Step 4—Graphing Inequalities and Polygons of Constraints

CHAPTER 1

Slope-Intercept Form of a Line

Review

- slope

$$a = \frac{y2 - y1}{x2 - x1}$$

- equation of a line

$$y = ax + b \; \boldsymbol{OR} \; y = mx + b$$

$$a = slope$$

$$b = y - intercept$$

MATHKETBALL

1. Test yourself to see how much you remember.
2. If you are alone, play for both the red and blue teams. If you are Zooming with a friend, share you screen and play against each other.

Play Mathketball

http://www.math-play.com/slope-intercept-game.html

Ex. 1 What is the slope of the line?

$$8x - 3 + 2y = 0$$

$$\frac{2y}{2} = \frac{-8x + 3}{2}$$

$$y = -4x + \frac{3}{2}$$

a b

$\boldsymbol{slope = -4}$

Ex. 2 What is the y-intercept of the line?

$$7y - 2x = 56$$

$$\frac{7y}{7} = \frac{2x + 56}{7}$$

$$y = \frac{2}{7}x + 8$$

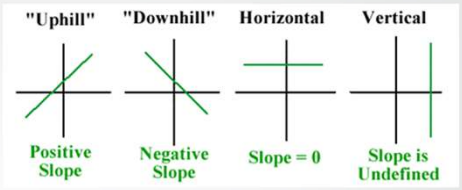
a b

$\boldsymbol{y - int = 8}$

Slopes

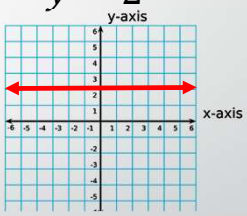
rises (increasing): positive slope

falls (decreasing): negative slope



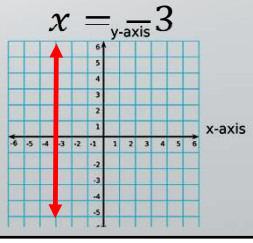
horizontal line: ⟷ slope = zero OR y = 0x + b

$y = 2$



vertical line: ↕ slope = undefined

$x = -3$

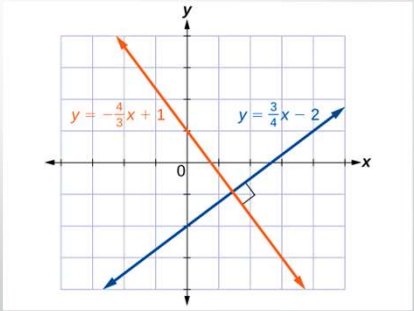


Slope of a line that is Perpendicular to another line

- Negative Reciprocal

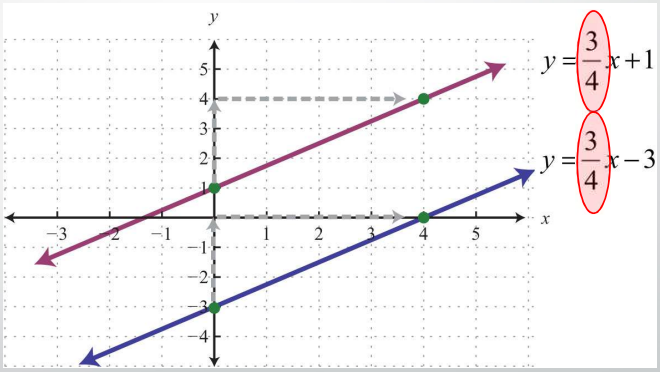
$ex\ 1: \quad \frac{2}{1} \rightarrow -\frac{1}{2}$

$ex\ 2: \quad -\frac{1}{3} \rightarrow \frac{3}{1}$



Slope of a line that is Parallel to another line

- Slope of both lines are the SAME!



Slope-Intercept Basketball

REMATCH

Play again, see if you did better after a bit of review.

- http://www.math-play.com/slope-intercept-game.html

Classwork/Homework

MHS worksheets from Chapter 1

- Introduction to Linear Functions
- Slope of a Line
- Slope-Intercept form of a Line

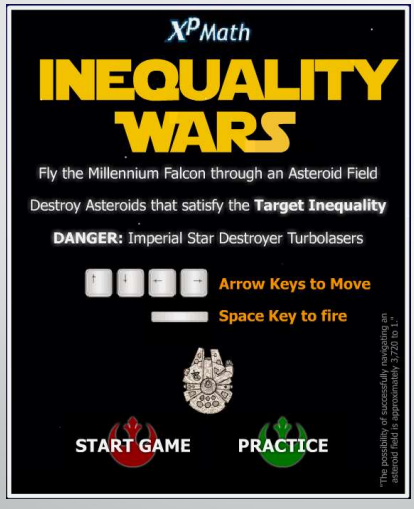
Review these worksheets and make sure you can do them really easily—you should be zipping through them before you move on to the next section.

CHAPTER 1

Solving one-variable first degree inequalities

Symbol	Meaning
$<$	less than
$\leq$	less than or equal to
$>$	greater than
$\geq$	greater than or equal to

Inequality Wars



http://www.xpmath.com/forums/arcade.php?do=play&gameid=87

- Solve inequalities like equations except for:

1. Inequality signs
2. If dividing OR multiplying by a negative number, flip the inequality sign.

Solve the inequalities

Ex. 1: $2x + 5 > 7$

$$2x > 7 - 5$$

$$\frac{2x}{2} > \frac{2}{2}$$

$$x > 1$$

Ex. 2:

$$4 - 3x + 1 > 2$$
$$-3x + 5 > 2$$
$$-3x > 2 - 5$$
$$\frac{-3x}{-3} > \frac{-3}{-3}$$
$$x < 1$$

MUST FLIP the sign when multiplying or dividing by a negative number

Classwork/Homework

- Solving One-Variable First Degree Inequalities

  # 1, 3, 5, 7, 9 and 10

- Do the rest of the problems in this worksheet if you are ***not flying*** through these questions (max: 15 mins).

CHAPTER 1

Graphing Linear Inequalities

REVIEW Graphing Linear Equations (Lines)

Try this game! It's a great review for graphing straight lines.

- http://www.mathplayground.com/SaveTheZogs/index.html

Graphing Inequalities

BASIC How to—Graphing Inequalities

1. Graph the line (put it in function form first)
2. Shade all included values

Shade, Shade, Shade, Shade It

- http://www.teachertube.com/video/shade-it-121267

DETAILED How to:

Graphing Linear Inequalities

A. Change the inequality into slope-intercept (function) form,

B. $f(x) = ax + b$. When solving, if dividing OR multiplying by a negative number, flip the inequality sign. Graph the equation.

C. If $>$ or $<$ then the line should be dashed.

D. If $\geq$ or $\leq$ then the line should be solid.

E. If $f(x) > ax+b$ or $f(x) \geq ax+b$, shade above the line.

F. If $f(x) < ax+b$ or $f(x) \leq ax+b$, shade below the line.

G. To **check** that the shading is correct, pick a point clearly on one side of the line, plug it into the inequality and solve. **Choose (0,0) if it's not on the line.**

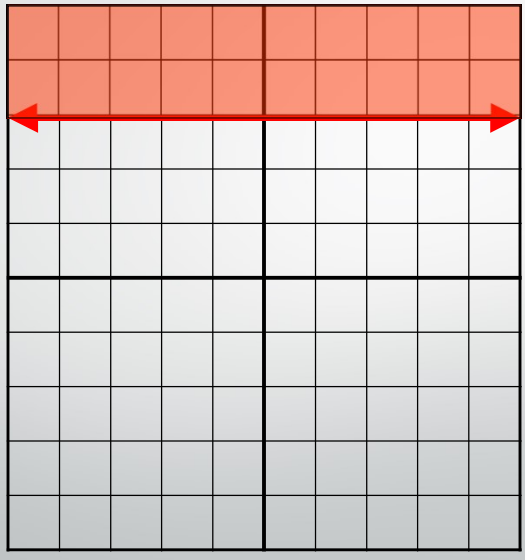
- If TRUE, shade TOWARD THE POINT
- If FALSE, shade AWAY FROM THE POINT

GRAPHING INEQUALITIES

INEQUALITY SYMBOL	TYPE OF LINE (dashed or solid)	WHERE TO SHADE (above or below line) SHORTCUT—MUST BE IN FUNCTION FORM
<	dashed	below
>	dashed	above
≤	solid	below
≥	solid	above

Special Case

Sketch a graph of $y \geq 3$



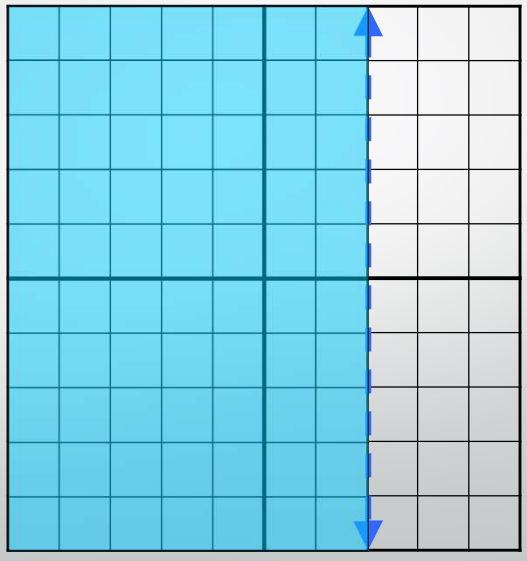
Special Case

Graph $x < 2$

Step 1: Start by graphing the line $x = 2$

Now what points would give you less than 2?

Since it has to be $x < 2$ we shade everything to the left of the line.



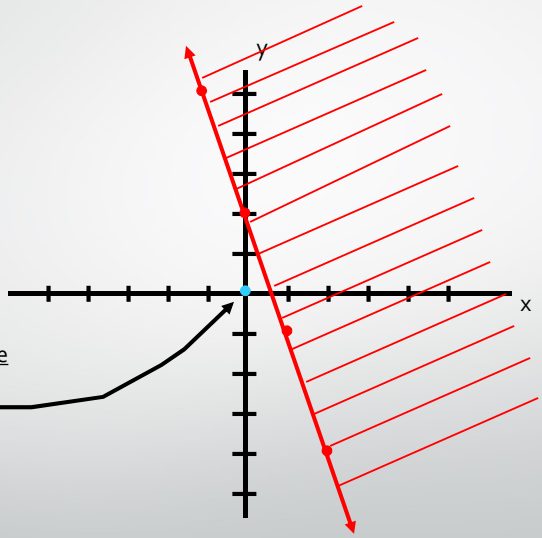
Graph $y \geq -3x + 2$ on the Cartesian plane.

Boundary Line

y = -3x + 2

a = -3 $= \frac{-3}{1}$

b = 2



Test a point not on the line

test (0,0)

$0 \geq -3(0) + 2$

$0 \geq 2$

FALSE (shade away from test point)

Graph on the Cartesian plane.

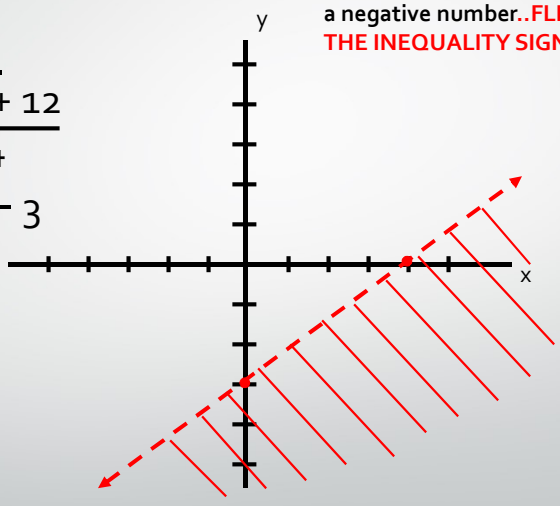
$3x - 4y > 12$

$-3x \quad -3x$

$\frac{-4y}{-4} > \frac{-3x + 12}{-4}$

$y < \frac{3}{4}x - 3$

Remember that when you multiply or divide by a negative number..FLIP THE INEQUALITY SIGN!!



Boundary Line

a = $\frac{3}{4}$

b = -3

Shade, Shade, Shade, Shade It

- http://www.teachertube.com/video/shade-it-121267

Classwork/Homework

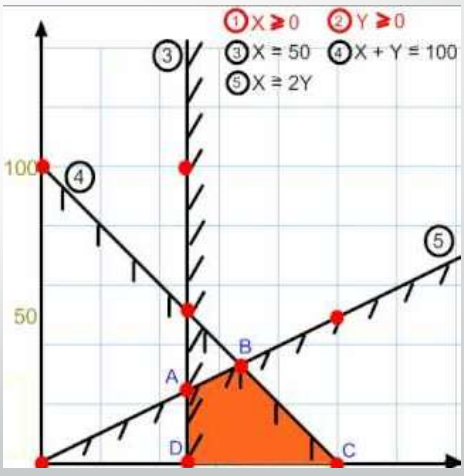
- Chapter 1—Graphing Linear Inequalities MHS Worksheet # 1-10
- Come back next class with questions that you had trouble with or email me to set up a Zoom.

Chapter 2

Polygon of Constraints ~Level 2

What is a polygon of constraints?

- A system (2 or more) of inequalities graphed on the same Cartesian Plane.
- The solution (answer) of a polygon of constraints is where all the shading overlaps.



TRANSLATION: We have some rules (constraints/inequalities) to follow, if we follow all these rules, our answer is when we follow all the rules at the same time.

- Example:

Dress Code Rules

1. black or white
2. solid color
3. collar
4. no leggings
5. no jeans




How to—Polygon of Contraints

I. Graph all the **constraints** (inequalities) on the same Cartesian Plane (label axes, origin, scale, lines).

II. Use arrows to indicate where the shading should go.

III. Color in (shade) the area where the shading OVERLAPS.

IV. Possible solutions:

a) Points in the overlapping shaded area

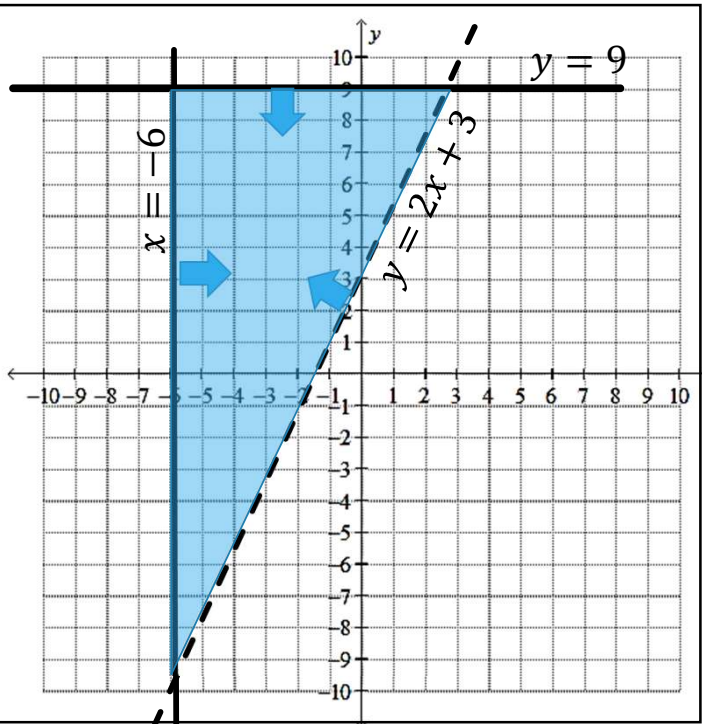
b) Points on the solid lines, NOT DASHED lines

Graph the following system of inequalities.

$$y > 2x + 3$$
$$y \leq 9$$
$$x \geq -6$$

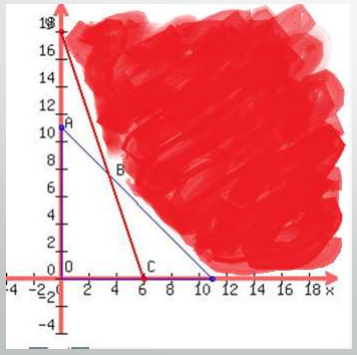
Where are the possible solutions (answers) for this polygon of constraints?

- blue shaded area
- on the line $x = -6$
- on the line $y = 9$
- **NOT** on the line $y = 2x + 3$

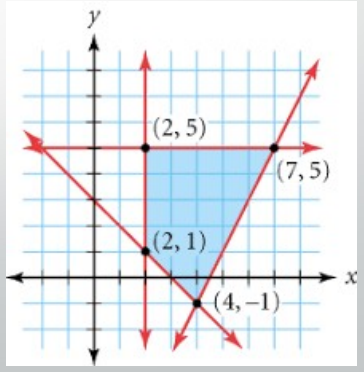


Bounded vs Unbounded Solutions

- **Unbounded solutions**: shading goes on forever



- **Bounded solutions**: are solid shapes



Classwork/Homework

- Polygons of Constraints (BASIC) WORKSHEET, the link is on my website

Real World Situations

- REMEMBER: Word Problems will very likely be Real World Situations, and when they are, you must add:

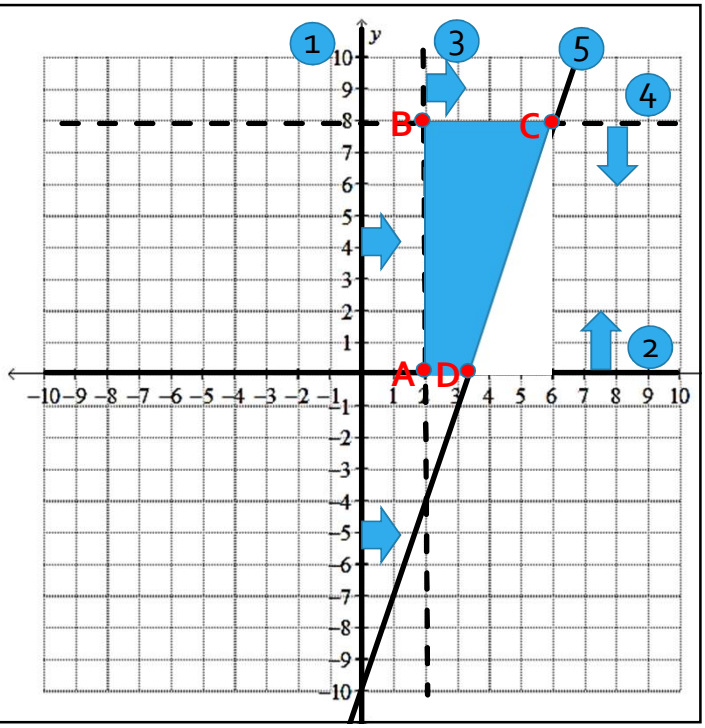
$$x \geq 0$$

$$y \geq 0$$

Graph the following system of inequalities.

$x \geq 0$..... 1
$y \geq 0$..... 2
$x > 2$..... 3
$y < 8$..... 4
$y \geq 3x - 10$.... 5

Identify the vertices (corners) of the polygon of constraints (A, B, C, D).



Classwork/Homework

- MHS worksheets "Graphing Polygons of Constraints ~Level 2" p. 69 #1-10