8.1 Comparing and Interpreting Rates

↗ same things

A **ratio** is a comparison of two quantities, and can be written in three ways:

1. a:b
2. $\frac{a}{b}$
3. a to b

speed: 35km/h

A **rate** is a ratio of unlike quantities. Ratios and rates should always be expressed in lowest terms.

↳ different things

Example 1: Your pay is $60 for each 8 hours of work. What is your rate of pay?

$$\frac{\$60}{8h} \div 4 = \frac{\$15}{2h}$$

A **unit rate** is a rate in which the denominator is equal to 1.

$$\frac{\$15}{2h} \div 2 = \frac{\$7.50}{1h}$$

∴ unit rate is $7.50/hour

Example 2: A Japanese-made car can travel 50km on 4L of gas and a Canadian-made car can travel 160km on 13L of gas. Which car gets the better gas mileage in km/h?

- use unit rate to compare

Japanese Made

$$\frac{50km}{4L} = \frac{12.5km}{1L} = 12.5km/L$$

Canadian made

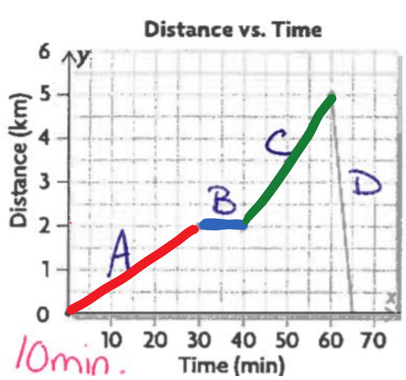
$$\frac{160km}{13L} = \frac{12.31km}{1L} = 12.31km/L$$

∴ Japenese-Made car has better gas mileage.

Rate of change is defined as the ratio of different units. From Grade 10 we learned that this can also be represented as the slope of a line.

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

Example 4: Describe a scenario for the graph, comparing the rates shown.



10min.

Rate of change of A.

$$\frac{2km}{30\,min} = \frac{2000m}{30\,min} = \frac{66.7m}{1\,min}$$

Liam walks 30 min. from home.

Rate of change of B.

$$\frac{0km}{10\,min} = \frac{0\,km}{1\,min}$$

Liam stops + taks to Brendan.

Rate of change of C.

$$\frac{3km}{20min} = \frac{3000m}{20min} = \frac{150m}{1min}$$

Liam runs for 20min.

Rate of change of D

$$\frac{-5km}{5min} = \frac{-5000m}{5\,min} = \frac{-1000m}{1\,min}$$

Liam catches a bus home.

8.2 Solving Problems That Involve Rates

Example 1: Jeff lives in Abbotsford. The gas tank of his truck is 135L. He can either buy gas in Abbotsford at \$1.20/L or in Sumas at \$4.55 US/gal. (There are 3.79L in a US gallon). Which option makes the most sense economically?

$\therefore$ Abbotsford makes more sense.

\$1.03 CAD = \$1.00 USD

Abbotsford : $\frac{\$1.20\ CAD}{1L}$

Sumas: $\frac{\$4.55\cancel{US}}{1\ \cancel{gal}} \times \frac{1.03\ CAD}{1\ \cancel{US}} \times \frac{\cancel{1\ gal}}{3.79L} = \frac{\$4.69\ CAD}{3.79L} = \frac{\$1.24\ CAD}{1L}$

Example 2: A faucet leaks 1mL per minute. How many liters are wasted in a week?

$\frac{1mL}{1min} \times \frac{1L}{1000mL} \times \frac{60min}{1h} \times \frac{24h}{1day} \times \frac{7days}{1week}$

$= \frac{10.08L}{1week}$

Example 3: Mr. T is asked to order snacks for a staff meeting for 60 people. He decides to order cookies, which come in boxes of 12. He estimates he will need 2.5 cookies/ person.

a. How many boxes should Mr. T order?

$\frac{2.5\ cookies}{1\ person} \times \frac{1\ box}{12\ cookies} \times 60\ people = 12.5\ boxes$

$\boxed{\therefore 13\ boxes}$

b. If each person actually ate 1.5 cookies on average, how many boxes of cookies were left over?

$\frac{1.5\ cookies}{1\ person} \times \frac{1\ box}{12\ cookies} \times 60\ people = 7.5\ boxes$

13 boxes − 7.5 boxes = 5.5 boxes left over.

Homework: p. 458 # 1-2 (a), 3, 5, 6, 7 (a, b), 9, 12*, 13* & p. 466 # 1(a, c), 2 - 4, 6, 8, 11, 15*, 16*

*Optional