STAT 8010 Statistical Methods I
Homework 2

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Due Date: June 2, 11:59pm via Canvas

Problem 1   Numerical Summary of a Quantitative Variable

The number of hours that students spend on STAT 8010 final exam are as follows:
$0, 2.9, 3.5, 3.7, 3.9, 4.0, 4.1, 4.3, 5.4, 6.1, 6.4, 6.7, 7.1, 7.4, 7.7, 7.9, 8.6, 9.1, 9.1, 9.2$

(a) Find the `minimum, maximum, first quartile` (Q_1), median, and `third quartile` (Q_3)

(b) Find the range and IQR for this data set.

(c) Make a boxplot for the data.

(d) Compute the sample mean and sample standard deviation of the data.

Problem 2   Summarizing Two Categorical Variables

The following table contains the Monster University 2055 fall graduate school admission information:

	Admitted	Rejected	Total
College of Science	60		160
College of Engineering	320	800	
School of Business		250	
Total	580		

(a) Fill in the missing numbers in the table

(b) What percent of applicants are admitted by Monster University?

(c) What is the probability that an applicant is apply for Engineering and got rejected?

(d) If we pick an applicant at random, what is the probability that the applicant apply for B school and got accepted?

Problem 3   Probability

Given $\mathbb{P}(A) = 0.8$, $\mathbb{P}(B) = 0.4$

(a) What is the range of possible value of $\mathbb{P}(A \cup B)$?

$A : 0.8 \sim 1.2$

$B : 0.8 \sim 1.0$

$C : 0.4 \sim 0.8$

$D : 0 \sim 0.4$

(b) What is the largest possible value of $\mathbb{P}\left((A \cap B)^c\right)$?

$A : 1.2$

$B : 1.0$

$C : 0.8$

$D : 0$

(c) Suppose $\mathbb{P}(A|B) = 0.8$, what is the value of $\mathbb{P}(B|A)$?

$A : 1.6$

$B : 1.0$

$C : 0.8$

$D : 0.4$

Problem 4 Binomial and Hypergeometric Distributions

Suppose that you have an urn with 500 balls, 100 of which are red and 400 are black.

(a) You sample 10 balls at random with replacement. What is the probability that at least 2 of them are red?

(b) You sample 10 balls at random without replacement. What is the probability that none of them are red? (expression only)

Problem 5   Normal Distribution

Suppose an exam score follows a normal distribution with mean 74.8 and standard deviation 7.2. Let X to denote the exam score, answer the following questions:

   (a) What is the probability that a randomly chosen test taker got a score greater than 83?

   (b) Suppose the passing score for this exam is 80. What is the probability that a randomly chosen test taker got a score greater than 83 given that she/he pass the exam?

   (c) Instead of a fixed passing score. Only top 20% can pass the exam. What is the passing score?

   (d) Using the empirical rule to find the 84_{th} percentile.