Exercise 3.2

Question 1:

Form the pair of linear equations in the following problems, and find their solutions graphically.

(i) 10 students of Class X took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz.

(ii) 5 pencils and 7 pens together cost ₹ 50, whereas 7 pencils and 5 pens together cost ₹ 46. Find the cost of one pencil and that of one pen.

Answer 1:

(i) Let the number of girls = x and let the number of boys = y

Total number of students = 10

Therefore, $x + y = 10$ ... (1)

According to question, number of girls is 4 more than the number of boys, so

$x = y + 4$ ... (2)

To represent graphically, three solutions of each equation is needed.

From the equation (1), we get

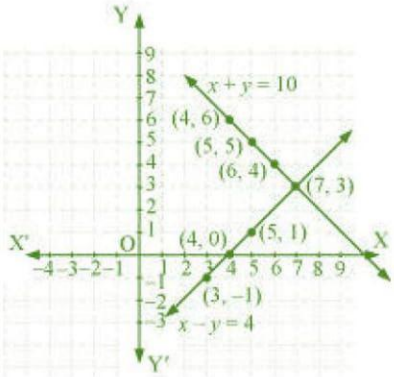
$x = 10 - y$

x	5	4	6
y	5	6	4

From the equation (2), we get

$x = y + 4$

x	5	4	3
y	1	0	−1



(ii) Let the cost of one pencil = ₹ x and let the cost of one pen = ₹ y

According to first condition,

$5x + 7y = 50$ ... (1)

According to second condition,

$7x + 5y = 46$ ... (2)

To represent graphically three solutions of each equation is given below,

From the equation (1), we get

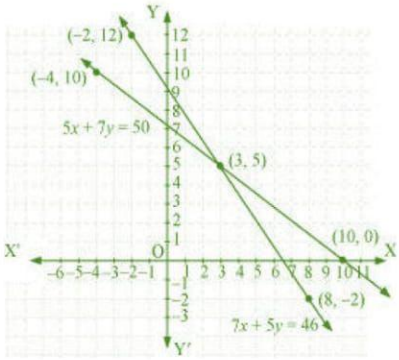
$x = \frac{50-7y}{5}$

x	3	10	−4
y	5	0	10

From the equation (2), we get

$x = \frac{46-5y}{7}$

x	8	3	−2
y	−2	5	12



Question 2:

On comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the lines representing the following pairs of linear equations intersect at a point, are parallel or coincident:

(i) $5x - 4y + 8 = 0$
$7x + 6y - 9 = 0$

(ii) $9x + 3y + 12 = 0$
$18x + 6y + 24 = 0$

(iii) $6x - 3y + 10 = 0$
$2x - y + 9 = 0$

Answer 2:

(i) $5x - 4y + 8 = 0$
$7x + 6y - 9 = 0$

Here, $\frac{a_1}{a_2} = \frac{5}{7}$ and $\frac{b_1}{b_2} = \frac{-4}{6} = \frac{-2}{3}$

$\Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, so, the given pairs of linear equations intersect at a point.

(ii) $9x + 3y + 12 = 0$
$18x + 6y + 24 = 0$

Here, $\frac{a_1}{a_2} = \frac{9}{18} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{12}{24} = \frac{1}{2}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, so, the following pairs of linear equations are coincident.

(iii) $6x - 3y + 10 = 0$
$2x - y + 9 = 0$

Here, $\frac{a_1}{a_2} = \frac{6}{2} = \frac{3}{1}$, $\frac{b_1}{b_2} = \frac{-3}{-1} = \frac{3}{1}$ and $\frac{c_1}{c_2} = \frac{10}{9}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, so, the following pairs of linear equations are parallel.

Question 3:

On comparing the ratios $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the following pair of linear equations are consistent, or inconsistent:

(i) $3x + 2y = 5$; $2x - 3y = 7$

(ii) $2x - 3y = 8$; $4x - 6y = 9$

(iii) $\frac{3}{2}x + \frac{5}{3}y = 7$; $9x - 10y = 14$

(iv) $5x - 3y = 11$; $-10x + 6y = -22$

(v) $\frac{4}{3}x + 2y = 8$; $2x + 3y = 12$

Answer 3:

(i) $3x + 2y = 5$
$2x - 3y = 7$

Here, $\frac{a_1}{a_2} = \frac{3}{2}$ and $\frac{b_1}{b_2} = \frac{2}{-3}$

$\Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, so, pair of linear equations are consistent.

(ii) $2x - 3y = 8$
$4x - 6y = 9$

Here, $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{-3}{-6} = \frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{8}{9}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, so, pair of linear equations are inconsistent.

(iii) $\frac{3}{2}x + \frac{5}{3}y = 7$
$9x - 10y = 14$

Here, $\frac{a_1}{a_2} = \frac{3/2}{9} = \frac{1}{6}$ and $\frac{b_1}{b_2} = \frac{5/3}{-10} = -\frac{1}{6}$

$\Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, so, pair of linear equations are consistent.

(iv) $5x - 3y = 11$
$-10x + 6y = -22$

Here, $\frac{a_1}{a_2} = \frac{5}{-10} = -\frac{1}{2}$, $\frac{b_1}{b_2} = \frac{-3}{6} = -\frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{11}{-22} = -\frac{1}{2}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, so, pair of linear equations are consistent.

(v) $\frac{4}{3}x + 2y = 8$
$2x + 3y = 12$

Here, $\frac{a_1}{a_2} = \frac{4/3}{2} = \frac{2}{3}$, $\frac{b_1}{b_2} = \frac{2}{3}$ and $\frac{c_1}{c_2} = \frac{8}{12} = \frac{2}{3}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, so, pair of linear equations are consistent.

Question 4:

Which of the following pairs of linear equations are consistent/inconsistent? If consistent, obtain the solution graphically:

(i) $x + y = 5$, $2x + 2y = 10$ **(ii)** $x - y = 8$, $3x - 3y = 16$

(iii) $2x + y - 6 = 0$, $4x - 2y - 4 = 0$ **(iv)** $2x - 2y - 2 = 0$, $4x - 4y - 5 = 0$

Answer 4:

(i) $x + y = 5$ ... (1)
$2x + 2y = 10$ ... (2)

Here, $\frac{a_1}{a_2} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{5}{10} = \frac{1}{2}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, so, pairs of linear equations are consistent.

For three solutions of each equation,

Form equation (1), we get,

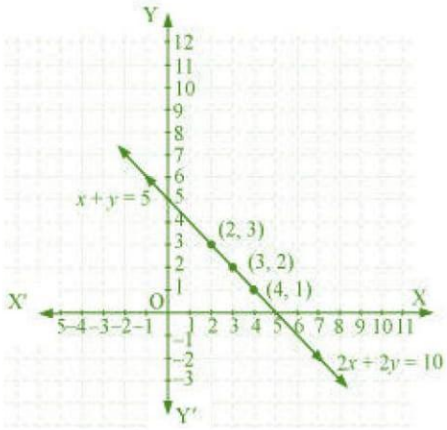
$x = 5 - y$

x	4	3	2
y	1	2	3

From equation (2), we get

$x = \frac{10 - 2y}{2}$

x	4	3	2
y	1	2	3



(ii) $x - y = 8$ ... (1)
$3x - 3y = 16$ ... (2)

Here, $\frac{a_1}{a_2} = \frac{1}{3}$, $\frac{b_1}{b_2} = \frac{-1}{-3} = \frac{1}{3}$ and $\frac{c_1}{c_2} = \frac{8}{16} = \frac{1}{2}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, so, pairs of linear equations are inconsistent.

(iii) $2x + y - 6 = 0$ ... (1)
$4x - 2y - 4 = 0$ ... (2)

Here, $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$ and $\frac{b_1}{b_2} = \frac{1}{-2}$

$\Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$, so, pairs of linear equations are consistent/inconsistent

For three solutions of each equation,

From equation (1), we get

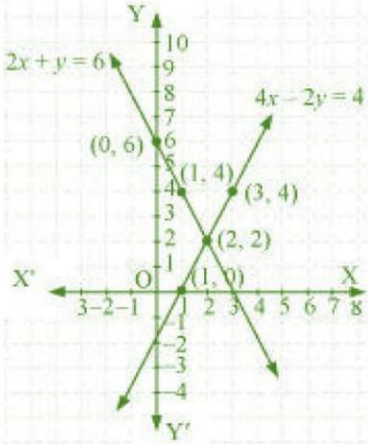
$x = \frac{6-y}{2}$

x	0	1	2
y	6	4	2

From equation (2), we get

$x = \frac{4+2y}{4}$

x	1	2	3
y	0	2	4



(iv) $2x - 2y - 2 = 0$ ... (1)

$4x - 4y - 5 = 0$ ... (2)

Here, $\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$, $\frac{b_1}{b_2} = \frac{-2}{-4} = \frac{1}{2}$ and $\frac{c_1}{c_2} = \frac{-2}{-5} = \frac{2}{5}$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, so, pairs of linear equations are inconsistent.

Question 5:

Half the perimeter of a rectangular garden, whose length is 4 m more than its width, is 36 m. Find the dimensions of the garden.

Answer 5:

Let the breadth of garden = x m and

Let the length of the garden = y m

Half of the perimeter = 36 m

$\Rightarrow \frac{1}{2}[2(x+y)] = 36$

$\Rightarrow x + y = 36$ ... (1)

According to question, length is 4 m more than its width, so

$y = x + 4$ ... (2)

To get three solutions of each equation,

Form the equation (1), we get

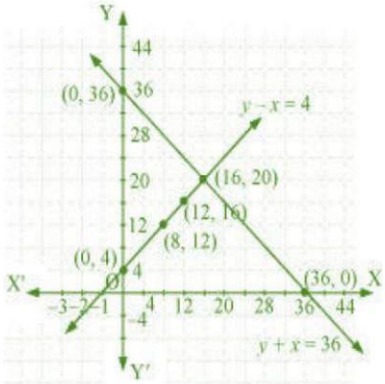
$x = 36 - y$

x	0	36	16
y	36	0	20

From the equation (2), we get

$y = x + 4$

x	0	8	12
y	4	8	16



Both the lines intersects at (16, 20). So, the breadth of the garden is 16 m and the length is 20 m.

Question 6:

Given the linear equation $2x + 3y - 8 = 0$, write another linear equation in two variables such that the geometrical representation of the pair so formed is:

(i) intersecting lines **(ii)** parallel lines **(iii)** coincident lines

Answer 6:

(i) Given line $2x + 3y - 8 = 0$ intersect the line $x + 3y - 10 = 0$, as

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

(ii) Given line $2x + 3y - 8 = 0$ is parallel to $4x + 6y - 9 = 0$, as

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

(iii) Given line $2x + 3y - 8 = 0$ is coincident to $4x + 6y - 16 = 0$, as

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

Question 7:

Draw the graphs of the equations $x - y + 1 = 0$ and $3x + 2y - 12 = 0$. Determine the coordinates of the vertices of the triangle formed by these lines and the x-axis, and shade the triangular region.

Answer 7:

From the equation (1), we get

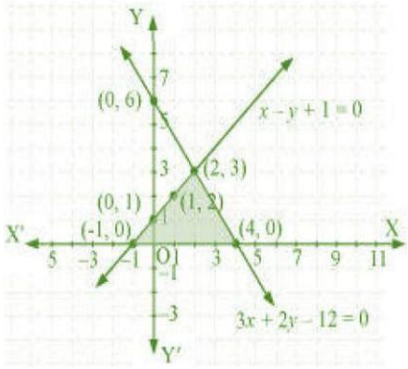
$x = y - 1$

x	0	1	2
y	1	2	3

From the equation (2), we get

$x = \dfrac{12 - 2y}{3}$

x	4	2	0
y	0	3	6



The coordinates of the vertices of the triangle formed by these lines and the x-axis are $(-1, 0)$, $(4, 0)$ and $(2, 3)$.