

# 5.9

## Exploring Rates



### Quick Review

- A **rate** is a comparison of two quantities measured in different units.

Leo types 180 words in 3 min.  
180 words in 3 min is a **rate**.

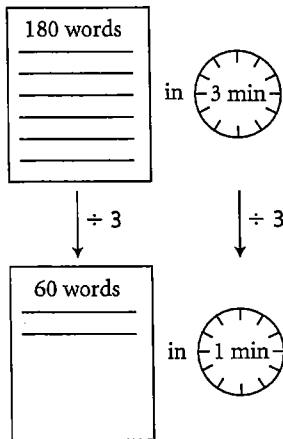
This means Leo types 60 words in 1 min.  
Leo's rate of typing is 60 words per minute.  
You can write this as 60 words/min.

60 words/min is a **unit rate**.  
It compares a quantity (60 words) to 1 unit (1 min).

- To find a unit rate, you can use a diagram, a table, or a graph.

In 3 min, Leo types 180 words.  
In 1 min, Leo types 60 words.

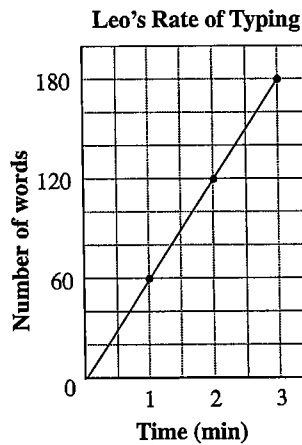
#### A Diagram



#### A Table

|         |     |     |    |
|---------|-----|-----|----|
|         |     | ÷ 3 |    |
| Minutes | 3   | 2   | 1  |
| Words   | 180 | 120 | 60 |
|         |     | ÷ 3 |    |

#### A Graph



## Practice

1. Express as a unit rate.

- a) Serena walks 4 km in 1 h. \_\_\_\_\_  
 b) Sanjit reads 3 books in 1 week. \_\_\_\_\_  
 c) The tap drips 25 drops in 1 min. \_\_\_\_\_

2. Express as a unit rate. Show your work.

- a) Betty drives her car 150 km in 2 h.

$$150 \text{ km} \div 2 = \text{_____ km}$$

Betty's average driving speed is \_\_\_\_\_ km/h.

- b) The helicopter travels 180 km in 3 h.

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- c) Gerald walks 1 km in 15 min.

|               |    |    |  |  |
|---------------|----|----|--|--|
| Distance (km) | 1  | 2  |  |  |
| Time (min)    | 15 | 30 |  |  |

Gerald's rate of walking is \_\_\_\_\_ km/h.

**Tip**

Express each rate in kilometres per hour (km/h).

**Tip**

1 h = 60 min

3. Determine whether the sentence expresses a ratio or a rate. Write the rate or ratio for each.

- a) The cost of pecans is \$10.89 for each kilogram. ratio/rate \_\_\_\_\_ per kg  
 b) Three out of every seven people are wearing glasses. ratio/rate \_\_\_\_\_  
 c) Mr. Thompson travelled 620 km in 6 h. ratio/rate \_\_\_\_\_  
 d) Each block of a quilt has 5 red patches, 4 yellow patches, and 6 blue patches.  
 ratio/rate \_\_\_\_\_  
 e) In 7 games, the team scored a total of 23 points. ratio/rate \_\_\_\_\_

4. Maria charges \$15 for 3 h of babysitting.

- a) What is Maria's rate per hour? \_\_\_\_\_  
 b) How much does Maria charge for 5 h of babysitting? \_\_\_\_\_  
 c) How many hours does Maria have to babysit to earn \$50?

Maria has to babysit \_\_\_\_\_ to earn \$50.

5. The graph shows the distance a freight train travels in 3 h.

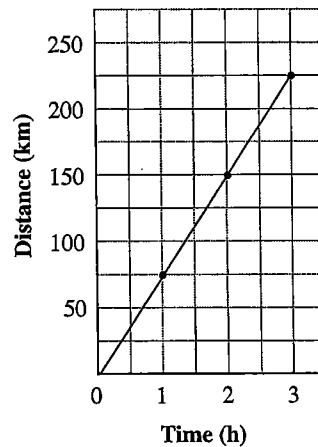
a) How far does the train travel in 1 h?

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b) What is the average speed of the train?

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How a Freight Train Travels



6. Frozen fruit bars cost \$3.95 for 5 bars.  
Find how many you can buy with \$12. Show your work.

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7. Terence came to Canada shopping on a long weekend.  
The exchange rate for his US money was \$1.00 US to \$1.05 Canadian.

a) How many Canadian dollars would Terence get for \$500.00 US?

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b) Terence spent \$504.90 Canadian altogether during his 3-day stay in Canada.  
What was his average spending per day?

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c) A jacket he purchased cost \$39.95 Canadian.  
What is this value in US dollars?

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# 5.10

## Comparing Rates



### Quick Review

► To compare different rates, you need to calculate their unit rates.

A case of 12 cartons of juice costs \$11.76.

A packet of 3 cartons of the same juice costs \$2.88.

To find which juice is the better buy, compare the unit costs of the 2 packages.

The unit cost of the case of 12 cartons is:  $\$11.76 \div 12 = \$0.98$

The unit cost of the packet of 3 cartons is:  $\$2.88 \div 3 = \$0.96$

So, the packet of 3 cartons is the better buy.

The unit cost can be written as a unit rate:

The unit rate of the better-buy juice is \$0.96/carton.

To find the unit rate of a 450-g packet of cereal that costs \$3.96, use the cost of 100 g as the unit cost.

The cost of 100 g of the 450-g packet is:  $\frac{\$3.96}{450} \times 100 = \$0.88$

So, the unit rate of the 450-g packet of cereal is \$0.88/100 g.

### Practice

1. Write a unit rate for each.

a) 6 bottles of juice for \$3.96

$$\frac{\$3.96}{6} = \underline{\hspace{2cm}}$$

b) 840 words typed in 12 min

$$\underline{\hspace{2cm}}$$

c) \$564 earned in 4 weeks

$$\underline{\hspace{2cm}}$$

d) 130 mL of toothpaste for \$1.69

$$\underline{\hspace{2cm}}$$

**Tip**

A unit rate can be a rate for a quantity greater than 1.

2. Which is the better buy? Explain.

a) 475 g of cereal for \$3.80 or 750 g for \$6.30

$$\underline{\hspace{10cm}}$$

b) 385 mL of shampoo for \$5.39 or 400 mL for \$5.72

$$\underline{\hspace{10cm}}$$

3. Find the average speed of each.

a) 242 km in 4 h

b) 372 km in 6 h

c) 309 km in 5 h

\_\_\_\_\_

Which is the greatest average speed? \_\_\_\_\_

4. Shamar types 279 words in 4.5 min, Tasha types 320 words in 5 min, and Cody types 341 words in 5.5 min. Who has the greatest average typing speed?

\_\_\_\_\_ has the greatest average typing speed.

5. In the first 6 games of the basketball season, Lucinda scored 87 points.

a) What was her average number of points scored per game? \_\_\_\_\_

b) At this rate, how many points will Lucinda score in 26 games? \_\_\_\_\_

6. Which is the better buy?

Twelve 710-mL bottles of water for \$6.60 or twenty-four 500-mL bottles for \$9.18

\_\_\_\_\_

7. Population density is defined as the average number of people per square kilometre. The population density of Canada is approximately 3.5 people/km<sup>2</sup>. Use the data in the table. Name a province or territory that has:

a) A population density closest to that of Canada \_\_\_\_\_

b) A population density about half of that of Canada \_\_\_\_\_

c) A population density about 4 times that of Canada \_\_\_\_\_

d) A population density about 300 times that of Nunavut \_\_\_\_\_

| Province/Territory | Population | Area (km <sup>2</sup> ) |
|--------------------|------------|-------------------------|
| Ontario            | 12 393 000 | 917 700                 |
| Saskatchewan       | 995 000    | 591 700                 |
| British Columbia   | 4 196 000  | 925 200                 |
| Nunavut            | 29 600     | 1 939 000               |