

Name: _____

Lesson 2.2 - Rates

Definitions

- 1) Rate: Comparison of quantities with different units
- 2) Unit Rate: the second unit is reduced to ONE
ex/kilometres PER hour

Example #1: Marni drives 200 km in 4 hours. What is her average rate per hour?

$$\frac{200 \text{ km}}{4 \text{ hours}} = \frac{?}{1 \text{ hour}} \quad 50 \text{ km/h}$$

Example #2: Save-On Foods sells 6 cans of Tomato Sauce for \$4.99. What is the unit price?

$$\frac{\$4.99}{6 \text{ cans}} = \$0.83/\text{can} \quad \text{OR} \quad 83\text{\$/can}$$

Example #3: Costco sells three different types of Kleenex. Brand A comes with 12 boxes and 120 tissues per box for \$23.99. Brand B comes with 18 boxes and 110 tissues per box for \$29.50. Brand C comes with 14 boxes and 160 tissues per box for \$31.99. Which one should you buy if all you care about is getting the most tissues for the lowest price?

(A) $\frac{23.99}{(120 \times 12)}$.0166	(B) $\frac{29.50}{(110 \times 18)}$.014899	(C) $\frac{31.99}{(160 \times 14)}$.01428
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Assignment Part 1

1. Compare the following situations, and determine the lower rate.

- a) At store A, 8 kg of cheddar cheese costs \$68.
At store B, 12 kg of cheddar cheese costs \$88.20.

A) $\frac{68}{8} = \$8.50/\text{kg}$ B) $\frac{88.2}{12} = \$7.35/\text{kg}$

- b) At gas station A, 44 L of fuel costs \$41.36.
At gas station B, 32 L of fuel costs \$31.36.

A) $\frac{41.36}{44} = 94¢/\text{L}$ B) $\frac{31.36}{32} = 98¢/\text{L}$

2. Compare the following situations, and determine the greater rate.

- a) It takes 4 h 15 min to drain tank A, which holds 300 L of water.
It takes 2 h 10 min to drain tank B, which holds 150 L of water.

hour = 60 mins

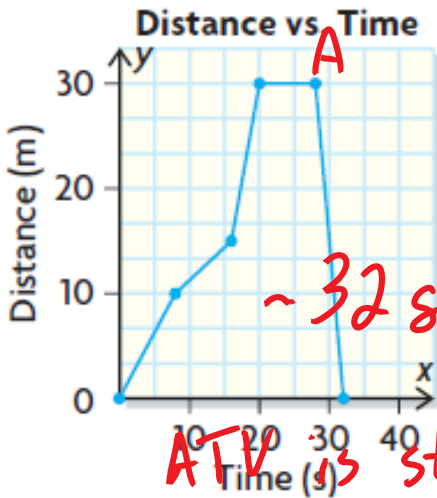
$\frac{300\text{ L}}{4.25\text{ h}} = 70.6\text{ L/h}$ $\frac{150}{2.167} = 69.2\text{ L/h}$

- b) Person A runs 400 m in 1 min 15 s.
Person B runs 1 km in 5 min 20 s.

min = 60 secs

$\frac{400}{1.25} = 320\text{ m/min}$ $\frac{1000}{5.3} = 187.5\text{ m/min}$

3. The graph to the left shows how an all-terrain vehicle (ATV) travels over time.



- a) Over which interval of time is the ATV travelling the slowest?
Over which interval is it travelling the fastest?

- b) When does the ATV start to return to its starting position?
When does it get there?

- c) What does a zero slope mean in the context of this graph?

4. Apple juice is sold in 1 L bottles and 200 mL boxes. A 1 L bottle sells for \$1.75, and fifteen 200 mL boxes sell for \$4.99.

a) Determine the unit rate, in dollars per millilitre, for each size.

$$\frac{1.75}{1000} = 0.00175/\text{mL}$$

$$\frac{4.99}{(15 \times 200)} = 0.00166/\text{mL}$$

b) Which size has the lower cost per millilitre?

15 boxes

5. The list price for a 925 mL container of paint is \$20.09. A 3.54 L container of the same paint costs \$52.99. Which container has the lower unit cost?

$$\frac{20.09}{925} = 0.0217$$

$$\frac{52.99}{3540} = 0.01497$$

6. When Rupi goes to her aerobics class, she can burn 140 Cal in 20 min. When she plays hockey for 1.5 h, she can burn 720 Cal. Which activity burns Calories at a greater rate?

$$\frac{140}{20} = 7 \text{ cal/min}$$

$$\frac{720}{90} = 8 \text{ cal/min}$$

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

a) whole chickens: \$3.61/kg or 10 lb for \$17.40

b) jogging speeds: 6 mph or 2 km in 10 min

c) fuel efficiency: 10.6 L/100 km or 35.1 L of fuel needed to travel 450 km

d) driving speeds: 30 m/s or 100 km/h

8. Jay can buy a 25 lb bag of bird seed for \$21.30 from the Farmers Co-op. The pet store in town sells an 18 kg bag for \$24.69. At which store can Jay buy bird seed at a lower cost?

9. Shelley has two choices for a long-distance telephone plan:

- her telephone company, which charges 4¢/min
- a device that plugs into her Internet modem, which costs \$19.95 with an additional charge of 1.5¢/min

Shelley makes, on average, 50 min of long-distance calls per month.

Which option would be cheaper on an annual basis? Justify your decision.

Assignment Part 2 - Using one rate to solve another:

1. **a)** 50 L of oil costs \$163. How much oil, to the nearest litre, could you buy for \$30?

 - b)** It takes 3 min 25 s to fill a 75 L gas tank. How long, to the nearest minute, will it take to fill a 55 L gas tank?

 - c)** 8 kg of beef costs \$68.00. How much will it cost, to the nearest cent, for 1.5 kg of beef?

 - d)** The adult dosage of an antibiotic medicine is 25 mL/80 kg. How much medicine is needed for a person with a mass of 95 kg?
2. Two competing stores have 350 mL cans of pop on sale this week. Supersaver is selling a case of 24 cans for \$5.99. Gord the Grocer is selling cans of the same pop in cases of 12, with three cases for \$9.99.
Which store is selling soft drinks at the lower price per can?
3. A screw has 32 turns over a distance of 24 mm of thread.
Another screw, with the same pattern, has 42 mm of thread. How many turns does it have?
4. The Wildcats won 12 of their first 20 games. At this rate, predict how many games they will win during the 30-game season.
5. Mario borrowed \$1000 and paid \$40 simple interest. If he borrowed the money for eight months, what interest rate was he charged?
6. Basic units of data are transferred by a particular computer at 12 MB (megabytes) every 2 s. How long will it take this computer to transfer 1.5 GB (gigabytes) of data? (1 GB is equivalent to 1024 MB.)
7. Melanie wants to defrost a frozen roast, which weighs 2.68 kg, in her microwave. To find out how much time she needs, she looks in a cookbook. She reads that 2 lb of meat takes 15 min to defrost. How long, to the nearest minute, should she set the timer for?
8. A nurse administers a vaccine that comes in a 10 mL bottle. The adult dosage is 0.5 cc (1 cc = 1 mL). How many adults can the nurse vaccinate before the bottle is empty?

Answer Key**Part 1**

1. a) store A: \$8.50/kg; store B: \$7.35/kg; store B has the lower rate
- b) station A: \$0.94/L; station B: \$0.98/L; station A has the lower rate
2. a) tank A: 71 L/h; tank B: 69 L/h; tank A has the greater rate
- b) person A: 5 m/s; person B: 3 m/s; person A has the greater rate
3. a) 20 s to 28 s; 28 s to 32 s
- b) 28 s; 32 s
- c) distance does not change; speed is zero
4. a) bottles: \$0.00175/mL; boxes: \$0.00166/mL
- b) Boxes have the lower unit cost.
5. 925 mL container: \$0.022/mL; 3.54 L container: \$0.015/mL; The larger container has the lower unit cost.
6. aerobics: 7 cal/min; hockey: 8 cal/min; She burns calories at a greater rate playing hockey.
7. a) 10 lb for \$17.40 is the same as \$3.83/kg; \$3.61/kg is the lower rate.
- b) 6 mph is the same as 10 km/h; 2 km in 10 min is the same as 12 km/h; the first rate is lower.
- c) 35.1 L for 450 km is the same as 7.8 L/100 km; this is the lower rate
- d) 30 m/s is the same as 108 km/h; 100 km/h is the lower rate.

Part 2

1. a) 9 L c) \$12.75
- b) 3 min d) about 30 mL
2. a) Supersaver: \$0.25/can; Gord: \$0.28/can; Supersaver has the lower unit price.
- b) e.g., size of container, amount that must be bought
3. 56 turns
4. 18 games
5. 6% per year
6. 4 min 16 s
7. 44 min
8. 20