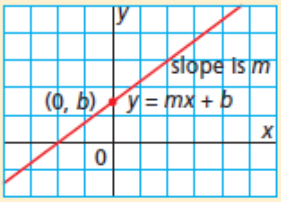
Topic 8 (Day 1) - 6.4 Slope – Intercept form (y = mx+b) of a Linear Equation

Slope-Intercept Form of the Equation of a Linear Function

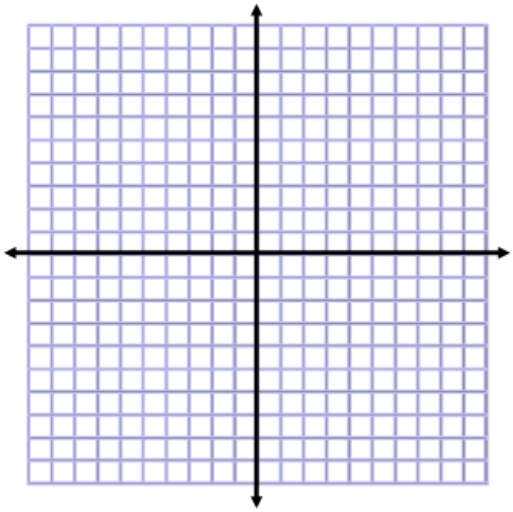
The equation of a linear function can be written in the form $y = mx + b$, where m is the slope of the line and b is its y-intercept.



Concept #32: 6.4 Write the equation of a linear function in **slope-intercept form** (either from given info or from a graph). Given an equation in **slope-intercept** form be able to identify the values of slope and y intercept. Graph an equation given in **slope-intercept** form. **(NC)(Skill)**

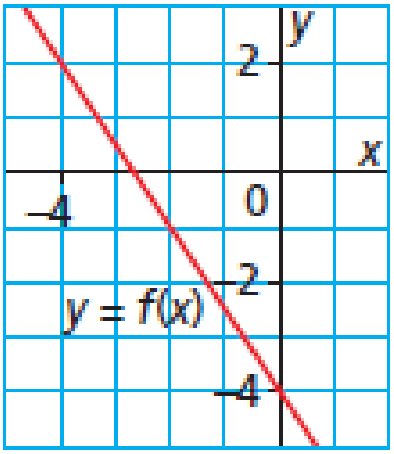
Example #1: a) Write the equation of the line with a slope of $\frac{4}{3}$ and a y intercept of -2.

B) Draw a sketch of this line.



Example #2: a) Write the equation of the line in slope intercept form, y=mx+b.

b) Verify the equation. (Use a point to check if the equation is correct)



Example #3: a) Re-write the equation into slope- intercept form. b) State the slope and y-intercept of the line

i) $5x - 2y + 12 = 0$ ii) $3x - 2y - 16 = 0$

Example #4: Consider the equation $y = 3x + b$. What is the value of b if a graph of the line passes through the point (-5, 2)?

Example #5:

The student council sponsored a dance. A ticket cost $5 and the cost for the DJ was $300.

a) Write an equation for the profit, *P* dollars, on the sale of *t* tickets

b) Suppose 123 people bought tickets. What was the profit?

c) Suppose the profit was $350. How many people bought tickets?

d) Could the profit be exactly $146? Justify the answer.

Topic 8 Day 1 - 6.4 Assignment: Pg 362 #4bcef, 5cde, 6bc, 7ac, 12, 14, 18, 21 Ext. #22,23,24

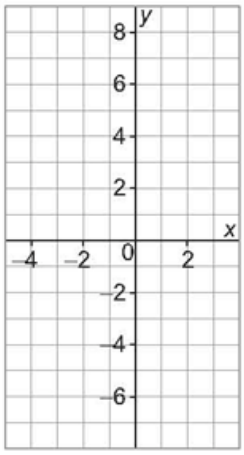
Topic 8 (Day 2) - 6.5 Finding equations of lines using the slope- point formula

Slope-Point Form of the Equation of a Linear Function

The equation of a line that passes through $P(x_1, y_1)$ and has slope m is:
$y - y_1 = m(x - x_1)$

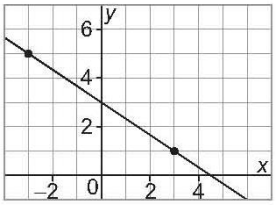
Concept #33: 6.5 Write an equation of a line in **point-slope form** (either from given info or from a graph)**.** Given an equation in **point-slope** form be able to identify the values of slope and one point and graph it. Graph a linear function given its equation in **point-slope form (NC)(Skill)**

Example #1: If a line has a slope of 6 and passes through the point (3, 7), write the equation of the line in Slope-Point form. Graph it.



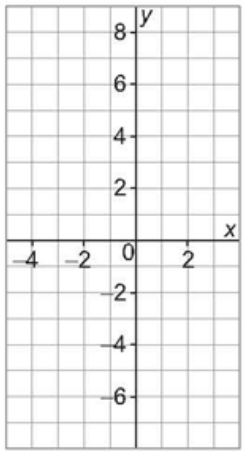
Example #2:

a) Write the equation of the line shown in the graph in Slope-Point form.



b) Use algebra to change your answer in part "a" into Slope-Y Intercept form.

Example #3: Write the equation of the line that has x intercept of -2 and slope 4/5. Graph the line.



Concept #34 - 6.5 Write an equation (in more than one form) of a line given two points on the line **(NC)(Skill)**

Example #4: If a line passes through the points (-2, 3) and (3, 7), find its equation in slope point form.

STEPS TO FINDING EQN GIVEN 2 POINTS

1. Use $m = \frac{y_2 - y_1}{x_2 - x_1}$ to find the slope (m)
2. Use this m and ONE of the original points in the formula $y - y_1 = m(x - x_1)$
3. Check to see what form you need to leave your answer in – rearrange your equation if necessary

b) Rewrite your equation to be in slope y intercept form.

Concept #37:6.4 Use an **equation of a linear function** to solve a situational problem **(NC) (Skill & Problem Solving)**

Example #5: A temperature in degrees Celsius, c, is a linear function of the temperature in degrees Fahrenheit, f. The boiling point of water is $100^0 C$ and $212^0 F$. The freezing point of water is $0^0 C$ and $32^0 F$.

a) Write a linear equation to represent this function. b) Re- write in function notation and determine the temperature in degrees Celsius at which iron melts, $2795^0 F$

Topic 8 (Day 2) ASSIGNMENT 6.5 Page 372 #4adf, 5, 6cd, 9ab, 10, 11cd, 16, 19

Topic 8 (Day 3)- 6.6 General Form Ax + By +C = 0

Equation of a Line:

- Every line that we can draw on a graph can be represented by an equation.
- In 6.4 we found the equation by using the slope of the line and the y intercept - which will always turn out to be the ordered pair (0,b)

  SLOPE-Y INTERCEPT FORM OF A LINE y = mx + b

- In 6.5 we found the equation by using the slope of the line and ANY point – this point will be called the ordered pair (x_1, y_1)
  SLOPE-POINT FORM OF A LINE $y - y_1 = m(x - x_1)$

- In this section we will learn to take either of the above forms of a line and write the final answer in the
  GENERAL FORM OF A LINE AX + BY + C = 0 where There are no Fractions in the answer and A is positive. **A, B and C are integers**

  - Sometimes we will also use the following:

  - **STANDARD FORM OF A LINE is AX + BY = C where we move the "C" to the other side of the equation, and A, B & C are integers**

Concept #35- 6.6 Rewrite an equation in general form ax + by + c = 0 and graph a line in general form (using intercept and slope-intercept method) **(NC)(Skill)**

Example #1: Write the following equations in General Form.

a) y = 4x – 8

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

c) $y = -\frac{5}{2}x + \frac{1}{7}$

Steps to Changing a line Into General Form

- If there are brackets, distribute the number in front of them first.
- If there are fractions, do the following: --- Put all terms over 1
  --- Find the Lowest Common Denominator Number (LCD)
  --- Multiply EVERY term by the LCD over 1 $\left(\frac{LCD\ \#}{1}\right)$
- Pick the side where the x term will be positive. Add or subtract the x term to get it to this side.
- Add or subtract all the other terms to get it to the side where x is.
- Simplify by combining like terms. Write your answer so the x term is first, then the y term, then the "plain number" (constant) = 0. This is called the form Ax + By + C = 0

e) y – 5 = -3(x + 3)

f) $y+2=\frac{-5}{6}(x-3)$

Example #2: In which form is each equation written? Determine the slope of each of the following.

a) y = -5x + 12

b) 7x – 3y + 2 = 0

c) 4x – 8y = 6

d) $y-3=\frac{2}{9}(x-8)$

e) y = 7(x – 4)

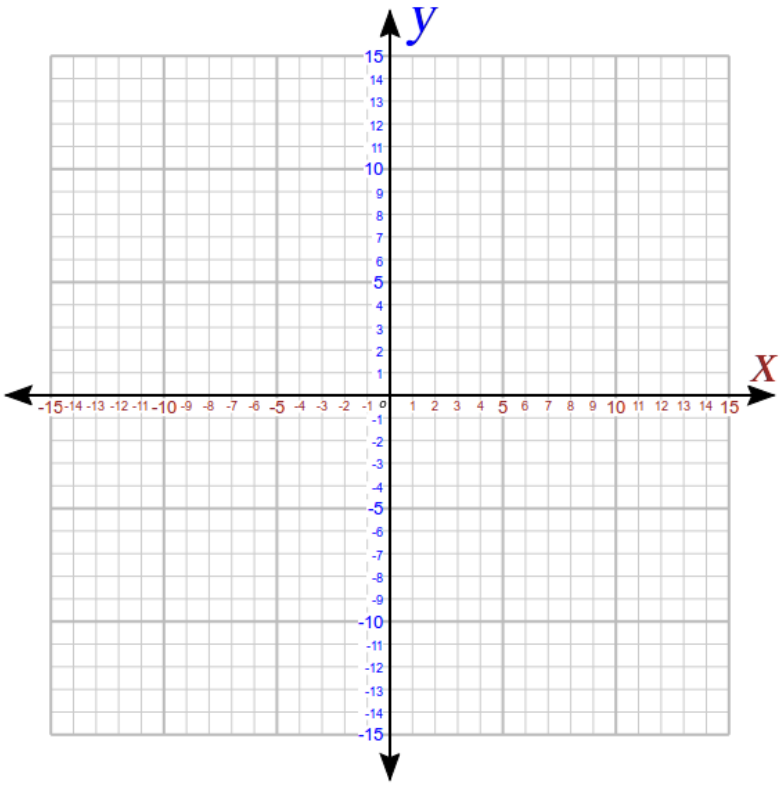
f) $\frac{2}{3}x+8y-5=0$

Example #3 – Graph each line. Use method of choice.

a) $y = -4x + 1$

b) 7x +8y -56 =0

c) y -1 = -3 (x+5)



Topic 8 (Day3) - 6.6 Assignment Page 384 #4, 5a, 6, 7a, 8, 12ac, 13ac, 18,22, 26

Topic 8 (Day 4) - 6.5/ 6.6 Parallel and Perpendicular lines and Writing Equations

Review

- **Parallel Lines have the same slope**
- **Perpendicular lines have slopes that are negative reciprocals of each other.**

Concept #36 - 6.5 Write an equation of a line that is parallel or perpendicular to a given line **(NC)(Skill)**

Example #1 Write an equation for the line AR that passes through R (1, -1) and is parallel to the line $y = \frac{2}{3}x - 5$

Example #2 Write the equation of a line perpendicular to 3x + 2y - 6 = 0 with and x-intercept of 9. Express the equation in slope-intercept form and in general form.

Example #3

Write the equation of a line in general form that is parallel to each line and passes through the given point

a) x – 8 = 0 , (-2, 4) b) y = 9 , (6,5) c) $y = -4x + 5$, (3,4)

Example #4

Write an equation that passes through (4,3) and is perpendicular to the x - axis

Topic 8 (Day 4) Assignment

1. Write an equation of a line in slope-intercept form that is parallel to each line and passes through the given point.
   a) y = 2x + 5, (1, -6)
   b) 5x + y – 1 = 0, (3, -8)
   c) y = -7x – 2, (2, 5)
   d) 4x + 2y – 5 = 0, x-intercept of 3
2. Write an equation of a line in general form that is parallel to each line and passes through the given point
   a) y = -3x + 7, (-2, 5)
   b) 6x – 2y + 10 = 0, (3, -5)
   c) y = 8, (3, 4)
   d) x – 5 = 0, (-1, -8)

3. Write an equation of a line in slope-intercept form that is perpendicular to each line and passes through the given point
   a) y = 3x + 5, (9, 5)
   b) x + 3y + 4 = 0, (5, -9)
   c) x + 5y – 10 = 0, x-intercept of -2
   d) y = -5x + 4, y-intercept of 3

4. Write an equation of a line in general form that is perpendicular to each line and passes through the given point
   a) y = -4x + 7, (-12, -7)
   b) 4x – 3y – 6 = 0, (-2, -1)
   c) x – 2 = 0, (-3, 7)
   d) y = -5, (4, -6)
5. Write the general form equation of a line that passes through (7, 5) and is
   a) parallel to the x-axis
   b) perpendicular to the y-axis
6. Determine an equation representing each line
   a) parallel to 5x + y + 4 = 0 with a y-intercept of -6
   b) perpendicular to x + 5y – 10 = 0 with the same y-intercept as y = 4x – 3
   c) perpendicular to 5x + 4y -2 = 0 with the same x-intercept as 3x – 5y = 15

Solutions

1a)	y = 2x – 8	b)	y = -5x + 7	c)	y = -7x + 19	d)	y = -2x + 6
2a)	3x + y + 1 = 0	b)	3x – y – 14 = 0	c)	y – 4 = 0	d)	x + 1 = 0
3a)	$y = -\frac{1}{3}x + 8$	b)	y = 3x – 24	c)	y = 5x + 10	d)	$y = \frac{1}{5}x + 3$
4a)	x – 4y – 16 = 0	b)	3x + 4y + 10 = 0	c)	y – 7 = 0	d)	x – 4 = 0
5a)	y – 5 = 0	b)	y – 5 = 0				
6a)	y = -5x – 6	b)	y = 5x – 3	c)	$y = \frac{4}{5}x - 4$		

Topic 8 (Day 5) - 6.4 – 6.6 Solving Linear relations Word Problems

Concept #37:6.4 Use an **equation of a linear function** to solve a situational problem **(NC) (Skill & Problem Solving)**

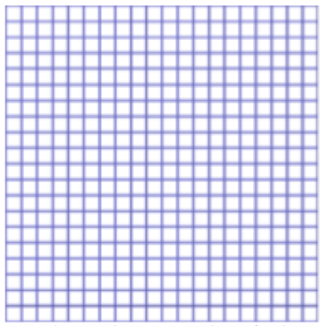
Topic 8 (Day 5) 6.4-6.6 Assignment Please do the following on Looseleaf.

1. Write an equation to represent each situation
   a) The cost, C, to take n students to the theatre is $300 to rent a bus and $6.25 per ticket.
   b) The taxi fee, T, is $3.60 to start plus $1.48 for each kilometer travelled, x.
   c) A rewritable Blu-ray disc has 1024 MB of data stored on it. When new data is added to the disc, the total data, D, in megabytes, stored on the disc at time t seconds increases at a rate of 54 MB/s.
   d) A water delivery truck is filling the water tank in Simeonie's house. The truck arrived with 2500 L of water. The number of litres of water, L, remaining in the truck at time t minutes decreases at a rate of 120 L/min.
2. An online music site charges a one-time membership fee of $20, plus $0.80 for every song that is downloaded.
   a) Write an equation for the total cost, C dollars, for downloading n songs.
   b) Jacques downloaded 109 songs. What was the total cost?
   c) Michele paid a total cost of $120. How many songs did she download?

3. To join the local gym, Karim pays a start up fee of $99 plus a monthly fee of $29.
   a) Write an equation for the total cost, C dollars, for n months at the gym.
   b) Suppose Karim went to the gym for 23 months. What was the total cost?
   c) Suppose the total cost was $505. For how many months did Karim use the gym?
   d) Could the total cost be exactly $600? Justify your answer.

4. Asha has selected a hotel for her wedding reception. The cost involves a fee for the deluxe ballroom and a buffet charge that depends on the number of guests. This is shown in the table.

Number of Guests	Cost ($)
0	425
25	1800
50	3175
100	5925



a) Sketch a graph of the data in the table.
b) What are the slope and y-intercept of the line? What does each of these represent?
c) Write an equation that describes the relationship between the cost and the number of guests. Express the equation in slope-intercept form.
d) What is the cost for 140 guests?
e) Asha would like the total cost to be no more that $15000. What is the maximum number of guests that can attend?
f) Did you need to draw the graph to determine the equation or was there enough information in the table of values?

5. A group of students tested how different masses changed the lengths of two different coil springs. The results of their experiments are summarized in the table.

Mass (g)	Spring 1 Length (cm)	Spring 2 Length (cm)
0	8	24
4	14	18
8	20	12
12	26	6

   a) For each spring, write an equation to model how spring length, L, in centimeters, changes with mass, x, in grams. Express each equation in slope-intercept form.
   b) What does a negative slope represent in the experiment?

6. Consider the equation y = 3x + b. What is the value of b if a graph of the line passes through the point (4, 9)?

7. For the equation y = mx – 2, what is the value of m if the line passes through the point (-2, 8)

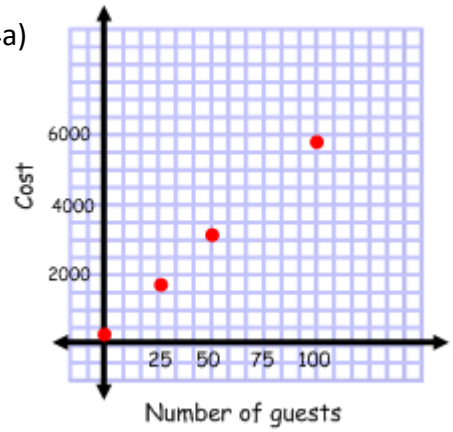
Topic 8 (Day 5) 6.4-6.6 Assignment Solutions

1a) C = 6.25n + 300 b) T = 1.48x + 3.60
c) D = 54t + 1024 d) L = -120t + 2500

2a) C = 0.80n + 20 b) $107.20 c) 125

3a) C = 29n + 99 b) $766 c) 14 d) No

4a)



b) m = 55; b = 425
$55/person; $425 cost of ballroom
c) C = 55n + 425
d) $8125
e) 265
f) Discussion

5a) Spring 1: y = 1.5x + 9 Spring 2: y = -1.5x + 24

b) Discussion

6) -3

7) -5