# DPP
DAILY PRACTICE PROBLEMS

**Class : XIth** | **Solutions** | **Subject : MATHS**
**Date :** | | **DPP No. :5**

## Topic :-STRAIGHT LINES

281 **(c)**
The given lines are
$4x + 3y - 11 = 0$ and $4x + 3y - \frac{15}{2} = 0$
$\therefore$ Required distance $= \frac{\left|-11 + \frac{15}{2}\right|}{\sqrt{4^2 + 3^2}} = \frac{7}{10}$

282 **(d)**
These lines cannot be the sides of a rectangle as none of these are parallel nor they are perpendicular.
Now, for concurrent $\begin{vmatrix} 1 & 2 & -3 \\ 3 & 4 & -7 \\ 2 & 3 & -4 \end{vmatrix}$
$= 1(-16 + 21) - 2(2) - 3(1)$
$\neq 0$
Hence, these are not concurrent.
Opposite side of the parallelogram are
$x^2 - 5x + 6 = 0$ and $y^2 - 6y + 5 = 0$
$\Rightarrow (x - 2)(x - 3) = 0$ and $(y - 1)(y - 5) = 0$
$\Rightarrow x - 2 = 0, x - 3 = 0$ and $y - 1 = 0, y - 5 = 0$
$\therefore$ Vertices are (3, 5), (2,5), (2,1) and (3,1)

283 **(b)**
The perpendicular distance of (1, 3) from the line $3x + 4y = 5$ is 2 units while,
$\sec^2\theta + 2\,\text{cosec}^2\theta \geq 3$ [as $\sec^2\theta, \text{cosec}^2\theta \geq 1$]
So, there will be two such points on the line

284 **(b)**
The equation of line passing through the point of intersection of
$\frac{x}{\alpha} + \frac{y}{\beta} = 1$ and $\frac{x}{\beta} + \frac{y}{\alpha} = 1$ is
$\left(\frac{x}{\alpha} + \frac{\lambda}{\beta} - 1\right) + \lambda\left(\frac{x}{\beta} + \frac{\lambda}{\alpha} - 1\right) = 0$
$\Rightarrow x\left(\frac{1}{\alpha} + \frac{\lambda}{\beta}\right) + \lambda\left(\frac{1}{\beta} + \frac{\lambda}{\alpha}\right) - \lambda - 1 = 0$

This meets the coordinate axes at $A\left(\frac{\lambda+1}{\frac{1}{\alpha}+\frac{\lambda}{\beta}}, 0\right)$ and $B\left(0, \frac{\lambda+1}{\frac{1}{\beta}+\frac{\lambda}{\alpha}}\right)$

Let $(h, k)$ be the mid point of $AB$. Then, $h = \frac{1}{2}\left(\frac{\lambda+1}{\frac{1}{\beta}+\frac{\lambda}{\alpha}}\right)$ and $k = \frac{1}{2}\left(\frac{\lambda+1}{\frac{1}{\beta}+\frac{\lambda}{\alpha}}\right)$

On eliminating $\lambda$ from these two equations, we get

$2hk(\alpha+\beta) = \alpha\beta(h+k)$

Hence, the locus of $(h, k)$ is $2xy(\alpha+\beta) = \alpha\beta(x+y)$

285 **(a)**

The coordinates of a point of intersection of given lines are (1, 1)

The equation of the perpendicular to the line $3x + 2y + 5 = 0$ is $2x - 3y + \lambda = 0$. It is also passes through (1, 1).

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

$\therefore$ Required equation of line is $2x - 3y + 1 = 0$

286 **(a)**

Let line be $x + 2y + \lambda = 0$

$\therefore\ \lambda = \frac{-5 \times 6 + 1 \times 9}{7} = -3 \quad \left(\lambda = \frac{mc_2 + nc_1}{m+n}\right)$

So, required line is $x + 2y - 3 = 0$

287 **(c)**

The equation of line perpendicular to line

$3x - y + 5 = 0$ is $x + 3y + \lambda = 0$ ...(i)

Also it passes through $(-2, -4)$.

$\therefore\ -2 - 12 + \lambda = 0$

$\Rightarrow \lambda = 14$

$\therefore$ Required equation of line is

$x + 3y + 14 = 0$[from Eq. (i)]

288 **(c)**

We have,

$3x^2 + xy - y^2 - 3x + 6y + k = 0$ ...(i)

Comparing this equation with

$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, we have

$a = 3, b = -1, h = 1/2, c = k, f = 3$ and $g = -3/2$

Equation (i) will represent a pair of straight lines if

$abc + 2fgh - af^2 - bg^2 - ch^2 = 0$

$\Rightarrow -3k - \frac{9}{2} - 27 + \frac{9}{4} - \frac{k}{2} = 0$

$\Rightarrow -\frac{13k}{3} - \frac{117}{4} = 0 \Rightarrow k = -9$

289 **(b)**

Since, the required lines make an angle 45° either above the line or below the line

$\therefore$ Required slopes are

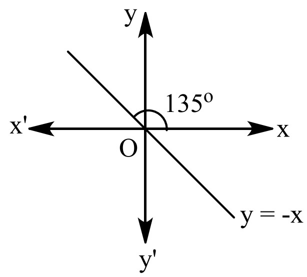
$m = 90°, 180°$

$\therefore y - 1 = \tan 90° (x - 1)$

$\Rightarrow x = 1$

and $y-1=\tan 180°(x-1)$

$\Rightarrow y=1$




290 **(b)**

Slope of the line segment joining $(-4,6)$ and $(8,8)$ is given by

$$=\frac{8-6}{8+4}=\frac{1}{6}$$

$\therefore$ Slope of line perpendicular to it is

$$m=-\frac{1}{1/6}=-6$$

As the line bisecting it.

$\therefore$ Mid point of this line is $\left(\frac{8-4}{2},\frac{8+6}{2}\right)=(2,7)$

$\therefore$ Required equation is

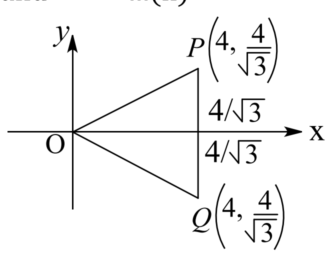
$y-7=-6(x-2)$

$\Rightarrow y+6x-19=0$

291 **(b)**

We have, $x^2-3y^2=0$...(i)

and $x=4$ ...(ii)




From Eqs. (i) and (ii), we get

$$y^2=\frac{16}{3}$$

$$\Rightarrow y=\pm\frac{4}{\sqrt{3}}$$

$\therefore$ Three sides of triangle are $x-\sqrt{3}y=0$, $x+\sqrt{3}y=0$ and

$x-4=0$ *ie*, $OP=OQ=PQ=\frac{8}{\sqrt{3}}$

$\therefore$ Triangle is an equilateral triangle

292 **(a)**

We observe that none of the vertices $A(-2,1)$ and $B(2,4)$ lie on the side $3x-4y-10=0$.

Therefore,

Length of one side of the rectangle is
$AB = \sqrt{(-2-2)^2 + (1-4)^2} = 5$
Also,
Length of the other side
$=$ Length of the perpendicular drawn from $A(-2,1)$ on $3x - 4y - 10 = 0$
$= \left|\frac{-6-4-10}{\sqrt{9+16}}\right| = 4$
$\therefore$ Area of the rectangle $= 5 \times 4 = 20$ sq. units
293 **(b)**
Let $a$ and $b$ be the intercepts made by the straight line on the axes. Then, according to questions
$a + b = \frac{ab}{2}$
$\Rightarrow \frac{2}{a} + \frac{2}{b} = 1$
On comparing with $\frac{x}{a} + \frac{y}{b} = 1$, we get
$\Rightarrow x = 2, y = 2$
Hence, straight line passes through the point (2, 2)
294 **(c)**
Two sides $x - 3y = 0$ and $3x + y = 0$ are perpendicular to each other. Therefore, its orthocentre is the point of intersection of $x - 3y = 0$ and $3x + y = 0$ *ie*, (0,0).
So, the line $3x - 4y = 0$ passes through the orthocentre of triangle
295 **(b)**
Let the coordinates of $C$ be $(x,y)$. Then,
$BC = 5 \Rightarrow x^2 + (y+1)^2 = 5^2$ ...(i)
Now, $AB \perp AC$
$\Rightarrow \frac{y-3}{x-2} \times \frac{4}{2} = -1$
$\Rightarrow 2y - 6 = -x + 2 \Rightarrow x = -2y + 8$ ...(ii)
From (i) and (ii), we have,
$(-2y+8)^2 + (y+1)^2 = 5^2$
$\Rightarrow 5y^2 - 30y + 40 = 0$
$\Rightarrow y^2 - 6y + 8 = 0 \Rightarrow y = 2,4$
Putting $y = 2$ and $y = 4$ in (ii), we get $x = 4, x = 0$ respectively. Hence, the coordinates of $C$ are (4,2) or (0,4)
296 **(c)**
On comparing the given equation with standard equation, we get
$a = \cos\theta - \sin\theta$, $b = \cos\theta + \sin\theta$, $h = \cos\theta$
$\tan\phi = \frac{2\sqrt{\cos^2\theta - (\cos^2\theta - \sin^2\theta)}}{\cos\theta - \sin\theta + \cos\theta + \sin\theta} = \frac{2\sin\theta}{2\cos\theta}$
$\Rightarrow \tan\phi = \tan\theta \Rightarrow \phi = \theta$
297 **(d)**
Let $m$ be the required slope

$\therefore \left|\frac{m-3}{1+3m}\right| = 1$

$\Rightarrow \frac{m-3}{1+3m} = \pm 1$

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

and $m-3 = -1-3m$

$\Rightarrow m = -2, m = \frac{1}{2}$

298 **(a)**

Given equation of line are

$x+2y-3=0$ ...(i)

$2x+3y-4=0$ ...(ii)

$3x+4y-5=0$ ...(iii)

and $4x+5y-6=0$ ...(iv)

On solving Eqs. (i) and (ii), we get

$x=-1, y=2$

From, Eq. (iii),

$3(-1)+4(2)-5=0 \Rightarrow 0=0$

From Eq. (iv),

$4(-1)+5(2)-6=0 \Rightarrow 0=0$

Hence, given lines are concurrent.

299 **(a)**

The equation of a line passing through $P(4,1)$ and slope $-2$ is

$\frac{x-4}{-\frac{1}{\sqrt{5}}} = \frac{y-1}{\frac{2}{\sqrt{5}}} \left[\because \tan\theta = -2 \Rightarrow \cos\theta = -\frac{1}{\sqrt{5}}, \sin\theta = \frac{2}{\sqrt{5}}\right]$

Suppose it cuts $x+y-8=0$ at $Q$ such that $PQ=r$. Then, the coordinates of $Q$ are given by

$\frac{x-4}{-\frac{1}{\sqrt{5}}} = \frac{y-1}{\frac{2}{\sqrt{5}}} = r \Rightarrow x = 4-\frac{r}{\sqrt{5}}, y = 1+\frac{2r}{\sqrt{5}}$

Since $Q$ lies on the line $x+y-8=0$

$\therefore 4-\frac{r}{\sqrt{5}}+1+\frac{2r}{\sqrt{5}}-8=0 \Rightarrow r = 3\sqrt{5}$

Hence, required distance $=3\sqrt{5}$ units

300 **(d)**

Let $P(x_1, y_1)$ be the image of point $Q(4, -3)$

Mid point of $PQ$ is $\left(\frac{x_1+4}{2}, \frac{y_1-3}{2}\right)$. This point lies on $y=x$

$\therefore \frac{x_1+4}{2} = \frac{y_1-3}{2} \Rightarrow x_1 - y_1 = -7$ ...(i)

Slope of $PQ = \frac{-3-y_1}{4-x_1}$ and slope of $y=x$ is 1

$\because$ $PQ$ is perpendicular to $y=x$

$\therefore \left(\frac{-3-y_1}{4-x_1}\right)(1) = -1$

$\Rightarrow y_1 + x_1 = 1$ ...(ii)

On solving Eqs. (i) and (ii), we get $x_1 = -3, y_1 = 4$

| **ANSWER-KEY** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Q. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| **A.** | C | D | B | B | A | A | C | C | B | B |
| | | | | | | | | | | |
| Q. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **A.** | B | A | B | C | B | C | D | A | A | D |
| | | | | | | | | | | |