

(a) rectangle (b) cyclic quadrilateral
(c) parallelogram (d) rhombus

[NDA-2024 (2)]

166. If P(2,4) , Q(8,12), R(10,14) and S(x,y) are vertices of a parallelogram then what is (x + y) equal to ?

(a) 8 (b) 10
(c) 12 (d) 14

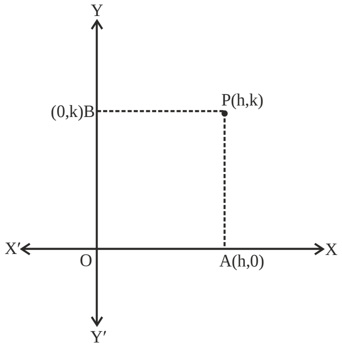
[NDA-2024 (2)]

ANSWER KEY

1.	a	**2.**	d	**3.**	d	**4.**	d	**5.**	c	**6.**	c	**7.**	c	**8.**	a	**9.**	a	**10.**	b
11.	a,b	**12.**	a	**13.**	d	**14.**	a	**15.**	a	**16.**	d	**17.**	b	**18.**	c	**19.**	b	**20.**	d
21.	a	**22**	a	**23.**	c	**24.**	d	**25.**	a	**26.**	a	**27.**	d	**28.**	b	**29.**	b	**30.**	a,b
31.	b	**32.**	b	**33.**	b	**34.**	b	**35.**	a	**36.**	d	**37.**	c	**38.**	b	**39.**	c	**40.**	a
41.	c	**42.**	a	**43.**	d	**44.**	b	**45.**	c	**46.**	d	**47.**	a	**48.**	d	**49.**	c	**50.**	c
51.	b	**52.**	c	**53.**	b	**54.**	a	**55.**	b	**56.**	d	**57.**	b	**58.**	b	**59.**	d	**60.**	b
61.	a	**62.**	b	**63.**	c	**64.**	c	**65.**	c	**66.**	b	**67.**	a	**68.**	a	**69.**	b	**70.**	c
71.	a	**72.**	d	**73.**	d	**74.**	d	**75.**	b	**76.**	a	**77.**	a	**78.**	c	**79.**	a	**80.**	c
81.	d	**82.**	b	**83.**	d	**84.**	d	**85.**	d	**86.**	b	**87.**	a	**88.**	a	**89.**	a	**90.**	a
91.	d	**92.**	b	**93.**	a	**94.**	d	**95.**	b	**96.**	b	**97.**	d	**98.**	c	**99.**	b	**100.**	c
101.	c	**102.**	d	**103.**	b	**104.**	a	**105.**	d	**106.**	d	**107.**	a	**108.**	b	**109.**	c	**110.**	a
111.	a	**112.**	b	**113.**	c	**114.**	d	**115.**	a	**116.**	d	**117.**	d	**118.**	a	**119.**	c	**120.**	c
121.	c	**122.**	c	**123.**	b	**124.**	c	**125.**	b	**126.**	c	**127.**	a	**128.**	c	**129.**	d	**130.**	b
131.	a	**132.**	b	**133.**	d	**134.**	c	**135.**	d	**136.**	c	**137.**	c	**138.**	d	**139.**	a	**140.**	c
141.	c	**142.**	a	**143.**	c	**144.**	a	**145.**	c	**146.**	c	**147.**	b	**148.**	a	**149.**	c	**150.**	d
151.	d	**152.**	b	**153.**	b	**154.**	b	**155.**	c	**156.**	d	**157.**	b	**158.**	b	**159.**	a	**160.**	a
161.	b	**162.**	b	**163.**	c	**164.**	b	**165.**	d	**166.**	b								

Solutions

Sol.1. (a)
Since, P is the point which equidistant from coordinate axes.



Then, $(PA)^2 = (PB)^2$
$\Rightarrow (h-h)^2 + (k-0)^2 = (h-0)^2 + (k-k)^2$
$k^2 = h^2$, $h = \pm k$
$\Rightarrow h \pm k = 0$
Hence, the locus of point 'P' is $x \pm y = 0$

Sol.2. (d)
Given line, $mx + ny = 1$
Passes through the points (1,2) and (2,1), then
$m+2n = 1$ …(i)
and $2m + n = 1$ …(ii)
On solving Eqs. (i) and (ii), we get
$m + 2n = 1$
$4m + 2n = 2$

$-3m = -1$
$\Rightarrow m = 1/3$

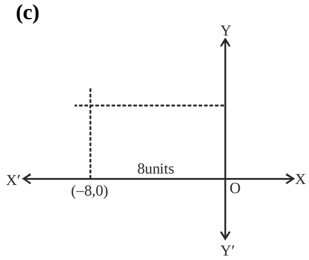
Sol.3. (d)
Let the given points are P(x, y), A (a, 0) and B(–a,0).
According to given condition
$(PA)^2 + (PB)^2 = 2b^2$
$\Rightarrow (x-a)^2 + y^2 = (x+a)^2 + y^2 = 2b^2$
$\Rightarrow 2x^2 + 2a^2 + 2y^2 = 2b^2$
$\Rightarrow x^2 + y^2 = b^2 - a^2$
$\therefore x^2 + a^2 = b^2 - y^2$

Sol.4. (d)
Given equation of lines are,
$4x + 3y = 12$ …(i)
and $3x + 4y = 12$ …(ii)
On solving Eqs. (i) and (ii), we get
$16x + 12y = 48$
$9x + 12y = 36$

$7x = 12$
$\Rightarrow x = 12/7$
From Eq. (i),
$3y = 12 - \frac{48}{7} = \frac{36}{7}$
$\Rightarrow y = 12/7$
Now, the equation of line passing through origin and $\left(\frac{12}{7}, \frac{12}{7}\right)$
$(y - 0) = \frac{12/7 - 0}{12/7 - 0}(x - 0)$
$\Rightarrow y = x$

Sol.5. (c)
The equation of line which is parallel to Y-axis and passes through the point (2,–3) is:
$(y-y_1) = m\,(x-x_1)$ ($\because m = \tan 90° = \infty$)
$(y + 3) = \infty\,(x-2)$
$\Rightarrow x = 2$

Sol.6. (c)



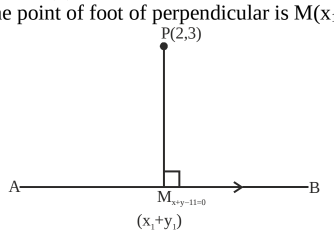
The locus of the point is
$\therefore x = -8$

Sol.7. (c)
The given three points are (a,0), (0,b) and (1,1). If three points are collinear.
Then, area of triangle = 0
$$\frac{1}{2}\begin{vmatrix} a & 0 & 1 \\ 0 & b & 1 \\ 1 & 1 & 1 \end{vmatrix} = 0$$
$\Rightarrow a(b-1) + (-b) = 0$
$\Rightarrow ab - a - b = 0 \Rightarrow a + b - ab = 0$

Sol.8. (a)
These lines are parallel because $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Sol.9. (a)
If two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel then, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
For the lines $x + 2y - 9 = 0$ and $kx + 4y + 5 = 0$
$\frac{1}{k} = \frac{2}{4} \neq \frac{9}{5}$
Taking first two parts, k = 2

Sol.10. (b)
Let the point of foot of perpendicular is $M(x_1, y_1)$



Now, PM ⊥AB
$\therefore$ Slope of line AB is $m_1 = -1$
and also of line MP is
$m_2 = \frac{y_1 - 3}{x_1 - 2}$
$\Rightarrow m_1m_2 = -1 \Rightarrow -1\left(\frac{y_1-3}{x_1-2}\right) - -1$
$\Rightarrow y_1 - 3 = x_1 - 2 \Rightarrow x_1 - y_1 + 1 = 0$…(i)
Since, the point M lies on the line AB, then
$x_1 + y_1 - 11 = 0$ …(ii)
On solving Eqs. (i) and Eq. (ii), we get
$2x_1 - 10 = 0 \Rightarrow x_1 = 5$ and $y_1 = 6$
So, the required point of perpendicular M is (5,6)

Sol.11. (a,b)
Let A (p,q) be the point on the X-axis which is equidistant from the point B(1,2) and C(2,3), then
$AB = AC \Rightarrow AB^2 = AC^2$
$\Rightarrow (p-1)^2 + (q-2)^2 = (P-2)^2 + (q-3)^2$
$\Rightarrow p^2 + 1 - 2p + q^2 + 4 - 4q = p^2 + 4 - 4p + q^2 + 9 - 6q$
$\Rightarrow 2p + 2q = 8$
$\Rightarrow p + q = 4$ …(i)
Since, the value of p = 4 and q = 0 satisfies the Eq. (i) and on the X-axis q must be zero, then (p,q) = (4,0)
a and b both options are correct.

Sol.12. (a)
The perpendicular distance of the point (x_1, y_1) to line $ax + by + c = 0$ is $p = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$
$$p = \left|\frac{0+0-1}{\sqrt{\frac{1}{a^2} + \frac{1}{b^2}}}\right| \Rightarrow \frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$$

Sol.13. (d)
equation of line parallel to x axis is y = c
equation of line 5 units below the x axis y = – 5

Sol.14. (a)
Since both equations of lines are same that means both lines are coincident to each other
$3 + 4y = 9$ …(i)
and $6x + 8y = 18$
$\Rightarrow 3x + 4y = 9$ …(ii)
Hence, the distance between two coincident line is zero.

Sol.15. (a)
Since, the line passes through the point (0,1) and making an angle with Y-axis which is equivalent to the slope of the line y=x–4.
i.e., $\theta = 45° \Rightarrow \tan\theta = 1 = m$
$\therefore$ Equation of line is $(y-1) = m\,(x-0) = 1\,(x)$
$\Rightarrow y = x + 1$

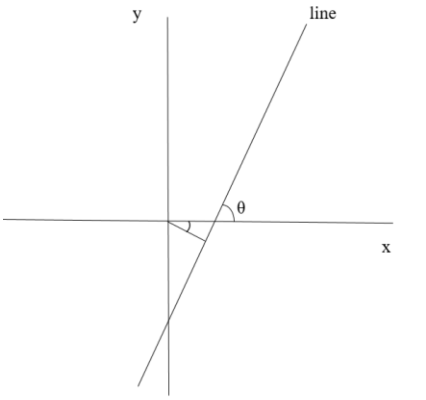
Sol.16. (d)
The perpendicular distance of the point (x_1, y_1) to line $ax + by + c = 0$ is $p = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$
So, the equation of x-axis y = 0
$\therefore p = \frac{|y|}{\sqrt{(1)^2}} = |y|$

Sol.17. (b)
A(–4, 2), B(0, –1), C(3,3)
by distance formulae
AB = 5, BC = 5, CA = $5\sqrt{2}$
so perimeter will be $10 + 5\sqrt{2}$

Sol.18. (c)
mid point of (a + b, a – b) and (–a, b) is $\left(\frac{b}{2}, \frac{a}{2}\right)$
that is lie on the line ax + by = k so
$a\left(\frac{b}{2}\right) + b\left(\frac{a}{2}\right) = k = ab$

Sol.19. (c)

slope of line $7x - 3y = 4$ is $7/3$ that is more than 1, so line will make angle more than 45° with x axis.



according to above diagram we can say that normal makes negative angle with x axis.

Sol.20. (d)

We know that, if the line making an angle θ with the positive direction of x-axis with y intercept.

Then, equation of the line is $y = mx + c = \tan\theta$. x + c

$\because \theta = 45°$ x + 101 unit

$\therefore y = \tan 45°\ x + 101 \Rightarrow y = 1.\ x + 101$

$\Rightarrow x - y + 101 = 0$

Sol.21. (a)

on y axis x = 0

$$0 = \frac{m(-4) + n(3)}{m + n}$$

$0 = -4m + 3n$

$4m = 3n$

$m:n = 3 : 4$

Sol.22. (a)

Given, $(2x+3y+4) + \lambda\,(6x-y+12) = 0$

$2x + 6\lambda x + 3y - \lambda y + 4 + 12\lambda = 0$

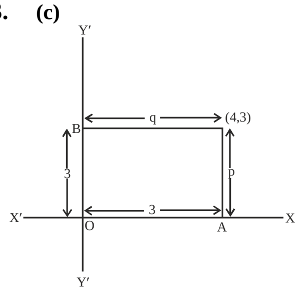
$2x(3\lambda+1) + y\,(3-\lambda) + 4 + 12\lambda = 0$

Since, line (i) is parallel to Y-axis

So, the coefficient of y must be zero

$\therefore 3 - \lambda = 0 \Rightarrow \lambda = 3$

Sol.23. (c)



by figure

$3q = 4p$

Sol.24. (d)

We know that, if two parallel lines $ax + by + c_1 = 0$ and $ax + by + c_2 = 0$, then the distance between them is $\left|\frac{c_2 - c_1}{\sqrt{a^2 + b^2}}\right|$

For lines, $3x + 4y - 9 = 0$ …(i)

and $9x + 12y + 28 = 0$

$$\Rightarrow 3x + 4y + \frac{28}{3} = 0 \qquad \text{…(ii)}$$

distance between them

$$= \left|\frac{\frac{28}{3} + 9}{\sqrt{9+16}}\right| = \left|\frac{55}{3} \times \frac{1}{5}\right| = \frac{11}{3} \text{ unit}$$

Sol.25. (a)

The points (5,1) (1–1) and (11,4) are collinear, if $x_1(y_1 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) = 0$

Here, $x_1 = 5, y_1 = 1, x_2 = 1, y_2 = -1, x_3 = 11, y_3 = 4$

From Eq. (i)

$5(-1-4) + 1(4-1) + 11(1+1) = 0$

$\Rightarrow 5(-5) + 1(3) + 22 = 0$

$-25 + 3 + 22 = 0 \Rightarrow 0 = 0$

Hence, points (5, 1), (1, –1) and (11,4) satisfy he given Eq. (i)

So, they are collinear.

Sol.26. (a)

Let A (1,0) and B (0, –2) are two given points and P(h, k) be any variable point.

According to the question,

PA = PB

$\Rightarrow PA^2 = PB^2$

$\Rightarrow (h-1)^2 + (k-0)^2 = (h-0)^2 + (k+2)^2$

$\Rightarrow h^2 + 1 - 2h + k^2 = h^2 + k^2 + 4 + 4k$

$\Rightarrow 4k + 2h + 3 = 0$

$\Rightarrow 2h + 4k + 3 = 0$

Hence, locus of point P (h, k) is $2x + 4y + 3 = 0$

Sol.27. (d)

Let the three points A(3,1), B(12,–2) and C(0,2) are collinear and the point P(h,k) are equivalent from these points A, B and C.

Now, $PA^2 = PB^2 = PC^2$

$\Rightarrow (1-3)^2 + (k-1)^2 = (h-12)^2 = (h-10)^2 + (k-2)^2$

$\Rightarrow h^2 + k^2 = 6h - 2k + 10$

$= h^2 + k^2 - 24h + 4k + 148 = h^2 + k^2 - 4k + 4$

Taking first and third, we get

$3h - k = -3$ …(i)

Taking second and third, we get

$3h - k = 18$ …(ii)

Since, Eqs. (i) and (ii) are two parallel lines.

Hence, the locus will be a null set.

Sol.28. (b)

distance of q(3,4) from origin is $\sqrt{3^2 + 4^2} = 5$, that is whole number.

Sol.29. (b)

If A(2,4), B(2,6), C(2 + √3, k) are vertices of an equilateral triangle than

AB = BC

$$\sqrt{(0)^2 + (2)^2} = \sqrt{(\sqrt{3})^2 + (k-6)^2}$$

$4 = 3 + k^2 - 12k + 36$

$k^2 - 12k + 35 = 0$

$k = 5, 7$

Sol.30. (a,b)

The equation of line in intercept form is

$$\frac{x}{a} + \frac{y}{b} = 1 \qquad \text{…(i)}$$

Where a and b are length of intercepts of the line with X and Y-axis, respectively.

Now, by given condition

Sum of x and y intercepts = 4

$\Rightarrow a + b = 14$ …(ii)

Since, the line (i) passes through the point (3, 4), then

$$\frac{3}{a} + \frac{4}{b} = 1$$

$$\Rightarrow \frac{3}{a} + \frac{4}{(14-a)} = 1$$

[from Eq. (ii)]

$\Rightarrow 3(14-a) + 4a = a\,(14-a)$

$\Rightarrow 42 - 3a + 4a = 14a - a^2$

$\Rightarrow a^2 - 13a + 42 = 0$

$\Rightarrow a^2 - 6a - 7a + 42 = 0 \Rightarrow a(a-6) - 7\,(a-6) = 0$

$\Rightarrow (a-6)\,(a-7) = 0 \Rightarrow a = 6, 7$

$\therefore b = 8, 7$

Hence, required equation of straight line.

$\frac{x}{6} + \frac{y}{8} = 1$ [when, a = 6 and b = 8]

$\Rightarrow 8x + 6y - 48 = 0$

$\Rightarrow 4x + 3y - 24 = 0$

and $\frac{x}{7} + \frac{y}{7} = 1$

(when, a = b = 7)

$\Rightarrow x + y = 7$

a and b both are correct.

Sol.31. (b)

A line which passes through the points (5,0) and (0,3) is

$$(y-0) = \frac{3-0}{0-5}(x-5)$$

$\Rightarrow -5y = 3x - 15$

$\Rightarrow 3x + 5y - 15 = 0$ …(i)

Now, length of the perpendicular from the point (4, 4) on the line (i) is

$$= \frac{|(4) + 5(4) - 15|}{\sqrt{(3)^2 + (5)^2}} = \frac{|12 + 20 - 15|}{\sqrt{9+25}} = \frac{17}{\sqrt{34}} = \sqrt{\frac{17}{2}}$$

Sol.32. (b)

Given equation of line,

$\sqrt{3}x - y - 1 = 0$

On comparing with $y = mx + c$, we get $m = \sqrt{3}$

$(\because m = \tan\theta)$

$\Rightarrow \tan\theta = \sqrt{3} = \tan 60° \Rightarrow \theta = 60°$

So, the inclination of the given line is 60°.

Sol.33. (b)

Given equation of straight lines,

$2x - y - 2 = 0$ …(i)

and $-4x + 2y - 6 = 0$ …(ii)

On comparing with $ax + by + c = 0$, we get

$a_1 = 2, b_1 = -1$ and $c_1 = -2$

and $a_2 = -4, b_2 = 2$ and $c_2 = -6$

Now, $\frac{a_1}{a_2} = \frac{-1}{2}, \frac{b_1}{b_2} = \frac{-1}{2}$ and $\frac{c_1}{c_2} = \frac{1}{3}$

Since, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Hence, both straight lines are parallel i.e., they never cross each other.

Sol.34. (b)

a point P whose abscissa = ordinate is P(h,h)

A(–1, 0) and B(0, 5)

given that PA = PB

$$\sqrt{(h+1)^2 + (h)^2} = \sqrt{(h)^2 + (h-5)^2}$$

$2h + 1 = -10h + 25$

$h = 2$

so point is (2,2)

Sol.35. (a)

Area of triangle with vertices (3,0), (0,4), (3,4) is

$$\frac{1}{2}\begin{vmatrix} 3 & 0 & 1 \\ 0 & 4 & 1 \\ 3 & 4 & 1 \end{vmatrix} = 6$$

Sol.36. (d)

Given equation of lines is

$x + y = 1 \Rightarrow y = -x + 1$ …(i)

and x−y = 1 ⇒ y = − 1 …(ii)

∴ Slope of line (i) is $m_1 = -1$

and Slope of line (ii) is $m_2 = 1$

∵ $m_1 : m_2 = (-1)(1) = -1$

Thus, the angle between both lines is $\pi/2$.

Sol.37. (c)

Equation of straight line which passes through the points (5, −2) and (−4, 7) is:

$(y-y_1) = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$

$\Rightarrow (y + 2) = \frac{7+2}{-4-5}(x-5)$

$\Rightarrow y + 2 = \frac{9}{-9}(x-5) \Rightarrow y + 2 = -x + 5$

∴ x + y = 3

Sol.38. (b)

We know that, the equation of straight line in intercept from is

$\frac{x}{a} + \frac{y}{b} = 1$ …(i)

By given condition, $a = \frac{1}{m}$ and $b = \frac{1}{n}$

On putting the values of a + b in Eq. (i) we get

$\frac{x}{(1/m)} + \frac{y}{(1/n)} = 1$

⇒mx + ny = 1

Which is the required equation of straight line.

Sol.39. (c)

A point which is equidistant from the axes means a line which is equally inclined with the axes and passes through the origin.

i.e., m = 45° and 135°

∴ Required equation is

y = tan 45° x and y = tan 135° x

y = x and y = − x

So, the combined equation is y = ± x.

Sol.40. (a)

Let the coordinates of point P is (h,k)

Now, by given condition,

Distance between (h, k) and (1,2)

Distance between (h, k) and (−2,3)

$\Rightarrow \sqrt{(h-1)^2 + (k-2)^2} = \sqrt{(h+2)^2 + (k-3)^2}$

$\Rightarrow h^2 + 1 - 2h + k^2 + 4 - 4k = h^2 + 4 + 4h + k^2 + 9 - 6k$

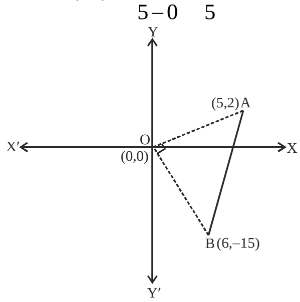
⇒ −2h − 4k + 5 = 4h − 6k + 13

⇒6h − 2k + 8 = 0 ⇒ 3h − k + 4 = 0

So, the locus of P is 3x − y + 4 = 0, which represent a straight line.

Sol.41. (c)

∵ Slope of OA $(m_1) = \frac{2-0}{5-0} = \frac{2}{5}$



and slope of OB$(m_2) = \frac{2}{5} \times \frac{-5}{2} = -1$

i.e., angle between OA and OB is $\pi/2$.

Hence, the line segment AB subtend right angle at origin O.

Sol.42. (a)

Since, the required line is perpendicular to the line 3x + 4y + 5 = 0

So, the slope of required line is: $\left[\frac{1}{(-3/4)}\right] = \frac{4}{3}$

Also, required line passing through the point (4, −5).

Then, its equation

$(y + 5) = \frac{4}{3}(x-4)$

⇒3y +15 = 4x − 16 ⇒ 4x − 3y = 31

Sol.43. (d)

Perpendicular distance of the line 3x + 4y −1 = 0 from the point (1,1) = perpendicular distance of the line 4x + 3y + 2k = 0 from the point (1,1)

$\Rightarrow \frac{|3\times1+4\times1-1|}{\sqrt{9+16}} = \frac{|4\times1+3\times1+2k|}{\sqrt{16+9}}$

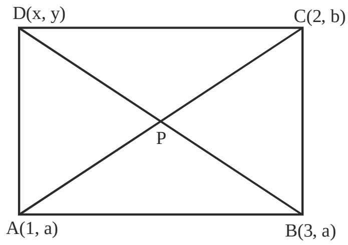
$\Rightarrow \frac{|3+4-1|}{5} = \frac{|4+3-2k|}{5}$

⇒6 = 7 + 2k ⇒ 2k = − 1

∴ k = −1/2

Sol.44. (b)

We know that, in parallelogram, diagonals bisect each other.



∴ mid-point of BD = mid-point of AC

$\Rightarrow \left(\frac{x+3}{2} + \frac{y+a}{2}\right) = \left(\frac{3}{2}, \frac{a+b}{2}\right)$

$\Rightarrow \frac{x+3}{2} = \frac{3}{2} \Rightarrow x = 0$

and $\frac{y+a}{2} = \frac{a+b}{2} \Rightarrow y = b$

So, the coordinates of point D is (0,b)

Sol.45. (c)

if 2x + 3y + a = 0 and 5x + ky + a = 0 are parallel than $\frac{2}{5} = \frac{3}{k}$ so k = 7.5

Sol.46. (d)

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

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

Sol.47. (a)

Let he required equation in intercept form

$\frac{x}{2} + \frac{y}{4} = 1$ …(i)

Given that, the straight line (i) makes equal intercepts on the coordinate axes.

∴ a = b

From Eq. (i),

$\frac{x}{a} + \frac{y}{a} = 1$

⇒x + y = a …(ii)

Also, the straight line passes through the point (4, 3).

∴ 4 + 3 = a

⇒a = 7

Now, put the value of a in Eq. (ii), we get

x + y = 7

Which is the required equation.

Sol.48. (d)

The given equation of lines are,

3x+4y + 12 = 0 …(i)

and 3x − 4y = 6

or 3x − 4y − 6 = 0 …(ii)

On comparing with ax + bx + c = 0, we get

$a_1 = a_2 = 3, b_1 = b_2 = -4$

and $c_1 = 12$, $c_2 = -6$

So, the equation of line mid way between the given lines is

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

Which is the required equation.

Sol.49. (c)

Given, equation of line

3x + y = 5

$\Rightarrow \frac{x}{\left(\frac{5}{3}\right)} + \frac{y}{(5)} = 1$ …(i)

Let S ≡ 3x + y − 5 = 0 …(ii)

I. At point (0,5)

$S_{(0,5)} \equiv 3(0) + 5 - 5$

=0 + 0 = 0

So, the point (0,5) lies on the given line.

and distance between (0,5) and (1,2)

$= \sqrt{(1-0)^2 + (2-5)^2}$

$\sqrt{1+9} = \sqrt{10}$

[∵by distance formula]

$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

II. At point (2, −1)

$S_{(2,-1)} \equiv 3(2) + (-1) - 5 = 6 - 1 = 6 - 6 = 0$

So, the point (2, −1) also lie on the given line and distance between (2,−1) and (1,2)

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

$= \sqrt{(-1)^2 + (3)^2} = \sqrt{1+9} = \sqrt{10}$

III. At point (3,−4)

$S_{(3,-4)} = 3(3) + (-4) - 5 = 9 - 4 - 5 = 9 - 9 = 0$

So, the point (3, −4) also lie on the given line and distance between (3, −4) and (1,2)

$= \sqrt{(1-3)^2 + (2+4)^2}$

$= \sqrt{(-2)^2 + (6)} = \sqrt{4+36} = \sqrt{40} = 2\sqrt{10}$

Hence, points (0,5) and (2, −1) lie on the line 3x + y = 5 and at a distance $\sqrt{10}$ from (1,2)

Sol.50. (b)

let a line cuts x axis at P(a, 0) and y axis at Q(0,b)

mid point of PQ is given (1,2)

so $= \left(\frac{a+0}{2}, \frac{0+b}{2}\right) = (1,2)$

so a = 2 and b = 4

equation of line passing through (2, 0) and (0, 4) is 2x + y − 4 = 0

Sol.51. (b)

We have, equation of line as

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

$\Rightarrow 3x - 3 = 2y - 4 \Rightarrow 3x - 2y + 1 = 0$
and equation of second line is $2x+3y = 5$
$\therefore$ slope of first line, $m_1 = 3/2$
and slope of second line, $m_2 = -2/3$
$\therefore m_1 m_2 = -1$
Hence, two lines are perpendicular to each other.

Sol.52. (c)
We have, A(3,4) and B(5,–2)
Let P(x,y)
Given that, PA = PB
$\Rightarrow PA^2 = PB^2$
$\Rightarrow (x-3)^2 + (y-4)^2 = (x-5)^2 + (y+2)^2$
$\Rightarrow x^2 - 6x + 9 + y^2 - 8y + 16$
$= x^2 - 10x + 25 + y^2 + 4y + 4$
$\Rightarrow 4x - 12y = 4$
$\Rightarrow x - 3y = 1 \qquad \dots(i)$
$\because$ Area of $\Delta PAB = 10$

$$\therefore \begin{vmatrix} x & y & 1 \\ 3 & 4 & 1 \\ 5 & -2 & 1 \end{vmatrix} = \pm 10$$

$\Rightarrow x(x+2) - y(3-5) + 1(-6-200) = \pm 20$
$\Rightarrow 6x + 2y - 26 = \pm 20$
Or $6x + 2y - 26 = -20$
$\Rightarrow 6x + 2y = 46 \qquad \dots(ii)$
Or $6x + 2y = 6 \qquad \dots(iii)$
On solving Eqs. (i) and (ii), we get
$x = 7$, $y = 2$
Similarly, solving Eqs. (i) and (iii), we get
$x = 1$, $y = 0$
Hence, coordinates of P are(7,2) or (1, 0)

Sol.53. (b)
We have, equation of line as
$Bx \cos\alpha + ay\sin\alpha = ab$
Perpendicular distance from point $\left(\sqrt{a^2-b^2}, 0\right)$ is

$$d_1 = \left|\frac{b\cos\alpha\sqrt{\alpha^2-b^2}+0-ab}{\sqrt{b^2\cos^2\alpha+a^2\sin^2\alpha}}\right|$$

$$\left(\because \text{distance from } (x_1, y_1) \text{ to } ax+by+c=0 \text{ is } - \left|\frac{ax_1+by_1+c}{\sqrt{a^2+b^2}}\right|\right)$$

Similarly, perpendicular distance from point.
$(-\sqrt{a^2-b^2}, 0)$ is $d_2 =$

$$\left|\frac{-b\cos\alpha\sqrt{a^2-b^2}+0-ab}{\sqrt{b^2\cos^2\alpha+a^2\sin^2\alpha}}\right|$$

Now, $d_1 \times d_2$

$$= \left|\frac{\left(b\cos\alpha\sqrt{a^2-b^2}-ab\right)\left(b\cos\alpha\sqrt{a^2-b^2}+ab\right)}{\left(\sqrt{b^2\cos^2\alpha+a^2\sin^2\alpha}\right)\left(\sqrt{b^2\cos^2\alpha+a^2\sin^2\alpha}\right)}\right|$$

$$= \frac{b^2\cos^2\alpha\left(a^2-b^2\right)-a^2b^2}{b^2\cos^2\alpha+a^2\sin^2\alpha}$$

$$= \frac{a^2b^2\cos^2\alpha-b^4\cos^2\alpha-a^2b^2}{b^2\cos^2\alpha+a^2\sin^2\alpha}$$

$$= \frac{a^2b^2\left(\cos^2\alpha-1\right)-b^4\cos^2\alpha}{b^2\cos^2\alpha+a^2\sin^2\alpha}$$

$$= \frac{-b^2\left[a^2\sin^2\alpha+b^4\cos^2\alpha\right]}{b^2\cos^2\alpha+a^2\sin^2\alpha}$$

$-b^2 = b^2$ (since, distance is positive)

Sol.54. (a)
Let P(x, y) is the Circum-centre of the ΔABC.
We know, $AP^2 = PB^2$
$\Rightarrow (x+2)^2 + (y-3)^2 = (x-2)^2 + (y-1)^2$
$\Rightarrow x^2 + 4 + 4x + y^2 + 9 - 6y = x^2 + 4 - 4x + y^2 + 1 - 2y$
$\Rightarrow 4x - 6y + 13 = 4 - 4x + 1 - 2y$
$\Rightarrow 8x - 4y + 2 = 0$
$\Rightarrow 2x - y + 2 = 0 \qquad \dots(i)$
Also, $AP^2 = PC^2$
$\Rightarrow (x + y)^2 + (y - 3)^2 = (x - 1)^2 + (y - 2)^2$
$\Rightarrow x^2 + 4 + 4x + y^2 + 9 - 6y = x^2 + 1 - 2x + y^2 + 4 - 4y$
$\Rightarrow 4x - 6y + 13 = -2x - 4y + 5$
$\Rightarrow 6x - 2y + 8 = 0$
$\Rightarrow 3x - y + 4 = 0 \qquad \dots(ii)$
On subtracting Eq. (ii) from Eq. (i), we get
$-x - 2 = 0$
$\Rightarrow x = -2$
$\therefore$ Hence, the required Circumcentre is (–2, –2).

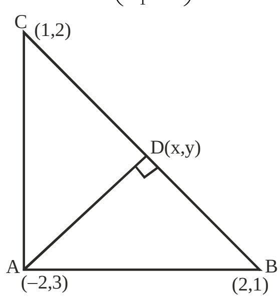
Sol.55. (b)
Given, vertices of a triangle are A(–2,3), B(2,1) and C(1,2)
Then, centroid of ΔABC

$$= \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$

Centroid of the ΔABC

$$= \left(\frac{-2+2+1}{3}, \frac{3+1+2}{3}\right) = \left(\frac{1}{3}, 2\right)$$

Sol.56. (d)
Let D be the foot of altitude from A in ΔABC and $D \equiv (x,y)$
Slope of BC $= \frac{1-2}{2-1} = -1$
$\therefore m = -1$
Also, slope of AD is $\left(\frac{x_1-3}{x_1+2}\right)$



But $\frac{y_1-3}{x_1+2} - 1 = -1 \; [\because AD \perp BC]$
$\Rightarrow y_1 - 3 = x_1 + 2 \Rightarrow -x_1 - x_1 = 5$
From the given points, only (–1,4) satisfies this equation.
Here, the required foot of altitude is (–1,4)

Sol.57. (b)
We have,
$6x+8y+15 = 0$ and $6x+8y+18 = 0$
$\therefore$ Perpendicular distance between them is
$\left|\frac{18-15}{\sqrt{26+64}}\right| = \frac{3}{10}$ unit

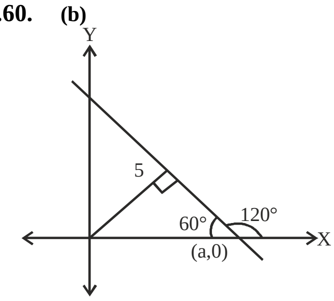
Sol.58. (b)
$y = 3 - 3x$ (given)
$\Rightarrow m = -3$
$\therefore$ Slope of the line perpendicular to the line
$Y = 3 - 3x$, is
$m' = \frac{-1}{-3} = \frac{1}{3}$
$\therefore$ required equation of the line is
$y - 2 = \frac{1}{3}(x - 2)$
$\Rightarrow 3y - 6 = x - 2 \Rightarrow 3y - x = 4$
$\Rightarrow \frac{x}{-4} + \frac{y}{\frac{4}{3}} = 1$
So, y intercept is 4/3

Sol.59. (d)
The point of intersection of $x = a$ and $y = 5$ is $(a,5)$

$$\therefore \text{Area of triangle} = \frac{1}{2}\begin{vmatrix} 5 & 2 & 1 \\ 3 & 4 & 1 \\ a & 5 & 1 \end{vmatrix} = 3$$

$\Rightarrow \frac{1}{2}[5(4-5) - 2(3-a) + 1(15-4a)] = 3$
$\Rightarrow 1/2\,[-5 - 2(3-a) + (15-4a)] = 3$
$\Rightarrow 1/2\,[-5 - 6 + 2a + 15 - 4a] = 3$
$\Rightarrow 2 - a = \pm 3$
$\Rightarrow a = 5$ or -1
$\therefore a = 5$
Hence, required value of a = 5.

Sol.60. (b)



Let the required line intercept x-axis at a.
Slope of the line is
$m = \tan 120° = -\sqrt{3}$
Also, $\sin 60° = \frac{5}{a} \Rightarrow \frac{\sqrt{3}}{2} = \frac{5}{a}$
$\therefore a = \frac{10}{\sqrt{3}}$
$\therefore$ Equation of line passing through (a,0) and having slope $-\sqrt{3}$ is
$y - y = m(x - x_1)$
$\Rightarrow y - 0 = -\sqrt{3}\left(x - \frac{10}{\sqrt{3}}\right)$
$\Rightarrow y = -\sqrt{3}x + 10$
$\Rightarrow \sqrt{3}.x + y = 10$

Sol.61. (a)
We have,
$\frac{x}{a} + \frac{y}{b} = 1 \qquad \dots(i)$
and $\frac{x}{b} + \frac{y}{a} = 1 \qquad \dots(ii)$
$\Rightarrow bx + ay = ab$ and $ax + by = ab$
$\therefore bx + ay = ax + by$
$\Rightarrow x(b - a) = y(b - a)$
$\Rightarrow \frac{x}{y} = 1$
$\Rightarrow x = y$
$\therefore$ Equation of the line is $x - y = 0$
Now, from Eq. (i), we get

$\therefore \frac{y}{a}+\frac{y}{b}=1 \Rightarrow y=\frac{ab}{a+b}$

and x = $\frac{ab}{a+b}$

$\therefore$ Equation of line joining origin (0,0) and point $\left(\frac{ab}{a+b},\frac{ab}{a+b}\right)$ is

$\Rightarrow$y – 0 = 1 (x – 0)

$\Rightarrow$y = x $\Rightarrow$x – y = 0

Sol.62. (b)

Three lines are 4x + 4y = 1, 8x – 3y = 2, y = 0

Now, $\begin{vmatrix} 4 & 4 & 1 \\ 8 & -3 & 2 \\ 0 & 0 & 0 \end{vmatrix}$ = 4(0) – 4(0) + (0) = 0

$\therefore$ The lines are concurrent.

Sol.63. (c)

The line 3x + 4y – 24 = 0

Or $\frac{x}{8}+\frac{y}{6}=1$

$\therefore$ A≡(8,0) and B≡(0,6)

We know that the Circum-centre of a right angled triangle is the mid-point of its hypotenuse.

$\therefore$ C≡$\left(\frac{8+0}{2},\frac{0+6}{2}\right)$

or C≡(4,3)

Sol.64. (c)

Let measurement of perpendicular from (–4,0) = p_1 and measurement of perpendicular from (4,0)=P_2

$\because$ length of the perpendicular is given as

P=$\left(\frac{ax_1+by_1+c}{\sqrt{a^2+b^2}}\right)$

$\therefore P_1 \times P_2 = \frac{3\times 4\cos\phi+5\times 0\sin\phi-15}{\sqrt{9\cos^2\phi+25\sin^2\phi}}$

$\times \frac{-4\times 3\cos\phi+5\times 0\sin\phi-15}{\sqrt{9\cos^2\phi+25\sin^2\phi}}$

$= \frac{-(12\cos\phi-15)(12\cos\phi+15)}{\left(\sqrt{9\cos^2\phi+25\sin^2\phi}\right)^2}$

$= \frac{-9[4\cos\phi-5][4\cos\phi+5]}{\left(\sqrt{9\cos^2\phi+25-25\cos^2\phi}\right)^2}$

$= \frac{-9[16\cos^2\phi-25]}{\left(\sqrt{25-16\cos^2\phi}\right)^2} = \frac{+9[25-16\cos^2\phi]}{(25-16\cos^2\phi)^2} = 9$

Sol.65. (c)

The equation of the line PQ passing through the point (3,2) perpendicular to the given line.

2y–x–3 = 0 is

2(x–3) + (y–2) = 0

2x – 6 + y – 2 = 0

2x + y – 8 = 0

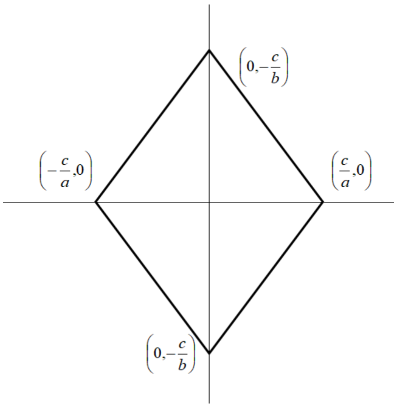
Sol.66.

ax + by + c = 0, ax – by + c = 0, ax + by – c = 0 and ax – by – c = 0

line 1 and line 3 are parallel to each other

line 2 and line 4 are also parallel.

and distance between parallel lines are equal so quadrilateral is a rhombus.



area of rhombus is half of products of diagonals.

area = $\frac{1}{2}\left(\frac{2c}{a}\right)\left(\frac{2c}{b}\right)=\frac{2c^2}{ab}$

Sol.67.

line perpendicular to 5x – y = 0 is x + 5y + k = 0 this line cuts the x axis at A(–

Sol.68. (a)

y = 3x …(i)

y = 6x …(ii)

y = 9 …(iii)

On solving equation (i) and (ii)

3x = 6x

–3x = 0 $\Rightarrow$ x = 0

$\Rightarrow$y = 0 $\therefore$ A ≡(0,0)

On solving equations (ii) and (iii)

6x = 9 $\Rightarrow$ x = $\frac{3}{2}$

$\Rightarrow$y=9 $\therefore$ B≡(3,9)

Now, area of ΔABC

$=\frac{1}{2}\left[x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right]$

$=\frac{1}{2}\left[0(9-9)+\frac{3}{2}(9-0)+3(0-9)\right]$

$=\frac{1}{2}\left[\frac{27}{2}-27\right]=\frac{1}{2}\left[-\frac{27}{2}\right]=-\frac{27}{4}$

Area of Δ ABC = 27/4 square units.

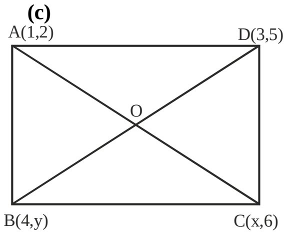
Sol.69. (b)

Centroid of ΔABC

$=\left(\frac{x_1+x_2+x_3}{3},\frac{y_1+y_2+y_3}{3}\right)$

$=\left(\frac{0\frac{3}{2}+3}{3},\frac{0+9+9}{3}\right)=\left(\frac{3}{2},9\right)$

Sol.70. (c)



Mid-point of diagonal AC =

$\left(\frac{1+x}{2},\frac{2+6}{2}\right)=\left(\frac{1+x}{2},4\right)$

Mid-point of diagonal BD =

$\left(\frac{4+3}{2},\frac{y+5}{2}\right)=\left(\frac{7}{2},\frac{y+5}{2}\right)$

Since, the diagonals of parallelogram intersect each other at mid points then we get

$\left(\frac{1+x}{2},4\right)=\left(\frac{7}{2},\frac{y+5}{2}\right)$

$\Rightarrow \frac{1+x}{2}=\frac{7}{2}$ and $\frac{y+5}{2}$ = 4

or x = 7 – 1 and y + 5 = 8

or x = 6 and y = 3

Now, C(x,6) = C (6,6)

B(4,y) = B(4,3)

$\therefore AC^2 - BD^2 = \left[\sqrt{(1-6)^2+(2-6)^2}\right]^2$

$-\left[\sqrt{(4-3)^2+(3-5)^2}\right]^2$

=(25+16)–(1+4)

=25 + 16 – 5 = 36

Sol.71. (a)

Intersection point of diagonals

= O$\left(\frac{7}{2},4\right)$

Sol.72. (d)

Area of ΔABCD = Area of Δ ABC + Area of Δ ACD = $\frac{7}{2}+\frac{7}{2}$ =7 sq. units

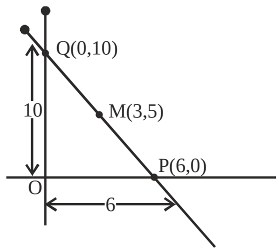
Sol.73. (d)

Mid-point of PQ = M(3,5)

Let P(a,0) and Q(0,b)

Then $\left(\frac{a+0}{2},\frac{0+b}{2}\right)$=(3,5)

$\left(\frac{a}{2},\frac{b}{2}\right)$=(3,5)



On comparing both sides

$\frac{a}{2}=3$

$\Rightarrow$a = 6

$\frac{b}{2}=5$

$\Rightarrow$b = 10

We get P(6,0) and Q(0,10)

$\Rightarrow$OP = 6 and OQ = 10

Now,

Area of ΔOPQ

$=\frac{1}{2}\times OP\times OQ=\frac{1}{2}\times 6\times 10$ =30square units.

Sol.74. (d)

The given lines are

x + y + 1 = 0 …(i)

3x + 2y + 1 = 0 …(ii)

On solving the above equations of line we get the intersection points of the lines i.e.,

(1,–2) = (a,b)

Here a = 1, b = –2

Now, the equation of the line parallel to x-axis, passing through the point (a, b) is

y = b $\Rightarrow$ y = – 2 $\Rightarrow$ y + 2 = 0

Sol.75. (b)

Equation of line parallel to y-axis and passing through the point (a,b) is:

x = a

$\Rightarrow$x=1 $\Rightarrow$ x − 1 = 0

Sol.76. (a)

The mid point

$\left(\frac{10+k}{2},\frac{-6+4}{2}\right)$=(a, 2b)

$\left(\frac{10+k}{2},-1\right)$=(a,2b)

a = $\frac{10+k}{2}$ and 2b = − 1 …(i)

Since a − 2b = 7

Or $\frac{10+k}{2}-(-1)=7$ [from (i)]

Or $\frac{10+k}{2}=7-1$

Or 10 + k = 12

k = 2

Sol.77. (a)

y− $\sqrt{3}x-5=0$

$\Rightarrow$y = $\sqrt{3}x+5$

$\Rightarrow m_1=\sqrt{3}$

$\sqrt{3}y-x+6=0$

$\Rightarrow$y= $\frac{x}{\sqrt{3}}+\frac{6}{\sqrt{3}}$

$\Rightarrow m_2=\frac{1}{\sqrt{3}}$

So,tanθ= $\frac{m_1-m_2}{1+m_1m_2}=\frac{\sqrt{3}-\frac{1}{\sqrt{3}}}{1+\sqrt{3}.\frac{1}{\sqrt{3}}}=\frac{\frac{3-1}{\sqrt{3}}}{2}=\frac{2}{2\sqrt{3}}$

Or tanθ = $\frac{1}{\sqrt{3}}$ or tanθ = tan30°

Or θ =30°

Sol.78. (c)

Two given vertices are (0,0) and (3,√3).

Third vertex is

$\left(\frac{(x_1+x_2)\pm\sqrt{3}(y_1-y_2)}{2},\frac{(y_1+y_2)\pm\sqrt{3}(x_1-x_2)}{2}\right)$

$\left(\frac{(0+3)\pm\sqrt{3}(0-\sqrt{3})}{2},\frac{(0+\sqrt{3})\pm\sqrt{3}(0-3)}{2}\right)$

$\left(\frac{3\pm3}{2},\frac{\sqrt{3}\pm3\sqrt{3}}{2}\right)$

$(0,2\sqrt{3})$ and $(3,-\sqrt{3})$

Sol.79. (a)

Mid-point of (1,1) and (2,3) is $\left(\frac{3}{2},2\right)$

Slope of line joining the point A(1,1)& B(2,3) is 2

slope of line perpendicular to it will be −1/2

so equation of right bisector is

y −2 =(−1/2) (x−3/2)

4y − 8 = −2x + 3

2x + 4y −11 = 0

Sol.80. (c)

for x + y = 2

if (a,a) lie towards origin then

a + a < 2

a < 1 ....(i)

for x + y = −2

a + a > −2

a > −1 ....(ii)

by (i) and (ii)

|a| < 1

Sol.81. (d)

line perpendicular to the line 3x + 4y = 10 will be of 4x −3y + k = 0 type

and intersection point of x + 2y = 5 and 3x + 7y = 17 is (1,2)

this point will satisfy equation of line

4(1) −3(2) + k = 0

k = 2

so 4x −3y + 2 = 0

Sol.82. (b)

$\left|\frac{8a+6b+1}{\sqrt{8^2+6^2}}\right|=1$

$\frac{8a+6b+1}{10}=\pm1$

8a + 6b −9 = 0 and 8a + 6b +11 = 0

Sol.83. (d)

line cuts intercept of 2 units on x axis it means line passing through A(2,0) and passing through B(−3, 5) so equation of line AB is

$y-0=\frac{5-0}{-3-2}(x-2)$

x + y − 2 = 0 ………(i)

line perpendicular to above line is

x − y + k = 0

passing through (3,3) so 3 − 3 + k = 0

k = 0

equation of perpendicular line is

x − y = 0 ……(ii)

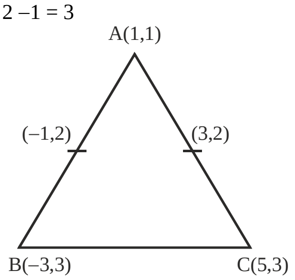
by solving (i) and (ii) intersection point is (1,1)

Sol.84. (d)

Co-ordinates of B are

X=(−1) × 2 − 1 = − 3

Y= 2 × 2 −1 = 3



Similarly co-ordinates of C are

x = 5 and y = 3

$\therefore$Centroid of ΔABC =

$\left(\frac{1+(-3)+5}{3},\frac{1+3+3}{3}\right)=\left(1,\frac{7}{3}\right)$

Sol.85. (d)

In ΔABC,

a = BC = $\sqrt{(2-0)^2\,(0-0)^2}=2$

b = CA = $\sqrt{(2-1)^2+(0-\sqrt{3})^2}=3$

c = AB = $\sqrt{(1-0)^2+(\sqrt{3}-0)^2}=2$

$\therefore$Co-ordinates of in centre of ΔABC are

$=\left(\frac{ax_1+bx_2+cx_3}{a+b+c},\frac{ay_1+by_2+cy_3}{a+b+c}\right)$

=

$\left(\frac{2\times1+0+2\times2}{2+2+2},\frac{2\times\sqrt{3}+0+0}{2+2+2}\right)=\left(\frac{6}{6},\frac{2\sqrt{3}}{6}\right)=\left(1,\frac{1}{\sqrt{3}}\right)$

Alternate method: Clearly, ΔABC is an equilateral triangle.

$\therefore$The coordinates of its in centre and centroid are same.

$\Rightarrow$Required co-ordinates are

$=\left(\frac{1+0+2}{3},\frac{\sqrt{3}+0+0}{3}\right)=\left(1,\frac{1}{\sqrt{3}}\right)$

Sol.86. (b)

Let the required ratio be m:1, then co-ordinates of C are:

$\frac{2m+(-2)}{m+1}=\frac{-2}{7}$

$\Rightarrow$7m−7= −m −1

$\Rightarrow$m =3/4

Sol.87. (a)

Education of the straight line that is parallel to 2x+3y + 1 = 0 is given as

2x + 3y + c = 0 …(i)

$\Rightarrow$c = − 4

Putting this value in equation (i), we get 2x + 3y − 4 = 0.

Sol.88. (a)

Equations of the lines are:

y= $-\frac{\sqrt{2}}{\sqrt{3}}x+\frac{1}{\sqrt{3}}\Rightarrow m_1=-\frac{\sqrt{2}}{\sqrt{3}}$

and y = $-\frac{\sqrt{3}}{\sqrt{2}}x+\frac{2}{\sqrt{2}}\Rightarrow m_2=-\frac{\sqrt{3}}{\sqrt{2}}$

$\therefore$Angle between them (θ) = $\tan^{-1}\left|\frac{m_1-m_2}{1+m_1+m_2}\right|$

$=\tan^{-1}\left|\frac{-\frac{\sqrt{2}}{\sqrt{3}}+\frac{\sqrt{3}}{\sqrt{2}}}{1+\left(-\frac{\sqrt{2}}{\sqrt{3}}\right)\left(-\frac{\sqrt{3}}{\sqrt{2}}\right)}\right|=\tan^{-1}\left(\frac{1}{2\sqrt{6}}\right)$

Sol.89. (a)

By the given condition,

$\frac{7+y+9}{3}=6\Rightarrow y=2$

$\frac{x-6+10}{3}=3\Rightarrow x=5$

Sol.90. (a)

P(−2, −1), Q(1,0), R(4, 3) and S(x, y) are vertices of parallelogram than mid point of diagonal PR and QS will coincide

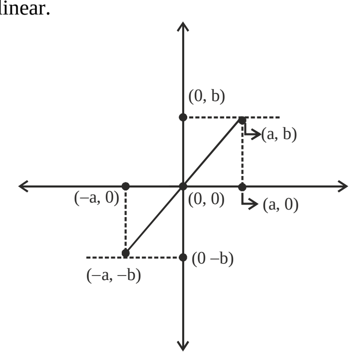
$\frac{-2+4}{2}=\frac{1+x}{2}\Rightarrow x=1$

and $\frac{-1+3}{2}=\frac{0+y}{2}\Rightarrow y=2$

froth vertex is (1,2)

Sol.91. (d)

From the figure (0,0), (a,b) and (−a, −b) are collinear.



Sol.92. (b)
Angle between lines x+y–3 = 0 and x–y+3=0 is

Tan $\alpha = \left|\frac{-1-(1)}{1+(-1)(1)}\right| = \left|\frac{-2}{0}\right| \Rightarrow \alpha = \frac{\pi}{2}$

Angle between lines $x - \sqrt{3}y + 2\sqrt{3} = 0$

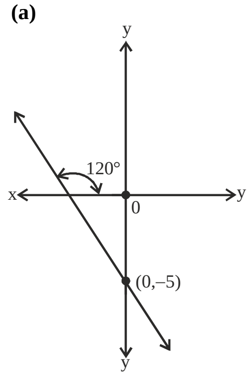
And $\sqrt{3}x - y + 1 = 0$ is

$\tan\beta$

$= \left|\frac{\frac{1}{\sqrt{3}} - \sqrt{3}}{1 + \frac{1}{\sqrt{3}} \times \sqrt{3}}\right| = \left|\frac{1-3}{\sqrt{3}(2)}\right| = \left|-\frac{1}{\sqrt{3}}\right| = \frac{1}{\sqrt{3}}$

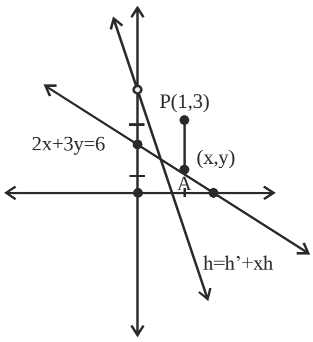
$\Rightarrow \beta = \frac{\pi}{6}$

Sol.93. (a)



The equation of the lines is:
$y = mx + c \Rightarrow y = (\tan 120°)\, x + (-5)$
$\Rightarrow y = -\sqrt{3}x - 5 \Rightarrow y + \sqrt{3}x + 5 = 0$

Sol.94. (d)
The equation of the line passing through P and A and parallel to line.



[4x+y=4 is given as
$y - y_1 = m(x - x_1)$
$\Rightarrow y - 3 = -4(x-1)$
$\{\because m = -4\}$
$\Rightarrow y - 3 = -4x + 4$
$\Rightarrow 4x + y = 7$ …(i)
Since 4x+y = 7 and 2x+3y = 6
Intersect at A
$\therefore$ Solving the above equation, we get A(x,y) = $\left(\frac{3}{2}, 1\right)$

$\therefore AP = \sqrt{\left(\frac{3}{2}-1\right)^2 + (1-3)^2} = \sqrt{\frac{1}{4}+4} = \frac{\sqrt{17}}{2}$ unit

Sol.95. (b)
2x – 3y + 7 = 0
7x + 4y + 2 = 0

Solving above equations, we get the point of intersection as $\left(-\frac{34}{29}, \frac{45}{29}\right)$

$\therefore$ The required equation of line that passes through (2,3) and $\left(-\frac{34}{29}, \frac{45}{29}\right)$ is given as:

$\left(y - \frac{45}{29}\right) = \frac{3 - \frac{45}{29}}{2 + \frac{34}{29}} \cdot \left(x + \frac{34}{29}\right)$

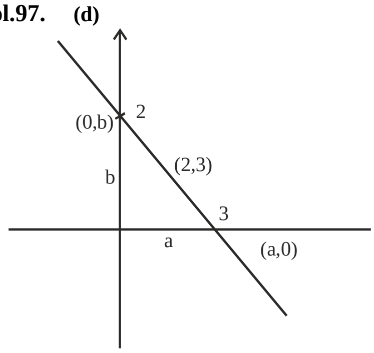
$\Rightarrow 29y - 45 = \frac{42}{92}(29x + 34)$

$\Rightarrow (29y - 45) \times 46 = 21(29x + 34)$
$\Rightarrow 21 \times 29x - 29 \times 46y + 21 \times 34 + 45 \times 46 = 0$
$\Rightarrow 21x - 46y + 96 = 0$

Sol.96. (b)

Distance = $\frac{\left|9 - \frac{15}{2}\right|}{5} = \frac{3}{10}$

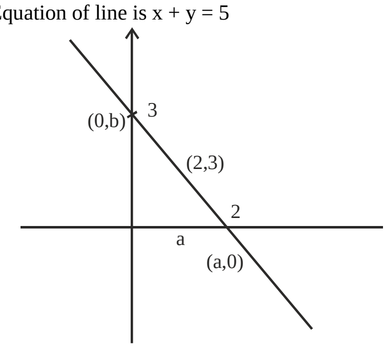
Sol.97. (d)



Now $\frac{2a}{5} = 2 \Rightarrow a = 5$

$\frac{3b}{5} = 3 \Rightarrow b = 5$

Equation of line is x + y = 5



$\frac{3a}{5} = 2 \Rightarrow a = \frac{10}{3}$

$\frac{2b}{5} = 3 \Rightarrow b = \frac{15}{2}$

Equation of line is

$\frac{3x}{10} + \frac{2y}{15} = 1$

$\Rightarrow 9x + 4y = 30$

Sol.98. (c)

Let $\left(\frac{5}{2}, 0\right)$ be a point on 2x + 11y = 5

Now, perpendicular from $\left(\frac{5}{2}, 0\right)$ to 24x + 7y = 20 is 8/5

Perpendicular from $\left(\frac{5}{2}, 0\right)$ to 4x – 3y = 2 is8/5

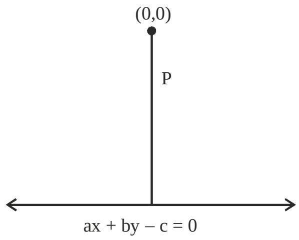
Sol.99. (b)

Equation of line is $\frac{x}{a} + \frac{y}{2a} = 1$

$\Rightarrow 2x + y = 2a$ …(i)
Putting (2,3), we get 2a = 7
$\therefore$ Equation of line is 2x + y = 7

Sol.100. (c)

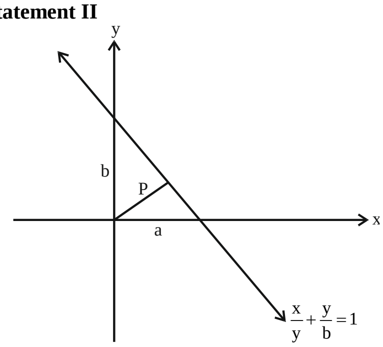
Statement I



$P = \frac{|-c|}{\sqrt{a^2+b^2}} \Rightarrow P^2 = \frac{c^2}{a^2+b^2}$

It is true

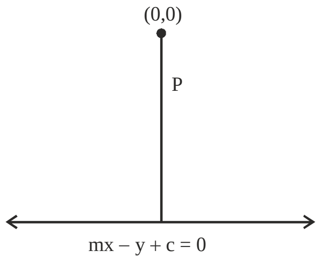
Statement II



$\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

It is true.

Statement III



$P = \frac{|-c|}{\sqrt{m^2+1}}$

$\Rightarrow P^2 = \frac{c^2}{m^2+1} \Rightarrow \frac{1}{p^2} = \frac{m^2+1}{c^2}$

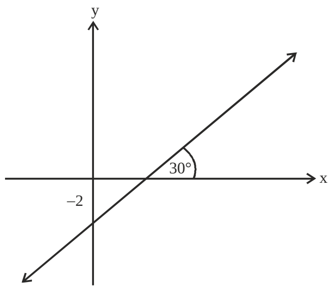
It is false

Sol.101. (c)
Equation of line is
$x + 2y - 3 + \lambda(2x - y + 5) = 0$
$\Rightarrow (1 + 2\lambda)x + (2 - \lambda)y + 5y - 3 = 0$

Now, $\frac{1+2\lambda}{\lambda - 2} = 1 \Rightarrow \lambda = -3$

$\therefore$ Equation is $-5x + 5y - 18 = 0$
$\Rightarrow 5x - 5y + 18 = 0$

Sol.102. (d)



Equation of line is

$y = \dfrac{1}{\sqrt{3}}x - 2$

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

$\Rightarrow x - \sqrt{3}y - 2\sqrt{3} = 0$

Sol.103. (b)
Slope S_1

$= \dfrac{mn+n^2}{m^2-mn}, \text{Slope}\, S_2 = \dfrac{mn-n^2}{mn+m^2}$

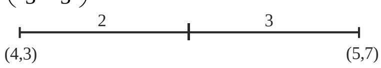
Angle = $\tan^{-1}\left(\dfrac{\dfrac{mn+n^2}{m^2-mn} - \dfrac{mn-n^2}{mn+m^2}}{1+\dfrac{mn+n^2}{m^2+mn}\times\dfrac{mn-n^2}{mn+m^2}}\right)$

After Solving

Angle = $\tan^{-1}\left(\dfrac{4m^2n^2}{m^4-n^4}\right)$

Sol.104. (a)

$\left(\dfrac{22}{5}, \dfrac{23}{5}\right)$



$\therefore$ PQ

$= \sqrt{\left(2-\dfrac{22}{5}\right)^2 + \left(5-\dfrac{23}{5}\right)^2} = \dfrac{12}{5}\sqrt{17}$

Sol.105. (d)
Area = 1/2

$\left|x_1\left(\dfrac{1}{x_2}-\dfrac{1}{x_3}\right)+x_2\left(\dfrac{1}{x_3}-\dfrac{1}{x_1}\right)+x_3\left(\dfrac{1}{x_1}-\dfrac{1}{x_2}\right)\right|$

$= \dfrac{1}{2}\left|\dfrac{x_1(x_3-x_2)}{x_2x_3}+\dfrac{x_2(x_1-x_3)}{x_1x_3}+\dfrac{x_3(x_2-x_1)}{x_1x_2}\right|$

$= \dfrac{1}{2}\left|\dfrac{-x_1^2(x_2-x_3)-x_2^2(x_3-x_1)-x_3^2(x_1-x_2)}{x_1x_2x_3}\right|$

$= \left|\dfrac{(x_1-x_2)(x_2-x_3)(x_3-x_1)}{2(x_1x_2x_3)}\right|$

Sol.106. (d)

$\cos\alpha = \dfrac{mr+ns}{\sqrt{m^2+n^2}\sqrt{r^2+s^2}}$

Statement I is false, statement II is true.

Sol.107. (a)

Point of intersection $\left(\dfrac{6}{5}, \dfrac{6}{5}\right)$

Let equation of line be 4x + 5y + k = 0

Putting $\left(\dfrac{6}{5}, \dfrac{6}{5}\right)$, k = $-\dfrac{54}{5}$

$\therefore$ Equation of line is 20x + 25y – 54 = 0

Sol.108. (b)
Using distance between two parallel lines formula.

Sol.109. (c)

$\tan^{-1}(\theta) = \tan^{-1}\left|\dfrac{lm'-l'm}{ll'+mm'}\right| \Rightarrow \theta = \left|\dfrac{l'm-l'm}{ll'+mm'}\right|$

Sol.110. (a)
$(x^2 - 2x + 1) + (4y^2 - 4y + 1) = 0$
$\Rightarrow (x-1)^2 + (2y-1)^2 = 0$
$\Rightarrow$ x = 1, y = 1/2
It is a point

Sol.111. (a)
First line x + y − 4 = 0 .....(i)
Second line 3x + y − 4 = 0 .....(ii)
third line x + 3y − 4 = 0 .....(iii)
Intersection point of (i) and (ii) is P(0,4)
Intersection point of (ii) and (iii) is Q(1,1)
Intersection point of (i) and (iii) is R(4,0)
Now by distance formula

$PQ = \sqrt{10}$, $QR = \sqrt{10}$, $PR = 4\sqrt{2}$

Triangle is isosceles.

Sol.112. (b)
Equation of line perpendicular to the line y = x is x + y + k = 0
this line passing through the point (3,2)
so 3 + 2 + k = 0 ⇒ k = − 5
required line is x + y = 5

Sol.113. (c)
if lines 3y + 4x = 1, y = x + 5, 5y + bx = 3 are concurrent then

$\begin{vmatrix} 4 & 3 & -1 \\ 1 & -1 & 5 \\ b & 5 & -3 \end{vmatrix} = 0$

4(3 − 25) − 3 (−3 − 5b) −1(5 + b) = 0
b = 6

Sol.114. (d)
Mid-point of given diagonal A(1,3) and B(5,1) is (3,2)
this mid-point is also mid-point of second diagonal.
so this point will satisfy the equation of second diagonal.
y = 2x + c
2 = 2(3) + c ⇒c = −4

Sol.115. (d)
Perpendicular distance of a point (x_1, y_1) from line ax + by + c = 0 is $\left|\dfrac{ax_1+by_1+c}{\sqrt{a^2+b^2}}\right|$

Sol.116. (d)
If x = 0 then y = k is a equation of line parallel to x axis.
If y = 0 then x = k is a equation of line parallel to y axis.
so ax + by + c = 0, represents a straight line only when at least one of a and b is non-zero.

Sol.117. (d)
Slope of line xcosα + ysinα = a is m_1
= − cotα
Slope of line xsinβ − ysinβ = a is m_2
= tanβ

$\tan\theta = \left|\dfrac{m_1-m_2}{1+m_1m_2}\right|$

$\tan\theta = \left|\dfrac{-\cot\alpha-\tan\beta}{1+(-\cot\alpha)\tan\beta}\right| = \left|\dfrac{-\dfrac{1}{\tan\alpha}-\tan\beta}{1+(-\dfrac{1}{\tan\alpha})\tan\beta}\right|$

$\tan\theta = \left|\dfrac{\tan\alpha\tan\beta+1}{\tan\alpha-\tan\beta}\right| = \left|\dfrac{1}{\tan(\alpha-\beta)}\right|$

$\tan\theta = \cot(\alpha-\beta) = \tan\left(\dfrac{\pi}{2}-(\alpha-\beta)\right)$

$\theta = \left(\dfrac{\pi}{2}-(\alpha-\beta)\right)$ or $\pi - \left(\dfrac{\pi}{2}-(\alpha-\beta)\right)$

$\theta = \left(\dfrac{\pi-2\alpha+2\beta}{2}\right)$ or $\left(\dfrac{\pi-2\beta+2\alpha}{2}\right)$

Sol.118. (a)
Distance formula

$= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$\sqrt{(m\cos2\beta-m\cos2\alpha)^2+(m\sin2\beta-m\sin2\alpha)^2}$

$= m\sqrt{(\cos2\beta-\cos2\alpha)^2+(\sin2\beta-\sin2\alpha)^2}$

$= m\sqrt{(2\sin(\alpha+\beta)\sin(\alpha-\beta))^2+(2\cos(\alpha+\beta)\sin(\alpha-\beta))^2}$

$= 2m\sin(\alpha-\beta)\sqrt{\sin^2(\alpha+\beta)+\cos^2(\alpha+\beta)}$

$= |2m\sin(\alpha-\beta)|$

Sol.119. (c)
Third vertex of equilateral triangle

$\left(\dfrac{(x_1+x_2)\pm\sqrt{3}(y_1-y_2)}{2}, \dfrac{(y_1+y_2)\pm\sqrt{3}(x_1-x_2)}{2}\right)$

$\left(\dfrac{(-1-\sqrt{3})\pm\sqrt{3}(-1-\sqrt{3})}{2}, \dfrac{(-1+\sqrt{3})\pm\sqrt{3}(-1+\sqrt{3})}{2}\right)$

by solving this third vertex is (1,1)

Sol.120. (c)
All diagonals of a square are perpendicular to each other given diagonal is 3x + 2y = 5
then other diagonal will be 2x − 3y = k,
it will pass through the point (1,−1) , because this vertex is not satisfying to the given first diagonal.
2(1) − 3(−1) = k
k = 5
equation of diagonal will be
2x − 3y = 5

Sol.121. (c)
x + 2 = 0 , and y + 2 = 0 lines are perpendicular.
so kx + y + 2 = 0 line is hypotenuse of right triangle,
and circum-centre is always lie on mid-point of hypotenuse so (-1,-1) will satisfy the equation of hypotenuse
k(–1) + (–1) + 2 = 0
k = 1

Sol.122. (c)
If A(a,b) , B(c,d) , C(a−c, b−d) collinear
then slope of AB = Slope of line BC

$\begin{vmatrix} a & b & 1 \\ c & d & 1 \\ a-c & b-d & 1 \end{vmatrix} = 0$

a(d − b + d) − b(c − a + c) + 1(cb − cd − ad + cd) = 0
ad − ab + ad – bc + ba − bc + cb − cd − ad + cd = 0
ad = bc

Sol.123. (b)
ΔABC and ΔADE are similar
so BC = 2 DE (D, E are mid points)

DE = $\sqrt{(5-2)^2+(9-5)^2}$ = 5 units

so BC = 10 units

Sol.124. (c)
slope of line 3x−4y−5 = 0 is 3/4

slope of Line joining the points A(0,k) and P(3,1) is $\frac{1-k}{3-0}$

both lines are perpendicular $m_1m_2 = -1$

$\frac{1-k}{3} \times \frac{3}{4} = -1$

k = 5

Sol.125. (b)

$m_1 = 2-\sqrt{3}$, $m_2 = 2+\sqrt{3}$

$\tan\theta = \left|\frac{(2-\sqrt{3})-(2+\sqrt{3})}{1+(2-\sqrt{3})(2+\sqrt{3})}\right|$

$\tan\theta = \sqrt{3}$

Acute angle is 60° then obtuse angle will be 120°

Sol.126. (c)

side of square = distance between parallel lines

= $\left|\frac{15+5}{\sqrt{3^2+4^2}}\right| = 4$ units

area of square = 16 sq units.

Sol.127. (a)

three consecutive vertices A(−3,4),B(0, −4) and C(5,2). and let D(x,y)

mid-point of diagonals AC and BD is same for parallelogram

−3 + 5 = 0 + x

x = 2

4 + 2 = −4 + y

y = 10

coordinates of D is (2,10)

Sol.128. (c)

slope of line y + px = 1 is − p

slope of line y −qx = 2 is q

both are perpendicular then m_1m_2

= −1(−p)(q) = −1

pq = 1

Sol.129. (d)

A , B and C are in AP the 2B = A + C

C = 2B − A

given line is Ax + 2By + C = 0

Ax + 2By + (2B − A) = 0

A(x−1) + 2B(y + 1) = 0

x−1 = 0

x = 1

and y + 1 = 0 then y = −1

Sol.130. (b)

mid-point of A(−4,2) and B(4, −2) is (0,0)

so line will pass through origin

slope of line AB is $\frac{-2-2}{4+4} = -\frac{1}{2}$

then slope of mirror line will be 2

Equation of mirror line will be y = 2x.

Sol.131. (a)

$$\begin{vmatrix} p & p-3 & 1 \\ q+3 & q & 1 \\ 6 & 3 & 1 \end{vmatrix}$$

$C_1 \leftrightarrow C_1 - C_2$

$$\begin{vmatrix} 3 & p-3 & 1 \\ 3 & q & 1 \\ 3 & 3 & 1 \end{vmatrix} = 0$$

So these points are collinear.

These points can lie in any quadrant, it depends upon values of p and q.

Sol.132. (b)

Line x – 2 = 0 is perpendicular to x axis

and line $\sqrt{3}x - y - 2 = 0$ makes 60° with x axis .so angle between lines will be 30°

Sol.133. (d)

A(4,2) and O(0,0) equation of AO

y = (2/4)(x)

x – 2y = 0

Sol.134. (c)

If two vertices are rational number then third vertex must be irrational number and area of equilateral triangle is $\frac{\sqrt{3}}{4}a^2$ i.e. irrational.

So both statements are correct.

Sol.135. (d)

Two given vertex (0, 0) and (2, 2)

Third vertex

$\left(\frac{x_1+x_2 \pm \sqrt{3}(y_1-y_2)}{2}\right), \left(\frac{y_1+y_2 \pm \sqrt{3}(x_1-x_2)}{2}\right)$

$\left(\frac{2 \pm \sqrt{3}(2)}{2}, \frac{2 \pm \sqrt{3}(2)}{2}\right)$

$(1 \pm \sqrt{3}, 1 \pm \sqrt{3})$

So coordinates are $(1+\sqrt{3},\ 1-\sqrt{3}$ and $(1-\sqrt{3}, 1+\sqrt{3})$

Difference = $(1+\sqrt{3}) - (1-\sqrt{3}) = 2\sqrt{3}$

Sol.136. (c)

A(1,3), B(–1,2), C(3,5), D(x,y)

–1 + x = 1 + 3

x = 5

2 + y = 3 + 5

y=6

coordinates of D (5, 6)

equation of BD

$y-2 = \frac{6-2}{5+1}(x+1)$

6y – 12 = 4x + 4

4x – 6y + 16 = 0

2x – 3y + 8 = 0

Sol.137. (c)

Area of parallelogram= 2 × area of Δ ABD

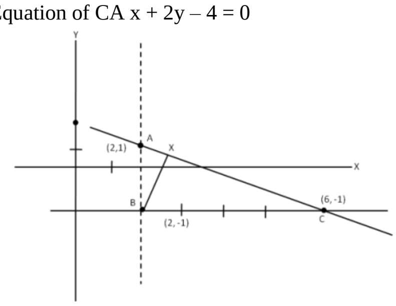
$= 2 \times \frac{1}{2}\begin{vmatrix} 1 & 3 & 1 \\ -1 & 2 & 1 \\ 5 & 6 & 1 \end{vmatrix}$ = 2 square units

Sol.138. (d)

Equation of AB x – 2 = 0

Equation of BC y + 1 = 0

Equation of CA x + 2y – 4 = 0



Sol.139. (a)

Circum-centre of mid-point of hypoteneous

$\left(\frac{2+6}{2}, \frac{1-1}{2}\right) \Rightarrow (4,0)$

Sol.140. (c)

(–5,0), $(5p^2, 10p)$, $(5q^2\ 10q)$

are collinear

$\frac{10p-0}{5p^2+5} = \frac{10q-0}{5q^2+5}$

$\frac{10p}{5(p^2+1)} = \frac{10q}{5(q^2+1)}$

$pq^2 + p = p^2q + q$

$pq^2 - p^2q + p - q = 0$

pq(q–p)–1(q–p)=20

(q–p) (pq–1)=0

p=q or pq = 1

But p ≠ q given

So, pq = 1

Sol.141. (c)

eq^n of line

$\frac{x}{a} + \frac{y}{a} = 1$

$\frac{1}{a} + \frac{-2}{a} = 1$

a= –1

⇒x + y + 1 = 0

Sol.142. (a)

x+2y + 2 = 0

2x – 3y – 3 = 0

By solving above equations

(0,–1) lie on both lines

line cuts equal intercept

$\frac{x}{a} + \frac{y}{a} = 1$

$\frac{0}{a} + \frac{-1}{a} = 1$

a = – 1

x + y + 1 = 0

x intercept =1 unit

y intercept = 1 unit

sum of absolute values = 2

Sol.143. (c)

ax + by + c = 0 is parallel to bx + ay + c = 0

$\Rightarrow \frac{a}{b} = \frac{b}{a}$

$a^2 = b^2$

$a^2 - b^2 = 0$

Sol.144. (a)

x +y = p

above line cuts the x axis at A(p, 0) and y axis at B(0,p)

let mid point of AB is (b,k)

$\Rightarrow \frac{p+0}{2} = h$

$\Rightarrow \frac{0+p}{2} = k$

⇒p = 2h = 2k

⇒ h=k

⇒x = y

Sol.145. (c)

P(x, y)

A(2a, θ)

B(0, 3a)

PA = PB

$\sqrt{(x-2a)^2 + y^2} = \sqrt{x^2 + (y-3a)^2}$

$x^2 + 4a^2 - 4ax + y^2$

$= x^2 + y^2 - 6ay + 9a^2$

$\Rightarrow 4ax - 6ay + 5a^2 = 0$

⇒4x – 6y + 5a = 0

Sol.146. (c)

equation of line passing through origin and angle with x axis 75° is

y = tan75°x

$y = (2+\sqrt{3})x$

point given in 1st statement satisfies above equation so statement 1 is correct.

line is passing through origin and its slope is positive so line is exists only in 1st and 3rd quadrant. both statements are correct.

Sol.147. (b)

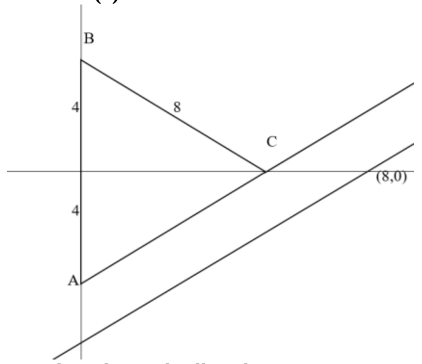
let line cuts x axis at A(a, 0) and y axis at B(0,b)

mid point of AB is (3, 4)

$\frac{a+0}{2} = 3 \Rightarrow a = 6$

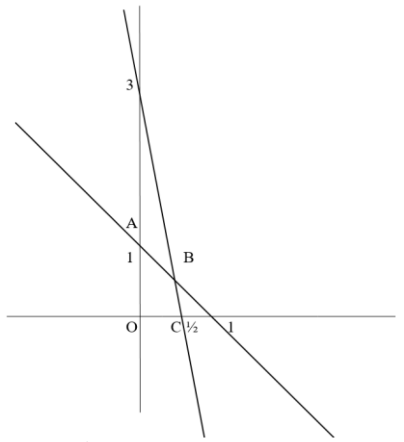
$\frac{0+b}{2}=4 \Rightarrow b=8$
so x intercept of line is 6 and y intercept is 8
equation is $\frac{x}{6}+\frac{y}{8}=1$ or 4x + 3y – 24 = 0

Sol.148. **(a)**



in equilateral triangle all angles are 60°
if angle BAC is 60° than line AC will make 30° angle with positive x axis
slope of line = tan30°
equation of parallel line
y – 0 = tan30°(x – 8)
$x-\sqrt{3}y-8=0$

Sol.149. **(c)**



equations of both lines x + y = 1 and 6x + y = 3, these two lines are intersecting at $B\left(\frac{2}{5},\frac{3}{5}\right)$
equation of line OB
$y-0=\frac{3/5}{2/5}(x-0)$
3x – 2y = 0

Sol.150. **(d)**
In above diagram equation of line AC by intercept form
$\frac{x}{1/2}+\frac{y}{1}=1$
2x + y – 1 = 0

Sol.151. **(d)**
Given A(–a, –b), B(0, 0), C(a,b), D(a^2,ab)
slope of AB = BC = CD = b/a so these points are collinear.
for finding slope use $m=\frac{y_2-y_1}{x_2-x_1}$

Sol.152. **(b)**
(px + qy + r)(px + qy – r)
$p^2x^2+q^2y^2+2pqxy-r^2=0$ ……..(i)
but given that $16p^2+49q^2-4r^2-56pq=0$
multiply (i) by 4
$4p^2x^2+4q^2y^2+8pqxy-4r^2=0$
now compare both equations
$4x^2=16$
x = 2 or – 2
$4y^2=49$
y = 7/2 or – 7/2
8xy = – 56
xy = –7
so x and y will be of opposite sign.
i.e. points are (2, – 7/2) and (–2, 7/2)

Sol.153. **(b)**
line $(k-3)x-(5-k^2)y+k^2-7k+6=0$ parallel to the line x + y = 1
so $\frac{k-3}{1}=\frac{-(5-k^2)}{1}$
$k-3=-(5-k^2)$
$k^2-k-2=0$
k = 2, –1

Sol.154. **(b)**
let R cuts the line PQ in ratio m : n then by section formula
$R\left(\frac{5m-n}{m+n},\frac{7m+n}{m+n}\right)$
this R point lie on line x + y = 4
$\frac{5m-n}{m+n}+\frac{7m+n}{m+n}=4$
$\Rightarrow 5m-n+7m+n=4m+4n$
$\Rightarrow 2m=n$, so m : n = 1 : 2

Sol.155. **(c)**
equation of line in Normal form is $x\cos\alpha+y\sin\alpha=p$
so line is $x\cos15+y\sin15=4$
intercept on x axis = $\frac{4}{\cos15}$
intercept on y axis = $\frac{4}{\sin15}$
sum of intercepts = $4\left(\frac{1}{\cos15}+\frac{1}{\sin15}\right)$
$=4\left(\frac{2\sqrt{2}}{\sqrt{3}+1}+\frac{2\sqrt{2}}{\sqrt{3}-1}\right)=8\sqrt{2}\left(\sqrt{3}\right)=8\sqrt{6}$

Sol.156. **(d)**
x = 5 is the equation of line parallel to y axis , and there are infinite points on a line.

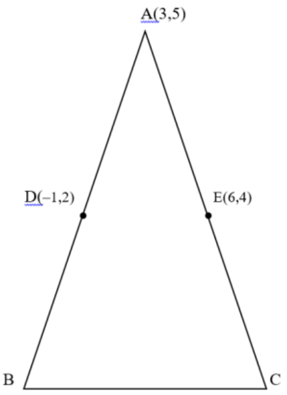
Sol.157. **(b)**
let A(a,0) and B(0,b) , mid point of AB is $\left(\frac{a}{2},\frac{b}{2}\right)$
, let locus of this mid point is (h,k)
i.e. $h=\frac{a}{2},k=\frac{b}{2}$
intersection point of x + 2y – 1 = 0 and 2x – y – 1 = 0, is $\left(\frac{3}{5},\frac{1}{5}\right)$
equation of line in intercept form is
$\frac{x}{a}+\frac{y}{b}=1$
line is passing through $\left(\frac{3}{5},\frac{1}{5}\right)$ and a = 2h , b = 2k
$\frac{3/5}{2h}+\frac{1/5}{2k}=1$
h + 3k = 10hk
so required locus is x + 3y = 10xy

Sol.158. **(b)**
line perpendicular to xcosθ + ysinθ = 9 will be xsinθ – ycosθ + k =0
line passing through the point (–sinθ, cosθ)
so given point will satisfy the equation
(–sinθ)sinθ – (cosθ)cosθ + k = 0
k = 1
equation of required line
xsinθ – ycosθ + 1 = 0

Sol.159. **(a)**
let 2 points P and Q on line y = 2x + 3 are (x_1, y_1) and (x_2, y_2)
or (x_1, $2x_1+3$) and (x_2, $2x_2+3$)
distance of P and Q from R(1,5) is 2
PR = $\sqrt{(x_1-1)^2+(2x_1-2)^2}=2$
$\sqrt{(x_1-1)^2+4(x_1-1)^2}=2$
$\sqrt{5(x_1-1)^2}=2$
$5(x_1-1)^2=4$
$(x_1-1)=\pm\frac{2}{\sqrt{5}}$
$x_1=1+\frac{2}{\sqrt{5}},x_2=1-\frac{2}{\sqrt{5}},$
than $y_1=5+\frac{4}{\sqrt{5}},y_2=5-\frac{4}{\sqrt{5}}$
both points are
$\left(1+\frac{2}{\sqrt{5}},5+\frac{4}{\sqrt{5}}\right),\left(1-\frac{2}{\sqrt{5}},5-\frac{4}{\sqrt{5}}\right)$

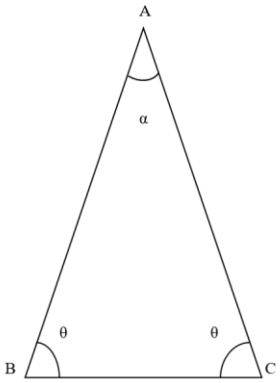
Sol.160. **(a)**
2x + y – 3 = 0 and 4x + 2y + 5 = 0 are parallel lines
4x + 2y – 6 = 0 ………(i)
4x + 2y + 5 = 0 ………(ii)
side of square = distance between above parallel lines = $\frac{5+6}{\sqrt{16+4}}=\frac{11}{\sqrt{20}}$
so area of square = $(\text{side})^2$ = 121/20 = 6.05

Sol.161. **(b)**



D is mid point of AB and E is mid point of AC so by mid point formulae coordinates of B = (–5, –1) and C (9,3)
centroid of ΔABC
$=\left(\frac{x_1+x_2+x_3}{3},\frac{y_1+y_2+y_3}{3}\right)$
$=\left(\frac{3-5+9}{3},\frac{5-1+3}{3}\right)$
$=\left(\frac{7}{3},\frac{7}{3}\right)$

Sol.162. **(b)**
equation of line AB is 7x – y – 3 = 0 , its slope $m_1=7$
equation of line BC is x + y – 5 = 0, its slope $m_2=-1$



angle between AB and AC is α than

$$\tan\alpha = \frac{7+1}{1+7(-1)} = \frac{4}{3}$$

and we know that $\alpha + \theta + \theta = 180°$

$2\theta = 180° - \alpha$

$\tan 2\theta = \tan(180° - \alpha) = -\tan\alpha$

$$\frac{2\tan\theta}{1-\tan^2\theta} = -\frac{4}{3}$$

$2\tan^2\theta + 3\tan\theta - 2 = 0$

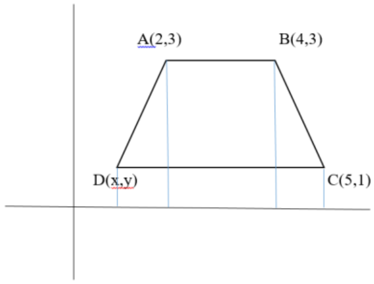
$2\tan^2\theta - 4\tan\theta + \tan\theta - 2 = 0$

$2\tan\theta(\tan\theta - 2) + 1(\tan\theta - 2) = 0$

$\tan\theta = -1/2$ and 2 , triangle is acute angle so $\tan\theta = 2$ than $\cot\theta = 1/2$

Sol.163. (c)

A(2, 3), B(4, 3), C(5, 1), D(x, y) are vertices of isosceles trapezium than by diagram



coordinates of D(1,1)

Sol.164. (a)

equation of diagonal AC

$$y-1 = \frac{2}{-3}(x-5)$$

$2x + 3y - 13 = 0$ ………(i)

equation of diagonal BD

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

$2x - 3y + 1 = 0$ ……..(ii)

by solving (i) and (ii) intersection point is (3, 7/2)

Sol.165. (d)

diagonals of quadrilateral ABCD are along the lines $x - 2y = 1$ and $4x + 2y = 3$.

slope of $x - 2y = 1$ is 1/2

slope of $4x + 2y = 3$ is -2

$m_1m_2 = -1$, so line are perpendicular.

if diagonals are perpendicular than quadrilateral will be rhombus.

Sol.166. (b)

P(2, 4), Q(8,12), R(10, 14) and S(x, y) are vertices of parallelogram than mid point of diagonal PR and QS will coincide

$$\frac{2+10}{2} = \frac{8+x}{2} \Rightarrow x = 4$$

and $\frac{4+14}{2} = \frac{12+y}{2} \Rightarrow y = 6$

$x + y = 10$