Exercise 7

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Draw the graph of the solution set of each of the following inequations: (Question 1 to Question 6)

Question 1: x + y ≥ 4

Solution:

Step 1: Convert into equation

x + y = 4

Step 2: Convert the equation in the slope-intercept form and find the solutions.

y = 4 – x .....(1)

Putting x = 0 in (1)

y = 4

Putting y = 0 in (1)

x = 4

x	y
0	4
4	0

Step 3: Find the solution area.

Mark points (0, 4) and (4, 0) on the graph and draw a line passing through them.

Now, checking for (0, 0)

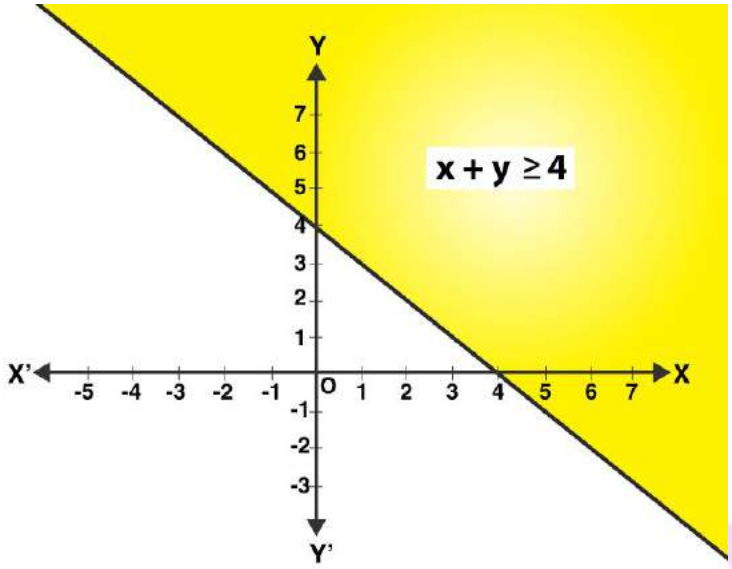
Here x = 0 and y = 0, putting in given inequation

0 + 0 ≥ 4

0 ≥ 4

Which is false.

Therefore, point (0, 0) is not part of solution. Shade the region which does not contain origin.



Hence shaded region including the points on the line is the solution of given inequation.

Question 2: x – y ≤ 3

Solution:
Step 1: Convert into equation

x – y = 3

Step 2: Write the equation in the slope-intercept form and find the solutions.
y = x – 3 ...(1)

Putting x = 0 in (1)
y = -3

Putting y = 0 in (1)
x = 3

x	y
0	-3
3	0

Step 3: Find the solution area.

Mark points (0, -3) and (3, 0) on the graph and draw a line passing through them.

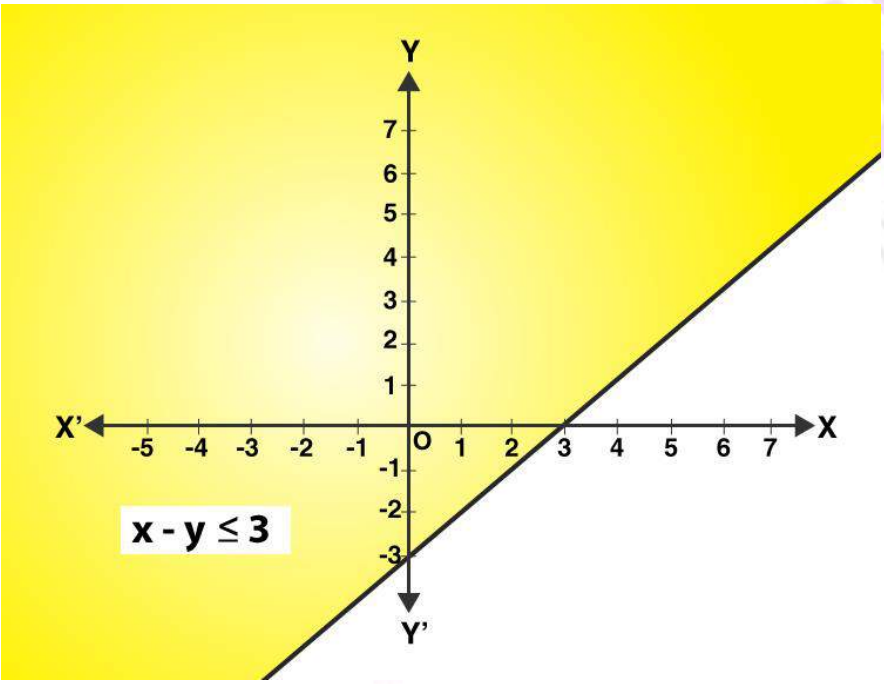
Now, checking for (0, 0) in given inequation $x – y \leq 3$

Here $x = 0$ and $y = 0$

$0 – 0 \leq 3$

$0 \leq 3$

Which is true.
Therefore, point (0, 0) is part of the solution. Shade the region which contains origin.



Hence, solution of given inequation is shaded region including the points on the line.

Question 3: $y – 2 \leq 3x$

Solution:
Step 1: Convert into equation

$y – 2 = 3x$

Step 2: Write the equation in the slope-intercept form and find the solutions.
$y = 3x + 2$ ...(1)

Putting x = 0 in (1)
y = 2

Putting y = 0 in (1)
x = -2/3

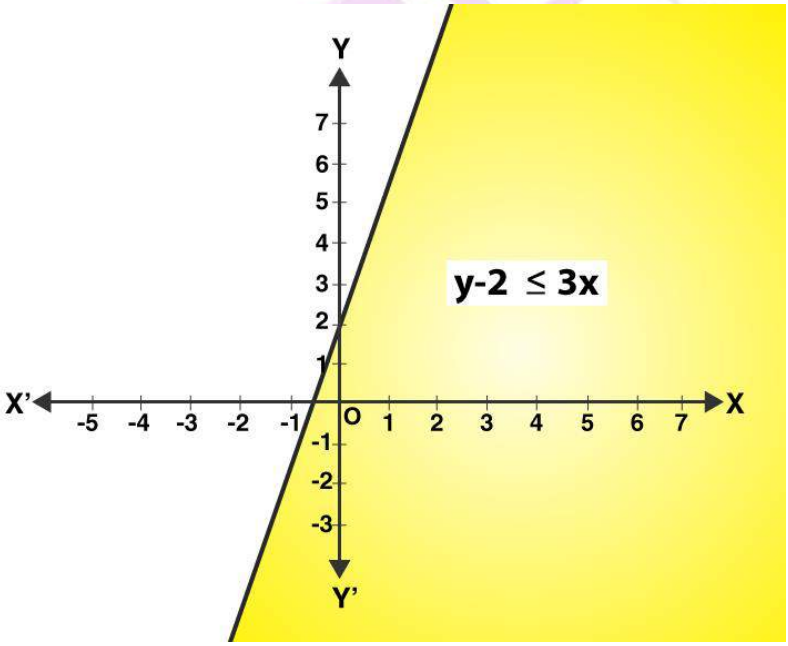
x	y
0	2
-2/3	0

Step 3: Find the solution area.
Mark points (0, 2) and (-2/3 , 0) on the graph and draw a line passing through them.

Now, checking for (0, 0)
Here x = 0 and y = 0, putting in given inequation, $y - 2 \leq 3x$

$0 - 2 \leq 0$

$-2 \leq 0$
Which is true.
Therefore, point (0, 0) is part of the solution. Shade the region which contains origin.



Hence, solution of given inequation is shaded region including the points on the line.

Question 4: $x \geq y - 2$

Solution: Step 1: Convert into equation

$x = y - 2$

Step 2: Write the equation in the slope-intercept form and find the solutions.

$y = x + 2$ ……(1)

Putting $x = 0$ in (1)

$y = 2$

Putting $y = 0$ in (1)

$x = -2$

x	y
0	2
-2	0

Step 3: Find the solution area.

Mark points (0,2) and (-2, 0) on the graph and draw a line passing through them.

Now, checking for (0, 0)

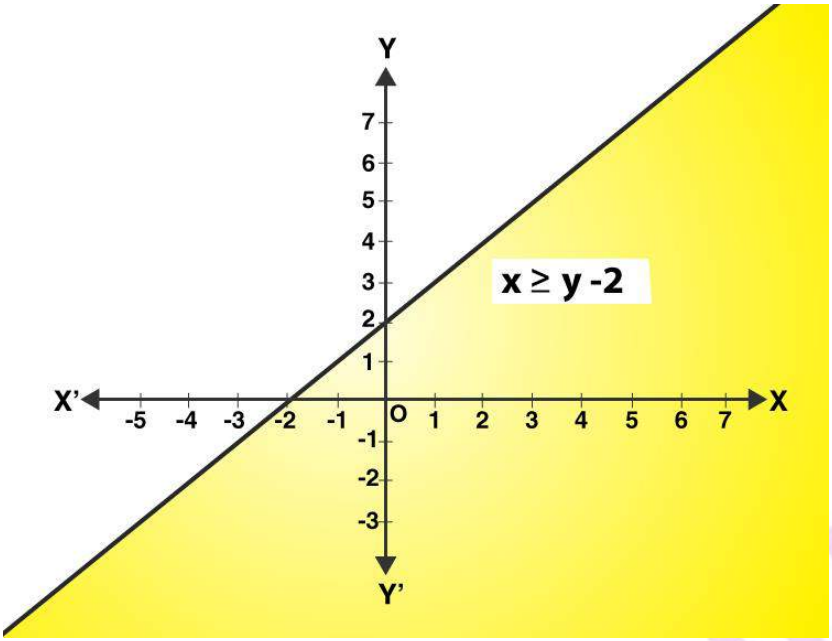
Here $x = 0$ and $y = 0$, putting in given inequation, $x \geq y - 2$

$0 \geq 0 - 2$

$0 \geq -2$

Which is true.

Therefore, point (0, 0) is part of the solution. Shade the region which contains origin.



Hence, solution of given inequation is shaded region including the points on the line.

Question 5: 3x + 2y > 6

Solution: Step 1: Convert into equation

3x + 2y = 6

Step 2: Write the equation in the slope-intercept form and find the solutions.
y = 1/2 (6 – 3x) .....(1)

Putting x = 0 in (1)
y = 3

Putting y = 0 in (1)
x = 2

x	y
0	3
2	0

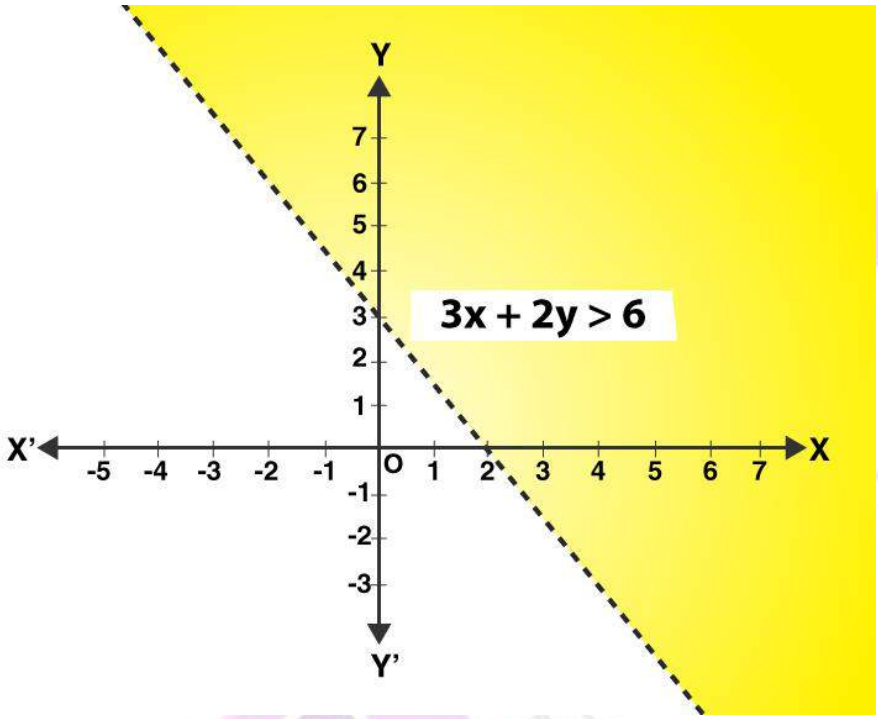
Step 3: Find the solution area.
Mark points (0, 3) and (2, 0) on the graph and draw a line passing through them.

Now, checking for (0, 0)
Here x = 0 and y = 0, putting in given inequation, 3x + 2y > 6

0 + 0 > 6

Which is false.

Therefore, point (0, 0) is not part of solution. Shade the region which does not contain origin.



Hence, solution of given inequation is shaded region excluding the points on the line.

Question 6: 3x + 5y < 15

Solution:

Step 1: Convert into equation

3x + 5y = 15

Step 2: Write the equation in the slope-intercept form and find the solutions.

y = 1/5 (15 – 3x) ...(1)

Putting x = 0 in (1)

y = 3

Putting y = 0 in (1)

x = 5

x	y
0	3
5	0

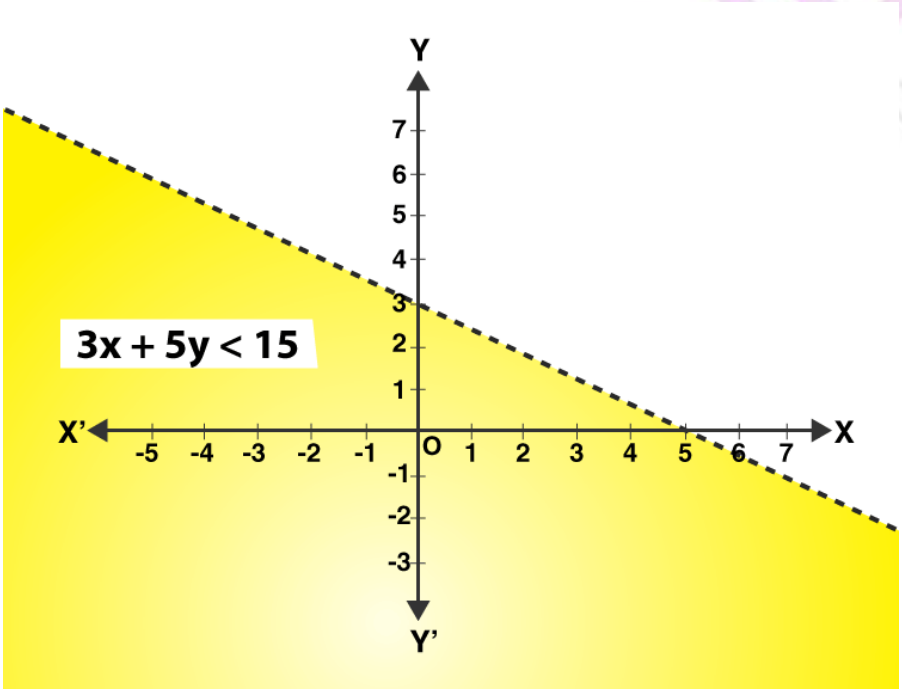
Step 3: Find the solution area.
Mark points (0, 3) and (5, 0) on the graph and draw a line passing through them.

Now, checking for (0, 0)

Here x = 0 and y = 0, putting in given inequation, 3x + 5y < 15

0 + 0 < 15

Which is true.
Therefore, point (0, 0) is part of the solution. Shade the region which contains origin.



Hence, solution of given inequation is shaded region excluding the points on the line.

Solve the following system of inequalities graphically: (Question 7 to Question 12)

Question 7 : x ≥ 2 and y ≥ 3
Solution:
Step 1: Write inequations as equations
x = 2, y = 3
Step 2: Draw graph for both the lines.

Step 3: Find the solution area.

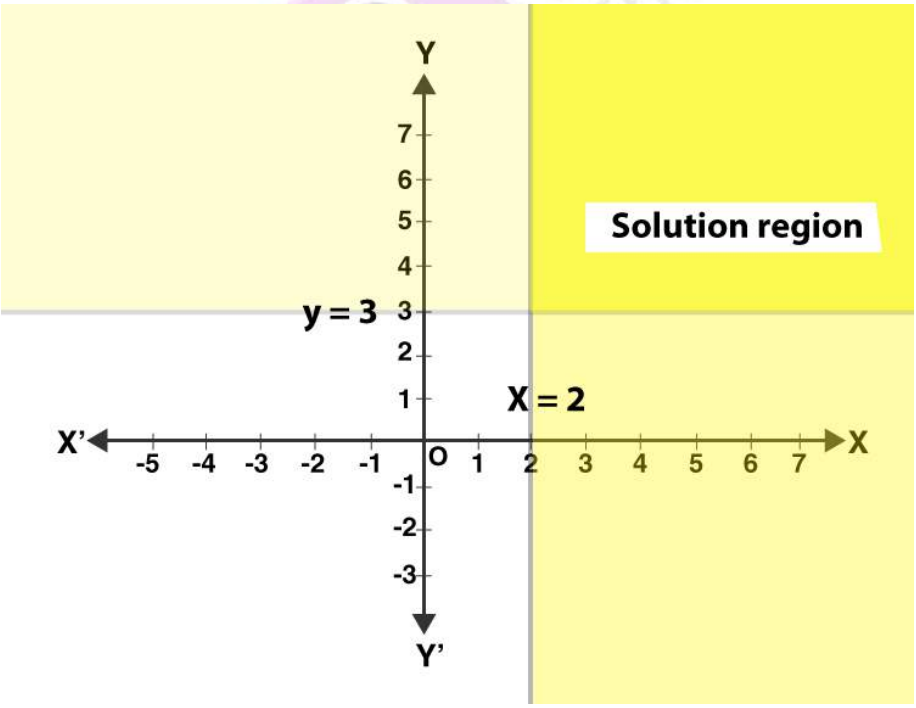
Checking for (0, 0)
Here x = 0 and y = 0, putting in given inequations, x ≥ 2 and y ≥ 3
Case 1: x ≥ 2
0 ≥ 2 (Which is false)

Shade the region which does not contain origin.

Case 2: y ≥ 3
0 ≥ 3 (Which is false)

Shade the region which does not contain origin.

Now, highlight the common region by both the inequations.



Hence, solution of given inequations is highlighted area (“solution region”) including the points on the lines.

Question 8 : 3x + 2y ≤ 12, x ≤ 1, y ≥ 2
Solution:
Step 1: Write inequations as equations

3x + 2y = 12, x = 1 and y = 2

Step 2: Draw graph for all the lines.

Step 3: Find the solution area.

Checking for (0, 0)
Here x = 0 and y = 0, putting in given inequations, 3x + 2y ≤ 12, x ≤ 1, y ≥ 2
Case 1: 3x + 2y ≤ 12
0 ≤ 2 (Which is true)

Shade the region which contain origin.

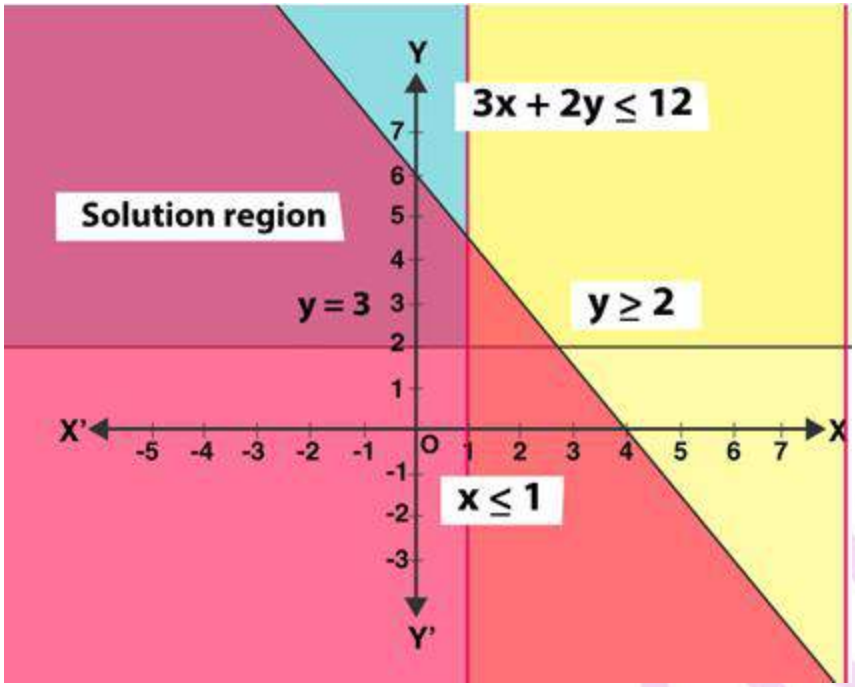
Case 2: x ≤ 1
0 ≤ 1 (Which is true)

Shade the region which contain origin.

Case 2: y ≥ 2
0 ≥ 2 (Which is false)

Shade the region which does not contain origin.

Now, highlight the common region by all the inequations.



Hence, solution of given inequations is highlighted area ("solution region") including the points on the lines.

Question 9: x + y ≤ 6, x + y ≥ 4
Solution:

Step 1: Write inequations as equations
x + y = 6, x + y = 4

Step 2: Draw graph for both the lines.
For x + y = 6

x	y
0	6
6	0

Mark points, (0,6) and (6,0) on the graph and draw a line passing through both the points.

For x + y = 4

x	y
0	4
4	0

Mark points, (0,4) and (4,0) on the graph and draw a line passing through both the points.

Step 3: Find the solution area.

Checking for (0, 0)
Here x = 0 and y = 0, putting in given inequations, $x + y \leq 6$, $x + y \geq 4$

Case 1: $x + y \leq 6$
$0 \leq 6$ (Which is true)

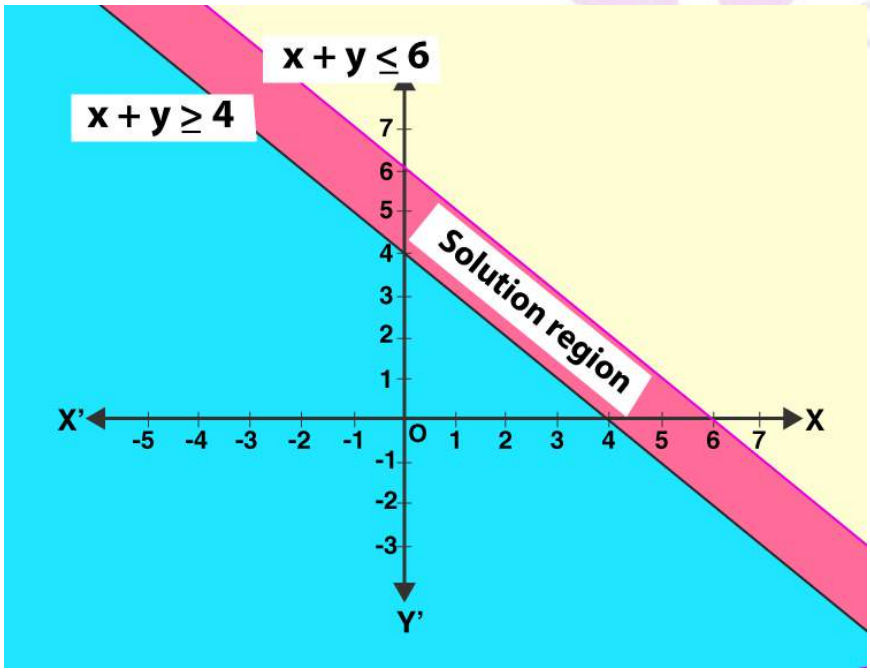
Shade the region which contains origin.

Case 2: $x + y \geq 4$

$0 \geq 1$ (Which is false)

Shade the region which does not contain origin.

Now, highlight the common region found by both the inequations.



Hence, solution of given inequations is highlighted area ("solution region") including the points on the lines.

Question 10 : $2x + y \geq 6, 3x + 4y \leq 12$

Solution:
Step 1: Write inequations as equations

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

Step 2: Draw graph for both the lines.
For $2x + y = 6$

x	y
0	6
3	0

Mark points, (0,6) and (3,0) on the graph and draw a line passing through both the points.

For $3x + 4y = 12$

x	y
0	3
4	0

Mark points, (0,3) and (4,0) on the graph and draw a line passing through both the points.

Step 3: Find the solution area.

Checking for (0, 0)
Here $x = 0$ and $y = 0$, putting in given inequations, $2x + y \geq 6, 3x + 4y \leq 12$

Case 1: $2x + y \geq 6$
$0 \geq 6$ (Which is false)

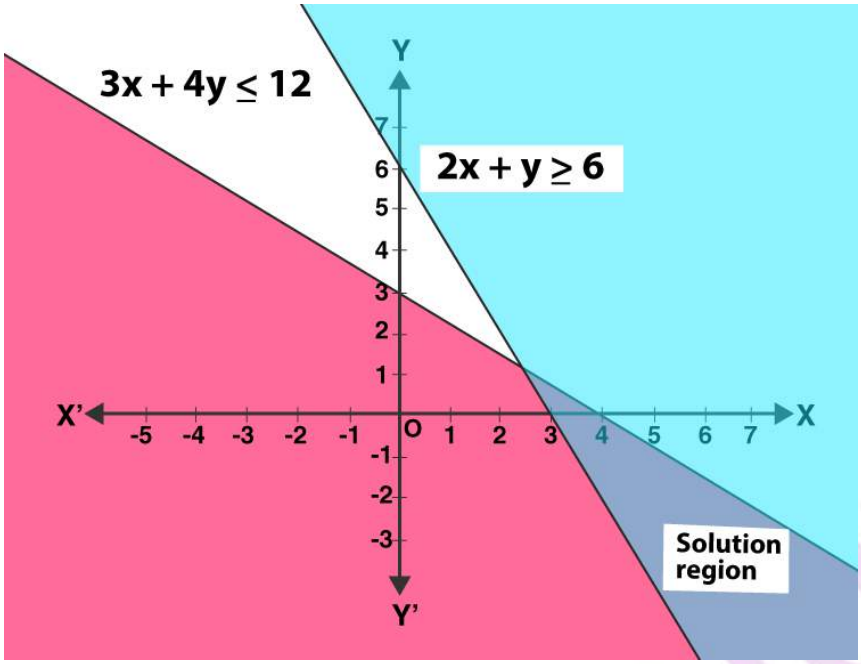
Shade the region which does not contain origin.

Case 2: $3x + 4y \leq 12$

$0 \leq 1$ (Which is true)

Shade the region which contains origin.

Now, highlight the common region found by both the inequations.



Hence, solution of given inequations is highlighted area including the points on the lines.

Question 11: x + y ≤ 9, y > x, x ≥ 0

Solution:

Step 1: Write inequations as equations

x + y = 9, y = x and x = 0

Step 2: Draw graph for both the lines.

For x + y = 9

x	y
0	9
9	0

Mark points, (0,9) and (9,0) on the graph and draw a line passing through both the points.

For y = x

x	y
0	0
1	1
-1	-1

Mark points, (0,0), (1,1) and (-1, -1) on the graph and draw a line passing through the points.

Step 3: Find the solution area.
Checking for (0, 0)
Here x = 0 and y = 0, putting in given inequations, $x + y \leq 9$, $y > x$, $x \geq 0$

Case 1: $x + y \leq 9$

$0 \leq 6$ (Which is true)

Shade the region which contain origin.

Case 2: $y > x$

$0 > 0$ (Which is not true)

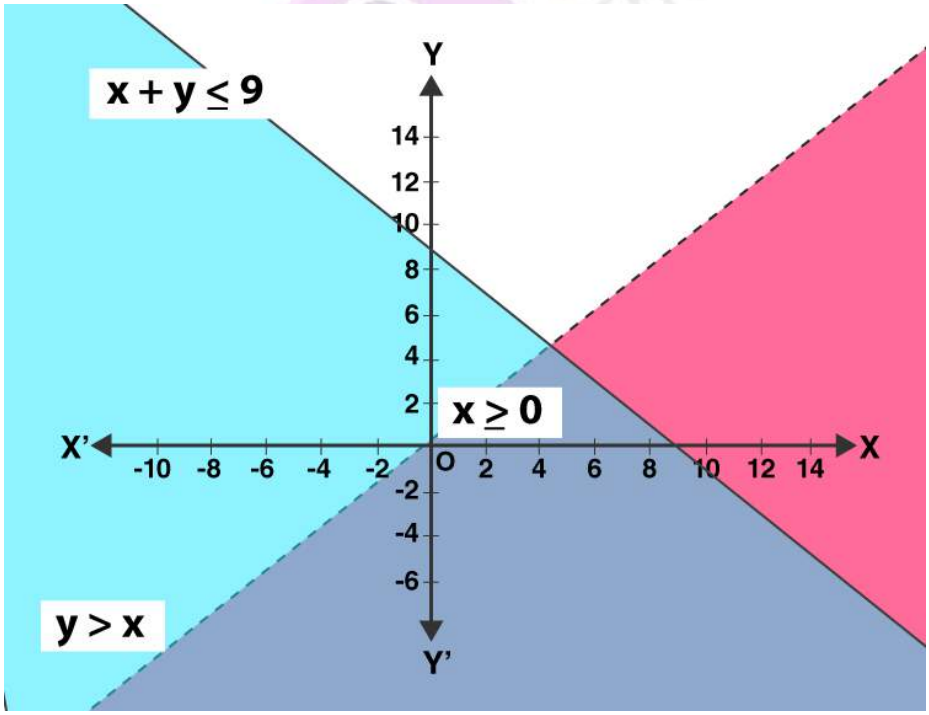
Shade the region away from the origin. (Towards top)

Case 3: $x \geq 0$

$0 \geq 0$ (Which is true)

Shade the region toward right side of the line.

Now, highlight the common region found by the inequations.



Hence, solution of given inequations is highlighted area including the points on the lines (excluding line y=x).

Question 12: 2x – y > 1, x – 2y < -1
Solution:
Step 1: Write inequations as equations

2x – y = 1 and x – 2y = -1
Step 2: Draw graph for both the lines.
For 2x – y = 1

x	y
0	-1
0.5	0

Mark points, (0, -1) and (0.5, 0) on the graph and draw a line passing through both the points.

For x – 2y = -1

x	y
0	0.5
-1	0

Mark points, (0, 0.5) and (-1, 0) on the graph and draw a line passing through the points.

Step 3: Find the solution area.

Checking for (0, 0)
Here x = 0 and y = 0, putting in given inequations, 2x – y > 1, x – 2y < -1

Case 1: 2x – y > 1

0 > 1 (Which is false)

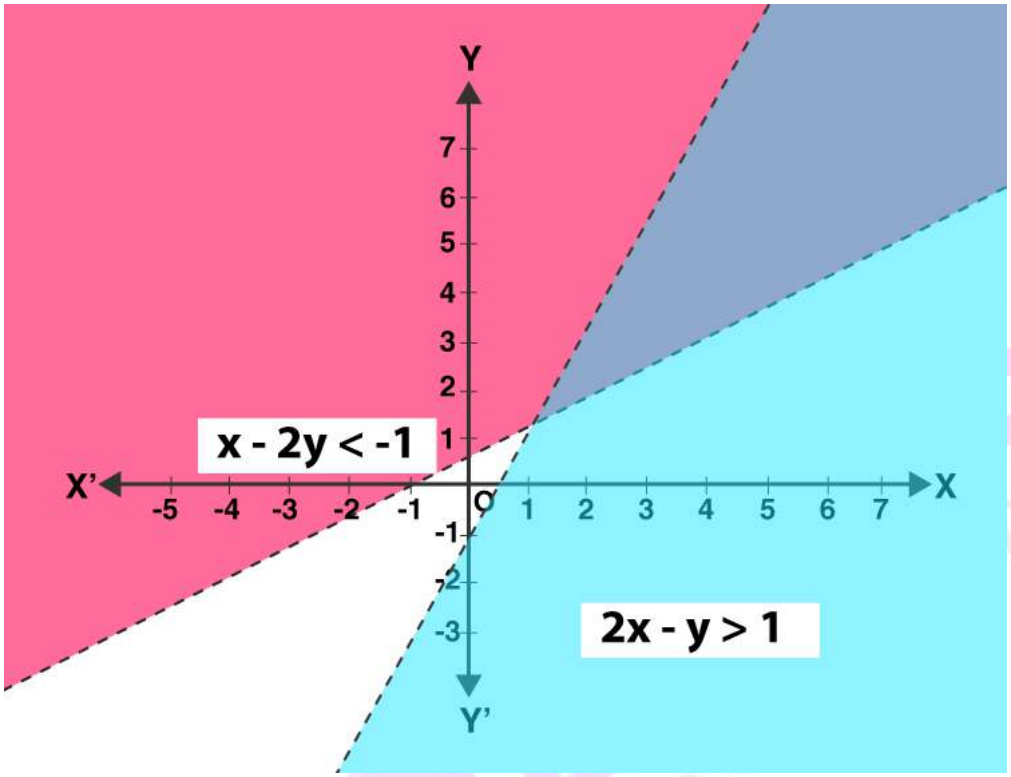
Shade the region which does not contain origin.

Case 2: x – 2y < -1

0 < -1 (Which is false)

Shade the region which does not contain origin.

Now, highlight the common region found by the inequations.



Hence, solution of given inequations is highlighted area excluding points on the lines.