## Unit 5: Proportional Reasoning Lesson 5.1

### Coach's Corner – II

1. How much washer fluid, to the nearest litre, could be purchased for $20.00, if 40L of washer fluid is $45.99?

   Let x = number of litres for $20.

   $$\frac{x}{\$20} = \frac{40\text{ L}}{\$45.99}$$
   $$x = \frac{\$20 \times 40\text{ L}}{\$45.99}$$
   $$x \doteq 17.395\text{ Litres}$$

   Approximately 17 litres can be purchased for $20.00.

2. Two local Alberta meat shops are competing for the best price on a particular cut of meat. Tip sirloin roast sells in a 6 kg package for $121.74 at the Meats Plus store. The same cut of meat at AAA Meats Shop sells a 1 kg package for $19.95. Which shops offers the better deal?

   $$\frac{\$121.74}{6\text{ kg}} = \$20.29\,/\,\text{kg}$$

   For 1 kg of sirloin tip, the cost is $20.29 at Meats Plus and $19.95 at AAA Meats. AAA Meats offers the better deal.

3. In a particular NHL season, the Edmonton Oilers won 9 games out of their first 15 games played. If this record continued for the rest of the season, how many games would they have won in an 82-game season?

   Let x = number of games won in the season.

   $$\frac{x}{82\text{ games}} = \frac{9\text{ wins}}{15\text{ games}}$$
   $$x = \frac{82\text{ games} \cdot 9\text{ wins}}{15\text{ games}}$$
   $$x = 49.2\text{ wins}$$

   Of the 82 games played, 49 games would have been won by the Oilers.

4. In 2005, the oil sands produced 32 Megatonnes (Mt) of green-house gas (GHG) emissions starting. By 2010, 48 Mt of GHG emissions were produced. Calculate the average rate of increase in GHG emissions between those years.

   Let $m$ = average rate of change (slope); $e$ = GHG emissions in Mt; $t$ = time in years

   $$m = \frac{\text{change in emissions}}{\text{change in time}}$$
   $$m = \frac{e_2 - e_1}{t_2 - t_1}$$
   $$m = \frac{48 - 32}{2010 - 2005}$$
   $$m = \frac{16}{5}$$
   $$m = 3.2$$

   The average rate of increase was 3.2 Mt/year.

5. Use the following information about the Great White North Triathlon to answer the following questions. Show all work.

   The Great White North Triathlon in Stony Plain, Alberta consists of a 2.0 km swim, a 90.0 km bicycle ride, and a 21.0 km run (half-marathon). The race must be completed in 8 hours. The swim cut-off time is 1.5 hour, the bike cut-off time is 4.5 hours, and the running cut-off time is 2.0 hours.

   Useful conversions and formulas:
   - 1 mile = 1.6 km
   - $\text{speed} = \frac{\text{distance}}{\text{time}}$
   - $\text{time} = \frac{\text{distance}}{\text{speed}}$

   a. Determine the average rate of speed required for each of the three events to stay within the mandatory cut-off times.

| Swim | Cycle | Run |
|---|---|---|
| 2.0 km in 1.5 hour<br>$\frac{2.0 \text{ km}}{1.5 \text{ h}} = 1.\overline{3}$ km/h | 90.0 km in 4.5 hours<br>$\frac{90.0 \text{ km}}{4.5 \text{ h}} = 20.0$ km/h | 21 km in 2.0 hours<br>$\frac{21 \text{ km}}{2.0 \text{ h}} = 10.5$ km/h |

b. Convert each speed to miles per hour.

The unit measure for time is already per hour, so no conversion is needed for time. Convert the distance from kilometres to miles.

| **Swim** | **Cycle** | **Run** |
|---|---|---|
| $x$ miles $= 1.\overline{3}$ km<br>1 mi $= 1.6$ km<br>$\frac{x}{1.\overline{3}\text{ km}} = \frac{1\text{ mi}}{1.6\text{ km}}$<br>$x = \frac{1\text{ mi} \cdot 1.\overline{3}\text{km}}{1.6\text{ km}}$<br>$x = 0.8\overline{3}$ mi<br>**$0.8\overline{3}$ mi/h** | $x$ miles $= 20.0$ km<br>1 mi $= 1.6$ km<br>$\frac{x}{20.0\text{ km}} = \frac{1\text{ mi}}{1.6\text{ km}}$<br>$x = \frac{1\text{ mi} \cdot 20.0\text{ km}}{1.6\text{ km}}$<br>$x = 12.5$ mi<br>**12.5 mi/h** | $x$ miles $= 10.5$ km<br>1 mi $= 1.6$ km<br>$\frac{x}{10.5\text{ km}} = \frac{1\text{ mi}}{1.6\text{ km}}$<br>$x = \frac{1\text{ mi} \cdot 10.5\text{ km}}{1.6\text{ km}}$<br>$x = 6.5625$ mi<br>**6.56 mi/h** |

c. One racer had the following speeds:

1.2 mi/h for the swim, 16.5 mi/h for the cycle, and 5.0 mi/h for the run. How fast did the racer complete the race?

| **Swim** | **Cycle** | **Run** |
|---|---|---|
| $x$ miles $= 2.0$ km<br>1 mi $= 1.6$ km<br>$\frac{x}{2.0\text{ km}} = \frac{1\text{ mi}}{1.6\text{ km}}$<br>$x = \frac{1\text{ mi} \cdot 2.0\text{ km}}{1.6\text{ km}}$<br>$x = 1.25$ mi<br>time $= \frac{\text{distance}}{\text{speed}}$<br>time $= \frac{1.25\text{ mi}}{1.2\text{ mi/h}}$<br>time $\doteq 1.04$ h | $x$ miles $= 90.0$ km<br>1 mi $= 1.6$ km<br>$\frac{x}{90.0\text{ km}} = \frac{1\text{ mi}}{1.6\text{ km}}$<br>$x = \frac{1\text{ mi} \cdot 90.0\text{ km}}{1.6\text{ km}}$<br>$x = 56.25$ mi<br>time $= \frac{\text{distance}}{\text{speed}}$<br>time $= \frac{56.25\text{ mi}}{16.5\text{ mi/h}}$<br>time $\doteq 3.41$ h | $x$ miles $= 21.0$ km<br>1 mi $= 1.6$ km<br>$\frac{x}{21.0\text{ km}} = \frac{1\text{ mi}}{1.6\text{ km}}$<br>$x = \frac{1\text{ mi} \cdot 21.0\text{ km}}{1.6\text{ km}}$<br>$x = 13.125$ mi<br>time $= \frac{\text{distance}}{\text{speed}}$<br>time $= \frac{13.125\text{ mi}}{5.0\text{ mi/h}}$<br>time $\doteq 2.63$ h |

Total time $\doteq 1.04 + 3.41 + 2.63$

Total time $\doteq 7.08$ hours

The racer will complete the race in 7.08 hours.

Please complete *Lesson 5.1 Game On!* located in *Workbook 5A* before proceeding to *Lesson 5.2*.