Warm Up:

Find the equations of the lines that pass through the following points:

(0,2) and (4,10) (-2,-3) and (4,3)

$m = \frac{10-2}{4-0} = \frac{8}{4} = 2$

$y - 10 = 2(x-4)$

$y - 10 = 2x - 8$

$y = 2x + 2$

12. The y-intercept b is 2.

Slope is $\frac{\text{rise}}{\text{run}} = -\frac{3}{2}$.

$y = mx + b$

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

13. The y-intercept b is -2.

Slope is $\frac{\text{rise}}{\text{run}} = \frac{5}{3}$.

$y = mx + b$

$y = \frac{5}{3}x - 2$

14. The y-intercept b is 3.

Slope is $\frac{\text{rise}}{\text{run}} = 0$.

$y = mx + b$

$y = 0x + 3$

$y = 3$

15. $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{\frac{1}{3} - (\frac{-1}{3})}{1 - 0}$

$= \frac{2}{3}$

16. $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-4 - 3}{1 - (-1)}$

$= -\frac{7}{2}$

17. $y = mx + b$

$11 = \frac{7}{3}(3) + b$

$11 = 7 + b$

$b = 4$

$y = \frac{7}{3}x + 4$

18. $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-7 - (-2)}{15 - 10}$

$= \frac{-5}{5}$

$= -1$

$y = mx + b$

$-2 = -1(10) + b$

$-2 = -10 + b$

$b = 8$

$y = -x + 8$

19a. $m = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{20 - 16}{93 - 84}$

$= \frac{4}{9}$

$f(T) = mT + b$

$16 = \frac{4}{9}(84) + b$

$16 = \frac{112}{3} + b$

$-\frac{64}{3} = b$

$f(T) = \frac{4}{9}T - \frac{64}{3}$

20. $m = -\frac{1}{5}$

$y = mx + b$

$3 = -\frac{1}{5}(2) + b$

$3 = -\frac{2}{5} + b$

$b = \frac{17}{5}$

$y = -\frac{1}{5}x + \frac{17}{5}$

21. $m = -\frac{1}{3}$

$y = mx + b$

$3 = -\frac{1}{3}(0) + b$

$b = 3$

$y = -\frac{1}{3}x + 3$

23. neither

24. perpendicular

25. parallel

42. B is incorrect; x- and y-coordinates must be subtracted in the same order

49. No; the slopes between each pair of points are $\frac{4}{3}$, $\frac{5}{4}$, and $\frac{9}{7}$.

2-5 Linear Inequalities in Two Variables

Objectives

Graph linear inequalities on the coordinate plane.

Solve problems using linear inequalities.

2-5 Linear Inequalities in Two Variables

Vocabulary

linear inequality

boundary line

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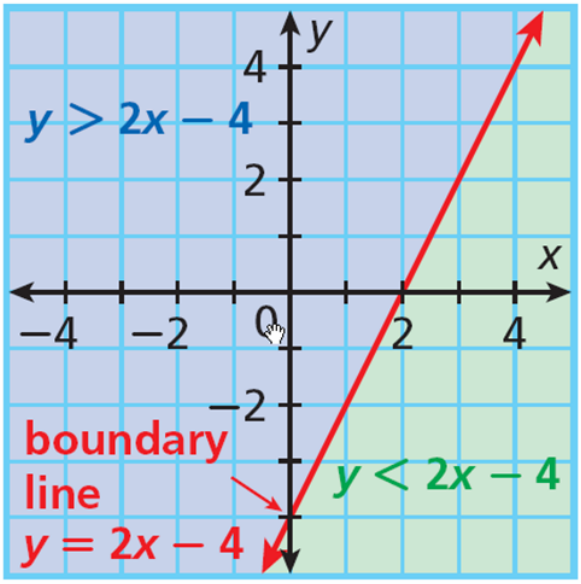
Linear functions form the basis of *linear inequalities*. A **linear inequality** in two variables relates two variables using an inequality symbol, such as $y > 2x - 4$. Its graph is a region of the coordinate plane bounded by a line. The line is a **boundary line**, which divides the coordinate plane into two regions.

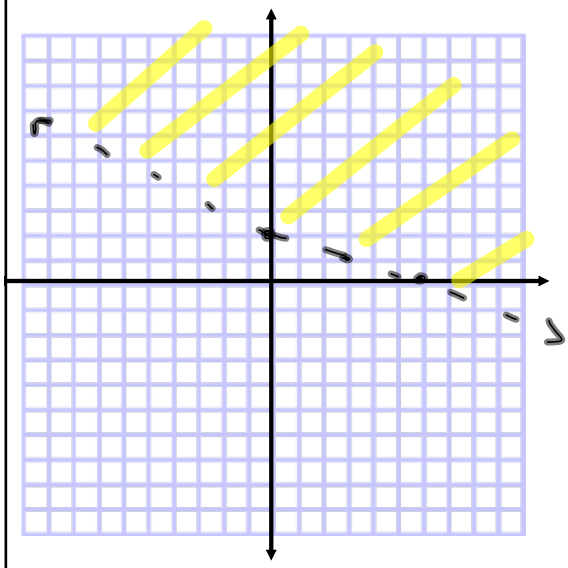
For example, the line $y = 2x - 4$, shown at right, divides the coordinate plane into two parts: one where $y > 2x - 4$ and one where $y < 2x - 4$. In the coordinate plane higher points have larger y values, so the region where $y > 2x - 4$ is above the boundary line where $y = 2x - 4$.



To graph:
1) Use the equation to graph your line. Pretend the inequality sign is an = to get your line. Like graphing inequalities on a number line there are two different lines, solid and dashed.
-Use a **solid line** when dealing with $\leq$ or $\geq$.
-Use a **dashed line** when dealing with < or >.

2) Shade the portion of the graph that fulfills the inequality. Best way is to use a test point such as (0,0). If that works then shade that side.

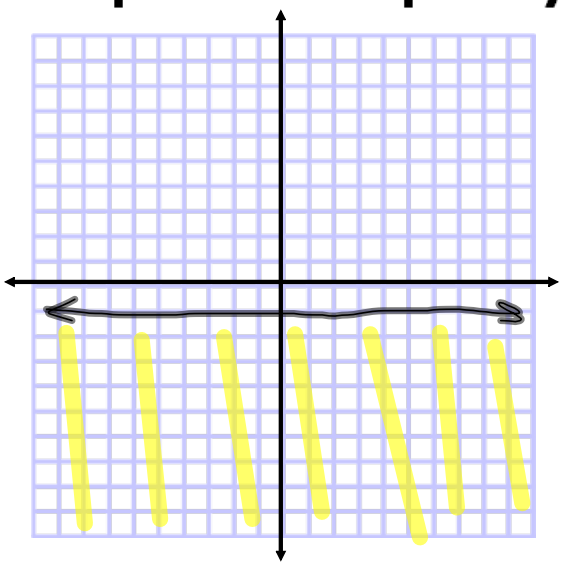
Graph the inequality $y > -\frac{1}{3}x + 2$.



$0 > -\frac{1}{3} \cdot 0 + 2$

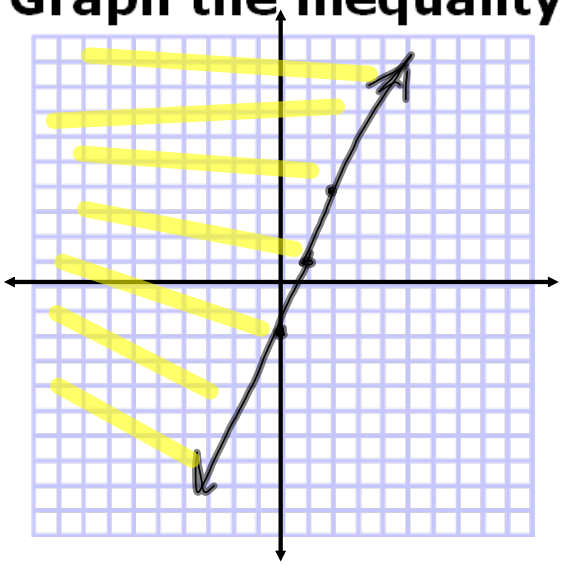
$0 > 2$

Graph the inequality $y \leq -1$.



$0 \leq -1$

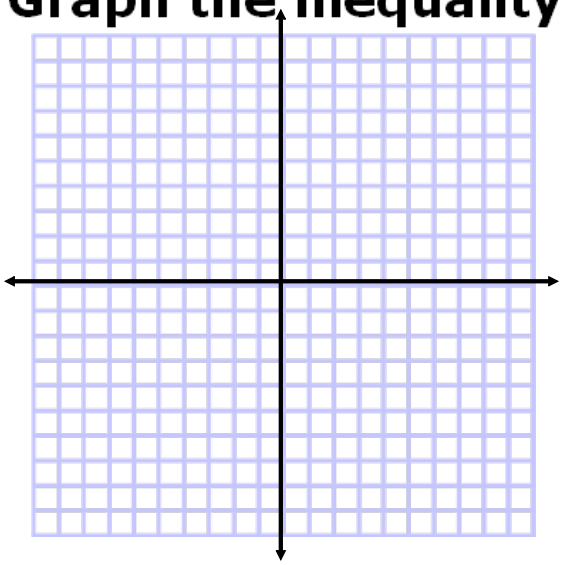
Graph the inequality $y \geq 3x - 2$.



$0 \geq 3 \cdot 0 - 2$

$0 \geq -2$

Graph the inequality $y < -3$.

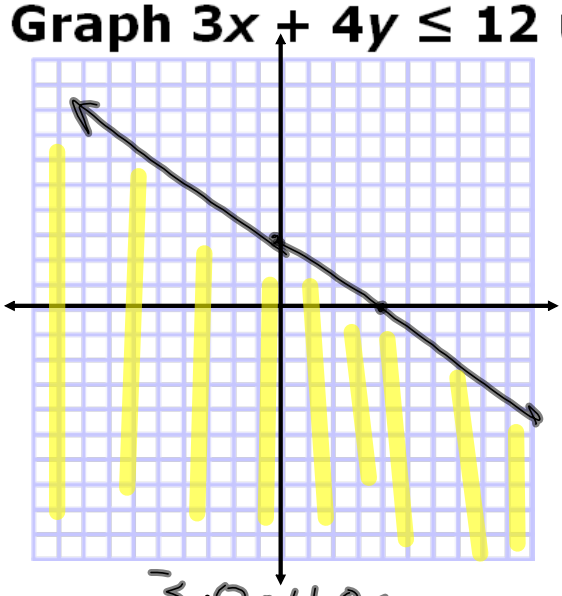


Give your partners a linear inequality, have them graph it.

When graphing with intercepts use the same steps as with an equal sign. Plug in 0 for x to find y-intercept and 0 for y to find x-intercept.

Plot those points and connect them using a solid or dashed line and shade the correct side of the graph.

Graph $3x + 4y \leq 12$ using intercepts.



$3 \cdot 0 + 4y \leq 12$

$y \leq 3$

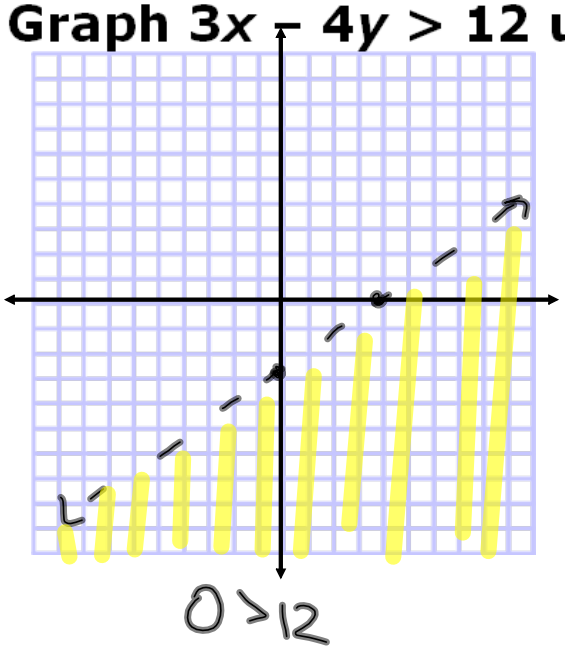
$3x + 4 \cdot 0 \leq 12$

$x \leq 4$

$3 \cdot 0 + 4 \cdot 0 \leq 12$

$0 \leq 12$

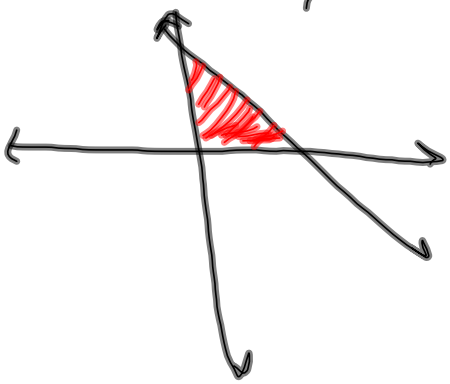
Graph $3x - 4y > 12$ using intercepts.



Sometimes you will deal with real world problems, such as those with money. When you get to these you can only shade in the first quadrant because you can't buy negative items or sell for a negative price, it doesn't make sense.

A café gives away prizes. A large prize costs the café $125, and the small prize costs $40. The café will not spend more than $1500. How many of each prize can be awarded? How many small prizes can be awarded if 4 large prizes are given away?

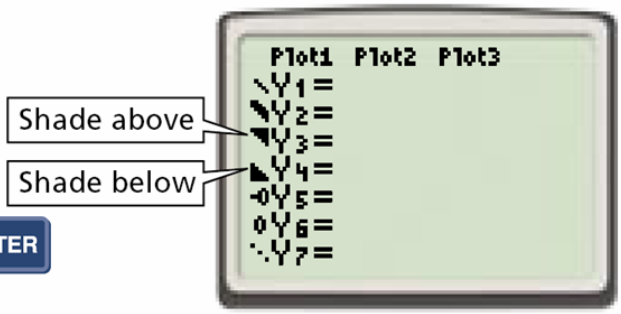
$125x + 40y \leq 1500$



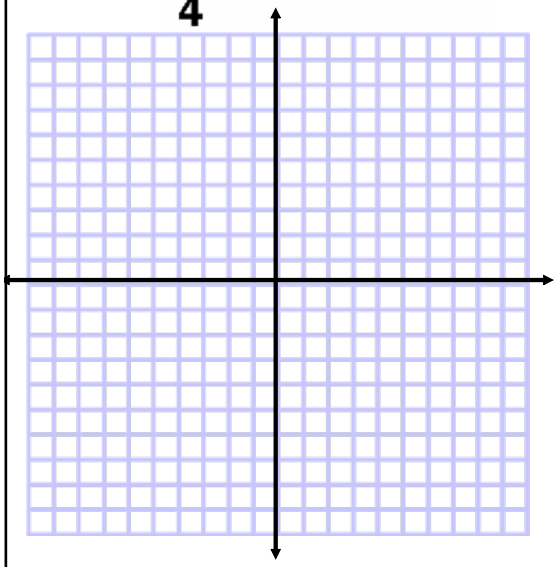
2-5 Linear Inequalities in Two Variables

You can graph a linear inequality that is solved for *y* with a graphing calculator. Press **Y=** and use the left arrow key to move to the left side.

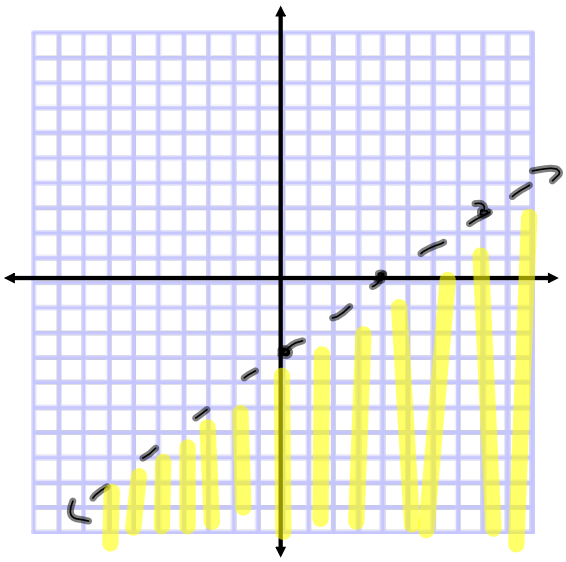
Each time you press **ENTER** you will see one of the graph styles shown here. You are already familiar with the line style.



Solve $\frac{3}{4}(8x - 2y) > 6$ for y. Graph the solution.



Solve $2(3x - 4y) > 24$ for y. Graph the solution.



$6x - 8y > 24$

$\frac{-8y}{-8} > \frac{-6x + 24}{-8}$

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

$0 > 24$

Homework:

p. 128 #14-19, 22, 31-33, 38-40