ST311 Extra Practice

I HAVE PROVIDED Z-SCORES AND P-VALUES RELEVANT TO THESE PROBLEMS. USE THE PROVIDED INFORMATION ON PAGE 5 TO HELP YOU PIECE IT ALL TOGETHER.

The Precision Scientific Instrument Company manufactures thermometers that are supposed to give readings of 0°C at the freezing point of water. Tests on a large sample of these thermometers reveal that at the freezing point of water, some give readings below 0°C (denoted by negative numbers) and some give readings above 0°C (denoted by positive numbers). Assume that the mean reading is 0°C and the standard deviation of the readings is 1.00°C. Also assume that the frequency distribution of errors closely resembles the normal distribution. A thermometer is randomly selected and tested. Find the temperature reading corresponding to the given information.

1) If 7% of the thermometers are rejected because they have readings that are too high, but all other thermometers are acceptable, find the temperature that separates the rejected thermometers from the others. 1) _____

A) 1.39° B) 1.45° C) 1.48° D) 1.26°

2) If 6.3% of the thermometers are rejected because they have readings that are too high and another 6.3% are rejected because they have readings that are too low, find the two readings that are cutoff values separating the rejected thermometers from the others. 2) _____

A) -1.45° , 1.45° B) -1.46° , 1.46° C) -1.53° , 1.53° D) -1.39° , 1.39°

Provide an appropriate response.

3) Assume that adults have IQ scores that are normally distributed with a mean of 100 and a standard deviation of 15 (as on the Wechsler test). Find the IQ score separating the top 16% from the others. 3) _____

A) 108.1 B) 99.1 C) 85.0 D) 114.9

Assume that X has a normal distribution, and find the indicated probability.

4) The mean is $\mu = 15.2$ and the standard deviation is $\sigma = 0.9$. 4) _____
9.1Find the probability that X is greater than 15.2.

A) 0.9998 B) 1.0000 C) 0.0003 D) 0.5000

Find the indicated probability.

5) The diameters of bolts produced by a certain machine are normally distributed with a mean of 0.30 inches and a standard deviation of 0.01 inches. What percentage of bolts will have a diameter greater than 0.32 inches? 5) _____

A) 47.72% B) 37.45% C) 97.72% D) 2.28%

6) A bank's loan officer rates applicants for credit. The ratings are normally distributed with a mean of 200 and a standard deviation of 50. If an applicant is randomly selected, find the probability of a rating that is between 170 and 220. 6) _____

A) 0.1554 B) 0.3811 C) 0.2257 D) 0.0703

7) Assume that the weights of quarters are normally distributed with a mean of 5.67 g and a standard deviation 0.070 g. A vending machine will only accept coins weighing between 5.48 g and 5.82 g. What percentage of legal quarters will be rejected? 7) _____

A) 1.62% B) 2.48% C) 1.96% D) 0.0196%

Solve the problem.

8) The amount of snowfall falling in a certain mountain range is normally distributed with a mean of 89 inches, and a standard deviation of 14 inches. What is the probability that the mean annual snowfall during 49 randomly picked years will exceed 91.8 inches? 8) _____

A) 0.4192 B) 0.5808 C) 0.0808 D) 0.0026

9) Suppose that replacement times for washing machines are normally distributed with a mean of 9.3 years and a standard deviation of 1.1 years. Find the probability that 70 randomly selected washing machines will have a mean replacement time less than 9.1 years. 9) _____

A) 0.4357 B) 0.0643 C) 0.4286 D) 0.0714

10) The weights of the fish in a certain lake are normally distributed with a mean of 18 lb and a standard deviation of 12. If 16 fish are randomly selected, what is the probability that the mean weight will be between 15.6 and 21.6 lb? 10) _____

A) 0.0968 B) 0.6730 C) 0.3270 D) 0.4032

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

11) An entomologist writes an article in a scientific journal which claims that fewer than 3 in ten thousand male fireflies are unable to produce light due to a genetic mutation. Use the parameter p, the true proportion of fireflies unable to produce light. 11) _____

A) $H_0: p < 0.0003$ $H_1: p \geq 0.0003$

B) $H_0: p = 0.0003$ $H_1: p > 0.0003$

C) $H_0: p > 0.0003$ $H_1: p \leq 0.0003$

D) $H_0: p = 0.0003$ $H_1: p < 0.0003$

12) Carter Motor Company claims that its new sedan, the Libra, will average better than 25 miles per gallon in the city. Use μ, the true average mileage of the Libra. 12) _____

A) $H_0: \mu = 25$ $H_1: \mu < 25$

B) $H_0: \mu = 25$ $H_1: \mu > 25$

C) $H_0: \mu < 25$ $H_1: \mu \geq 25$

D) $H_0: \mu > 25$ $H_1: \mu \leq 25$

13) 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. 13) _____

A) $H_0: \mu \neq 48°$ $H_1: \mu = 48°$

B) $H_0: \mu \leq 48°$ $H_1: \mu > 48°$

C) $H_0: \mu = 48°$ $H_1: \mu \neq 48°$

D) $H_0: \mu \geq 48°$ $H_1: \mu < 48°$

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

14) A claim is made that the proportion of children who play sports is less than 0.5, and the sample statistics include n = 1899 subjects with 30% saying that they play a sport. 14) _____

A) 17.43 B) 35.58 C) -17.43 D) -35.58

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).

15) With $H_1: p \neq 0.221$, the test statistic is $z = 2.21$. 15) _____

A) 0.0136; reject the null hypothesis
B) 0.0272; reject the null hypothesis
C) 0.0272; fail to reject the null hypothesis
D) 0.0136; fail to reject the null hypothesis

16) With $H_1: p > 0.249$, the test statistic is $z = 0.41$. 16) _____

A) 0.3409; fail to reject the null hypothesis
B) 0.6818; reject the null hypothesis
C) 0.3409; reject the null hypothesis
D) 0.6591; fail to reject the null hypothesis

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

17) An entomologist writes an article in a scientific journal which claims that fewer than 17 in ten thousand male fireflies are unable to produce light due to a genetic mutation. 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. 17) _____

18) Carter Motor Company claims that its new sedan, the Libra, will average better than 30 miles per gallon in the city. 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. 18) _____

19) A skeptical paranormal researcher claims that the proportion of Americans that have seen a UFO, p, is less than 2 in every ten thousand. 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. 19) _____

20) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a true mean temperature, μ, of 42°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. 20) _____

FROM THIS POINT FORWARD, I WILL EXPECT YOU TO SOLVE THE PROBLEM BY GIVING THE TEST STATISTIC, USING PROPER NOTATION (z OR t) AND DRAWING A DIAGRAM OF THE NORMAL CURVE. THOUGH THE ANSWER KEY MENTIONS P-VALUES, DON'T CONCERN YOURSELF WITH FINDING THE P-VALUE.

I MAY SET UP A SCENARIO AND ASK FOR THE WORK UP TO THE TEST STATISTIC ALONG WITH A DIAGRAM OF THE NORMAL CURVE. OR I MAY GIVE YOU THE TEST STATISTIC AND P-VALUE AND ASK YOU TO CREATE THE DIAGRAM OF THE NORMAL CURVE ALONG WITH MAKING HYPOTHESIS TEST CONCLUSIONS.

MOST OF YOUR TEST WILL BE LIKE THIS!! ALL THE PROBLEMS THAT PRECEDE THIS ONE WERE TRYING TO SHOW THE VARIOUS PARTS OF THE STEPS REQUIRED TO GET THESE KINDS OF ANSWERS.

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

21) 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. 21) _____

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.

22) A public bus company official claims that the mean waiting time for bus number 14 during peak hours is less than 10 minutes. Karen took bus number 14 during peak hours on 18 different occasions. Her mean waiting time was 7.3 minutes with a standard deviation of 1.5 minutes. At the 0.01 significance level, test the claim that the mean waiting time is less than 10 minutes. Use the P-value method of testing hypotheses. 22) _____

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.

23) 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 $\alpha = 0.1$. 23) _____

THIS SECTION OF THE TEST IS CONFIDENCE INTERVALS. THESE SHOULD BE PRETTY STRAIGHTFORWARD. I WILL PROVIDE THE CRITICAL VALUES... FOR QUICK REFERENCE, 90% USES $Z_{ALPHA/2}$=1.645, 95% USES 1.96, AND 99%, WE USE 2.576.

Assume that a sample is used to estimate a population proportion p. Find the margin of error E that corresponds to the given statistics and confidence level. Round the margin of error to four decimal places.

24) 95% confidence; n = 470, x = 50 24) _____

A) 0.0335 B) 0.0293 C) 0.0279 D) 0.0251

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion p.

25) n = 51, x = 23; 95% confidence 25) _____

A) 0.336 < p < 0.566 B) 0.335 < p < 0.567
C) 0.314 < p < 0.588 D) 0.313 < p < 0.589

26) A survey of 865 voters in one state reveals that 408 favor approval of an issue before the legislature. Construct the 95% confidence interval for the true proportion of all voters in the state who favor approval. 26) _____

A) 0.435 < p < 0.508 B) 0.471 < p < 0.472
C) 0.444 < p < 0.500 D) 0.438 < p < 0.505

Use the given degree of confidence and sample data to construct a confidence interval for the population mean μ. Assume that the population has a normal distribution.

27) n = 10, $\bar{x} = 12.7$, s = 3.7, 95% confidence 27) _____

A) 10.05 < μ < 15.35 B) 10.56 < μ < 14.84
C) 10.07 < μ < 15.33 D) 10.09 < μ < 15.31

28) A laboratory tested twelve chicken eggs and found that the mean amount of cholesterol was 198 milligrams with s = 10.5 milligrams. Construct a 95% confidence interval for the true mean cholesterol content of all such eggs. 28) _____

A) 191.2 mg < μ < 204.8 mg B) 191.4 mg < μ < 204.6 mg
C) 192.6 mg < μ < 203.4 mg D) 191.3 mg < μ < 204.7 mg

Use the confidence level and sample data to find a confidence interval for estimating the population μ. Round your answer to the same number of decimal places as the sample mean.

29) Test scores: n = 102, $\bar{x} = 77.4$, $\sigma = 6.5$; 99% confidence 29) _____

A) 75.7 < μ < 79.1 B) 76.1 < μ < 78.7 C) 75.9 < μ < 78.9 D) 76.3 < μ < 78.5

30) A laboratory tested 73 chicken eggs and found that the mean amount of cholesterol was 230 milligrams with $\sigma = 17.4$ milligrams. Construct a 95% confidence interval for the true mean cholesterol content, μ, of all such eggs. 30) _____

A) 225 mg < μ < 234 mg B) 227 mg < μ < 235 mg
C) 225 mg < μ < 233 mg D) 226 mg < μ < 234 mg

Table of Values

Find p (area to the left), given z.

z	p	z	p	z	p
0	0.5	1.4	0.9192	0.3	0.6179
-2	0.0228	0.2	0.5793	1.2	0.8849
-0.6	0.2742	-0.18	0.4279	2.21	0.9864
0.4	0.6554	-1.52	0.0641	0.41	0.6591
-2.71	0.0033	-0.2	0.4207	1.57	0.9418
2.14	0.9839	-0.8	0.2119		

Find z, given p (area to the left).

p	z	p	z	p	z
0.07	-1.48				
0.063	-1.53				
0.16	-0.99				
0.84	0.99				
0.5	0				
0.0228	-2				

1) C
2) C
3) D
4) D
5) D
6) B
7) C
8) C
9) B
10) B
11) D
12) B
13) C
14) C
15) B
16) A
17) There is sufficient evidence to support the claim that the true proportion is less than 17 in ten thousand.
18) There is sufficient evidence to support the claim that the mean is greater than 30 miles per gallon.
19) There is not sufficient evidence to support the claim that the true proportion is less than 2 in ten thousand.
20) There is sufficient evidence to support the claim that the mean temperature is different from 42°F.
21) 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.
22) H_0: μ = 10 min. H_1: μ < 10 min. Test statistic: t = -7.637. P-value < 0.005. Reject H_0. There is sufficient evidence to support the claim that the mean is less than 10 minutes.
23) α = 0.1
Test statistic: t = 1.57
P-value: p = 0.1318
Critical values: t = ±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 μ = 132 lb.
24) C
25) C
26) D
27) A
28) D
29) A
30) D