Section 1.4 Presenting Scientific Data
(pages 22–25)

Data Analysis *Organizing Data in Tables and Line Graphs*

Content and Vocabulary Support

Organizing Data

To be the most useful, scientific data should be organized. The simplest way to organize data is in a data table. Often, the data in tables are plotted in graphs, because graphs make it easier to see relationships and trends in the data. Commonly used types of graphs include line graphs, bar graphs, and circle graphs.

Line Graphs

A line graph is a good choice for showing changes in related variables. Generally, values for the manipulated variable are plotted on the horizontal ($x-$) axis, and values for the responding variable are plotted on the vertical ($y-$) axis. When all the data points are plotted, they are connected to form a line.

The steepness of the line is called the **slope**. The slope is calculated with the formula:

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}}$$

Rise is the difference between two y values. Run is the difference between the two corresponding x values. The steeper the line, the greater the slope. The greater the slope, the more the responding variable changes with each change in the manipulated variable. If the slope is positive, both variables change in the same direction. If the slope is negative, the two variables change in opposite directions.

When the ratio of two variables is constant, they have a relationship called a **direct proportion**. For example, if one variable is always twice as great as the other, the two variables are directly proportional. A direct proportion produces a straight-line graph. When the product of two variables is constant, they have a relationship called an **indirect proportion**. For example, The product of speed and time equals distance. If distance is constant, as it is in a race, then speed and time are indirectly proportional. An indirect proportion produces a curved-line graph.

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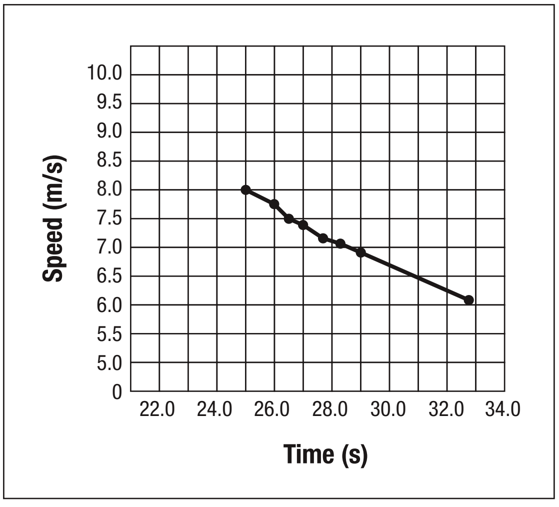
Data

Average temperatures vary by latitude, or distance north or south of the equator. At higher latitudes, the sun's rays are less direct, leading to less heating of Earth's surface. The table shows latitudes and average annual temperatures for several cities in the U.S.

Latitude and Average Annual Temperature for U.S. Cities		
City	*Latitude*	*Average Annual Temperature*
Denver	39° 45 min N	10°C
Houston	29° 58 min N	19°C
Los Angeles	33° 56 min N	18°C
Miami	25° 48 min N	24°C
New York	40° 47 min N	12°C
Portland	45° 36 min N	12°C
San Francisco	37° 37 min N	13°C
Tulsa	36° 12 min N	15°C

At a high school track meet, eight runners competed in the 200-m dash. The graph shows their speeds and finishing times.

Speeds and Finishing Times for 200-m Dash



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Questions

1. a. **Identifying** Identify the city in the table that has the lowest latitude and the city that has the highest latitude. What is the average annual temperature for each city?

   b. **Graphing** If you were going to draw a line graph of the values in the table, which variable would you plot on the *x*-axis and which variable you would plot on the *y*-axis? Explain your choices.

   c. **Interpreting Data** Based on the data in the table, how does average temperature change as latitude increases? How could you reorganize the data in the table to make this relationship more obvious?

2. a. **Describing** Describe how the responding variable changes as the manipulated variable increases.

   b. **Applying Concepts** Does the graph represent a direct proportion or an inverse proportion?

   c. **Predicting** Use the graph to predict how long it would take a runner to finish the 200-m dash at a speed of 6.5 m/s. At a speed of 8.2 m/s.

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