ENGR/PHYS 216 Spring 2023

How to format your homework

One defining characteristic of engineers is their ability to present information with great clarity in a neat, careful manner. How you document your work reflects how you think about your work. Carefully documenting your solution forces you to think through the steps of the engineering design method.

Your skills as an engineer will often be judged by how well your write and present your findings. This applies to calculations, reports, memos, presentations, and emails. The way you present your work is habit forming. Some habits are good. Sloppy habits can lead to overall concerns about your engineering skills. Form good habits now that will last throughout your career.

For every homework problem, include the following information:

- **Given**: State what facts are provided in the problem statement, including units.
- **Find**: State what you are going to solve for, including units.
- **Diagram**: Draw a diagram of the problem with all relevant information. This can be as simple or complex as you need to understand the problem.
- **Theory**: Write important equations or concepts you will need to use.
- **Assumptions**: List the assumptions you need to make to solve the problem.
- **Solution**: Provide all of the steps of your solution in a clear and organized way. Please draw a box around your final answer and provide a brief explanation for answers that look odd to you.

At the top of the first page, include your full name, UIN, class section, assignment name, date, and total number of pages. You may hand write and scan your homework, or you may type it. Handwritten homework must be legible; if we cannot read your handwriting, we will assume it is incorrect. See the example below.

Problem 1:

An old car has to travel a 2-mile route, both uphill and down. Because it is so old, the car cannot climb the first mile (the ascent) faster than an average speed of 15 mph. How fast does the car have to travel the second mile (the descent) in order to achieve an average speed of a) 20 mph and b) 30 mph for the entire trip?

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Problem 1

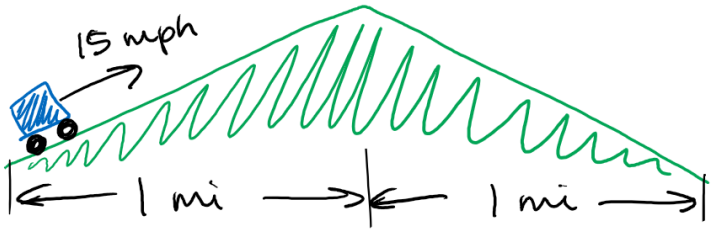
Given:

total distance = 2 miles
average speed up = 15 mph
average speed down a = 20 mph
average speed down b = 30 mph

Find:

average speed going down in mph

Diagram:



Theory:

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$$

Assumptions:

car does not break down
mph is miles per hour
car can go faster during descent
nothing travels faster than speed of light in a vacuum

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Solution:

$$\text{time going up} = \frac{1 \text{ mile}}{15 \text{ mph}} = \frac{1}{15} \text{ hour}$$

$$\text{time going down} = \frac{1 \text{ mile}}{x \text{ mph}} = \frac{1}{x} \text{ hour}$$

$$\text{total time} = \text{time up} + \text{time down} = \frac{1}{15} + \frac{1}{x} \text{ hour}$$

a) $$\text{total time} = \frac{\text{total distance}}{\text{average speed}} = \frac{2 \text{ miles}}{20 \text{ mph}} = \frac{1}{10} \text{ hour}$$

$$\frac{1}{10} \text{ hour} = \frac{1}{15} + \frac{1}{x} \text{ hour} \Rightarrow \boxed{x = 30 \text{ mph}}$$

b) $$\text{total time} = \frac{2 \text{ miles}}{30 \text{ mph}} = \frac{1}{15} \text{ hour}$$

$$\frac{1}{15} \text{ hour} = \frac{1}{15} + \frac{1}{x} \text{ hour} \Rightarrow \boxed{x = \infty \text{ mph}}$$

The answer for part b is reasonable (no solution) because if the total distance traveled is 2 miles and the average speed for the entire trip is 30 mph, then the total time available is 2/30 = 1/15 hours. The driver used the entire time to drive uphill, so there is no time available for the downhill portion. Unless the engineer develops teleportation, it is not possible.