Name: ____

y = kx
k is the _______________
or the ___________________

Functions

8.F.A.1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.

1. Prerequisite:

A. Haley is making pizza dough. For every 4 cups of flour, she needs 2 cups of water. Represent the relationship using a table and an equation.

Table:

Flour, *f*	2	3	4	5	6	7	8
Water, *w*			2				

Equation:

Using your equation, how many cups of water would Haley need for 12 cups of flour?

B. Caleb buys 4 small drinks for $6. Make a table and write an equation to represent the cost, *c*, for *d* small drinks.

Equation:

C. A horse ran 800 meters in 40 seconds, 1,200 meters in 60 seconds, and 480 meters in 24 seconds. Is this a proportional relationship? If so, what is the constant of proportionality? What does it represent? Write an equation to represent this distance, *d*, in meters, that the horse runs in *t* seconds.

Distance	time

D. Lina and Meredith studied the data in the table. They each wrote an equation to represent the relationship between number of miles and the number of hours ridden by a bicyclist.

Miles, m	Hours, h
27	3
45	5
18	2
54	6

Lina's equation: $m = 9h$

Meredith's equation: $h = \frac{1}{9}m$

The teacher said that both equations were correct. Explain why.

2. Introduction to Functions

What is a function? It is a _______ that ___________ exactly one __________ for each ______________.

Input – the _________________ put into a function

Output – the ____________ that ________ from applying the _______ to the input.

A. Describe the relationship shown in each table. Is the relationship a function?

Table A

Hours (input)	1	2	3	4	5
Cost (output)	\$3	\$6	\$9	\$12	\$15

Explain:

Table B

Week (input)	Plant growth in inches (output)
1	4
2	3.25
3	2
4	2
5	1.75

1. Can you represent either of functions in the tables above with an equation?

2. Suppose you reverse the inputs and outputs in Table B. Would the relationship be a function? Explain.

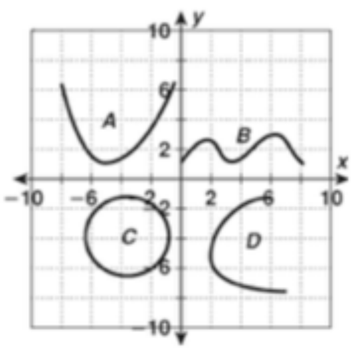
B. The table shows the number of concert tickets sold by five students. Is the relationship a function? Explain.

Student (input)	1	2	3	4	5
Tickets (output)	12	18	12	22	16

C. Can the table shown represent values of a function? Explain.

Input (x)	0.5	7	7	12	15
Output (y)	1	15	10	23	30

D. Do each of these curves represent a function? Explain why or why not.



A.

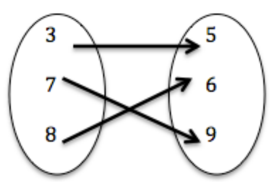
B.

C.

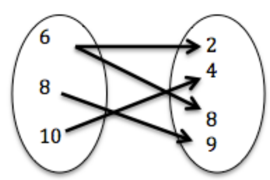
D.

E. Do either of the following diagrams represent a function?

1.



2.



F. Do the following equations represent a function?

1. $y = 3x$

2. $y = 2x + 5$

3. $y = -5x + 1$

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

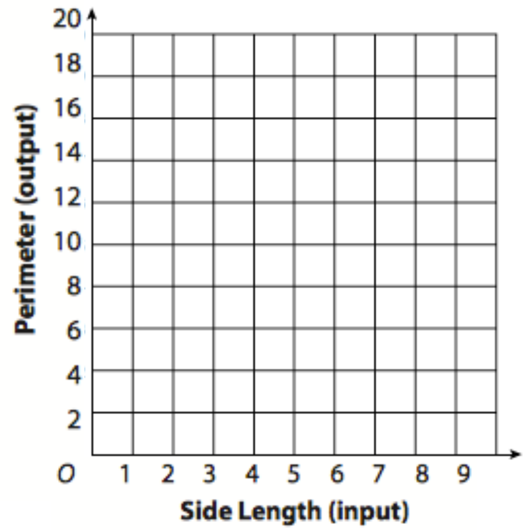
5. $x = y^2 + 2$

3. Comparing Functions

A. Identify Functions

The table shows the relationship between the length of the sides of a square, in feet, and the perimeter of the square in feet.

Side length (input)	1	2	3	4	5
Perimeter (output)	4				



1. Describe the relationship between the input and output values in the example above.

2. Can you represent the function in the example with an equation?

3. In the example, could one side length ever produce two different perimeters?

The relationship is a _______________ because there is only ____________ value for each ____________ value.

B. Interpret and Compare Rates of Change

Rate of change – the ____________ at which one quantity _____________ or _____________ in relation to a change in the other quantity.

It is the ______________________ $\frac{y_2 - y_1}{x_2 - x_1}$

Practice:

a. (4, 5) and (5, 7)

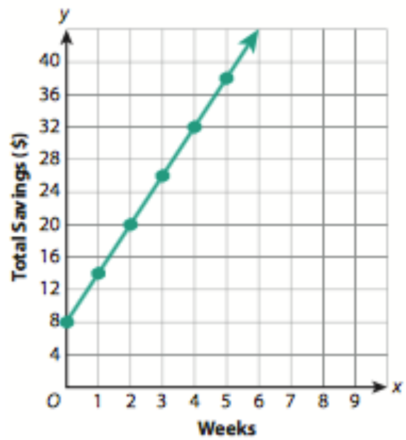
$\frac{y_2 - y_1}{x_2 - x_1}$

b. (5, 8) and (9, 16)

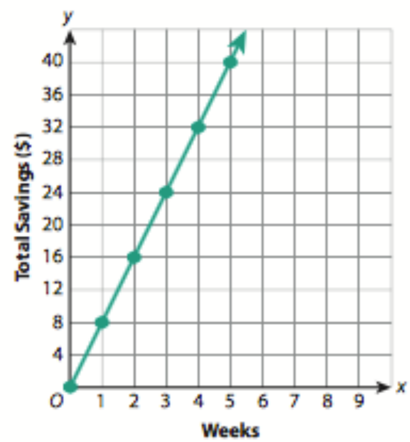
$\frac{y_2 - y_1}{x_2 - x_1}$

1. Compare the rates of change for these two functions. Which function has a greater rate of change?

Abigail's Savings



Peyton's Savings



Rate of Change:

$$\frac{\textit{vertical change (rise)}}{\textit{horizontal change (run)}} \qquad \frac{y_2 - y_1}{x_2 - x_1}$$

a. What do the rates of change in the example represent?

b. What does it mean in the context of the example that Peyton's rate of change is greater than Abigail's?

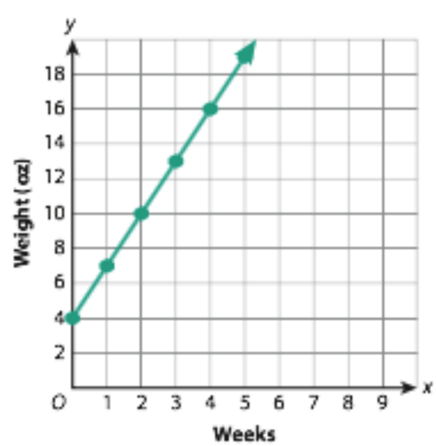
c. Write the ordered pairs for the initial values of each function in the example. Tell what the initial values represent.

2. The table shows the weight gain of a kitten over a 5-week period. The graph shows the weight gain of a second kitten over the same period. Compare the rates of change for these two functions.

Kitten A

Week	Weight (oz)
0	3
1	7
2	11
3	15
4	19
5	23

Kitten B

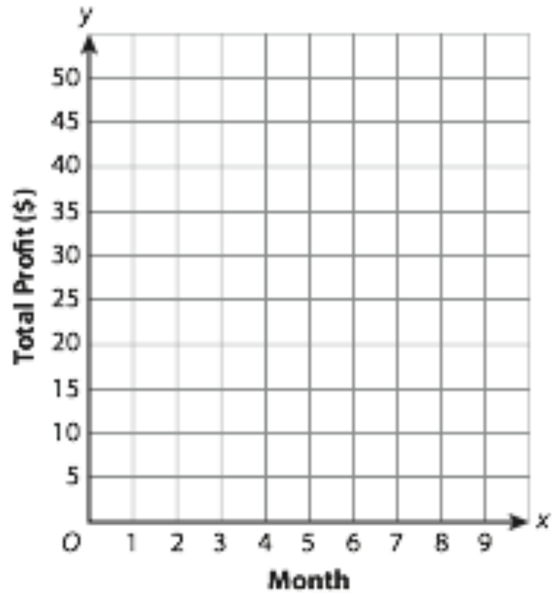


$$\frac{\textit{vertical change (rise)}}{\textit{horizontal change (run)}} \qquad \frac{y_2 - y_1}{x_2 - x_1}$$

3. Morgan sells bracelets once a month at a flea market. The table shows her profits for a 5-month period.

Morgan

Month	1	2	3	4	5
Total Profit ($)	30	60	90	120	150



a. Maddie sells bracelets once a month at a different flea market. The rate of change for her profits is $10 per month. Complete the table and the graph to show her total profits.

Maddie

Month	1	2	3	4	5
Total Profit ($)	10				

b. Morgan says that her profit is increasing 4 times as fast as Maddie's profit. Do you agree? Explain.

4. Compare the rate of change for the two functions.

Function A

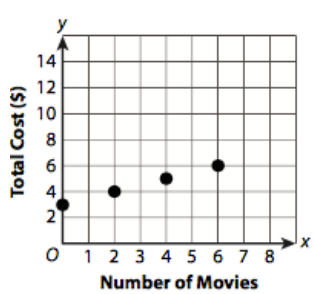
x	0	3	5	7
y	3	9	13	17

Function B

$y = 3x + 2$

5. Two movie clubs charge an initial membership fee plus a constant rate for each movie that is rented. The table and graph show what the two movie clubs charge:

Club A



Club B

Number of Movies	Total Cost ($)
0	2.25
1	3.00
2	3.75
3	4.50

Part A

Complete the equation to represent each relationship. Let y represent the total cost for renting x movies.

Answers: Club A: y = _____________ Club B: y = ________________

Part B

Which club has the greater initial value? Which club has the greater rate of change? ***Describe*** what this means in the context of the problem.