CE 311S: Homework 1
Due Friday, January 29

Instructions: Attempt all questions and show all the steps. Submit the homework on Canvas as a single pdf file. The file can contain scans or photographs of handwritten work *if it is legible*.

Problem 1. The following data set represents a set of high temperatures in Austin over seven days, in degrees Fahrenheit.

$$61 \quad 60 \quad 75 \quad 78 \quad 58 \quad 72 \quad 75$$

(a) What is the mean temperature?

(b) What is the median?

(c) What is the mode, using the data as given?

(d) What is the mode, if we round each temperature to the nearest 5 degrees?

(e) What is the sample variance?

(f) What is the sample standard deviation?

Problem 2. Using the same data set as in Problem 1, imagine that the temperature on the first day was something other than 61 degrees. The mean temperature would certainly be different; but how high could it have been before the median was different?

Problem 3. Convert the data from Problem 1 into degrees Celsius, and recompute the mean, median, sample variance, and sample standard deviation of the temperature. Some (but not all) of these could have been calculated by directly converting your answers from Problem 1 from Fahrenheit into Celsius — which ones could be calculated this way, and which ones could not?

Problem 4. Your grade point average is calculated as a *weighted* mean, where classes with more credit-hours count more heavily. The formula for a weighted mean is

$$\frac{\sum w_i x_i}{\sum w_i}$$

where w_i is the weight assigned to the the i-th data point (for GPA, it is the number of credit-hours for a class). Some universities (like UT) convert a letter grade (A, A-, ...) into "grade points" (4.0, 3.7, ...), which are the x_i values in this formula. Other universities use "decimal grading" where there is no letter grade, and you are simply assigned a numerical grade for the class (e.g., you could get a 3.8 or 3.5 in a specific class).

Assume that you are at such a university, and you have the following grades at the end of the semester:

Course	Credit-hours	Grade points
Probability and statistics	3	3.4
Statics	4	2.8
Differential equations	3	3.7
Elementary Dutch	5	4.0
Introduction to mountain unicycling	1	2.0

(a) Compute your GPA this semester.

(b) You set out to improve your GPA by studying more for statics. How much would your statics grade need to rise to increase your GPA to 3.5? (Assume all the other classes have the same grade.)

(c) If you instead improve your GPA by studying more for mountain unicycling, how much would your grade in that class need to rise to get a GPA of 3.5? (Again assume all other classes have the same grade as in the table.)

(d) Prove that if all the weights are the same (nonzero) value, the weighted mean is the same as the regular mean.