EXERCISE 5.1

Q.1 Solve and represent the solution on a real line.

(i) $12x+30=-6$

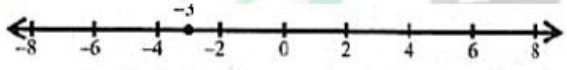
Ans:

$12x+30=-6$

$12x=-6-30=-36$

$x=\dfrac{-36}{12}$

$x=-3$



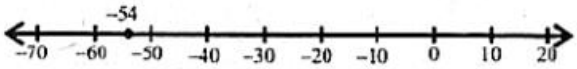
(ii) $\dfrac{x}{3}+6=-12$

Ans:

$\dfrac{x}{3}=-12-6=18$

$x=3x-18=3x-18$

$x=-54$



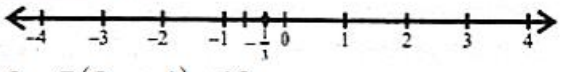
(iii) $\dfrac{x}{2}-\dfrac{3x}{4}=\dfrac{1}{12}$

Ans:

$\dfrac{2x-3x}{4}=\dfrac{1}{12}$

$-x=\dfrac{4}{12}=\dfrac{1}{3}$

$x=-\dfrac{1}{3}$



(iv) $2=7(2x+4)+12x$

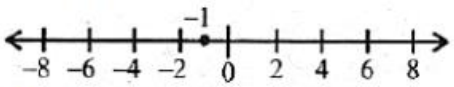
Ans:

$2=14x+28+9x$

$2-28=23x$

$-\dfrac{26}{23}=x$

$x=\dfrac{-26}{23}$



(v) $\dfrac{2x-1}{3}-\dfrac{3x}{4}=\dfrac{5}{6}$

Ans:

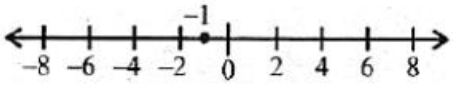
$\dfrac{4(2x-1)-3(3x)}{12}=\dfrac{5}{6}$

$8x-4-9x=\dfrac{12\times5}{6}$

$-x-4=10$

$-x=10+4$

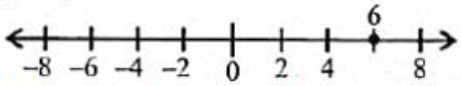
$x=-14$



(vi) $\frac{-5x}{10}=9-\frac{10}{5}x$

Ans:

$$-\frac{5x}{10}+\frac{10x}{5}=9$$
$$\frac{-5x+20x}{10}=9$$
$$15x=9\times10$$
$$x=\frac{90}{15}$$
$$x=6$$

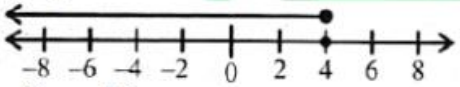


Q.2 Solve each inequality and represent the solution on a real line.

(i) $x-6\le-2$

Ans:

$$x-6\le-2$$
$$x\le-2+6$$
$$x\le4$$



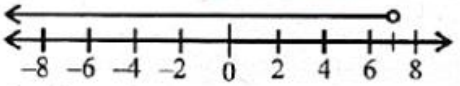
(ii) $-9>-16+x$

Ans:

$$-9+16>x$$
$$7>x$$

Or

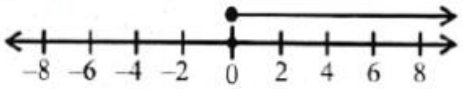
$$x<7$$



(iii) $3+2x\ge3$

Ans:

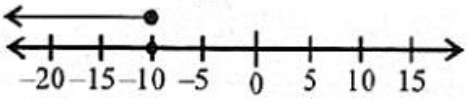
$$2x\ge3-3$$
$$2x\ge0$$
$$x\ge\frac{0}{2}$$
$$x\ge0$$



(iv) $6(x+10)\le0$

Ans:

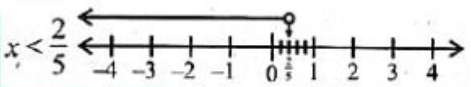
$$6x+60\le0$$
$$6x\le-60$$
$$x\le-\frac{60}{6}$$
$$x\le-10$$



(v) $\frac{5}{3}x-\frac{3}{4}<\frac{-1}{12}$

Ans:

$$\frac{20x-9}{12}<-\frac{1}{12}$$
$$20x-9<-\frac{1}{12}\times12$$
$$20x-9<-1$$
$$2x<-1+9$$
$$2x<8$$
$$x<\frac{8}{20}$$
$$x<\frac{2}{5}$$



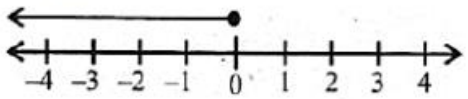
(vi) $\frac{1}{4}x-\frac{1}{2}\le-1+\frac{1}{2}x$

Ans:

$$\frac{x-2}{4}\le\frac{-2+x}{2}$$
$$x-2\le2\left[\frac{-2+x}{2}\right]$$
$$x-2\le2[-2+x]$$
$$x-2\le-4+2x$$
$$-2+4\le2x-x$$
$$2\le x$$

Or

$$x\ge2$$



Q.3 Shade the solution region for the following linear inequalities in xy-plane:

(i) $2x+y\le6$

Ans:

$$2x+y\le6$$

Associated form

$$2x+y=6 \quad \text{(i)}$$

Intercepted form

$$2x+y=6$$

Dividing whole equation by 6

$$\frac{12x}{6}+\frac{y}{6}=\frac{6}{6}$$

$$\frac{x}{3}+\frac{y}{6}=1$$

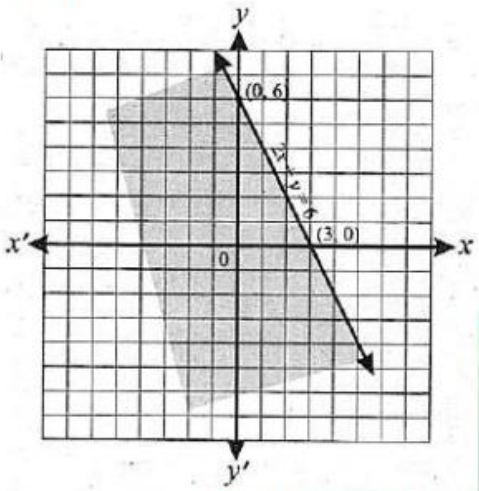
Test point

$(x,y)=(0,0)$ in _____(i)

$2x+y\le 6$

$2(0)+0=6$

$0\le 6$



It is true so toward the origin

(ii) $3x+7y\ge 21$

Ans:

$3x+7y\ge 21$

Associated form

$3x+7y=21$

Intercepted form

$3x+7y=21$

Dividing by 21

$$\frac{3x}{21}+\frac{7y}{21}=\frac{21}{21}$$

$$\frac{x}{7}+\frac{y}{3}=1$$

x into $(7,0)$

y into $(0,3)$

Test point

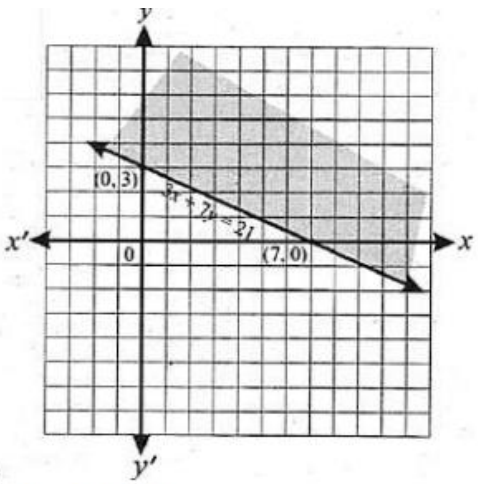
Put $(x,y)=(0,0)$

$3(0)+7(0)\ge 21$

$0\ge 21$

False

It is false so away from origin



(iii) $3x-2y\ge 6$

Ans:

$3x-2y\ge 6$ ____(i)

Associated form

$3x-2y\ge 6$

Dividing by 6

$$\frac{3x}{20}-\frac{2y}{63}=\frac{6}{6}$$

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

x int $(2,0)$

y int $(0,3)$

Test point

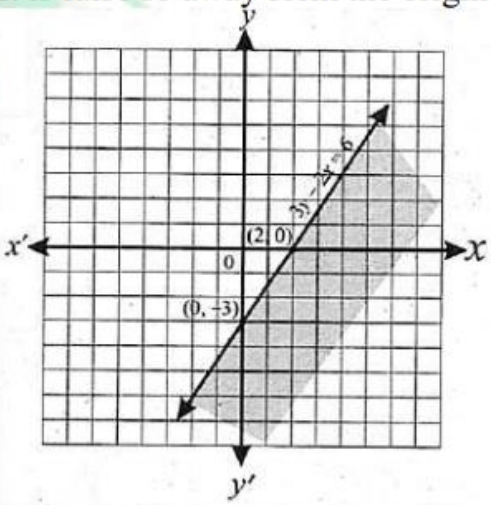
Put $(x,y)=(0,0)$

$3(0)-2(0)\ge 6$

$0\ge 6$

False

It is false so away form the origin



(iv) $5x-4y\le 20$

Ans:

$5x-4y\ge 20$ ____(i)

Associated form

$5x-4y\ge 20$

Dividing by 20

$$\frac{5x}{20}-\frac{4y}{20}\geq\frac{20}{20}$$

$$\frac{x}{4}-\frac{y}{5}\geq 1$$

x int $(4,0)$

y int $(0,-5)$

Test point

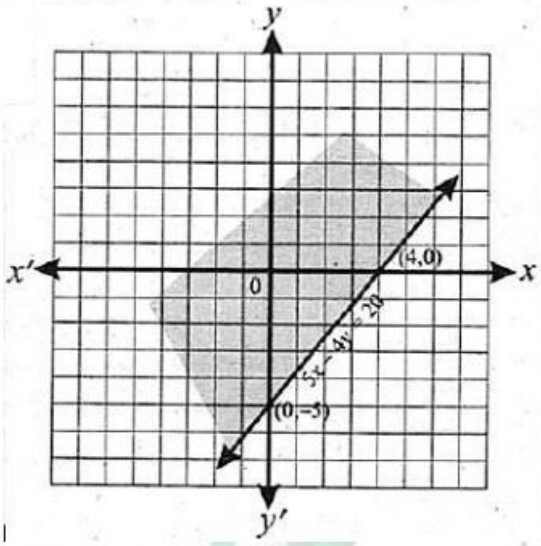
Put $(x,y)=(0,0)$

$3(0)-2(0)\geq 2$

$0\geq 2$

False

It is false so away form the origin



(v) $2x+1\geq 0$

Ans:

$2x+1\geq 0$ ____(i)

Associated form

$2x+1=0$

$2x=-1$

$x=\dfrac{-1}{2}$

Test point $x=0$

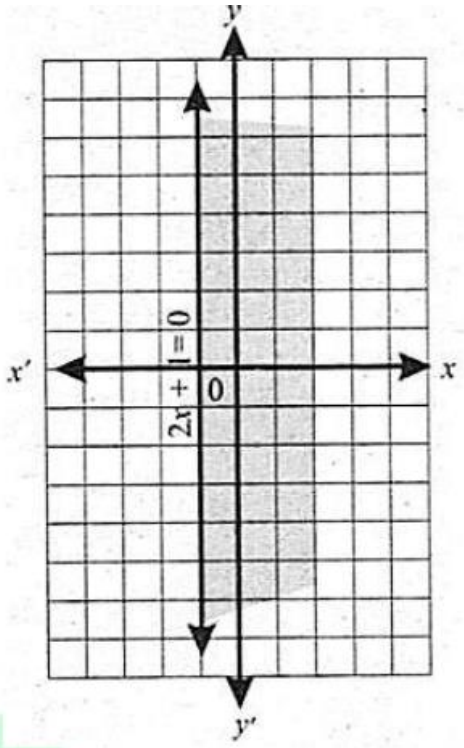
$2x+1\geq 0$

$2(0)+1\geq 0$

$1\geq 0$

True

Towards origin



(vi) $3y-4\leq 0$

Ans:

$3y-4\leq 0$ ____(i)

Associated form

$3y-4=0$

$3y=4$

$y=\dfrac{4}{3}$

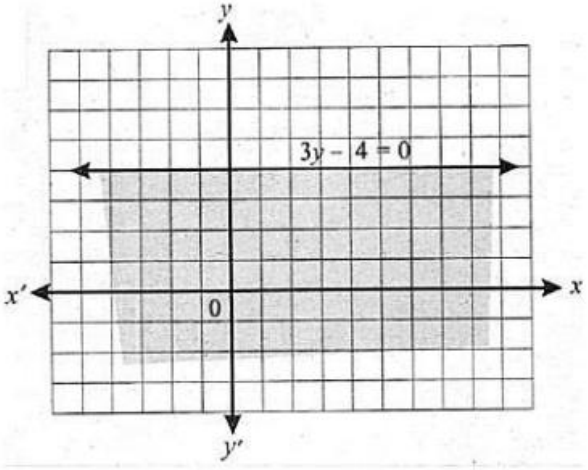
Test point $y=0$

$3(0)-4\leq 0$

$-4\leq$

True

Towards origin



Q.4 **Indicate the solution region of the**

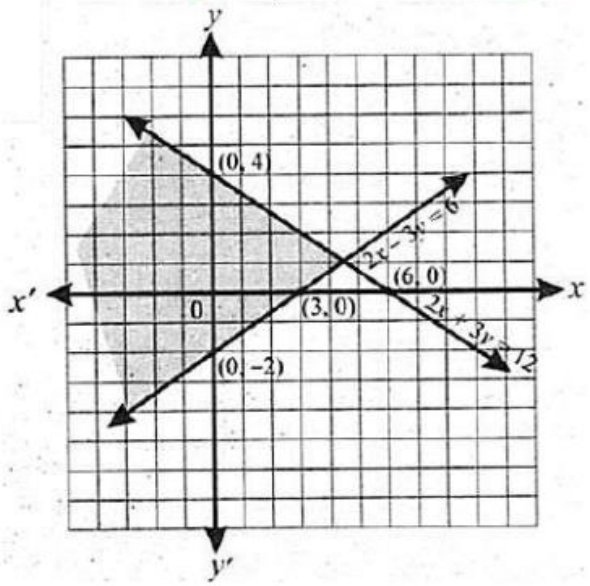
following linear inequalities by shading.

(i)

$$2x-3y\le 6$$
$$2x+3y\le 12$$

Ans:

$2x-3y=6$ ___(i)	$2x+3y=12$ ___(ii)
Dividing by 6	Dividing by 12
$\frac{2x}{36}-\frac{3y}{6}=\frac{6}{6}$	$\frac{2x}{12}+\frac{3y}{12}=\frac{12}{12}$
$\frac{x}{3}-\frac{y}{2}=1$	$\frac{x}{6}+\frac{y}{4}=1$
x int $(3,0)$	x int $(6,0)$
y int $(0,-2)$	y int $(0,4)$
Test point	Test point
$(x,y)=(0,0)$	$(x,y)=(0,0)$
$2(0)-3(0)\le 6$	$2(0)+3(0)\le 12$
$0\le 6$	$0\le 12$
True	True
It is true towards origin	It is true towards origin



(ii)

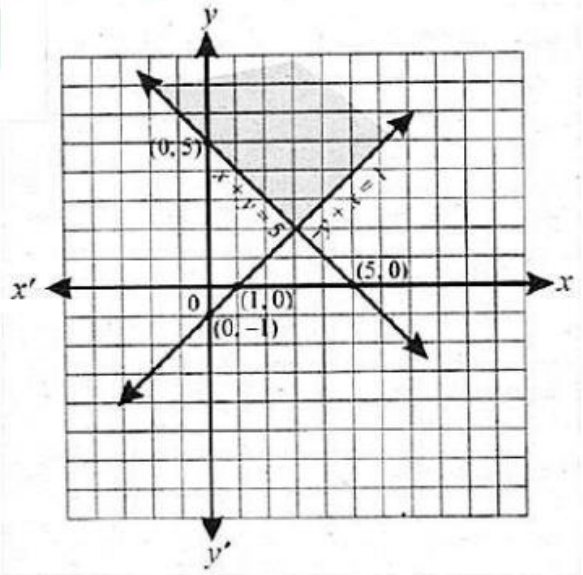
$$x+y\ge 5$$
$$-y+x\le 1$$

Ans:

$$x+y\ge 5 \qquad -y+x\le 1$$

Associated

$x+y=5$ _____(i)	$-y+x\le 1$ _____(ii)
Dividing by 5	$x-y\le 1$
$\frac{x}{5}+\frac{y}{5}=1$	x int $(1,0)$
x int $(5,0)$	y int $(0,-1)$
y int $(0,5)$	Test point
Test point	$-0+0\le 1$
$(x,y)=(0,0)$	True
$0+0\ge 5$	Towards origin
$0\ge 5$	
False	
Away from origin	



(iii)

$$3x+7y\ge 21$$
$$x-y\le 2$$

Ans:

$$3x+7y\ge 21 \qquad x-y\le 2$$

Associated form

$3x+7y=21$ _____(i)

Dividing by 21

$\frac{3x}{21}+\frac{7y}{21}=\frac{21}{21}$

$\frac{x}{7}+\frac{y}{3}=1$

x int $(7,0)$

y int $(0,3)$

Test point

Put $(x,y)=(0,0)$

$3(0)+7(0)\geq 21$

$0\geq 21$

False

Away from origin

$x-y\leq 2$ _____(ii)

Dividing by 2

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

$\frac{x}{2}-\frac{y}{2}\leq 1$

x int $(2,0)$

y int $(0,-2)$

Test point

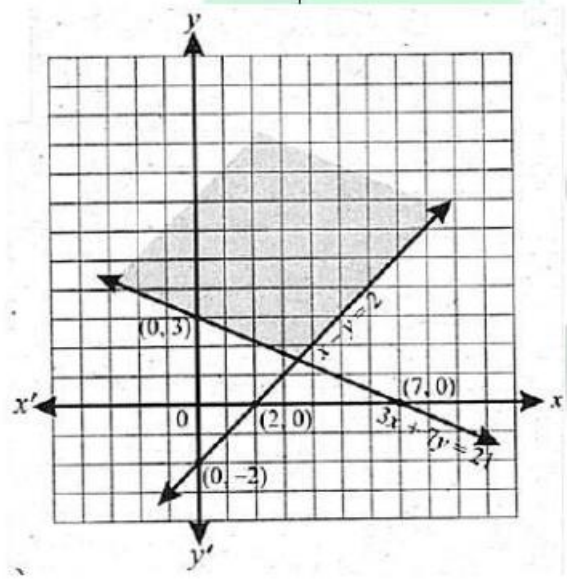
Put $(x,y)=(0,0)$

$0-0\leq 2$

$0\leq 2$

True

Towards origin



Associated form

$4x-3y=12$ $\quad x=\frac{-3}{2}$ parallel to y-axis

Dividing by 12

$\frac{4x}{12}-\frac{3y}{12}=\frac{12}{12}$

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

x int $(3,0)$

y int $(0,-4)$

Test point

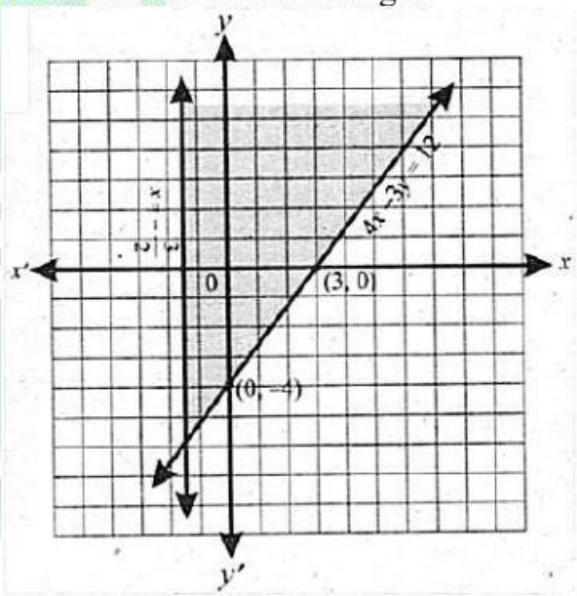
$P(x,y)=(0,0)$

$4(0)-3(0)\leq 12$

$0\leq 12$

True

It is true so towards the origin



(iv) $4x-3y\leq 12$

$x\geq -\frac{3}{2}$

Ans:

$4x-3y\leq 12$ $\quad x\geq\frac{-3}{2}$

(v) $3x+7y\geq 21$

$y\leq 4$

Ans:

Associated equation is

$3x+7y\geq 21$

For x intercept

Put $y=0$

$3x=21$

$x=7$

1st ordered pair is $(7,0)$

For y-intercept, put $x=0$

$7y=21$

$y=3$

2nd ordered pair is $(0,3)$

Origin test, put $x=y=0$ in

$3x+7y>21$

$3(0)+7(0)>21$

$0>21$(False)

So shading region away from origin side

Now

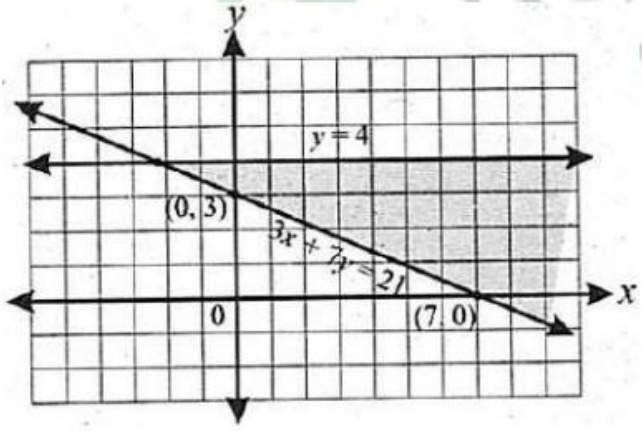
$y\le 4$

$y=4$

S point is $(0,4)$

$y=0\Rightarrow 0<4$ (true)

Shading lies towards origin side



(vi) $5x+7y\le 35$

$x-2y\le 2$

Ans:

$5x+7y\le 35$ $x-2y\le 2$

Associated form

$5x+7y=35$ _____(i)

Dividing by 35

$\frac{5x}{35}+\frac{7y}{35}=\frac{35}{35}$

$\frac{x}{7}+\frac{y}{5}=1$

x int $(7,0)$

y int $(0,5)$

Test point

$(x,y)=(0,0)$

$5(0)+7(0)\le 35$

$0\le 35$

True

$x-2y=2$ _____(ii)

Dividing by 2

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

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

x int $(2,0)$

y int $(0,-1)$

$0-2(0)\le 2$

$0\le 2$

True