STATS-10 Final Practice Problems

1. A student worried that she would be late to an early morning exam, she set TWO alarm clocks. Suppose Alarm Clock 1 is 60% reliable, meaning it will wake her up 6 times out of 10. Suppose Alarm Clock 2 is 90% reliable. What is the chance at least one of the alarms will wake her up?
   A) 0.90
   B) 0.54
   C) 0.96
   D) 0.36

2. A true/false pop quiz contains five questions. What is the probability that when guessing, a student will get at least one question correct? (Round to the nearest hundredth)
   0.97

3. A random sample of college students was asked to respond to a survey about how they spend their free time on weekends. One question, summarized in the table below, asked each respondent to choose the one activity that they are most likely to participate in on a Saturday morning. The activity choices were homework, housework, outside employment, recreation, or other.

	Homework	Housework	Outside Employment	Recreation	Other	Total
Male	29	15	20	23	9	96
Female	18	17	26	39	4	104
Total	47	32	46	62	13	200

   i. If one student is randomly chosen from the group, what is the probability that the student is female?
   0.52

   ii. Given that the randomly chosen student from the group is female, what is the probability that the student chose "outside employment" as their most likely activity on Saturday mornings?
   0.25

   iii. What is the probability that a randomly chosen survey respondent is male or chose "recreation" as their most likely activity on Saturday mornings
   0.675

4. You and your friend were studying, and you left your cell phone either in the computer lab or in the cafe (these were the only two places you visited). You think that with probability .4 it was left in the computer lab, because you always take it out of your backpack there, otherwise, it was left in the cafe. If you left the phone in the computer lab, the probability that someone stole it is .3. In the cafe, the probability that someone stole it is twice that of the computer lab.

    i.   The probability of NOT finding your cell phone (i.e., it was stolen) is
           0.48

    ii.   The probability of finding your cell phone (i.e., it was stolen) is
           0.52

    iii.   Given that your cell phone was found, what was the probability that it was found in the computer lab?
           0.54

5. determine whether the variable would best be modeled as continuous or discrete:

    i.   The number of "Yes" votes a ballot proposition received in an election.
           Discrete
    ii.   The weight of babies born in North Carolina in 2009.
           Continuous
    iii.   The temperature of a greenhouse at a certain time of the day.
           Continuous
    iv.   The number of tomatoes harvested each week from a greenhouse tomato plant.
           Discrete

6. Male players at the high school, college, and professional ranks use a regulation basketball that weighs 22.0 ounces with a standard deviation of 1.0 ounce. Assume that the weights of basketballs are approximately Normally distributed.

    i.   Roughly what percentage of regulation basketballs weigh less than 20.7 ounces? Round to the nearest tenth of a percent.
           9.7%

    ii.   If a regulation basketball is randomly selected, what is the probability that it will weigh between 20.5 and 23.5 ounces? Round to the nearest thousandth.
           0.866

7. The Normal model N(58, 21) describes the distribution of weights of chicken eggs in grams. Suppose that the weight of a randomly selected chicken egg has a z-score of 1.78. What is the weight of this egg in grams? Round to the nearest hundredth of a gram.
95.38 grams

8. The mean travel time to work for a person working in Kokomo, Indiana, is 17 minutes. Suppose the standard deviation of travel time to work is 4.5 minutes and the distribution of travel time is approximately Normally distributed.

    i.   Approximately what percentage of people living and working in Kokomo have a travel time to work that is at least 20 minutes? Round to the nearest whole percent.
           25%

    ii.   Suppose that it is reported in the news that 12% of the people living and working in Kokomo feel that their commute is too long. What is the travel time to work that separates the top 12% of people with the longest travel times and the lower 88%? Round to the nearest tenth of a minute
           22.3 mins

9. Suppose the probability that a person between the ages of 19 and 24 checks their daily horoscope is .12. A survey is then conducted in which 400 people between the ages of 19 and 24 were randomly selected and asked "Do you check your daily horoscope?"
If the sample size were 250 instead of 400, would the standard error for the sample proportion of people between the ages of 19 and 24 who check their daily horoscope increase or decrease?
Increase. Sqrt(p*(1-p)/n). When n increased from 250 to 400, the denominator increases, and the value of the whole term would decrease.

10. Suppose that the age of all the US first ladies when they married was recorded. The mean age of US first ladies when they married is an example of which of the following?
A) Population
B) Sample
C) Parameter
D) Statistic

11. Researchers are interested in learning more about the age of women when they marry for the first time, so they survey 500 married or divorced women and ask them how old they were when they first married. The collection of the ages of the 500 women when they first married is an example of which of the following?
A) Population
B) Sample
C) Parameter
D) Statistic

12. We have calculated a confidence interval based on a sample of size n=100. Now we want to get a better estimate with a margin of error that is only one fourth as large. How large does our new sample need to be?
1600

13. A certain population is approximately Normal. We want to estimate its proportion, so we will collect (random) samples. Which of the following statements should be true if we use a large sample size rather than a small one? (select all that apply)
I. The mean of the sampling distribution will stay approximately the same.
II. The sampling distribution of the sample proportions will be approximately Normal.
III. The variability of the sample proportions will be smaller.
All of the above

14. Which of the following is not an assumption or condition that needs to be checked for the one-proportion z-test? (select all that apply)
A) The sample is randomly selected from the population.
B) The population is Normal.
C) The sample is large enough to expect at least ten successes and ten failures.
D) The population size is at least ten times as large as the sample size.

15. We have calculated a 95% confidence interval and would prefer that our next confidence interval has a smaller margin of error without a decrease in confidence. Which of the following will do this? (select all that apply)
I. change the z* multiplier to a smaller number.
II. take a larger random sample.
III. take a smaller random sample.

16. Which is true about a 98% confidence interval for a population proportion based on a given random sample? (select all that apply)
I. We are 98% confident that the sample proportion is in our interval.
II. There is a 98% chance that our interval contains the population proportion.
III. The interval is wider than a 95% confidence interval for a population proportion would be.

17. When constructing a confidence interval, if the level of confidence increases the margin of error will ___increase___ and the confidence interval will be ___wider___. A larger sample size will improve the accuracy of the confidence interval, therefore the margin of error will ___decrease___ and the confidence interval will be ___narrower___.
(Decrease or increase? Narrower or wider?)

18. In a recent poll of 1100 randomly selected home delivery truck drivers, 26% said they had encountered an aggressive dog on the job at least once.

   i.   What is the margin of error, using a 95% confidence level, for estimating the true population proportion of home delivery truck drivers who have encountered an aggressive dog on the job at least once? (Round to the nearest thousandth)
   A) 0.013
   B) 0.053
   C) 0.026
   D) 0.004

   ii.   Report the 95% confidence interval for the proportion of all home delivery truck drivers who have encountered an aggressive dog on the job at least once. (Round final calculations to the nearest tenth of a percent)
   A) (24.7 %, 27.3%)
   B) (20.7%, 31.3%)
   C) (23.4%, 28.6%)
   D) None of these

19. Choose the statement that best describes what is meant when we say that the sample statistic is unbiased when estimating the population parameter.
   A) The sample statistic will always equal the population parameter.
   B) The standard deviation of the sampling distribution (also called the standard error) and the population standard deviation are equal.
   C) On average, the sample statistic is the same as the population parameter.
   D) The variation in the sample statistic is near zero.
   E) None of the above

20. Obtain the required confidence interval for the difference between two population proportions. Assume that independent simple random samples have been selected from the two populations. A survey found that 27 of 71 randomly selected women and 48 of 72 randomly selected men follow a regular exercise program. Find a 95% confidence interval for the difference between the proportions of women and men who follow a regular exercise program.
   A) (-0.443, -0.130)
   B) (0.223, 0.537)
   C) (-0.473, 0.567)
   D) (0.194, 0.567)

21. A polling agency wants to estimate the proportion of U.S. citizens who support the president's domestic policies. They surveyed 2500 U.S. citizens and found a 95% confidence interval for the difference in proportions between men and women who support the president's domestic policies as (-0.025 to 0.050) where population 1 is men and population 2 is women. Select the correct interpretation of this result.
    A) The interval does not contain zero which shows that there is no significant difference in the proportions between men and women.
    B) The interval contains zero which shows that women are more likely than men to disagree with the president's foreign policies.
    C) The interval contains zero which shows that men are more likely than women to disagree with the president's foreign policies.
    D) The interval contains zero which shows that there is no significant difference in the proportions between men and women.

22. A statistics professor wants to see if more than 80% of her students were statistics major. At the beginning of the term, she takes a random sample of students from her large class and asks, in an anonymous survey, if the student's major is statistics. State the hypotheses in context and in mathematical notations.
    H0: p = 0.8 Ha: p>0.8

23. Suppose that the following hypotheses are to be tested: H0: $p = 0.25$ and Ha: $p > 0.25$. Calculate the observed z-statistic for the following sample data: 40 out of 75 test subjects have the characteristic of interest. Round to the nearest hundredth.
    A) $z = 1.88$
    B) $z = -4.33$
    C) $z = 5.67$
    D) $z = 2.81$

24. A p-value indicates
    A) the probability that the null hypothesis is true.
    B) the probability that the alternative hypothesis is true.
    C) the probability of obtaining a test statistic as extreme or more extreme than the observed test statistic, given that the null hypothesis is true.
    D) the probability of obtaining a test statistic as extreme or more extreme than the observed test statistic, given that the alternative hypothesis is true.
    E) None of the above

25. Historical data reveals that 47% of all adult women think they do not get enough time for themselves. A recent opinion poll interviews 1025 randomly chosen women and records the sample proportion of women who do not feel that they get enough time for themselves. This statistic will vary from sample to sample if the poll is repeated. Suppose the true population proportion is 0.47. In what range will the middle 68% of all sample results fall for samples of size 1025?

   A) 0.314 to 0.626
   B) –1 to +1
   C) 0.548 to 0.822
   D) 0.454 to 0.486
   E) 0.439 to 0.501

26. A research firm carried out a hypothesis test on a population proportion using a right-sided alternative hypothesis. Which of the following z-scores would be associated with a p-value of 0.0301? Round to the nearest hundredth.

   A) $z = -1.75$
   B) $z = 1.75$
   C) $z = 1.88$
   D) $z = -1.88$

27. A researcher is interested in studying the drinking habits of adults in a certain city. Suppose a recent study stated that the proportion of adults who reported drinking once a week or less in the last month was 0.26. The researcher's hypotheses for this test are H0: $p = 0.26$ and Ha: $p > 0.26$. The researcher collected data from a random sample of 75 adults in the city and found that 12% among the sampled adults reported drinking once a week or less in the last month.

   i.   Check that the conditions hold so that the sampling distribution of the z statistic will approximately follow the standard normal distribution. Are the conditions satisfied? If not, choose the condition that is not satisfied.

   A) No, the researcher did not collect a random sample.
   B) No, the researcher did not collect a large enough sample.
   C) No, the population of interest is not large enough.
   D) Yes, all the conditions are satisfied.

   ii.   To continue the study into the drinking habits of adults, the researcher decides to collect data from adults working in "blue collar" jobs to see whether their drinking habits are in the same proportion as the general public. The null hypothesis for this test is H0: $p = 0.26$ and the alternative hypothesis is Ha: $p > 0.26$. The researcher collected data from a random sample of 90 adults with "blue collar" jobs of which 32 stated that they drank once a week or less in the last month. Assume that the conditions that must be met in order for us to use the N(0, 1) distribution as the sampling distribution are satisfied. Find the values of the test statistic, and the p-value associated with the test statistic. Round all values in calculation to the nearest thousandth.

A) z = 1.920, p-value = 0.027
B) z = 2.087, p-value = 0.982
C) z = 1.920, p-value = 0.973
D) z = 2.087, p-value = 0.018

28. Suppose you are testing your friend to see whether she can tell the difference between the name brand and generic peanut butter. You give her 40 samples selected randomly, half from the name brand and half from the generic brand. The null hypotheses is that she is just guessing and should get about half right. Select all correct statement(s) about the two types of errors.

A) The type II error would be saying that your friend can tell the difference between the two kinds of peanut butter, when she really cannot.
B) The type I error would be saying that your friend cannot tell the difference between the two kinds of peanut butter, when she really can.
C) The type I error would be saying that your friend can tell the difference between the two kinds of peanut butter, when she really cannot.
D) The type II error would be saying that your friend cannot tell the difference between the two kinds of peanut butter, when she really can.