Lesson 4-9

Example 1 Find a Positive Rate of Change
HEIGHTS The table below shows Julia's height in inches between the ages of 5 and 12. Find the rate of change in her height between ages 5 and 10.

Age (yr)	5	10	12
Height (in.)	48	60	67

$$\frac{\text{change in height}}{\text{change in age}} = \frac{(60 - 48)\text{ inches}}{(10 - 5)\text{ years}}$$ Julia grew from 48 to 60 inches tall from age 5 to age 10.

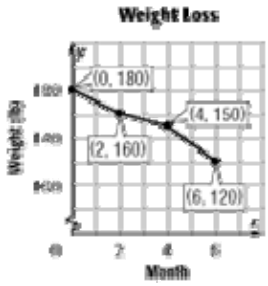
$$= \frac{12\text{ inches}}{5\text{ years}}$$ Subtract to find the change in heights and ages.

$$= \frac{2.4\text{ inches}}{1\text{ year}}$$ Express this rate as a unit rate.

Julia grew an average of 2.4 inches per year.

Example 2 Find a Negative Rate of Change

WEIGHT LOSS The graph shows Celia's weight over a period of 6 months. Find the rate of change between the first month and the sixth month, and describe how this rate is shown on the graph.



Use the data to write a rate comparing the change in weight to the change in time.

$$\frac{\text{change in weight}}{\text{change in time}} = \frac{120 - 180}{6 - 0}$$

Celia's weight changed from 180 pounds to 120 pounds during the 6-month period.

$$= \frac{-60}{6}$$

Simplify.

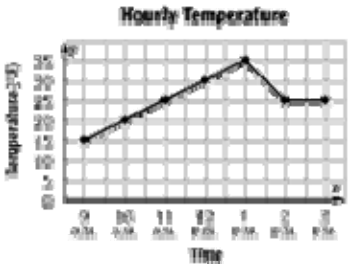
$$= \frac{-10}{1}$$

Express as a unit rate.

The rate of change is –10 pounds per month. The rate is negative because between the first month and the sixth month, her weight *decreased*. This is shown on the graph by a line slanting downward from left to right.

Example 3 Compare Rates of Change

TEMPERATURE The graph shows the temperature during the day over a 6-hour period. Compare the rate of change between 9 A.M. and 10 A.M. to the rate of change between 12 P.M. and 1 P.M. During which period was the rate of change greater?



The segment from 9 A.M. to 10 A.M. appears to have the same steepness as the segment from 12 P.M. to 1 P.M. So, the rate of change during these periods was the same.

Check Find and compare the rates of change.

From 9 A.M. and 10 A.M.

$$\frac{\text{change in temperature}}{\text{change in time}} = \frac{20-15}{1}$$

$$= 5°\text{F}$$

From 12 P.M. and 1 P.M.

$$\frac{\text{change in temperature}}{\text{change in time}} = \frac{35-30}{1}$$

$$= 5°\text{F}$$

Since 5°F = 5°F, the rate of change was the same during both hours. ✓