Name: _____
BSAD 210—Montgomery College

EXAM 2

Practice B

- 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. ___ Alternative hypothesis
2. ___ Margin of error
3. ___ Null hypothesis
4. ___ Point estimate
5. ___ Proportion
6. ___ t distribution
7. ___ z distribution

A. Changes as n changes
B. Example: This person is allergic to cats.
C. Example: This person is not allergic to cats.
D. Example: Share of people who like cats.
E. Middle point for a confidence interval
F. Used when you know the population range
G. Used when you know the sample range
H. Used when you know the population standard deviation
I. What determines the size of a confidence interval

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

4 points each.

8. A smaller α always results in:
    a. A larger critical z score
    b. A larger confidence level
    c. A smaller confidence level
    d. A & B
    e. None of the above

9. Our definitions of type I error and type II error rely on understanding what the null hypothesis is. But it would be nice to have an accurate definition that does not rely on that technical detail. Which of the following definitions that don't refer to the null hypothesis describe type II error?
    a. Determining that an unusual thing is actually due to randomness.
    b. Mistakenly doing the unusual thing.
    c. Mistakenly doing the usual thing.
    d. Calculating a point estimate that's outside the confidence interval.
    e. None of the above makes sense

10. We say "fail to reject" the null hypothesis rather than "accept" the null hypothesis. Why?
    a. Because we don't have evidence that the null is correct.
    b. Because the difference between the parameter and the statistics is not zero.
    c. Because there is always randomness.
    d. A & B
    e. None of the above

11. A machine should put eight pounds of flour in a bag. Miguel tests if the machine is working well by weighing six randomly selected bags. The average weight of these bags is 6.1 pounds with a sample standard deviation of 1.2 pounds. What should Miguel conclude?
    a. It's statistically significant at the 95% level and lower.
    b. It's statistically significant at the 99% level and lower.
    c. It's statistically significant at the 99.9% level and lower.
    d. It's not statistically significant.
    e. It is impossible to tell with the information provided.

12. Suppose the flight time between two cities follows a normal distribution with an average of 2.5 hours and a standard deviation of ten minutes. What's the probability that the flight will last longer than 2 hours and 45 minutes (2.75 hours)?
    a. 0.0130
    b. 0.4900
    c. 0.9332
    d. It is impossible to tell with the information provided.
    e. It is possible to tell but the option is not listed here.

13. William Wails wonders which whistle works best for his whale-watching work. His whistle is important. When he sees a whale on a whale-watching trip, he can use the whistle to attract the attention of his passengers, but it's hard to hear over the wind and seas. His current whistle attracts 80% of passengers. He tries a new whistle and it attracts 83% of passengers. If you were to run an analysis on if this whistle is better, you need more information. What information do you need?
    a. How many trips he took.
    b. The cost of the new whistle.
    c. The standard deviation.
    d. A & C
    e. What you need isn't listed here.

14. Which idea explains why we can never "prove" anything in statistics?
    a. The central limit theorem
    b. Hypothesis testing
    c. The types of error
    d. The confidence level
    e. None of the above

15. What's the difference between practical significance and statistical significance?
    a. Statistical significance only occurs if there's practical significance.
    b. Practical significance focuses on z scores while statistical significance uses t scores.
    c. Statistical significance is the math side of the analysis while practical significance is more the business side of the analysis.
    d. A & C
    e. None; they are functionally the same thing.

16. Muhammad is running for a local election. He surveys 82 people and finds that 46 will vote for him. At 99.9% confidence, determine Muhammad's confidence interval.
    a. Between 0.381 & 0.741
    b. Between 0.392 & 0.730
    c. Between 0.420 & 0.702
    d. Between 0.433 & 0.689
    e. None of the above

17. Suppose there's a sample of 25 observations with a sample standard deviation of 4. What is the two-tailed critical value at 99% confidence?
    a. 0.9921
    b. 2.4922
    c. 2.5760
    d. 2.7874
    e. 2.7970

18. Suppose the calculated z score of a one-tailed hypothesis test is 2.45. What is the p-value of this test?
    a. 0.0071
    b. 0.0142
    c. 0.0198
    d. 0.9929
    e. It is impossible to tell with the information provided

19. Which of the following is/are true?
    a. "The CONFIDENCE function in Excel outputs the confidence interval."
    b. "A confidence interval made with a critical t score will be smaller than a confidence interval made with a critical z score (holding all else constant)."
    c. "A larger confidence interval is always preferred to a smaller one because you're more likely to include the population mean."
    d. B & C
    e. None of these are true

Part III: Short Answer. *Answer the following.*
16 points each.

20. Zachary Zambango is analyzing the amount of traffic at an intersection as part of a larger project to understand traffic patterns. He needs to know about how many cars pass through the intersection each weekday. After sampling 10 days, the sample average is 417.8 cars with a sample standard deviation of 38.8 cars. Give the confidence interval for 95% confidence and 99% confidence.

21. Suppose Octavian College advertises that 80% of its graduates find a job that requires a college degree within one year of getting their degrees. You wonder if this is accurate and test it by talking to 106 randomly selected recent graduates. Of those 106 recent graduates, 77 of them found a job that required a college degree. Is Octavian College's claim accurate?

    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-values are; and
    - Determine if this is statistically significant

22. I showed you how to derive the Empirical Rule in Excel. Using that same technique, determine a "new" empirical rule for 0.5, 1.5, and 2.5 standard deviations from the mean.

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

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

t-test

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

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											