Lesson 13: Rates and Unit Rates

A **rate** is a ratio that compares two different units. Some examples of rates are 72 miles per 3 gallons, $6 for 3 pounds, and 130 heartbeats in 2 minutes.

A **unit rate** is a rate that compares two different units, where one of the measurements is 1. Some unit rates are 24 miles per gallon, $2 per pound, and 65 heartbeats per minute. Notice that these unit rates could also be stated as 24 miles per 1 gallon, $2.00 per 1 pound, and 65 heartbeats per 1 minute.

▷ Example

Mr. Easton bought 12 gallons of gas for $36. What is Mr. Easton's unit rate for the cost of 1 gallon of gas?

Use the ratio of dollars to gallons of gas to find the unit rate.

$$\frac{\text{dollars}}{\text{gallons of gas}} = \frac{36}{12}$$
$$= \frac{3}{1}$$
$$= 3$$

Mr. Easton paid $3 for every gallon of gas.

▷ Example

Julia traveled 432 miles in 8 hours. What is the unit rate for the average number of miles she traveled per 1 hour?

Use the ratio of miles to hours to find the unit rate.

$$\frac{\text{miles}}{\text{hours}} = \frac{432}{8}$$
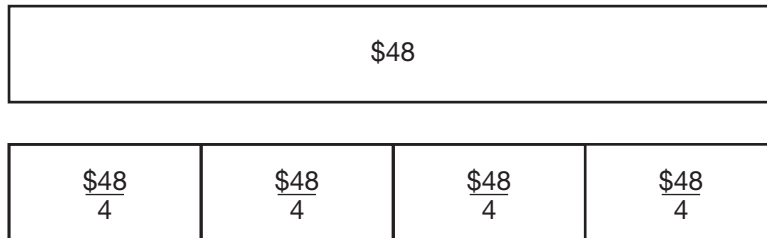$$= \frac{54}{1}$$
$$= 54$$

Julia traveled an average of 54 miles per 1 hour.

A tape diagram can help solve a rate problem. You can use it to find the unit rate. Then you can multiply the unit rate by the number of items.

▷ Example

The cost of 4 curtains is $48. What is the cost of 6 curtains?

The following tape diagram shows $48 split into 4 equal parts. The value of each part represents the cost of 1 curtain.

$48

$\frac{\$48}{4}$	$\frac{\$48}{4}$	$\frac{\$48}{4}$	$\frac{\$48}{4}$

$48 ÷ 4 = $12

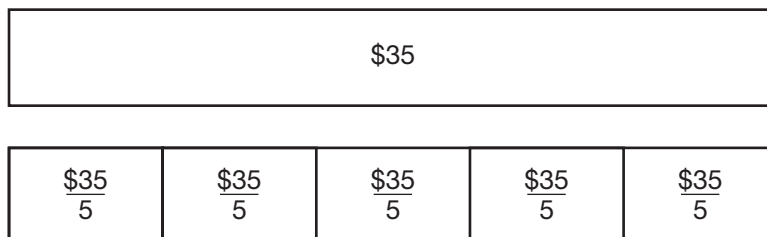The unit rate is $12 for 1 curtain, so the cost of 6 curtains will be equal to the unit rate times 6.

$12 × 6 = $72

The cost of 6 curtains is $72.

▷ Example

The cost of 5 toy cars is $35. What is the cost of 9 toy cars?

The following tape diagram shows $35 split into 5 equal parts. The value of each part represents the cost of 1 toy car.

$35

$\frac{\$35}{5}$	$\frac{\$35}{5}$	$\frac{\$35}{5}$	$\frac{\$35}{5}$	$\frac{\$35}{5}$

$35 ÷ 5 = $7

The unit rate is $7 for 1 toy car, so the cost of 9 toy cars will be equal to the unit rate times 9.

$7 × 9 = $63

The cost of 9 toy cars is $63.

77