Unit 1 1.6 **Dimensional Analysis (w/ Rates) Notes** Name: Key

Objective: Use dimensional analysis to convert from one rate to another.

What is a Rate? a ratio with two different units

Examples: $\frac{miles}{hour}$ $\frac{cents}{ounce}$

Write some other rates and share with your neighbor: $/hour mi/gal.

Example: Convert 38 feet/second into miles per hour

1. Write the rate given as a ratio $\frac{38\ feet}{1\ second}$

2. Convert the units of the numerator (if needed) $\frac{38\ \cancel{feet}}{1\ second} \cdot \frac{1\ mile}{5280\ \cancel{feet}}$

3. Convert the units of the denominator (if needed) $\frac{38\ \cancel{feet}}{1\ \cancel{second}} \cdot \frac{1\ mile}{5280\ \cancel{feet}} \cdot \frac{3600\ \cancel{seconds}}{1\ hour}$

4. Cancel dimensions

5. Multiply all numerators then all denominators $\frac{136{,}800\ miles}{5280\ hours}$

6. Divide numerator by denominator to create a "unit rate" $25.91\ \frac{miles}{hour}$ or $25.91\ miles\ per\ hour$

   DON'T FORGET TO LABEL YOUR ANSWER or $25.91\ miles/hour$

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Practice:

1. 55 km/hr to mi/hr

$$\frac{55\text{km}}{1\text{ hr.}} \cdot \frac{1\text{ mi}}{1.6\text{km}} = \frac{55}{1.6} = 34.375$$

34.4 mi/hr.

2. 19 quarts/min to cups/min

$$\frac{19\text{ qts}}{1\text{ min}} \cdot \frac{2\text{ pints}}{1\text{ qt.}} \cdot \frac{2\text{ cups}}{1\text{ pint}} = 76\text{ cups/min}$$

3. 1.5 yards/min to in/sec

$$\frac{1.5\text{yards}}{1\text{ min}} \cdot \frac{1\text{ min}}{60\text{sec}} \cdot \frac{3\text{ ft.}}{1\text{ yd}} \cdot \frac{12\text{ in}}{1\text{ ft.}} = \frac{54}{60} = 0.9\text{ in/sec}$$

4. 25 km/L to mi/gal

$$\frac{25\text{km}}{1\text{ L}} \cdot \frac{1\text{ mi}}{1.6\text{km}} \cdot \frac{3.8\text{L}}{1\text{gal}} = \frac{95}{1.6} = 59.375$$

59.4 mi/gal

5. 75 mi/hr to ft/sec

$$\frac{75\text{mi}}{1\text{ hr.}} \cdot \frac{5280\text{ft.}}{1\text{ mi}} \cdot \frac{1\text{hr}}{3600\text{sec}} = \frac{396000}{3600} = 110\text{ ft./sec}$$

6. 320 ft/min to yds/hr

$$\frac{320\text{ft.}}{1\text{ min}} \cdot \frac{60\text{ min}}{1\text{hr}} \cdot \frac{1\text{ yard}}{3\text{ft}} = \frac{19200}{3} = 6400\text{ yds./hr.}$$

7. 12 fl. oz./day to gal/year

$$\frac{12\text{fl.oz}}{1\text{ day}} \cdot \frac{365\text{ day}}{1\text{year}} \cdot \frac{1\text{gal}}{128\text{fl oz}} = \frac{4380}{128} = 34.21875$$

34.2 gal/yr.