Homework Information and Format

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Homework Philosophy

One of the best ways to learn something is through practice and repetition. Therefore, homework assignments are extremely important in this class! Homework sets are carefully designed to be workable yet challenging. All homework assignments are ***comprehensive***. If you study and understand the homework, you should not have to struggle with the quizzes or the final exam.

Homework Policy

The due date for each homework assignment is clearly indicated on the course website. Typically, each weekly homework assignment is due by midnight on the Tuesday of the following week. Homework turned in late will receive partial credit (automatically deducted by Canvas), according to the following rules:

- 20% off per day if turned in late. [This is very generous, but you need to keep up!]
- No credit if turned in after Canvas has penalized down to zero points.

Exceptions are made under certain circumstances (illness with doctor's note, death in the family, etc.). Discuss any such issues with Professor Cimbala. His solutions will be made available within a week after the due date.

Students may work together on the homework assignments in study groups (to help each other), provided that ***each person in the group is contributing to each solution***. If students choose to work in a group, a homework solution needs to be submitted for **each student** individually, with all students in the group listed on the cover page. ***No copying***. Note that homework counts for a considerable portion of your final course grade, so it is critical that you understand how to solve the homework problems.

Homework Format

For ease of grading, and for consistency, each homework set *must* be submitted in the following format:

1. Print out the homework assignment, add your name(s) and then add additional sheets for each homework problem. The homework assignment serves as the cover page for the student's completed assignment and must be included in your upload so that the grader is able to fill in the points readily.
2. Write your name in the appropriate place on the cover page, along with the name(s) of students with whom you worked (if you worked with anyone else).
3. One problem per page is preferred, but short problems can be combined on one page. If so, draw a **dark line** between problems to separate them.
4. Scan/convert to PDF format and submit the entire assignment as one file (cover page plus each completed problem). Also attach scans of your software if appropriate.

Problem Format

For ease of grading, and for consistency, each problem *must* be submitted in the following format:

1. Write down the problem number and encircle it.
2. Include these three parts for each problem:
   - ***Given***: Summarize the problem at hand, including any relevant sketches, dimensions, and given information.
   - ***To do***: State briefly what is *unknown*; i.e. what is the goal of the problem?
   - ***Solution***: Present a step-by-step solution of the problem. ***Show all of your work!*** Explain your assumptions, and indicate where equations come from (e.g., "...From the definition of volume flow rate, Eq. (2.24), it is seen that ..."). As you go along, include equation numbers so the grader can follow your work. Always include units (if appropriate) in any calculations, and put a box around the final answer. Never give an answer with more significant digits than the minimum number of significant digits provided in the problem statement. If the number of significant digits is not clear from the problem statement, give your answer to three significant digits. (Only rarely are more than three significant digits relevant in engineering analyses.)
3. Set your final answer(s), **each encircled by a box** at the right edge of the page so that your answer can be clearly spotted by the grader.

See next pages for sample homework problems and solutions in the proper format →

First Sample Homework Problem in Required Format

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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:

1. (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.]

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(1) [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.]

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

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,

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

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.]

Second Sample Homework Problem in Required Format

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Finally, here is what to submit if you solve a (different) problem using **software** (I used Excel):

Example Problem:

> **2.** (10 pts) Suppose Maria measures water flow as part of an experiment. She uses the stopwatch app on her phone to time how long it takes to fill a one-gallon bucket. It takes 74.8 seconds. Calculate the volume flow rate in units of cubic meters 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.]

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

Given: Volume of water = 1.00 gallon. Fill time = 74.8 s. [Notice that you don't need to re-write the whole problem, but just a summary of the given information.]

To do: Calculate the volume flow rate in m^3/min.

Solution: I used Excel to solve this problem. To get volume flow rate I divided volume by time. I had to apply appropriate unit conversions, which I looked up online. My result is **0.00304 m^3/min** to three significant digits. A screenshot of my Excel spreadsheet is shown below.

	A	B	C	D	E	F	G
2		**HW Set 1, Problem 2**					
4		**Given:**					
5		Volume =	1	gal	=	0.00378541	m^3
6		Δt =	74.8	s	=	1.246666667	min
8		**Calculations:**					
9		Volume flow rate =	0.0134	gal/s	=	0.003036425	m^3/min
10					=	**0.00304**	**m^3/min**

[Some quick comments, which I recommend that you adopt for all work, whether in this class, some other class, or when you get a job:

- I clearly labeled each value and added units. This is important for grading and for when you need to go back to change something or need to copy this segment into another spreadsheet.
- If you use MATLAB or other software, I suggest similar comments/labels as I have here in Excel.
- I like to highlight cells that I can change in yellow, in other words all cells that are not just text or equations. This is useful if you need to repeat the problem with different values given.
- I included the cell row and column labels. This is convenient for grader feedback. For example, the grader may comment about something where it is convenient to refer to a cell – "In cell F9, …"
- I **bolded** and boxed the final answer, both in Excel and in my written (or typed) solution. I also colored the answer red in Excel and made it larger so that the grader can more easily spot it.

Notice that you do not need to write out your entire solution when you use software, but rather just a brief description of what you did in the software, along with a screenshot.]