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) Define P–values. Explain the two methods of interpreting P–values.

2) In a population, 11% of people are left handed. In a simple random sample of 160 people selected from this population, the proportion of left handers is 0.10. What is the number of left handers in the sample and what notation is given to that number? What are the values of p and $\hat{p}$?

Solve the problem.

3) What do you conclude about the claim below? Do not use formal procedures or exact calculations. Use only the rare event rule and make a subjective estimate to determine whether the event is likely.

Claim: An employee of a company is equally likely to take a sick day on any day of the week. Last year, the total number of sick days taken by all the employees of the company was 143. Of these, 52 were Mondays, 14 were Tuesdays, 17 were Wednesdays, 17 were Thursdays, and 43 were Fridays.

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

4) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a true mean temperature, μ, of 48°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.

A) H_0: $\mu \geq 48°$ H_1: $\mu < 48°$
B) H_0: $\mu \neq 48°$ H_1: $\mu = 48°$
C) H_0: $\mu = 48°$ H_1: $\mu \neq 48°$
D) H_0: $\mu \leq 48°$ H_1: $\mu > 48°$

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) $\alpha = 0.05$ for a two–tailed test.

A) ±1.764
B) ±1.645
C) ±2.575
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 accidental deaths of the elderly attributable to residential falls is more than 0.15, and the sample statistics include $n = 900$ deaths of the elderly with 20% of them attributable to residential falls.

A) –3.96
B) –4.20
C) 3.96
D) 4.20

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: $p \neq 3/4$, the test statistic is $z = 0.77999997$.

A) 0.43540001; fail to reject the null hypothesis
B) 0.43540001; reject the null hypothesis
C) 0.2177 fail to reject the null hypothesis
D) 0.2177; reject the null hypothesis

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

8) A researcher claims that the amounts of acetaminophen in a certain brand of cold tablets have a standard deviation different from the $\sigma = 2.5$ mg claimed by the manufacturer. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is failure to reject the null hypothesis, state the conclusion in nontechnical terms.

A) There is not sufficient evidence to support the claim that the standard deviation is different from 2.5 mg.

B) There is sufficient evidence to support the claim that the standard deviation is different from 2.5 mg.

C) There is sufficient evidence to support the claim that the standard deviation is equal to 2.5 mg.

D) There is not sufficient evidence to support the claim that the standard deviation is equal to 2.5 mg.

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 medical researcher claims that 20% of children suffer from a certain disorder. Identify the type I error for the test.

A) Fail to reject the claim that the percentage of children who suffer from the disorder is equal to 20% when that percentage is actually 20%.

B) Reject the claim that the percentage of children who suffer from the disorder is different from 20% when that percentage really is different from 20%.

C) Fail to reject the claim that the percentage of children who suffer from the disorder is equal to 20% when that percentage is actually different from 20%.

D) Reject the claim that the percentage of children who suffer from the disorder is equal to 20% when that percentage is actually 20%.

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

10) A manufacturer considers his production process to be out of control when defects exceed 3%. In a random sample of 85 items, the defect rate is 5.9% but the manager claims that this is only a sample fluctuation and production is not really out of control. At the 0.01 level of significance, test the manager's claim.

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Find the P–value for the indicated hypothesis test.

11) In a sample of 47 adults selected randomly from one town, it is found that 9 of them have been exposed to a particular strain of the flu. Find the P–value for a test of the claim that the proportion of all adults in the town that have been exposed to this strain of the flu is 8%.

A) 0.0524 B) 0.0262 C) 0.0048 D) 0.0024

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

12) For a simple random sample, the size is $n = 17$, σ is not known, and the original population is normally distributed.

A) No B) Yes

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

13) Various temperature measurements are recorded at different times for a particular city. The mean of 20°C is obtained for 40 temperatures on 40 different days. Assuming that $\sigma = 1.5$°C, test the claim that the population mean is 22°C. Use a 0.05 significance level.

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) A simple random sample of 15–year old boys from one city is obtained and their weights (in pounds) are listed below. Use a 0.01 significance level to test the claim that these sample weights come from a population with a mean equal to 150 lb. Assume that the standard deviation of the weights of all 15–year old boys in the city is known to be 16.7 lb. Use the traditional method of testing hypotheses.

150 138 158 151 134 189 157 144 175 127 164

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

15) Claim: $\mu = 959$. Sample data: $n = 25$, $\overline{x} = 951$, $s = 25$. The sample data, for this simple random sample, appear to come from a normally distributed population with $\sigma = 28$.

A) Neither B) Normal C) Student t

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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 for the population of female college students, the mean weight is given by $\mu = 132$ lb. Sample data are summarized as $n = 20$, $\bar{x} = 137$ lb, and $s = 14.2$ lb. Use a significance level of $\alpha = 0.1$.

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) Use a significance level of $\alpha = 0.05$ to test the claim that $\mu = 32.6$. The sample data consist of 15 scores for which $\bar{x} = 38.9$ and $s = 8$. Use the traditional method of testing hypotheses.

18) In tests of a computer component, it is found that the mean time between failures is 520 hours. A modification is made which is supposed to increase the time between failures. Tests on a random sample of 10 modified components resulted in the following times (in hours) between failures.

518	548	561	523	536
499	538	557	528	563

At the 0.05 significance level, test the claim that for the modified components, the mean time between failures is greater than 520 hours. Use the P–value method of testing hypotheses.

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

19) $H_1: \sigma < 0.629$
$n = 19$
$\alpha = 0.025$

A) 31.526 B) 8.907 C) 8.231 D) 7.015

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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) A machine dispenses a liquid drug into bottles in such a way that the standard deviation of the contents is 81 milliliters. A new machine is tested on a sample of 24 containers and the standard deviation for this sample group is found to be 26 milliliters. At the 0.05 level of significance, test the claim that the amounts dispensed by the new machine have a smaller standard deviation.

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1) A P–value is the probability of getting a value of the sample test statistic that is at least as extreme as the one found from the sample data, assuming that the null hypothesis is true.
1) Compare the P–value to α and reject if $p < \alpha$.
2) State the P–value and leave the conclusion of significance to the reader.
2) The number of left handers in the sample is denoted by x and is equal to 16.
$p = 0.11$, $\hat{p} = 0.10$.
3) If the employees were equally likely to take sick days on any day of the week, the probability of obtaining such a distribution of sick days would be extremely small. Therefore, by the rare event rule, we conclude that the claim that an employee of the company is equally likely to take a sick day on any day of the week is probably not correct.
4) C
5) D
6) D
7) A
8) A
9) D
10) H_0: $p = 0.03$. H_1: $p > 0.03$. Test statistic: $z = 1.57$. P–value: $p = 0.0582$.
Critical value: $z = 2.33$. Fail to reject null hypothesis. There is not sufficient evidence to warrant rejection of the manager's claim that production is not really out of control.
11) C
12) B
13) H_0: $\mu = 22$; H_1: $\mu \neq 22$. Test statistic: $z = -8.43$. P–value: 0.0002. Because the P–value is less than the significance level of $\alpha = 0.05$, we reject the null hypothesis. There is sufficient evidence to warrant rejection of the claim that the population mean temperature is 22°C.
14) H_0: $\mu = 150$ lb
H_1: $\mu \neq 150$ lb
Test statistic: $z = 0.67$
Critical–values: $z = \pm 2.575$
Do not reject H_0; At the 1% significance level, there is not sufficient evidence to warrant rejection of the claim that these sample weights come from a population with a mean equal to 150 lb.
15) B
16) $\alpha = 0.1$
Test statistic: $t = 1.57$
P–value: $p = 0.1318$ (by STATDISK & TI–84+ calculator); $0.10 <$ P–value $< .20$ (by Table A–3)
Critical values: $t = \pm 1.729$
Because the test statistic, $t < 1.729$, we fail to reject the null hypothesis. There is not sufficient evidence to warrant rejection of the claim that $\mu = 132$ lb.
17) H_0: $\mu = 32.6$. H_1: $\mu \neq 32.6$. Test statistic: $t = 3.050$. Critical values: $t = \pm 2.145$. Reject H_0. There is sufficient evidence to warrant rejection of the claim that the true mean is 32.6.
18) H_0: $\mu = 520$ hrs. H_1: $\mu > 520$ hrs. Test statistic: $t = 2.612$.
$.01 <$ P–value < 0.025 (by Table A–3); P–value $= 0.0141$ (by STATDISK & TI–84+ calculator).
Reject H_0. There is sufficient evidence to support the claim that the true mean is greater than 520 hours.
19) C
20) H_0: $\sigma = 81$. H_1: $\sigma < 81$. Test statistic: $\chi^2 = 2.370$. Critical value: $\chi^2 = 13.091$. Reject the null hypothesis. There is sufficient evidence to support the claim that the new machine produces a lower standard deviation.

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