

# UNIT RATE

NAME: \_\_\_\_\_

DATE: \_\_\_\_\_

- \* Reduce a rate to a single unit.
- \* Used to compare (shopping!)

E.G.  $\frac{750 \text{ mL}}{6 \text{ people}} \div 6 = \frac{125 \text{ mL}}{1 \text{ person}}$

Do Q# 1-23 (ODD)

Since the price per unit of mass or volume is often very small, we may express the unit price as the price per 100 units.

### Example 2

The price of a 1-L bottle of shampoo was \$4.20, while a 750-mL bottle cost \$3.00.

- a) Express each unit price as the cost per 100 mL.
- b) Which size is the better value?

### Solution

Let the  $\frac{\text{cost}}{100 \text{ mL}}$  be  $\frac{x}{100}$ .

Recall that 1 L = 1000 mL.

For the 1-L bottle

$$\frac{4.20}{1000} = \frac{x}{100}$$

$$4.20 \times 100 = 1000x$$

$$\frac{420}{1000} = \frac{1000x}{1000}$$

$$0.42 = x$$

For the 750-mL bottle

$$\frac{3.00}{750} = \frac{x}{100}$$

$$3.00 \times 100 = 750x$$

$$\frac{300}{750} = \frac{750x}{750}$$

$$0.4 = x$$

$300 \div 1000 = 0.3$



The unit price is \$0.42/100 mL.

The unit price is \$0.4/100 mL.

Since \$0.4/100 mL < \$0.42/100 mL, the 750-mL bottle is the better value.

### Practice

Express as a unit rate.

1. 68 students for 2 buses
2. 120 hamburgers for 60 people
3. driving 165 km in 3 h
4. 750 mL of juice for 6 people
5. skiing 14 km in 4 h
6. \$35 for 4 h of work
7. 900 g of batter for 4 cakes

Find the unit price. Round to the nearest tenth of a cent if necessary.

8. \$15.30 for 3 small pizzas
9. \$4.20 for 30 coloured markers
10. \$1.29 for 10 pens
11. \$32.00 for 25 party hats
12. \$5.00 for 6 sandwiches
13. \$0.70 for 40 g of potato chips
14. \$42.00 for 2.5 h of sailing

### Problems and Applications

15. Nicole earned \$46.00 for 8 h of babysitting. Leon earned \$67.20 for 12 h of babysitting. Who had the higher rate of pay and by how much?
16. In Halifax, Nova Scotia, there are about 320 000 people in an area of 80 km<sup>2</sup>. In Kingston, Ontario, there are about 60 000 people in an area of 30 km<sup>2</sup>. In which city are there more people per square kilometre?
17. One year, British Columbia had 6149 police officers and a total population of 3 282 000. Nova Scotia had 1542 police officers and a total population of 900 000. Which province had the greater number of people for each police officer?
18. Each of your fingernails grows at about 0.05 cm/week. Each of your toenails grows at about 0.65 cm/year. Do your toenails or your fingernails grow faster?

CONTINUED



**19.** Great Britain's Linford Christie won the men's 100-m run at the 1992 Summer Olympics in 9.96 s. The Canadian women's team won the 3000-m speed skating relay at the 1992 Winter Olympics in 4 min 36.62 s. Who travelled faster, the sprinter or the speed skaters?

**20.** The density of a material is defined as its mass per unit volume. A  $15\text{-cm}^3$  lump of uranium has a mass of 285.75 g. A  $25\text{-cm}^3$  lump of gold has a mass of 472 g.

**a)** Express the density of each of these metals in grams per cubic centimetre.

**b)** State which metal has the higher density.

**21.** Decide which is the better value.

**a)** \$25.00 for concert tickets for 2 people or \$36.00 for concert tickets for 3 people

**b)** \$340.00 for a bus for 35 people or \$432.00 for a bus for 40 people

**c)** \$4.30 for 4 L of milk or \$2.40 for 2 L of milk

**d)** 28 g of mixed nuts for \$0.98 or 35 g of mixed nuts for \$1.40

**e)** ski rentals at \$72.00 for 5 h or \$52.50 for 3 h

**f)** 1.5 L of juice for \$1.65 or 2.5 L of juice for \$2.25

**g)** 500 sheets of computer paper for \$9.50 or 2000 sheets of computer paper for \$36.00

**h)** 18 L of gas for \$9.36 or 8 L of gas for \$4.08

**22.** Calculate the rate per 100 units to find the better value.

**a)** 450 g of peanuts for \$1.80 or 250 g of peanuts for \$0.75

**b)** 700 g of cheese for \$4.20 or 0.5 kg of cheese for \$3.50

**c)** 90 mL of hand lotion for \$4.05 or 0.6 L of hand lotion for \$21.00

**d)** 50 drinking straws for \$0.69 or 110 drinking straws for \$1.49

**23.** Loose-leaf paper costs \$1.49 for 200 sheets or \$3.49 for 500 sheets. Find

**a)** the least you can pay for 1000 sheets.

**b)** the least you can pay for 1600 sheets.

**24.** List reasons why the unit price is often lower for a larger size of a product than for a smaller size of the same product.

**25.** With a classmate, list the advantages and disadvantages of buying 1 L of milk for \$2.00 or 3 L of milk for \$5.75.

**26.** Collect store flyers that advertise food products. With a classmate, compare prices of 10 products in different stores. When product sizes differ, calculate the best value.

**27.** Write a problem that involves 2 unit rates. Have a classmate solve your problem.

## PATTERN POWER

**a)** Find these differences in the squares of consecutive whole numbers.

$$1^2 - 0^2 = \blacksquare$$

$$2^2 - 1^2 = \blacksquare$$

$$3^2 - 2^2 = \blacksquare$$

$$4^2 - 3^2 = \blacksquare$$

$$5^2 - 4^2 = \blacksquare$$

**b)** Describe the pattern.

**c)** Use the pattern to evaluate mentally  $245^2 - 244^2$ .