INSTRUCTIONS

This homework assignment must be completed individually (and not in groups). Completing this assignment will set you up to use the tools you’ll need for the rest of the course, and will give you and us an idea of your mastery of the prerequisite knowledge before you start the course.

For this assignment, you will receive full credit for completing all required steps. For the pre-test, this means an honest attempt at answering all the questions; correctness of the answers will not be used to calculate your score for this first homework.

REQUIRED READING Rosen Chapters 1 and 2, Sections 5.1-5.2 (covers prerequisite concepts).

1. Make sure you can access the Gradescope site for this class.
   - Login with your @ucsd email account.
   - Having trouble? You can manually add this course using entry code: 9WJ36M. Please use your official full name when signing up.

2. Enroll in Piazza.

3. Register your iClicker remote.
   - Navigate to our class and look for “Register your iClicker” in the left side bar.

4. Sign up for a discussion section.
   - Discussion sections are on Mondays, starting January 4.
   - You must attend the section you sign up for.
   - Sections will be filled on a first-come, first-served basis.
   - Sign up here: https://sections.ucsd.edu/default.aspx.
1. (10 points) Prove that for every $a > 1$ and $b > 1$, $a^{\log_2 b} = b^{\log_2 a}$.

2. (a) Give a formula for the number of digits in the decimal expansion for a positive integer $n$.
   (b) Give a formula for the number of digits in the binary expansion for a positive integer $n$.
   (c) Give a formula for the number of digits in the base $b$ expansion for a positive integer $n$ and base $b > 1$.

3. Consider the following algorithm

$$\text{procedure Loops}(n: \text{a positive integer})$$
1. for $i := 1$ to $n$
2. for $j := 1$ to $n$
3. print $(i,j)$

   (a) Write what the algorithm prints when $n = 4$.
   (b) Describe what the algorithm prints in general terms.
   (c) How many times does print routine get called?
   (d) Describe (in words) a rule to decide, if $(i_1, j_1)$ and $(i_2, j_2)$ have both been printed for some $n$ then which ordered pair was printed first?

4. Consider a room of people and over the course of the evening, some people shook hands. Prove that whatever pairs of people shake hands, there are an even number of people who have shaken hands an odd number of times.