Name: ______________________ **Teacher:** ______________________ **School:** _________________

Grade 8: Lesson 6 Using functions to model linear relationships

Complete the following exercises. You may use a calculator as needed.

1. Think about what you know about linear equations. Look at the information provided and then fill in each example box. Use words, numbers and pictures. Show as many ideas as you can.

slope-intercept form

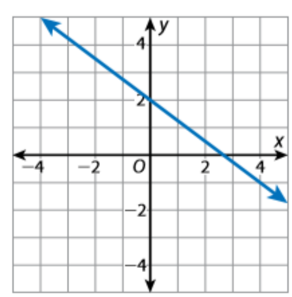
What is it?
A linear equation is in slope-intercept form when it is written in the form y = mx + b
Write this in your own words.

What I know about it
When an equation of the form y = mx + b is graphed, m is the slope and b is the y-intercept of the line.
Write this in your own words.

Examples
y = 3x - 7
y = -9x + 2.5
Can you give two more examples?

Non-examples
4x + y = 100
x - 11y + 22 = 0
Can you give two more non-examples?

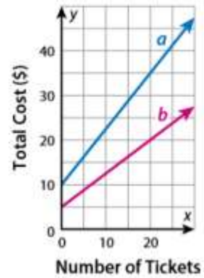
2. Write an equation for the graph in slope-intercept form.



3. A poster announces a carnival is coming to town. People pay an admission fee to enter the carnival. Then they buy tickets to go on rides. The total cost of attending the carnival is a function of the number of tickets bought. The graphs and equations model the total costs for children and for adults.

$y = 1.25x + 10$

$y = 0.75x + 5$



Adults
Admission $10
Ride Tickets $1.25

Children
Admission $5
Ride Tickets $0.75

a. Which equation and which line model the total cost for a child? How do you know?

b. Which equation and line model the total cost for an adult? How do you know?

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Name: ________________________ **Teacher:** ________________________ **School:** ___________________

Grade 8: Lesson 7 Interpreting a Linear Function

Complete the following exercises. You may use a calculator as needed.

Study the example showing how to interpret a linear function. Then solve the problems.

Example
Snow falls early in the morning and stops. Then at noon snow begins to fall again and accumulate at a constant rate. The tables shows the number of inches of snow on the ground as a function of time afternoon. What is the initial value of the function? What does this value represent?

The initial value is 6, the number of inches of snow at noon, when the time value is 0. It represents the amount of snow that was already on the ground before it began snowing again.

Hours after Noon	Inches of Snow
0	6
1	8.5
2	11

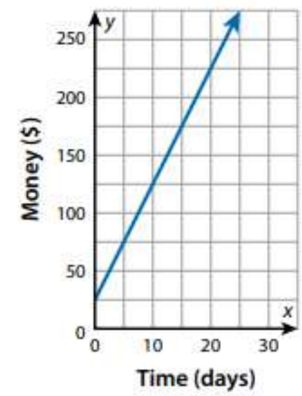
1a) What is the rate of change of the function in the Example? What does this value represent?

1b) Suppose there was no snow on the ground before it began snowing at noon.

What is the equation of this function?

2) The graph shows money in dollars as a function of time in days. White an equation for the function, and describe a situation that it could represent. Include the initial value, rate of change, and what each quantity represents in the situation.

Equation of the function (y = mx + b) and what situation it represents	
Initial Value	
Rate of Change	
"x" represents	
"y" represents	



3. Each day Kyle buys a cup of soup and a salad for lunch. The salad costs a certain amount per ounce. The equation below models the total cost of Kyle's lunch.

$$y = 0.45x + 3.75$$

a. What do the variables x and y represent? Use the phrase *is a function of* to describe how the equation relates these quantities to one another.

b. What does the value of the function for x = 0 represent?

c. What does the rate of change represent?

d. What is the cost of an 8-ounce salad without soup? How do you know?

4. Carmela is a member of a social club. She pays an annual membership fee and $15 for each event she attends. The equation y = 15x + 25 represents her total cost each year. Which statement(s) about the function is true? **Circle, star, or underline all that apply.** (Hint: three of these are true)

A. The initial value is 15.

B. x represents the cost of each event.

C. The rate of change is 15.

D. The initial value represents the annual membership fee.

E. The number of events she attends is a function of the total cost.

F. The total cost is a function of the number of events she attends.

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Name: ________________________ **Teacher:** ________________________ **School:** ___________________

Grade 8: Lesson 8 Writing an Equation for a Linear Function from Two Points

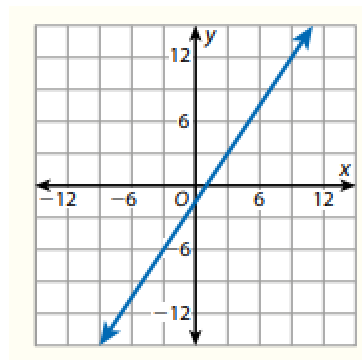
Complete the following exercises. You may use a calculator as needed.

Study the example showing how to write an equation for a linear function from two points. Then solve the problems.

Example
What is the equation of the function shown by the graph? Show your work.

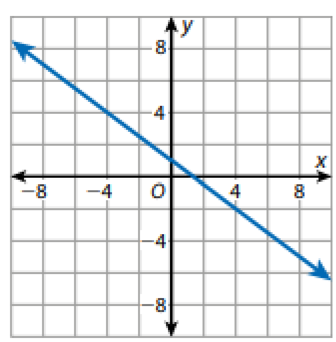
The line passes through (9, 12) and (3,3).

Slope $= \frac{12-3}{9-3}$ $= \frac{9}{6}$ $= \frac{3}{2}$	*y = mx + b* $12 = \frac{3}{x}(9) + b$ $12 = \frac{27}{2} + b$ $\frac{24}{2} - \frac{27}{2} = \frac{27}{2} - \frac{27}{2} + b$ $-\frac{3}{2} = b$ $y = \frac{3}{2}x - \frac{3}{2}$



1)

What is the equation of the function shown by the graph? Show your work. Remember to find two integer points where the line passes through so you can calculate the slope. (Hint: One is (-4, 4) Find the second point)



2) The graph of a linear function passes through the points (3, 19) and (5.23). Write an equation for the function. Show your work.

3)

Vinh pays a convenience fee when he reserves movie ticket son his cell phone app. The app shows him the total cost of his purchase for different number of tickets in the table shown.

a) What is the equation that models this linear function? Show your work. *Don't forget to define your variables!*

Tickets	Total Cost
2	\$32.00
3	\$44.50
6	\$82.00

b) Use the phrase *is a function of* to describe the situation represented by the equation you wrote in problem 3a.

c) How much is each movie ticket?

d) How much is the convenience?

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Grade 8: Lesson 9 Writing an Equation for a Linear Function from a Verbal Description

Complete the following exercises. You may use a calculator as needed.

Study the example showing how to write an equation for a linear function from a verbal description. Then solve the problems.

Example	**Vocabulary**
Dolores is making a music video using a drone. She sets the drone on a platform 1 meter above the ground. Then she uses the controls to make it rise at a constant rate. The drone reaches a height of 16 meters in 5 seconds. What is the equation for the drone's height, *y*, as a function of time, *x*? *At 0 seconds, the drone is 1 meter above the ground represented by (0, 1).* *At 5 seconds, the drone is 16 meters above the ground represented by (5, 16).* *Rate of Change:* $\frac{16-1}{5-0} = \frac{15}{5} = 3$ *Initial Value: 1* *Use the equation for a linear function, y = mx + b* *By substituting in the values, the equation is y = 3x + 1*	***Initial value*** – in a linear function, the value of the output when the input is 0. ***Linear function*** – a function that can be represented by a linear equation. ***Rate of change*** – in a linear relationship between *x* and *y*, it tells how much *y* changes when *x* changes by 1.

1. The drone in the Example hovers at 16 meters for a few minutes before being lowered at constant rate. It reaches the ground after 6 seconds.
   a. Why can the drone's descent be modeled by a linear function? (Hint – think about the described rate of change)

   b. The linear model of the drone's descent gives its height a function of time. Is the rate of change positive or negative? Explain. (Hint – think about the direction the drone is moving)

   c. What equation models the drone's descent as time increases? Show your work? (Hint – let (0,16) represent the initial value when the descent begins. Then, when it reaches the ground 6 seconds later, what height is it at? (0, ____))

Choose ONE of the following problems to solve.

2. The Drama Club is selling tie-dye T-shirts as a fundraiser. They buy the dyeing materials for $60 and white T-shirts for $2.50 each. They sell the finished shirts for $10 each.
    a. Write an equation for the money they **spend**, *y*, as a function of the number of T-shirts they buy, *x*.

    b. Write an equation for the money they **collect**, *y*, as a function of the number of T-shirts they sell, *x.* (Hint – if they sell 0 T-shirts, they collect $0)

    c. Write an equation for their profit, *y*, as a function of the number of T-shirts they sell, *x*. (Hint – profit is found by subtracting the amount spent from the amount collected)

3. On his first birthday, Tomas was 30 inches tall. For the next year, he grew half an inch each month. What equation models his height during that year, *y*, as a function of the number of months, *x*.

   (Hint – let Tomas' height at the start of the next year be represented by (0, 30). What would the rate of change be based on the description?)

Name: ______________________ Teacher: ______________________ School: _________________

Grade 8: Lesson 10 Using Function to Model Linear Relationships

Complete the following exercises. You may use a calculator as needed.

Using the examples from Lesson 10 today as a guide, solve the following problems as an overall review of this week's lesson.

1. Which savings plan can be modeled by y = 50x + 25? (choose one)
   a. Start with $50. Save $25 each week.
   b. Save $250 in 5 weeks for a total of $300.
   c. Start with $25. The total saved after 5 weeks is $275.
   d. The total saved is $25 the first week and $50 the second week.

   How do you know? Explain your thinking.

2. The equation y = 0.15x + 0.40 represents the cost of mailing a letter weighing 1 ounce or more. In the equation, *x* represents the weight of the letter in ounces and *y* represents the cost in dollars of mailing the letter.
   a. Fill in the blank: In this situation, the ___________________ is a function of the ___________________.
   b. What is the cost of mailing a letter that weighs 3 ounces?

3. Tell whether the information given is enough to write an equation for the linear function. Put a checkmark in the appropriate column.

	Yes	**No**
a. The initial value and the rate of change of the function.		
b. The slope of the line and the rate of change of the function		
c. The slope of the line and one point on the line that is not the y-intercept		
d. The y-intercept of the line and the value of the function at x = 5		
e. The y-intercept of the line and the value of the function at x = 0		

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