

Understand Functions

Name: _____

How can you use an equation to represent a proportional relationship?



Study the example showing how to write equations for proportional relationships. Then solve problems 1–8.

Example

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

The table represents this

proportional relationship. All of the ratios are equivalent to $\frac{4}{2} = \frac{2}{1}$.

Flour, f	2	3	4	5	6	7	8
Water, w	1	1.5	2	2.5	3	3.5	4

You can also use an equation. The ratio of flour to water is $\frac{4}{2} = \frac{2}{1}$, so the constant of proportionality is $\frac{2}{1}$, or 2.

amount of flour = constant of proportionality • amount of water
 \downarrow \downarrow \downarrow
 f = 2 • w **equation: $f = 2w$**

- 1** What does the constant of proportionality represent in terms of the problem?

- 2** Use the equation in the example to find the number of cups of water you need if you have 12 cups of flour.

- 3** For a different pizza dough recipe, the equation $f = 2.5w$ represents the number of cups of flour, f , that you need for w cups of water. What is the constant of proportionality? Explain what it means in this context.

Vocabulary

constant of proportionality the unit rate in a proportional relationship.

Solve.

- 4 Basir buys 4 small drinks for \$6. Write an equation to represent the cost, c , for d small drinks.

- 5 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 the distance d , in meters, that the horse runs in t seconds.

- 6 The equation $c = 6.4w$ represents the cost c for w pounds of walnuts. Does a value of 2.5 for w make sense in this situation? Explain your reasoning.

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

Lina's equation: $m = 9h$

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

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

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

- 8 Zach's car travels 21 miles on 1 gallon of gas. Write an equation to represent the relationship between the gas Zach's car uses and the distance he travels. Then solve the equation to see how far Zach travels on a trip if he uses 16 gallons of gas.

Identify Functions

Study the example problem showing how to determine whether a relationship is a function. Then solve problems 1–7.

Example

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

The input identifies the hours, and the output gives the cost for those hours. The relationship is a function because there is only one output for each input.

Table A

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

The input identifies the week and the output gives the growth for each week. The relationship is a function because there is only one output for each input.

Table B

Week (input)	1	2	3	4	5
Plant Growth in Inches (output)	4	3.25	2	2	1.75

- 1** Can you represent either of the functions in the example problem with an equation? Explain.

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

- 3** 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

Vocabulary

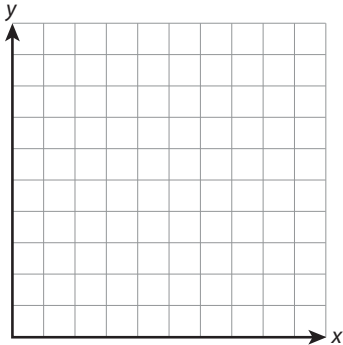
function a rule that produces exactly one output for each input.

Solve.

Use the following situation to solve problems 4–5.

The table shows the number of calories in different numbers of servings of blueberries.

Servings (input)	1	2	3	4	5
Calories (output)	21	42	63	84	105



4 On the blank graph to the right, add a title and then label and number the axes. Then plot the ordered pairs on the graph.

5 Explain whether the relationship is a function. Can you represent the data with an equation? If so, write the equation.

6 Substitute values into the equation $y = x - 3$ to complete the table. Then state whether the equation represents a function. Explain your reasoning.

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

7 Complete the table to show a relationship that is a function that you haven't used yet. Be sure that you can represent your function with an equation.

x (input)	1	2	3	4	5
y (output)					

Describe the relationship between the input and output values of your function. Then represent your function with an equation.

Reason and Write

Study the example. Underline two parts that you think make it a particularly good answer and a helpful example.

Example

An object traveling at the speed of sound at sea level travels about 20 kilometers in 1 minute. Write equations that can be used to find the following:

- the distance when given the time
- the time when given the distance

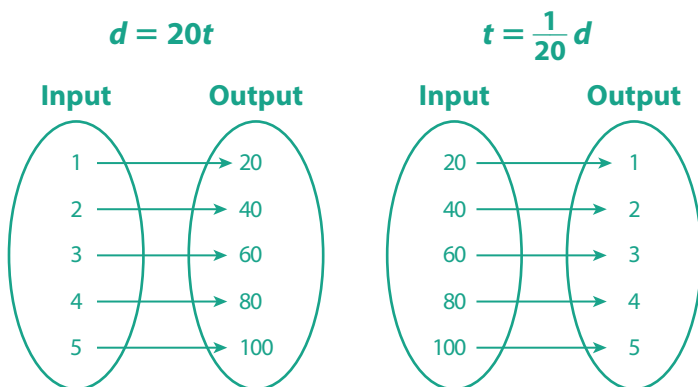
Use a table, diagram, or graph to show the two relationships. Then describe the relationships. Explain whether or not the relationships are functions.

Show your work. Use a table, diagram, or graph as well as words and numbers to explain your answer.

Possible answer: Let d = distance and t = time.

An equation for the distance given the time is $d = 20t$ and

an equation for the time given the distance is $t = \frac{1}{20}d$.



The distance is 20 times the time, and the time is $\frac{1}{20}$ of the distance.

In both relationships, there is only one possible output for each input, so both are functions.

Where does the example ...

- answer all of the parts of the problem?
- use a table, diagram, or graph to explain?
- use words to explain?
- use numbers to explain?



Solve the problem. Use what you learned from the model.

Each molecule of carbon dioxide contains 2 oxygen atoms and 1 carbon atom. Write equations that can be used to find the following:

- the number of oxygen atoms when given the number of carbon atoms
- the number of carbon atoms when given the number of oxygen atoms

Use a table, diagram, or graph to show the two relationships. Then describe the relationships. Explain whether or not the relationships are functions.

Show your work. Use tables, diagrams, or graphs as well as words and numbers to explain your answer.

Did you ...

- answer all of the parts of the problem?
- use a table, diagram, or graph to explain?
- use words to explain?
- use numbers to explain?

