Name: _____
BSAD 210—Montgomery College

EXAM 2

Practice A

- 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. Writing down what you put into Excel is sufficient to show your work.
- 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
2. ___ Confidence interval
3. ___ Degrees of freedom
4. ___ Practical significance
5. ___ Statistical significance
6. ___ Type I Error
7. ___ Type II Error

A. Attempts to capture the true population mean but not always.
B. Example: Buying a video game that turned out to be boring.
C. Example: Determining that a machine is putting in twice as many chips in a bag as it was designed to.
D. Example: Refusing to major in a subject you find interesting and would lead to a great job.
E. Justifies why a difference between the population and sample means does not mean something interesting is going on.
F. Needed for critical t scores but not for critical z scores.
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?
    a. $\mu = 0.00$
    b. $\mu = 0.40$
    c. $\mu = 0.50$
    d. $\mu = 0.60$
    e. $\mu = 1.00$

9. Which of the following is an example of a two-tailed test?
    a. If your new internet is faster than the average.
    b. Whether a clock keeps better time than the standard clock.
    c. Testing if a different car frame design changes its strength.
    d. Determining if a dispenser puts the right amount of catnip in a cat toy.
    e. None of the above

10. If the null hypothesis is rejected at the 99% level, what must be true?
    a. The null hypothesis is rejected at the 95% level.
    b. The null hypothesis is rejected at the 99.9% level.
    c. The p value is less than 0.01
    d. A & C
    e. All of the above

11. 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?
    a. It's statistically significant and practically significant.
    b. It's statistically significant but not practically significant.
    c. It's not statistically significant but it is practically significant.
    d. It's not statistically significant nor practically significant.
    e. None of the above / It is impossible to tell with the information provided.

12. 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.
    a. Reject the null because the result is less than the critical value.
    b. Fail to reject the null because the result is less than the critical value.
    c. Reject the null because the result is more than the critical value.
    d. Fail to reject the null because the result is more than the critical value.
    e. None of the above

13. 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?
    a. Between 0.464 & 0.656
    b. Between 0.472 & 0.648
    c. Between 0.487 & 0.633
    d. Between 0.491 & 0.629
    e. None of the above

14. Suppose you wanted to if people spent an usually large amount of time looking at your website. Based on a sample of 300 users, you found they spent an average of 14.8 minutes looking at your website with 99% margin of error of 3 minutes. Suppose the average amount of time spent on a website is 12.2 minutes. Is your sample average statistically significant compared to the average?
    a. No, because the sample size is too small.
    b. No, because the population average is in the confidence interval.
    c. Yes, because the population average is larger than the margin of error.
    d. Yes, because the difference between the sample average and the population average is less than the confidence interval.
    e. Because you do not have the standard deviation, it is impossible to tell the answer to this question.

15. Which of the following is a true statement?
    a. "As α increases, the margin of error decreases."
    b. "All practically significant results are statistically significant."
    c. "There is no maximum value for the standard deviation of a sample proportion."
    d. A & B
    e. 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?
    a. 0.1%
    b. 14.8%
    c. 19.7%
    d. 24.5%
    e. None of the above

17. Alice is an analyst for an airline and she wants to know if removing the charge for checked bags will reduce how often people carry on their luggage. Suppose 60% of airline passengers have no checked bags. The airline decides to offer 122 different customers across five flights free checked bags and 52% of those customers have no checked bags. Using standard thresholds for statistical significance, is this result statistically significant?
    a. It's not statistically significant.
    b. It is statistically significant at a confidence level of 95%, but no higher.
    c. It is statistically significant at a confidence level of 99%, but no higher.
    d. It is statistically significant at a confidence level of 99.9%.
    e. There is not enough information to determine an answer.

18. Where is the sample average in relation to a confidence interval?
    a. In the exact middle.
    b. Somewhat near the middle; it depends on how the sample was gathered.
    c. It depends on the standard deviation.
    d. It's either at the low end or the high end of the interval.
    e. It's impossible to know.

19. Suppose you find that 10% of men are "tall," with "tall" being defined as more than 72 inches tall. Assuming a symmetric normal distribution of height, if the standard deviation of men's height increased, what would happen?
    a. Fewer than 10% of men would be "tall."
    b. Fewer than 10% of men would be "tall" for small increases, but it would be the opposite for large increases.
    c. 10% of men would still be "tall."
    d. More than 10% of men would be "tall" for small increases, but it would be the opposite for large increases.
    e. More than 10% of men would be "tall."

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 or p-value is;
    - 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 or p-value is;
    - Determine if this is statistically significant;
    - Determine how you would know if this is practically significant

Exam 2 Equation and Information Reference

Function	*Output*
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 σ)
CONFIDENCE.T	Determines the margin of error to make a confidence interval (unknown σ)
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^{th} to 4^{th} 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.

Geometric Mean

$$Geometric\ Mean = \sqrt[n]{\prod_{i=1}^{n}(1 + x_i)} - 1$$

Weighted Average

$$Weighted\ Average = \frac{\sum_i^n (w_i x_i)}{\sum_i^n w_i}$$

Coefficient of Variation

$$CV = \frac{s}{\bar{x}}$$

Confidence interval for proportion

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

Hypothesis testing

z-test

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

t-test

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

z-test (proportion)

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

Critical z scores

Use =NORM.S.INV command

Confidence	*α*	$z_{\alpha/2}$	z_{α}
95%	0.05	1.960	1.645
99%	0.01	2.576	2.326
99.9%	0.001	3.291	3.090

Critical t scores

Use T.INV or T.INV.2T commands or see the table on the last page

p-values

Make your calculated value negative and then use one of the following (make sure cumulative is turned on):

	1 tail	*2 tails*
z	NORM.S.DIST	Multiply 1 tail result by 2
t	T.DIST	

Table B t distribution critical values

	Tail probability p											
df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	127.3	318.3	636.6
2	.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.09	22.33	31.60
3	.765	.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.21	12.92
4	.741	.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	.727	.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	.718	.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	.711	.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	.706	.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	.703	.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	.700	.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	.697	.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	.695	.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	.694	.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	.692	.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	.691	.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	.690	.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	.689	.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	.688	.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	.688	.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	.687	.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	.686	.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	.686	.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	.685	.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	.685	.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	.684	.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	.684	.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	.684	.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	.683	.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	.683	.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	.683	.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	.681	.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	.679	.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	.679	.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
80	.678	.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	.677	.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	.675	.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
∞	.674	.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291
	50%	60%	70%	80%	90%	95%	96%	98%	99%	99.5%	99.8%	99.9%
	Confidence level C											