

Essential Question 1/25/2021

- How can I convert units within the metric and customary system of measurement?
- How can I convert units between the metric and customary systems?

Unit 1



Day 8 - Multi-Step Dimensional Analysis, Customary and Metric Rate Conversions.

Customary Conversion Factors

Measurement	Time	Capacity	Weight
1 foot = <u>12</u> inches	1 minute = <u>60</u> seconds	1 cup = <u>8</u> fl. oz	1 ton = <u>2000</u> lbs
1 yard = <u>3</u> feet	1 hour = <u>60</u> minutes	1 pint = <u>2</u> cups	1 lb = <u>16</u> oz
1 mile = <u>5,280</u> feet	1 day = <u>24</u> hours	1 quart = <u>2</u> pints	
1 mile = <u>1,760</u> yards	1 week = <u>7</u> days	1 gal = <u>4</u> quarts	
	1 year = <u>52</u> weeks		

Muti-Step Dimensional Analysis and Rate Conversions in Customary & Metric Systems

1/25/2021

Standard: MGSE9–12. N.Q.1

Convert units and rates using dimensional analysis (English-to-English and Metric-to- Metric without conversion factor provided and between English and Metric with conversion factor);

Rate Conversions

Most of the rates we are going to discuss today include both an amount and a time frame such as miles per hour or words per minute. When we convert our rates, we are going to change the units in **both** the numerator and denominator.

a. Ms. Howard can run about 2 miles in 16 minutes. How fast is she running in miles per hour?

$$\begin{array}{l}
 \frac{\text{miles}}{\text{min}} \rightarrow \frac{\text{miles}}{\text{hr}} \\
 \frac{2 \text{ miles}}{16 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = \frac{120}{16} \\
 = 7.5 \text{ miles/hr} \\
 \text{or } \frac{7.5 \text{ miles}}{\text{hr}} \quad \text{or } 7.5 \text{ miles per hr}
 \end{array}$$

b. Convert 36 inches per second to miles per hour.

Inches → ft → miles
Second → min → hr

c. Convert 45 miles per hour to feet per minute.

1 mile = 5280 ft
 60 min = 1 hr

$\frac{\text{miles}}{\text{hr}} \rightarrow \frac{\text{ft}}{\text{min}}$

$\frac{45 \cancel{\text{miles}}}{1 \cancel{\text{hr}}} \cdot \frac{5280 \text{ ft}}{1 \cancel{\text{mile}}} \cdot \frac{1 \cancel{\text{hr}}}{60 \text{ min}}$

$$45 \times 5280$$

$$\frac{\quad}{60} = 3960 \text{ ft/min}$$

$$\textcircled{b} \frac{36 \cancel{\text{inches}}}{1 \cancel{\text{sec}}} \cdot \frac{1 \cancel{\text{ft}}}{12 \cancel{\text{inches}}} \cdot \frac{1 \text{mile}}{5280 \cancel{\text{ft}}} \cdot \frac{60 \cancel{\text{sec}}}{1 \cancel{\text{min}}} \cdot \frac{60 \cancel{\text{min}}}{1 \text{hr}}$$

$$\frac{36 \times 60 \times 60}{12 \times 5280}$$

$$= 2.05 \text{ miles/hr}$$

d. Convert 32 feet per second to meters per minute. (Use 1 in = 2.54 cm)

ft → meters
Sec → min

1 m = 100 cm
 12 inches = 1 ft

$$\frac{32 \cancel{\text{ft}} \cdot \frac{12 \cancel{\text{inches}}}{1 \cancel{\text{ft}}} \cdot \frac{2.54 \cancel{\text{cm}}}{1 \cancel{\text{inch}}} \cdot \frac{1 \text{ meter}}{100 \cancel{\text{cm}}}$$

$$\cdot \frac{60 \cancel{\text{sec}}}{1 \text{ min}} = 585.22 \text{ m/min}$$

Home Work Review 1/28/2021

Day 7: 1 & 2-Step Dimensional Analysis

Name: _____

Do any 5 problems; one must either be # 4 or # 7.

Use dimensional analysis to convert the following. Round your answers to the nearest tenth. You MUST set up each problem using a conversion factor.

 One & Two Step Dimensional Analysis

1. How many feet are in 5 miles?

$$\frac{5 \cancel{\text{mile}} \cdot \frac{5280 \text{ft}}{1 \cancel{\text{mile}}}}{1} = \boxed{26,400 \text{ft}}$$

Possible Conversion Factors

$$1 \text{ mile} = 5280 \text{ft}$$

2. How many minutes are in 4680 seconds?

$$\frac{4680 \cancel{\text{sec}} \cdot \frac{1 \text{min}}{60 \cancel{\text{sec}}}}{1} = \frac{4680}{60} = \boxed{78 \text{min}}$$

$$60 \text{sec} = 1 \text{min}$$

3. How many gallons are in 200 quarts?

$$1 \text{ gal} = 4 \text{ qts}$$

$$\frac{200 \cancel{\text{qts}}}{1} \cdot \frac{1 \cancel{\text{gal}}}{4 \cancel{\text{qts}}} = \frac{200}{4} = 50 \text{ gal}$$

4. How many pounds are in 9,102 grams? (Use 1 lb = 453.6 grams)

$$\frac{9,102 \cancel{\text{g}}}{1} \cdot \frac{1 \cancel{\text{lb}}}{453.6 \cancel{\text{g}}} = \frac{9,102}{453.6} = 20.07 \text{ lbs}$$

Multi-Step Dimensional Analysis

5. How many pints are in 3 gallons?

$$2 \text{ pints} = 1 \text{ qt}$$

$$4 \text{ qts} = 1 \text{ gal}$$

$$\frac{3 \cancel{\text{gal}}}{1} \cdot \frac{4 \cancel{\text{qts}}}{1 \cancel{\text{gal}}} \cdot \frac{2 \text{ pints}}{1 \cancel{\text{qt}}}$$

$$3 \times 4 \times 2 = \boxed{24 \text{ pints}}$$

6. How many inches are in 2 miles?

$$12 \text{ inches} = 1 \text{ ft}$$

$$\frac{2 \cancel{\text{miles}}}{1} \cdot \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mile}}} \cdot \frac{12 \text{ inches}}{1 \cancel{\text{ft}}}$$

$$= \boxed{126,720 \text{ inches}}$$

7. How many inches are in 3 kilometers? (use 1 in = 2.54 cm) $1 \text{ km} = 100,000 \text{ cm}$

$$\frac{3 \text{ km}}{1} \cdot \frac{100,000 \text{ cm}}{1 \text{ km}} \cdot \frac{1 \text{ in}}{2.54 \text{ cm}} = 118,110.24 \text{ inches}$$

8. Keenan wants to make sure he has enough homemade iced tea for everyone. He makes 2 gallons of iced tea. He wants to have enough for 40 cups of tea. Did he make enough?

$$\frac{2 \text{ gal}}{1} \cdot \frac{4 \text{ qts}}{1 \text{ gal}} \cdot \frac{2 \text{ pints}}{1 \text{ qt}} \cdot \frac{2 \text{ cups}}{1 \text{ pint}} = 32 \text{ cups}$$

$\checkmark 2 \text{ pints} = 1 \text{ qt}$
 $\checkmark 2 \text{ cups} = 1 \text{ pint}$
 $\checkmark 4 \text{ qts} = 1 \text{ gal}$

No he did not make enough for 40 cups.

Metric Conversions

A helpful way to remember the order of the prefixes is **King Henry Died Unusually Drinking Chocolate Milk**

King	Henry	Died	Unexpectedly	Drinking	Chocolate	milk
k	h	<i>Dag</i> d <i>Dam</i> DaL	U <i>Base</i>	<i>Dg</i> d <i>Dm</i> DL	c	m
kilo	hecto	deka	UNIT GRAM METER LITER	deci	centi	milli

- When moving the decimal to the left, you are dividing by a power of 10.
- When moving the decimal to the right, you are multiplying by a power of 10.
- When comparing two quantities, make sure they are in the same unit before comparing.

K H D U D C m

Examples: Convert from one prefix to another

A. 2500 dL = .2500 kL
 (4 places left)

B. 38.2 dag = 38,200 cg
 (3 places right)

C. 5 dm = .5 m
 (1 place left)

D. 1000 mg = 1 g
 (3 places left)

E. 14 km = 14,000 m
 (3 places right)

F. 1 L = 1000 mL
 (3 places right)

Examples: Compare measurements using <, >, or =.

(Hint: They must be written in the same units of measure before you can compare.)

A. 502 mm = .502 m

B. 90,801 cg > 5 hg
9.0801 kg

C. 160 dL > 1.6 L
160 L

K H D U D C m
 m
 L
 g

K H D U D C m

K H D U D C m
 L
 mL

Defining Appropriate Units – Mixed Multiple Choice

1. Sandra collected data about the amount of rainfall a city received each week. Which value is MOST LIKELY part of Sandra's data?
 - a) 3.5 feet
 - b) 3.5 yards
 - c) 3.5 inches
 - d) 3.5 meters

2. What is a good unit to measure the area of a room in a house?
 - a) Square feet
 - b) Square miles
 - c) Square inches
 - d) Square millimeters

3. If you were to measure the volume of an ice cube in your freezer, what would be a reasonable unit to use?
 - a) Cubic feet
 - b) Cubic miles
 - c) Square feet
 - d) Cubic inches

4. Which unit is the most appropriate for measuring the amount of water you drink in a day?
 - a) Kiloliters
 - b) Liters
 - c) Megaliters
 - d) Milliliters

Class Work

1/25/2021

Day 8 - Multi-Step Dimensional Analysis, Rate Conversions & The Metric System

Practice Assignment

Use dimensional analysis to convert the following. Round your answers to the nearest tenth. You MUST set up each problem using a conversion factor.

Rate Conversions

1. How many feet per second is 60 miles per hour?

$$\frac{60 \cancel{\text{miles}}}{1 \cancel{\text{hr}}} \cdot \frac{5280 \cancel{\text{ft}}}{1 \cancel{\text{mile}}} \cdot \frac{1 \cancel{\text{hr}}}{60 \cancel{\text{min}}} \cdot \frac{1 \cancel{\text{min}}}{60 \cancel{\text{sec}}} = 88 \text{ ft/sec}$$

1 mile = 5280 ft
60 min = 1 hr
1 min = 60 sec

2. How many inches per second is 50 yards per hour?

$$\frac{50 \cancel{\text{yds}}}{1 \cancel{\text{hr}}} \cdot \frac{3 \cancel{\text{ft}}}{1 \cancel{\text{yd}}} \cdot \frac{12 \cancel{\text{inches}}}{1 \cancel{\text{ft}}} \cdot \frac{1 \cancel{\text{hr}}}{60 \cancel{\text{min}}} \cdot \frac{1 \cancel{\text{min}}}{60 \cancel{\text{sec}}} = 0.5 \text{ inches/sec}$$

12 inches = 1 ft
3 ft = 1 yd
1 hr = 60 min
1 min = 60 sec

3. How many pounds per hour are in 721 kilograms per week? (Use 1 kg = 2.2 pound)

$$\frac{721 \cancel{\text{kg}}}{1 \cancel{\text{wk}}} \cdot \frac{2.2 \cancel{\text{lbs}}}{1 \cancel{\text{kg}}} \cdot \frac{1 \cancel{\text{wk}}}{7 \cancel{\text{days}}} \cdot \frac{1 \cancel{\text{day}}}{24 \cancel{\text{hrs}}} = \frac{721 \times 2.2}{7 \times 24} = \frac{1586.2}{168} = 9.4 \text{ lbs/hr}$$

4. Imagine that water is leaking from a container, at a rate of 1.2 ml/hour. If this rate does not change, how many milliliters of water will be lost in a week?

$$\frac{1.2 \text{ mL}}{\text{hr}} \cdot \frac{24 \text{ hrs}}{1 \text{ day}} \cdot \frac{7 \text{ days}}{1 \text{ wk}} = 201.6 \text{ mL of water will be lost in a week.}$$

5. A pitcher throws a 98-mph fastball. How fast is that in feet per second?

$$\frac{98 \text{ miles}}{\text{hr}} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} \cdot \frac{1 \text{ hr}}{60 \text{ min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}}$$

$$= \frac{517,440}{3600}$$

$$= \boxed{143.8 \text{ ft/sec fast}}$$

The Metric System

1. Write the equivalent measurements.

a. 65 dm = .0065 km

b. 2500 mL = 2.5 L

c. 0.58 dag = 580 cg

d. 580 dL = .58 hL

2. Compare the measurements using <, >, or =. ****SHOW YOUR WORK****

a. 880 cm < 9 m
8.8m

b. 5020 mg > 5 g
5.02g

c. 1500 hL > 1.5 L
150.060L

d. 75 g = 7.5 dag
7.5dag