

Name: \_\_\_\_\_  
BSAD 210—Montgomery College

## EXAM 2

### Practice #1

- There are 110 possible points on this exam. The test is out of 100.
- You have one class period to complete this exam, but you should be able to complete it in less than that
- Please turn off all cell phones and other electronic equipment.
- Be sure to read all instructions and questions carefully.
- Remember to show all your work. You may print your formulas in Excel using the Show Formulas option in the Formulas tab. Printed versions of your work showing formulas *and* showing the results counts as showing your work. But you must include both with your test for “showing your work” to count this way. Write your name on both print outs.
- Try all questions! You get zero points for questions that are not attempted.
- Note the last sheet lists all the equations you will need for this exam.
- *Please print clearly and neatly.*

**Part I: Matching.** Write the letter from the column on the right which best matches each word or phrase in the column on the left. You will not use all the options on the right and you cannot use the same option more than once.

2 points each.

- |                                 |  |
|---------------------------------|--|
| 1. ___ Central Limit Theorem    | A. Attempts to capture the true population mean but not always.  |
| 2. ___ Confidence interval      | B. Example: Buying a video game that turned out to be boring.  |
| 3. ___ Degrees of freedom       | C. Example: Determining that a machine is putting in twice as many chips in a bag as it was designed to.               |
| 4. ___ Practical significance   | D. Example: Refusing to major in a subject you find interesting and would lead to a great job.                         |
| 5. ___ Statistical significance | E. Justifies why a difference between the population and sample means does not mean something interesting is going on. |
| 6. ___ Type I Error             | F. Needed for critical t scores but not for critical z scores.   |
| 7. ___ Type II Error            | G. Needed for critical z scores but not for critical t scores.   |
|                                 | H. When the absolute value of the calculated score is greater than the critical score.                                 |
|                                 | I. When you know the population standard deviation.  |

**Part II: Multiple Choice.** Choose the best answer to the following.

4 points each.

8. Suppose you're running a poll to determine if Senator Andy Guzman will win his re-election. He has one opponent. Out of 100 likely voters surveyed, Sen. Guzman had 60% in favor of his re-election. What is the null hypothesis of this test?
- $\mu = 0.00$
  - $\mu = 0.40$
  - $\mu = 0.50$
  - $\mu = 0.60$
  - $\mu = 1.00$
9. Which of the following is an example of a two-tailed test?
- If your new internet is faster than the average.
  - Whether a clock keeps better time than the standard clock.
  - Testing if a different car frame design changes its strength.
  - Determining if a dispenser puts the right amount of catnip in a cat toy.
  - None of the above

10. Gordon's pizza company wants to offer a guarantee: if the pizza takes too much time to arrive, it's free. The accounting department says they can afford to give away no more than 4% of all pizzas. Suppose the time it takes to complete a delivery follows a normal distribution with an average of 20 minutes and a standard deviation of 2.4 minutes. Use Excel to determine, to the appropriate minute, what Gordon should set the guarantee at.
- 15
  - 16
  - 24
  - 25
  - None of the above
11. Yolanda wants to determine how much a steel cord can hold before it breaks. Assume such strength follows a normal distribution with a population standard deviation of 0.3 tons. At 95% confidence, she'd like a margin of error no more than 0.08 tons. How many cords should she test?
- 54
  - 55
  - 77
  - It is impossible to tell with the information provided.
  - It is possible to tell but the option is not listed here.
12. Suppose you sample various factories in Maryland and various factories in Virginia. You find that when you take into account the costs of labor, regulatory compliance, quality control, and other considerations, moving your factories to Virginia would save your firm \$15 a year. The calculated z-value associated with this difference is 3.52. At 99% confidence, what should your conclusion be?
- It's statistically significant and practically significant.
  - It's statistically significant but not practically significant.
  - It's not statistically significant but it is practically significant.
  - It's not statistically significant nor practically significant.
  - None of the above / It is impossible to tell with the information provided.
13. Suppose you gambled on some farmland which was priced very cheaply because it was once occupied by a feed lot. This could make the land very good, very poor, or have no effect. To test if your investment was a good one, you weigh a sample of 13 randomly select watermelons you just grew. You're new at watermelon planting so you can only go on the standard deviation of your sample which was four pounds with an average of 18.25 pounds. The average watermelon weighs 20 pounds. At 95% confidence, describe the results of your test.
- Reject the null because the result is less than the critical value.
  - Fail to reject the null because the result is less than the critical value.
  - Reject the null because the result is more than the critical value.
  - Fail to reject the null because the result is more than the critical value.
  - None of the above

14. Huyen runs a shoe company needs to figure out how much leather to order (which changes due to variations of assembly, differences in shoe sizes, etc.). Based on a sample of 40 pairs, each pair uses, on average, 0.56 square meters of leather with a sample standard deviation of 0.17. At 99.9% confidence, what's the confidence interval of leather, in square meters, used per pair of shoes?
- Between 0.464 & 0.656
  - Between 0.472 & 0.648
  - Between 0.487 & 0.633
  - Between 0.491 & 0.629
  - None of the above
15. Which of the following is a true statement?
- "As  $\alpha$  increases, the margin of error decreases."
  - "All practically significant results are statistically significant."
  - "You can determine optimal sample size even if you don't know  $\sigma$ ."
  - A & B
  - All of these are true
16. Consider a normal distribution with a mean of sixty and a standard deviation of eight. What percent of observations have a value more than 58 but no bigger than 61?
- 0.1%
  - 14.8%
  - 19.7%
  - 24.5%
  - None of the above
17. Alice works for an airline company. Her company recently launched a new ad campaign and she wants to see if had an effect on sales. Before the ad campaign, there would be 4,000 bookings a day with a standard deviation of 325 bookings. Alice lets the campaign go on for one week. She then examines data covering nine days after the ad campaign concludes. Over that nine days, the average number of bookings was 3,800 per day. Using standard thresholds for statistical significance, is this result statistically significant?
- It's not statistically significant.
  - It is statistically significant at a confidence level of 90%, but no higher.
  - It is statistically significant at a confidence level of 95%, but no higher.
  - It is statistically significant at a confidence level of 99%, but no higher.
  - It is statistically significant at a confidence level of 99.9%.
18. Where is the sample average in relation to a confidence interval?
- In the exact middle.
  - Somewhat near the middle; it depends on how the sample was gathered.
  - It depends on the standard deviation.
  - It's either at the low end or the high end of the interval.
  - It's impossible to know.

19. Jesse wants to estimate what percent of people have a cat with no more than two points of a margin of error. At 99% confidence how many people should he sample?
- 4,147
  - 4,147.36
  - 4,148
  - It's impossible to determine with the information provided.
  - It is possible to tell how many to sample, but it's none of these.

**Part III: Short Answer.** *Answer the following.*

16 points each.

20. The self-checkout was invented by David R. Humble in 1984. It uses a scale to confirm the item scanned was placed in the bag. But all item weights vary. And some weights—like of the bread baked in the store—vary a lot. So the self-checkout uses a confidence interval: as long as the weight of the item is in the interval, the computer reads it as the item in question. Suppose you're programming the computer with bread weights. You test the weight of 12 loaves of bread, getting an average of 1.4 pounds with a population standard deviation of 0.2 pounds. To 99% confidence, what's the range of the confidence interval? Remember to show all your work and/or relevant Excel commands.

21. Suppose 34% of people drink coffee in the morning and you want to know the effect of a new advertising campaign your coffee company is about to launch. After it's launched, a survey (based on 2,395 people) reveals that 36% drink coffee in the morning. At 95%, 99%, and 99.9%, what should you conclude?

In answering this question, be sure to:

- Show your work on the calculated value
- Indicate what your calculated value is
- Indicate what your critical values are
- Determine if this is statistically significant

22. Gustav Graves is slicing meat at his deli. Like all meat slicers, his slices meat as thinly as physically possible; that way he gets the largest number of slices, and the most flavor, per pound of meat. Thinner slices are always better.

His meat slicer normally slices meat 0.8 mm thick but he's wondering if it needs to be cleaned and serviced. He uses it to make 14 slices. The average thickness of this sample is 1 mm with a standard deviation of 0.4.

At 95% confidence, does Gustav need to have his meat slicer serviced? If this difference is statistically significant, how would you know if it's practically significant (name at least two factors)?

In answering this question, be sure to:

- Show your work on the calculated value
- Indicate what your calculated value is
- Indicate what your critical value is
- Determine if this is statistically significant
- Determine how you would know if this is practically significant

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## Exam 2 Equation and Information Reference

| <i>Function</i> | <i>Output</i>   |
|-----------------|---|
| ABS             | The absolute value of an input  |
| AVERAGE         | Arithmetic mean of a dataset  |
| CONFIDENCE.NORM | Determines the margin of error to make a confidence interval (known $\sigma$ )                            |
| CONFIDENCE.T    | Determines the margin of error to make a confidence interval (unknown $\sigma$ )                          |
| CORREL          | Correlation coefficient of two variables  |
| CTRL + `        | Show formulas   |
| CTRL + F        | Find  |
| CTRL + P        | Print   |
| CTRL + X        | Cut highlighted area  |
| CTRL + C        | Copy highlighted area   |
| CTRL + V        | Paste highlighted area  |
| CTRL + Z        | Undo  |
| F4              | Makes cell reference absolute   |
| GEOMEAN         | Geometric mean of a dataset (adjustments must be added manually)  |
| LARGE           | Larger values of a dataset (k=1 is largest, k=2 is second largest, k=3 is third largest...)               |
| MAX             | Maximum value of a dataset  |
| MEDIAN          | Median of a dataset   |
| MIN             | Minimum value of a dataset  |
| MODE            | Mode of a dataset   |
| NORM.DIST       | Returns the normal distribution for a specified mean and standard deviation.                              |
| NORM.INV        | Returns the inverse of the normal cumulative distribution for a specified mean and standard deviation.    |
| NORM.S.DIST     | Returns the standard normal distribution.   |
| NORM.S.INV      | Returns the inverse of the standard normal cumulative distribution. Useful for finding critical z scores. |
| QUARTILE        | The 0 <sup>th</sup> to 4 <sup>th</sup> quartile of a dataset  |
| SQRT            | Finds the square root of the value in question.   |
| SMALL           | Smaller values of a dataset (k=1 is smallest, k=2 is second smallest, k=3 is third smallest...)           |
| STDEV.S         | Standard deviation of a sample  |
| T.INV           | Finds area under a t distribution; useful for finding one-tailed critical t scores.                       |
| T.INV.2T        | Finds area under a t distribution; useful for finding two-tailed critical t scores.                       |

Coefficient of Variation

$$CV_{\text{sample}} = \frac{s}{\bar{x}} (100)$$

z-test

$$z_{\bar{x}} = \left| \frac{\bar{x} - \mu_{H_0}}{\sigma/\sqrt{n}} \right|$$

Confidence interval for proportion

$$\widehat{CI}_{\bar{p}} = \bar{p} \mp z_{\alpha/2} \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

Proportion

$$z_p = \left| \frac{p - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}} \right|$$

Optimal Sample Size

$$n = \left( \frac{z_{\alpha/2} \sigma}{ME} \right)^2$$

t-test

$$n = \left( \frac{z_{\alpha/2}}{ME} \right)^2 \bar{p}(1-\bar{p})$$

$$t_{\bar{x}} = \left| \frac{\bar{x} - \mu_{H_0}}{s/\sqrt{n}} \right|$$

Critical z scores

Use =NORM.S.INV command

| Confidence | $\alpha$ | $z_{\alpha/2}$ | $z_{\alpha}$ |
|------------|----------|----------------|--------------|
| 90%        | 0.1      | 1.645          | 1.280        |
| 95%        | 0.05     | 1.960          | 1.645        |
| 99%        | 0.01     | 2.576          | 2.330        |
| 99.9%      | 0.001    | 3.291          | 3.090        |

Critical t scores

Use T.INV or T.INV.2T commands