

As you learned in the previous lesson, a correlation is a relationship between two sets of data. Two quantities have a *causal relationship* if the change in one quantity causes the change in the other quantity. Two quantities can correlate, but not have a causal relationship.

**NY A.S.13** Understand the difference between correlation and causation.

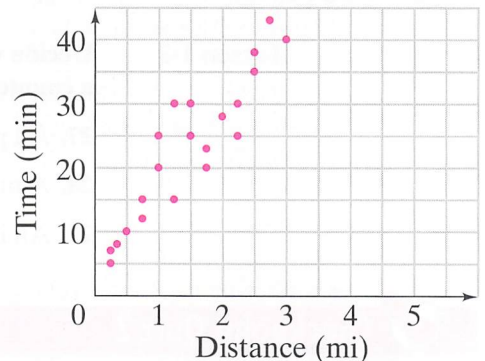
**Examples:** Height of a plant increases as the amount of sunlight it receives increases  
 Correlation: Yes  
 Causal Relationship: Yes

A survey of a class shows that the students who get lower grades spend more time sleeping each week.  
 Correlation: Yes  
 Causal Relationship: No

### 1 ACTIVITY

The scatter plot shows the relationship between the distance from school and the times it takes each bus to get to school.

1. Is there a correlation between the distance from school and the time it takes to get to school? Explain.
2. What type of relationship does the scatter plot show?
3. Is there a causal relationship between the two quantities? Explain.
4. **Critical Thinking** Examine newspaper and magazine articles or television news programs. Find an example of a correlation that may or may not be a causal relationship.



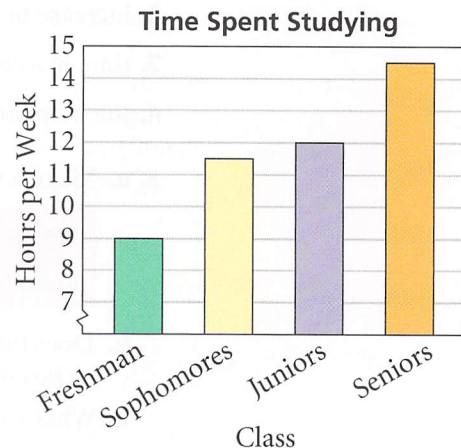
Bar graphs, line graphs, and circle graphs are three of the most common ways to represent data. Venn diagrams are another way to show relationships among data.

Bar graphs are used to compare amounts. One axis shows the categories and the other axis shows the amounts.

### 2 ACTIVITY

The bar graph shows the number of hours per week that Central High School students study.

5. How many hours per week do juniors study?
6. **Writing** How can you identify which class spends the *least* amount of time studying, without determining the actual value? Explain.
7. Do seniors study twice as long as freshmen?
8. **Critical Thinking** Suppose you saw the same data in a bar graph where the y-axis was labeled from 0 to 20. Explain how the new bar graph might convey a different impression from the one above.



Line graphs are used to show the change in a set of data over a period of time. You can use a line graph to look for trends and make predictions.

### 3 ACTIVITY

The line graph shows the profits of a small company over several years.



9. **Multiple Choice** Choose the statement that best describes the profits for this company.
- (A) Profits generally decreased from 1998 to 2006.
  - (B) Profits showed no general trend.
  - (C) Profits generally increased from 1998 to 2006.
  - (D) Profits showed no change from 1998 to 2006.
10. What were the company's profits in 2002?
11. **Estimate** Based on the data shown in the graph, estimate the company's profits in 2005.
12. **Predict** Based on the data shown in the graph, predict the company's profits in 2008.

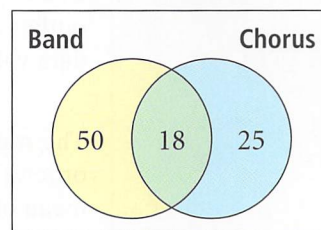
*Interpolation* is estimating a value among existing data. *Extrapolation* is predicting a value outside the existing data.

13. **Critical Thinking** In Question 7 you interpolated and in Question 8 you extrapolated. Why are interpolated values generally more reliable than extrapolated values?

A Venn diagram shows the relationships among collections of objects or numbers. The intersection, or overlap, of two circles indicates what is common to both collections.

### 4 ACTIVITY

The Venn diagram shows the results of a survey of students who are in either band or chorus or both.



14. **Multiple Choice** Based on the diagram, which of the following statements is true?
- (A) Twice as many students are in band than are in chorus.
  - (B) There are 18 more students in band than in chorus.
  - (C) There are 68 students in band.
  - (D) Seventy-five students were surveyed.

15. What does the number 18 in the intersection represent?