STATISTICS 2023 **NAME, PRINT IN INK**_____

EXAM THREE **SIGNATURE, IN INK**_____

FALL 2018 **CWID IN INK**_____

Once this exam is graded and returned to you retain it for grade verification.
TRUE OR FALSE. Answer with a capital T or F. **(3 points each)**

_____ 1. The standard error of the point estimate for the population mean is the center of a confidence interval to estimate the population mean.

_____ 2. The width of a confidence interval to estimate the population mean can be increased by increasing the confidence level if the sample size and variance remain constant.

_____ 3. If the absolute value of the Z test statistic is equal to six, then the null hypothesis could be rejected with a reasonable error rate.

_____ 4. The only possible values for the parameter, population proportion, are the values zero, one, and the values between zero and one.

_____ 5. The decision in a hypothesis test is whether to reject or not reject the alternative hypothesis.

_____ 6. The p-value of a hypothesis test is the error rate that the researcher must tolerate if the statement in the null hypothesis is accepted and the alternative hypothesis shown to be false.

_____ 7. The t-multiplier in the bound of error in a 95% confidence interval to estimate the mean of a population with unknown variance based on only 20 observations would be the value 2.093, not 1.729.

Questions on the t-table. **State the answer on the line.** **(3 points each)**

_____ 8. What is the P ($t > -3.965$) if df=17?

_____ 9. What is the P ($-4.032 < t < 4.032$) if df=5?

_____ 10. State the value of t_o, if the P($-t_o < t < t_o$)=.998 and the df=20.

STATE THE ANSWER. Write the answer on the line. (3 points each)

_____ 11. How many units wide is a 98% confidence interval to estimate the mean based on a sample of 16 observations with a sample standard deviation of 20 units?

_____ 12. If a 90% confidence interval to estimate a population mean is (25.36, 28.48), what is the value of the point estimate for the population mean?

_____ 13. If a 99% confidence interval based on a large sample to estimate a population mean is (9.48, 86.76), then what is the value of the bound of error?

_____ 14. If the rejection region in a left-tail hypothesis test based on a large sample is below –2.326, what is the maximum error rate of rejecting a true null hypothesis that this researcher will tolerate?

_____ 15. If 313 out of 1000 consumers prefer the company's cereal brand, calculate a 95% confidence interval for the proportion of all consumers who prefer the company's brand? Round the interval answers to 3 decimal places.

_____ 16. If a two-tail hypothesis test on the population mean based on a large sample provides a test statistic value of – 1.56, what is the p-value of the hypothesis test?

_____ 17. In a left-tail hypothesis test based on a random sample of 12 observations the null hypothesis would be rejected at the error rate of 0.01 if the t test statistic is less than what value?

Many public polling agencies conduct surveys to determine the current consumer sentiment concerning the state of the economy. For example, the Bureau of Economic and Business Research (BEBR) at the University of Florida conducts quarterly surveys to gauge consumer sentiment in the Sunshine State. Suppose that BEBR randomly samples 500 consumers and finds that 266 are optimistic about the state of the economy. Use this information to answer the following questions.

_____ 18. What is the point estimate for the proportion of consumers who are optimistic about the state of the economy?

_____ 19. Based on the data what is the estimated standard error for the point estimate for the proportion of consumers who are optimistic about the state of the economy? Round to four digits past the decimal.

_____ 20. Assume that the estimated standard error of the point estimate for the proportion of consumers who are optimistic about the state of the economy is 0.04. What is the numerical value of the test statistic to check if the proportion is equal to 50% against an alternative that the proportion is greater than 50%?

STATE THE ANSWER. Write the answer on the line. (3 points each)

An institution of higher education is analyzing the changes in class size due to a new enrollment system. Class size changes for twelve classes have resulted in the following Excel output. Use this information to answer the questions on this page.

One Sample t test				
Subject	**Class Size change**		count	12
1	23		mean	4.67
2	15		std dev	11.15
3	-5		std err	3.22
4	7			
5	1		hyp mean	0
6	-10		α	0.05
7	12		tails	1
8	-8		df	11
9	20		t stat	1.45
10	8		p value	0.087585
11	-2		t crit	1.7959
12	-5		sig	no

_____ 21. What is the point estimate for the mean?

_____ 22. What is the estimated standard error of the point estimate for the mean?

_____ 23. What is the value of the test statistic to test the null hypothesis that the mean class size change is equal to 0?

_____ 24. What is the p-value to test the null hypothesis that the mean class size change is equal to 0 versus an alternative that the mean class size has increased?

_____ 25. What is the p-value to test the null hypothesis that the mean class size change is equal to 0 versus an alternative that the mean class size differs from 0?

_____ 26. What is the value of the test statistic to test the null hypothesis that the mean class size change is equal to 2? This value is not provided in the output, but can be calculated from the values provided. Round your answer to 3 digits past the decimal.

HYPOTHESIS TEST QUESTIONS. Write the answer on the line. (3 points each)

An auditing firm was hired to determine if a particular defense plant was overstating the value of their inventory items. Of particular interest was whether it could be demonstrated that the average is less than $55, in which case the defense plant would be subject to a loss of contract and financial penalties. It was decided that 9 items would be randomly selected and yielded a mean of $47 with a standard deviation of $9.60. Use this information to answer the following questions.

_____ 27. State the appropriate alternative hypothesis.

_____ 28. What is the numerical value of the test statistic to test the null hypothesis that the average amount is equal to $55?

_____ 29. Assume that the value of the test statistic in this situation was – 2.4 then the p-value associated with the test statistic value would be between what two values?

_____ 30. What is the maximum error rate of rejecting a true null hypothesis that this researcher will tolerate, if the rejection region in a left-tail hypothesis test is below – 1.860?

_____ 31. If the researcher performing this hypothesis test (left-tail) can not tolerate more than 1% chance of rejecting a true null hypothesis then what value must the test statistic be less than in order to reject the null hypothesis?

_____ 32. Assume the p-value in this hypothesis test is 10%. Would the null hypothesis be rejected at the 5% significance level in this case? Answer with a YES or NO.

_____ 33. Assume the p-value in this hypothesis test is 10%. Do the data indicate that the mean amount is less than $55 at the 5% significance level stated above? Answer with a YES or NO.

STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	**0.50**	**0.25**	**0.20**	**0.15**	**0.10**	**0.05**	**0.025**	**0.01**	**0.005**	**0.001**	**0.0005**
two-tails	**1.00**	**0.50**	**0.40**	**0.30**	**0.20**	**0.10**	**0.05**	**0.02**	**0.01**	**0.002**	**0.001**
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										