Sample Homework Problem

Author: John M. Cimbala, Penn State University
Latest revision: 20 August 2012

This is a sample homework problem, illustrating the format in which you are required to submit your homework. Failure to conform to this format will result in a grade penalty. *Note*: You are not required to type your homework solutions.

Consider this sample homework problem statement, which is Problem 2 of a sample homework assignment:

2. (10 pts) A small village draws 1.00 acre ft/day of water from its reservoir. Convert this water usage to (a) gallons per minute and (b) liters per second.

Here is the solution, in the format required for this course: [Comments in red and in square brackets are for your information only – you would not be required to write these.]

---

(2) [Note that the problem number is clearly defined on the page – to make it easier for the grader.]

Given: A village uses 1.00 acre ft/day of water. [We use the notation $\dot{V}$ for volume flow rate – the font V is used for volume, and is distinguished from the font V used for velocity.]

To do: Calculate the water usage (i.e., volume flow rate) in (*a*) gal/min, and (*b*) L/s.

Solution: Use known conversions, and conversions from references. [We know that 1 day = 24 hr., 1 hr. = 60 min., 1 min. = 60 s. Also, from references we find that 1 ft = 0.3048 m, 1 acre = 4.0469×10^3 m^2, and 1 gal = 3.7854×10^{-3} m^3 = 3.7854 L.]

(***a***) [Note: The proper (and least confusing) way to do conversions is with ***unity conversion ratios*** as shown here.]

$$\dot{V} = \left(\frac{1.00 \text{ acre} \cdot \text{ft}}{\text{day}}\right)\left(\frac{4.0469\times10^{3} \text{ m}^2}{\text{acre}}\right)\left(\frac{0.3048 \text{ m}}{\text{ft}}\right)\left(\frac{1 \text{ gal}}{3.7854\times10^{-3} \text{ m}^3}\right)\left(\frac{1 \text{ day}}{24 \text{ hr}}\right)\left(\frac{1 \text{ hr}}{60 \text{ min}}\right) = 226.289 \frac{\text{gal}}{\text{min}}$$

Or, to three significant digits,

$$\boxed{\dot{V} = 226. \frac{\text{gal}}{\text{min}}}$$

[Note: The number of significant digits (3) is clearly defined in the above problem statement. In cases in which the number of significant digits is not clear, the standard engineering assumption of three significant digits is assumed. Never give your *final* answer to more significant digits than that implied by the problem. However, it is wise to write down several additional digits when the value is needed for subsequent calculations, as illustrated below.]

(***b***) Converting to SI units,

$$\dot{V} = 226.289 \frac{\text{gal}}{\text{min}}\left(\frac{3.7854 \text{ L}}{\text{gal}}\right)\left(\frac{1 \text{ min}}{60 \text{ s}}\right) = 14.2766 \frac{\text{L}}{\text{s}}$$

Or, to three significant digits,

$$\boxed{\dot{V} = 14.3 \frac{\text{L}}{\text{s}}}$$

[Notice that the final answers are boxed – to make it easier for the grader.]