Test 12A AP Statistics Name: ______________

Directions: Work on these sheets. Answer completely, but be concise. *Tables are attached.*

Part 1: Multiple Choice. *Circle the letter corresponding to the best answer.*

1. 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) $H_0 : p = 0; H_a : p > 0$
(e) None of the above. The answer is ______________________________.

2. Bags of a certain brand of tortilla chips claim to have a net weight of 14 ounces. Net weights actually vary slightly from bag to bag and are Normally distributed with mean μ. A representative of a consumer advocate group wishes to see if there is any evidence that the mean net weight is less than advertised and so intends to test the hypotheses
H_0: μ = 14, H_a: μ < 14
To do this, he selects 16 bags of this brand at random and determines the net weight of each. He finds the sample mean to be $\bar{x}$ = 13.82 and the sample standard deviation to be s = 0.24.

We conclude that we would
(a) reject H_0 at significance level 0.10 but not at 0.05.
(b) reject H_0 at significance level 0.05 but not at 0.025.
(c) reject H_0 at significance level 0.025 but not at 0.01.
(d) reject H_0 at significance level 0.01.
(e) fail to reject H_0 at the α = 0.10 level.

3. A Type I error in the previous question would mean
(a) concluding that the bags are being underfilled when they actually aren't.
(b) concluding that the bags are being underfilled when they actually are.
(c) concluding that the bags are not being underfilled when they actually are.
(d) concluding that the bags are not being underfilled when they actually aren't.
(e) none of these

4. You are thinking of using a *t* procedure to test hypotheses about the mean of a population using a significance level of 0.05. You suspect that the distribution of the population is not Normal and may be moderately skewed. Which of the following statements is correct?
(a) You should not use the *t* procedure because the population does not have a Normal distribution.
(b) You may use the *t* procedure if your sample size is large, say, at least 50.
(c) You may use the *t* procedure, but you should probably claim only that the significance level is 0.10.
(d) You may not use the *t* procedure. The *t* procedures are robust to non-Normality for confidence intervals but not for tests of hypotheses.
(e) You may use the *t* procedure if there are no outliers.

5. After once again losing a football game to the archrival, a college's alumni association conducted a survey to see if alumni were in favor of firing the coach. An SRS of 100 alumni from the population of all living alumni was taken. 64 of the alumni in the sample were in favor of firing the coach. Suppose you wish to see if a majority of living alumni are in favor of firing the coach. The appropriate test statistic is

(a) $z = (0.64 - 0.5)\Big/\sqrt{(0.64)(0.36)/100}$

(b) $z = (0.64 - 0.5)\Big/\sqrt{(0.5)(0.5)/100}$

(c) $z = (0.64 - 0.5)\Big/\sqrt{(0.64)(0.36)/64}$

(d) $z = (0.64 - 0.5)\Big/\sqrt{(0.5)(0.5)/64}$

(e) $t = (0.64 - 0.5)\Big/\sqrt{(0.5)(0.64)/100}$

6. We prefer the *t* procedures to the *z* procedures for inference about a population mean because

(a) *z* can be used only for large samples.

(b) *z* requires that you know the population standard deviation σ.

(c) *z* requires that you can regard your data as an SRS from the population of interest.

(d) *z* requires that your population be Normally distributed.

(e) *z* requires that your observations be independent.

7. Looking online (for example, at espn.go.com) you find the salaries of all 22 players for the Chicago Cubs as of opening day of the 2005 baseball season. The club total was $87 million, eighth in the major leagues. Which inference procedure would you use to estimate the average salary of the Cubs players?

(a) one-sample *z* interval for μ

(b) one-sample *t* interval for μ

(c) one-sample *t* test

(d) one-sample *z* test

(e) none of these

8. You read in the report of a psychology experiment that "separate analyses for our two groups of 12 participants revealed no overall placebo effect for our student group (mean = 0.08, SD = 0.37, $t(11) = 0.49$) and a significant effect for our non-student group (mean = 0.35, SD = 0.37, $t(11) = 3.28$, $p < 0.01$)." Are the two values given for the *t* test statistic correct? (The null hypothesis is that the mean effect is zero.)

(a) Yes, both are correct.

(b) The *t* statistic for the student group is correct, but the one for the non-student group is incorrect.

(c) The *t* statistic for the non-student group is correct, but the one for the student group is incorrect.

(d) Both *t* statistics are incorrect.

(e) We can't tell whether either *t* statistic is correct, because we aren't given the actual data.

Part 2: Free Response

Communicate your thinking clearly and completely.

9. In a study of the effectiveness of weight-loss programs, 47 subjects who were at least 20% overweight took part in a group support program for 10 weeks. Private weighings determined each subject's weight at the beginning of the program and 6 months after the program's end. The paired t test was used to assess the significance of the average weight loss. The paper reporting the study said, "The subjects lost a significant amount of weight over time, $t(46) = 4.68$, $P < 0.01$."

(a) What hypotheses were tested in this study? Be sure to define any parameters you use.

(b) Discuss whether each of the required conditions for using the paired t test is satisfied in this study.

(c) The paper follows the tradition of reporting significance only at fixed levels such as $\alpha = 0.01$. In fact the results are more significant than "$P < 0.01$" suggests. What is the P-value of this t test?

(d) Explain to someone who knows no statistics but is interested in weight-loss programs what the practical conclusion is.

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

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

A bag of plain M&M's 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

(a) You want to conduct an appropriate test of the manufacturer's claim for the proportion of yellow M&M's. Identify the population and parameter of interest. Then state hypotheses.

(b) State and verify the conditions for performing the significance test.

(c) Calculate the test statistic and the *P*-value.

(d) What do you conclude about the manufacturer's claim? Explain.

(e) Based on this sample, construct and interpret a 90% confidence interval for the proportion of yellow M&M's candies produced by Mars.

Answers to Chapter 12 Practice Test

Multiple Choice:

1. e
2. d
3. a
4. b
5. b
6. b
7. e
8. c

Free Response

9a) We want to test Ho: μ=0, Ha: $\mu \neq 0$ where μ = mean weight loss

9b) SRS – The subjects were probably not a random sample, hopefully they are representative of a larger population
Normality – sample size is large enough to assume normality (n>30)
Independent – The population is easily greater than 10 * 47

9c) Using Table C and df=50, we can see that the p-value is less than .0005 (off the chart)

9d) This means that over the 6 months, there was a significant mean weight loss for the subjects. The results do not appear to have happened by chance.

10a) Population of interest is all bags of plain M&Ms. We want to test Ho: p=.20, Ha: $p \neq .20$

10b) SRS – The bag must be thought of as a random sample of all plain M&Ms
Normality – np_0=12.2 and $n(1-p_0)$=48.8 both are at least 10
Independent – The population of all plain M&Ms is easily at least 610

10c) Test statistic is z = (.311-.2) / root((.2)* (.8) / 61) = 2.18 and p-value = .0292

10d) There is sufficient evidence to reject Ho amd conclude that the true percentage of yellow M&M''s is not 20%

10e) The 90% confidence interval should be .311 + 1.645* root((.311)(.689)/61)) = (.214,.408)