



5.2 billion **Math 1030 #6a** 1 cm = 50 mi

Putting Numbers in Perspective

Estimation and Comparison

4.5×10^{12}

3×10^8

Perspective Through Estimation - A big picture understanding of a quantity. It is not intended to be super accurate, the attention is not in the details, but with the idea.

An Order of Magnitude Estimate - Specifies a broad range of values.

EX 1: Estimate the following quantities.

a) the number of steps in an average day.

3,000 - 12,000 steps

b) the number of hours per month you spend listening to music.

$\sim 90 \text{ hrs/mo}$ ($\text{@ } 3 \text{ hrs/day}$)

$\sim 30 \text{ hrs/mo}$ ($\text{@ } 1 \text{ hr/day}$)

Perspective Through Comparisons

How does an unfamiliar number (or unit) compare to a more familiar number (or unit)? The answer to this question often gives meaning to a problem or description of a quantity.

EX 2: How many gallons of oil are required to supply the electrical energy needs of an average home for a month?

$$600 \text{ gallons/yr} \quad \frac{600}{12} = 50 \text{ gallons/mo.}$$

EX 3: Suppose that we could somehow capture all the energy released by the sun for just 1 second. Would this energy be enough to supply U.S. energy needs for a year?

$$\begin{aligned} \text{sun generates } & \sim 1 \times 10^{34} \text{ joules/yr} \\ \frac{1 \times 10^{34} \text{ joules}}{\text{yr}} & \left(\frac{1 \text{ yr}}{365 \text{ days}} \right) \left(\frac{1 \text{ day}}{24 \text{ hrs}} \right) \left(\frac{1 \text{ hr}}{3600 \text{ sec}} \right) \\ & = \frac{10^{34}}{365(24)(3600)} \frac{\text{joules}}{\text{sec}} \approx 3.17 \times 10^{26} \frac{\text{joules}}{\text{sec}} \end{aligned}$$

(this is about 3 million times the energy use)