"Unit Conversion & Scientific Notation" Solutions

1. Convert the following.

a) $60 \text{ mi} \times \frac{1.609 \text{ km}}{1 \text{ mi}} = \mathbf{96.5 \frac{km}{hr}}$

b) 100 cm = **0.1 m**

c) 1609 m = **1.609 km**

d) 900 grams = **0.9 kg**

e) $100 \text{ in} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{1 \text{ m}}{100 \text{ cm}} = \mathbf{2.54 \text{ m}}$

f) $24 \text{ hours} \times \frac{3600 \text{ sec}}{1 \text{ hr}} = \mathbf{86{,}400 \text{ sec}}$

g) First we have to deal with the prefixes (kilo = 1000), then we need to convert meters to millimeters.

1 kilo km = 1 x 1000 x km = 1 x 1000 x 1000 meters = 1,000,000 meters

$1{,}000{,}000 \text{ m} \times \frac{1000 \text{ mm}}{1 \text{ m}} = \mathbf{1 \times 10^{9} \text{ mm}}$

h) First we have to deal with the prefix ($\mu = 10^{-6}$), then we need to convert meters to inches.

$1 \ \mu\text{m} = 1 \times 10^{-6} \text{ m}$

$1 \times 10^{-6} \text{ m} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1 \text{ in}}{2.54 \text{ cm}} = \mathbf{3.9 \times 10^{-5} \text{ in}}$

i) 2 gigabytes = **2×10^{9} bytes**

j) $1 \text{ hour} = 3600 \text{ seconds} \times \frac{1 \text{ nanosecond}}{10^{-9} \text{ seconds}} = \mathbf{3.6 \times 10^{12} \text{ nanoseconds}}$

2. $18 \text{ years} \times \frac{365 \text{ days}}{1 \text{ yr}} \times \frac{24 \text{ hrs}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ hr}} \times \frac{60 \text{ sec}}{1 \text{ min}} = \mathbf{5.7 \times 10^{8} \text{ sec}}$

3. Weight in Newtons

$130 \text{ lbs} \times \frac{1 \text{ N}}{0.2248 \text{ lb}} = \mathbf{578 \text{ N}}$

150 lbs x $\frac{1\text{ N}}{0.2248\text{ lb}}$ = **667 N**

170 lbs x $\frac{1\text{ N}}{0.2248\text{ lb}}$ = **756 N**

4. 1 megaton = 1×10^6 tons x $\frac{2000\text{ lbs}}{1\text{ ton}}$ = **2×10^9 lbs (2,000,000,000 lbs)**

5. The box

a) I chose: 5.5 ft x 3 ft x 2 ft = **33 ft^3**

b) 33 ft^3 x $\frac{12\text{ in}}{1\text{ ft}}$ x $\frac{12\text{ in}}{1\text{ ft}}$ x $\frac{12\text{ in}}{1\text{ ft}}$ x $\frac{2.54\text{ cm}}{1\text{ in}}$ x $\frac{2.54\text{ cm}}{1\text{ in}}$ x $\frac{2.54\text{ cm}}{1\text{ in}}$ = **934,455 cm^3**

c) 934,455 cm^3 x $\frac{1\text{ mL}}{1\text{ cm}^3}$ x $\frac{1\text{ L}}{1000\text{ mL}}$ = **934 L**

6. 1 yotta dollars = 1×10^{24} dollars

1 million dollars = 1×10^6 dollars

# of millions = $\frac{\text{how many dollars we have}}{\text{number of dollars in a million}}$ = $\frac{1 \times 10^{24}}{1 \times 10^6}$ = **1×10^{18} million**

7. Write the following numbers in scientific notation; keep only 3 significant figures.

a) 9.88×10^6
b) 1.00×10^3
c) **1.00×10^9**
d) 9.88×10^{-6}
e) **1.00×10^{-9}**

8. Multiply and divide

a) $10^{8+(-3)}$ = **10^5**

b) $10^{8-(-3)}$ = **10^{11}**

c) $(14 \times 2) \times 10^{15+(-12)}$ = **28×10^3** = **2.8×10^4**

d) $(14 \div 2) \times 10^{15-(-12)}$ = **7×10^{27}**

e) 4.6×10^{-24}

Summary: Converting from one set of units to another may require multiple steps, especially if the unit is squared or cubed.