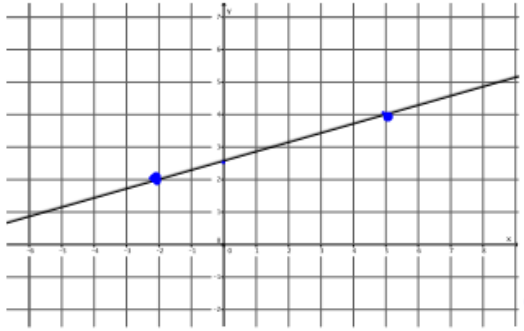
Lesson 21: Some Facts about Graphs of Linear Equations in Two Variables

$y = mx + b$

Classwork

Example 1

Let a line l be given in the coordinate plane. What linear equation is the graph of line l?



1. Write 2 good points
2. Find/Calculate the slope

$(-2, 2)$ $(5, 4)$ ★

$m = \frac{4-2}{5-(-2)} = \frac{2}{7}$

3. Plug-in a point and the slope to solve for b.

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

$4 = \frac{2}{7}(5) + b$

$4 = \frac{10}{7} + b$

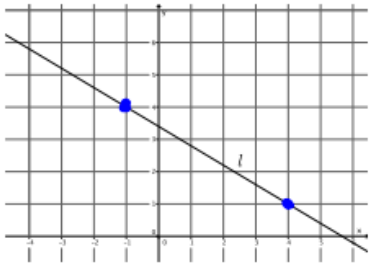
$-\frac{10}{7}$ $-\frac{10}{7}$

$\frac{28}{7} - \frac{10}{7} = \frac{18}{7} = b$

$y = \frac{2}{7}x + \frac{18}{7}$

Example 2

Let a line l be given in the coordinate plane. What linear equation is the graph of line l?



$(-1, 4)$ and $(4, 1)$ ★

$m = \frac{1-4}{4-(-1)} = \frac{-3}{5}$

$y = -\frac{3}{5}x + b$

$1 = -\frac{3}{5}(4) + b$

$1 = -\frac{12}{5} + b$

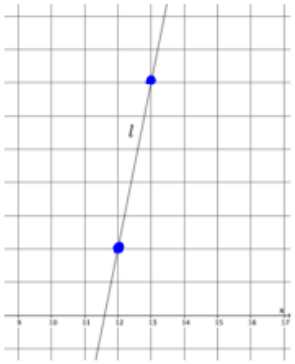
$\frac{5}{5} + \frac{12}{5} = \frac{17}{5} = b$

$+\frac{12}{5}$ $+\frac{12}{5}$

$y = -\frac{3}{5}x + \frac{17}{5}$

Example 3

Let a line l be given in the coordinate plane. What linear equation is the graph of line l?



(12, 2) (13, 7)

$m = \frac{7-2}{13-12} = \frac{5}{1} = 5$

$y = 5x + b$

$2 = 5(12) + b$

$2 = 60 + b$

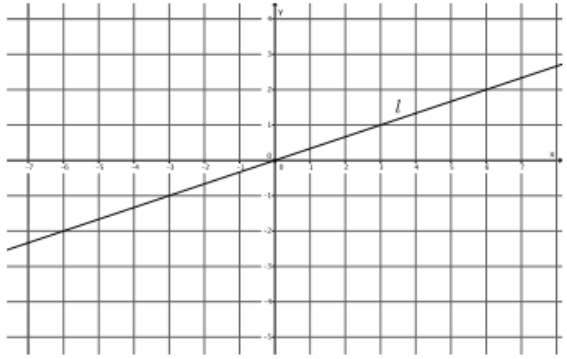
$-60 \quad -60$

$-58 = b$

$y = 5x - 58$

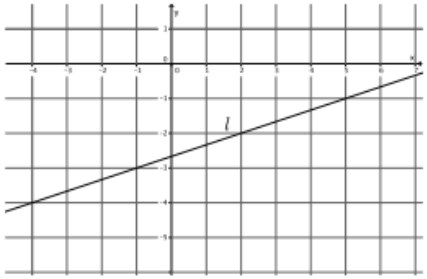
Example 4

Let a line l be given in the coordinate plane. What linear equation is the graph of line l?

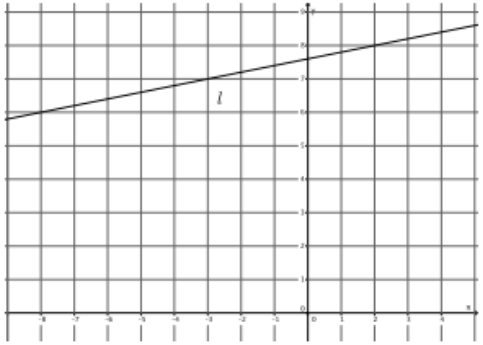


Exercises

1. Write the equation for the line l shown in the figure.

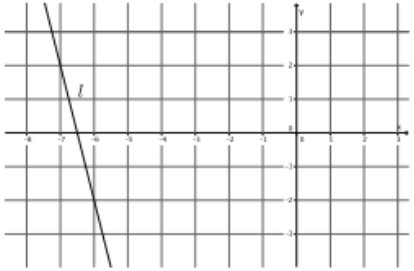


2. Write the equation for the line l shown in the figure.



3. Determine the equation of the line that goes through points $(-4, 5)$ and $(2, 3)$.

4. Write the equation for the line l shown in the figure.



5. A line goes through the point $(8, 3)$ and has slope $m = 4$. Write the equation that represents the line.

Lesson Summary

Let (x_1, y_1) and (x_2, y_2) be the coordinates of two distinct points on a line l. We find the slope of the line by

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

This version of the slope formula, using coordinates of x and y instead of p and r, is a commonly accepted version.

As soon as you multiply the slope by the denominator of the fraction above, you get the following equation:

$$m(x_2 - x_1) = y_2 - y_1.$$

This form of an equation is referred to as the point-slope form of a linear equation.

Given a known (x, y), then the equation is written as

$$m(x - x_1) = (y - y_1).$$

The following is slope-intercept form of a line:

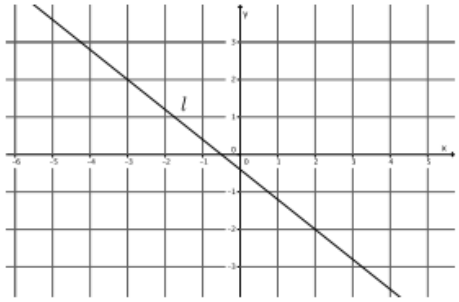
$$y = mx + b.$$

In this equation, m is slope and $(0, b)$ is the y-intercept.

To write the equation of a line you must have two points, one point and slope, or a graph of the line.

Problem Set

1. Write the equation for the line l shown in the figure.



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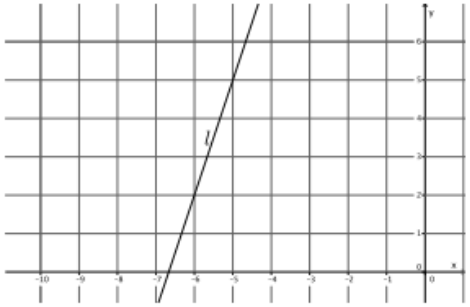

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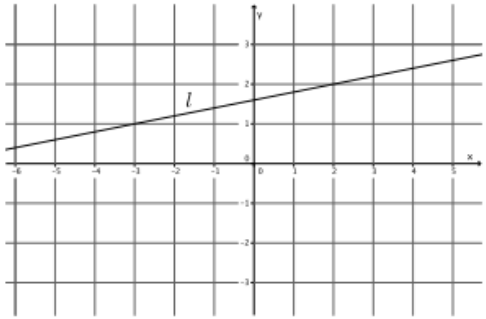
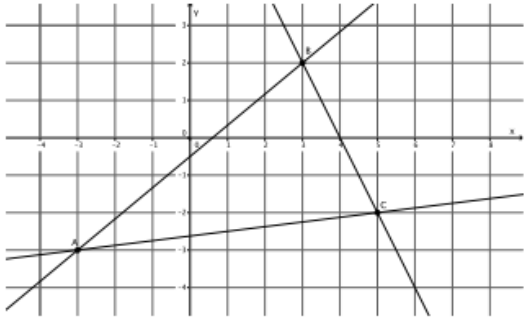


Triangle ABC is made up of line segments formed from the intersection of lines L_{AB}, L_{BC}, and L_{AC}. Write the equations that represent the lines that make up the triangle.



5. Write the equation for the line that goes through point $(-10, 8)$ with slope $m = 6$. $8 = 6(-10) + b$ $y = 6x +$

6. Write the equation for the line that goes through point $(12, 15)$ with slope $m = -2$.

7. Write the equation for the line that goes through point $(1, 1)$ with slope $m = -9$.

8. Determine the equation of the line that goes through points $(1, 1)$ and $(3, 7)$.