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

EXAM THREE   **SIGNATURE, IN INK**_____

SPRING 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 point estimate for the population parameter is the center of the confidence interval to estimate the population parameter.

_____ 2. The width of a confidence interval is equal to bound of error multiplied by 2.

_____ 3. If the null hypothesis is not rejected then the conclusion states that the data supports the value of the mean stated in the null hypothesis.

_____ 4. The rejection region in a hypothesis test is the tail area cut off by the calculated value of the test statistic.

_____ 5. In a hypothesis test the null hypothesis is rejected if the p-value of the test is large, since the p-value is the probability that the null hypothesis is false.

_____ 6. Population parameters are used to estimate sample statistics.

_____ 7. As the sample size increases the standard errors of the point estimates also increase.

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

_____ 8. What is the $P(t < 3.499)$ if df=7?

_____ 9. What is the $P(-2.110 < t < 2.110)$ if df=17?

_____ 10. State the value of t_o, if the $P(t < t_o)=.999$ and the df=22.

_____ 11. From a sample of 5 data values, which are, 8, -3, 7, -2, and 6, what is the estimate of the population standard deviation? Round your answer to three digits past the decimal.

_____ 12. If a two-tail hypothesis test on the population mean based on a large sample provides a test statistic value of -2.02 what is the p-value of the hypothesis test?

_____ 13. If the rejection region in a left-tail hypothesis test based on a large sample is below -1.645 what is the maximum error rate of rejecting a true null hypothesis which this researcher will tolerate?

_____ 14. If a 80% confidence interval to estimate a population mean is (75.25, 124.75) what is the value of the point estimate for the population mean?

_____ 15. If a 97% confidence interval based on a large sample to estimate a population mean is (112.9, 134.6) then what is the value of the bound of error?

_____ 16. If a 99% confidence interval based on a large sample to estimate a population mean is (75, 92), then would the value of 80 be rejected in a two tail test on the population mean at the alpha value of 1%? Answer yes or no.

_____ 17. A random sample of 784 observations yields a sample mean of 85 with a standard deviation of 14. What is the 95% confidence interval for the mean?

_____ 18. An attorney claims that more than 25% of all lawyers advertise. A sample of 100 lawyers in a certain city showed that 30 had used some form of advertising. What is the value of the test statistic to test that 25% of all lawyers advertise based on this sample? Use the estimated standard error based on the observed data. Round the answer to 2 decimal places.

_____ 19. How many observations are needed in the sample to construct a confidence interval to estimate a population mean to within a bound of error, B=3, using a 95% confidence interval and the standard deviation is known to be 17.2?

Unoccupied seats on flights cause airlines to lose revenue. Suppose a large airline wants to estimate its average number of unoccupied seats per flight over the past year. To accomplish this, the records of 225 flights are randomly selected and the sample mean is 11.2 seats and standard deviation is 2.4 seats. Use this information to answer the following questions.

_____ 20. What is the numerical value of the point estimate for the mean of unoccupied seats per flight?

_____ 21. What is the numerical value of the estimated standard error of the point estimate for the mean of unoccupied seats per flight?

_____22. What is the numerical value of the test statistic to test the null hypothesis that the mean of unoccupied seats per flight is equal to 11 seats against an alternative that the mean is not equal to 11 seats?

_____23. Assume that the estimated standard error of the point estimate for the mean of unoccupied seats per flight is 0.2. What is the numerical value of the bound of error for a 95% confidence interval to estimate the mean of unoccupied seats per flight?

A food-products company conducted a market study by randomly sampling and interviewing 100 consumers to determine which brand of breakfast cereal they prefer. Suppose 31 consumers were found to prefer the company's brand. Use this information to answer the following questions.

_____ 24. Based on this sample what is the numerical value of the point estimate for the proportion of all consumers who prefer the company's cereal brand?

_____ 25. What is the numerical value of the estimated standard error for the point estimate for the proportion of consumers who prefer the company's cereal brand? Round to three digits past the decimal.

_____ 26. Assume that the estimated standard error of the point estimate for the proportion of consumers who prefer the company's cereal brand is 0.05. What is the numerical value of the test statistic if the proportion is equal to 40% against an alternative that the proportion is less than 40%?

A physician wants to prove that joggers' maximum volume oxygen uptake is greater than the mean maximum volume oxygen uptake of all adults. A sample of 16 joggers has a mean of 40.6 ml/kg and a standard deviation of 6 ml/kg. Assume the average maximum volume oxygen uptake of all adults is 37 ml/kg. Use this information to answer the following questions.

_____ 27. State the appropriate alternative hypothesis that the physician should use.

_____ 28. What is the name of the distribution that represents the set of possible test statistic values, if in fact the mean joggers' maximum volume oxygen uptake is 37 ml/kg?

_____ 29. What is the numerical value of the test statistic to test the null hypothesis that joggers' maximum volume oxygen uptake is equal to the average of all adults?

_____ 30. Assume that the value of the test statistic is 2.5, then the p-value associated with the test statistic value would be between what two values?

_____ 31. If the researcher performing this hypothesis test cannot tolerate more than 5% chance of rejecting a true null hypothesis, then what value must the test statistic be greater than in order to reject the null hypothesis?

_____ 32. What is the maximum error rate of rejecting a true null hypothesis which the researcher will tolerate, if the rejection region in a right-tail hypothesis test is greater than 3.733?

_____ 33. Assume the p-value in this hypothesis test is 0.03. Would the null hypothesis be rejected at the 5% significance level in this case? 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					