Lesson 0 Equations and Inequalities Review

Chapter 2: Optimization

Lesson 0: Equations and Inequalities Review

Optimization:

trying to <u>maximize</u> or <u>minimize</u> values while paying attention to particular constraints

examples:

In **business** we generally want to **maximize profit**. In **education and health** we want to **minimize cost**. Both involve **optimizing** the situation, given certain constraints. Constraints may be time, materials, labour, distance, market, other limiting resources.

What you already KNOW from last year(s):

Situation #1

a ***one-variable*** equation (in the 1st degree)
has only ONE solution.

$$3x - 5 = 13$$

$$3x = 13 + 5$$

$$3x = 18$$

$$x = \frac{18}{3}$$

$$\boxed{x = 6}$$

There is only **ONE** value for the unknown variable (x) that will make the equation TRUE

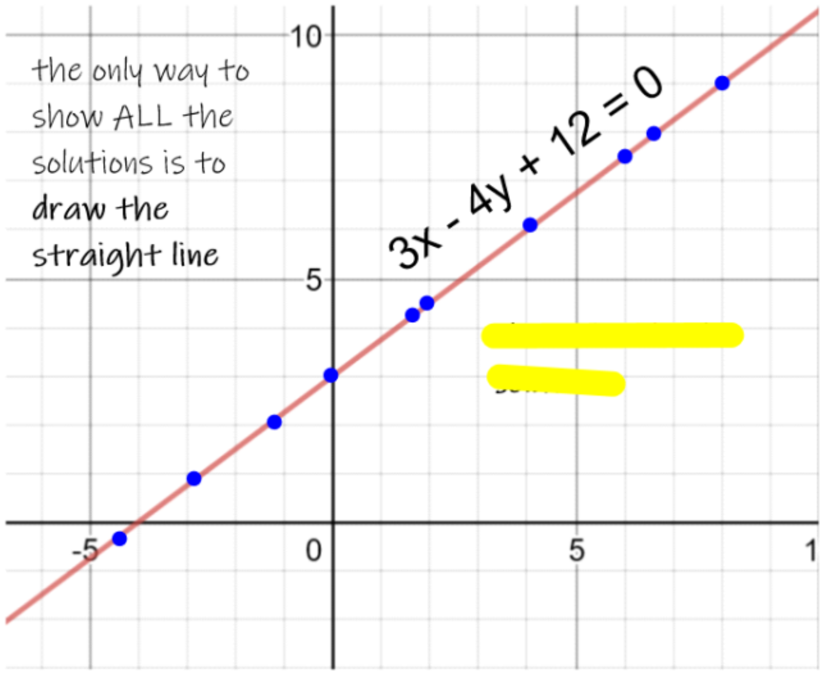
Situation #2

a ***two-variable*** equation (in the 1st degree)
has infinitely many solutions.

$$3x - 4y + 12 = 0$$

x	0	2	4	6	8
y	3	4.5	6	7.5	9

There are **many ordered pairs** for the unknown variables **(x,y)** that will make the equation TRUE. These ordered pairs form a **straight line.**


10
the only way to
show ALL the
solutions is to
draw the
straight line
3x - 4y + 12 = 0
5
-5
0
5
1

Situation #3

a ***one-variable*** inequation (in the 1st degree) has infinitely many solutions.

$-2x + 3 > 15$

There are **infinitely** many values for the unknown variable that will make the inequation TRUE.

$-2x + 3 > 15$

$-2x > 12$

$x < -6$

recall from Secondary 3, when you multiply or divide both sides of an inequation by a negative number, the sign changes.

solution can be shown as an interval :

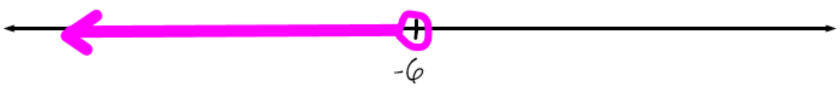
[,] included values

] , [excluded values

$]-\infty, -6[$

or

this is how you would graph this solution:



Situation #4

a ***two-variable* <u>in</u>equation** (in the 1st degree) has infinitely many solutions.

$2x + 5y - 10 > 0$

What are possible solutions?

examples (0, 40)

(941, 16)

(28.6, 13.7)

How do we "list" all of them?

We CAN'T "list" them....it would take FOREVER

you have to graph it

you learned how to do this last year

1. Draw the straight line

(broken or solid depending on inequality sign)

$2x + 5y - 10 > 0$

2. Test a point... usually (0,0)

3. Shade appropriately

1. **Draw a straight line:**

$2x + 5y - 10 \geq 0$

Ignore the inequality...imagine that it is really an ***equal*** sign. $2x + 5y - 10 = 0$

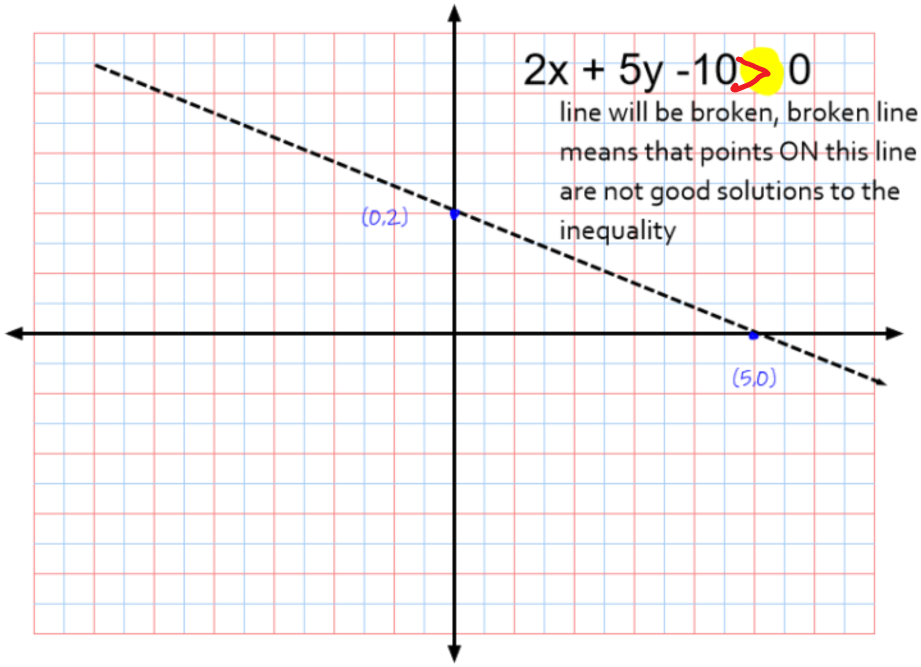
Find **two** points on the line---one of the easiest ways is to find the x- and y- intercepts (let x=0 and let y=0)

Make a table of values to show the ordered pairs

$2(0) + 5y - 10 = 0$
$5y = 10$
$y = 2$ (0,2)

$2x + 5(0) - 10 = 0$
$2x = 10$
$x = 5$ (5,0)

x	y
0	2
5	0



2x + 5y -10 > 0
line will be broken, broken line means that points ON this line are not good solutions to the inequality
(0,2)
(5,0)

2. Test a point

Determine if the point you are testing belongs to the region described by the inequation.

NEVER test a point that is ON the line

Usually use (0,0) as your test point → do not test (0,0) if line goes through origin

Determine if your test is **True** or **False**

- choose a different point to test

$$2x + 5y - 10 > 0$$

$$2(0) + 5(0) - 10 > 0$$

$$-10 > 0$$

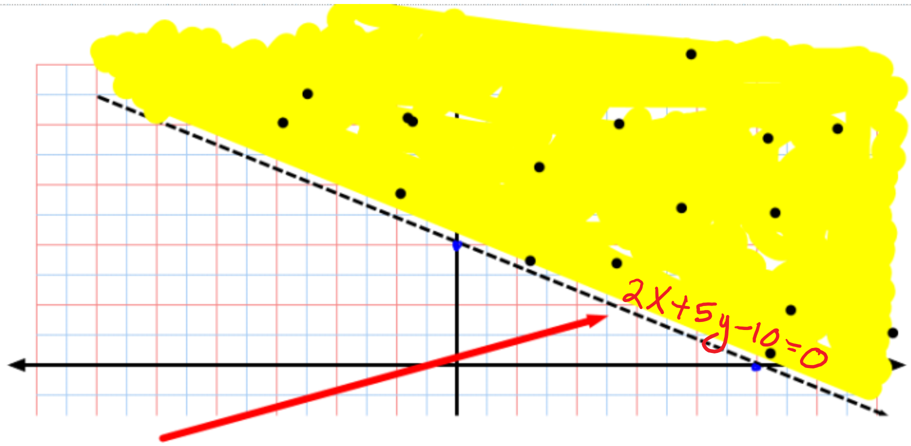
FALSE

so start at line and shade away from test point

3. **Shade Appropriately**

If the statement is **TRUE** start at the line and shade **TOWARD** your test point

If your statement is **FALSE** start at the line and shade away **FROM** from your test point



this line is the boundary between the two "half-planes". The shaded region contains all the ordered pairs that are solutions to the inequation.

The other (unshaded) region contains all the ordered pairs that are not solutions to the inequation

The SHADED **region** represents the infinite number of ordered pairs that make the ***two-variable*** <u>in</u>equation TRUE

When does a point verify an equation or inequation?

A point P will **verify** an in/equation if the point makes the equation or inequation true.

examples:

determine if the point (8, 5) verifies the equation: $2x - 7y + 19 = 0$

$2(8) - 7(5) + 19 = 0$
$16 - 35 + 19 = 0$
$0 = 0$ ✓
yes.

determine if the point (11, -2) verifies the inequation: $3x - 2y > 38$

$3(11) - 2(-2) > 38$
$33 + 4 > 38$
$37 > 38$ ✗ NO.

You can now do:

WB

- Page 31 #1
- Page 32 #2, 3, 4
- Page 35 #1,2