

HW_00 CSCI-720

Use: Python, R, Matlab, Java:

Your submitted files should include:

- Your write-up named HW_00_Lastname_Firstname.pdf.
Submit one PDF document with all your results in it. To the dropbox.
This way the grader can look at your PDF file, without necessarily looking at your code.
- Your code and all your data files should be zipped into one directory named HW_00_Lastname_Firstname.
Then zip up the directory into a file named HW_00_Lastname_Firstname.zip.

Submit both the *.pdf and the *.zip files to the dropbox.

Motivations:

- Practice plotting. To have the computer generate the plots instead of relying on Microsoft.
This way you can have a computer program generate hundreds of plots that you quickly flip through to look for trends in the data.
- Most people think they will save a lot of time by driving faster. In reality, you will save only a few seconds by driving 60 instead of 55. It is not worth the risk. And, the energy in the car goes up with the velocity squared, so it becomes much less stable. Here you discover how much extra time you really save.
- Most people do not understand how the gear ratios on their bicycle overlay. Sometimes people think that the biggest gear on the front combined with any gear on the back, results in a higher gear ration then the next smaller gear on the front combined with any gear on the back. This is not the case.
- The instructor wants you to learn to work with the data, or to plot out the results, to see for yourself.
- To show that many of the implicit assumptions we have about some things are wrong.

Task list:

- (3 pts) Assume I drive 20 miles to work. I can drive 1 mph to 80 mph.
Plot the time that it takes me to get to work (in minutes), as a function of speed (in miles per hour).
Label both the X and Y axes, with units.
- (3 pts) Then, for each increment of 5mph (from 5 to 75 mph): plot how much time (in minutes) I save by driving an extra 5 mph. Label both the X and Y axes, with units.
(For example, at 40 mph, plot the savings in time of driving 45 mph.)
- (3 pts) Assume that the front gears on my bicycle are labeled A, B, C, *largest* to smallest. (From the outside to the inside.)
The back gears on my bicycle are a,b,c,d,e,f,g, *smallest* to *largest*. (Again, from the outside to the inside.)

A gear ratio here is the number of teeth on the front gear divided by the number of teeth on the back gear.

For each front gear, plot or graph all possible gear ratios. (Y axis should be gear ratio, X axis should be the number of teeth on the back cog. Notice all possible gear combinations so that we can see how the gear ratios relate to each other.

Front Gear – “Chain Wheel”	A	B	C
Number of Teeth	73	51	31

Back Gear – back “cog”	a	b	c	d	e	f	g
Number of Teeth	19	23	33	41	53	63	71

- (1 pt) What can you conclude from this exercise? What was the relationship for the graph in each first part? Where any of the relationships linear? Which were proportional or inversely proportional? What did you learn overall?