## 6.7: Graph Linear Inequalities in Two Variables

Goals: *Graph a linear inequality on a coordinate plane

- Decide if the line is solid or dotted
- Decide which half of the plane to shade
- Identify solutions to a linear inequality

Linear inequality: an inequality that when graphed forms a line and identifies solutions. (Same as a line, except instead of an equals sign, $=$, there will be an inequality sign, $>,<, \geq$, $\leq$.)

Solution: 1) Any ordered pair that when substituted into the inequality is true.
Might be located on the line (if the line is part of the solution) and always in the shaded region.

Ex: Which of the following are solutions to $x-3 y \leq 6$ ?
a. $(0,0)$
b. $(6,-1)$
c. $(10,3)$
d. $(-1,2)$
$\mathrm{a}, \mathrm{c}$ and d are all solutions because when you plug them into the inequality they work.

Ex: Tell whether the given ordered pair is a solution to: $-x+2 y<8$
a. $(0,0)$
b. $(0,4)$
c. $(3,5)$
d. $(-2,3)$
a and c are solutions

## To Graph:

1. Graph the inequality the exact same way you would graph a line- either use $y=m x+b$ or $x$ and $y$ intercepts, depending on how the line is given.

* If the inequality is > or <, draw a dotted line. This means that the points on the line are NOT part of the solution.
* If the inequality is $\geq$ or $\leq$, draw a solid line. This means that the points on the line are included in the solution.

2. Choose a test point, (typically the origin if possible) that is located on one side of the line. Plug your test point into the inequality to see if it works.

- If it does, then the test point is part of the solution. Shade the side containing the test point.
- If it doesn't work, then the test point is not part of the solution. Shade the other side.


## Graph the following linear inequalities:

Ex: $y>4 x-3$
Graph using $y=m x+b$
$m=4, b=-3$
Test ( 0,0 ), which works, so shade with the origin


Ex: $x+2 y \leq 0$


Ex: $y \geq 3 x+1$
Graph using $y=m x+b \quad m=3, b=1$ Test ( 0,0 ), doesn't work (shade other side)




Ex: You have 2 summer jobs at a youth center. You earn $\$ 8$ per hour giving basketball lessons and $\$ 10$ giving swimming lessons. Let $x$ represent the number of hours you spend coaching basketball and $y$ represent the amount of time you spent giving swimming lessons. Your goal is to earn at least $\$ 200$ per week.
a. Write an inequality to represent the situation

$$
8 x+10 y \geq 200
$$

b. Graph the inequality.

Graph using $x$ and $y$ intercepts, be sure to connect with a solid line. Origin doesn't work. Shade without.
c. Give two possible solutions so you would make the amount you want.

Can choose anything on the line or in the shaded region.


## Write the inequality of the graph shown.

Ex:


Find equation of the line by finding $m$ and $b$
Ex:

$m=1, b=-3$ so $y=x-3$
Inequality sign is > or < since line is dotted.
Origin does not work. Plug in $(0,0)$ and choose
inequality sign that makes it false.

$$
y<x-3
$$

$$
y \leq-2 x+3
$$

