Chapter 9 AP Statistics Practice Test

Section I: Multiple Choice *Select the best answer for each question.*

T9.1. 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: $p = 0.5$; H_a: $p > 0.5$

(c) H_0: $p = 0.5$; H_a: $p < 0.5$

(d) H_0: $p = 0.5$; H_a: $p \neq 0.5$

(e) H_0: $p > 0.5$; H_a: $p = 0.5$

Show Answer

T9.2. You are thinking of conducting a one-sample t test about a population mean μ using a 0.05 significance level. 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 carry out the test because the population does not have a Normal distribution.

(b) You can safely carry out the test if your sample size is large and there are no outliers.

(c) You can safely carry out the test if there are no outliers, regardless of the sample size.

(d) You can carry out the test only if the population standard deviation is known.

(e) The t procedures are robust—you can use them any time you want.

Show Answer

T9.3. To determine the reliability of experts who interpret lie detector tests in criminal investigations, a random sample of 280 such cases was studied. The results were

	Suspect's True Status	
Examiner's Decision	Innocent	Guilty
"Innocent"	131	15
"Guilty"	9	125

If the hypotheses are H_0: suspect is innocent versus H_a: suspect is guilty, then we could estimate the probability that experts who interpret lie detector tests will make a Type II error as

(a) 15/280.

(b) 9/280.

(c) 15/140.

(d) 9/140.

(e) 15/146.

Show Answer

T9.4. A significance test allows you to reject a null hypothesis H_0 in favor of an alternative H_a at the 5% significance level. What can you say about significance at the 1% level?

(a) H_0 can be rejected at the 1% significance level.

(b) There is insufficient evidence to reject H_0 at the 1% significance level.

(c) There is sufficient evidence to accept H_0 at the 1% significance level.

(d) H_a can be rejected at the 1% significance level.

(e) The answer can't be determined from the information given.

Show Answer

T9.5. A random sample of 100 likely voters in a small city produced 59 voters in favor of Candidate A. The observed value of the test statistic for testing the null hypothesis H_0: $p = 0.5$ versus the alternative hypothesis H_a: $p > 0.5$ is

(a) $z = \dfrac{0.59 - 0.5}{\sqrt{\dfrac{0.59(0.41)}{100}}}$

(b) $z = \dfrac{0.59 - 0.5}{\sqrt{\dfrac{0.5(0.5)}{100}}}$

(c) $z = \dfrac{0.5 - 0.59}{\sqrt{\dfrac{0.59(0.41)}{100}}}$

(d) $z = \dfrac{0.5 - 0.59}{\sqrt{\dfrac{0.5(0.5)}{100}}}$

(e) $t = \dfrac{0.59 - 0.5}{\sqrt{\dfrac{0.5(0.5)}{100}}}$

Show Answer

T9.6. A researcher claims to have found a drug that causes people to grow taller. The coach of the basketball team at Brandon University has expressed interest but demands evidence. Over 1000 Brandon students volunteer to participate in an experiment to test this new drug. Fifty of the volunteers are randomly selected, their heights are measured, and they are given the drug. Two weeks later, their heights are measured again. The power of the test to detect an average increase in height of one inch could be increased by

(a) using only volunteers from the basketball team in the experiment.

(b) using $\alpha = 0.01$ instead of $\alpha = 0.05$.

(c) using $\alpha = 0.05$ instead of $\alpha = 0.01$.

(d) giving the drug to 25 randomly selected students instead of 50.

(e) using a two-sided test instead of a one-sided test.

Show Answer

T9.7. A 95% confidence interval for a population mean μ is calculated to be (1.7, 3.5). Assume that the conditions for performing inference are met. What conclusion can we draw for a test of H_0: $\mu = 2$ versus H_a: $\mu \neq 2$ at the $\alpha = 0.05$ level based on the confidence interval?

(a) None. We cannot carry out the test without the original data.

(b) None. We cannot draw a conclusion at the $\alpha = 0.05$ level since this test is connected to the 97.5% confidence interval.

(c) None. Confidence intervals and significance tests are unrelated procedures.

(d) We would reject H_0 at level $\alpha = 0.05$.

(e) We would fail to reject H_0 at level $\alpha = 0.05$.

Show Answer

T9.8. In a test of H_0: $p = 0.4$ against H_a: $p \neq 0.4$, a random sample of size 100 yields a test statistic of $z = 1.28$. The P-value of the test is approximately equal to

(a) 0.90.

(b) 0.40.

(c) 0.05.

(d) 0.20.

(e) 0.10.

Show Answer

T9.9. An SRS of 100 postal employees found that the average time these employees had worked at the postal service was 7 years with standard deviation 2 years. Do these data provide convincing evidence that the mean time of employment μ for the population of postal employees has changed from the value of 7.5 that was true 20 years ago? To determine this, we test the hypotheses H_0: $\mu = 7.5$ versus H_a: $\mu \neq 7.5$ using a one-sample t test. What conclusion should we draw at the 5% significance level?

(a) There is convincing evidence that the mean time working with the postal service has changed.

(b) There is not convincing evidence that the mean time working with the postal service has changed.

(c) There is convincing evidence that the mean time working with the postal service is still 7.5 years.

(d) There is convincing evidence that the mean time working with the postal service is now 7 years.

(e) We cannot draw a conclusion at the 5% significance level. The sample size is too small.

Show Answer

T9.10. Are TV commercials louder than their surrounding programs? To find out, researchers collected data on 50 randomly selected commercials in a given week. With the television's volume at a fixed setting, they measured the maximum loudness of each commercial and the maximum loudness in the first 30 seconds of regular programming that followed. Assuming conditions for inference are met, the most appropriate method for answering the question of interest is

(a) a one-proportion z test.

(b) a one-proportion z interval.

(c) a paired t test.

(d) a paired t interval.

(e) None of these.

Show Answer

Section II: Free Response *Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.*

T9.11. A software company is trying to decide whether to produce an upgrade of one of its programs. Customers would have to pay $100 for the upgrade. For the upgrade to be profitable, the company needs to sell it to more than 20% of their customers. You contact a random sample of 60 customers and find that 16 would be willing to pay $100 for the upgrade.

(a) Do the sample data give good evidence that more than 20% of the company's customers are willing to purchase the upgrade? Carry out an appropriate test at the $\alpha = 0.05$ significance level.

(b) Which would be a more serious mistake in this setting—a Type I error or a Type II error? Justify your answer.

(c) Other than increasing the sample size, describe one way to increase the power of the test in (a).

Show Answer

T9.12. "I can't get through my day without coffee" is a common statement from many students. Assumed benefits include keeping students awake during lectures and making them more alert for exams and tests. Students in a statistics class designed an experiment to measure memory retention with and without drinking a cup of coffee one hour before a test. This experiment took place on two different days in the same week (Monday and Wednesday). Ten students were used. Each student received no coffee or one cup of coffee, one hour before the test on a particular day. The test consisted of a series of words flashed on a screen, after which the student had to write down as many of the words as possible. On the other day, each student received a different amount of coffee (none or one cup).

(a) One of the researchers suggested that all the subjects in the experiment drink no coffee before Monday's test and one cup of coffee before Wednesday's test. Explain to the researcher why this is a bad idea *and* suggest a better method of deciding when each subject receives the two treatments.

(b) The data from the experiment are provided in the table below. Set up and carry out an appropriate test to determine whether there is convincing evidence that drinking coffee improves memory.

Student	No cup	One cup
1	24	25
2	30	31
3	22	23
4	24	24
5	26	27
6	23	25
7	26	28
8	20	20
9	27	27
10	28	30

Show Answer

T9.13. A government report says that the average amount of money spent per U.S. household per week on food is about $158. A random sample of 50 households in a small city is selected, and their weekly spending on food is recorded. The Minitab output below shows the results of requesting a confidence interval for the population mean μ. An examination of the data reveals no outliers.

One-Sample T

N	Mean	StDev	SE Mean	95% CI
50	165.00	20.00	2.83	(159.32, 170.68)

(a) Explain why the Normal condition is met in this case.

(b) Can you conclude that the mean weekly spending on food in this city differs from the national figure of $158? Give appropriate evidence to support your answer.

Show Answer

Chapter 9 AP Statistics Practice Test