

## ECI114: Probabilistic Systems Analysis for Engineers

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HW # 4, Due: 19May2023, by midnight on Canvas.

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### Problem:

1. Will the sample mean always correspond to one of the observations in the sample?
2. An article in Human Factors ["Visual Performance on CRT Screens and Hard-Copy Displays" (1989, Vol. 31(3), pp. 247-257)] presented data on visual accommodation (a function of eye movement) when recognizing a speckle pattern on a high-resolution CRT screen. The data are as follows: 36.45, 67.90, 38.77, 42.18, 26.72, 50.77, 39.30, and 49.71. Calculate the sample mean and sample standard deviation. Construct a dot diagram of the data.
3. When will the median of a sample be equal to the sample mean?
4. An article in Technometrics ["Validation of Regression Models: Methods and Examples" (1977, Vol. 19(4), p. 425)] presented the following data on the motor fuel octane ratings of several blends of gasoline:

88.5 98.8 89.6 92.2 92.7 88.4 87.5 90.9 94.7 88.3 90.4  
83.4 87.9 92.6 87.8 89.9 84.3 90.4 91.6 91.0 93.0 93.7  
88.3 91.8 90.1 91.2 90.7 88.2 94.4 96.5 89.2 89.7 89.0  
90.6 88.6 88.5 90.4 84.3 92.3 92.2 89.8 92.2 88.3 93.3  
91.2 93.2 88.9 91.6 87.7 94.2 87.4 86.7 88.6 89.8 90.3  
91.1 85.3 91.1 94.2 88.7 92.7 90.0 86.7 90.1 90.5 90.8  
92.7 93.3 91.5 93.4 89.3 100.3 90.1 89.3 86.7 89.9 96.1  
91.1 87.6 91.8 91.0 91.0

Construct a stem-and-leaf display for these data. Calculate the median and quartiles of these data.

5. Construct a frequency distribution and histogram for the motor fuel octane data from previous problem. Use eight bins.
6. The "cold start ignition time" of an automobile engine is being investigated by a gasoline manufacturer. The following times (in seconds) were obtained for a test vehicle: 1.75, 1.92, 2.62, 2.35, 3.09, 3.15, 2.53, 1.91
  - (a) Calculate the sample mean, sample variance, and sample standard deviation.
  - (b) Construct a box plot of the data.