STAT 1030 Stats for Business Exam 3 Additional Practice Questions

DIRECTIONS:

- There are 26 practice questions. Choose the single best answer. Simulate the exam experience as much as possible by *answering all questions first* before checking them at the back. Use incorrect answers as a guide to go back and study the associated Notebook examples, worksheet questions, quizzes, and homework.
- Make <u>exact</u> numerical calculations, as we did in Topic 7 and Topic 8 homework.
- **Disclaimer:** Practice questions provide some useful review of Topics 7–8 and show the general exam *style*. The types of questions on Exam 3 will differ.
- Though the primary topics covered by Exam 3 are Topics 7–8, the concepts are cumulative so the exam may also include concepts from Topics 1–6.

Questions 1–3.

- 1. A confidence interval improves Step 6 of the Six Steps of Inference by
 - (a) calculating the shaded area in the Z curve.
 - (b) providing more precision than the best estimate for a population parameter.
 - (c) replacing the word "approximately" with a margin of error.
 - (d) providing a single numerical estimate for the population parameter.
- 2. The Topic 8 Notes show a cartoon with the two hypotheses H_0 and H_A as figures boxing in a ring. Speaking metaphorically, which of these hypotheses is considered the more *aggressive* boxer?
 - (a) H_0
 - (b) $H_{\rm A}$
 - (c) both H_0 and H_A
 - (d) neither H_0 nor H_A
- 3. The sample size n most directly represents which of the following?
 - (a) wealth of sample information
 - (b) margin of error
 - (c) the right-hand shaded area in the t table
 - (d) the determining factor between a means problem and a proportions problem
 - (e) Type I error

Questions 4–8.

The level of carbon monoxide air pollution in parts per million (ppm) is measured at an entrance ramp to interstate highway I-80 near Iowa City each day. Measurements from two different samples are summarized as follows:

Sample 1:	Sample 2:
n = 96	n = 143
$\bar{x} = 126.8$	$\bar{x} = 126.8$
s = 140.2	s = 140.2

Let μ = mean daily level of carbon monoxide pollution at the entrance ramp, in ppm

- Interval 1 is a 90% confidence interval for μ calculated from Sample 1.
- Interval 2 is a 99% confidence interval for μ calculated from Sample 1.
- Interval 3 is a 99% confidence interval for μ calculated from Sample 2.
- 4. Calculate Interval 1.
 - (a) (89.04, 164.56)
 - (b) (89.19, 164.41)
 - (c) (102.99, 150.61)
 - (d) (103.03, 150.57)
 - (e) (103.26, 150.34)
- 5. Calculate Interval 2.
 - (a) (89.04, 164.56)
 - (b) (89.19, 164.41)
 - (c) (102.99, 150.61)
 - (d) (103.03, 150.57)
 - (e) (103.26, 150.34)
- 6. Calculate Interval 3.
 - (a) (89.22, 164.38)
 - (b) (89.44, 164.16)
 - (c) (103.05, 150.55)
 - (d) (107.34, 146.26)
 - (e) None of the answers is correct to the second decimal place

- 7. Which statement about Interval 1 and Interval 2 is correct?
 - (a) Interval 1 is contained in Interval 2 since a larger percentage implies less precision in a confidence interval.
 - (b) Interval 1 is contained in Interval 2 since a larger percentage implies more precision in a confidence interval.
 - (c) Interval 2 is contained in Interval 1 since a larger percentage implies less precision in a confidence interval.
 - (d) Interval 2 is contained in Interval 1 since a larger percentage implies more precision in a confidence interval.
 - (e) Neither Interval 1 nor Interval 2 is entirely contained within the other interval.
- 8. Which statement about Interval 2 and Interval 3 is correct?
 - (a) Interval 2 is contained in Interval 3 since a larger sample size implies less precision in a confidence interval.
 - (b) Interval 2 is contained in Interval 3 since a larger sample size implies more precision in a confidence interval.
 - (c) Interval 3 is contained in Interval 2 since a larger sample size implies less precision in a confidence interval.
 - (d) Interval 3 is contained in Interval 2 since a larger sample size implies more precision in a confidence interval.
 - (e) Neither Interval 2 nor Interval 3 is entirely contained within the other interval.

Questions 9–11.

The amount of iron ore (in tons) which can be mined each day at various locations is known to be approximately normally distributed. Building a mine at any location is *economically feasible* if the mean production at that location is at least 20 tons per day. Samples of daily production at each of two locations are shown below.

Location 1 sample daily production = $\{14, 16, 19, 26, 13\}$

Location 2 sample daily production = $\{20, 24, 21, 11\}$

- 9. Find a 95% confidence interval for the mean daily iron ore production at Location 1.
 - (a) (12.90, 22.30) tons
 - (b) (11.60, 23.60) tons
 - (c) (15.34, 19.86) tons
 - (d) (12.61, 22.59) tons
 - (e) None of the answers is correct to the second decimal place
- 10. Find a 95% confidence interval for the mean daily iron ore production at Location 2.
 - (a) (10.09, 27.91) tons
 - (b) (14.55, 23.45) tons
 - (c) (12.41, 25.59) tons
 - (d) (11.23, 26.77) tons
 - (e) None of the answers is correct to the second decimal place
- 11. Which of these locations is plausibly economically feasible?
 - (a) Only Location 1 is plausibly economically feasible.
 - (b) Only Location 2 is plausibly economically feasible.
 - (c) Both locations are plausibly economically feasible.
 - (d) Neither location is plausibly economically feasible.
 - (e) More information is needed before this question can be answered.

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Questions 12–23.

The University of Iowa has a "health and fitness" goal that at least 40% of all students visit the Campus Rec Center at least once each semester. A survey of 80 UI students shows that 36 of these students did not visit the Rec Center in Fall 2015, often citing time pressure due to school and work as reasons in the survey. Did the university fail to meet its goal in Fall 2015, at 1% significance?

Use the parameter p = proportion of all UI students who visited the Campus Rec Center at least once in Fall 2015

12. <u>True or False</u>: The number 36 is a statistic.

Tip: There are four key concepts (population, sample, parameter, statistic) that we learned together with the Six Steps of Inference at the beginning of the semester and have used throughout Business Stats. Do you remember the definition of a *statistic*?

- (a) True
- (b) False
- (c) Additional information is needed before this question can be answered.
- 13. <u>True or False</u>: The number 40% is a statistic.
 - (a) True
 - (b) False
 - (c) Additional information is needed before this question can be answered.
- 14. <u>True or False</u>: The number 1% is a statistic.
 - (a) True
 - (b) False
 - (c) Additional information is needed before this question can be answered.
- 15. Determine the rejection region.
 - (a) Reject if Z < -2.575 or Z > 2.575
 - (b) Reject if t > 2.390
 - (c) Reject if t < -2.660 or t > 2.660
 - (d) Reject if Z < -2.33
 - (e) None of the answers is correct

(continued)

16. Calculate the value of the test statistic.

(a) 1.837 (b) 2.739 (c) 4.167 (d) 50.000

(e) None of the answers is correct to the third decimal place

17. Make a decision.

- (a) Reject H_A since the test statistic is in the rejection region.
- (b) Fail to Reject H_A since the test statistic is in the rejection region.
- (c) Reject H_A since the test statistic is not in the rejection region.
- (d) Fail to Reject H_A since the test statistic is not in the rejection region.
- (e) None of the answers is correct.

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- 18. Interpret the test.
 - (a) There is insufficient evidence to show that the university met its goal in Fall 2015.
 - (b) There is sufficient evidence to show that the university met its goal in Fall 2015.
 - (c) There is insufficient evidence to show that more than 40% of the 80 surveyed students attended the Campus Rec Center at least once in Fall 2015.
 - (d) There is sufficient evidence to show that more than 40% of the 80 surveyed students attended the Campus Rec Center at least once in Fall 2015.
 - (e) None of the answers is correct.
- 19. In this study we're protecting against a Type I error with a very low significance level of 1%. Describe the meaning of a Type I error in this study.
 - (a) Conclude that the university failed to meet its attendance goals for the Campus Rec Center in Fall 2015 when in fact it did meet those goals.
 - (b) Conclude that the university met its attendance goals for the Campus Rec Center in Fall 2015 when in fact it failed to meet those goals.
 - (c) Conclude that 40% of UI students attended the Campus Rec Center at least once in Fall 2015 when in fact some percentage other than 40% actually attended.
 - (d) Conclude that some percentage other than 40% of UI students attended the Campus Rec Center at least once in Fall 2015 when in fact 40% actually attended.
 - (e) Conclude that the sample proportion equals 40% when in fact it doesn't equal 40%.
- 20. Find the P-value.
 - (a) 0.0031 (b) 0.1841 (c) 0.8159 (d) 0.9969
 - (e) None of the answers is correct to the fourth decimal place.

(continued)

- 21. Which of the following best explains why the P-value is either less than 50% or more than 50%?
 - (a) There is overwhelming evidence against the null hypothesis so the risk in rejecting it is very low.
 - (b) The evidence actually favors the null hypothesis so the risk in rejecting it is very high.
 - (c) There is overwhelming evidence against the alternative hypothesis so the risk in rejecting it is very low.
 - (d) The evidence actually favors the alternative hypothesis so the risk in rejecting it is very high.
- 22. Find a 99% confidence interval for the percentage of UI students who attended the Campus Rec Center at least once in Fall 2015.
 (a) (30.2, 59.8) (b) (30.7, 59.3) (c) (40.2, 69.8) (d) (40.7, 69.3) (e) (44.1, 65.9)
- 23. With 99% confidence, did the university plausibly meet its goal in Fall 2015?
 - (a) Yes
 - (b) No
 - (c) Additional information is needed before this question can be answered.

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(end of Questions 12–23)

Questions 24–26.

A medical device company produces 50 mechanical heart valves each month. The valves are designed to be implanted during heart surgery. The company will decide to double its production of heart valves, beginning two years from now, if it can definitely conclude that less than 10% of all valves produced are defective.

At the end of each month, the company quality control officer receives a report which shows the number of defective valves produced during that month. She currently has the last six months of data at her disposal:

Month	Number of Defective Valves
1	4
2	3
3	14
4	9
5	2
6	4

24. Find a 95% confidence interval for the percentage of all heart valves produced which are defective.

(a) (8.32, 15.68) (b) (-51.69, 75.69) (c) (11.96, 12.04) (d) (10.12, 13.88)

- (e) None of the answers is correct to the second decimal place
- 25. If the company makes a decision based on the 95% confidence interval, will it decide to double production?
 - (a) Yes (b) No
 - (c) More information is needed before this question can be answered.
- 26. Suppose that the company statistician wants to calculate the percentage of defective heart valves to within 3% of the true percentage with 95% confidence. How many more months must she wait before she can make the calculation?
 - (a) 1 month (b) 2 months (c) 16 months (d) 22 months
 - (e) More information is needed before this question can be answered.

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(end of practice questions)

Solution

1. c 2. b 3. a 4. c 5. a 6. e (96.01, 157.59)7. a 8. d 9. e (11.11, 24.09)10. a 11. c 12. a 13. b 14. b 15. d 16. b 17. e Fail to Reject H_0 since the test statistic is not in the rejection region.

18. e

There is insufficient evidence to show that the university failed to meet its goal in Fall 2012.

19. a
20. d
21. b
22. d
23. a
24. a
25. b It's plausible but not definite that less than 10% of valves produced are defective.
26. c