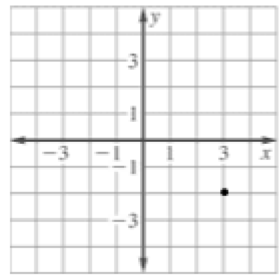
Chapter 4: Solving Linear Equations
Study Guide

4.1: Plot Points in the Coordinate Plane

- Identify/graph ordered pairs
- Identify the 4 quadrants

Ex: Write the coordinates of point graphed and identify the quadrant it lies in.



The ordered pair is (3, –2) and it is in quadrant IV.

4.2: Graph Linear Equations

- Graph an equation using a table (choose appropriate values for x)

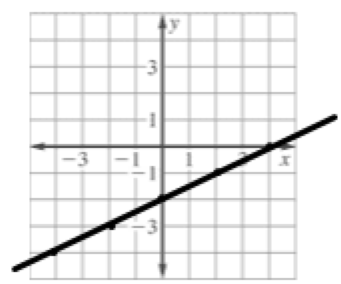
Ex: Graph $2x - 4y = 8$

First rewrite the equation so it is in function form (isolate y)

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

Then choose five appropriate values for x. Since x is being divided by 2 when you isolate y, you should choose values that will get rid of the fraction (in this case, multiples of 2). Plug in the five values for x to see what comes out for y.

x	–4	–2	0	2	4
y	–4	–3	–2	–1	0



Graph the five ordered pairs.

- Identify domain and range of a function

Ex: You are transferring photos from your digital camera to a CD. Each photo on the camera takes up 2 megabytes of space. The number p photos that will fit onto a CD is given by the function $s = 2p$ where s is the amount of space on the CD. One CD can store up to 700 megabytes of data. Identify the domain and range of the function.

First decide input and output, based on what is dependent and what is independent. Since space, s, **depends** on how many photos, p, you put on the CD, photos is independent and space is dependent. This makes photos input and space output. Input = domain. Output = range.

The problem tells you that you can only fit 700 MB of data (space) which was already decided is the range, so the range can be:

$$0 \le s \le 700$$

You can then use this information to figure out what the domain (number of photos can be)…

If you use 0 MB of space, that is 0 photos, if you use all 700 MB of space, and you know that each photo uses 2 MB, then divide 700 by 2 to get 350 photos. This is the maximum number of photos that you can put on a CD. So your domain would look like:

$$0 \le p \le 350$$

4.3: Graph Linear Functions Using *x* and *y* intercepts

- Find *x* and *y* intercepts from an equation
- Identify *x* and *y* intercepts from a graph
- Interpret the meaning of *x* and *y* intercepts as they apply to real-world problems

Ex: Find the *x* and *y* intercepts of the equation $0.2y - 0.3x = 0.6$

Ex: Graph $4x - 2y = -16$ using intercepts.

*Remember that to find the *x* intercept, the *x* happens when *y* is 0 (because the line is touching the *x* – axis) so you would replace *y* with 0 and then find *x*. To find the *y* intercept, remember that it happens when *x* is 0, so to find it you replace *x* with 0 and solve for *y*.

<u>*x* – int:</u>

$0.2(0) - 0.3x = 0.6$ (replaced *y* with 0)

$\frac{-0.3x}{-0.3} = \frac{0.6}{-0.3}$ (simplify) (divide by - 0.3)

$x = -2$

<u>*y* – int:</u>

$0.2y - 0.3(0) = 0.6$ (replace *x* with 0)

$\frac{0.2y}{0.2} = \frac{0.6}{0.2}$ (simplify) (divide by 0.2)

$y = 3$

<u>*x* – int:</u>

$4x - 2(0) = -16$

(divide by 4) $\frac{4x}{4} = \frac{-16}{4}$

$x = -4$

<u>*y* – int:</u>

$4(0) - 2y = -16$

(divide by –2) $\frac{-2y}{-2} = \frac{-16}{-2}$

$y = 8$

Ex: Your earn \$20 an hour mowing lawns and \$10 an hour washing windows. You want to make \$500 in one week.

a) Write an equation to represent the situation $20x + 10y = 500$

b) Graph the equation using x and y intercepts. $x = 25$ $y = 50$

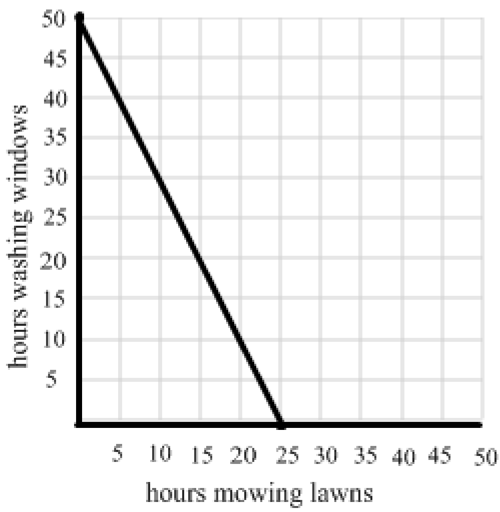
c) What do the intercepts mean in this situation? The x intercept means that you would have to work 25 hours if you ONLY mowed lawns. The y intercept means that you would have to work 50 hours if you ONLY wash windows.

d) What are three possible numbers of hours you can work at each job? Create a graph and scale each axis by five. Be sure to use a ruler and graph paper . Look for points on the line that cross a corner of the graph and then check if the numbers that go with that ordered pair work in the original equation (see part a)

e) If you work 30 hours washing windows, how many hours do you have to work mowing lawns?

Replace y with 30.

$$\begin{aligned} 20x + 10(30) &= 500 \\ 20x + 300 &= 500 \\ \underline{\quad -300} &\quad \underline{-300} \\ \frac{20x}{20} &= \frac{200}{20} \\ x &= 10 \end{aligned}$$



4.4: Slope and Rate of Change

- Find slope of a line that passes through two points
- Find slope of a line that is graphed
- Identify zero slope and undefined slope
- Find rate of change

Ex: Find the slope of the line that passes through the points (6, -4), (-5, -8)

Ex: Find the slope of the line that passes through the points (-5, 5) (2, 5)

*remember the formula for slope given two points is:

$$\frac{y_2 - y_1}{x_2 - x_1}$$

$\frac{-8 - (-4)}{-5 - 6}$

$= \underline{-4}$

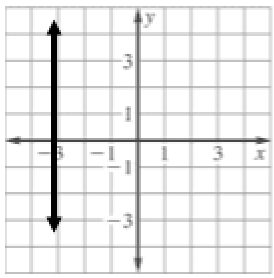
$\frac{5 - 5}{2 - (-5)}$

$= \underline{0}$

–11 7

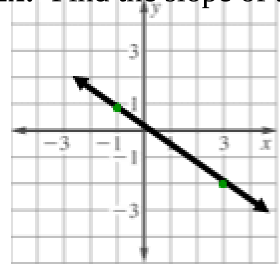
$= \frac{4}{11}$ $= 0$

Ex: Find the slope of the line



* remember vertical lines have an undefined slope

Ex: Find the slope of the line



*Remember that the slope formula for a graphed line is $\frac{\text{rise}}{\text{run}}$

Count the boxes up and down and left

to right. Rise = -3, run = 4, so slope = -3/4

Ex: At 12:20 P.M. a parachutist is 6200 feet above the ground. At 12:27, the parachutist is 1100 feet above the ground. Find the average rate of change in feet per minute.

*remember that rate of change is simply slope but with units, so you would use the same slope formula:

$$\frac{y_2 - y_1}{x_2 - x_1}$$

decide *x* and *y* based on what depends on what. Elevation depends on time, so elevation is the **dependent variable**, which is always *y*, and time is the **independent variable**, which is always *x*. Create two ordered pairs with the given information and remember that ordered pairs always go (*x*, *y*)

(12:20, 6200) and (12:27, 1100)

Plug them into the formula:

$$\frac{1100 - 6200 \text{ (feet)}}{12{:}27 - 12{:}20 \text{ (minutes)}}$$

$$\frac{-5100 \text{ feet}}{7 \text{ minutes}}$$

Create a unit rate so you know how much the elevation changes in **one** minute rather than in **7 minutes**. To do this, divide top and bottom by 7.

$$\frac{-728.57\text{ feet}}{1\text{ minute}}$$

This means that the parachutist falls 728.57 feet in 1 minute. Also, you can check that this makes sense, since when you parachute you know that you are getting lower and going down and the rate of change came out as a negative number.

4.5: Graphing Lines Using Slope-Intercept Form

- Identify slope and y-intercept of a line by looking at the equation
- Write equations in slope intercept form
- Use equations in slope-intercept form to graph a line
- Identify parallel lines

Ex: Identify the slope and y-intercept

$$y = -\frac{3}{4}x - 1$$

Slope = $-\frac{3}{4}$

y – intercept: –1

Ex: Write the following equation in slope-intercept form then identify slope and y intercept

$$4x - 9y = 18$$

*remember that slope – intercept form occurs when y is isolated. So you need to isolate y.

$$4x - 9y = 18$$
$$-4x \qquad -4x$$
$$\frac{-9y}{-9} = \frac{18 - 4x}{-9}$$
$$y = -2 + \frac{4}{9}x$$

slope = $\frac{4}{9}$ y – int: –2

Ex: Graph the following equation using slope-intercept form:

$4x - 3y = -6$ *put in slope – intercept form first.

$y = \frac{4}{3}x + 2$ Graph the y – intercept first by going up 2 on the graph . Then move where the slope tells you to, which is up 4 and to the right 3 spaces.

Ex: Tell whether the graphs of the two equations are parallel lines without graphing the lines:

$4x - 8y = 8$ and $y = 0.5x - 1$

*Remember that parallel lines have the same slope. Since the second line is in slope – intercept as 0.5 or ½ . Rewrite the first line in slope intercept form so you can also identify the slope and decide if the two lines are parallel.

First line: $y = \frac{1}{2}x - 1$

Since this line also has a slope of ½ , then you can say that the lines are in fact parallel lines.

4.7: Linear Functions

- Evaluate a function for a given value of x
- Find x for the given value of a function

Ex: Evaluate the function when $x = -2$

$f(x) = -5x - 8$

*Replace x with –2

$f(-2) = -5(-2) - 8$

*Do the math on the right side of the equals sign

$f(-2) = 10 - 8$

$f(-2) = 2$

Ex: Find the value of x so $f(x) = -1$

$f(x) = -2x + 5$

*Replace $f(x)$ with –1

$-1 = -2x + 5$

*Solve for x

$$\begin{aligned} -1 &= -2x + 5 \\ \underline{-5} & \quad \underline{\quad -5} \\ \frac{-6}{-2} &= \frac{-2x}{-2} \\ 3 &= x \end{aligned}$$