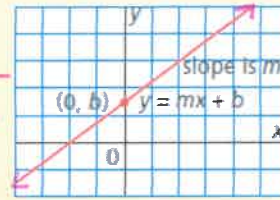


Topic 8 (Day 1) - 6.4 Slope – Intercept form ($y = mx+b$) of a Linear Equation

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.

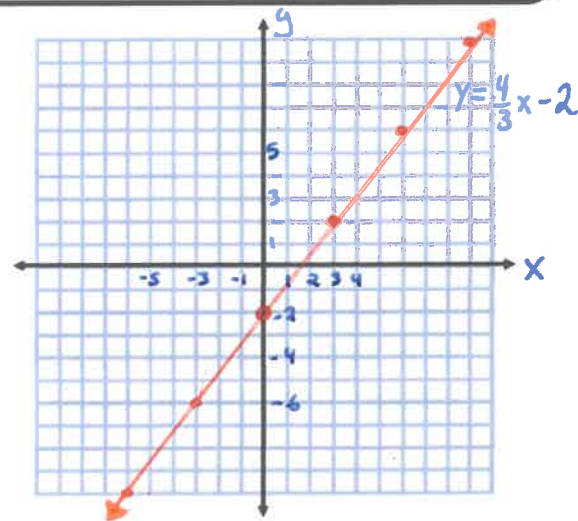


Concept #32: 6.4 Write the equation of a linear function in **slope-intercept form** (either from given info or from a graph). Given an equation in **slope-intercept form** be able to identify the values of slope and y intercept. Graph an equation given in **slope-intercept form**. (NC)(Skill)

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.

a) $y = m \cdot x + b$ (slope m , y -intercept b)
 $y = \frac{4}{3}x - 2$



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)

a) $m = -\frac{3}{2}$ (slope), $b = -4$ (y -intercept)
 $y = -\frac{3}{2}x - 4$

b) Pick a point on the line $(-4, 2)$

Substitute these values in for x and y to see if it satisfies the equation

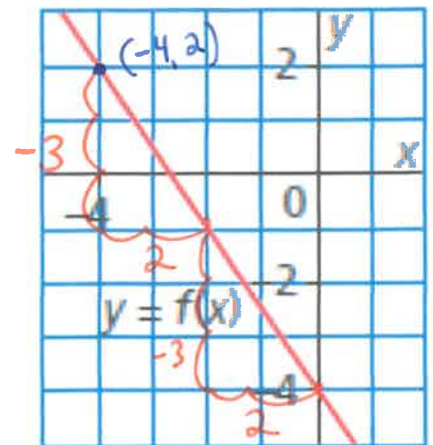
$$y = -\frac{3}{2}x - 4$$

$$2 = -\frac{3}{2}(-4) - 4$$

$$2 = 6 - 4$$

$$2 = 2 \checkmark$$

\therefore We can conclude this is the correct equation for this graph.



Note: Assume the line continues if it goes to the edge of the graph.

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

Note: Isolate the "y" and re-write in $y = mx + b$ form.

i) $5x - 2y + 12 = 0$
 $5x - 2y + 12 = 0 - 12$
 $5x - 2y = -12 - 5x$
 $-2y = -5x - 12$
 $y = \frac{5}{2}x + 6$

$m = \frac{5}{2}$
 $b = 6$
 The slope is $\frac{5}{2}$ and the y-int. is 6.

ii) $3x - 2y - 16 = 0$
 $m = \frac{3}{2}$
 $b = -8$

The slope is $\frac{3}{2}$ and the y-int. is -8.

$3x - 2y - 16 = 0 + 16$
 $3x - 2y = 16 - 3x$
 $-2y = -3x + 16$
 $y = \frac{3}{2}x - 8$

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)?

$x \ y$
 $y = 3x + b$
 $2 = 3(-5) + b$
 $2 = -15 + b$
 $17 = b$

The value of b is 17.

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

$P = 5t - 300$

\$5 made for every ticket sold (Rate of change) subtract the cost of the DJ because it is an expense.

c) Suppose the profit was \$350.

How many people bought tickets? $P = 350$

$350 = 5t - 300 + 300$

$\frac{650}{5} = \frac{5t}{5}$

$130 = t$

If the profit was \$350 they would have sold 130 tickets.

b) Suppose 123 people bought tickets.

What was the profit? $t = 123$

$P = 5(123) + 300$

$P = 615 - 300$

$P = 315$ The profit would be \$315 if 123 tickets were sold.

d) Could the profit be exactly \$146?

Justify the answer.

$146 = 5t - 300 + 300$

$\frac{446}{5} = \frac{5t}{5}$

$89.2 = t$

No, tickets are represented by whole #'s. Only if someone made a donation.

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:

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

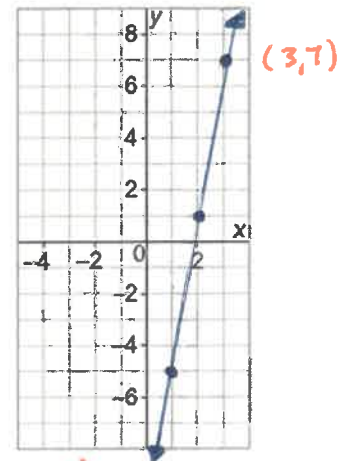
Concept #33: 6.5 Write an equation of a line in **point-slope form** (either from given info or from a graph). Given an equation in **point-slope form** be able to identify the values of slope and one point and graph it. Graph a linear function given its equation in **point-slope form** (NC)(Skill)

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.

$m = +6$
 $(3, 7)$
 x_1, y_1

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

$$y - 7 = 6(x - 3)$$



Example #2:

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

To find slope use $\frac{\text{rise}}{\text{run}}$ or the two point slope formula $m = \frac{y_2 - y_1}{x_2 - x_1}$

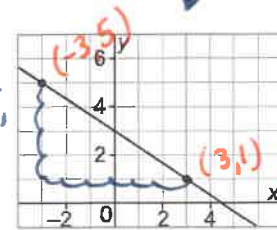
You can use either point

$m = -\frac{4}{6}$
 $m = -\frac{2}{3}$

Answer 1

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

Note minus a negative makes it positive
 or Answer 2



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

Answer 1

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

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

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

Answer 2

$$y - 1 = -\frac{2}{3}(x - 3)$$

$$y - 1 = -\frac{2}{3}x + 2$$

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

Example #3: Write the equation of the line that has x intercept of -2 and slope $\frac{4}{5}$. Graph the line.

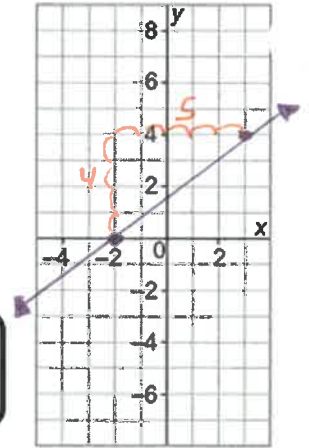
$$m = \frac{4}{5}$$

$$\begin{matrix} (-2, 0) \\ x_1 \ y_1 \end{matrix}$$

$$y - 0 = \frac{4}{5}(x + 2)$$

$$y = \frac{4}{5}(x + 2)$$

Note: x-intercept is a point with coordinates (-2, 0)



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.

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

$$m = \frac{7 - 3}{3 - (-2)}$$

$$m = \frac{4}{5}$$

Remember it doesn't matter which point you use

$$y - 7 = \frac{4}{5}(x - 3)$$

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

$$y - 7 = \frac{4}{5}(x - 3)$$

$$y - 7 = \frac{4}{5}x - \frac{12}{5} + 7$$

$$y = \frac{4}{5}x - \frac{12}{5} + \frac{7 \cdot 5}{1 \cdot 5}$$

$$y = \frac{4}{5}x - \frac{12}{5} + \frac{35}{5}$$

$$y = \frac{4}{5}x + \frac{23}{5}$$

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

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 $100^\circ C$ and $212^\circ F$. The freezing point of water is $0^\circ C$ and $32^\circ F$.

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, $2795^\circ F$

$$\begin{matrix} (100^\circ C, 212^\circ F) \\ x_1 \ y_1 \end{matrix}$$

$$\begin{matrix} (0^\circ C, 32^\circ F) \\ x_2 \ y_2 \end{matrix}$$

$$m = \frac{32 - 212}{0 - 100}$$

$$m = \frac{-180}{-100}$$

$$m = \frac{9}{5}$$

$$F - 32 = \frac{9}{5}(C - 0)$$

$$F - 32 = \frac{9}{5}C + 32$$

$$F = \frac{9}{5}C + 32$$

$$b) F(C) = \frac{9}{5}C + 32$$

$$2795 = \frac{9}{5}C + 32$$

$$\left(\frac{5}{9}\right)2763 = \left(\frac{5}{9}\right)\frac{9}{5}C$$

$$1535^\circ C = C$$

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, +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) $y = 4x - 8 - y$

$$0 = 4x - y - 8$$

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

$$(3) 0 = (3)\frac{2}{3}x - y + 4(3)$$

$$0 = 2x - 3y + 12$$

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

$$(14) 0 = -\frac{5}{2}x - y + \frac{1}{7}(14)$$

$$0 = 35x + 14y - 2$$

d) $y = -4x + 4x$

$$4x + y = 0$$

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) $y - 5 = -3(x + 3)$

$$y - 5 = -3x - 9 + 3x$$

$$3x + y + 4 = 0$$

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

$$y + 2 = -\frac{5}{6}x + \frac{15}{6}$$

$$0 = -\frac{5}{6}x - y + \frac{15}{6} - 2$$

$$0 = 5x + 6y - 15 + 12$$

$$0 = 5x + 6y - 3$$

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

a) $y = -5x + 12$

Slope-intercept
 $m = -5$

b) $7x - 3y + 2 = 0$

General Form $m = \frac{7}{3}$

$$-3y = -7x - 2$$

$$y = \frac{7}{3}x + \frac{2}{3}$$

c) $4x - 8y = 6$

Standard Form $m = \frac{1}{2}$

$$4x - 8y = 6 - 4x$$

$$-8y = -4x + 6$$

$$y = \frac{1}{2}x - \frac{3}{4}$$

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

Point-Slope form
 $m = \frac{2}{9}$

e) $y = 7(x - 4)$

Point slope form
 $m = 7$

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

No particular form
 $m = -\frac{1}{12}$

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

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

$$y = -\frac{2}{24}x + \frac{5}{8}$$

$$y = -\frac{1}{12}x + \frac{5}{8}$$

Is there a way to predict the slope when an equation is in general form?

Graph each line. Use method of choice.

Example #3 – Determine the x and y intercept of each of the following. Use the x and y intercepts to graph the line.

a) $y = -4x + 1$

b) $2x + 7y + 6 = 0$ $7x + 8y - 56 = 0$

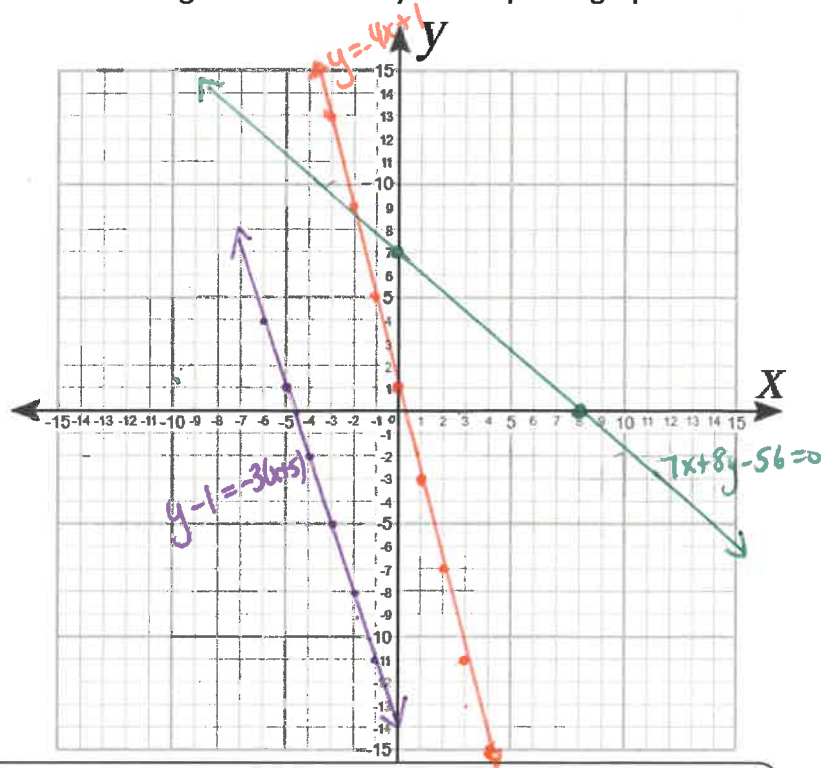
c) $y - 1 = -3(x + 5)$

a) $m = -4$
 $y\text{-int} = 1$

b) Find x-int
 $7x + 8(0) = 56$
 $7x = 56$
 $\frac{7x}{7} = \frac{56}{7}$
 $x = 8 (8, 0)$

c) $m = -3$
 $(-5, 1)$

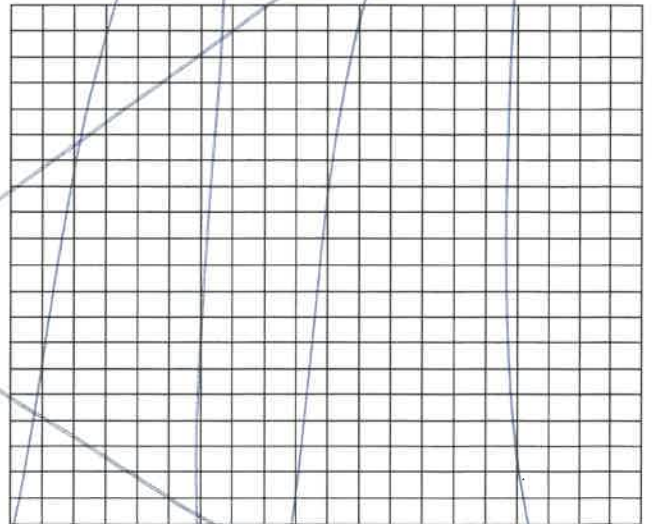
Find y-int
 $7(0) + 8y = 56$
 $8y = 56$
 $y = 7 (0, 7)$



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

Example #4 Mrs. Sundeen's Math class decided to buy her a nice present by using the money from taking in the bottles and cans from her classroom. They got \$12 by returning some cans for \$0.10 each and some bottles for \$0.25 each.

- Create some possible data for this situation
- Graph the data. Should you join the points?
- Write the equation (in slope – y intercept form) to relate the variables. Hint: Use the graph to help you
- Could Mrs Sundeen have had 55 bottles that ?Why or why not?
- Write the equation you received as an answer in part c in general form



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.

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

$$m = \frac{2}{3}$$

$$(1, -1)$$

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

$$y - (-1) = \frac{2}{3}(x - 1)$$

$$y + 1 = \frac{2}{3}(x - 1)$$

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

$$3x + 2y - 6 = 0$$

$$3x + 2y = 6$$

$$\frac{2y}{2} = \frac{-3x + 6}{2}$$

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

$m = -\frac{3}{2}$ Perpendicular slope is $\frac{2}{3}$

x-int (9, 0)

Equation

$$y - 0 = \frac{2}{3}(x - 9)$$

$$y = \frac{2}{3}x - \frac{18}{3}$$

Slope-intercept Form.

$$y = \frac{2}{3}x - \frac{18}{3}$$

$$0 = \frac{2}{3}x - y - \frac{18}{3}$$

General Form.

$$0 = 2x - 3y - 18$$

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)

$x = 8$
vertical line slope is undefined

$x = -2$

$x + 2 = 0$

b) $y = 9$, (6, 5)

Horizontal line slope is 0

$y = 5$

c) $y = -4x + 5$, (3, 4)

$$y - 4 = -4(x - 3)$$

$$y - 4 = -4x + 12 + 4$$

$$4x + y - 4 = 12 + 4$$

$$4x + y - 16 = 0$$

Example #4

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

$y = 3$

y-axis slope of zero.

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.
- $y = 2x + 5$, (1, -6)
 - $5x + y - 1 = 0$, (3, -8)
 - $y = -7x - 2$, (2, 5)
 - $4x + 2y - 5 = 0$, 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
- $y = -3x + 7$, (-2, 5)
 - $6x - 2y + 10 = 0$, (3, -5)
 - $y = 8$, (3, 4)
 - $x - 5 = 0$, (-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
- $y = 3x + 5$, (9, 5)
 - $x + 3y + 4 = 0$, (5, -9)
 - $x + 5y - 10 = 0$, x-intercept of -2
 - $y = -5x + 4$, 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
- $y = -4x + 7$, (-12, -7)
 - $4x - 3y - 6 = 0$, (-2, -1)
 - $x - 2 = 0$, (-3, 7)
 - $y = -5$, (4, -6)
5. Write the general form equation of a line that passes through (7, 5) and is
- parallel to the x-axis
 - perpendicular to the y-axis
6. Determine an equation representing each line
- parallel to $5x + y + 4 = 0$ with a y-intercept of -6
 - perpendicular to $x + 5y - 10 = 0$ with the same y-intercept as $y = 4x - 3$
 - 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.

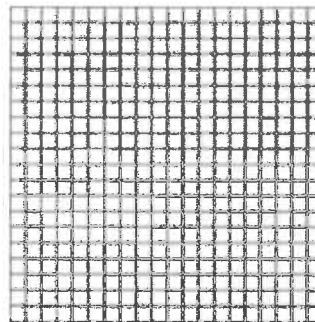
1. Write an equation to represent each situation
 - a) The cost, C , to take n students to the theatre is \$300 to rent a bus and \$6.25 per ticket.
 - b) The taxi fee, T , is \$3.60 to start plus \$1.48 for each kilometer travelled, x .
 - c) A rewritable Blu-ray disc has 1024 MB of data stored on it. 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 o values?

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

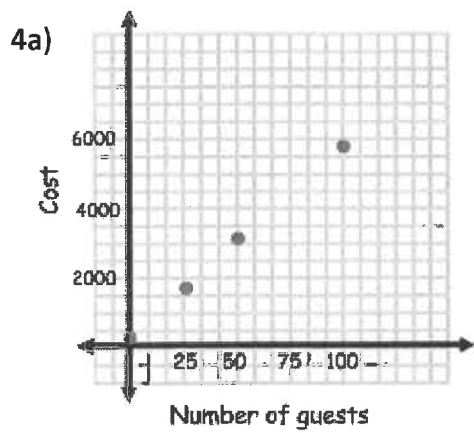
- a) For each spring, write an equation to model how spring length, L , in centimeters, changes with mass, x , in grams. Express each equation in slope-intercept form.
- b) What does a negative slope represent in the experiment?

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
- c) $C = 29n + 99$ b) \$766 c) 14 d) No



- 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

