AP Statistics Practice Test
Unit Ten – Inference for the Proportion of a Population

Name_____Period_____Date_____

Vocabulary:

A survey was undertaken through the mail. The pollsters attempted to reach 1000 people to ask them the question, "Have efforts to promote equality for women gone far enough in the United States?" The pollsters received the survey from 715 people and of those, 363 responded "yes" to the question.

1. What is the value of the sample proportion? _____

2. What was the percent of nonresponse? Do you feel this is a problem? Explain.

3. I collect a random sample of size *n* from a population and from the data collected compute a 95% confidence interval for the proportion of the population. If I would like to decrease the size of the confidence interval, suggest two things that I could do to narrow my interval.

4. A random sample of 900 individuals has been selected from a large population. It was found that 180 are regular users of vitamins. Thus, the proportion of the regular users of vitamins in the population is estimated to be 0.20. Find the standard error of this estimate.

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5. Some scientists believe that a new drug would benefit about half of all people with a certain blood disorder. To estimate the proportion of patients who would benefit from taking the drug, the scientists will administer it to a random sample of patients who have the blood disorder. What sample size is needed so that the 95% confidence interval will have a *width* of 0.06?

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Multiple Choice:

6. A radio talk show host with a large audience is interested in the proportion *p* of adults in his listening area who think the drinking age should be lowered to eighteen. To find this out he poses the following question to his listeners. "Do you think that the drinking age should be reduced to eighteen in light of the fact that eighteen-year-olds are eligible for military service?" He asks listeners to phone in and vote "yes" if they agree the drinking age should be lowered and "no" if not. Of the 100 people who phoned in 70 answered "yes." Which of the following conditions for inference about a proportion using a confidence interval are violated?
   (a) The data are an SRS from the population of interest.
   (b) The population is at least ten times as large as the sample.
   (c) *n* is so large that both the count of successes n p and the count of failures $n(1 - p)$ are ten or more.
   (d) There appear to be no violations.
   (e) More than one condition is violated.

7. A study was conducted to estimate the proportion of American family who owned a VCR and/or a DVD player. A random sample of a large group of Americans was taken. The 95% confidence interval created from the data produced the interval (0.784, 0.844). Which of the following is correct?
   (a) Ninety-five percent of the time, a sample such as this one will produce a sample proportion between 0.784 and 0.844.
   (b) There is a 95% chance that the sample proportion from the data is between 0.784 and 0.844.
   (c) About 95% of Americans have between a 78% to 84% chance of owning a VCR and/or DVD player.
   (d) There is a 95% probability that the population proportion is between 0.784 and 0.844.
   (e) None of the statements are correct.

8. A researcher has conducted a survey using a simple random sample of 50 registered voters to create a confidence interval to estimate the proportion of registered voters favoring the election of a certain candidate for mayor. Assume that a sample proportion does not change. Which of the following best describes the anticipated effect on the width of the confidence interval if the researcher were to survey a random sample of 200, rather than 50, registered voters?
   (a) The width of the new interval would be about one-fourth the width of the original interval.
   (b) The width of the new interval would be about one-half the width of the original interval.
   (c) The width of the new interval would be about the same width as the original interval.
   (d) The width of the new interval would be about twice the width of the original interval.
   (e) The width of the new interval would be about four times the width of the original interval.

9. A polling organization asks a random sample of 1,000 registered voters which of two candidates they plan to vote for in an upcoming election. Candidate A is preferred by 400 respondents, Candidate B is preferred by 500 respondents, and 100 respondents are undecided. George uses a large sample confidence interval for two proportions to estimate the difference in the population proportions favoring the two candidates. This procedure is <u>not</u> appropriate because
   (a) the two sample proportions were not computed from independent samples
   (b) the sample size was too small
   (c) the third category, undecided, makes the procedure invalid
   (d) the sample proportions are different; therefore the variances are probably different as well
   (e) George should have taken the difference $\frac{500 - 400}{1,000}$ and then used a large sample confidence interval for a single proportion instead

10. In a test of H_0: $p = 0.4$ against H_a: $p \neq 0.4$, a sample of size 100 produces $z = 1.28$ for the value of the test statistic. Thus the *P*-value (or observed level of significance) of the test is approximately equal to:
    (a) 0.90
    (b) 0.40
    (c) 0.05
    (d) 0.20
    (e) 0.10

11. An opinion poll asks a random sample of adults whether they favor banning ownership of handguns by private citizens. A commentator believes that more than half of all adults favor such a ban. The null and alternative hypotheses you would use to test this claim are:
    (a) $H_0 : \hat{p} = 0.5; H_a : \hat{p} > 0.5$
    (b) $H_0 : \hat{p} = 0.5; H_a : \hat{p} \neq 0.5$
    (c) $H_0 : p = 0.5; H_a : p \neq 0.5$
    (d) $H_0 : p = 0; H_a : p > 0$

Free Response:

An association of Christmas tree growers in Indiana sponsored a sample survey of 500 Indiana households to help improve the marketing of Christmas trees. One question the researchers asked was, "Did you have a Christmas tree this year?" Of the 500 respondents, 407 answered "Yes."

12. Construct a 90% confidence interval for the proportion of Indiana households who had a Christmas tree last year. Do all steps.

Mars Inc., makers of M&M candies, claims that they produce plain M&Ms with the following distribution:

Brown: 30%	Red: 20%	Yellow: 20%
Orange: 10%	Green: 10%	Blue: 10%

A bag of plain M&Ms was selected randomly from the grocery store shelf, and the color counts were as follows:

Brown: 16	Red: 11	Yellow: 19
Orange: 5	Green: 7	Blue: 3

13. You want to conduct an appropriate test of the manufacturer's claim for the proportion of yellow M&Ms. Do all steps! Let $\alpha = .05$.

14. A polling organization announces that the proportion of American voters who favor congressional term limits is 64%, with a 95% confidence margin of error of 3%. Briefly explain what this means to a friend who knows very little about statistics. Don't just restate the sentence. There should be 2 sentences – one explaining the margin of error and one explaining what 95% confidence means.

Genetically modified foods. Europeans have been more skeptical than Americans about the use of genetic engineering to improve foods. A sample survey gathered responses from random samples of 863 Americans and 12,178 Europeans. (The European sample was larger because Europe is divided into several nations.) Subjects were asked to consider:

> *using modern biotechnology in the production of foods, for example, to make them higher in protein, keep longer, or change in taste.*

They were asked if they considered this "risky for society." In all, 52% of Americans and 64% of Europeans thought the application was risky.

15. Construct and interpret a 98% confidence interval for the percentage difference between Europe and the United States.

16. Using your confidence interval, is there evidence that the proportion of Americans and Europeans are different? Explain. (NO TEST)

17. An airline wants to know if there is a difference in the proportion of business travelers on the 4:00 p.m. flight between Chicago and New York and the 6:00 p.m. flight between the same two cities. These flights operate 7 days a week. Random samples of 40 passengers were taken from flight manifests of each flight for the past month. There were 12 business travelers on 4:00 p.m. flights and 18 on 6:00 p.m. flights. Is there a significant difference in the proportion of business travelers at these different times? Do all steps.

Review:

18. A study cannot be an experiment if

a) only a subset of an existing population is measured.
b) a well-defined procedure of random sampling is not constructed.
c) a bias in measures is discovered.
d) a confounding variable is identified.
e) a procedure of random assignment to treatments is not performed.

19. Which of the following variables yields data that would be suitable for use in a histogram?

a) color of hair
b) brand of stereo
c) species of trees
d) gender of an individual
e) length of a phone call

20. A point is called an influential point if:

a) it has a residual with a large absolute value compared to s_e.
b) it has a residual with a large absolute value compared to the mean residual.
c) it plays a large role in determining the slope of the least squares line.
d) it plays a small role in determining the correlation coefficient.
e) it plays a large role in determining the coefficient of determination.

21. Which of the following random variables is not continuous?

a) the birth weight of a newborn baby
b) the number of fumbles in a football game
c) the length of life of a 60 watt light bulb
d) time from take-off to landing of an airline flight
e) the velocity of an asteroid

22. Which of the following statements about normal curves is false?

a) Every normal curve is symmetric.
b) Every normal curve is symmetric about 0.
c) Every normal curve is bell-shaped.
d) Every normal curve is centered at its mean.
e) About 0.68 of the area under a normal curve is within 1 standard deviation of its mean.