Warmup

① Simplify

$4\sqrt{3} + \sqrt{12} - \sqrt{3}$

$12 = 3 \cdot 2 \cdot 2$

$4\sqrt{3} + 2\sqrt{3} - \sqrt{3}$

$\boxed{5\sqrt{3}}$

② Multiply $(3x-2)(x+7)$

	$3x$	-2
x	$3x^2$	$-2x$
7	$21x$	-14

$3x^2 + 19x - 14$

③ Convert $\frac{45 \text{ drops}}{\text{sec}}$ to $\frac{\text{mL}}{\text{min}}$

(1 mL = 15 drops)

$\frac{45 \text{ drops}}{1 \text{ sec}} \cdot \frac{1 \text{ mL}}{15 \text{ drops}} \cdot \frac{60 \text{ sec}}{1 \text{ min}}$

180 mL/min

Module 0.10B

Dimensional Analysis/Units in Context

Name:

1.) d = vt
If the units for v are "cm/s"
and the units for t are "s"
What are the units for distance?

$d = vt$

$= \frac{cm}{s} \cdot \frac{s}{1} = cm$

2.) $a = \frac{v}{t}$
If the units for v are "m/s"
and the units for t are "s"
What are the units for a?

$a = \frac{v}{t} = \frac{\frac{m}{s}}{\frac{s}{1}} = \frac{m}{s} \cdot \frac{1}{s} = \frac{m}{s^2}$

3.) $C = kmt$
the units for C are "cal"
the units for m are "pounds"
the units for t are "minutes"
What are the units for k?

$Cal = k \cdot lbs \cdot min$

$\frac{Cal}{lbs \cdot min} = \frac{k \cdot lbs \cdot min}{lbs \cdot min}$

$k = \frac{Cal}{lbs \cdot min}$

4.) The formula for density *d* is $d = m/V$, where *m* is mass and *v* is volume. If mass is measured in kilograms and volume is measured in cubic meters, what is the unit rate for density?

$d = \frac{m}{V} = \frac{kg}{m^3}$ (cubic meters)

5.) The tension caused by a wave moving along a string is found using the formula $T = \frac{mv^2}{L}$
If *m* is the mass of the string in grams, *L* is the length of the string in centimeters (cm), and *v* is the velocity of the wave in cm per second, what is the unit of the tension of the string, *T*?

A. gram-cm per second squared
B. cm per second squared
C. grams per cm-second squared
D. cm squared per second

$T = \frac{g\left(\frac{cm}{sec}\right)^2}{cm} = \frac{g\frac{cm^2}{sec^2}}{cm} = g \cdot \frac{cm^2}{sec^2} \cdot \frac{1}{cm}$

6.) Convert 60 miles per hour to feet per minute.

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

5280 ft/min

7.) One gallon every five miles is how many dollars per day?

~~1 hour to travel 55 miles~~
~~1 gallon is $3.10~~
1 driving day is 10 hours

$\frac{1 \text{ gal}}{5 \text{ miles}} \cdot \frac{\$3.10}{1 \text{ gal}} \cdot \frac{55 \text{ miles}}{1 \text{ hr}} \cdot \frac{10 \text{ hr}}{1 \text{ day}}$

$341

8.) A rectangular prism has a volume of 2 m^3, a length of 40 cm, and a width of 50 cm. What is the height of the prism?

left 2

$V = l \cdot w \cdot h$

40 cm = 0.4 m = l
50 cm = 0.5 m = w

$2 = 0.4 \cdot 0.5 \cdot h$

$2 = 0.2h$

$\frac{2}{0.2} = \frac{0.2h}{0.2}$

$h = 10 m \rightarrow 1000 cm$

9.) For every 12 kibs, there are 5 dats.
For every 7 dinks, there are 2 dats.
For every cham, there are 10 dinks.
How many kibs are there per cham?

$\frac{12 \text{ kibs}}{5 \text{ dats}} \cdot \frac{2 \text{ dats}}{7 \text{ dinks}} \cdot \frac{10 \text{ dinks}}{1 \text{ cham}}$

6.86 OR 6.9 kibs/cham

10.) When Bryce goes to work, he drives at an average speed of 65 miles per hour. It takes about 1 hour and 30 minutes for Bryce to arrive at work. His car travels about 25 miles per gallon of gas. If gas costs $3.65 per gallon, how much money does Bryce spend going to work?

$\frac{65 \text{ miles}}{1 \text{ hr}} \cdot \frac{1.5 \text{ hr}}{\text{work}} \cdot \frac{1 \text{ gal}}{25 \text{ miles}} \cdot \frac{\$3.65}{1 \text{ gal}}$

$14.24

11.) The width of the rectangle is $\sqrt{2}$ cm but Katie has crazy fear of crazy numbers, so she estimates it to 1.41 cm. The length of the rectangle is $3\sqrt{2}$ cm but Katie estimates to 4.24 cm. What is the area of the rectangle? Calculate both decimals and radicals.

$\sqrt{2}$

$\sqrt{2} \cdot 3\sqrt{2}$ 6 $3\sqrt{2}$

1.41

1.41 · 4.24 5.9784 4.24

Which area of the rectangle is more precise? Why?

6 → did not Round OR estimate

If you were pouring concrete for the base of a house, which answer would you want to use? Why?

top one → more precise

12.) The distance from Commerce to Athens is 18 miles. How long would that be in centimeters? (1 inch = 2.54 cm)

$\frac{18 \text{ miles}}{1} \cdot \frac{5280 \text{ ft}}{1 \text{ mile}} \cdot \frac{12 \text{ in}}{1 \text{ ft}} \cdot \frac{2.54 \text{ cm}}{1 \text{ in}}$

5280 ft = 1 mile

12 in = 1 ft

2,896,819.2 cm

If you ride your bike to Athens from Commerce at a rate of 120 centimeters per hour, how long would it take you to get there?

$\frac{2896819.2 \text{ cm}}{1} \cdot \frac{1 \text{ hr}}{120 \text{ cm}}$

24140.16 hr

13.) Jane noticed that her faucet was dripping. She later figured out that the rate of dripping was 50 drops every minute. If 20 drops equals 1 milliliter, how many liters per year is the faucet leaking?

$\frac{50 \text{ drops}}{1 \text{ min}} \cdot \frac{1 \text{ mL}}{20 \text{ drops}} \cdot \frac{1 \text{ L}}{1000 \text{ mL}} = \frac{0.0025 \text{ L}}{1 \text{ min}}$

$\frac{0.0025 \text{ L}}{1 \text{ min}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{24 \text{ hr}}{1 \text{ day}} \cdot \frac{365 \text{ days}}{1 \text{ yr}}$

1314 L/yr

How many gallons a year is the faucet leaking? (1 gal = 3.79 liters)

$\frac{1314 \text{ L}}{1 \text{ yr}} \cdot \frac{1 \text{ gal}}{3.79 \text{ L}}$

346.701847 gal/yr