



## Connect and Reflect

### Key Ideas

- A rate is the ratio of two measurements with different units.
- You can express a rate as a fraction that includes the two different units.
- A unit rate is a rate in which the second term is a single unit of measure, often 1.
- The units in the unit rate come from the two quantities being divided. For example, amount of rainfall measured in centimetres divided by months gives centimetres per month, or cm/mo.
- A unit price is a unit rate that makes it easier to compare the cost of similar items.

### Practise

For help with #1 to #4, refer to Example 1 on page 233.

1. Determine the speed of each animal. Include units in your answer.
  - a) An orca swims 110 km in 2 h.
  - b) A blue whale travels 193 km in 10 h.
  - c) A Canada goose flies 800 m in 50 seconds.
  - d) A snail moves 40 mm in 5 min.
2. What is the unit rate in each case?
  - a) A black bear eats 22 kg of berries in 2 weeks.
  - b) Cathy plants 45 daffodils in 30 min.
  - c) A bank teller helps 65 customers in 2.5 h.
  - d) A water tank leaks 58 L of water in 4 days.
3. Ruby-throated hummingbirds and monarch butterflies travel similar paths across the Gulf of Mexico. The distance is just over 800 km. It takes the hummingbird 18.5 h and the monarch butterfly 41.6 h to cross the Gulf.
  - a) Estimate the speed of the hummingbird and the butterfly.
  - b) Calculate the speed of the hummingbird and the butterfly to the nearest tenth.

4. Gina earns \$78.00 for working 6 h. Asad makes \$192.50 for working 14 h. Who has the greater hourly rate of pay?

For help with #5 and #6, refer to Example 2 on pages 234–235.

5. Fraser is shopping for milk. It is available in three sizes.



- a) What is the unit price per 100 mL for each carton of milk?
- b) Determine the unit price using different units than you used in part a).
- c) Which carton of milk is the best buy? Explain how you know.
- d) What other factors might Fraser consider when deciding which size to buy?



6. Mala is shopping for peanut butter. Her favourite brand is available in two sizes.



250 g  
\$5.49



1 kg  
\$7.99

- Estimate which jar is the better buy. Explain your thinking.
- Determine the better buy. Justify your answer mathematically.
- Which approach (estimating or calculating) would you be more likely to use if you were actually shopping? Explain your choice.

For help with #7, refer to Example 3 on page 236.

7. The table shows some data that Brent has collected about the growth rates of polar bear cubs.

Birth Mass (kg)	Mass After 8 Weeks (kg)	Mass After 20 Weeks (kg)
0.6	6.2	12.2

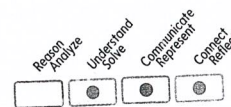
Do the data support the statement that bear cubs grow faster immediately after birth compared to later on?

### Apply

8. How is a rate different from a ratio? Explain using your own examples.

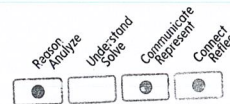
### 9. ✓ Competency Check

- Give two examples of rates that are used in everyday life. Share your examples with a classmate.
- What units measure each of the rates in part a)?
- Explain why a rate cannot be expressed as a percent.



10. ✓ Competency Check Two brands of canned dog food are on sale. The cans are the same size. Brand A costs \$13.60 for 8 cans and Brand B costs \$8.75 for 5 cans.

- Explain how you can compare the cost of the two brands of dog food. Determine the better buy.
- Is the lowest cost always the best decision when making a purchase? What other factors could be considered in this case?



11. The table shows driving information for three drivers. There are two ways to use rates to express how the distance travelled compares to the fuel used in metric units: fuel economy, expressed in km/L, or fuel consumption, expressed in L/100 km.

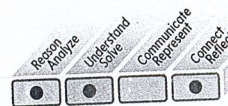
Driver	Distance (km)	Fuel Used (L)
Joe	400	28
Sarah	840	60
Martin	245	20

- What is the fuel economy for each vehicle in km/L? Give your answers to two decimal places.
- What is the fuel consumption of each vehicle in L/100 km? Give your answers to two decimal places.
- Which driver's vehicle has the best rate? Is it the higher value for both parts a) and b)? Explain.



12. Cara works for an airline and uses an app on her phone to check daily currency conversion rates. The screen shows the rates for some popular currencies on a particular day. She has \$400 CDN to convert to another currency.

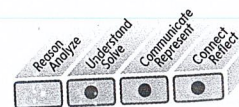
- Use mental math to estimate the value of \$400 in British pounds and in U.S. dollars.
- How many euros can Cara get?
- What is the money worth in Russian rubles?
- Compare the rates given here to current conversion rates. Which places are better for a Canadian travelling abroad today?



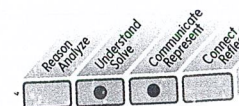
13. Grace is an egg farmer who sells eggs in two different-sized containers: a dozen eggs for \$5 or a 30-egg flat for \$10.80. She is going to start selling an 18-egg carton as well and is wondering what price to charge. She wants to set the unit price of the 18-egg carton between the unit prices for the other two sizes. What price range can she choose from for the new size?

**Extend**

14. **Competency Check** Hardeep goes to the bank to get some U.S. dollars for a trip to Seattle. He pays \$500 CDN and receives \$379.15 USD. At the end of his trip, Hardeep returns to the bank and converts an unspent \$180 USD back to Canadian dollars. He receives \$245.50 CDN. Will Hardeep be happy with how the exchange rate has changed during his trip?



15. Daniel's yard is 10 m by 6 m. His push lawnmower can cut the grass in 15 minutes. The field behind Grace's house measures 30 m by 50 m. Her ride-on mower can mow the field in an hour. There is a 400-m<sup>2</sup> area between the two properties. How long will it take Daniel to mow this area? How long will it take Grace?



16. A planet takes one day to make one revolution of its axis. Think of each planet as a sphere. If you are standing on the equator of a planet, you are travelling in a circle as the planet spins on its axis. Use the table to find the rotation rate in kilometres per hour for a point on the equator of each planet.

Planet	Radius at Equator (km)	Length of Day (h)
Venus	6 051	2 808
Earth	6 378	24
Saturn	60 268	10 233

The formula relating the circumference,  $C$ , of a circle to its radius is  $C = 2 \times \pi \times r$ .

17. A farmer applies liquid fertilizer to a field at a rate of 2 L/m<sup>2</sup>. What is this equivalent to in millilitres per square centimetre?