mpg

ft/sec

Math 1030 #4a

Solving Problems with Units

US vs Metric Units

ppm

$/lb

What quantities do we measure and what units do we use?

	Customary units	Metric system
length & distance	ft, yds, miles, inches	cm, m, km
volume (liquid)	oz, cup, pint, qt, gallons	ml, cc, l
weight (mass)	lb, oz	g, kg

Here are a few commonly used conversions between Metric and USCS measurements:

1 in ≈ 2.540 cm   1 oz ≈ 28.3495 g   1 qt ≈ 0.9464 liter

1 yd ≈ 0.9144 m   1 lb ≈ 0.4536 kg

1 mi ≈ 1.6093 km

EX 1:

a) How many liters are in a 6-pack of 12-oz cans of soda?

$$6(12)\,oz\left(\frac{1\ qt}{32\ oz}\right)\left(\frac{0.9464\ L}{1\ qt}\right) = 2.12\ L$$

b) If you go 100 km/hr in your Porsche, what is the speed in mph?

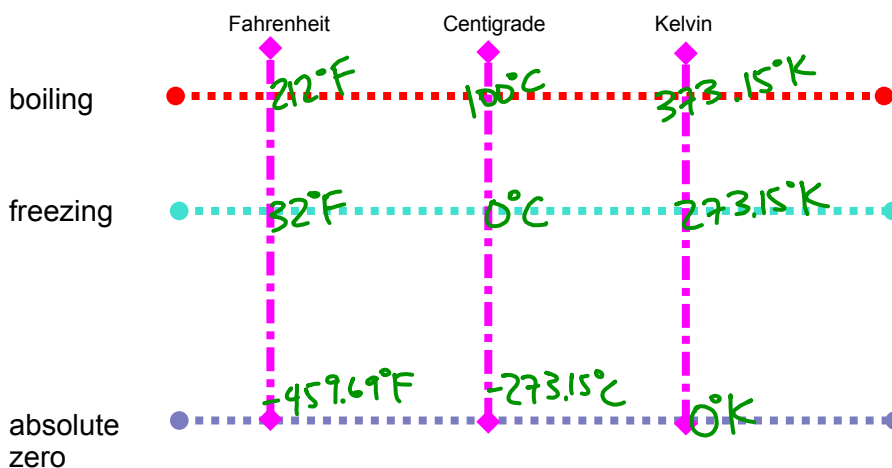$$\frac{100\ km}{hr}\left(\frac{1\ mi}{1.6093\ km}\right) \approx 62\ mi/hr$$

c) If water sells for \$2.00 per quart and soda sells for \$0.99 per 2-liter bottle, how much more expensive is water?

Water: $\dfrac{\$2}{qt}$ Soda: $\dfrac{\$0.99}{2\ L}\left(\dfrac{0.9464\ L}{1\ qt}\right)$

$$\approx \$0.47/qt$$

$$\frac{\$2.00/qt}{\$0.47/qt} \approx 4.26 \Rightarrow \text{water is 4.26 times more expensive than soda!}$$

Temperature

	Fahrenheit	Centigrade	Kelvin
boiling	212°F	100°C	373.15°K
freezing	32°F	0°C	273.15°K
absolute zero	-459.69°F	-273.15°C	0°K

Formulas:

$$F = 1.8\, C + 32 \qquad \Leftrightarrow \qquad C = \frac{F-32}{1.8} = \frac{5}{9}(F-32)$$

$$K = C + 273.5 \qquad \Leftrightarrow \qquad C = K - 273.5$$

EX 2:

a) Our normal body temperature is 98.6° F. What is this in Centigrade?

$$C = \frac{5}{9}(F-32) = \frac{5}{9}(98.6-32) = \frac{5}{9}(66.6) \approx 37°C$$

b) The average temperature of Madrid, Spain ranges from 0° C to 32° C. How do these compare with Salt Lake City (21° F to 91° F) which is close to the same latitude of 41°N?

	Madrid	SLC (°F)
low	0°C = 32°F	21°F
high	32°C ≈ 89.6°F	91°F

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