

## Probability and Statistics in Engineering, Fall 2016

### Exercise #1

1. A study of 250 households in Taipei showed that a household produced an average of 4 pounds of garbage per day.
  - (1) What is the sample in this study?
  - (2) How many observations are there?
  - (3) What is the variable of interest?
  - (4) What is the population?
  - (5) Discuss the role of statistical inference in the context of this example.
  
2. For each of the following examples of data, indicate the measurement scale that is appropriate.
  - (1) the starting salaries of graduates from a Mechanical Engineering program
  - (2) the month of highest sales for each firm in a sample
  - (3) the weekly closing price of gold throughout the year
  - (4) the size of soft drink (small, medium, or large) ordered by a sample of Burger King customers
  - (5) method of payment (cash, check, credit card)
  - (6) the time to start a baseball game
  - (7) the final letter grades received by students in a statistics course
  - (8) the amount of crude oil imported monthly by the U.S.
  - (9) the number of miles driven annually by employees in company cars
  - (10) the marks achieved by the students in a statistics course final exam in which there are ten questions each worth 10 marks
  
3. Let  $\bar{X} = 3600.7$  and  $S^2 = 14655$  be the sample mean and variance of the weights of nineteen neonates in grams. Suppose that there was a typewriting error in the eighth observation, the accurate weight of the eighth neonate, 4210 was recorded as 4120. After we correct it, what are the accurate sample mean and variance?
  
4. A random sample of the Statistics scores for 100 freshmen in a university was selected, and the frequency distribution was obtained as follows. Given the mean and the standard deviation of the sample equal to 71.4 and 11.5, respectively, find the following statistics.
  - (1) the median of the data set
  - (2) the mode of the data set using Pearson's method, King's method, and Czuber's

method

(3) the Pearson coefficient of skewness

Score boundaries	Frequency
30-40	1
40-50	3
50-60	13
60-70	21
70-80	40
80-90	20
90-100	2

5. A large manufacture company believes that their hourly wages follow a normal probability distribution. To confirm this, 300 workers were sampled and the results organized into the following frequency distribution.
  - (1) What are the mean, median, and standard deviation of these data.
  - (2) Find the coefficient of skewness for these data and interpret it.
  - (3) Find the coefficient of kurtosis for these data and interpret it.
  - (4) Based on what you have got from the above, do you agree that the hourly wages follow a normal distribution?
  
6. Consider a sample of 12 measurements:  
1, 1, 0, 15, 2, 3, 4, 0, 1, 3, 1, 5
  - (1) Calculate the range, sample mean, variance, and standard deviation.
  - (2) Find the median, lower quartile, and upper quartile for the data.
  - (3) Construct a box-and-whisker plot for the data and identify any outliers.
  
7. Example 2.4 in Chapter 2 - Descriptive Statistics.