

STAT 8010–003 Statistical Methods I

Homework 2

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Due Date: September 25, 1:25pm

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)

- (c) Is there any approximation for (b)? If yes, justify the appropriateness of the approximation and calculate the approximate probability.

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