Name:_____ Date: _____ Class: _____

Dimensional Analysis Notes Sheet 2

Objective: Use Dimensional Analysis to convert and compare simple rates (using one or two conversion ratios).

A. The "Review"

RATIO: comparison of 2 quantities

RATE: comparing w/ 2 different units

UNIT RATE: a rate in which the denominator is 1

DIMENSIONAL ANALYSIS: process of converting units

USING DIMENSIONAL ANALYSIS TO CONVERT AND COMPARE:

How many inches are in 6 feet?

$$\frac{6\ ft}{1} \times \frac{12\ in}{1\ ft} = 72\ in$$

Which is larger, 16 yards or 50 feet?

$$\frac{16\ yd}{1} \times \frac{3\ ft}{1\ yd} = 48\ ft \quad 48 < 50$$

50 ft is larger

B. The "New"

The uses of dimensional analysis go far beyond conversion between simple measures. It can also be used to convert and compare rates with different units. Examples include $\frac{miles}{hour} \rightarrow \frac{miles}{minute}$, $\frac{dollars}{pound} \rightarrow \frac{cents}{ounce}$, $\frac{miles}{gallon} \rightarrow \frac{meters}{second}$, inches/hr → feet/sec. Using dimensional analysis to convert rates is slightly more difficult, but also much more useful!

C. The "How To Do"

Example 1 (One conversion ratio): $144 per lb equals how many $ per oz?

Step 1 – Set up the "given", the "get" and the "ratios":

What you are **given:** ← **Ratios** used to get you from here to there → What you want to **get:**

Step 2 – Ensure that the units "cancel" correctly:

$$\frac{\$144}{1\ lb} \cdot \frac{1\ lb}{16\ oz} = \frac{\$9}{1\ oz}$$

Units (lb) cancel!

Step 3 – Multiply, multiply and divide:

Multiply numerators → $\frac{\$144}{1\ lb} \cdot \frac{1\ lb}{16\ oz}$

Multiply denominators → $= \frac{\$144}{16\ oz} = \frac{\$9}{1\ oz}$

Divide the product of the numerators by the product of denominators

So the answer is "$144 per lb equals $ 9 per oz."

Name:_____ Date: _____ Class: _____

Dimensional Analysis Notes Sheet 2 (continued)

Objective: Use Dimensional Analysis to convert and compare simple rates (using one or two conversion ratios).

C. The "How To Do" (continued)

Example 2: 4 inches per minute equals how many feet per hour?

Step 1 – Set up the "given", the "get" and the "ratios":

What you are **given**: ← **Ratios** used to get you from here to there → What you want to **get**:

Step 2 – Ensure that the units "cancel" correctly:

$$\frac{4\ in}{1\ min} \cdot \frac{60\ min}{1\ hr} \cdot \frac{1\ ft}{12\ in} = \frac{20\ ft}{1\ hr}$$

Step 3 – Multiply, multiply and divide:

Multiply numerators → $4 \cdot 60 \cdot 1 = 240$

Multiply denominators → $1 \cdot 1 \cdot 12 = 12$

Divide the product of the numerators by the product of denominators

$$\frac{4\ in}{1\ min} \cdot \frac{60\ min}{1\ hr} \cdot \frac{1\ ft}{12\ in} = \frac{240\ ft}{12\ hr} = \frac{20\ ft}{1\ hr}$$

So the answer is:

"4 inches per minute equals 20 feet per hour."

D. The "Practice for you!"

Jimmy can eat 3 jelly beans per second. How many dozen jelly beans can he eat in one minute?

Step 1 – Set up the "given", the "get" and the "ratios":

What you are **given**: ← **Ratios** used to get you from here to there → What you want to **get**:

Step 2 – Ensure that the units "cancel" correctly:

$$\frac{3\ beans}{1\ s} \times \frac{1\ doz}{12\ beans} \times \frac{60\ s}{1\ min} = \frac{15\ doz}{1\ min}$$

Step 3 – Multiply, multiply and divide:

$$\frac{3 \cdot 1 \cdot 60}{1 \cdot 12 \cdot 1} = \frac{180}{12} = 15$$

"Jimmy can eat 15 dozen jelly beans in one minute."