

# STAT 8010–006 Statistical Methods I

## Homework 2

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**Due Date:** September 22, 3:30pm 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  $\mathbb{P}((A \cap B)^c)$ ?

$$A : 1.2$$

$$B : 1.0$$

$$C : 0.8$$

$$D : 0$$

(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   Continuous Random Variable**

The PDF of the continuous RV  $Y$  is given below.

$$f_Y(y) = \begin{cases} c(y^2 + 1) & \text{if } 0 < y < 2 \\ 0 & \text{otherwise} \end{cases}$$

(a) Find the value of  $c$  that makes this a legitimate PDF.

(b) What is the probability that  $Y$  is greater than 1?

(c) Find  $\mathbb{E}[Y]$ .

## Problem 6 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<sub>th</sub> percentile.