

# Compare Functions

Name: \_\_\_\_\_

## Prerequisite: Identify Functions

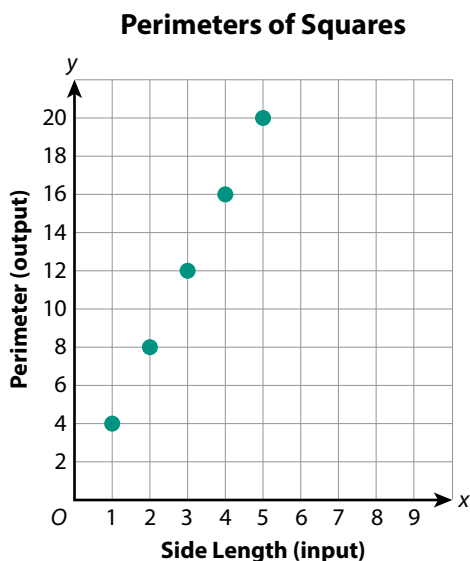
Study the example showing a function. Then solve problems 1–6.

### Example

The table and graph show 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	8	12	16	20

The relationship is a function because there is only one output value for each input value.



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

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- 2 Can you represent the function in the example with an equation? If so, what equation can you write? If not, why not?

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

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### Vocabulary

**function** a rule that assigns exactly one output to each input.

**input** the number put into a function.

**output** the number that results from applying the function to the input.

**Solve.**

- 4 Do the data in this table show a function? If you switch the input and the output values, would the data show a function? Explain.

Input	1	2	2	3	3
Output	6	9	11	12	14

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- 5 Substitute values into the equation to complete the table. Then state whether the equation represents a function. Explain your reasoning.

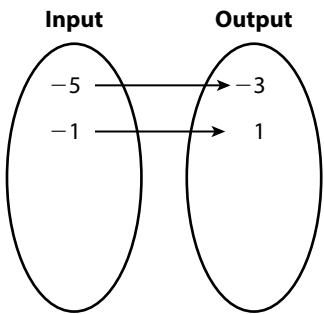
$y = 5x + 1$

x (input)	-2	-1	0	1	2
y (output)					

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- 6 A teacher wrote these numbers on the board: -5, -3, -1, 1, 1, 2, 3, 4, 4, 6. The input-output diagram has been started using the teacher's numbers to form ordered pairs of a function.



**Part A:** Put the remaining numbers in the ovals to complete the diagram.

**Part B:** If the input and output values were reversed, would the diagram still represent a function? Explain.

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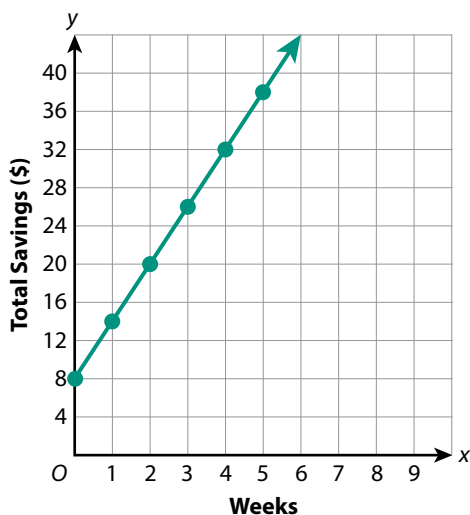
## Interpret and Compare Rates of Change

Study the example problem showing how to compare rates of change of change. Then solve problems 1–5.

## Example

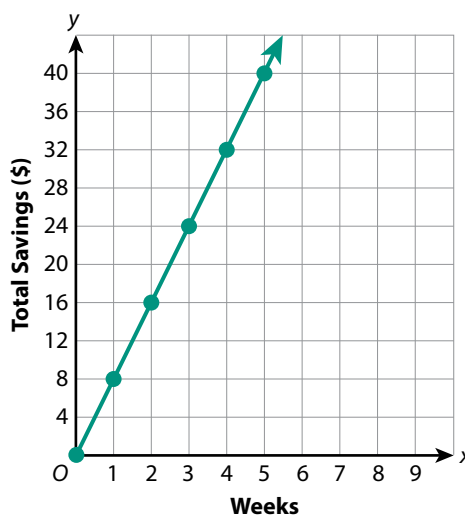
Compare the rates of change for these two functions. Which function has a greater rate of change?

Sarah's Savings



$$\frac{\text{vertical change}}{\text{horizontal change}} = \frac{6}{1} = 6$$

Alyssa's Savings



$$\frac{\text{vertical change}}{\text{horizontal change}} = \frac{8}{1} = 8$$

Alyssa's rate of change is greater than Sarah's.

- 1 What do the rates of change in the example represent?

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- 2 What does it mean in the context of the example that Alyssa's rate of change is greater than Sarah's?

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

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## Vocabulary

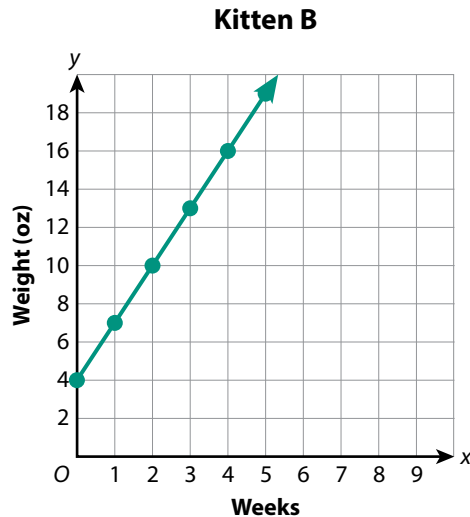
**rate of change** the rate at which one quantity increases or decreases with respect to a change in the other quantity. It is the ratio of the vertical change to the horizontal change on a graph.

**initial value** the starting value of a function.

**Solve.**

- 4** 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

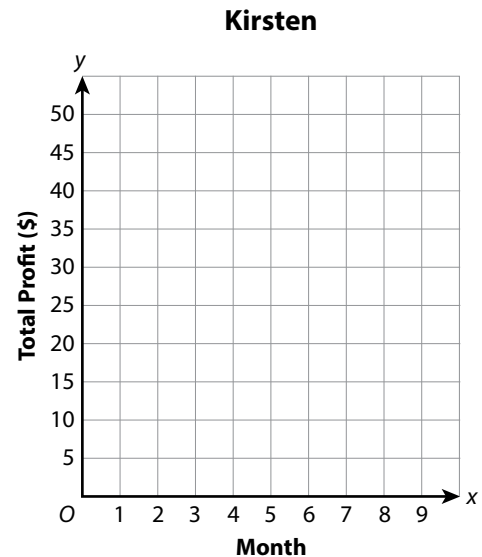


- 5** Sonya sells bracelets once a month at a flea market. The table shows her profits for a 5-month period.

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

- a.** Kirsten 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.

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



- b.** Sonya says that her profit is increasing 4 times as fast as Kirsten's profit. Do you agree? Explain.

## Compare Negative and Positive Rates of Change

**Study the example problem showing how to compare two functions. Then solve problems 1–6.**

### Example

Mr. Allen bought a new computer. His monthly payment plan is shown in the table.

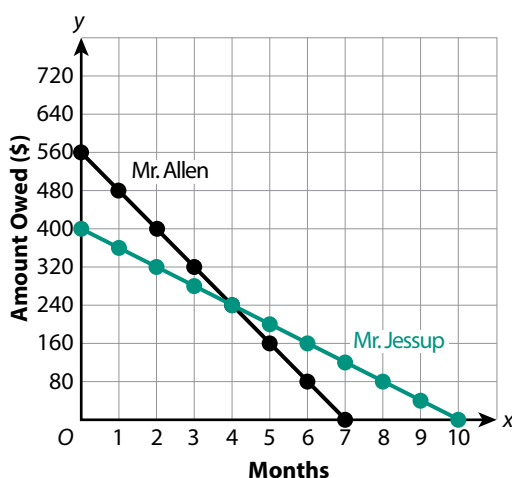
Month	0	1	2	3	4	5	6	7
Amount Mr. Allen Owes (\$)	560	480	400	320	240	160	80	0

Mr. Jessup buys a new computer for \$400. He makes monthly payments of \$40 until the computer is paid for. Compare the initial values and rates of change of each function.

You can graph both functions to show that the amount Mr. Allen owes starts at \$560 and decreases \$80 per month. The amount that Mr. Jessup owes starts at \$400 and decreases \$40 each month.

Mr. Allen's initial value is \$160 more than Mr. Jessup's. Mr. Allen's rate of change is greater than Mr. Jessup's rate of change.

**Payment Plans**



- 1 What do the initial values mean in the context of the example problem?

\_\_\_\_\_

- 2 Do the functions in the example show positive or negative rates of change? Explain.

\_\_\_\_\_

- 3 Write an equation for each function, where  $x$  is the number of months and  $y$  is the amount owed.

Mr. Allen's plan: \_\_\_\_\_

Mr. Jessup's plan: \_\_\_\_\_

## Solve.

- 4 Below are two companies' rates to rent a bicycle. How much does it cost per hour to rent a bicycle at Company A? What is the cost to rent a bicycle for 6 hours from each company?

**Company A:**  $c = 5h + 4$ , where  $c$  = total cost (in dollars) and  $h$  = number of hours

**Company B:** \$6 per hour per bicycle

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- 5 Roy wants to buy a new television for \$300. Two stores offer different payment options. Compare the initial values and rates of change.

Store A Payment Plan							
Month	0	1	2	3	4	5	6
Amount Owed (\$)	300	250	200	150	100	50	0

### Store B Payment Plan

Pay \$100 at the time of purchase. Pay \$50 per month until the television is paid for.

**Show your work.**

Solution: \_\_\_\_\_

- 6 Most plumbing companies charge a fee to come to your house plus a charge per hour of work. The fees and charges for two plumbing companies are shown.

Write an equation for each company, where  $c$  = total cost (in dollars) and  $h$  = number of hours. Explain what the initial values and rates of change mean in this context.

Company A: \_\_\_\_\_

Company B: \_\_\_\_\_

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### Company A

Fee: \$50

Charge per hour: \$40

### Company B

Fee: \$25

Charge per hour: \$50

## Compare Functions

Solve the problems.

- 1** A hardware store charges a \$30 rental fee and \$15 per day to rent a power washer. Which equation correctly relates the total cost  $y$  to rent the washer for  $x$  days?

**A**  $y = 15 + 30x$                       **C**  $y = 30 - \frac{x}{15}$   
**B**  $y = 30 + 15x$                       **D**  $y = 15 - \frac{x}{30}$

What do the parts of each equation represent?



- 2** Tony drives 18 miles to pick up his friend at his house. Then he drives at a constant speed of 40 miles per hour to a state park to go hiking. Let  $y$  represent the number of miles that Tony drives after  $x$  hours. Which of the following statements are true? Select all that apply.

- A** The relationship can be represented by the equation  $y = 40x + 18$ .  
**B** If Tony travels for 1.5 hours, he will have driven a total of 60 miles.  
**C** The initial value is 18 miles.  
**D** The rate of change is negative.

How do you determine the initial value and rate of change?



- 3** Alma borrows money from her mom to buy a \$150 bike. She gives her mom \$40 at the time of purchase and continues to pay her \$10 each month until the bike is paid for in full. Alma wrote this equation to represent the amount  $y$  that she will have paid her mom after  $x$  months.

Equation:  $y = 40x + 10$

Is her equation correct? How did she get that equation? If it is not correct, write a correct equation.

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How does an equation show a rate of change?



**Solve.**

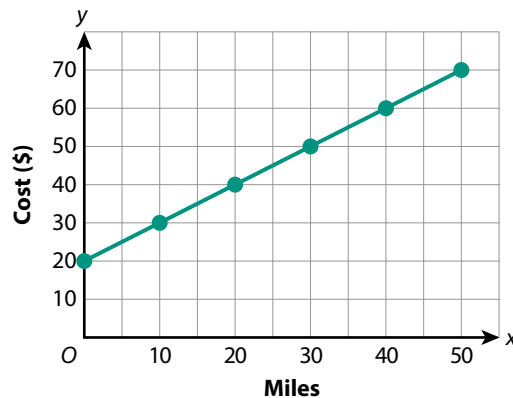
- 4** The rates for two airport shuttles are shown below.

**Quick Shuttle**

Rates for shuttle

- \$30 for passenger pickup
- \$0.50 for each mile driven

**We-Drive Shuttle**



**Part A**

Which shuttle service has a greater initial value?  
Which service has the greater rate of change?  
Explain what the greater initial value and greater rate of change mean.

**Show your work.**

How does the graph show the initial value?



Solution: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Part B**

Which shuttle company would cost less for a 25-mile trip?

**Show your work.**

Solution: \_\_\_\_\_