8 Mid-Chapter Review

FREQUENTLY ASKED Questions

Q: How do you compare rates? When is one strategy more effective than another?

Study *Aid*
- See Lesson 8.1.
- Try Mid-Chapter Review Questions 1 to 5.

A: Here are three strategies you can use to compare rates:

- It is often effective to express the rates as unit rates using the same units.

  For example, organic cashews may be sold for \$18.95/kg at one store and \$9.49/lb at another store. To determine which rate, or price, is less expensive, you can convert the rate in kilograms to a rate in pounds and then calculate the equivalent unit rate to make a proper comparison. (Alternatively, you could convert the rate in pounds to a rate in kilograms. The choice of which rate to convert might be affected by other comparisons that you need to make to solve a problem.)

  \$9.49/lb | \$18.95/kg
  1 kg : 2.2 lb
  $\frac{\$18.95}{1\ \text{kg}}\left(\frac{1\ \text{kg}}{2.2\ \text{lb}}\right) \doteq \$8.61/\text{lb}$
  \$18.95/kg is less expensive.

  This strategy is effective when you need to know and use the numerical value of each rate.

- On a graph of a relation, the slope of a line that joins two points is equivalent to the average rate of change.

  For example, car A travels 50 m in 4 s, and car B travels 40 m in 4 s. If these data are plotted on a graph, it is clear that car A is travelling at a greater rate than car B, because the blue line is steeper than the red line.

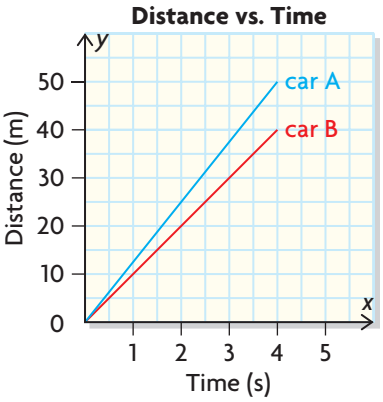
  This strategy is effective when you need to know which rate is greater or lesser, but you do not need to know the numerical values. However, the numerical values could be determined by calculating the slopes of the lines:

  $$\text{Slope} = \frac{\Delta y}{\Delta x}$$

  $$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

  $$\text{Rate of change for car A} = \frac{50 - 0}{4 - 0} \text{ or } 12.5 \text{ m/s}$$

  $$\text{Rate of change for car B} = \frac{40 - 0}{4 - 0} \text{ or } 10.0 \text{ m/s}$$



- Rates can also be compared by writing them as equivalent rates, with the second terms numerically the same.
  For example, suppose that you burn 320 Cal in 20 min of spin class and 210 Cal in 15 min of jogging. You can compare these rates by determining the amount of Calories burned in an hour by doing each activity, using the fact that there are 60 min in an hour.

Spinning:	Jogging:
$\frac{320 \text{ Cal}}{20 \cancel{\text{min}}}\left(\frac{60 \cancel{\text{min}}}{1 \text{ h}}\right) = 960 \text{ Cal/h}$	$\frac{210 \text{ Cal}}{15 \cancel{\text{min}}}\left(\frac{60 \cancel{\text{min}}}{1 \text{ h}}\right) = 840 \text{ Cal/h}$

Spinning burns Calories at a greater rate.

Study *Aid*
- See Lesson 8.2, Example 1.
- Try Mid-Chapter Review Question 6.

Q: When you are comparison shopping, what factors, other than unit price, should you consider?

A: The factors to consider will depend on the situation.

For example, if you want to buy a pair of jeans and you know the prices at two different stores, you might also consider
- the distance to each store and the time you will need to get there.
- the cost of fares you will pay or gas you will use to travel there and back.
- how busy each store will be.
- the exchange rate on the dollar, if one or both stores are located in the United States.

Study *Aid*
- See Lesson 8.2, Example 1, Example 3 (Mila's Solution), and Example 4 (Joanna's Solution).
- Try Mid-Chapter Review Questions 7 and 8.

Q: Why is analyzing the units in a rate problem a useful strategy?

A1: Often, a problem that involves rates can be solved by writing an equation. The equation you write will involve a pair of equivalent ratios. In this kind of equation, the units in the numerators of the two ratios must be the same and the units in the denominators must be the same. Paying attention to the units in each term of these ratios will help you write the equation correctly.

A2: Sometimes, a rate problem can be solved by using a multiplication strategy. When you use this strategy, including the units with each term in the product will help you verify that you have multiplied the quantities correctly. The units should cancel to leave you with the correct units for your answer.

PRACTISING

Lesson 8.1

1. Carol can key at the rate of 65 words/min. Jed can key 290 words in 5 min. Who is faster? Explain how you know.

2. Harry filled the 75 L gas tank of his pickup truck for $73.88. Stan paid 95¢/L to fill up his truck. Who paid less per litre for fuel?

3. For each of the following, compare the two rates and determine the lower rate.

a) Calories burned: 300 Cal/h or 4 Cal/min

b) water usage: 30 L/day or 245 L/week

c) ground beef: $8.40/kg or $3.99/lb

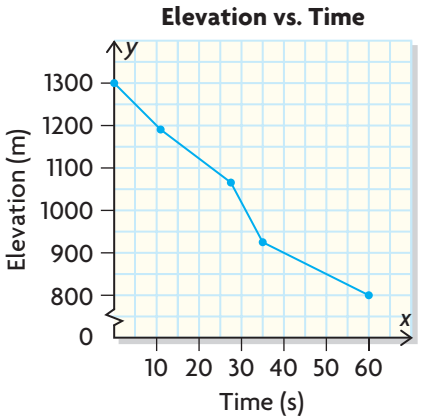
d) cycling speeds: 2 miles in 5 min or 5 km in 20 min

4. **a)** Draw a graph to show Lyn's body temperature, based on this description:

- rising at a constant rate from 98.6 °F to 102 °F over a period of 3 h
- remaining at 102 °F for 2 h
- falling back to 98.6 °F over a period of 5 h

b) During which interval of time was the rate of change in her body temperature the greatest?

5. The following graph shows elevation versus time for a skier who descended a mountain.



a) During which interval of time was the skier's speed the greatest? Explain.

b) During which interval of time was the skier's speed the least? Explain.

c) Estimate the skier's speeds for the intervals you identified in parts a) and b).

d) What was the skier's average speed over the entire run?

Lesson 8.2

6. Martin is shopping for a new MP3 player. The one he wants is on sale for $119.95 at Giant Electronics, located in his town. He has found the same MP3 player for $105.99 on the Internet, on the website for a U.S. store. Today's exchange rate is $1 U.S. = $1.08 Cdn.

a) Determine which store has the lower price in Canadian dollars.

b) What factors, besides the list price, should Martin consider before he makes the purchase?

7. An airplane travels 300 miles in 36 min. At this rate, how far will it travel in 2 h?

8. Sam bought a used fishing boat in the United States and brought it back to Canada. According to the literature that came with the boat, the gas tank holds 25 gal. The marina where Sam docks his boat sells gas for $1.08/L. Determine the cost to fill the gas tank at this marina. (The conversion rate is 1 U.S. gal/3.785 L.)

9. Hicham El Guerrouj of Morocco ran 1500 m in 00:03:26.00 in Rome, Italy, in July 1998. Just under a year later, he ran the mile in 00:03:43.13 on the same track.

a) Determine his average speed in each race.

b) Compare the distances run and his average speeds in both races.

c) Discuss some factors that may have led to his average speeds being different in these two races.