

3-1

Relating Graphs to Events

Check Skills You'll Need

- Vocabulary Review**
What type of data sets do *line graphs* best display?

Describe a set of data that is appropriate for each graph.

- line plot
- bar graph

GO for Help
Skills Handbook
pp. 397 and 398

What You'll Learn

To interpret and sketch graphs that represent real-world situations

New Vocabulary linear, nonlinear

Why Learn This?

Newspapers, books, and magazines often use graphs to display data. A graph shows complex relationships between variables in a simple, visual way.

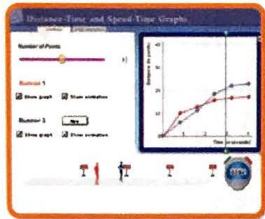
Drawing a graph makes it easier to analyze data. You can use a line graph to see if data is increasing or decreasing and if change in data is linear or nonlinear. Change in data is **linear** if it forms a straight line when graphed. If data does *not* form a straight line when graphed, then its change is **nonlinear**.



CONTENT STANDARD

8.F.5

Online
active math

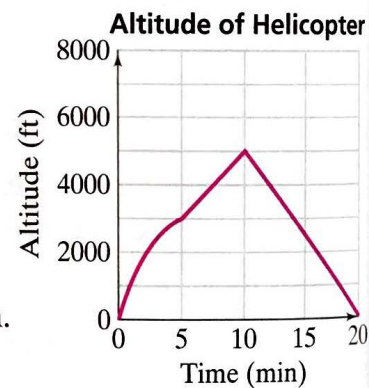


For: Graph Activity
Use: Interactive Textbook,
3-1

EXAMPLE Interpreting a Graph

- Transportation** The graph to the right shows the altitude of a helicopter during a flight.

- When is the altitude increasing?
Altitude is increasing from 0 min to 10 min.
- When is the altitude decreasing?
Altitude is decreasing from 10 min to 20 min.
- When is the change in altitude linear?
Altitude change is linear from 5 min to 10 min and from 10 min to 20 min.
- When is the change in altitude nonlinear?
Altitude change is nonlinear from 0 min to 5 min.



Quick Check

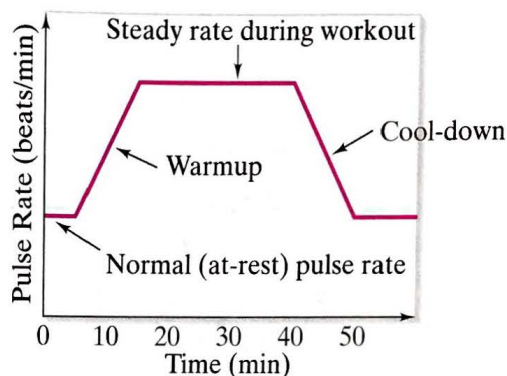
- Between which two times did the speed of the helicopter increase the most?

When you draw a graph without actual data, you are making a sketch.

EXAMPLE Sketching a Graph

- 2 **Fitness** Kim measured her pulse rate occasionally during a 45-min workout. The workout included a 10-min warmup period and a 10-min cool-down period. Sketch and label a graph showing her pulse rate during her workout.

The graph below shows that as Kim warmed up, her pulse rate increased. While she was in the middle of her workout, her pulse rate was high, but stable. The cool-down brought her pulse rate down again.



Quick Check

2. You walk to your friend's house. For the first 10 min, you walk from home to a park. For the next 5 min, you watch a ball game in the park. For the last 5 min, you run to your friend's house. Sketch and label a graph showing your distance from home during your trip.

Check Your Understanding

Use the following information for Exercises 1–5. A student wants to sketch a graph that shows the distance of a bus from the transit center during the morning commute. The trip includes three stops where people get on and a highway where the bus travels at 50 mi/h.

1. **Vocabulary** Why should the student use a line graph?
2. What label should the student put on the horizontal scale? What label should be on the vertical scale?
3. When is the line on the graph parallel to the horizontal axis?
4. When is the line farthest away from the horizontal axis?
5. **Reasoning** Which section of the graph should be steeper, the section for the bus on the highway or the section for the bus in the city? Explain.

Test Prep Tip

After you sketch a graph, check to be sure it makes sense in relation to the problem.

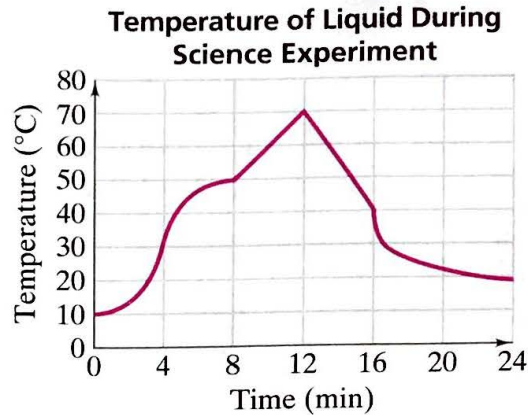
Homework Exercises

For more exercises, see Extra Skills and Word Problems.

GO for Help

For Exercises	See Examples
6–9	1
10–11	2

Science Use the graph below for Exercises 6–9.

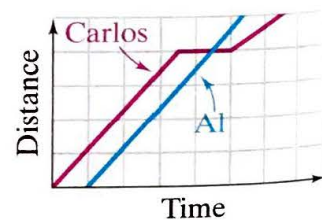


- When during the experiment is the temperature of the liquid increasing?
- When during the experiment is the temperature of the liquid decreasing?
- When during the experiment is the change in temperature linear?
- When during the experiment is the change in temperature nonlinear?
- Temperature** In general, air temperature rises during the day and drops during the night. Sketch and label a graph showing the temperature during a 24-hour period.
- Pets** Haley took her dog to the park. She walked slowly to the park and then sat with a friend. Haley and her dog ran home together. Sketch a graph showing their distance from home throughout the trip.

GPS

- Guided Problem Solving** Abel, Ben, and Cam left the computer lab at 2:30 P.M. Cam walked the fastest and Abel the slowest. At the same time, Dan and Erin were walking toward the lab. Erin was walking faster than Dan but slower than Cam. Sketch a graph of each student's distance from the computer lab over time.
 - For which students does distance from the lab increase with time?
 - Which student is represented by the steepest line in the graph?

Use the graph at the right for Exercises 13–16.



- Who started the race later?
- Who finished the race first?
- Who stopped to tie his shoe?
- Writing in Math** Describe the outcome of the race.



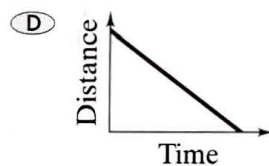
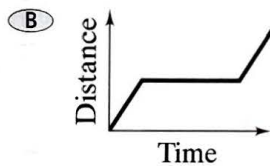
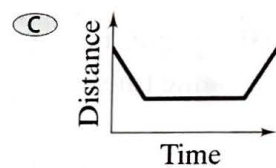
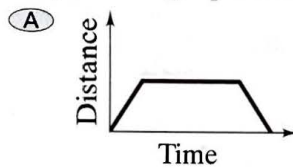
17. **Chemistry** Water is poured at a constant rate into the container at the left. Sketch a graph of the water level as the container is filled.
18. A boat travels at low speed for 3 min while leaving a harbor. Then it travels at a constant cruising speed for 15 min. Finally, it travels at low speed for 5 min while entering another harbor. Sketch a graph that shows the boat's speed during the trip.
19. **Geometry** As the length of the side of a square increases, the area of the square increases. Sketch a graph that shows the area of the square as the side length changes.
20. **Challenge** You throw a ball into the air. It lands four seconds later. Sketch and label a graph showing the ball's height during this time.

Test Prep and Mixed Review

Practice

Multiple Choice

21. Maritza walks home from school, stopping at a friend's house on the way. Which graph could describe the total distance she walked?

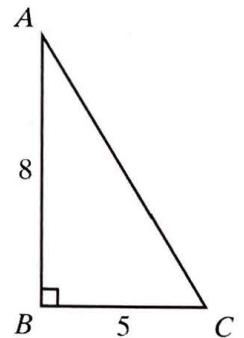


22. What is the length of the hypotenuse of triangle ABC ?

- (F) $\sqrt{13}$ (H) 13
(G) $\sqrt{89}$ (J) 89

23. At the movies, you buy a ticket for \$7.50. You also split the cost of a large popcorn with two friends. Your total cost is \$12.75. Which equation can you use to find the cost of the large popcorn?

- (A) $7.50 + p = 12.75$ (C) $7.50 + \frac{p}{3} = 12.75$
(B) $7.50 + \frac{p}{2} = 12.75$ (D) $\frac{7.50 + p}{3} = 12.75$



Simplify each expression.

24. $6x + x + 3x$

25. $12y - 7y + 2y$

26. $3a + 2b - 2a + 11b$

27. $4(k - 3) - 8k$

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For Exercises

See Lesson

24-27

2-2