CHAPTER 8 FORM C

Name_____ Course Number:_____ Section Number:_____

Directions: Answer the questions and solve the problems in the spaces provided, or attach paper. Circle the correct choice for each response set.

Provide an appropriate response.

1) Explain how to determine if a hypothesis test is one–tailed or two–tailed and explain how you know where to shade the critical region. Give an example for each which includes the claim, the hypotheses, and the diagram with the critical region shaded.

2) Jenny is testing a claim about a population mean. The hypotheses are as follows.

   H_0: $\mu = 50$

   H_1: $\mu > 50$

   She selects a simple random sample and finds that the sample mean is 54.2. She then does some calculations and is able to make the following statement: If H_0 were true, the chance that the sample mean would have come out as big (or bigger) than 54.2 is 0.3. What name is given to the value 0.3? Do you think that she should reject the null hypothesis? Why or why not?

Solve the problem.

3) Write the claim that is suggested by the given statement, then write a conclusion about the claim. Do not use symbolic expressions or formal procedures; use common sense.

   Of a group of 1000 people suffering from arthritis, 500 receive acupuncture treatment and 500 receive a placebo. Among those in the placebo group, 24% noticed an improvement, while of those receiving acupuncture, 44% noticed an improvement.

Express the null hypothesis and the alternative hypothesis in symbolic form. Use the correct symbol (μ, p, σ) for the indicated parameter.

4) A researcher claims that the amounts of acetaminophen in a certain brand of cold tablets have a standard deviation different from the $\sigma = 3.3$ mg claimed by the manufacturer.

A) $H_0: \sigma \neq 3.3$ mg
$H_1: \sigma = 3.3$ mg

B) $H_0: \sigma \leq 3.3$ mg
$H_1: \sigma > 3.3$ mg

C) $H_0: \sigma = 3.3$ mg
$H_1: \sigma \neq 3.3$ mg

D) $H_0: \sigma \geq 3.3$ mg
$H_1: \sigma < 3.3$ mg

Assume that the data has a normal distribution and the number of observations is greater than fifty. Find the critical z value used to test a null hypothesis.

5) $\alpha = 0.09$ for a right−tailed test.

A) ±1.96 B) ±1.34 C) 1.34 D) 1.96

Find the value of the test statistic z using $z = \dfrac{\hat{p} - p}{\sqrt{\dfrac{pq}{n}}}$.

6) The claim is that the proportion of drowning deaths of children attributable to beaches is more than 0.25, and the sample statistics include n = 700 drowning deaths of children with 20% of them attributable to beaches.

A) −3.06 B) 2.94 C) 3.06 D) −2.94

Use the given information to find the P−value. Also, use a 0.05 significance level and state the conclusion about the null hypothesis (reject the null hypothesis or fail to reject the null hypothesis).

7) With $H_1: p > 0.267$, the test statistic is $z = 1.56$.

A) 0.1188; reject the null hypothesis

B) 0.0594; fail to reject the null hypothesis

C) 0.9406; fail to reject the null hypothesis

D) 0.0594; reject the null hypothesis

Formulate the indicated conclusion in nontechnical terms. Be sure to address the original claim.

8) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a true mean temperature, μ, of 45°F, ideal for a certain type of German pilsner. The owner of the brewery does not agree with the refrigerator manufacturer, and claims he can prove that the true mean temperature is incorrect. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is to reject the null hypothesis, state the conclusion in nontechnical terms.

   A) There is not sufficient evidence to support the claim that the mean temperature is equal to 45°F.

   B) There is sufficient evidence to support the claim that the mean temperature is different from 45°F.

   C) There is sufficient evidence to support the claim that the mean temperature is equal to 45°F.

   D) There is not sufficient evidence to support the claim that the mean temperature is different from 45°F.

Assume that a hypothesis test of the given claim will be conducted. Identify the type I or type II error for the test.

9) A skeptical paranormal researcher claims that the proportion of Americans that have seen a UFO is less than 5 in a thousand. Identify the type I error for the test.

   A) Reject the claim that the proportion of Americans that have seen a UFO is equal to 5 in a thousand when that proportion is actually less than 5 in a thousand.

   B) Reject the claim that the proportion of Americans that have seen a UFO is equal to 5 in a thousand when that proportion is actually 5 in a thousand.

   C) Fail to reject the claim that the proportion of Americans that have seen a UFO is equal to 5 in a thousand when that proportion is actually less than 5 in a thousand.

   D) Fail to reject the claim that the proportion of Americans that have seen a UFO is equal to 5 in a thousand when that proportion is actually greater than 5 in a thousand.

Identify the null hypothesis, alternative hypothesis, test statistic, P–value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

10) In a clinical study of an allergy drug, 108 of the 202 subjects reported experiencing significant relief from their symptoms. At the 0.01 significance level, test the claim that more than half of all those using the drug experience relief.

Find the P–value for the indicated hypothesis test.

11) A manufacturer claims that fewer than 6% of its fax machines are defective. In a random sample of 97 such fax machines, 5% are defective. Find the P–value for a test of the manufacturer's claim.

A) 0.1591 B) 0.1736 C) 0.3264 D) 0.3409

Determine whether the given conditions justify testing a claim about a population mean μ.

12) For a simple random sample, the size is n = 25, $\sigma = 5.93$, and the original population is normally distributed.

A) Yes B) No

Identify the null hypothesis, alternative hypothesis, test statistic, P–value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

13) A random sample of 100 pumpkins is obtained and the mean circumference is found to be 40.5 cm. Assuming that the population standard deviation is known to be 1.6 cm, use a 0.05 significance level to test the claim that the mean circumference of all pumpkins is equal to 39.9 cm.

Test the given claim. Use the P–value method or the traditional method as indicated. Identify the null hypothesis, alternative hypothesis, test statistic, critical value(s) or P–value, conclusion about the null hypothesis, and final conclusion that addresses the original claim.

14) The maximum acceptable level of a certain toxic chemical in vegetables has been set at 0.4 parts per million (ppm). A consumer health group measured the level of the chemical in a random sample of tomatoes obtained from one producer. The levels, in ppm, are shown below.

0.31	0.47	0.19	0.72	0.56
0.91	0.29	0.83	0.49	0.28
0.31	0.46	0.25	0.34	0.17
0.58	0.19	0.26	0.47	0.81

Do the data provide sufficient evidence to support the claim that the mean level of the chemical in tomatoes from this producer is greater than the recommended level of 0.4 ppm? Use a 0.05 significance level to test the claim that these sample levels come from a population with a mean greater than 0.4 ppm. Use the P–value method of testing hypotheses. Assume that the standard deviation of levels of the chemical in all such tomatoes is 0.21 ppm.

Determine whether the hypothesis test involves a sampling distribution of means that is a normal distribution, Student t distribution, or neither.

15) Claim: $\mu = 78$. Sample data: $n = 24$, $\bar{x} = 101$, $s = 15.3$. The sample data, for this simple random sample, appear to come from a population with a distribution that is very far from normal, and σ is unknown.

A) Neither B) Normal C) Student t

Assume that a simple random sample has been selected from a normally distributed population. Find the test statistic, P–value, critical value(s), and state the final conclusion.

16) Test the claim that the mean age of the prison population in one city is less than 26 years. Sample data are summarized as $n = 25$, $\bar{x} = 24.4$ years, and $s = 9.2$ years. Use a significance level of $\alpha = 0.05$.

Assume that a simple random sample has been selected from a normally distributed population and test the given claim. Use either the traditional method or P–value method as indicated. Identify the null and alternative hypotheses, test statistic, critical value(s) or P–value (or range of P–values) as appropriate, and state the final conclusion that addresses the original claim.

17) A light–bulb manufacturer advertises that the average life for its light bulbs is 900 hours. A random sample of 15 of its light bulbs resulted in the following lives in hours.

995 590 510 539 739 917 571 555
916 728 664 693 708 887 849

At the 10% significance level, test the claim that the sample is from a population with a mean life of 900 hours. Use the P–value method of testing hypotheses.

18) A large software company gives job applicants a test of programming ability and the mean for that test has been 160 in the past. Twenty–five job applicants are randomly selected from one large university and they produce a mean score and standard deviation of 183 and 12, respectively. Use a 0.05 level of significance to test the claim that this sample comes from a population with a mean score greater than 160. Use the P–value method of testing hypotheses.

Find the critical value or values of χ^2 based on the given information.

19) H_1: $\sigma > 3.5$
n = 14
$\alpha = 0.05$

A) 23.685 B) 5.892 C) 22.362 D) 24.736

Use the traditional method to test the given hypothesis. Assume that the population is normally distributed and that the sample has been randomly selected.

20) Systolic blood pressure levels for men have a standard deviation of 19.7 mm Hg. A random sample of 31 women resulted in blood pressure levels with a standard deviation of 23.2 mm Hg. Use a 0.05 significance level to test the claim that blood pressure levels for women have the same variation as those for men.

1) Examples will vary. Relational operators in the alternative hypothesis indicate whether the test is one–tailed or two–tailed. Strict inequalities determine one–tailed tests, whereas "not equal to" and "different from" determine two–tailed tests. The critical region begins at the critical value for one–tailed tests and at both critical values for two–tailed tests. Shading begins at the critical value(s) and extends to the tails of the distribution.
2) 0.3 is the P–value. Since the P–value is large, she should not reject the null hypothesis. If H_0 were true, the sample mean could easily be as big as 54.2 by chance. So there is not sufficient evidence to reject H_0 in favor of the alternative H_1: $\mu > 50$.
3) The claim is that the proportion who notice an improvement in the treatment group is greater than the proportion who notice an improvement in the placebo group, i.e. that acupuncture is more effective than a placebo. If the acupuncture treatment and the placebo were equally effective, it would be very unlikely that the percentage of people in the group who notice an improvement in the acupuncture group would be so much greater than the percentage of people who notice an improvement in the placeboa group. The claim that acupuncture is more effective than a placebo therefore seems reasonable.
4) C
5) C
6) A
7) B
8) B
9) B
10) H_0: $p = 0.5$. H_1: $p > 0.5$. Test statistic: $z = 0.99$. P–value: $p = 0.1611$.
    Critical value: $z = 2.33$. Fail to reject null hypothesis. There is not sufficient evidence to support the claim that more than half of all those using the drug experience relief.
11) D
12) A
13) H_0: $\mu = 39.9$; H_1: $\mu \neq 39.9$. Test statistic: $z = 3.75$. P–value: 0.0002. Reject H_0. There is sufficient evidence to warrant rejection of the claim that the mean circumference of all pumpkins equals 39.9 cm.
14) H_0: $\mu = 0.4$ ppm
    H_1: $\mu > 0.4$ ppm
    Test statistic: $z = 0.95$
    P–value: 0.1711 (by Table A–2); P–value = 0.1716 (by STATDISK & TI–84+ calculator, given more precision for the test statistic, $z = 0.9477$.)
    Do not reject H_0. At the 5% significance level, the data do not provide sufficient evidence to support the claim that the mean level of the chemical in tomatoes from this producer is greater than the recommended level of 0.4 ppm.
15) A
16) $\alpha = 0.05$
    Test statistic: $t = -0.87$
    P–value: $p = 0.1966$ (by STATDISK & TI–84+ calculator); P–value > .10 (by Table A–3)
    Critical value: $t = -1.711$
    Because the test statistic, $t > -1.711$, we do not reject the null hypothesis. There is not sufficient evidence to support the claim that the mean age of the prison population in this city is less than 26 years.

17) H_0: $\mu = 900$ hrs. H_1: $\mu \neq 900$ hrs. Test statistic: $t = -4.342$. P−value < 0.01 (by Table A−3); P−value = 0.0007 (by STATDISK); P−value = 0.000676 (by TI−84+ calculator). Reject H_0. There is sufficient evidence to warrant rejection of the claim that the sample is from a population with a mean life of 900 hours. The light bulbs do not appear to conform to the manufacturer's specifications.
18) H_0: $\mu = 160$. H_1: $\mu > 160$. Test statistic: $t = 9.583$. P−value < 0.005 (by Table A−3); P−value = 0.0000 (by STATDISK); P−value = 5.60591E−10 (by TI−84+ calculator). Reject H_0. There is sufficient evidence to support the claim that the sample comes from a population with mean score greater than 160.
19) C
20) H_0: $\sigma = 19.7$. H_1: $\sigma \neq 19.7$. Test statistic: $\chi^2 = 41.607$. Critical values: $\chi^2 = 16.791, 46.979$. Fail to reject H_0. There is not sufficient evidence to warrant rejection of the claim that blood pressure levels for women have the same variation as those for men.