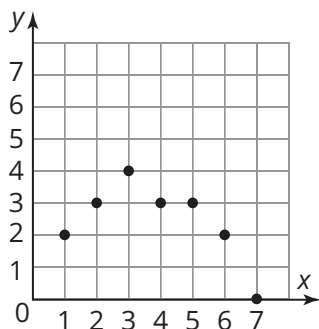


A Picture Is Worth a Thousand Words

Understanding Quantities and Their Relationships

Warm Up

Emma bought a new video game. The graph shown describes the number of hours Emma spent playing the game over a period of 7 days.



1. Label the axes.
2. What does the highest point on the graph represent with respect to the scenario? The lowest point?

Learning Goals

- Understand quantities and their relationships with each other.
- Identify the independent and dependent quantities for a scenario.
- Match a graph with an appropriate scenario.
- Use a reasonable scale for a graph modeling a scenario.
- Identify key characteristics of graphs.
- Describe similarities and differences between pairs of graphs and scenarios.

Key Terms

- dependent quantity
- independent quantity

You have analyzed graphs of relationships and identified important features such as intercepts and slopes. How can the key characteristics of a graph tell a story?

What Comes First?

Have you ever planned a party? You may have purchased ice, gone grocery shopping, selected music, made food, or even cleaned in preparation. Many times, these tasks depend on another task being done first. For instance, you wouldn't make food before grocery shopping, now would you?

When one quantity is determined by another in a problem situation, it is said to be the **dependent quantity**. The quantity it is determined from is called the **independent quantity**.

Consider the two quantities that are changing in each relationship.

- the number of movie tickets purchased and the total cost
- the number of eggs used and the number of cakes baked
- the number of students in attendance at school and the number of lunches served
- the number of hours driven and the number of miles to a vacation destination
- the number of minutes a swimming pool is filled with water and the number of gallons of water in the swimming pool

1. Circle the independent quantity and underline the dependent quantity in each relationship.

2. Describe how you can determine which quantity is independent and which quantity is dependent in any problem situation.

Connecting Scenarios and Their Graphs



While a person can describe the monthly cost to operate a business, or talk about a marathon pace a runner ran to break a world record, graphs on a coordinate plane enable people to see the data. Graphs relay information about data in a visual way.

You can use lines or smooth curves to represent relationships between points on a graph. In some problem situations, all the points on the line will make sense. In other problem situations, not all the points will make sense. So, when you model a relationship with a line or a curve, it is up to you to consider the situation and interpret the meaning of the data values shown.

This activity includes six scenarios and six graphs that are located at the end of the lesson.

- 1. Read each scenario. Determine the independent and dependent quantities. Then match each scenario to its corresponding graph. Glue the graph next to the scenario. For each graph, label the x - and y -axis with the appropriate quantity and a reasonable scale, and then interpret the meaning of the origin.**

Music Club

Jermaine loves music. He can lip sync almost any song at a moment's notice. He joined Songs When I Want Them, an online music store. By becoming a member, Jermaine can purchase just about any song he wants. Jermaine pays \$1 per song.

- **independent quantity:**

- **dependent quantity:**



Think

about:

Be sure to include the appropriate units of measure for each quantity.

Ask

yourself:

What strategies will you use to match each graph with one of the eight scenarios?

Something's Fishy

Candice is a building manager for the Crowley Enterprise office building. One of her responsibilities is cleaning the office building's 200-gallon aquarium. For cleaning, she must remove the fish from the aquarium and drain the water. The water drains at a constant rate of 10 gallons per minute.

- **independent quantity:**

- **dependent quantity:**

Smart Phone, but Is It a Smart Deal?

You have your eye on an upgraded smart phone. However, you currently do not have the money to purchase it. Your cousin will provide the funding, as long as you pay him back with interest. He tells you that you only need to pay \$1 in interest initially, and then the interest will double each week after that. You consider his offer and wonder if this *really* is a good deal.

- **independent quantity:**

- **dependent quantity:**

It's Magic

The Amazing Aloysius is practicing one of his tricks. As part of this trick, he cuts a rope into many pieces and then magically puts the pieces of rope back together. He begins the trick with a 20-foot rope and then cuts it in half. He then takes one of the halves and cuts that piece in half. He repeats this process until he is left with a piece so small he can no longer cut it.

- **independent quantity:**

- **dependent quantity:**

Baton Twirling

Jill is a drum major for the Altadena High School marching band. For the finale of the halftime performance, Jill tosses her baton in the air so that it reaches a maximum height of 22 feet. This gives her 2 seconds to twirl around twice and catch the baton when it comes back down.

- **independent quantity:**

- **dependent quantity:**

Jelly Bean Challenge

Mr. Wright judges the annual Jelly Bean Challenge at the summer fair. Every year, he encourages the citizens in his town to guess the number of jelly beans in a jar. He records all the possible guesses and the number of jelly beans that each guess was off by.

- **independent quantity:**

- **dependent quantity:**





Now that you have matched a graph with the appropriate problem situation, let's go back and examine all the graphs.

1. What similarities do you notice in the graphs?

2. What differences do you notice in the graphs?

3. How did you label the independent and dependent quantities in each graph?

4. Analyze each graph from left to right. Describe any graphical characteristics you notice.



Think

● about:

Look closely when analyzing the graphs. What do you see?

Think

about:

What do the points on each graph represent?

5. Compare the graphs for each pair of scenarios given and describe any similarities and differences you notice.

a. *Smart Phone, but Is It a Smart Deal?* and *Music Club*

b. *Something's Fishy* and *It's Magic*

c. *Baton Twirling* and *Jelly Bean Challenge*



Graph Cutouts

