MAT 254: Probability and Statistics
Lecturers: Dr. İlhan Baştürk, Dr. Olcay Üzengi Aktürk, Dr. Olcay Boyacıoğlu
Homework 1
Due by 16:30 on March 13th, 2017 Monday

Q.1 (15 points) In the article "Evaluation of Low-Temperature Properties of HMA Mixtures" (P. Sebaaly, A. Lake, and J. Epps, Journal of Transportation Engineering, 2002: $578 - 583$), the following values of fracture stress (in megapascals) were measured for a sample of 24 mixtures of hot-mixed asphalt (HMA).

30	75	79	80	80	105	126	138	149	179	179	191
223	232	232	236	240	242	245	247	254	274	384	470

Compute the mean, median, and the 5%, 10%, and 20% trimmed means.

Q.2 (20 points) The weather in Los Angeles is dry most of the time, but it can be quite rainy in the winter. The rainiest month of the year is February. The following table presents the annual rainfall in Los Angeles, in inches, for each February from 1965 to 2006.

0.2	3.7	1.2	13.7	1.5	0.2	1.7
0.6	0.1	8.9	1.9	5.5	0.5	3.1
3.1	8.9	8.0	12.7	4.1	0.3	2.6
1.5	8.0	4.6	0.7	0.7	6.6	4.9
0.1	4.4	3.2	11.0	7.9	0.0	1.3
2.4	0.1	2.8	4.9	3.5	6.1	0.1

a) Compute the sample mean and sample median for the given data.
b) Construct a stem-and-leaf plot for the given data.
c) Construct a boxplot for the given data.
d) Construct a dotplot for these data.

Q.3 (15 points) Sketch a histogram for which
    a) The mean is greater than the median.
    b) The mean is less than the median.
    c) The mean is approximately equal to the median.
After sketching write the skewness information of these histograms.

Q.4 (10 points) A simple random sample of five men is chosen from a large population of men, and their heights are measured. The five heights (in inches) are 65.51, 72.30, 68.31, 67.05, and 70.68.

a) Find the sample mean.
b) Find the sample variance and the sample standard deviation.

Q.5 (20 points) There are 15 numbers on a list, and the mean is 25. The smallest number on the list is changed from 12.9 to 1.29.

a) Is it possible to determine by how much the mean changes? If so, by how much does it change?

b) Is it possible to determine the value of the mean after the change? If so, what is the value?

c) Is it possible to determine by how much the median changes? If so, by how much does it change?

d) Is it possible to determine by how much the standard deviation changes? If so, by how much does it change?

Q.6 (20 points) A certain reaction was run several times using each of two catalysts, A and B. The catalysts were supposed to control the yield of an undesirable side product. Results, in units of percentage yield, for 24 runs of catalyst A and 20 runs of catalyst B are as follows:

Catalyst A			
4.4	3.4	2.6	3.8
4.9	4.6	5.2	4.7
4.1	2.6	6.7	4.1
3.6	2.9	2.6	4.0
4.3	3.9	4.8	4.5
4.4	3.1	5.7	4.5

Catalyst B			
3.4	1.1	2.9	5.5
6.4	5.0	5.8	2.5
3.7	3.8	3.1	1.6
3.5	5.9	6.7	5.2
6.3	2.6	4.3	3.8

Construct histograms for the yields of each catalyst.

Note: In the y-axis of your histograms use relative frequency values.