

Math 10: Assignment 3 (30 points) – There are 2 pages to this assignment
Due by the time you take Exam III – Late Assignments will not be accepted.

- Do all work on a separate sheet of paper.
 - You must show work to receive credit.
 - Turn in work in order (#2 should come after #1, etc.)
 - You may work in groups of up to 3 people. Points will be taken off, if more than 3 names are on one assignment.
1. (5 points) The life of a particular brand of phone follows an exponential distribution, with a mean of 3.2 years. A statistician studies 36 of this brand of phone.
 - a. State the Random Variable X and \bar{X} .
 - b. What are the distributions of X and \bar{X} ?
 - c. Find the probability that the life of one phone is more than 4 years.
 - d. Find the probability that the average life of 36 of these phones is more than 4 years.
 - e. Find the 65th percentile for the life of one phone.
 - f. Find the 65th percentile for the average life of 36 phones.
 - g. Create a 90% confidence interval for the true mean of the life of these phones, sketching a graph and labeling all relevant parts of the graph.
 2. (5 points) A mayor is planning on running for re-election. He wants to get an idea of his approval rating before he decides whether to run or not. In a telephone poll of 428 residents, 266 of them approve of the mayor. The mayor is interested in finding the true proportion of residents who approve of him.
 - a. What distribution should be used? Why?
 - b. What is the point estimate?
 - c. Create a 95% confidence interval of the true proportion of the people in town who approve of him, sketching a graph and labeling all relevant parts of the graph.
 - d. What is the error bound?
 - e. Do at least 60% of the residents of the town support him, based on the confidence interval?
 - f. What would happen to the level of confidence, if the number of residents polled was increased, but everything else was the same? Explain your answer.
 - g. What would happen to the mayor's level of confidence if the number of people polled decreased, but the confidence interval stayed the same? Explain your answer.
 3. (5 points) Irene doesn't like spotted bananas. She wants to know how long it takes, after she buys bananas from the store, for the first spots to appear. She gets 25 bananas and keeps track of them. On average, spots appear on the bananas 4.2 days after she gets them, with a standard deviation of 1.3 days.
 - a. What distribution should be used? Why?
 - b. Create a 90% Confidence Interval for the length of time for spots to appear on bananas.
 - c. What would happen to the Confidence Interval, if the Confidence Level is decreased, but everything else remains the same?
 - d. If Irene increased the number of bananas she observed, but keeps the same Confidence Level, what happens to the error bound?

4. (4 points) According to a poll, more than 70% of Americans oppose moving Guantanamo Bay prisoners to their state. Alison wants to test the claim in her state, so she calls 578 people. 417 of these people oppose moving Guantanamo Bay prisoners to their state.
- State H_0 and H_a .
 - What is the Type II error?
 - Find the p-value and explain what it means.
 - What should be Alison's conclusion? Explain your answer.
5. (5 points) A pizza company claims that they use at least $\frac{1}{4}$ pounds of cheese on their large pizzas. From years of pizza making, it is known that the population standard deviation is 0.04 pounds. Keenan doesn't believe this claim, so he decides to watch them make 60 pizzas at one of the company's stores. Of the 60 pizzas, the average amount of cheese used is 0.22 pounds, with a standard deviation of 0.06 pounds.
- What are H_0 and H_a ?
 - What is the Type I error?
 - What is the p-value? What does this mean?
 - What should be Keenan's conclusion? Explain your answer.
 - Create a 90% confidence interval for the mean for the weight of cheese on the pizzas.
6. (3 points) According to Google Maps, it takes 1 hour and 50 minutes to drive from Mountain View to Sebastopol. Charlie thinks it will not take that long. He makes the drive 15 times. It takes him an average of 1 hour and 42 minutes, with a standard deviation of 21 minutes.
- What are H_0 and H_a ?
 - What is the p-value? What does this mean?
 - Who is right? Google Maps or Charlie? Explain your answer.
7. (3 points) Jennifer thinks she can do more than 7 additional crunches in the morning than she can at night. She decided to record the number of crunches in the morning and at night, for a week. The results are presented below:

Morning	45	48	51	58	43	49	55
Night	40	39	50	49	45	46	50

- What are H_0 and H_a ?
 - What is the test statistic?
 - What is the p-value? What does this mean?
 - What is your conclusion? Explain.
8. (3 points) Jefferson believes that episodes of *Star Trek: Voyager* are longer than episodes of *The X-Files*. 12 episodes of *Voyager* and 16 episodes of *X-Files* are sampled. The *Voyager* episodes have an average length of 46.2 minutes, with a standard deviation of 0.8 minutes. The *X-Files* episodes have an average length of 44.9 minutes, with a standard deviation of 1.1 minutes.
- What are H_0 and H_a ?
 - What is the test statistic?
 - What can you conclude? Use numerical evidence to explain your answer.