

GRAPHING RELATIONSHIPS (Lesson 4.1)

Objectives

Match simple graphs with situations.

Graph a relationship.

Vocabulary

continuous graph

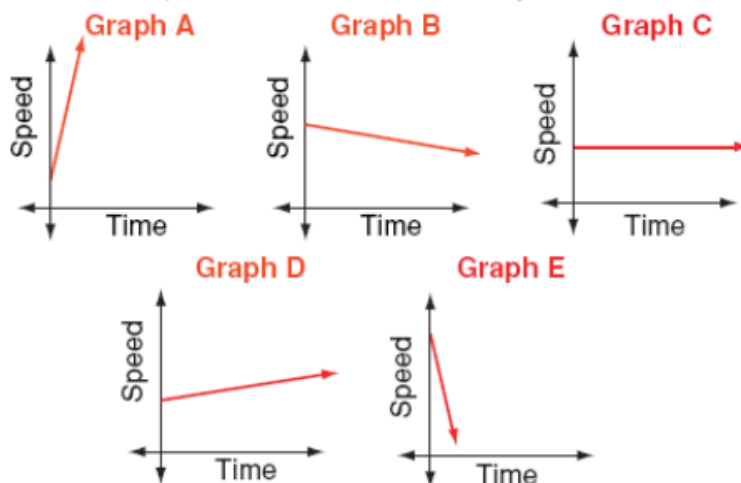
discrete graph

4-1

Graphing Relationships

The sentences below describe the motion of five cars on a highway. Match each sentence with the graph that represents it best.

1. The car's speed remains constant.
2. The car's speed increases slowly but steadily.
3. The car's speed increases sharply.
4. The car's speed decreases gradually.
5. The car's speed decreases suddenly.



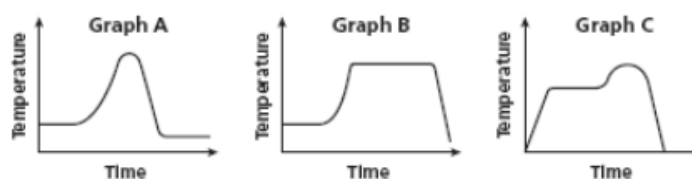
THINK AND DISCUSS

6. **Explain** how the graph for the car in Problem 2 would be different if the car started from a complete stop.
7. **Discuss** what it means for the graph of the car's speed to be a horizontal line.

EXAMPLE 1

Relating Graphs to Situations

The air temperature was constant for several hours at the beginning of the day and then rose steadily for several hours. It stayed the same temperature for most of the day before dropping sharply at sundown. Choose the graph that best represents this situation.



Step 1 Read the graphs from left to right to show time passing.

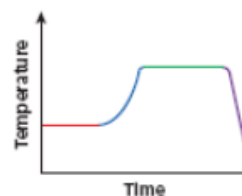
Step 2 List key words in order and decide which graph shows them.

| Key Words | Segment Description... | Graphs... |
|-----------------|------------------------|----------------|
| Was constant | Horizontal | Graphs A and B |
| Rose steadily | Slanting upward | Graphs A and B |
| Stayed the same | Horizontal | Graph B |
| Dropped sharply | Slanting downward | Graph B |

Step 3 Pick the graph that shows all the key phrases in order.

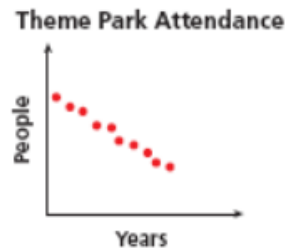
horizontal, slanting upward,
horizontal, slanting downward

The correct graph is B.



- The air temperature increased steadily for several hours and then remained constant. At the end of the day, the temperature increased slightly again before dropping sharply. Choose the graph above that best represents this situation.

The graph on theme-park attendance is an example of a discrete graph. It consists of distinct points because each year is distinct and people are counted in whole numbers only. The values between the whole numbers are not included, since they have no meaning for the situation.



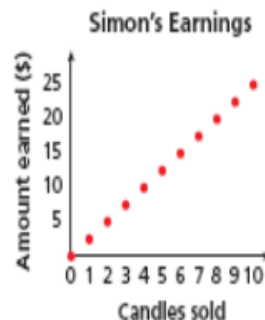
EXAMPLE 2 Sketching Graphs for Situations

Helpful Hint

When sketching or interpreting a graph, pay close attention to the labels on each axis.

Sketch a graph for each situation. Tell whether the graph is continuous or discrete.

- A** Simon is selling candles to raise money for the school dance. For each candle he sells, the school will get \$2.50. He has 10 candles that he can sell.



The amount earned (y-axis) increases by \$2.50 for each candle Simon sells (x-axis).

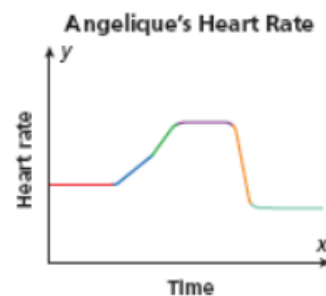
Since Simon can only sell whole candles or none at all, the graph is 11 distinct points.

The graph is discrete.

- B** Angelique's heart rate is being monitored while she exercises on a treadmill. While walking, her heart rate remains the same. As she increases her pace, her heart rate rises at a steady rate. When she begins to run, her heart rate increases more rapidly and then remains high while she runs. As she decreases her pace, her heart rate slows down and returns to her normal rate.

As time passes during her workout (moving left to right along the x-axis), her heart rate (y-axis) does the following:

- remains the same,
- rises at a steady rate,
- increases more rapidly (steeper than previous segment),
- remains high,
- slows down,
- and then returns to her normal rate.



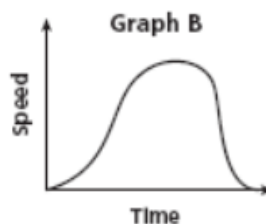
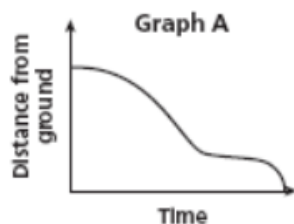
The graph is continuous.



Sketch a graph for each situation. Tell whether the graph is continuous or discrete.

- Jamie is taking an 8-week keyboarding class. At the end of each week, she takes a test to find the number of words she can type per minute. She improves each week.
- Henry begins to drain a water tank by opening a valve. Then he opens another valve. Then he closes the first valve. He leaves the second valve open until the tank is empty.

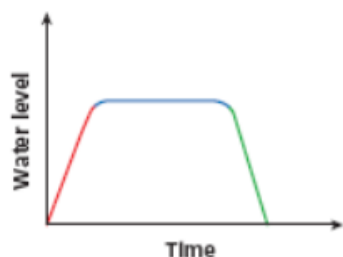
Both graphs show a relationship about a child going down a slide. Graph A represents the child's *distance from the ground* related to time. Graph B represents the child's *speed* related to time.



EXAMPLE 3

Writing Situations for Graphs

Write a possible situation for the given graph.



Step 1 Identify labels.

x-axis: time y-axis: water level

Step 2 Analyze sections.

Over time, the water level does the following:

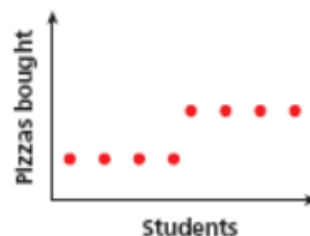
- **increases steadily,**
- **remains unchanged,**
- and then **decreases steadily.**

Possible Situation:

A watering can is **filled with water**. It **sits for a while** until the flowers are planted. The water in the can is then **emptied** on top of the planted flowers.



3. Write a possible situation for the given graph.



INTERPRETING TABLES & GRAPHS

1

Matching Situations to Tables

The table gives the speeds of three dogs in mi/h at given times. Tell which dog corresponds to each situation described below.

| Time | 12:00 | 12:01 | 12:02 | 12:03 | 12:04 |
|---------|-------|-------|-------|-------|-------|
| Dog 1 | 8 | 8 | 20 | 3 | 0 |
| Dog 2 | 0 | 10 | 0 | 7 | 0 |
| ✓ Dog 3 | 0 | 4 | 4 | 0 | 12 |

- A** David's dog chews on a toy, then runs to the backyard, then sits and barks, and then runs back to the toy and sits.

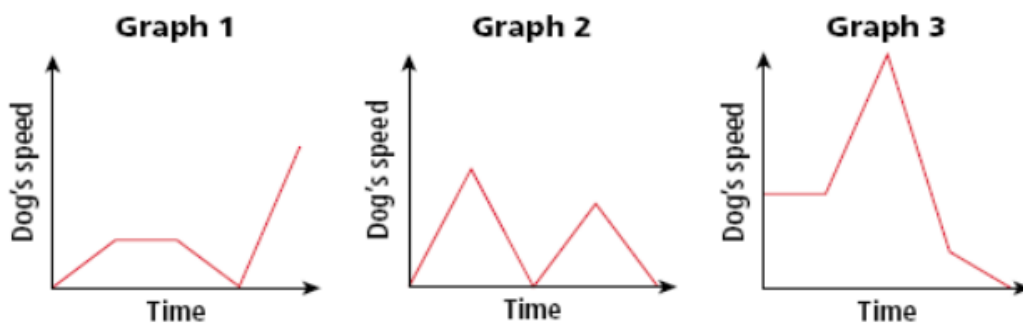
- B** Kareem's dog runs with him and then chases a cat until Kareem calls for him to come back. The dog returns to his side and sits.

- C** Janelle's dog sits on top of a pool slide, slides into the swimming pool, and swims to the ladder. He gets out of the pool and shakes and then runs around the pool.

2

Matching Situations to Graphs

Tell which graph corresponds to each situation described in Example 1.



A David's dog

B Kareem's dog

C Janelle's dog

3

Creating a Graph of a Situation

The temperature inside a car can get dangerously high. Create a graph that illustrates the temperature inside a car.

| Location | Temperature (°F) | |
|----------|------------------|--------------|
| | On Arrival | On Departure |
| Home | — | 140° at 1:00 |
| Cleaners | 75° at 1:10 | 95° at 1:20 |
| Mall | 72° at 1:40 | 165° at 3:40 |
| Market | 80° at 3:55 | 125° at 4:15 |

