Homework instructions:

You are responsible for this information.

General instructions to be followed on **_all_** future homework assignments:

1) **_You must do all of the work on your own._** **_While studying together is encouraged, copying work or providing answers is a violation of the honor code (see warning below)._**

2) **_Clearly circle all final answers!_** Your recitation instructor doesn't want to look through lots of stuff to figure out where you put your answer.

3) **_Do problems in order_** - i.e., hand in your assignments with your problems in the same order as on the assignment sheet (otherwise your instructor may assume you didn't do a problem).

   If you accidentally do get something out of order, please LABEL THIS CLEARLY!

4) **_Please write neatly._** It doesn't have to be perfect, but it shouldn't be impossible to read. Your instructor will mark problems wrong if he or she can't read your writing!

5) **_Show your work._** If you don't show all your steps, you may not get any credit! Really! Ask your recitation instructor if you're not sure about this.

6) **_Use R only for those problems which say to use R._**

7) **_Read these instructions again!_**

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Homework # 1

1) Find a cm ruler and measure the lengths of the fingers in your left hand to the nearest mm (you should have numbers like 5.2, 6.3, etc.). Write down these measurements and then calculate the following:

Calculate the following (*show your work!*):

a) $\sum_{i=1}^{n} y_i^2$
b) $\left(\sum_{i=1}^{n} y_i\right)^2$
c) $\sum_{i=1}^{n} (y_i-\bar{y})^3$
d) $\sum_{i=1}^{n} (y_i-\bar{y})^4$

e) $\sum_{i=1}^{n} (y_i-\bar{y})^2$
f) $\sum_{i=1}^{n} y_i^2 - \dfrac{\left(\sum_{i=1}^{n} y_i\right)^2}{n}$

g) Note the answers to (e) and (f). *Are you surprised?* The formula in (f) is a slightly easier way to calculate the *SS*, but because it often causes computational errors we prefer (e).

2) Now use the finger measurements from problem (1) and calculate:

a) the sample mean (*show your work*).

b) the sample median (*show your work*).

3) Refer to problem 2. Let's add a finger length of 23.5 cm. (I know this doesn't make sense, but let's suppose for this problem that you now have six finger lengths).

a) Calculate the sample mean of this new sample (*show your work*).

b) Calculate the sample median of this new sample (*show your work*).

c) Which statistic (mean or median) do you think better represents this new sample of 6 finger lengths? ***Why?***

4) Make up a sample of size $n = 10$ for which the average is -6 (note the $(-)$ sign). Not all 10 numbers should be identical.

5) Again, use your finger length measurements from problem (1).

a) Calculate the Sum of Squares (*SS*)   **b)** Calculate the sample variance (s^2)

c) Calculate the sample standard deviation (s)   **d)** Calculate the average absolute deviation

6) Now add 4 to each of your finger length measurements. For example, if your first finger length is 5.3, then it would become 9.3 (*show your work for all parts*).

    a) Calculate the sample variance (s^2)

    b) Are you surprised by the results? ***Why or why not?***

    c) What happens to the mean? (You don't need to do the actual calculation unless you're not sure what's going on).

    d) What happens to the median? (Again, you don't need to do the calculation unless you're not sure what's happening)

7) Now convert all of your finger length measurements into inches.

        To convert cm to inches, remember that 1 cm = 0.3937008 inches. This also means that 1 inch = 2.54 cm (see part (b)).

        For example, if your first finger length is 5.3 cm do: 5.3 x 0.3937008 = 2.087 inches

    a) Calculate the mean, variance and standard deviation of your finger measurements in inches.

    b) Now convert the your calculations in (a) back to cm and compare these to your answers in problems (2) and (5). (Comment - remember that the variance is squared, so when you convert use 2.54^2).

    c) Are you surprised by this? ***Why or why not?***

8) Here are some data giving the average annual temperature for New Hampshire. This is actually part of one of the built in data sets in R (there are many data sets built into R). The data have been sorted to help you.

      47.9 48.4 48.8 49.3 49.3 49.4 49.4 49.6 49.8 49.8 49.9 50.2 50.2 50.4 50.5 50.6
      50.6 50.6 50.7 50.8 50.8 50.9 50.9 50.9 50.9 50.9 51.0 51.0 51.1 51.1 51.3 51.4
      51.4 51.5 51.5 51.6 51.6 51.7 51.7 51.7 51.7 51.8 51.8 51.8 51.9 51.9 51.9 51.9
      52.0 52.0 52.1 52.3 52.6 52.6 52.7 52.8 53.0 53.1 54.0 54.6

    a) Make a stem and leaf plot of these data (do ***not*** use R).

    b) Make a histogram of these data (do ***not*** use R).

Be prepared to discuss these problems in recitation the week of February 2ⁿᵈ. Problems not discussed in recitation are due at the end of recitation.