MATH 100: Homework #1

Due Wednesday, 9/2, before 11:59pm, via a PDF file uploaded to the Homework#1 under Assignments in the Blackboard course page.

All problems require explicit and detailed explanations. Solutions should be written clearly, legibly, and concisely, and will be graded for both mathematical correctness and presentation. Points will be deducted for sloppiness, incoherent or insufficient explanation, or for lack of supporting rationale.

You are allowed to discuss the homework problems with no one except your classmates, the TA, and the instructor. However, the solutions should be written by you and you alone in your own words. **If you discussed HW problems with a classmate or TA, you have to write their name at the top of the HW submission as a collaborator.** Any incident of plagiarism/ cheating (from a person or from any online resource) will be strictly dealt with.

Re-read the 'Why and How' of Homework section of the course information sheet for some important advice on the HWs for this course.

Always remember that homework is NOT meant to be an examination, it is meant to assist in your learning and development. If you need help with any HW problem, don't hesitate to ask me. You are encouraged to ask questions during the *Live Class on Blackboard*, through the *Blackboard Discussion Forums*, during the *Google Meet Office Hours*, during the *TA office hours*, or through *Email to me*.

Submit solutions to each of the following problems.

1. As discussed in class, carefully write President Garfield's proof of Pythagoras' Theorem. Start by stating the axiom(s) underlying our proof. Then state the three Lemmas about the areas of Triangle, Rectangle, and Trapezoid, in the correct order, and give their proofs. Finally, use these lemmas to write the proof of Pythagoras's Theorem. (Remember to define all the symbols and notation that you use, and draw careful figures to help your reader understand what you are doing.)
Are there any fundamental assumptions (axioms) we are using in our proof, other than the one we discussed in class? Read your proof carefully to see if there is anything else we should state as an axiom.

2. Imagine you are tiling a square room and you have a sheet of marble that you can cut into square tiles of any sizes. Can you tile this square room using 2 square tiles? 3 square tiles? 4? 5? 6? ..... ? The square tiles you use together can be of any size (they are not required to be identical).
Here is the same question expressed mathematically:
Find all the values of n for which you can dissect a square into n smaller squares. (Dissect means "completely cut into pieces".)
For each n for which your answer is 'yes, a square can be dissected into n smaller squares', your solution should describe a proof (which could be a method or a procedure) of why or how this can be done. (Try $n = 4$ and $n = 6$ first.)

3. Pick 3 definitions or examples or concepts, from this week's reading assignment (see the

course webpage) that you found interesting, or you found confusing/challenging. Write short descriptions for each of these 3 items in your own words (between 50-150 words each).