MATH 21-01 (Introductory Statistics), HW3 (100 points). Due: 02/17/2017 in class.

Question 1 (25 points):
Note: Please prepare the R part of the homework on the computer. Please supply both the R commands you used and the requested plots as part of your homework.
Pick a stock which has generally risen or decreased in price over the past six months. You may choose any stock. Download the csv data from finance.yahoo.com. Plot the daily high stock price versus the date in a scatter plot. Write down the formulas for the correlation coefficient, and for the slope m and y-intercept b of the best fit least squares line through the points region. Find the values of the correlation coefficient r and of m and b from the formulas you wrote down, using evaluations with R (do not use a fixed R command to return the value). Then plot the scatter plot of the points (price vs date) along with the best fit line through the points.

Question 2 (25 points):
Suppose a set of fish is sampled in a large lake (using a catch and release method). The fish have the following weights in pounds:

$$w = \{1, 5, 0.5, 0.8, 6, 20, 42, 0.001, 4, 0.6, 31, 12, 3, 0.5, 10, 12, 9, 8, 15, 1\}$$

- Find the mean and sample standard deviation of w (you should evaluate the formulas, but you can use R to help with summation, etc). Make a quick plot of the histogram with R. Does the data appear approximately normal?

- Find the five number summary of w. Find the IQR. Are there any outliers? Plot the modified boxplot of the data.

- Find the z-scores for 2 smallest and 2 largest fish. Are they outliers by the z-score characterization?

- How many of the data fall within $x \pm 2s$? Compare this to the predictions made by the Empirical rule and Chebyshev's theorem.

Question 3 (10 points) Using Venn diagrams, prove the following set relation for arbitrary sets A and B:
$$A \cup B = A \cup [B - A \cap B]$$
Also argue that the sets A and $B - A \cap B$ are mutually exclusive. Optional: Can you show how the additive probability rule follows from these?

Question 4 (15 points):
Suppose that from a shuffled deck of 52 cards a card is drawn. Find the probability that it is:

- An ace.

- A jack of hearts.

- A three of clubs or a six of diamonds.

- A heart.

- Any suit except spades.

- Neither a four nor a club.

Hint: for each event above, write a logical expression in terms of simple (or at least simpler) events. E.g. $E = A \cup B$.

Question 5 (25 points): Please do the following problems from the textbook:

- 4.2 : 37-39, 44abc

- 4.3 : 5-9,28,29,31,32