Statistics 13V NAME:_____
Quiz 7 Last six digits of Student ID#:_____

For multiple choice questions circle the best answer. For other questions provide the information requested. Each problem is worth 10 points except where stated otherwise. **Open book and notes.**

1. A sampling distribution is the probability distribution for which one of the following:
   A. A sample
   B. A sample statistic
   C. A population
   D. A population parameter

2. Which of the following statements best describes the relationship between a parameter and a statistic?
   A. A parameter has a sampling distribution with the statistic as its mean.
   B. A parameter has a sampling distribution that can be used to determine what values the statistic is likely to have in repeated samples.
   C. A parameter is used to estimate a statistic.
   D. A statistic is used to estimate a parameter.

3. Which of the following is the most common example of a situation for which the main parameter of interest is a population proportion?
   A. A binomial experiment
   B. A normal experiment
   C. A randomized experiment
   D. An observational study

Scenario for Questions 4 to 6: Based on the 2000 Census, 52% (p = .52) of the California population aged 15 years old or older are married. Suppose n = 1000 persons are to be sampled from this population and the sample proportion of married persons ($\hat{p}$) is to be calculated.

4. (**5 points)**What is the mean of the sampling distribution of $\hat{p}$?
   The mean is p = .52.

5. **(5 points)**What is the standard deviation of the sampling distribution of $\hat{p}$?

   The standard deviation is $s.d.(\hat{p}) = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{(.52)(.48)}{1000}} = .0158$

6. Draw a picture of the sampling distribution of $\hat{p}$. Identify the mean and the values that have the middle 68% of the distribution between them.

   The picture should be a normal distribution with the mean at .52. The values with 68% between them are .52 - .0158 and .52 + .0158, or .5042 to .5358.

7. In a random sample of $n = 100$ students at a university, 85 said they owned their own computer. Use this information to find an approximate 95% confidence interval (*not* a conservative one) for the true proportion of students at the university who own their own computers. Show all of your work.

   The confidence interval is Sample estimate ± Multiplier × Standard error

   Sample estimate = $\hat{p} = .85$; *Multiplier = 2.0, Standard error =* $\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = \sqrt{\frac{(.85)(.15)}{100}} = .0357$

   The confidence interval is thus .85 ± (2.0)(.0357) or .85 ± .0714 or .7786 to .9214.

8. Which statement is *not* true about confidence intervals?
   A. A confidence interval is an interval of values computed from sample data that is likely to include the true population value.
   B. An approximate formula for a 95% confidence interval is sample estimate ± margin of error.
   C. A confidence interval between 20% and 40% means that the population proportion lies between 20% and 40%.
   D. A 99% confidence interval procedure has a higher probability of producing intervals that will include the population parameter than a 95% confidence interval procedure.

9. Which statement is *not* true about the 95% confidence level?
   A. Confidence intervals computed by using the same procedure will include the true population value for 95% of all possible random samples taken from the population.
   B. The procedure that is used to determine the confidence interval will provide an interval that includes the population parameter with probability of 0.95.
   C. The probability that the true value of the population parameter falls between the bounds of an already computed confidence interval is roughly 95%.
   D. If we consider all possible randomly selected samples of the same size from a population, the 95% is the percentage of those samples for which the confidence interval includes the population parameter.

Scenario for Questions 10 and 11: In a random sample of 50 men, 40% said they preferred to walk up stairs rather than take the elevator. In a random sample of 40 women, 50% said they preferred the stairs. The difference between the two sample proportions (men – women) is to be calculated.

10. Which of the following choices correctly denotes the difference between the two sample proportions that is desired?
    A. $p_1 - p_2 = 0.10$
    B. $\hat{p}_1 - \hat{p}_2 = 0.10$
    C. $p_1 - p_2 = -0.10$
    D. $\hat{p}_1 - \hat{p}_2 = -0.10$ ***<-Correct answer***

11. The standard error of $\hat{p}_1 - \hat{p}_2$ in this situation is .1051. Create an approximate 95% confidence interval for the appropriate parameter, and use it to answer the question: Although the sample proportions differ, is it feasible that equal proportions of men and women in the population prefer to walk up the stairs?
    The confidence interval is Sample estimate ± Multiplier × Standard error
    $\hat{p}_1 - \hat{p}_2 \pm 2.0\ (.1051)$
    $-0.10 \pm .2102$
    -0.3102 *to* $+0\ .1102$
    It is quite feasible that the population proportions are equal, in which case the population difference would be 0, which is well within the confidence interval of feasible values.