STATISTICS 2023 **NAME IN PRINT**_____

EXAM THREE **SIGNATURE IN INK**_____

SPRING 2017 **CWID IN INK**_____

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TRUE OR FALSE. Answer with a capital T or F. (3 points each)

_____ 1. The alpha-value of a hypothesis test is the probability of rejecting a true null hypothesis and must be less than the p-value of the test in order to reject the null hypothesis.

_____ 2. Larger sample size produces larger standard errors for point estimators.

_____ 3. Population parameters are unknown constants that are estimated by sample statistics that are called point estimates.

_____ 4. The center value of a confidence interval is the point estimate for the parameter of interest.

_____ 5. In a hypothesis test the researcher makes a claim about the value of a sample statistic, and then the population data are used to decide whether the claim should be rejected.

_____ 6. A confidence interval provides a set of reasonable and plausible values for the parameter being estimated and those values would not be rejected if tested in a two-tail hypothesis test with the same significance level.

_____ 7. When the null hypothesis is not rejected then it is concluded that the data in the sample provide evidence in support of the claim stated in the null hypothesis.

t-table Questions. Write your answer on the line. 3 points each)

_____ 8. What is the P(t > 2.819) if df = 22?

_____ 9. State the value of t_o, if the P(t > t_o) = .975 and the df = 18.

_____ 10. What is the P(- 2.583 < t < 2.583) if df = 16?

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

_____ 11. If a sample of 16 observations produced a sample mean of 45 and a standard deviation 24 what is the 95% confidence interval to estimate the mean from this sample? State the lower and upper bounds of the interval; state 3 digits past the decimals.

_____ 12. If a 90% confidence interval to estimate the mean of a population of company profits is 32 to 63 what is the numerical value of the point estimate for the mean of company profits?

_____ 13. If the numerical value of the z-multiplier for a confidence interval to estimate the population mean based on a sample of 500 observations is 2.326, then what is the confidence level on which the interval was calculated?

_____ 14. The t test statistic based on 18 observations must be greater than what numerical value in order to reject the null hypothesis in a right-tail test with 1% significance level?

_____ 15. If the value of the z test statistic is -2.15 in a hypothesis test on the population mean, but the alternative hypothesis states that the mean is more than some specific number, then what is the p-value in this situation?

_____ 16. In a left-tail hypothesis test based on a random sample of only fourteen observations the null hypothesis could be rejected at a 1% significance level if the t test statistic value is less than what number?

_____ 17. If a two-tail hypothesis test on the population mean based on a large sample provides a p-value of 0.0628, then what is the positive value of the test statistic?

_____18. How many observations would be required to estimate the mean weekly profit of a company with a 95% confidence interval that is 45 units wide if the standard deviation of weekly profit for this company is known to be 112?

_____ 19. Assume a 95% confidence interval to estimate the proportion of students who attend OSU basketball games is (0.18, 0.24), what is the numerical value of the point estimate for the proportion of students who attend OSU basketball games?

_____ 20. Fifty-six percent of a sample of 400 on-line businesses indicated that incorporating advertisements provided by Google AdSense increased their profit. How many of the businesses indicated that the advertisements increased their profit?

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

Websites like iStockphoto.com sell photographs uploaded by private and professional photographers for use in print and web media. The management of iStockphoto.com is interested in the mean number of times that a photograph will be sold in the first month it is available. In order to estimate this parameter, they sampled 25 photographs and recorded the number of times each was sold during the first month it was available. The 25 observations yielded a mean of 8.2 with a standard deviation of 2.4. Use this information to answer the next four questions.

_____ 21. What is the point estimate for the mean number of times that a photograph will be sold in the first month it is available based on these 25 observations?

_____ 22. What is the estimated standard error of the estimate for the mean number of times that a photograph will be sold in the first month it is available?

_____ 23. If the estimated standard error for the estimate of the mean number of times that a photograph will be sold in the first month it is available is .6, what is the bound of error for a 90% confidence interval to estimate the mean number of times that a photograph will be sold in the first month it is available? State four digits past the decimal.

_____ 24. If the bound of error for a 90% confidence interval is 1.5, what is the 90% confidence interval to estimate the population mean based on the sample mean stated above? State the interval.

Prospective employers gather additional information about possible employees through information posted on the internet. Due to this, the University is interested in estimating the proportion of OSU students who have posted personal information on Facebook pages. Three-hundred twenty-four OSU students out of nine-hundred students questioned indicated they had posted personal information at Facebook. Use this information to answer the remaining questions on this page.

_____ 25. Based on this sample what is the point estimate for the proportion of OSU students who have posted personal information at Facebook?

_____ 26. What is the estimated standard error for the point estimate for the proportion of OSU students who have posted personal information at Facebook? Round to four digits past the decimal.

_____ 27. Assume the estimated standard error of the point estimate for the proportion of students who have posted personal information on Facebook is 0.03. Then, what is the numerical value of the z test statistic to check if the proportion is equal to 30% against an alternative that the proportion is greater than 30%?

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

A new type of solar panel is advertised to produce 315 watts of electricity. In quality testing during manufacturing, sixteen of the panels produced an average of 311 watts of electricity with a standard deviation of 20 watts. Use this data as a random sample to answer the questions on this page.

_____ 28. State the appropriate alternative hypothesis if the research question is, "Do these sixteen panels provide evidence that the mean watts of electricity produced by this type of panel is less than the 315 watts at which they are labeled?"

_____ 29. What is the numerical value of the test statistic to test the null hypothesis that the mean amount of electricity produced by these panels is equal to 315 watts?

_____ 30. What is the name of the distribution of the test statistic if in fact the mean amount of electricity produced by these panels is equal to 315 watts?

_____ 31. If the numerical value of the test statistic in this case was -0.9 then the p-value of this hypothesis test would be between what two values?

_____ 32. If the researcher performing this hypothesis test can not tolerate more than 1% chance of rejecting a true null hypothesis, then the test statistic must be less than what value in order to reject the null hypothesis?

_____ 33. If the p-value of this hypothesis test is equal to .2653 and the significance level chosen by the researcher is 0.05 should the conclusion be that the mean amount of electricity produced by these panels is less than 315 watts? Answer 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										