LESSON 12.2

Independent and Dependent Variables in Tables and Graphs

FL 6.EE.3.9

Use variables to represent two quantities in a real-world problem that change in relationship to one another; . . . Analyze the relationship between the dependent and independent variables. . . .

ESSENTIAL QUESTION

How can you identify independent and dependent quantities from tables and graphs?

EXPLORE ACTIVITY 1 Real World FL 6.EE.3.9

Identifying Independent and Dependent Quantities from a Table

Many real-world situations involve two variable quantities in which one quantity depends on the other. The quantity that depends on the other quantity is called the **dependent variable**, and the quantity it depends on is called the **independent variable**.

A freight train moves at a constant speed. The distance *y* in miles that the train has traveled after *x* hours is shown in the table.

Time *x* (h)	0	1	2	3
Distance *y* (mi)	0	50	100	150

A What are the two quantities in this situation?

_____

Which of these quantities depends on the other?

_____

What is the independent variable? _____

What is the dependent variable? _____

B How far does the train travel each hour? _____

The relationship between the distance traveled by the train and the time in hours can be represented by an equation in two variables.

Distance traveled (miles)	=	Distance traveled per hour	·	Time (hours)
↓		↓		↓
y	=	50	·	x

EXPLORE ACTIVITY *(cont'd)*

Reflect

1. **Analyze Relationships** Describe how the value of the independent variable is related to the value of the dependent variable. Is the relationship additive or multiplicative?

_____

2. What are the units of the independent variable and of the dependent variable?

_____

_____

3. A rate is used in the equation. What is the rate?

_____

EXPLORE ACTIVITY 2 Real World

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Identifying Independent and Dependent Variables from a Graph

In Explore Activity 1, you used a table to represent a relationship between an independent variable (time) and a dependent variable (distance). You can also use a graph to show this relationship.

An art teacher has 20 pounds of clay but wants to buy more clay for her class. The amount of clay *x* purchased by the teacher and the amount of clay *y* available for the class are shown on the graph.

A If the teacher buys 10 more pounds of clay, how many pounds will be available for the art class? _____lb

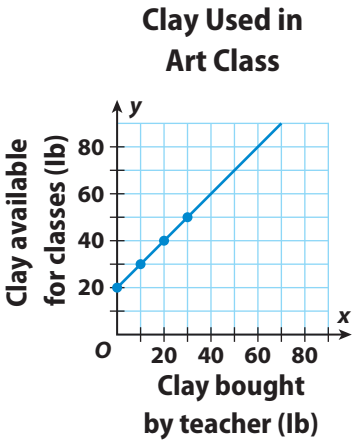
If the art class has a total of 50 pounds of clay available, how many pounds of clay did the teacher buy?

How can you use the graph to find this information?

_____

_____

_____



B What are the two quantities in this situation?

_____

_____

Which of these quantities depends on the other?

_____

_____

What is the independent variable? _____

What is the dependent variable? _____

C The relationship between the amount of clay purchased by the teacher and the amount of clay available to the class can be represented by an equation in two variables.

Amount of clay available (pounds)	=	Current amount of clay (pounds)	+	Amount of clay purchased (pounds)
↓		↓		↓
y	=	20	+	x

D Describe in words how the value of the independent variable is related to the value of the dependent variable.

_____

_____

Reflect

4. In this situation, the same units are used for the independent and dependent variables. How is this different from the situation involving the train in the first Explore?

_____

_____

5. **Analyze Relationships** Tell whether the relationship between the independent variable and the dependent variable is a multiplicative or an additive relationship.

_____

6. What are the units of the independent variable, and what are the units of the dependent variable?

independent variable: _____; dependent variable: _____

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Describing Relationships Between Independent and Dependent Variables

Thinking about how one quantity depends on another helps you identify which quantity is the independent variable and which quantity is the dependent variable. In a graph, the independent variable is usually shown on the horizontal axis and the dependent variable on the vertical axis.

EXAMPLE 1

Real World

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A The table shows a relationship between two variables, x and y. Describe a possible situation the table could represent. Describe the independent and dependent variables in the situation.

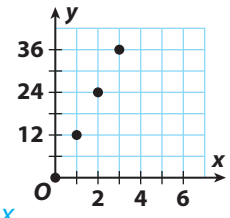
Independent variable, x	0	1	2	3
Dependent variable, y	10	11	12	13

As x increases by 1, y increases by 1. The relationship is additive. The value of y is always 10 units greater than the value of x.

The table could represent Jina's savings if she starts with $10 and adds $1 to her savings every day.

The independent variable, x, is the number of days she has been adding money to her savings.
The dependent variable, y, is her savings after x days.

B The graph shows a relationship between two variables. Describe a possible situation that the graph could represent. Describe the independent and dependent variables.



As x increases by 1, y increases by 12. The relationship is multiplicative. The value of y is always 12 times the value of x.

The graph could represent the number of eggs in cartons that each hold 12 eggs.

The independent variable, x, is the number of cartons.
The dependent variable, y, is the total number of eggs.

Reflect

7. What are other possible situations that the table and graph in the Examples could represent?

YOUR TURN

Describe real-world values that the variables could represent. Describe the relationship between the independent and dependent variables.

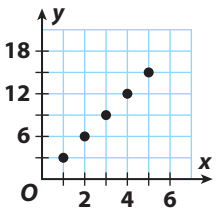
8.

x	0	1	2	3
y	15	16	17	18

9.

x	0	1	2	3	4
y	0	16	32	48	64

10.



Guided Practice

1. A boat rental shop rents paddleboats for a fee plus an additional cost per hour. The cost of renting for different numbers of hours is shown in the table.

Time (hours)	0	1	2	3
Cost ($)	10	11	12	13

What is the independent variable, and what is the dependent variable? How do you know? (Explore Activity 1)

_____

_____

_____

2. A car travels at a constant rate of 60 miles per hour. (Explore Activity 1)

Time x (h)	0	1	2	3
Distance y (mi)				

a. Complete the table.

b. What is the independent variable, and what is the dependent?

_____

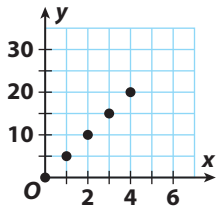
_____

c. Describe how the value of the independent variable is related to the value of the dependent variable.

_____

Use the graph to answer the questions.

3. Describe in words how the value of the independent variable is related to the value of the dependent variable. (Explore Activity 2)



_____

_____

4. Describe a real-world situation that the graph could represent. (Example 1)

_____

_____

ESSENTIAL QUESTION CHECK-IN

5. How can you identify the dependent and independent variables in a real-world situation modeled by a graph?

_____

_____

_____

Name _____ Class _____ Date _____

12.2 Independent Practice

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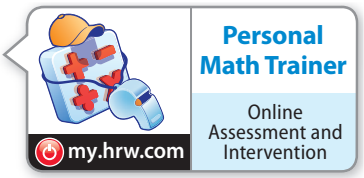
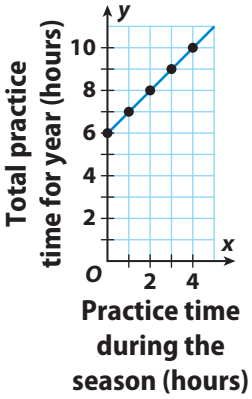


6. The graph shows the relationship between the hours a soccer team practiced after the season started and their total practice time for the year.



a. How many hours did the soccer team practice before the season began?

_____

b. What are the two quantities in this situation?

_____

_____

c. What are the dependent and independent variables?

_____

_____

d. Is the relationship between the variables additive or multiplicative? Explain.

_____

_____

e. **Analyze Relationships** Describe the relationship between the quantities in words.

_____

_____

7. **Multistep** Teresa is buying glitter markers to put in gift bags. The table shows the relationship between the number of gift bags and the number of glitter markers she needs to buy.

Number of gift bags, *x*	0	1	2	3
Number of markers, *y*	0	5	10	15

a. What is the dependent variable? _____

b. What is the independent variable? _____

c. Is the relationship additive or multiplicative? Explain.

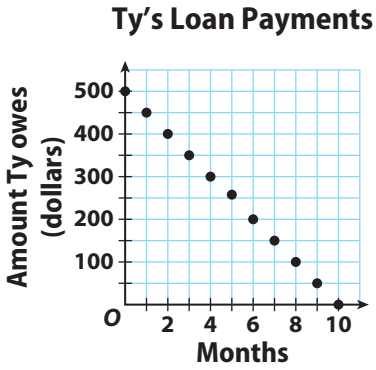
_____

_____

d. Describe the relationship between the quantities in words.

_____

8. Ty borrowed $500 from his parents. The graph shows how much he owes them each month if he pays back a certain amount each month.



a. Describe the relationship between the number of months and the amount Ty owes. Identify an independent and dependent variable and explain your thinking.

b. How long will it take Ty to pay back his parents?

H.O.T. FOCUS ON HIGHER ORDER THINKING

9. **Error Analysis** A discount store has a special: 8 cans of juice for a dollar. A shopper decides that since the number of cans purchased is 8 times the number of dollars spent, the cost is the independent variable and the number of cans is the dependent variable. Do you agree? Explain.

10. **Analyze Relationships** Provide an example of a real-world relationship where there is no clear independent or dependent variable. Explain.

Work Area