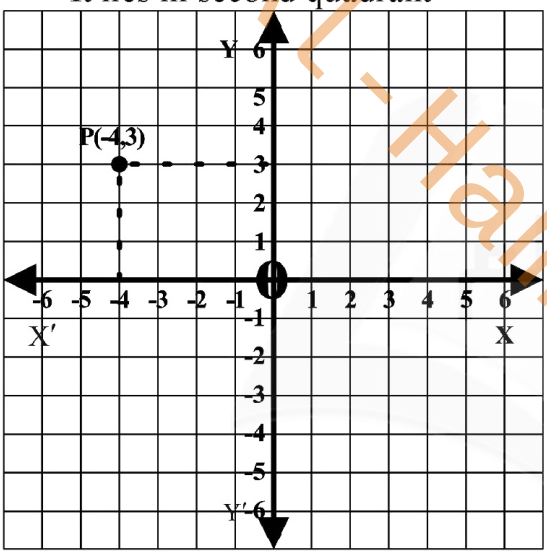
Exercise 8.1

Q.1

(i) Determine the quadrant of coordinate plane in which the following points lies

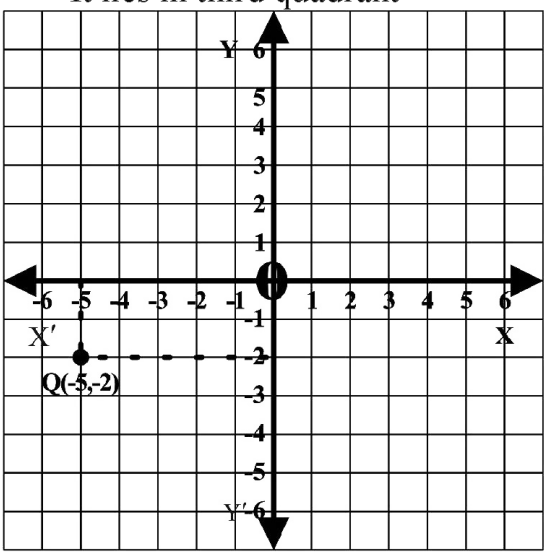
P (–4, 3)

It lies in second quadrant



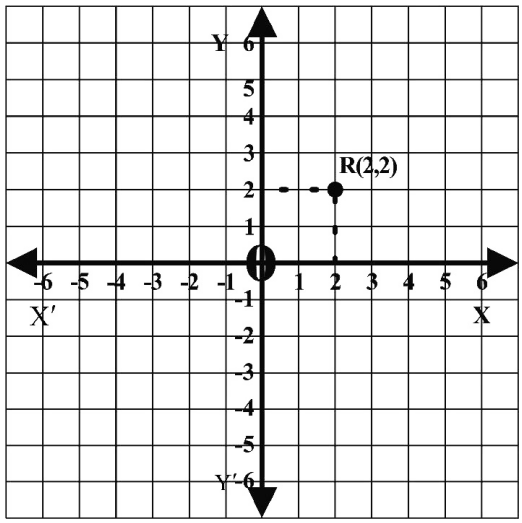
Q (–5, –2)

It lies in third quadrant



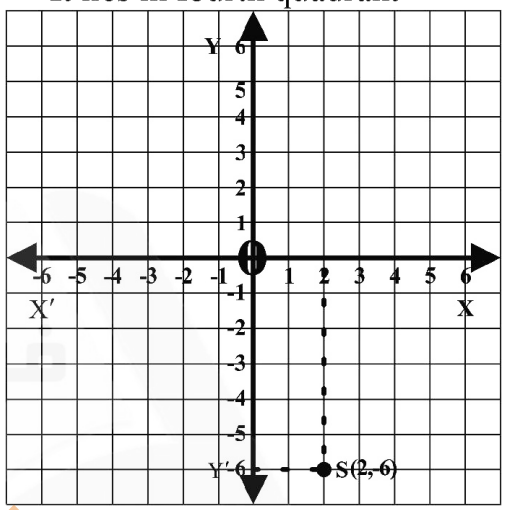
R (2, 2)

It lies in first quadrant



S (2, –6)

It lies in fourth quadrant

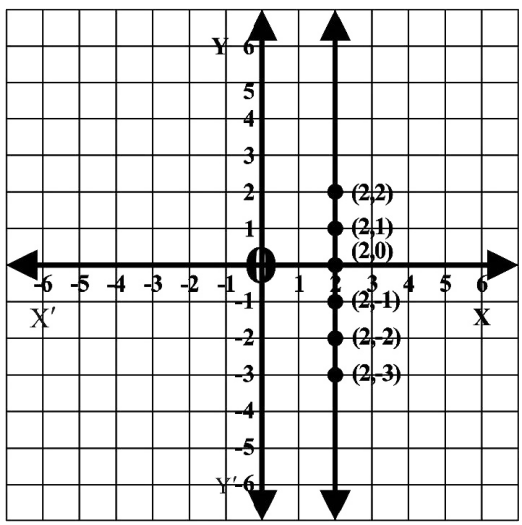


Q.2 Draw the graph of each of the following i.e.

(i) $x = 2$

The table for the points of equation $x = 2$ is as under

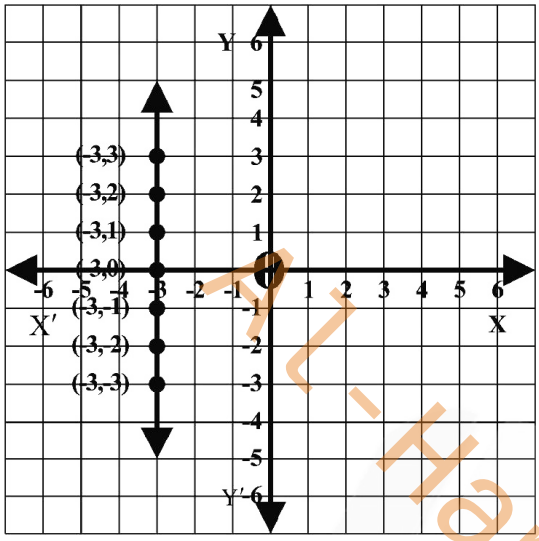
x	2	2	2	2	2	2
y	-3	-2	-1	0	1	2



(ii) $x = -3$

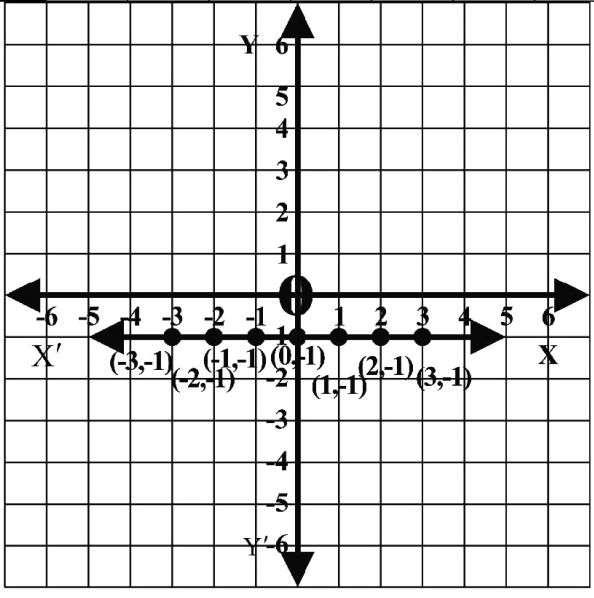
The table for the points of equation $x = -3$ is as under

x	-3	-3	-3	-3	-3	-3	-3
y	-3	-2	-1	0	1	2	3



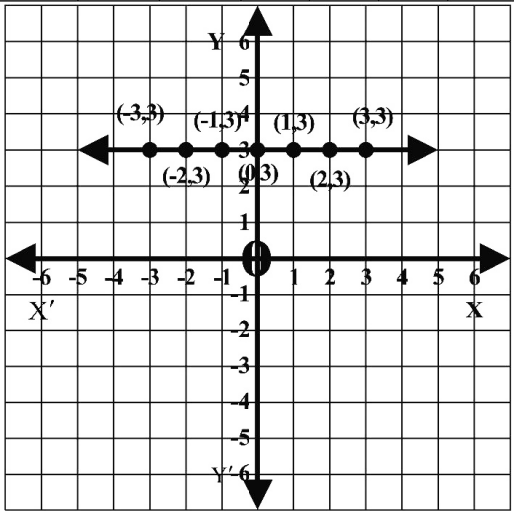
(iii) $y = -1$

x	-1	-1	-1	-1	-1	-1	-1
y	-3	-2	-1	0	1	2	3



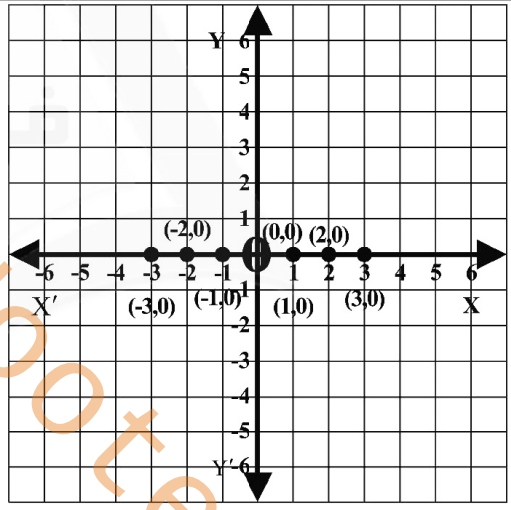
(iv) $y = 3$

x	3	3	3	3	3	3	3	3
y	-3	-2	-1	0	1	2	3	4



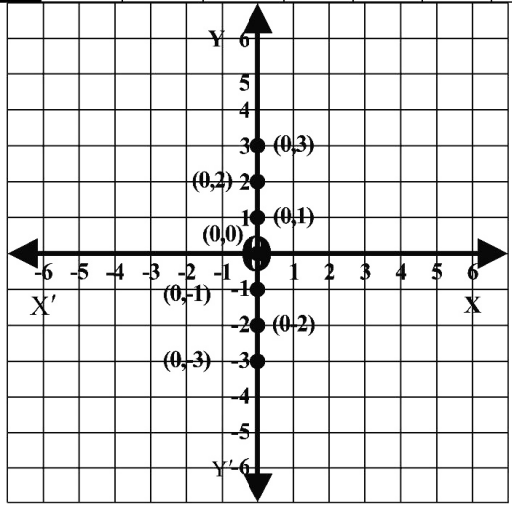
(v) $y = 0$

x	-3	-2	-1	0	1	2	3	4
y	0	0	0	0	0	0	0	0



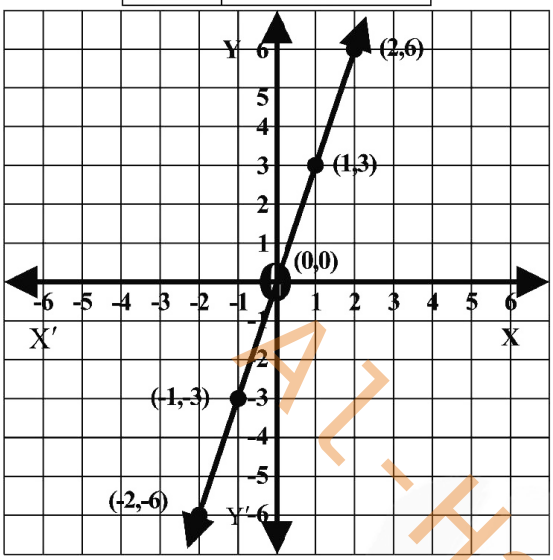
(vi) $x = 0$

x	0	0	0	0	0	0	0
y	-3	-2	-1	0	1	2	3



(vii) $y = 3x$

x	$y = 3x$
....	....
–2	$3(-2) = -6$
–1	$3(-1) = -3$
0	$3(0) = 0$
1	$3(1) = 3$
2	$3(2) = 6$
...	...



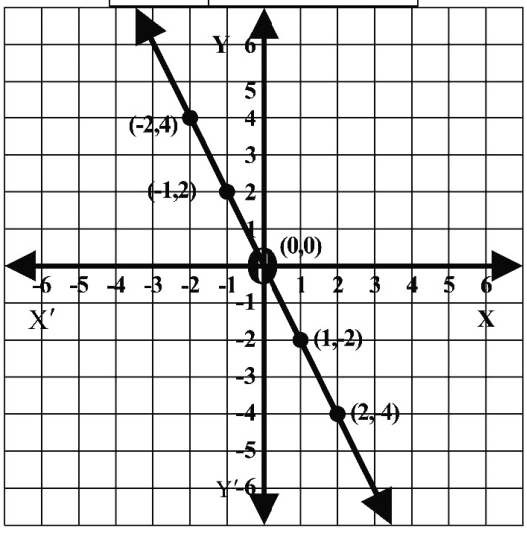
(viii) $-y = 2x$

Multiply both sides by (–)

$-(-y) = -2x$

$y = -2x$

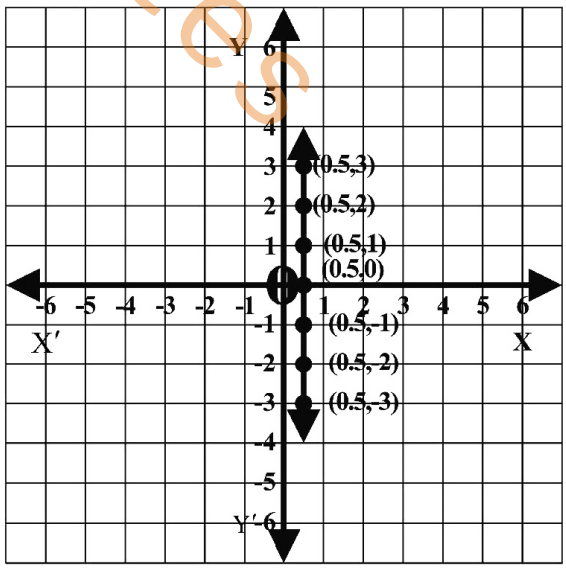
x	$y = -2x$
....	....
–2	$-2(-2) = 4$
–1	$-2(-1) = 2$
0	$-2(0) = 0$
1	$-2(1) = -2$
2	$-2(2) = -4$
...	...



(ix) $\frac{1}{2} = x$

Or $x = \frac{1}{2}$

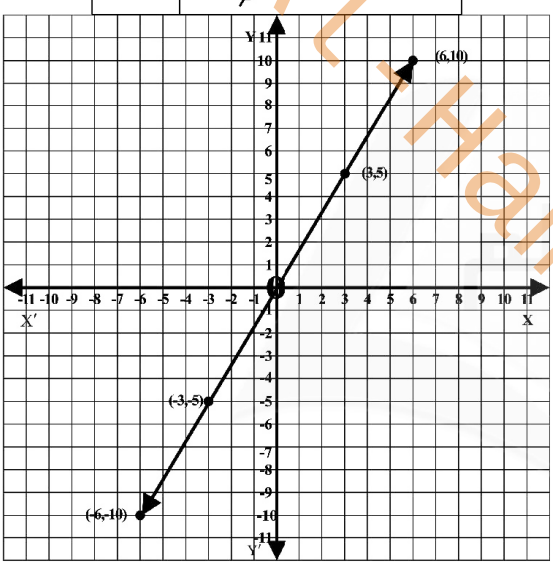
x	y
$\frac{1}{2} = 0.5$	–3
$\frac{1}{2} = 0.5$	–2
$\frac{1}{2} = 0.5$	–1
$\frac{1}{2} = 0.5$	0
$\frac{1}{2} = 0.5$	1
$\frac{1}{2} = 0.5$	2
$\frac{1}{2} = 0.5$	.....



(x) $3y = 5x$

$y = \frac{5}{3}x$

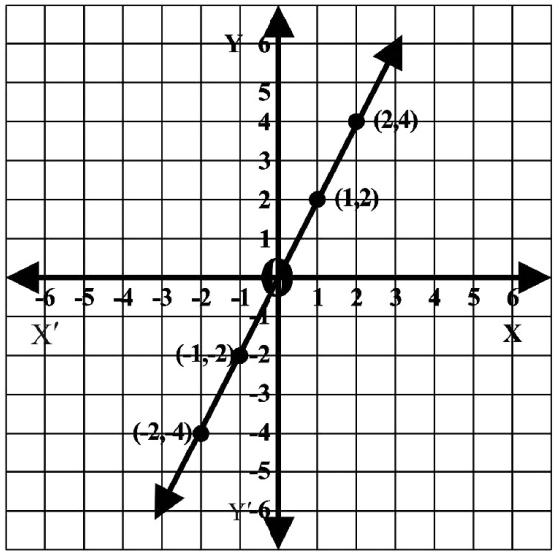
x	$y = \frac{5}{3}x$
-6	$\frac{5}{\cancel{3}} \times -\cancel{6}^{2} = -10$
–3	$\frac{5}{\cancel{3}} \times \cancel{-3} = -5$
0	$\frac{5}{3} \times 0 = 0$
3	$\frac{5}{\cancel{3}} \times \cancel{3} = 5$
6	$\frac{5}{\cancel{3}} \times \cancel{6}^{2} = 10$



(xi) $2x - y = 0$

$2x = y$ or $y = 2x$

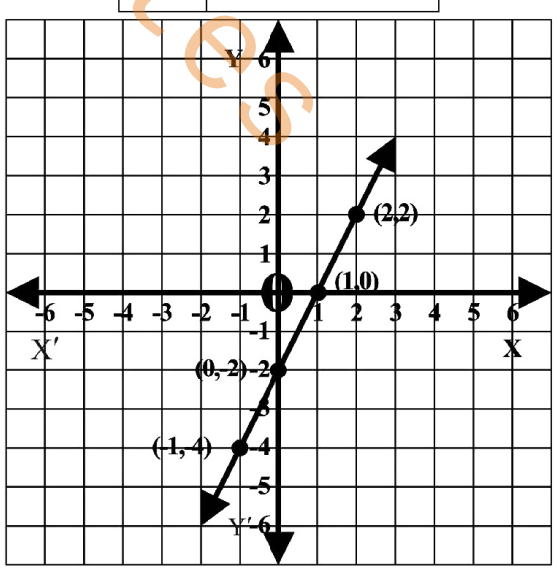
x	y = 2x
–2	2(–2)= –4
–1	2(–1)= –2
0	2(0)= 0
1	2(1)= 2
2	2(2)= 4



(xii) $2x - y = 2$

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

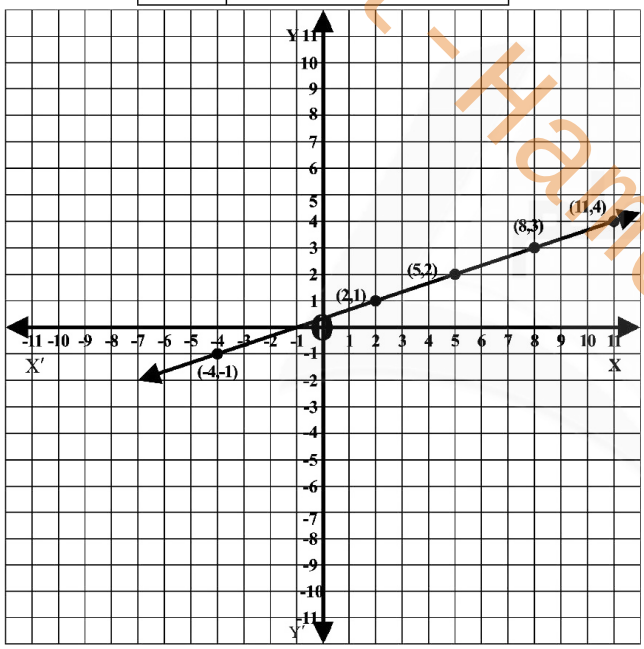
x	y = 2x -2
–1	2(–1)–2= –4
0	2(0)–2= –2
1	2(1)–2= 0
2	2(2)–2= 2



(xiii) $x-3y+1=0 \Rightarrow x+1=+3y$

$$y=\frac{x+1}{3}$$

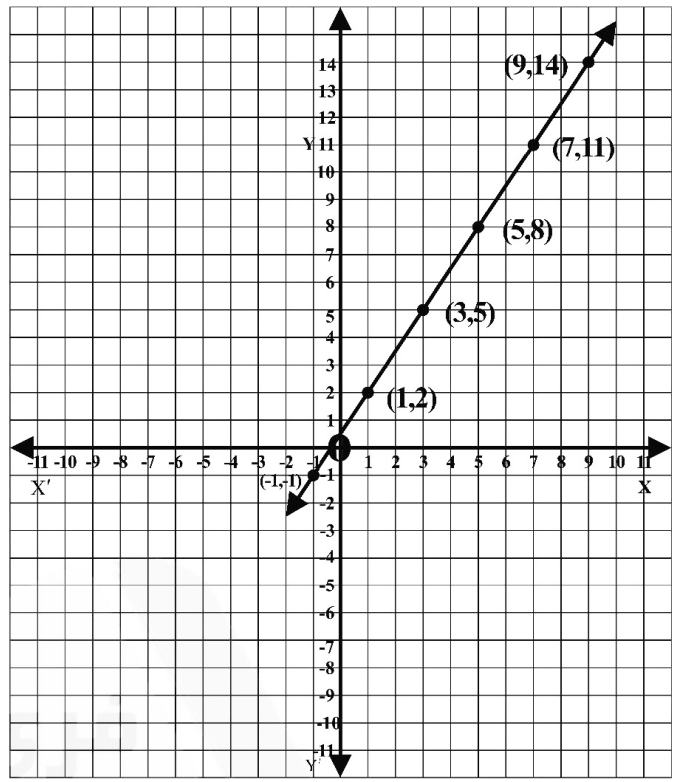
x	$y=\frac{x+1}{3}$
-4	$y=\frac{-4+1}{3}=-1$
2	$y=\frac{2+1}{3}=1$
5	$y=\frac{5+1}{3}=2$
8	$y=\frac{8+1}{3}=3$
11	$y=\frac{11+1}{3}=4$



(xiv) $3x-2y+1=0$

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

x	$y=\frac{3x+1}{2}$
-1	$y=\frac{3(-1)+1}{2}=\frac{-2}{2}=-1$
1	$y=\frac{3(1)+1}{2}=\frac{4}{2}=2$
3	$y=\frac{3(3)+1}{2}=\frac{10}{2}=5$
5	$y=\frac{3(5)+1}{2}=\frac{16}{2}=8$
7	$y=\frac{3(7)+1}{2}=\frac{22}{2}=11$
9	$y=\frac{3(9)+1}{2}=\frac{28}{2}=14$



Q.3 Are the following lines (i) parallel to $x-axis$ (ii) parallel to $y-axis$

Solution:

(i) $2x-1=3$

$2x=3+1$

$2x=4$

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

$x=2$ it is a line parallel to y-axis

(ii) $x+2=-1$

$x=-1-2$

$x=-3$ it is a line parallel to $y-axis$

(iii) $2y+3=2$

$2y=2-3$

$2y=-1$

$y = \frac{-1}{2}$ it is a line parallel to $x-axis$

(iv) $x + y = 0$

$x = -y$ It is neither parallel to $x-axis$ nor $y-axis$

(v) $2x - 2y = 0$

$2x = 2y$

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

$x = y$

$y = x$

It is neither parallel to $x-axis$ nor $y-axis$

Q.4 Find the value of m and c of the following lines by expressing them in the form $y = mx + c$

Solution:

(a) $2x + 3y - 1 = 0$

$3y = -2x + 1$

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

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

$m = -\frac{2}{3}$ and $c = \frac{1}{3}$

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

$x + 2 = 2y$

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

Or

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

$y = \frac{1}{2}x + \frac{2}{2}$

$y = \frac{1}{2}x + 1$

So, $m = \frac{1}{2}$ $c = 1$

(c) $3x + y - 1 = 0$

$y = 1 - 3x$

or

$y = -3x + 1$

$m = -3$ $c = 1$

(d) $2x - y = 7$

$2x - 7 = y$

Or

$y = 2x - 7$

$m = 2$ $c = -7$

(e) $3 - 2x + y = 0$

$y = 2x - 3$

$m = 2$ $c = -3$

(f) $2x = y + 3$

$2x - 3 = y$

Or

$y = 2x - 3$

$m = 2$ $c = -3$

Q.5 Verify whether the following point lies on the line 2x–y + 1 =0 or not

Solution:

(i) (2, 3)

$2x - y + 1 = 0$

$2(2) - 3 + 1 = 0$

$4 - 3 + 1 = 0$

$2 \neq 0$

$\therefore$ The point does not lie on the line

(ii) (0, 0)

$2x - y + 1 = 0$

$2(0) - 0 + 1 = 0$

$0 - 0 + 1 = 0$

$1 \neq 0$

$\therefore$ The point does not lie on the line

(iii) $(-1, 1)$

$2x - y + 1 = 0$

$2(-1) - 1 + 1 = 0$

$-2 - 1 + 1 = 0$

$-2 \neq 0$

$\therefore$ The point does not lie on the line

(iv) $(2, 5)$

$2x - y + 1 = 0$

$2(2) - 5 + 1 = 0$

$4 - 5 + 1 = 0$

$0 = 0$

$\therefore$ It lies on the line

(v) $(5, 3)$

$2x - y + 1 = 0$

$2(5) - 3 + 1 = 0$

$10 - 3 + 1 = 0$

$8 \neq 0$

$\therefore$ It does not lie on the line

Exercise 8.2

Q.1

Draw the conversion graph between liters and gallons using the relation 9 liters = 2 gallons (approximately) and taking liters along horizontal axis and gallons along vertical axis from the graph read.

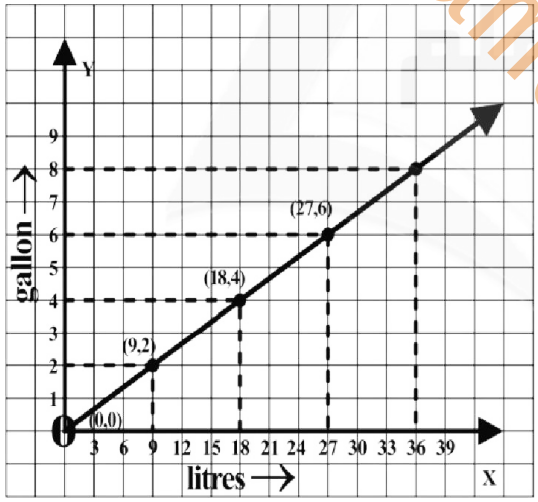
(i) The number of gallons in 18 liters.

(ii) The number of liters in 8 gallons.

We know 9 liters = 2 gallons

$1\text{liters} = \frac{2}{9}$ gallons

Solution:



$y = \frac{2}{9}x$

x	0	9	18	27
y	0	2	4	6

18 litters=4 gallons

Scale

Along *X-axis*

3 litters = 1 box

Along *Y-axis*

1 gallon = 1 box

(i) The number of gallons in 18 liters.

Ans: =4 Gallons

(ii) The number of liters in 8 gallons.

Ans: =36 Liters

Q.2 **On** 15-03-2008 **the exchange rate of Pakistan currency and Saudi Riyal was as under 1SRial = 16.70 rupees**

If Pakistani currency y is an expression of S. Riyal x expressed under. The rule $y = 16.70\ x$ then draw the conversion graph between these two currencies by taking S. riyal along x axis.

1SR = 16.70 Rupees

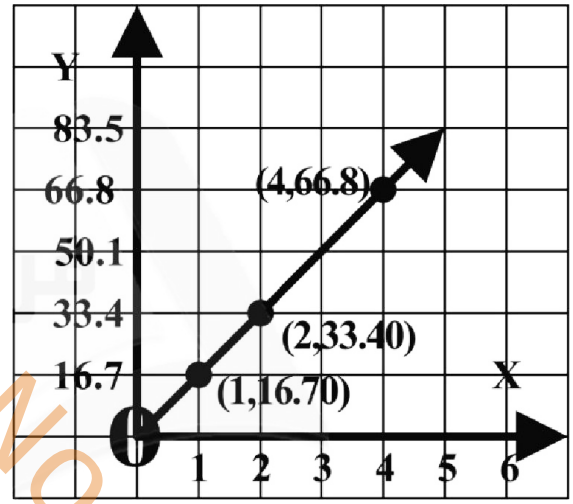
Scale

Along *X-axis*

1 SR =1 box

Along *Y-axis*

Rupees 16.7 = 1 box



x	1	2	3	4
y	16.70	33.4	50.1	66.8

Q.3 **Sketch the graph of each of the following lines.**

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

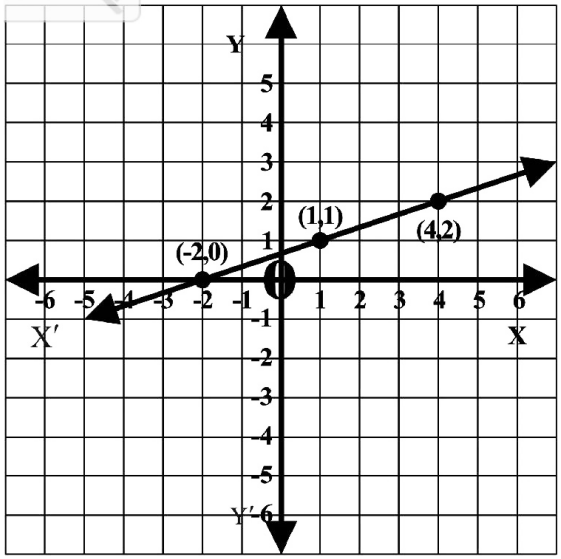
$x+2=3y$

$\frac{x+2}{3} = y$

Or

$y = \frac{x+2}{3}$

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



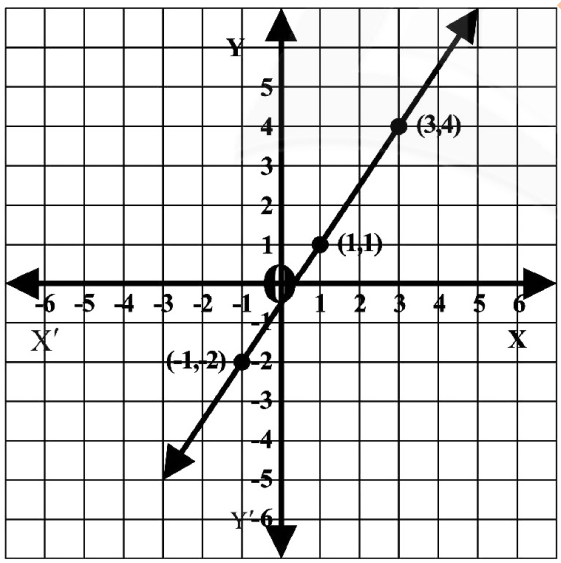
(b) $3x-2y-1=0$

$3x-1=2y$

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

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

x	1	3	−1
y	1	4	−2

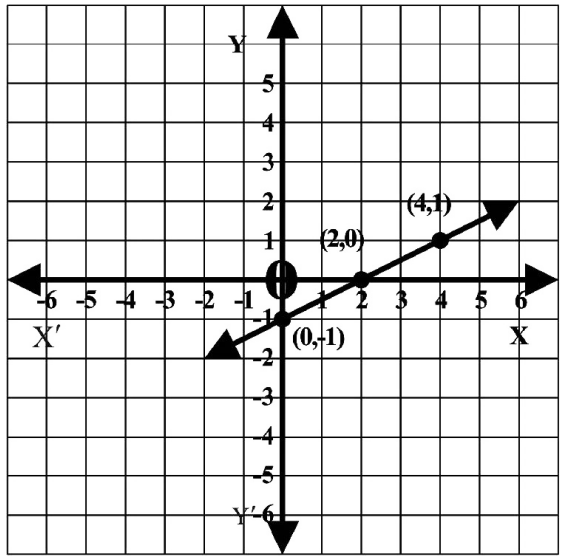


(c) $2y-x+2=0$

$2y=x-2$

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

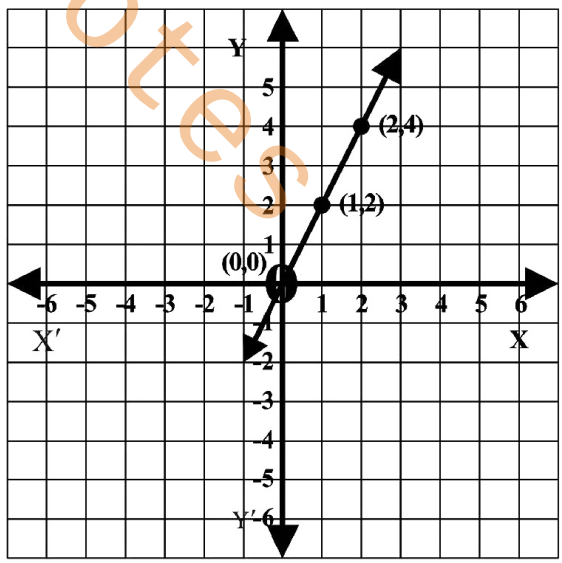
x	0	2	4
y	−1	0	1



(d) $y-2x=0$

$y=2x$

x	0	1	2
y	0	2	4

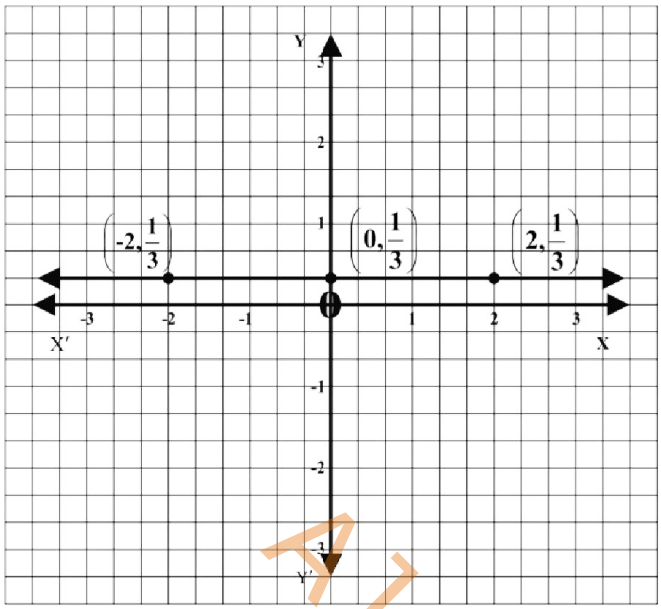


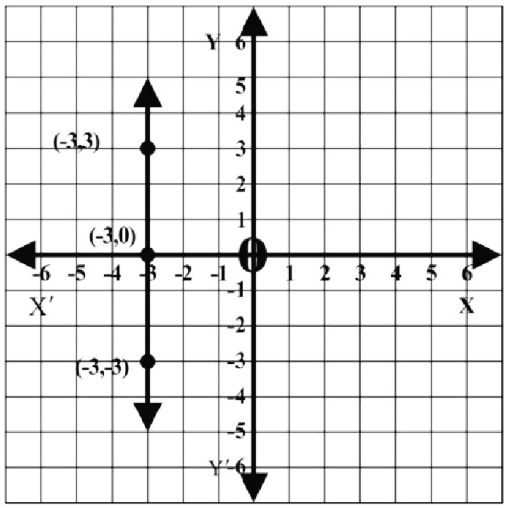
(e) $3y-1=0$

$3y=1$

$y=\frac{1}{3}$

x	-2	0	2
y	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

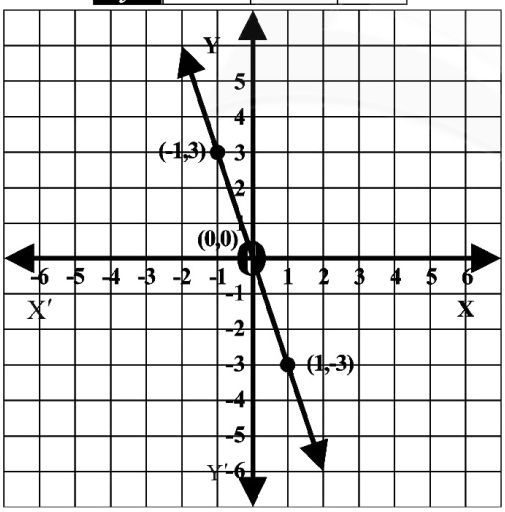




(f) $y+3x=0$

$y=-3x$

x	1	−1	0
y	−3	3	0



(g) $2x+6=0$

$2x=-6$

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

$x=-3$

x	-3	-3	-3
y	3	0	-3

Q.4 Draw the graph for following relations

(i) One mile $=1.6km$

$y=1.6x$

Scale

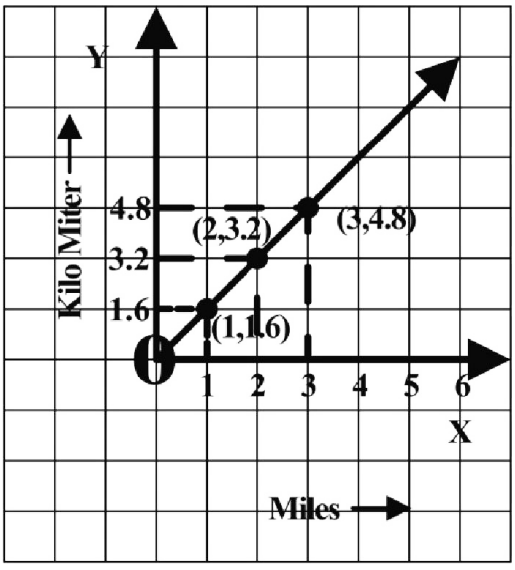
Along *x-axis*

1 Big Square = 1 Unit

Along *y-axis*

1 Big Square = 1.6 Units

x	0	1	2	3
y	0	1.6	3.2	4.8



(ii) One acre $= 0.4$ hectare

$y = 0.4x$

x	2	4
y	0.8	1.6

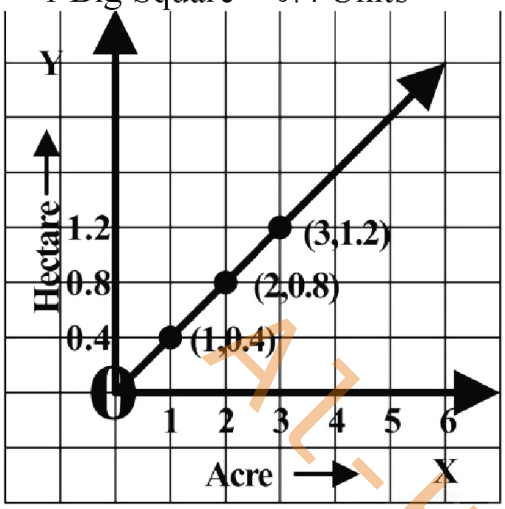
Scale

Along *x-axis*

1 Big Square= 1 Unit

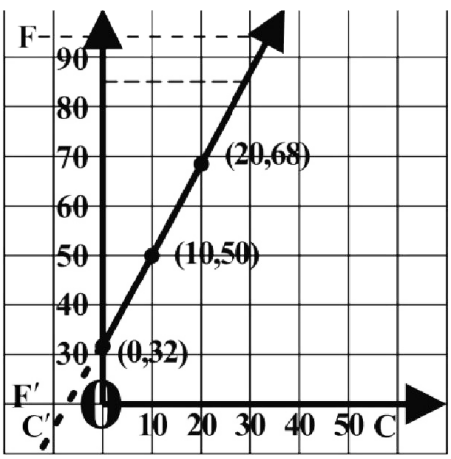
Along *y-axis*

1 Big Square = 0.4 Units



(iii) $F = \frac{9}{5}c + 32$

C	$F = \frac{9}{5}C + 32$
5	$\frac{9}{5} \times 5 + 32 = 41$
10	$\frac{9}{5} \times 10 + 32 = 50$
15	$\frac{9}{5} \times 15 + 32 = 59$
20	$\frac{9}{5} \times 20 + 32 = 68$



$10° =$ Length of square

Where value of c $= x$ and value of $f =$ y

x	5	10	15	20
y	41	50	59	68

(iv) 1Rupee $= \frac{1}{86}$\$

Scale

Along *x-axis*

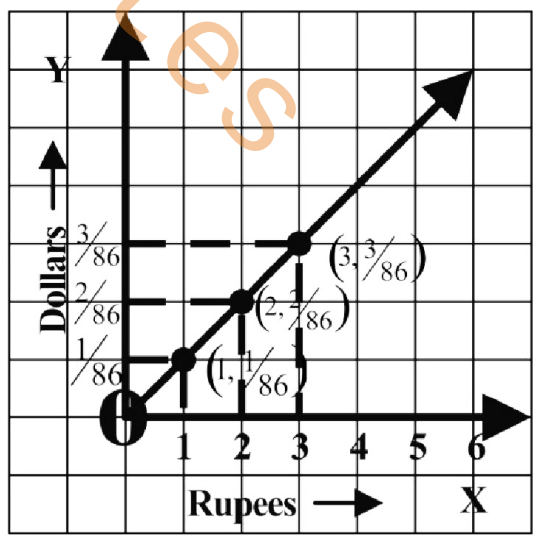
1 Big Square = 1 Unit

Along *y-axis*

1 Big Square = $\frac{1}{86}$ Units

$y = \frac{1}{86}x$

x	0	1	2	3
y	0	$\frac{1}{86}$	$\frac{2}{86}$	$\frac{3}{86}$



Exercise 8.3

Q.1 $x+y=0 \quad \text{——}(\text{I})$ and $2x-y+3=0-(\text{II})$

From equation I

from equation II

$y=-x$

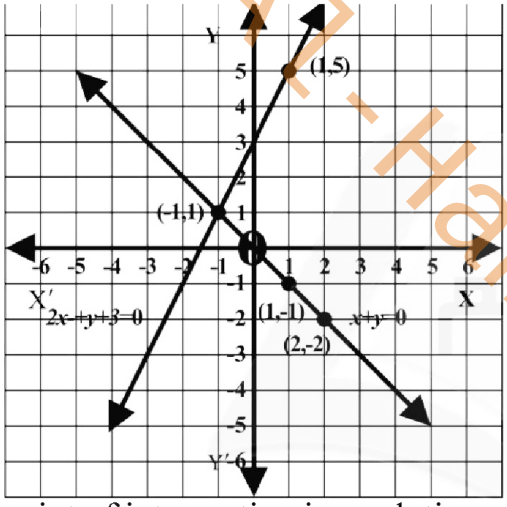
$2x-y+3=0$

$2x+3=y$

$y=2x+3$

x	$y=-x$	(x,y)
1	$-1(1)=-1$	(1,-1)
2	-(2)=-2	(2,-2)

x	$y=2x+3$	(x,y)
1	2(1)+3 = 5	(1,5)
−1	2(-1)+3=1	(-1,1)



The point of intersection is a solution set

Solution Set $=\{(-1,1)\}$

Q.2 $x-y+1=0$

$x-2y=-1$

$x+1=y$

$x+1=2y$

$y=x+1$

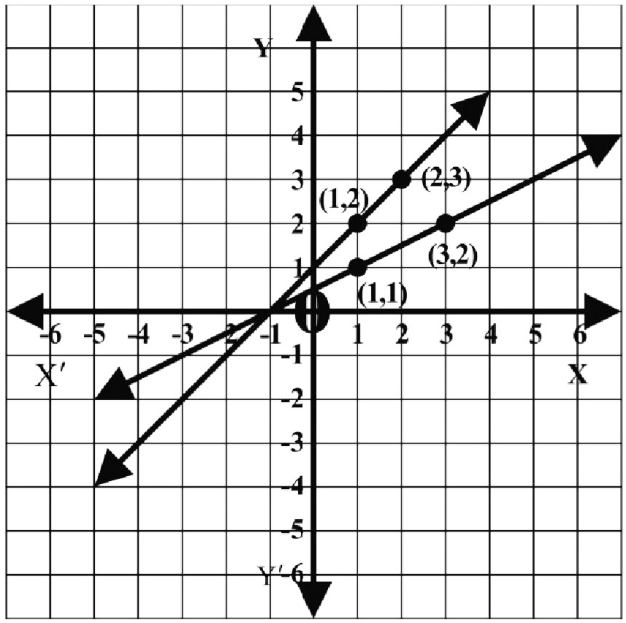
$\frac{x+1}{2}=y$

Or

$y=\frac{x+1}{2}$

x	$y=x+1$	(x,y)
1	1+1 = 2	(1,2)
2	2+1 = 3	(2,3)

x	$y=\frac{x+1}{2}$	(x,y)
1	$\frac{1+1}{2}=\frac{2}{2}=1$	(1,1)
3	$\frac{3+1}{2}=\frac{4}{2}=2$	(3,2)



Point of intersection is a solution set

Solution Set $=\{(-1,0)\}$

Q.3 $2x+y=0$

$x+2y=2$

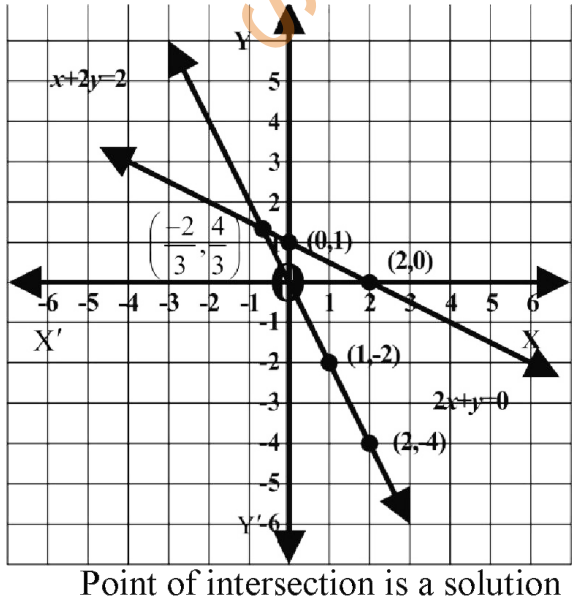
$y=-2x$

$2y=2-x$

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

x	$y=-2x$	(x,y)
1	$-2(1)=-2$	(1,-2)
2	$-2(2)=-4$	(2,-4)

x	$y=\frac{2-x}{2}$	(x,y)
0	$\frac{2-0}{2}=\frac{2}{2}=1$	(0,1)
2	$\frac{2-2}{2}=\frac{0}{2}=0$	(2,0)



Point of intersection is a solution

Solution Set $=\left(\frac{-2}{3},\frac{4}{3}\right)$

Q.4 $x+y-1=0$

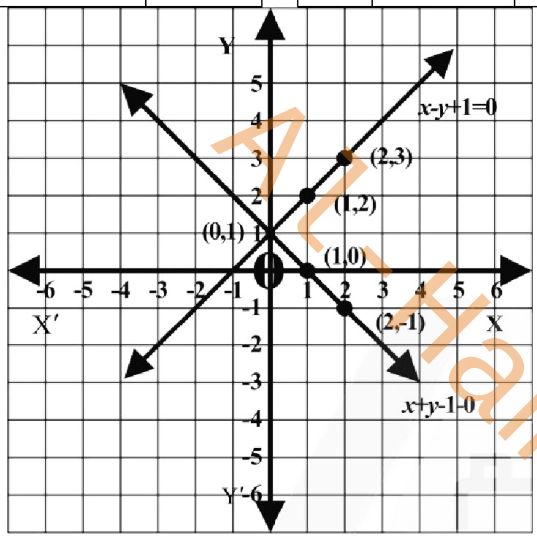
$x-y+1=0$

$y=1-x$

$x+1=y$ Or $y=x+1$

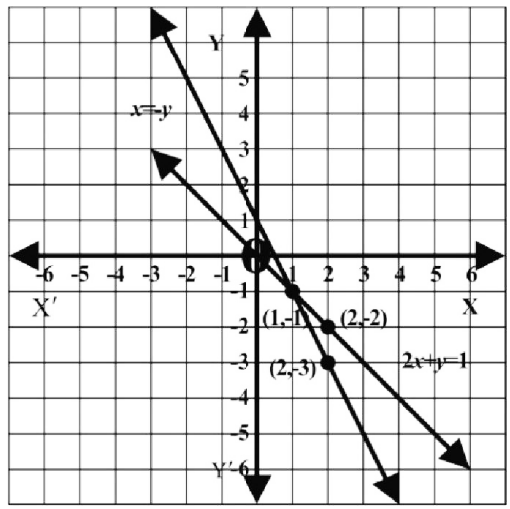
x	$y=1-x$	x,y
1	1–1= 0	(1,0)
2	1–2 = –1	(2,-1)

x	$y=x+1$	x,y
1	1+1 = 2	(1,2)
2	2+1 = 3	(2,3)



Point of intersection is a solution set

Solution Set $=\{(0,1)\}$



Point of intersection is a solution set

Solution Set $=\{(1,-1)\}$

Q.5 $2x+y-1=0$

$x=-y$

$y=1-2x$

$y=-x$

x	$y=1-2x$	(x,y)
1	1–2(1)= –1	(1,-1)
2	1–2(2) = –3	(2,-3)

x	$y=-x$	(x,y)
1	–(1) = –1	(1,-1)
2	–(2) = –2	(2,-2)

Review Exercise 8

Q.1 Choose the correct answer

(i) **If** $(x-1, y+1)=(0,0)$, **Then** (x, y) **is**

(a) (1,-1) **(b)** (-1,1)
(c) (1,1) **(d)** (-1,-1)

(ii) **If** $(x, 0)=(0, y)$ **Then** (x, y) **is**

(a) (0,1) **(b)** (1,0)
(c) (0,0) **(d)** (1,1)

(iii) **Point** $(2,-3)$ **lies in quadrant**

(a) I **(b)** II
(c) III **(d)** IV

(iv) **Point** $(-3,-3)$ **lies in quadrant**

(a) I **(b)** II
(c) III **(d)** IV

(v) **If** $y=2x+1, x=2$ **Then** y **is**

(a) 2 **(b)** 3
(c) 4 **(d)** 5

(vi) **Which order pair satisfy the equation** $y=2x$

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

ANSWER KEYS

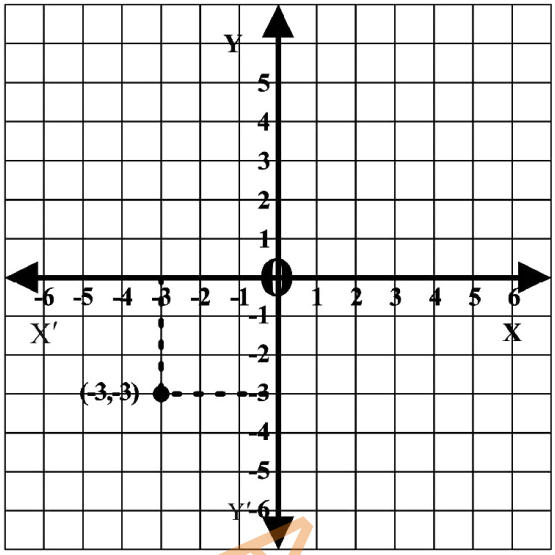
1	2	3	4	5	6
a	c	d	c	d	a

Q.2 Identify the following statement as true or false

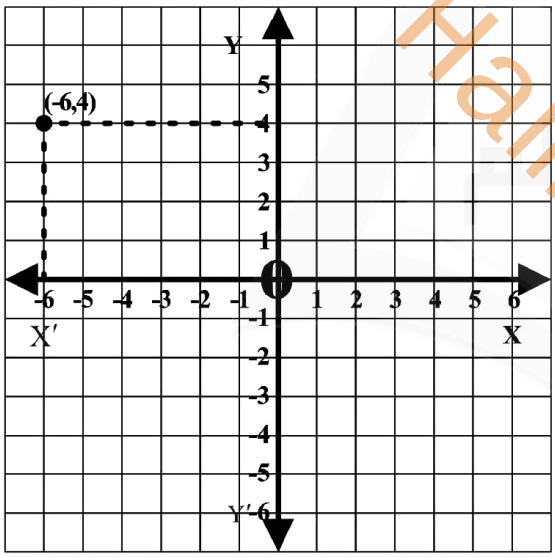
1.	The point O(0,0) is in quadrant II	False
2.	The point p (2,0) lies on x-axis	True
3.	The graph of x=-2 is a vertical line	True
4.	3-y =0 is a horizontal line	True
5.	The point Q (-1,2) is in quadrant II	True
6.	The point R (-1,-2) is in quadrant IV	False
7.	$y = x$ is a line on which origin lies	True
8.	The point p (1,1) lies on the line x + y = 0	False
9.	The point S (1,-3) lies in quadrant III	False
10.	The point R (0,1) lien on the x-axis	False

Q.3 Draw the following points on the graph paper

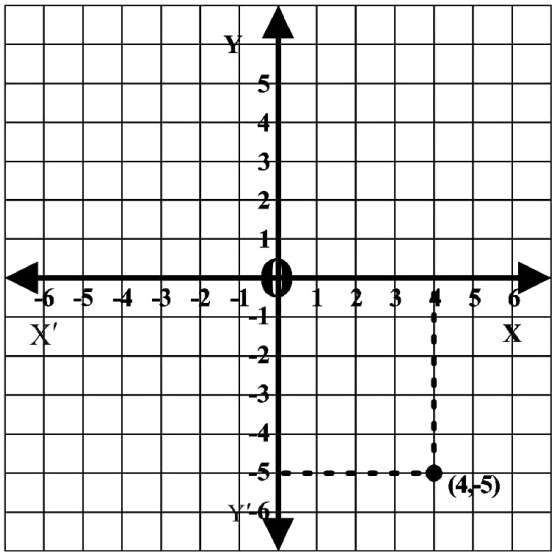
(i) $(-3,-3)$ =>



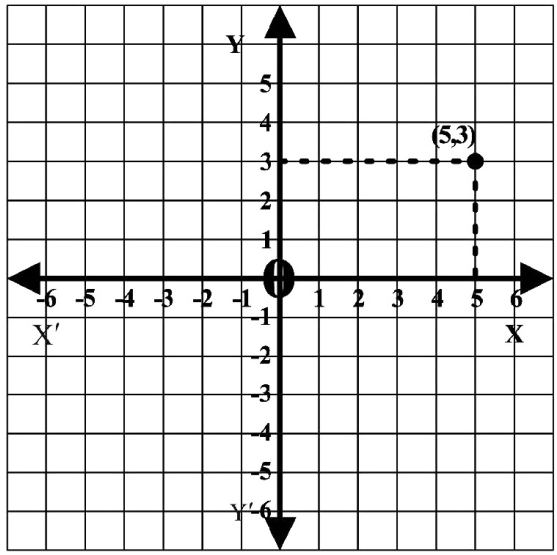
(ii) $(-6,4)$ =>



(iii) $(4,-5)$ =>



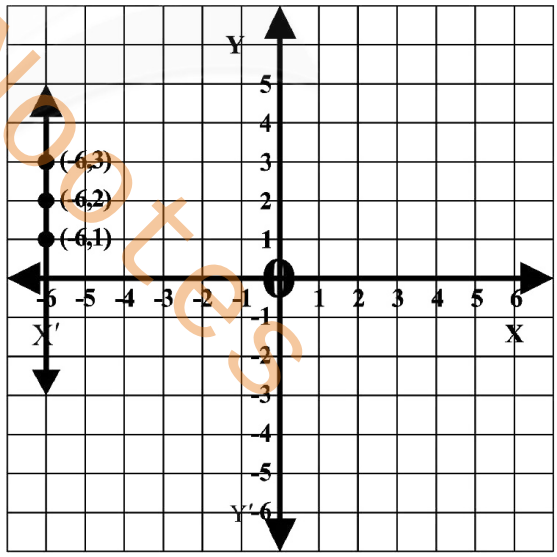
(iv) $(5,3)$



Q.4 Draw the graph of the following

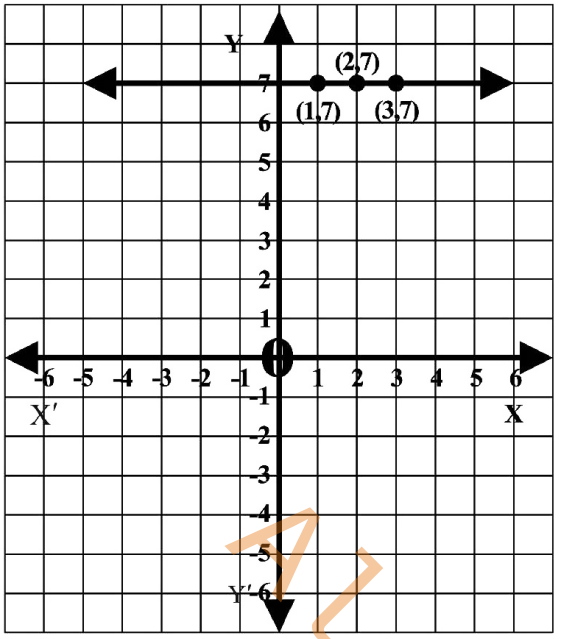
(i) $x = -6$

x	-6	-6	-6
y	1	2	3



(ii) $y = 7$

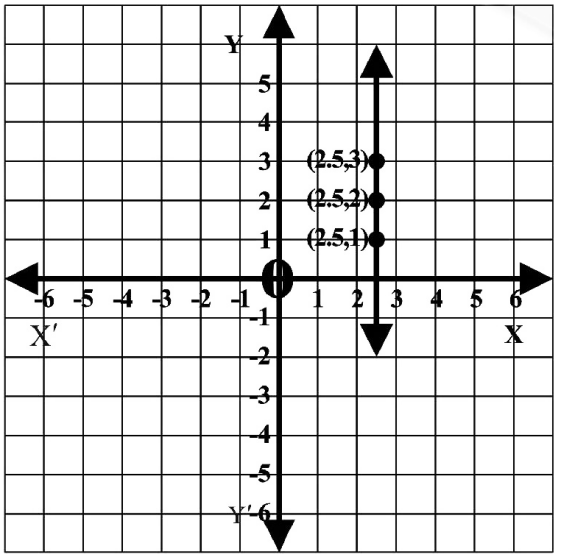
x	1	2	3
y	7	7	7



(iii) $x = \frac{5}{2}$

$x = 2.5$

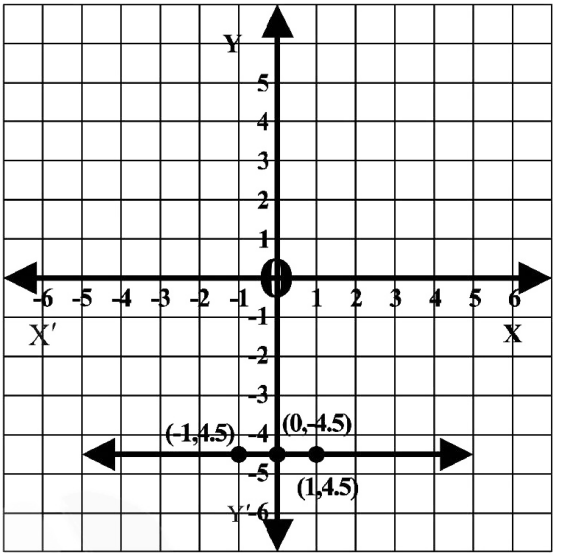
x	2.5	2.5	2.5
y	1	2	3



(iv) $y = -\frac{9}{2}$

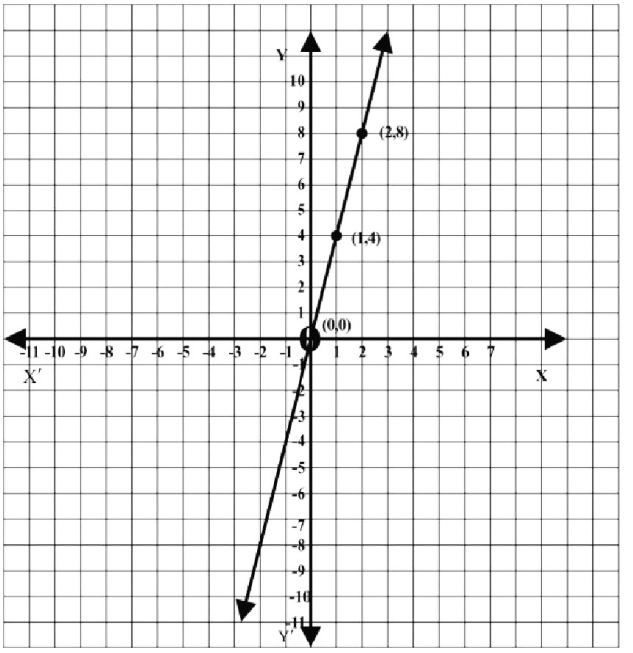
$y = -4.5$

x	-1	0	1
y	-4.5	-4.5	-4.5



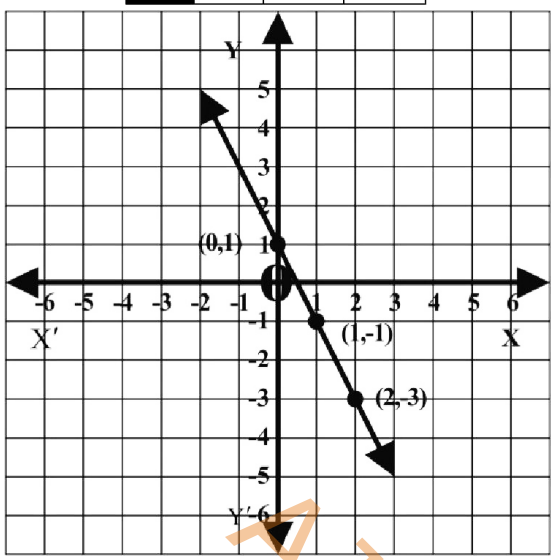
(v) $y = 4x$

x	0	1	2
$y = 4x$	$4\times0 = 0$	$4\times1=4$	$4\times2=8$



(vi) $y = -2x + 1$

x	0	1	2
y	1	-1	-3

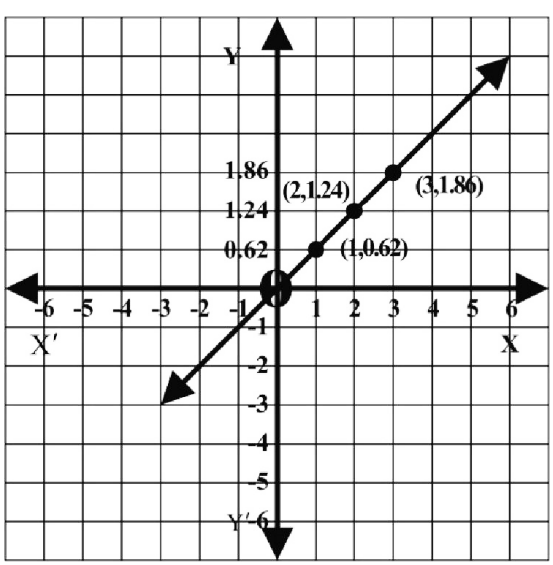


Q.5 Draw the following graph

(i) $y = 0.62x$

x	$y = 0.62x$
1	0.62×1= 0.62
2	0.62×2= 1.24
3	0.62×3= 1.86

Scale
Along *x-axis*
1 Big Square= 1 Unit
Along *y-axis*
1 Big Square = 0.62 Units



(ii) $y = 2.5x$

x	$y = 2.5x$
1	2.5(1) = 2.5
2	2.5(2) = 5.0
3	2.5(3) = 7.5

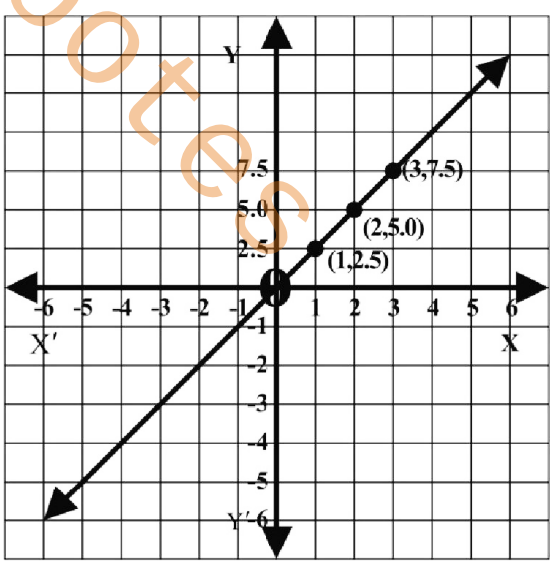
Scale

Along *x-axis*

1 Big Square= 1 Unit

Along *y-axis*

1 Big Square = 2.5 Units



Q.6

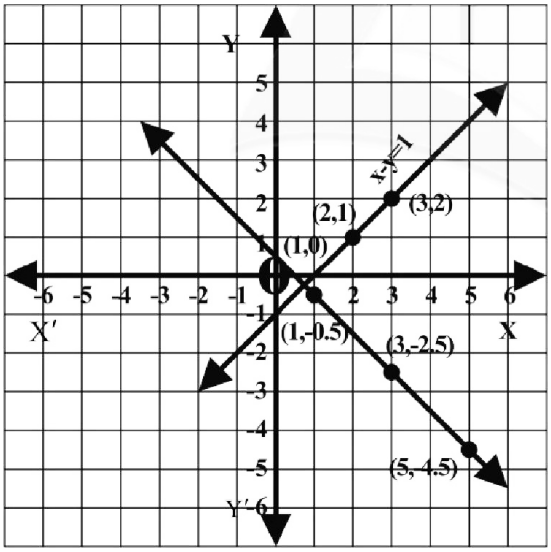
(i) $x - y = 1$ $\qquad x + y = \frac{1}{2}$

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

or $y = x - 1$ $\qquad y = \frac{1 - 2x}{2}$

x	$y = x-1$
1	1–1 = 0
2	2–1=1
3	3–1=2

x	$y = \frac{1-x}{2}$
1	$\frac{1-2}{2} = -\frac{1}{2}$
3	$\frac{1-6}{2} = \frac{-5}{2}$
5	$\frac{1-10}{2} = \frac{-9}{2}$



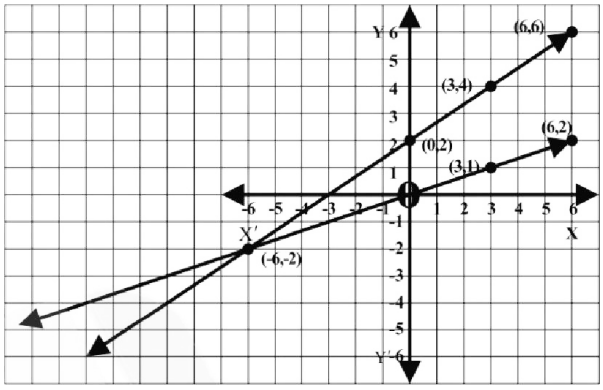
Point of intersection is a solution set

Solution Set $= \left\{\left(\frac{3}{4}, -\frac{1}{4}\right)\right\}$

(ii) $x = 3y$

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

x	$y = \frac{1}{3}x$
3	$\frac{1}{\cancel{3}} \times \cancel{3} = 1$
6	$\frac{1}{\cancel{3}} \times \cancel{6}^{2} = 2$



$2x - 3y = -6$

$2x + 6 = 3y$

$\frac{2x+6}{3} = y$

$y = \frac{2x+6}{3}$

Point of intersection is a solution set

Solution Set $= \{(-6, -2)\}$

x	$y = \frac{2x+6}{3}$
0	$\frac{2(0)+6}{3} = \frac{\cancel{6}^{2}}{\cancel{3}} = 2$
3	$\frac{2(3)+6}{3} = \frac{\cancel{12}^{4}}{\cancel{3}} = 4$
6	$\frac{2(6)+6}{3} = \frac{\cancel{18}^{6}}{\cancel{3}} = 6$

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

$x+y=6$ $x-y=-2$

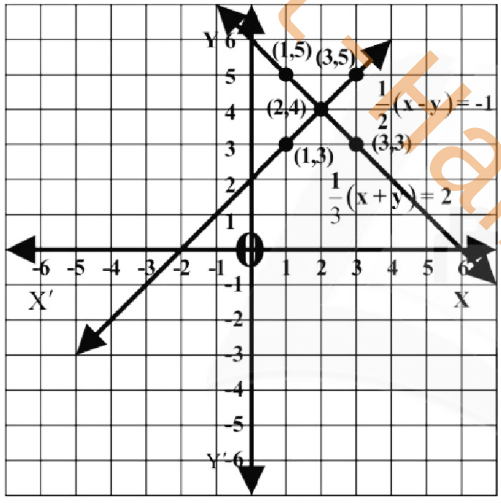
$y=6-x$ $x+2=y$

x	y=6-x
1	6–1 = 5
2	6–2=4
3	6–3=3

x	y= x+2
1	1+2 = 3
2	2+2 = 4
3	3+2 = 5

Point of intersection is a solution set

Solution Set $=\{(2,4)\}$



Unit 8: Linear Graph & Their Application

Overview

Ordered pair:

An ordered pair of real numbers x and y is a pair (x, y) in which elements are written in specific order.

For example $(2,3), (-1,-3)$

Cartesian Plane:

In plane two mutually perpendicular straight lines are drawn. The lines are called the coordinate axes. The point O, where the two lines meet is called origin. This plane is called the coordinate plane or the Cartesian plane.

Abscissa:

First value of the order pair (x, y) is called abscissa.

Ordinate:

Second value of the order pair (x, y) is called ordinate.

For Example $(5,-3)$

5 is abscissa and –3 is an ordinate