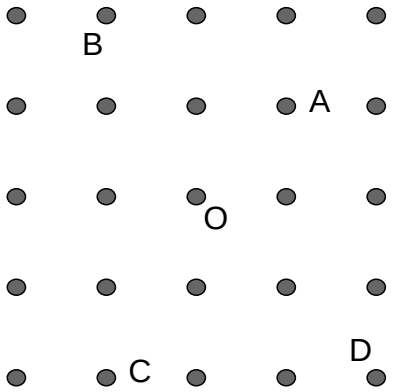
Inequalities and Graphs

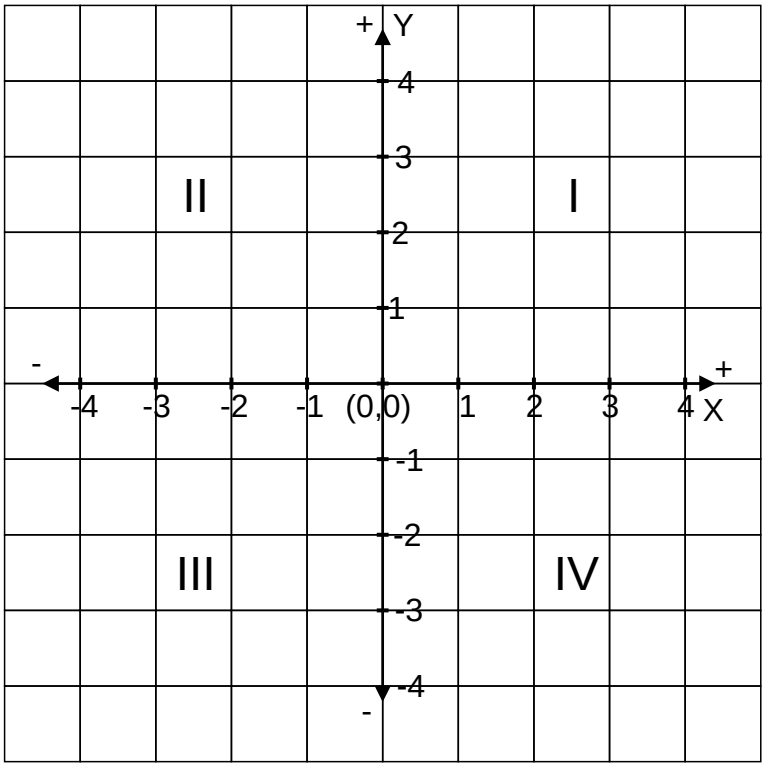
- If 10 children are standing in a line how will you point to a particular child? (Number 4 from left. We define a starting point and then give a number to each one.)

- If children are standing in rows as shown in the figure (all facing the blackboard) and if teacher stands in the middle position (marked with O), how will you describe position of boys and girls standing at A, B, C and D? (Make children stand in rows and ask positions of some students.)



- Define X axis as the line of students on right and left of the teacher.
- Define Y axis as the line of students standing in front and back of the teacher.
- Define positive and negative directions on both axes.
- Let each student describe her position in terms of x and y coordinates.
- Define what is an ordered pair.

- Now draw this figure on the blackboard.
- Let students draw on the graph paper.
- Draw X axis.
- Draw Y axis.
- Mark point (0,0)
- Mark positive and negative directions on X and Y axes.
- Define quadrants.
- Mark the points on X and Y axes as 1, 2, 3, 4, 5... (whatever fits in the graph paper) and -1, -2, -3 -4. -5... etc.
- After the students learn this system of representation, we can go to the next step of plotting points.



- Draw X axis, Y axis and Origin on a graph paper. Make all markings.

- Plot the points (2,3) (3,4) (4,5) (5,6) and (-1,0). What do we observe?
  (All these points lie on a straight line)

- Plot the points (2,3) (2,4) (2,5) (2,6) and (2,7). What do we observe?
  (All these points lie on a straight line). For all these points the x coordinate is 2.
  We call this the line x = 2

- Plot the points (3,1) (3,4) (3,5) (3,-1) and (3,0). What do we observe?
  (All these points lie on a straight line). For all these points the x coordinate is 3.
  We call this the line x = 3

- Draw the following lines :

  y = 3
  x = -2

- Discuss that the line of x = a constant number will always be a vertical line.
- Discuss that the line of y = a constant number will always be a horizontal line.

- On a graph paper draw necessary lines and show the regions for :

$x \geqslant 0$	$x \geqslant 4$	$x \geqslant -2$
$y \geqslant 0$	$y \geqslant 4$	$y \geqslant -2$
$x \leqslant 0$	$x \leqslant 3$	$x \leqslant -3$
$y \leqslant 0$	$y \leqslant 3$	$y \leqslant -3$

- Find any three points on the given line and fill in the following table.

x = 0

x	0	0	0
y	0	+2	-2

x = 4

x			
y			

x = -3

x			
y			

y = 0

x			
y			

y = 3

x			
y			

y = -2

x			
y			

- For plotting the following lines, first make a table of x and y coordinates of 3 points and then plot the line.
  (A trick: put x = 0 and find y. that is your first point. Then put y = 0 and find x, that is the second point. Draw the line and then write coordinates of the third point in the table)

1) Draw line $x + y = 5$

   Identify the region of $x + y \geqslant 5$ (By substituting value of any point on one side of the line.

2) Draw line $x - y = 1$

   Identify the region of $x - y \leqslant 1$

3) Draw line $x + 4y = 12$

   Identify the region of $x + 4y \leqslant 12$

4) Draw line $2x + y = 6$

   Identify the region of $2x + y \leqslant 6$

5) Draw line $3x + 5y = 15$

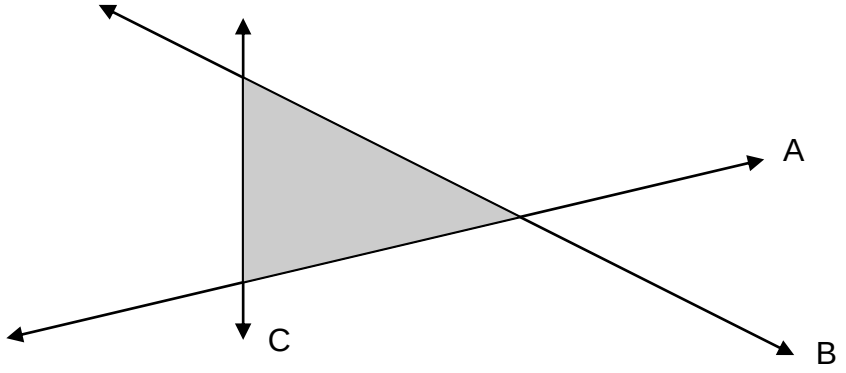
   Identify the region of $3x + 5y \geqslant 15$

6) Draw line $3x + 2y = 12$

   Identify the region of $3x + 2y \leqslant 12$

- Explain the concept of common region as follows :

  Draw any one line on the graph (line A). It rained in the region above this line on the first day. Colour that region with one type of shading (e.g. vertical lines). Draw another line B. It rained in the area below line B on the second day. Colour that region with a different type of shading. Draw a third line C. It rained on the right of line C on the third day. Find the region where it rained on all three days.



A solved example from exam paper :

Represent the following inequalities graphically and identify the common solution region

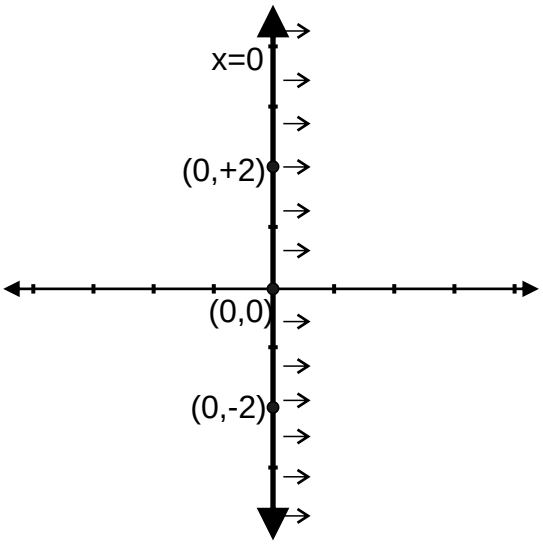
$x \geqslant 0$ $y \geqslant 0$ $2x + 6y \leqslant 12$

Solution :

1) $x \geqslant 0$.
Make table of ordered pairs.

x	0	0	0
y	0	+2	-2

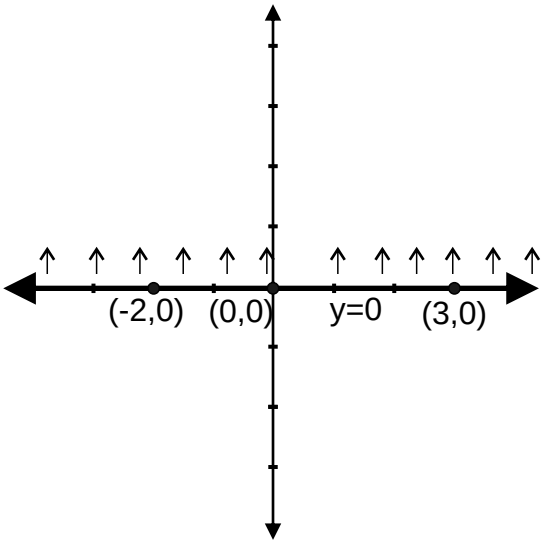
Plot the three points. Join them to plot the line x = 0.
Mark the region of $x \geqslant 0$ by arrows.



2) $y \geqslant 0$
Make table of ordered pairs.

x	0	3	-2
y	0	0	0

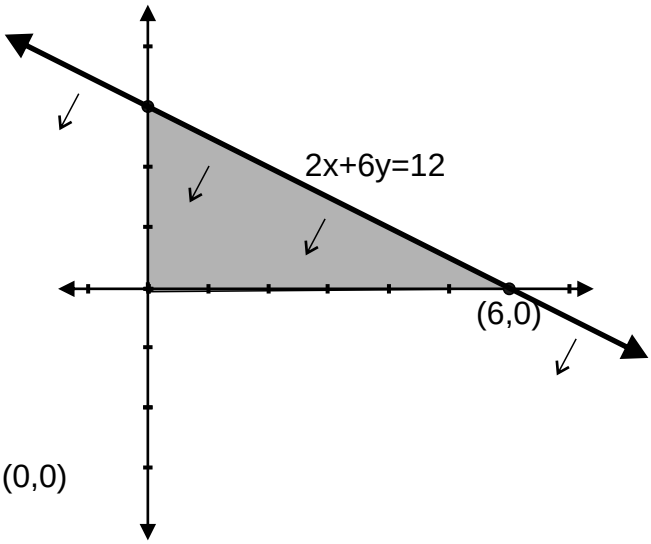
Plot the three points. Join them to plot the line y = 0.
Mark the region of $y \geqslant 0$ by arrows.



3) $2x + 6y \leqslant 12$
Make table of ordered pairs.
If x = 0, 6y = 12, y = 2
If y = 0, 2x = 12, x = 6

x	0	6	
y	3	0	

Plot the three points. Join them to plot the line 2x + 6y = 12
Take a point on one side of the line, e.g (0,0)
for (0,0) , 2x+6y will be 0, which is less than 12. So the region on the side of point zero is the region of $2x + 6y \leqslant 12$



Consider all three regions marked. Common region is the triangle formed. Colour it.

Exam Questions : (5 marks)

1) Represent the following inequality graphically and identify the common solution region.

$x \geqslant 0$ $y \geqslant 0$ $2x + 6y \leqslant 18$

2) Represent the following inequality graphically and identify the common solution region. (2009)

$x \geqslant 2$ $y \leqslant 2$ $4x + 5y \leqslant 20$

3) Represent the following inequality graphically and identify the common solution region. (2010)

$x + 2y \leqslant 6$ $x + y \leqslant 4$ $x \geqslant 0$ $y \geqslant 0$

4) Represent the following inequality graphically and identify the common solution region. (2011)

$3x + 4y \leqslant 12$ $2x + 5y \leqslant 10$ $x \geqslant 0$ $y \geqslant 0$

5) Represent the following inequality graphically and identify the common solution region. (2012)

$x + y \geqslant 3$ $2x + y \leqslant 12$ $y \geqslant 0$ $x \geqslant 0$

6) Represent the following inequality graphically and identify the common solution region. (2013)

$3x + 5y \geqslant 15$ $3x + 2y \leqslant 12$ $y \geqslant 1$ $x \geqslant 0$