

Assignment 2

Statistics for Social Science (201-401-DW)

Instructor: Emilie Richer

Instructions:

- The assignment is due at the beginning of class 8:30am on Wednesday, March 29, 2017. A late penalty will be applied to assignments submitted later in the day.
- Show all your work. Some solutions will require more written explanation than others. If you use your calculator to compute the mean and SD you do not have to show your work.
- You may work together, however your written solutions should be done on an individual basis. Solutions that are too similar to those of one of your classmates' will be marked zero.
- Your assignment **does not have to be typed**.
- The assignment is comprised of 9 questions and marked out of a total of **50 marks**.

[QUESTION 1] (5 marks)

The bookstore offers a chemistry textbook for \$159 and a book supplement for \$41. From past experience, they know about 25% of chemistry students just buy the textbook while 60% buy both the textbook supplement.

- a. What proportion of students don't buy either book? Assume no students buy the supplement without the textbook.
- b. Let Y represent the revenue from a single student. Write out the probability distribution of Y , i.e. a table for each outcome and its associated probability.
- c. Compute the expected revenue from a single chemistry student.
- d. Find the standard deviation associated with the revenue from a single student.

[QUESTION 2] (5 marks)

The probability that a random smoker will develop a severe lung condition in his or her lifetime is about 0.3. Suppose 8 smokers are selected at random from the population. What is the probability that

- (a) none of them will develop a severe lung condition?
- (b) one will develop a severe lung condition?
- (c) no more than one will develop a severe lung condition?
- (d) how many would you **expect** to develop a severe lung condition?

[QUESTION 3] (3 marks)

In the discrete probability distribution below, find μ and σ .

x	0	1	3	4
$P(x)$	0	0.2	0.4	0.3

[QUESTION 4] (5 marks)

In a certain course, 80% of the students study. Of the students who study, 75 will pass the course. However, among those students who do not study, only 50% will pass the course.

- (a) what proportion of students pass the course?
(b) if a student passes the course, what is the probability that he or she studied?

[QUESTION 5] (7 marks)

Using the standard normal distribution $N(z;0,1)$ table to find the following probabilities:

- (a) $P(0 < z < 0.72)$ (b) $P(-1.2 < z < 0)$ (c) $P(z > -2.06)$
(d) $P(-1.01 < z < 0.42)$ (e) $P(z < -1.42)$ (f) $P(0.2 < z < 1.18)$
(g) $P(-2.0 < z < -1.28)$

[QUESTION 6] (10 marks)

In triathlons, it is common for racers to be placed into age and gender groups. Friends Leo and Mary both completed the Hermosa Beach Triathlon, where Leo competed in the *Men, Ages 30-34 group* while Mary competed in the *Women, Ages 25-29 group*. Leo completed the race in 1:23:20 (5000 seconds), while Mary completed the race in 1:34:51 (5691 seconds). Obviously Leo finished faster, but they are curious about how they did within their respective groups. Here is the information on the performance of their groups:

- The finishing time of the *Men, Ages 30-34 group* has a mean of 4313 seconds with a standard deviation of 583 seconds.
- The finishing times of the *Women, Ages 25-29* has a mean of 5261 seconds with a standard deviation of 807 seconds.
- The distributions of finishing times for both groups are approximately **Normal**.

- (a) What are the z-scores for Leo's and Mary's finishing times? What do these z-scores tell you?
(b) Did Leo or Mary rank better in their respective groups? Explain your reasoning.
(c) What percent of triathletes did Leo finish faster than in his group?
(d) What percent of triathletes did Mary finish faster than in her group?
(e) Compute the cut-off time for the fastest 10% of athletes in the men's group i.e. those who took the shortest 10% of time to finish.
(f) Compute the cut-off time for the slowest 5% of athletes in the women's group.

[QUESTION 7] (5 marks)

The distribution of passenger vehicle speeds traveling on the Interstate 5 Freeway (I-5) in California is nearly normal with a mean of 72.6 miles/hour and a standard deviation of 4.78 miles/hour.

(a) What percent of passenger vehicles travel slower than 80 miles/hour?

(b) What percent of passenger vehicles travel between 60 to 80 miles/hour?

(c) How fast do the fastest 5% of passenger vehicles travel?

(d) The speed limit on this stretch of the I-5 is 70 miles/hour.

Approximate what percentage of the passenger vehicles travel above the speed limit on this stretch of the I-5.

[QUESTION 8] (5 marks)

SAT scores (out of 2400) are distributed normally with a mean of 1500 and a standard deviation of 300. Suppose a school council awards a certificate of excellence to all students who score at least 1900 on the SAT, and suppose we pick one of the recognized students at random. What is the probability this student's score will be at least 2100?

[QUESTION 9] (5 marks)

A TV network claims that 20% of all available viewers watch its evening news. If this is true, what is the probability that at most 450 viewers in a pool of 2500 viewers watch its news?