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

A. Write the following numbers in ordinary notation:

1) 1×10^5 cm
2) 1×10^{-5} sec
3) 2.56×10^8 ft^3
4) 73.89×10^9 BTU's

B. Express 55 mi/H in km/H C. Express 720 in^2 in ft^2 D. Express 6048 in^3 in ft^3

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

F. A water faucet has a cross sectional area of 1.500 in^2. Suppose water flows from the faucet at a speed of 6.00 in/s. What volume of water flowing from the faucet during every second?

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

H. A vertical force of 4.5 Newton is applied to a crate in order to lift it to a table 1.20 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) 100,000cm 3) 256,000,000 ft^3
2) 0.00001 sec 4) 73,890,000,000 BTU's

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

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

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

E. The area of the material is 4.0 ft x 20.0 ft = 80 ft^2;
However, 3 ft = 1 yd, or 9 ft^2 = 1 yd^2;

$$Cost = 80ft^2\left(\frac{1yd^2}{9ft^2}\right) * \left(\frac{\$5.50}{yd^2}\right) = \$49$$

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 in/sec)(1.500 in^2) = 9.00 in^3/sec

G. W =Force x distance = (10.0 lbs)(7.2 ft) = 72 ft. lbs.

H. W= Force x distance = (4.5 N)(1.20m) = 5.4 joules