EXERCISE 3.1 PAGE NO: 18

Choose the correct answer from the given four options:

1. Graphically, the pair of equations

$6x - 3y + 10 = 0$

$2x - y + 9 = 0$

represents two lines which are

(A) Intersecting at exactly one point. **(B) Intersecting at exactly two points.**

(C) Coincident **(D) parallel.**

Solution:

(D) Parallel

Explanation:

The given equations ARE,

6x-3y+10 = 0

dividing by 3

⇒ 2x-y+ 10/3= 0… (i)

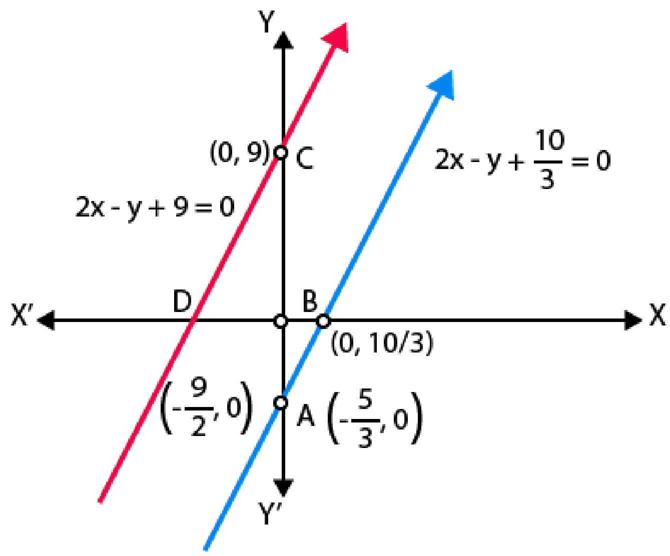
And 2x-y+9=0…(ii)

Table for 2x-y+ 10/3 = 0,

x	0	-5/3
y	10/3	0

Table for 2x-y+9=0

x	0	-9/2
y	9	0



Hence, the pair of equations represents two parallel lines.

2. The pair of equations $x + 2y + 5 = 0$ and $-3x - 6y + 1 = 0$ have

(A) a unique solution **(B) exactly two solutions**
(C) infinitely many solutions **(D) no solution**

Solution:

(D) No solution

Explanation:

The equations are:

$x + 2y + 5 = 0$

$-3x - 6y + 1 = 0$

$a_1 = 1$; $b_1 = 2$; $c_1 = 5$

$a_2 = -3$; $b_2 = -6$; $c_2 = 1$

$a_1/a_2 = -1/3$

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

$c_1/c_2 = 5/1 = 5$

Here,

$a_1/a_2 = b_1/b_2 \neq c_1/c_2$

Therefore, the pair of equation has no solution.

3. If a pair of linear equations is consistent, then the lines will be

(A) parallel **(B) always coincident**
(C) intersecting or coincident **(D) always intersecting**

Solution:

(C) intersecting or coincident

Explanation:

Condition for a pair of linear equations to be consistent are:

Intersecting lines having unique solution,

$a_1/a_2 \neq b_1/b_2$

Coincident or dependent

$a_1/a_2 = b_1/b_2 = c_1/c_2$

4. The pair of equations *y* = 0 and *y* = –7 has

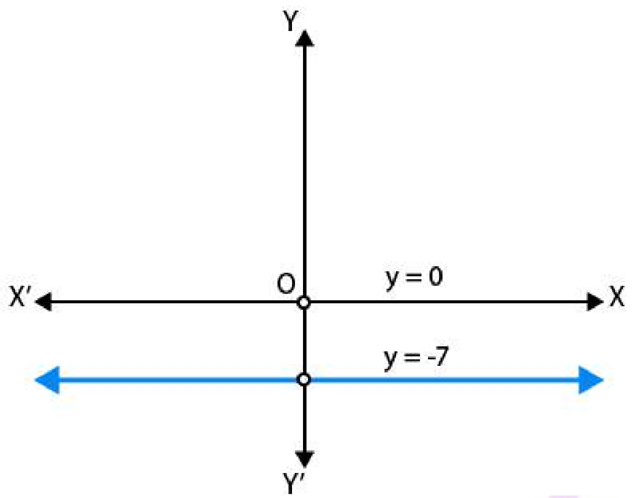
(A) one solution **(B) two solutions**
(C) infinitely many solutions **(D) no solution**

Solution:

(C) infinitely many solutions

Explanation:

The given pair of equations are y = 0 and y = – 7.



Graphically, both lines are parallel and have no solution

5. The pair of equations $x = a$ and $y = b$ graphically represents lines which are

(A) parallel **(B) intersecting at (b, a)**

(C) coincident **(D) intersecting at (a, b)**

Solution:

(D) intersecting at (a, b)

Explanation:

Graphically in every condition,

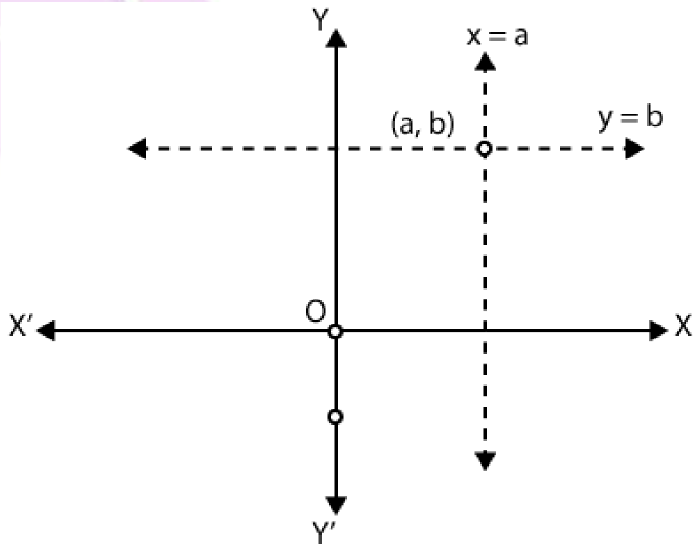
a, b>>0

a, b< 0

a>0, b< 0

a<0, b>0 but a = b≠ 0.

The pair of equations x = a and y = b graphically represents lines which are intersecting at (a, b).



Hence, the cases two lines intersect at (a, b).

EXERCISE 3.2 PAGE NO: 21

1. Do the following pair of linear equations have no solution? Justify your answer.

(i) $2x + 4y = 3$

$12y + 6x = 6$

(ii) $x = 2y$

$y = 2x$

(iii) $3x + y - 3 = 0$

$2x + 2/3y = 2$

Solution:

The Condition for no solution = $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ (parallel lines)

(i) Yes.

Given pair of equations are,

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

Comparing the equations with $ax+ by +c = 0$;

We get,

$a_1 = 2, b_1 = 4, c_1 = - 3$;

$a_2 = 6, b_2 = 12, c_2 = - 6$;

$a_1 /a_2 = 2/6 = 1/3$

$b_1 /b_2 = 4/12 = 1/3$

$c_1 /c_2 = - 3/ - 6 = ½$

Here, $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, i.e parallel lines

Hence, the given pair of linear equations has no solution.

(ii) No.

Given pair of equations,

$x = 2y$ or $x - 2y = 0$

$y = 2x$ or $2x - y = 0$;

Comparing the equations with $ax+ by +c = 0$;

We get,

$a_1 = 1, b_1 = - 2, c_1 = 0$;

$a_2 = 2, b_2 = - 1, c_2 = 0$;

$a_1 /a_2 = ½$

$b_1 /b_2 = -2/-1 = 2$

Here, $a_1/a_2 \neq b_1/b_2$.

Hence, the given pair of linear equations has unique solution.

(iii) No.

Given pair of equations,

$3x + y - 3 = 0$

$2x + 2/3 y = 2$

Comparing the equations with $ax+ by +c = 0$;

We get,

$a_1 = 3, b_1 = 1, c_1 = - 3$;

$a_2 = 2, b_2 = 2/3, c_2 = - 2$;

$a_1 /a_2 = 2/6 = 3/2$

$b_1/b_2 = 4/12 = 3/2$
$c_1/c_2 = -3/-2 = 3/2$
Here, $a_1/a_2 = b_1/b_2 = c_1/c_2$, i.e coincident lines

2. Do the following equations represent a pair of coincident lines? Justify your answer.

(i) $3x + 1/7y = 3$
$7x + 3y = 7$
(ii) $-2x - 3y = 1$
$6y + 4x = -2$
(iii) $x/2 + y + 2/5 = 0$
$4x + 8y + 5/16 = 0$

Solution:

Condition for coincident lines,
$a_1/a_2 = b_1/b_2 = c_1/c_2$;

(i) No.
Given pair of linear equations are:
$3x + 1/7y = 3$
$7x + 3y = 7$
Comparing the above equations with $ax + by + c = 0$;
Here, $a_1 = 3$, $b_1 = 1/7$, $c_1 = -3$;
And $a_2 = 7$, $b_2 = 3$, $c_2 = -7$;
$a_1/a_2 = 3/7$
$b_1/b_2 = 1/21$
$c_1/c_2 = -3/-7 = 3/7$
Here, $a_1/a_2 \neq b_1/b_2$.
Hence, the given pair of linear equations has unique solution.

(ii) Yes,
Given pair of linear equations.
$-2x - 3y - 1 = 0$ and $4x + 6y + 2 = 0$;
Comparing the above equations with $ax + by + c = 0$;
Here, $a_1 = -2$, $b_1 = -3$, $c_1 = -1$;
And $a_2 = 4$, $b_2 = 6$, $c_2 = 2$;
$a_1/a_2 = -2/4 = -½$
$b_1/b_2 = -3/6 = -½$
$c_1/c_2 = -½$
Here, $a_1/a_2 = b_1/b_2 = c_1/c_2$, i.e. coincident lines
Hence, the given pair of linear equations is coincident.

(iii) No,
Given pair of linear equations are
$x/2 + y + 2/5 = 0$
$4x + 8y + 5/16 = 0$
Comparing the above equations with $ax + by + c = 0$;
Here, $a_1 = ½$, $b_1 = 1$, $c_1 = 2/5$;

And $a_2 = 4$, $b_2 = 8$, $c_2 = 5/16$;
$a_1/a_2 = 1/8$
$b_1/b_2 = 1/8$
$c_1/c_2 = 32/25$
Here, $a_1/a_2 = b_1/b_2 \neq c_1/c_2$, i.e. parallel lines
Hence, the given pair of linear equations has no solution.

3. Are the following pair of linear equations consistent? Justify your answer.

(i) $-3x - 4y = 12$
$4y + 3x = 12$

(ii) $(3/5)x - y = ½$
$(1/5)x - 3y = 1/6$

(iii) $2ax + by = a$
$4ax + 2by - 2a = 0$; $a, b \neq 0$

(iv) $x + 3y = 11$
$2(2x + 6y) = 22$

Solution:

Conditions for pair of linear equations to be consistent are:
$a_1/a_2 \neq b_1/b_2$. [unique solution]
$a_1/a_2 = b_1/b_2 = c_1/c_2$ [coincident or infinitely many solutions]

(i) No.
The given pair of linear equations
$-3x - 4y - 12 = 0$ and $4y + 3x - 12 = 0$
Comparing the above equations with $ax + by + c = 0$;
We get,
$a_1 = -3$, $b_1 = -4$, $c_1 = -12$;
$a_2 = 3$, $b_2 = 4$, $c_2 = -12$;
$a_1/a_2 = -3/3 = -1$
$b_1/b_2 = -4/4 = -1$
$c_1/c_2 = -12/-12 = 1$
Here, $a_1/a_2 = b_1/b_2 \neq c_1/c_2$
Hence, the pair of linear equations has no solution, i.e., inconsistent.

(ii) Yes.
The given pair of linear equations
$(3/5)x - y = ½$
$(1/5)x - 3y = 1/6$
Comparing the above equations with $ax + by + c = 0$;
We get,
$a_1 = 3/5$, $b_1 = -1$, $c_1 = -½$;
$a_2 = 1/5$, $b_2 = 3$, $c_2 = -1/6$;
$a_1/a_2 = 3$
$b_1/b_2 = -1/-3 = 1/3$
$c_1/c_2 = 3$
Here, $a_1/a_2 \neq b_1/b_2$.

Hence, the given pair of linear equations has unique solution, i.e., consistent.

(iii) Yes.
The given pair of linear equations –
$2ax + by - a = 0$ and $4ax + 2by - 2a = 0$
Comparing the above equations with $ax + by + c = 0$;
We get,
$a_1 = 2a$, $b_1 = b$, $c_1 = - a$;
$a_2 = 4a$, $b_2 = 2b$, $c_2 = - 2a$;
$a_1 /a_2 = ½$
$b_1 /b_2 = ½$
$c_1 /c_2 = ½$
Here, $a_1/a_2 = b_1/b_2 = c_1/c_2$
Hence, the given pair of linear equations has infinitely many solutions, i.e., consistent

(iv) No.
The given pair of linear equations
$x + 3y = 11$ and $2x + 6y = 11$
Comparing the above equations with $ax + by + c = 0$;
We get,
$a_1 = 1$, $b_1 = 3$, $c_1 = 11$
$a_2 = 2$, $b_2 = 6$, $c_2 = 11$
$a_1 /a_2 = ½$
$b_1 /b_2 = ½$
$c_1 /c_2 = 1$
Here, $a_1/a_2 = b_1/b_2 \neq c_1/c_2$.
Hence, the given pair of linear equations has no solution.

EXERCISE 3.3 PAGE NO: 25

1. For which value(s) of λ , do the pair of linear equations

$\lambda x + y = \lambda^2$ and $x + \lambda y = 1$ have

(i) no solution?

(ii) infinitely many solutions?

(iii) a unique solution?

Solution:

The given pair of linear equations is

$\lambda x + y = \lambda^2$ and $x + \lambda y = 1$

$a_1 = \lambda$, $b_1 = 1$, $c_1 = -\lambda^2$

$a_2 = 1$, $b_2 = \lambda$, $c_2 = -1$

The given equations are;

$\lambda x + y - \lambda^2 = 0$

$x + \lambda y - 1 = 0$

Comparing the above equations with $ax + by + c = 0$;

We get,

$a_1 = \lambda$, $b_1 = 1$, $c_1 = -\lambda^2$;

$a_2 = 1$, $b_2 = \lambda$, $c_2 = -1$;

$a_1 / a_2 = \lambda/1$

$b_1 / b_2 = 1/\lambda$

$c_1 / c_2 = \lambda^2$

(i) For no solution,

$a_1/a_2 = b_1/b_2 \neq c_1/c_2$

i.e. $\lambda = 1/\lambda \neq \lambda^2$

so, $\lambda^2 = 1$;

and $\lambda^2 \neq \lambda$

Here, we take only $\lambda = -1$,

Since the system of linear equations has infinitely many solutions at $\lambda = 1$,

(ii) For infinitely many solutions,

$a_1/a_2 = b_1/b_2 = c_1/c_2$

i.e. $\lambda = 1/\lambda = \lambda^2$

so $\lambda = 1/\lambda$ gives $\lambda = \pm 1$;

$\lambda = \lambda^2$ gives $\lambda = 1,0$;

Hence satisfying both the equations

$\lambda = 1$ is the answer.

(iii) For a unique solution,

$a_1/a_2 \neq b_1/b_2$

so $\lambda \neq 1/\lambda$

hence, $\lambda^2 \neq 1$;

$\lambda \neq \pm 1$;

So, all real values of λ except ± 1

2. For which value(s) of *k* will the pair of equations

$$kx + 3y = k - 3$$
$$12x + ky = k$$

have no solution?

Solution:

The given pair of linear equations is

kx + 3y = k - 3 …(i)

12x + ky = k …(ii)

On comparing the equations (i) and (ii) with ax + by = c = 0,

We get,

$a_1 = k$, $b_1 = 3$, $c_1 = -(k - 3)$

$a_2 = 12$, $b_2 = k$, $c_2 = - k$

Then,

$a_1 /a_2 = k/12$

$b_1 /b_2 = 3/k$

$c_1 /c_2 = (k-3)/k$

For no solution of the pair of linear equations,

$a_1/a_2 = b_1/b_2 \neq c_1/c_2$

$k/12 = 3/k \neq (k-3)/k$

Taking first two parts, we get

$k/12 = 3/k$

$k^2 = 36$

$k = \pm 6$

Taking last two parts, we get

$3/k \neq (k-3)/k$

$3k \neq k(k - 3)$

$k^2 - 6k \neq 0$

so, $k \neq 0,6$

Therefore, value of k for which the given pair of linear equations has no solution is k = - 6.

3. For which values of *a* and *b*, will the following pair of linear equations have infinitely many solutions?

$$x + 2y = 1$$
$$(a - b)x + (a + b)y = a + b - 2$$

Solution:

The given pair of linear equations are:

x + 2y = 1 …(i)

(a-b)x + (a + b)y = a + b - 2 …(ii)

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

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

$a_2 = (a - b)$, $b_2 = (a + b)$, $c_2 = - (a + b - 2)$

$a_1 /a_2 = 1/(a-b)$

$b_1 /b_2 = 2/(a+b)$

$c_1 /c_2 = 1/(a+b-2)$

For infinitely many solutions of the, pair of linear equations,

$a_1/a_2 = b_1/b_2 = c_1/c_2$ (coincident lines)

so, 1/(a-b) = 2/ (a+b) = 1/(a+b-2)
Taking first two parts,
1/(a-b) = 2/ (a+b)
a + b = 2(a - b)
a = 3b …(iii)

Taking last two parts,
2/ (a+b) = 1/(a+b-2)
2(a + b - 2) = (a + b)
a + b = 4 …(iv)
Now, put the value of a from Eq. (iii) in Eq. (iv), we get
3b + b = 4
4b = 4
b = 1
Put the value of b in Eq. (iii), we get
a = 3
So, the values (a,b) = (3,1) satisfies all the parts. Hence, required values of a and b are 3 and 1 respectively for which the given pair of linear equations has infinitely many solutions.

4. Find the value(s) of *p* in (i) to (iv) and *p* and *q* in (v) for the following pair of equations:

(i) $3x - y - 5 = 0$ and $6x - 2y - p = 0$, if the lines represented by these equations are parallel.

Solution:

Given pair of linear equations is
3x - y - 5 = 0 …(i)
6x - 2y - p = 0 …(ii)
On comparing with ax + by + c = 0 we get
We get,
$a_1 = 3$, $b_1 = -1$, $c_1 = -5$;
$a_2 = 6$, $b_2 = -2$, $c_2 = -p$;
$a_1/a_2 = 3/6 = ½$
$b_1/b_2 = ½$
$c_1/c_2 = 5/p$
Since, the lines represented by these equations are parallel, then
$a_1/a_2 = b_1/b_2 \neq c_1/c_2$
Taking last two parts, we get $½ \neq 5/p$
So, $p \neq 10$
Hence, the given pair of linear equations are parallel for all real values of p except 10.

(ii) $-x + py = 1$ and $px - y = 1$, if the pair of equations has no solution.

Solution:

Given pair of linear equations is
- x + py = 1 …(i)
px - y - 1 = 0 …(ii)
On comparing with ax + by + c = 0,
We get,
$a_1 = -1$, $b_1 = p$, $c_1 = -1$;

$a_2 = p$, $b_2 = -1$, $c_2 = -1$;
$a_1/a_2 = -1/p$
$b_1/b_2 = -p$
$c_1/c_2 = 1$
Since, the lines equations has no solution i.e., both lines are parallel to each other.
$a_1/a_2 = b_1/b_2 \neq c_1/c_2$
$-1/p = -p \neq 1$
Taking last two parts, we get
$p \neq -1$
Taking first two parts, we get
$p^2 = 1$
$p = \pm 1$
Hence, the given pair of linear equations has no solution for $p = 1$.

(iii) $-3x + 5y = 7$ and $2px - 3y = 1$, if the lines represented by these equations are intersecting at a unique point.

Solution:

Given, pair of linear equations is
$-3x + 5y = 7$
$2px - 3y = 1$
On comparing with $ax + by + c = 0$, we get
Here, $a_1 = -3$, $b_1 = 5$, $c_1 = -7$;
And $a_2 = 2p$, $b_2 = -3$, $c_2 = -1$;
$a_1/a_2 = -3/2p$
$b_1/b_2 = -5/3$
$c_1/c_2 = 7$
Since, the lines are intersecting at a unique point i.e., it has a unique solution
$a_1/a_2 \neq b_1/b_2$
$-3/2p \neq -5/3$
$p \neq 9/10$
Hence, the lines represented by these equations are intersecting at a unique point for all real values of p except 9/10

(iv) $2x + 3y - 5 = 0$ and $px - 6y - 8 = 0$, if the pair of equations has a unique solution.

Solution:

Given, pair of linear equations is
$2x + 3y - 5 = 0$
$px - 6y - 8 = 0$
On comparing with $ax + by + c = 0$ we get
Here, $a_1 = 2$, $b_1 = 3$, $c_1 = -5$;
And $a_2 = p$, $b_2 = -6$, $c_2 = -8$;
$a_1/a_2 = 2/p$
$b_1/b_2 = -3/6 = -½$
$c_1/c_2 = 5/8$
Since, the pair of linear equations has a unique solution.
$a_1/a_2 \neq b_1/b_2$

so $2/p \neq -\frac{1}{2}$
$p \neq -4$
Hence, the pair of linear equations has a unique solution for all values of p except – 4.

(v) $2x + 3y = 7$ and $2px + py = 28 – qy$, if the pair of equations have infinitely many solutions.
Solution:
Given pair of linear equations is
$2x + 3y = 7$
$2px + py = 28 – qy$
or $2px + (p + q)y - 28 = 0$
On comparing with $ax + by + c = 0$,
We get,
Here, $a_1 = 2$, $b_1 = 3$, $c_1 = -7$;
And $a_2 = 2p$, $b_2 = (p + q)$, $c_2 = -28$;
$a_1/a_2 = 2/2p$
$b_1/b_2 = 3/(p+q)$
$c_1/c_2 = \frac{1}{4}$
Since, the pair of equations has infinitely many solutions i.e., both lines are coincident.
$a_1/a_2 = b_1/b_2 = c_1/c_2$
$1/p = 3/(p+q) = \frac{1}{4}$
Taking first and third parts, we get
$p = 4$
Again, taking last two parts, we get
$3/(p+q) = \frac{1}{4}$
$p + q = 12$
Since $p = 4$
So, $q = 8$
Here, we see that the values of $p = 4$ and $q = 8$ satisfies all three parts.
Hence, the pair of equations has infinitely many solutions for all values of $p = 4$ and $q = 8$.

5. Two straight paths are represented by the equations $x – 3y = 2$ and $–2x + 6y = 5$.Check whether the paths cross each other or not.
Solution:
Given linear equations are
$x - 3y - 2 = 0$ …(i)
$-2x + 6y - 5 = 0$ …(ii)
On comparing with ax + by c=0,
We get
$a_1 =1$, $b_1 =-3$, $c_1 =- 2$;
$a_2 = -2$, $b_2 =6$, $c_2 =- 5$;
$a_1/a_2 = -\frac{1}{2}$
$b_1/b_2 = -3/6 = -\frac{1}{2}$
$c_1/c_2 = 2/5$
i.e., $a_1/a_2 = b_1/b_2 \neq c_1/c_2$ [parallel lines]
Hence, two straight paths represented by the given equations never cross each other, because they are parallel to each other.

6. Write a pair of linear equations which has the unique solution *x* = – 1, *y* =3. How many such pairs can you write?

Solution:

Condition for the pair of system to have unique solution

$a_1/a_2 \neq b_1/b_2$

Let the equations be,

$a_1x + b_1y + c_1 = 0$

$a_2x + b_2y + c_2 = 0$

Since, x = - 1 and y = 3 is the unique solution of these two equations, then

It must satisfy the equations –

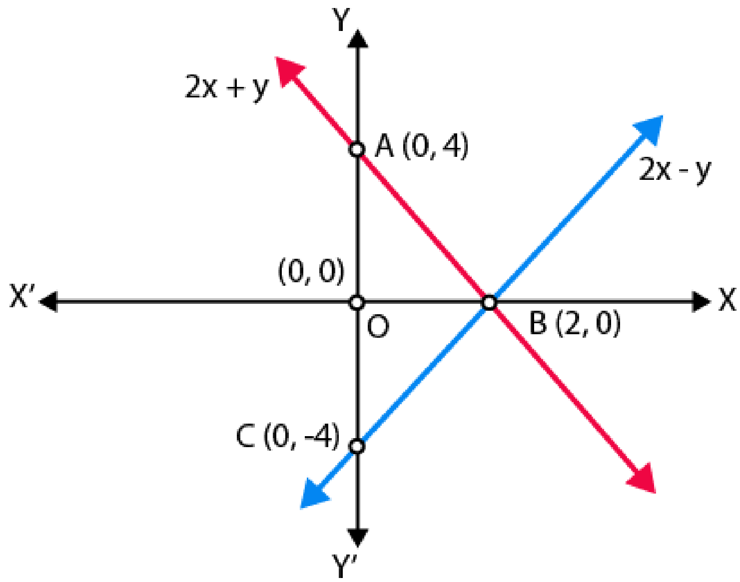
$a_1(-1) + b_1(3) + c_1 = 0$

$- a_1 + 3b_1 + c_1 = 0$ …(i)

and $a_2(- 1) + b_2(3) + c_2 = 0$

$- a_2 + 3b_2 + c_2 = 0$ …(ii)

Since for the different values of a_1, b_1, c_1 and a_2, b_2, c_2 satisfy the Eqs. (i) and (ii).



Hence, infinitely many pairs of linear equations are possible.

7. If 2*x* + *y* = 23 and 4*x* – *y* = 19, find the values of 5*y* – 2*x* and y/x - 2.

Solution:

Given equations are

2x + y = 23 …(i)

4x - y = 19 …(ii)

On adding both equations, we get

6x = 42

So, x = 7

Put the value of x in Eq. (i), we get

2(7) + y = 23

y = 23 – 14

so, y = 9
Hence 5y - 2x = 5(9) - 2(7) = 45 - 14 = 31
y/x – 2 = 9/7 -2 = -5/7
Hence, the values of (5y - 2x) and y/x – 2 are 31 and -5/7 respectively.

8. Find the values of *x* and *y* in the following rectangle [see Fig. 3.2].

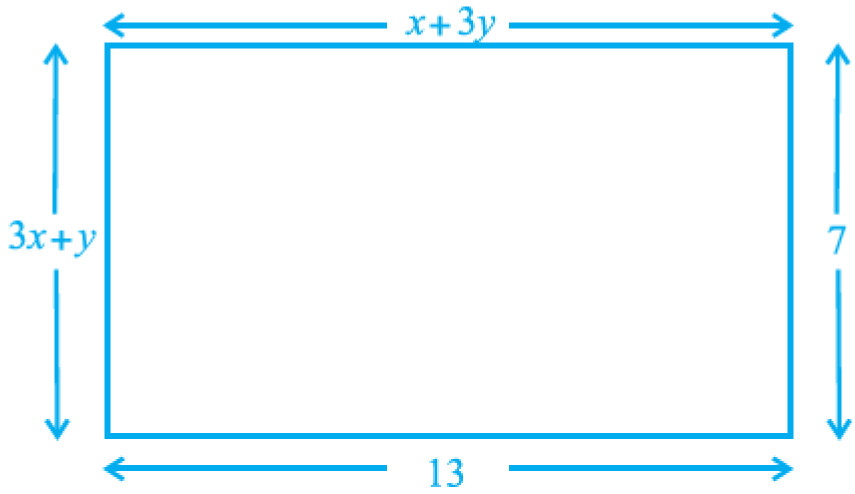


Fig. 3.2

Solution:

Using property of rectangle,
We know that,
Lengths are equal,
i.e., CD = AB
Hence, x + 3y = 13 …(i)
Breadth are equal,
i.e., AD = BC
Hence, 3x + y = 7 …(ii)
On multiplying Eq. (ii) by 3 and then subtracting Eq. (i),
We get,
8x = 8
So, x = 1
On substituting x = 1 in Eq. (i),
We get,
y = 4
Therefore, the required values of x and y are 1 and 4, respectively.

EXERCISE 3.4 PAGE NO: 33

1. Graphically, solve the following pair of equations:

$2x + y = 6$

$2x - y + 2 = 0$

Find the ratio of the areas of the two triangles formed by the lines representing these equations with the *x*-axis and the lines with the *y*-axis.

Solution:

Given equations are 2x + y = 6 and 2x – y + 2 = 0

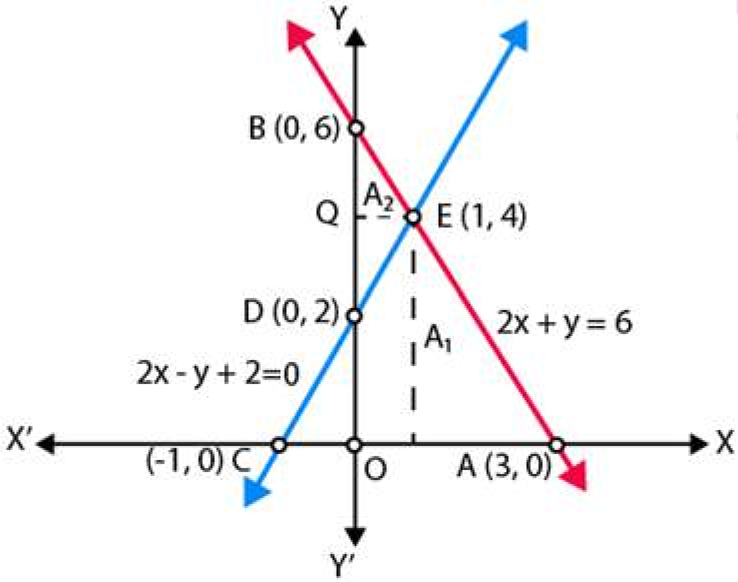
Table for equation 2x + y - 6 = 0, for x = 0, y = 6, for y = 0, x = 3.

x	0	3
y	6	0

Table for equation 2x – y + 2 = 0, for x = 0, y = 2, for y = 0,x = - 1

x	0	-1
y	2	0

Let A_1 and A_2 represent the areas of triangles ACE and BDE respectively.



Let, Area of triangle formed with x -axis = T_1

T_1 = Area of △ACE = ½ × AC × PE

T_1 = ½ × 4 × 4 = 8

And Area of triangle formed with y - axis = T_2

T_1 = Area of △BDE = ½ × BD × QE

T_1 = ½ × 4 × 1 = 2

$T_1:T_2$ = 8:2 = 4:1

Hence, the pair of equations intersect graphically at point E(1,4)

i.e., x = 1 and y = 4.

2. Determine, graphically, the vertices of the triangle formed by the lines
$y = x$, $3y = x$, $x + y = 8$

Solution:

Given linear equations are

y = x …(i)

3y = x …(ii)

and x + y = 8 …(iii)

Table for line y = x,

x	0	1	2
y	0	1	2

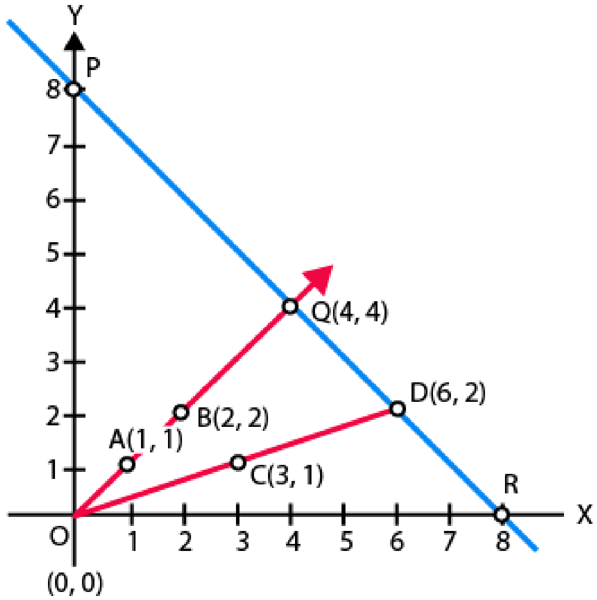
Table for line x = 3y,

x	0	3	6
y	0	1	2

Table for line x + y = 8

x	0	4	8
y	8	4	0

Plotting the points A (1, 1), B(2,2), C (3, 1), D (6, 2), we get the straight lines AB and CD. Similarly, plotting the point P (0, 8), Q(4, 4) and R(8, 0), we get the straight line PQR. AB and CD intersects the line PR on Q and D, respectively.



So, △OQD is formed by these lines. Hence, the vertices of the △OQD formed by the given lines are O(0, 0), Q(4, 4) and D(6,2).

3. Draw the graphs of the equations *x* = 3, *x* = 5 and 2*x* – *y* – 4 = 0. Also find the area of the quadrilateral formed by the lines and the *x*–axis.

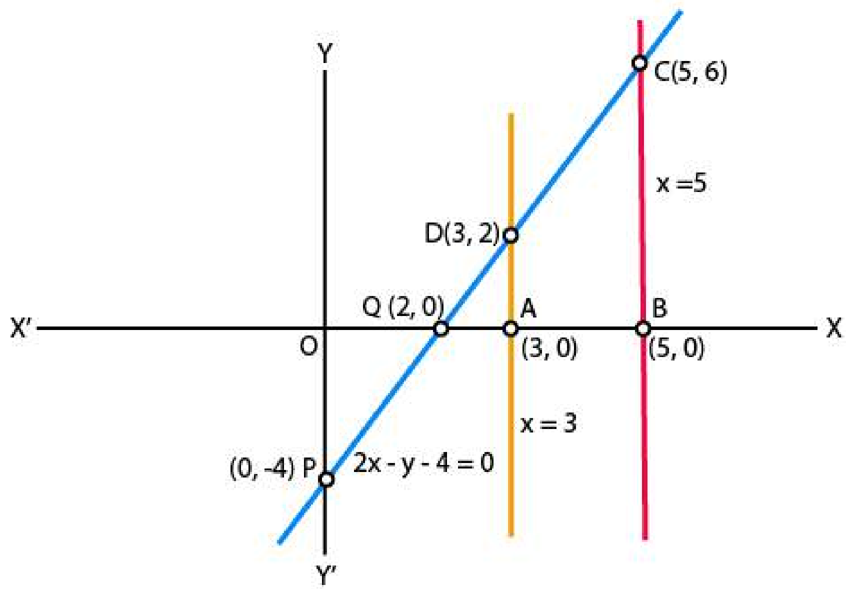
Solution:

Given equation of lines x = 3, x = 5 and 2x-y-4 = 0.

Table for line 2x - y - 4 = 0

x	0	2
y	-4	0

Plotting the graph, we get,



From the graph, we get,
AB = OB-OA = 5-3 = 2
AD = 2
BC = 6
Thus, quadrilateral ABCD is a trapezium, then,
Area of Quadrileral ABCD = ½ × (distance between parallel lines) = ½ × (AB) × (AD + BC)
= 8 sq units

4. The cost of 4 pens and 4 pencil boxes is Rs 100. Three times the cost of a pen is Rs 15 more than the cost of a pencil box. Form the pair of linear equations for the above situation. Find the cost of a pen and a pencil box.

Solution:

Let the cost of a pen and a pencil box be Rs x and Rs y respectively.
According to the question,
4x + 4y = 100
Or x + y = 25 …(i)
3x = y + 15
Or 3x-y = 15 …(ii)
On adding Equation (i) and (ii), we get,
4x = 40
So, x = 10
Substituting x = 10, in Eq. (i) we get
y = 25-10 = 15

Hence, the cost of a pen = Rs. 10
The cost of a pencil box = Rs. 15

5. Determine, algebraically, the vertices of the triangle formed by the lines

$$3x - y = 3$$
$$2x - 3y = 2$$
$$x + 2y = 8$$

Solution:

3x - y = 2 …(i)
2x -3y = 2 …(ii)
x + 2y = 8 …(iii)
Let the equations of the line (i), (ii) and (iii) represent the side of a ΔABC.
On solving (i) and (ii),
We get,
[First, multiply Eq. (i) by 3 in Eq. (i) and then subtract]
(9x-3y)-(2x-3y) = 9-2
7x = 7
x = 1
Substituting x=1 in Eq. (i), we get
3×1-y = 3
y = 0
So, the coordinate of point B is (1, 0)
On solving lines (ii) and (iii),
We get,
[First, multiply Eq. (iii) by 2 and then subtract]
(2x + 4y)-(2x-3y) = 16-2
7y = 14
y = 2
Substituting y=2 in Eq. (iii), we get
x + 2 × 2 = 8
x + 4 = 8
x = 4
Hence, the coordinate of point C is (4, 2).
On solving lines (iii) and (i),
We get,
[First, multiply in Eq. (i) by 2 and then add]
(6x-2y) + (x + 2y) = 6 + 8
7x = 14
x = 2
Substituting x=2 in Eq. (i), we get
3 × 2 - y = 3
y = 3
So, the coordinate of point A is (2, 3).
Hence, the vertices of the ΔABC formed by the given lines are as follows,
A (2, 3), B (1, 0) and C (4, 2).

6. Ankita travels 14 km to her home partly by rickshaw and partly by bus. She takes half an hour if she travels 2 km by rickshaw, and the remaining distance by bus.
Solution:

Let the speed of the rickshaw and the bus are x and y km/h, respectively.
Now, she has taken time to travel 2 km by rickshaw, $t_1 = (2/x)$ hr
Speed = distance/ time
she has taken time to travel remaining distance i.e., (14 - 2) = 12km
By bus $t_2 = (12/y)$ hr
By first condition,
$t_1 + t_2 = ½ = (2/x) + (12/y)$ … (i)
Now, she has taken time to travel 4 km by rickshaw, $t_3 = (4/x)$ hr
and she has taken time to travel remaining distance i.e., (14 - 4) = 10km, by bus = $t_4 = (10/y)$ hr
By second condition,
$t_3 + t_4 = ½ + 9/60 = ½ + 3/20$
$(4/x) + (10/y) = (13/20)$ …(ii)
Let $(1/x) = u$ and $(1/y) = v$
Then Equations. (i) and (ii) becomes
$2u + 12v = ½$ …(iii)
$4u + 10v = 13/20$…(iv)
[First, multiply Eq. (iii) by 2 and then subtract]
$(4u + 24v) – (4u + 10v) = 1–13/20$
$14v = 7/20$
$v = 1/40$
Substituting the value of v in Eq. (iii),
$2u + 12(1/40) = ½$
$2u = 2/10$
$u = 1/10$
$x = 1/u = 10$km/hr
$y = 1/v = 40$km/hr
Hence, the speed of rickshaw = 10 km/h
And the speed of bus = 40 km/h.