PhyzSpringboard: Conversions

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1. Consider the following pairs of units.
a. Is it possible to convert a number of **feet** to a number of **inches**? Yes

b. Is it possible to convert a number of **inches** to a number of **feet**? Yes

c. Is it possible to convert between **hours** and **seconds**? Yes

d. Between **seconds** and **decades**? Yes

f. Between **meters** and **seconds**? No

g. Between **kilograms** and **seconds**? No

2.a. Compare the pairs of quantities that can be converted between to those that cannot. What do all the **convertible** pairs have in common that **inconvertible** pairs do not have?

Pairs that CAN both measure the same physical quantity.

b. So can **kilograms** be converted to **pounds** (and vice versa)? No

3.a. It's about 400 miles from Sacramento to Los Angeles. How far is that in meters?

$$400\text{mi} = \frac{400\text{mi}}{1} \times \frac{1609\text{m}}{1\text{mi}} = 640{,}000\text{m}$$

b. How far is a light-year in inches?

$$1\text{ ly} = \frac{1\text{ ly}}{1} \times \frac{9.460\text{E+12 km}}{\text{ly}} \times \frac{3.94\text{E+4in}}{\text{km}} = 3.7\text{E+17in}$$

4.a. The speed limit on American River Drive is 35mph. How fast is that in m/s?

$$35\text{mph} = \frac{35\text{mi}}{\text{hr}} \times \frac{1609\text{m}}{1\text{mi}} \times \frac{1\text{ hr}}{3600\text{s}} = 15.6\text{m/s}$$

b. If a glacier advances at 2m/century, what's its speed in mph?

$$2\text{m/c} = \frac{2\text{m}}{\text{c}} \times \frac{1\text{mi}}{1609\text{m}} \times \frac{1\text{c}}{100\text{y}} \times \frac{1\text{ yr}}{8766\text{hr}} = 1.4\text{E–9 mph}$$

5.a. How many days pass during one Ms?

$$1\text{ Ms} = \frac{1\text{E+6s}}{1} \times \frac{1\text{d}}{86{,}400\text{s}} = 12\text{d}$$

b. What's the handiest unit of measure to use in counting out a nanomillenium (seconds, minutes, hours, weeks, months, years)? (A handy unit would allow easy expression of the value without the use of scientific notation.)

$$1\text{nM} = \frac{1\text{E-9M}}{1} \times \frac{1000\text{y}}{1\text{M}} = 1\text{E–6y} \times \frac{8770\text{h}}{\text{y}} = 8.77\text{E–3h} \times \frac{60\text{min}}{\text{h}} = 0.526\text{min} \times \frac{60\text{s}}{\text{min}} = 32\text{s}$$

6. What is 75mph in ångströms per fortnight? Show work on back.