AP Statistics – Test #12 review

1. An ecologist would like to estimate the mean carbon monoxide level of the air in a particular city. The carbon monoxide levels are measured on 14 days during a month and recorded. A histogram of the 14 readings is roughly symmetrical, with no outlying values. The mean and standard deviation of these values are 5.4 and 2.2 respectively. Assume the 14 days can be considered a simple random sample of all days. Which of the following is a correct statement?

   A. A 95% confidence interval for μ is $5.4 \pm 2.145\left(\frac{2.2}{\sqrt{14}}\right)$

   B. A 95% confidence interval for μ is $5.4 \pm 2.145\left(\frac{2.2}{\sqrt{13}}\right)$

   C. A 95% confidence interval for μ is $5.4 \pm 2.160\left(\frac{2.2}{\sqrt{14}}\right)$

   D. A 95% confidence interval for μ is $5.4 \pm 2.160\left(\frac{2.2}{\sqrt{13}}\right)$

   E. The sample is too small to trust the results.

2. Campaign managers conduct regular polls to estimate the proportion of people who will vote for their candidate in an upcoming election. Shortly before the actual election, the campaign manager doubles the sample size of the poll. What effect does this have on the estimate?

   A. It increases the reliability of the estimate.
   B. It decreases the standard deviation of the sampling distribution of the sample proportion.
   C. It decreases the variability in the population.
   D. It will reduce the effect of confounding variables.
   E. It reduces the bias that comes from interviewer effect.

3. When comparing a 95% confidence interval with a 99% confidence interval created from the same data, how will the intervals differ?

   A. The sample size must be known to determine the difference.
   B. The mean of the sample must be known to determine the difference.
   C. The use of the *t*-distribution or the *z*-distribution will determine how the two intervals differ.
   D. The 95% interval will be wider than the 99% interval.
   E. The 95% interval will be narrower than the 99% interval.

4. Which of the following is true about the *t*-distribution?

   A. The *t*-distribution is symmetrical about the mean.
   B. The *t*-distribution has more variation than the standard normal distribution.
   C. The *t*-distribution with k degrees of freedom has a smaller variance than the *t*-distribution with $k + 1$ degrees of freedom.
   D. Both *A* and *B* are true.
   E. All of the above are true.

5. There is no #5. Please keep moving.

6. To estimate the proportion of TV viewers watching a certain special, how large of a random sample is required so that the margin of error is 0.04 with 99.6 confidence?

   A. 18 B. 36 C. 96 D. 1296 E. 1492

7. A quality control engineer at a steel mill must estimate the mean tensile strength of a new machine using a random sample of 12 beams. The actual population distribution for this machine is unknown, but graphical displays of the sample indicate that the assumption of normality is reasonable. Since there are no historical data for this prototype machine, the variability of the process is completely unknown. The engineer determines a *t*-distribution rather than a *z*-distribution because…

   A. she has a small sample, making the *z*-distribution inappropriate.
   B. she is using data rather than theoretical methods to determine the mean.
   C. the data comes from only one machine.
   D. the variability of the machine is unknown.
   E. the t-distribution results in a narrower confidence interval.

8. A random sample of 25 tourists who visited Hawaii this summer spent an average of $1420 on this trip with a standard deviation of $285. The 95% confidence interval for the mean money spent by all tourists who visit Hawaii is…

   A. [$1302, $1538] B. [$1308, $1531] C. [$1397, $1443]
   D. [$1363, $1477] E. [$1385, $1465]

9. A sample of 1000 adults showed that 31% of them are smokers. To estimate the proportion of people in the entire population who smoke, what additional information would you need?

   A. The size of the population.
   B. The amount of confidence you desire in your estimate.
   C. The standard deviation for the number of smokers.
   D. The length of time the people smoked.
   E. All the information you need is contained in the original problem.

   A company wants to estimate the mean weight of all 32-ounce packages of its Yummy Taste cookies at 95% confidence. It is known that the standard deviation of net weights is .1 ounce. The sample size that will yield the margin of error within .02 ounces of the population mean is:

   A. 9 B. 10 C. 96 D. 97
   E. More information is needed.

10. A company is considering installing a facsimile machine at one of its offices. As part of the decision process, the company's manager wants to estimate the average number of documents that would be transmitted daily if the machine were installed. From experience at other offices, the company manager believes the standard deviation of the number of documents sent daily is 32. The manager also believes the number of documents transmitted daily is a normally

distributed random variable. The machine is tested over a random sample of 15 days, and the resulting sample mean is 267. Give a 99% confidence interval for the average number of documents that would be transmitted daily if the machine were installed.

11. An SRS of 1000 voters finds that 57% believe that competence is more important than character in voting for President of the United States.

    a. Determine a 95% confidence interval estimate for the percentage of voters who believe that competence is more important than character. Make sure you check your conditions/assumptions.

    b. If your parents know nothing about statistics, how would you explain to them why you can't simply say that 57% of voters believe that competence is more important.

    c. Explain to these same parents what is meant by "95% confidence".

12. Pollsters sometimes simply give a percentage result such as ""40% of the voters support candidate Victoria Bole," while at other time they express results in a form such as "40% plus or minus 5%." Tell what information is missing in such statements, and what a pollster might add so that readers can better understand the strength of such statements.

13. A random sample of 40 inner city gas stations shows a mean price for regular unleaded gasoline to be \$2.45 with a standard deviation of 5¢, while an SRS of 120 suburban stations shows a mean of \$2.38 with a standard deviation of 8¢.

    a. Construct 95% confidence interval estimates for the mean price of regular gas in inner city and suburban stations.

    b. Which confidence interval is wider? Why is that?

    c. Based on your answer in part *a*, are you confident that the mean price of inner city gasoline is less than \$2.50? Why or why not?

14. In a random sample of 30 subway cars during rush hour, the average number of riders per car was 83.5 with a standard deviation of 5.9.

    a. Establish a 90% confidence interval estimate for the average number of riders per car during rush hour.

    b. Assuming the same standard deviation of 5.9, how large a sample of cars would be necessary to determine the average number or riders to within ±1 at the 90% confidence level?

15. A Gallup Poll taken in May 2000 asked the question: "In general, do you feel that the laws covering the sale of firearms should be made: more strict, less strict, or kept as they are now?" Of the 493 men who responded, 52% said "more strict," while of the 538 women who responded, 72% said "more strict." Assuming these respondents constitute random samples of U.S. men and women, is there sufficient evidence to conclude that a higher proportion of women than men in the population think these laws should be made more strict? Justify your answer.

16. North Carolina State University looked at the factors that affect the success of students in a required chemical engineering course. Students must get a C or better in the course in order to continue as chemical engineering majors. There were 65 students from urban or suburban backgrounds, and 52 of these students succeeded. Another 55 students were from rural or small-town backgrounds; 30 of these students succeeded in the course.

    a. Construct a test to decide if there is evidence that urban and suburban students are more successful.

    b. Give a 90% confidence interval for the size of the difference.

17. The following were the approximate heights of 493 college women.

Height (cm)	Frequency	Height (cm)	Frequency
149	2	165	66
151	5	167	64
153	9	169	53
155	15	171	39
157	27	173	28
159	40	175	16
161	52	177	9
163	63	179	5

    Construct and interpret a 98% confidence interval.

18. Using the same information in the previous problem, is there evidence to suggest the mean height of college women is less than 166 cm?

19. A Gallup Poll taken on a random sample of Canadian adults in February 2000 asked the question: "Do you favor or oppose marriages between people of the same sex?" 431 out of 1003 respondants said that they were in favor. A similar poll was taken in April 1999 (Edwards and Mazzuza, 2000), and 360 out of 1000 people were in favor. Write the null and alternative hypotheses to test whether the proportion of adult Canadians who favor marriages between people of the same sex was different in April 1999 and February 2000.

20. You want to compute a 90% confidence interval for the mean of a population with unknown population standard deviation. The sample size is 30. What is the value of t^* that you would use for this interval?