Algebra 1.3 Unit III
Linear Inequality in two variables

Consider the following equation and inequations:

$$y = 2x + 3$$

$$y < 2x + 3$$

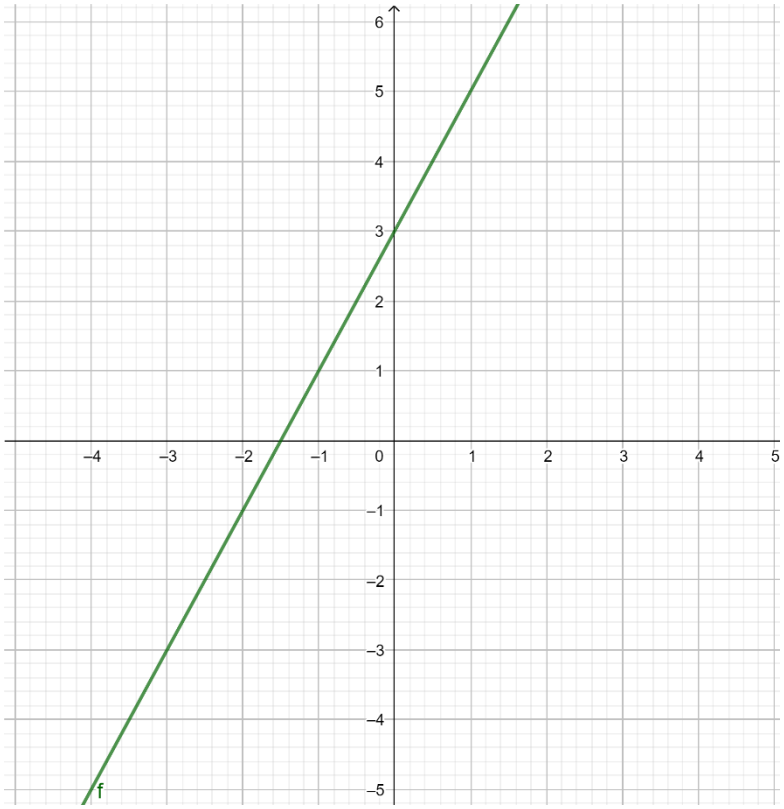
$$y > 2x + 3$$

Fill in the table below by ticking the box for the equation or the inequality for which the points given would be valid ('satisfied'). See example for (2, 5) Substituting 2 for x and 5 for y in each of the first column would give you that 5 < 2x2 + 3

	The points satisfy the equation/inequation										
	(1,5)	(-2, 3)	(1, 3)	(0, 0)	(2, 7)	(2, 5)	(3, 1)	(-1, 0)	(0, -2)	(1, 6)	(-1, -2)
$y = 2x + 3$											
$y < 2x + 3$						✓					
$y > 2x + 3$											

Are these the only points that satisfy the three equations/inequations? Give reasons for your answer.

Mark the above coordinates in the graph below. Observe their positions relative to the line.

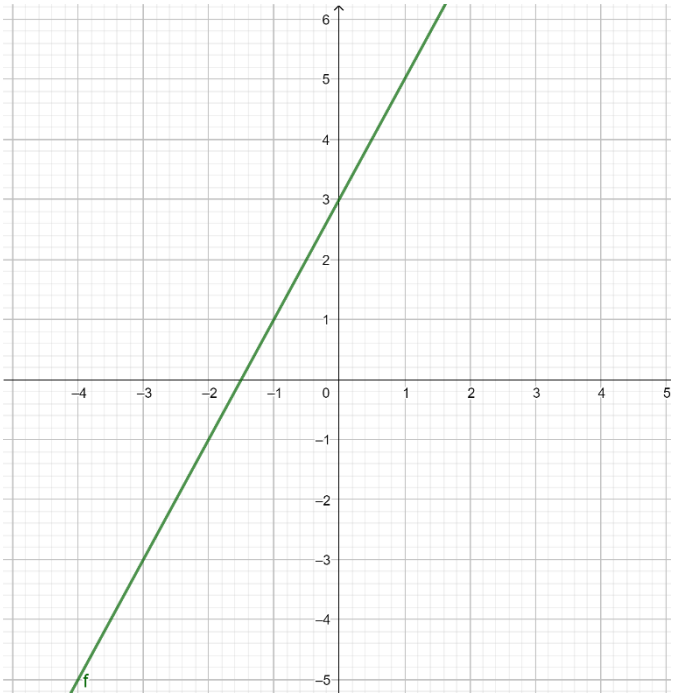


Write more (at least 5) coordinate points of your own, that would satisfy each of the following:

- $y = 2x + 3$
- $y < 2x + 3$
- $y > 2x + 3$

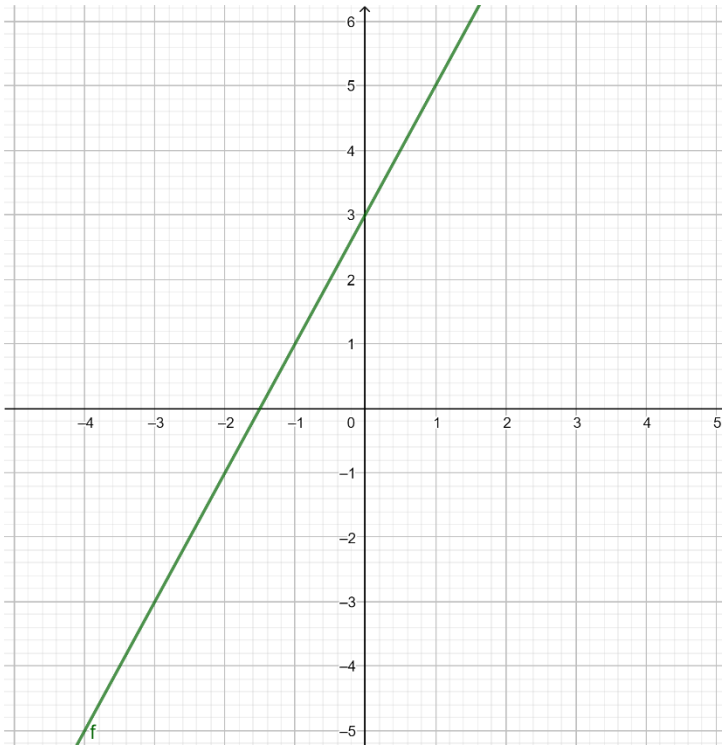
Now we will separate the coordinates individually. Mark all the points that you have found so far in each of the graphs shown below according to the equation or inequation given on the top of the graphs.

$y = 2x + 3$



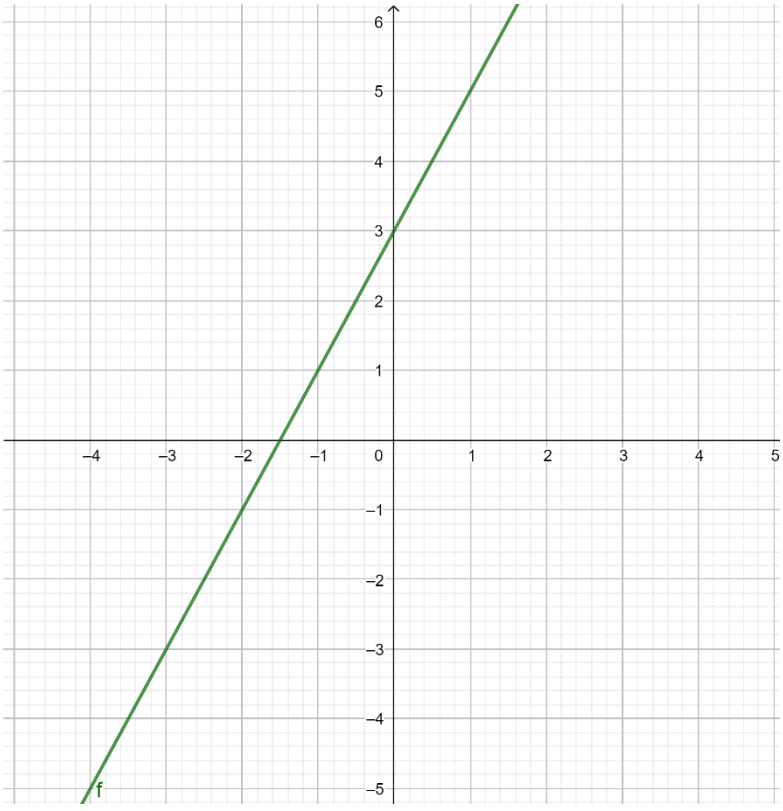
Can you find more points on the line? If you mark **all** possible points for y = 2 x + 3, what will you get on the graph?

$y > 2x + 3$



Can you mark more points for y > 2x + 3? If you mark **all** possible points on this graph that satisfy y > 2x + 3, where will all these points lie with respect to the line? Shade this area.

$y < 2x + 3$



Can you mark more points for y < 2x + 3? If you mark **all** possible points on this graph that satisfy y < 2x+3, where will all these points lie with respect to the line? Shade this area.

The areas that you have shaded in the above two inequalities are called the 'solution set' for the inequalities. As there are infinite number of solutions for each of them, we have a infinite set of real numbers as solutions.

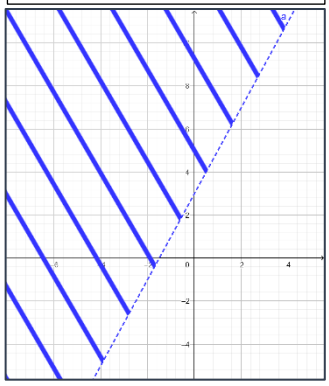
The solutions for y = 2x +3 are represented **ON** the line.

The solutions for y < 2x + 3 and y > 2x + 3 are represented by **shaded** regions on either side of the line y = 2x + 3 corresponding to the inequality given.

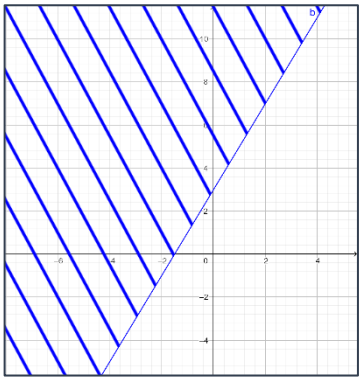
Hence

- If the inequality is $\geq or \leq$, the points **on** the line are included and you need to draw the line and shade the required area.
- If the inequality is simply < or >, the points **on** the line are not included and the line should be a **dotted one**.

y > 2x + 3 (note the dotted line y = 2x +3)



y ≥ 2x + 3 (note the thick line y = 2x +3)



Now, try to find the solution set for the following inequalities:

1. $y \leq x - 3$
2. $y > 2x + 1$
3. $y \geq 3x - 1$
4. $y < \frac{1}{2}x + 3$
5. $y < 3 - x$
6. $y \geq 5 + 2x$