Physics 1110  Problem Set 1  Note: Include units in all problems

A. Write the following numbers in ordinary notation:
   1) $1 \times 10^5 \text{cm}$
   2) $1 \times 10^{-5} \text{sec}$
   3) $2.56 \times 10^8 \text{ft}^3$
   4) $73.89 \times 10^9 \text{BTU's}$

B. Express $55 \text{mi/H}$ in km/H
   C. Express $720 \text{in}^2$ in ft$^2$
   D. Express $6048 \text{in}^3$ in ft$^3$

E. At a cost of $5.50 \text{ per square yard of material}$, how much will a person have to pay for a strip of material $4.0 \text{ feet wide by 20.0 \text{ feet long}}$?

F. A water faucet has a cross sectional area of $1.500 \text{ in}^2$. Suppose water flows from the faucet at a speed of $6.000 \text{ in/s}$. What volume of water flowing from the faucet during every second?

G. A horizontal force of $10.0 \text{ lbs.}$ is exerted on a block in sliding it along a horizontal surface a distance of $7.2 \text{ ft}$. How much work has been done by the force?

H. A vertical force of $4.5 \text{ Newton}$ is applied to a crate in order to lift it to a table $1.20 \text{ m}$ high. How much work has been done by the force?

**Solution to Problem Set 1:** Usual rules: Please do not look at this until making an attempt (or using this to check your answer).

A.  
   1) $100,000 \text{cm}$
   2) $0.00001 \text{sec}$
   3) $256,000,000 \text{ ft}^3$
   4) $73,890,000,000 \text{ BTU's}$

B. 
   $1.6 \text{km} = 1 \text{mi}$
   Hence, $55 \frac{\text{mi}}{\text{H}} = \left(\frac{55 \text{mi}}{1 \text{H}}\right) \ast \left(\frac{1.6 \text{km}}{1 \text{mi}}\right) = 88 \frac{\text{km}}{\text{H}}$

C. 
   $144 \text{in}^2 = 1 \text{ft}^2$
   Hence, $720 \text{in}^2 = \left(\frac{720 \text{in}^2}{1}\right) \ast \left(\frac{1 \text{ft}^2}{144 \text{in}^2}\right) = 5.00 \text{ ft}^2$

D. 
   $1728 \text{in}^3 = 1 \text{ft}^3$
   Hence, $6048 \text{in}^3 = \left(\frac{6048 \text{in}^3}{1}\right) \ast \left(\frac{1 \text{ft}^3}{1728 \text{in}^3}\right) = 3.50 \text{ ft}^3$

E. 
   The area of the material is $4.0 \text{ ft \times 20.0 ft} = 80 \text{ ft}^2$; However, $3 \text{ ft} = 1 \text{ yd}$, or $9 \text{ ft}^2 = 1 \text{ yd}^2$;
   
   $\text{Cost} = 80 \text{ ft}^2 \left(\frac{1 \text{yd}^2}{9 \text{ ft}^2}\right) \ast \left(\frac{$5.50}{1 \text{yd}^2}\right) = $49$

F. 
   This particular problem we have not determined how to do in class. However, one can deduce **from the units** (“dimensional analysis”) how to work the problem from what is asked for in the problem—i.e. what volume (in$^3$) is flowing per second(s)? Indeed the volume rate of flow can be determined by multiplying the speed (or velocity) times the area. Hence $(6.00 \text{ in/sec})(1.500 \text{ in}^2) = 9.00 \text{ in}^3/$sec

G. 
   $W = \text{Force \times distance} = (10.0 \text{ lbs})(7.2 \text{ ft}) = 72 \text{ ft. lbs}$.

H. 
   $W = \text{Force \times distance} = (4.5 \text{ N})(1.20 \text{m}) = 5.4 \text{ joules}$