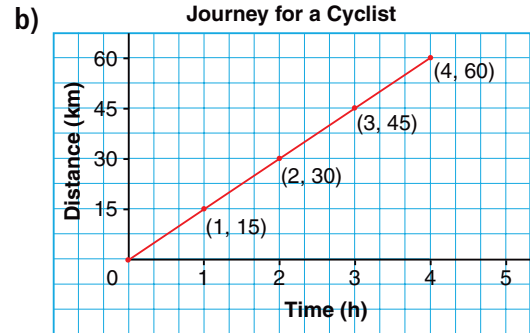
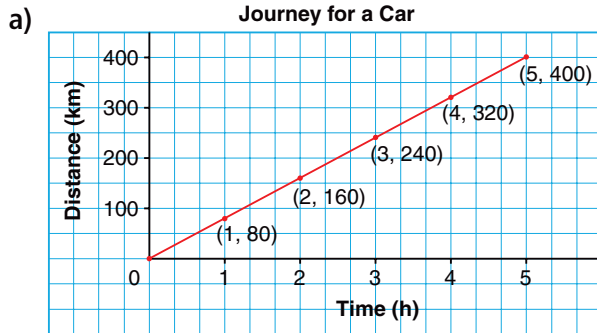


Practice

1. Determine each rate of change.



2. What does each rate of change in question 1 represent?

3. In *Connect the Ideas*, page 198, the rate of change was calculated using 2 points on the line. Choose 2 different points on the line. Confirm that the rate of change is the same for these points.

An average speed can be expressed in different units.

Example

Nathalie leaves downtown Ottawa to meet a friend at Dow's Lake, 6 km away. She skates along the Rideau Canal. It takes Nathalie 5 min to skate 1 km.

a) Assume Nathalie keeps skating at this rate.

Make a table to show her distance from downtown at 5-min intervals.
Graph the data.

b) Determine the rate of change from the graph.

What does the rate of change represent?

c) How long does it take Nathalie to reach Dow's Lake?

How did you determine this?

d) What is Nathalie's average speed in kilometres per hour?

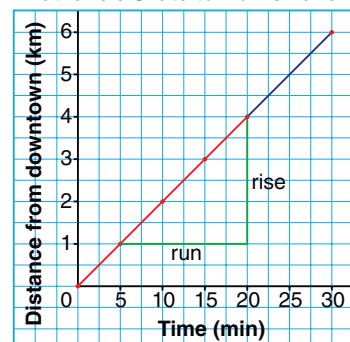
Ottawa's Rideau Canal Skateway was officially designated the world's largest naturally frozen ice rink.

Solution

a)

Time (min)	Distance from downtown (km)
0	0
5	1
10	2
15	3
20	4

Nathalie's Skate to Dow's Lake



- b) Choose 2 points on the line: (5, 1) and (20, 4)

The rise is: $4 \text{ km} - 1 \text{ km} = 3 \text{ km}$

The run is: $20 \text{ min} - 5 \text{ min} = 15 \text{ min}$

$$\begin{aligned} \text{Rate of change} &= \frac{\text{rise}}{\text{run}} \\ &= \frac{3 \text{ km}}{15 \text{ min}} \\ &= 0.2 \text{ km/min} \end{aligned}$$

The rate of change is 0.2 km/min.

This is Nathalie's average speed in kilometres per minute.

- c) By extending the graph, we can see that it takes Nathalie 30 min to travel the 6 km to Dow's Lake.

- d) Nathalie's average speed is 0.2 km/min.

There are 60 min in 1 h.

So, the average speed in kilometres per hour is: $60 \times 0.2 = 12$

Nathalie's average speed is 12 km/h.

To answer the questions in parts c and d, we could have extended the table.

4. Matt took 20 min to drive 24 km to attend a concert.
- Graph distance against time for this journey.
 - What is the rate of change of distance with time?
 - What was Matt's average speed for his trip? How do you know?
 - What was Matt's average speed in kilometres per hour?
5. **Assessment Focus** A group of friends is hiking 15 km around a lake. It takes the group 30 min to hike the first 2 km. Assume the group keeps hiking at this rate.
- Make a table to show the distance from the start at 30-min intervals. Graph the data.
 - Determine the rate of change. What does it represent?
 - How long will it take for the group to complete the hike? How did you determine this?
 - What is the average hiking speed in kilometres per hour?
 - Write a question you could answer using the graph. Answer the question.
6. **Take It Further** Keta and Aaron run in a half-marathon. Keta can run the 21-km course in 120 min. Aaron's average speed is 8.4 km/h. Who runs faster? How do you know? How many different ways can you find out?

Need Help?

Read the Example above.



In Your Own Words

What is the rate of change? How is it related to the steepness of a line? Make a Frayer model to explain.