Practice for Midterm Exam II
Math 11, UCSD, Winter 2018
(Do not turn in!)

Exercise I

You love playing guessthecorrelation.com. On a typical day, you expect to find 14 exact correlation values, with a standard deviation of 3 on this number.

1. If you play each day for a week (7 total days), how many times do you expect to find an exact correlation value R during the week?

2. What is the standard deviation in the number of times you find an exact R value during the week? (Assume your performance on any day of the week is independent of the other days of the week.)

3. Your friend is not as good at the game and only finds about 6 exact R value/day. What is the probability she finds at least three exact R values on a given day?

Exercise II

Suppose some process is modelled by the probability distribution

$$f(x) = \begin{cases} \cos x, & \text{if } 0 \leq x \leq \pi/2, \\ 0, & \text{otherwise.} \end{cases}$$

1. Show that this function meets both requirements of a density function

2. What is $P(X \geq \pi/3)$?

3. What is $P(X = \pi/12)$?

Exercise III

Suppose the number of people who visit a certain park in a day has a mean of 506 and a standard deviation of 30. Assume that the numbers of visitors to the park on different days are independent. Find the probability that the average number of visitors to the park per day, during the next 36 days, will be at least 500.

Exercise IV

A researcher is curious if the proportion of students at UCSD who believe in ghosts is higher than the proportion of all Californians who believe in ghosts. To check this, the researcher looks up the percentage of Californians who believe in ghosts (3%), and then walks around UCSD's campus asking every fifth person she sees about ghosts. After asking 400 students, the researcher had 14 who reported believing in ghosts.

1. What is the name of the random sampling technique used by the researcher?

2. If the researcher wishes to do a hypothesis test for this situation, what are the null and alternative hypotheses?

3. The researcher claims the sampling distribution for a proportion is approximately a Normal distribution. What three conditions must be true for this statement to be correct? Given a reason why each condition is or is not met in this problem.

4. What p-value do you get from this hypothesis test?

5. Explain what your p-value means in this context

6. What conclusion should you draw given your p-value in part 4?

Exercise V

A company is criticized because only 13 of 43 people in executive-level positions are women. The company explains that although this proportion is lower than it might wish, it's not surprising given that only 40% of all its employees are women. What do you think? Test an appropriate hypothesis and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed.

Exercise VI

In the Cleveland area, within children born prematurely at low birth weights between 1977 and 1979, only 74% graduated from high school. Among a comparison group of 233 children of normal birth weight, 83% were high school graduates.
Create a 80% confidence interval for the difference in graduation rates between children of normal and children of very low birth weights.