

# Statistics and Data Analysis, Fall 2016

## Pre-lecture Problems 6

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**Note 1.** The deadline of submitting the pre-lecture problem is **14:30, November 2, 2016**. Please submit a hard copy of your work to the instructor in class. Late submissions will not be accepted. Each student must submit her/his individual work. Submit **ONLY** the problem that counts for grades.

**Note 2.** Please make your answer as clear (i.e., easy to read) as possible. We reserve the right to take away points when the correctness cannot be easily determined (e.g., when the writing is messy and cannot be easily understood).

- (0 points) Let  $X$  be the outcome of rolling an unfair dice, where  $p_i = \Pr(X = i)$  is the theoretical probability for the outcome to be  $i$ ,  $i = 1, 2, \dots, 6$ . Suppose that in the past 1000 trials we observed 150 times of 1, 148 times of 2, 156 times of 3, 177 times of 4, 182 times of 5, and 187 times of 6. If we estimate the theoretical probability distribution as the observed frequency distribution, what is the probability of getting at least 4?
- (0 points) A population of 2500 students took an exam and obtained grades. A grade is either 0, 1, 2, 3, or 4. The following table lists the grade distribution.

Grade	0	1	2	3	4
Number of students	220	473	367	736	704

Let  $X$  be the grade of a randomly drawn student.

- Find the expected value of  $X$ .  
**Note.** This is exactly the population mean. Why?
  - Find the standard deviation of  $X$ .  
**Note.** This is exactly the population standard deviation. Why?
- (10 points; 5 points each) Continue from the previous problem.
    - Let  $\bar{x}_4$  be the sample mean of a random sample of four students. Find the expected value and standard deviation of  $\bar{x}_4$ .
    - May we calculate  $\Pr(\bar{x} < 2.7)$ ? If we can, find it; if we cannot, explain why.