STATISTICS 2023 **NAME, IN PRINT**_____

EXAM THREE **SIGNATURE, IN INK**_____

SPRING 2016 **CWID, IN INK**_____

Retain this exam for grade verification once it is returned to you.

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

_____1. A confidence interval constructed with 95% confidence to estimate the population mean will definitely contain the value of the sample mean.

_____ 2. The data in a sample can be used to calculate the parameter values that are used to estimate the sample statistics.

_____ 3. The width of a confidence interval will always increase if the confidence level is increased when sample variance and sample size remain the same.

_____ 4. If the data does not support the alternative hypothesis, then the null hypothesis is shown to be true by the data.

_____ 5. If the value of the Z test statistic is equal to six, then the null hypothesis could be rejected in a right-tail test with a reasonable error rate.

_____ 6. Increasing the sample size in a research project increases the magnitude of the standard errors associated with the point estimates in the study.

t table questions **(3 points each)**

_____ 7. What is the P(t > 2.567) in the t with df=17?

_____ 8. What is the value of t_o if P(t < t_o) = .001, when df=11?

_____ 9. What is the P (-2.160 < t < 2.160), if df=13?

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

_____ 10. If a 99% confidence interval to estimate a population mean is (102.3, 203.9) what is the value of the point estimate for the population mean?

_____ 11. If a 95% confidence interval based on a large sample to estimate a population mean is (46.08, 53.92) then what is the value of the bound of error for the confidence interval?

_____ 12. How many flights would have to be sampled in order to estimate the average amount of time in minutes that a flight is late with a 95% confidence interval that is 12 minutes wide? Assume the standard deviation of the time a flight is late is 20 minutes.

_____ 13. If the rejection region in a two-tail hypothesis test based on a sample with 21 observations drawn from a population whose variance is unknown is below –2.528 and above 2.528 what is the significance level, or alpha value, associated with this hypothesis test?

_____ 14. What is the point estimate for population proportion if a 96% confidence interval for the proportion of college students who binge drink is (0.11, 0.27)?

_____ 15. What value must the magnitude of the test statistic exceed before the null hypothesis would be rejected with only 2% error rate in a two-tail hypothesis test based only on 15 observations in a situation where the population variance is unknown?

_____ 16. What is the magnitude of the test statistic if the p-value in a two-tail hypothesis test based on a large sample is equal to 0.0232?

Assume that 392 out of 1000 people surveyed said they preferred Pepsi to Coca-Cola. Use this information to answer the remaining questions on this page.

_____ 17. What is the point estimate for the proportion of people who prefer Pepsi to Coca-Cola? State your answer with 3 digits past the decimal.

_____ 18. What is the estimated standard error of the proportion of people who prefer Pepsi to Coca-Cola? Round your answer to three digits past the decimal.

_____ 19. If the estimated standard error of the proportion of people who prefer Pepsi to Coca-Cola is 0.012 then what is the value of the test statistic to test whether the proportion of people who prefer Pepsi to Coca-Cola is 40%? Round your answer to two digits past the decimal.

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

Unoccupied seats on flights cause airlines to lose revenue. Suppose a large airline wants to estimate its mean 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 questions on this page. Large sample implies use Z.

_____ 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 number of unoccupied seats per flight?

_____ 22. If a 99% confidence interval is constructed to estimate the mean number of unoccupied seats, what is the value of the bound of error? Round your answer to 3 digits past the decimal.

_____ 23. Assume that the bound of error for a 99% confidence interval to estimate the mean number of unoccupied seats per flight is 0.4, then what is the 99% confidence interval to estimate the mean?

_____ 24. What is the alternative hypothesis if the research question is, “Do the data provide evidence that the mean number of unoccupied seats is greater than 11?”

_____ 25. What is the value of the test statistic to test that the mean number of unoccupied seats is equal to 11?

_____ 26. Assume the population mean is 11. What is the probability that the sample mean is equal to 11?

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

Many new vehicles run on Compressed Natural Gas, CNG. The home filling stations for this type of fuel, called time-fill, typically inject less than half-gallon of CNG per hour into the vehicle. A new type of home fill system advertises that it can inject more than half-gallon of CNG on average per hour. Twenty-five periods of one hour in length were recorded and the observed mean fill was 0.52 gallon for the one-hour periods with a standard deviation of 0.05 gallon. Use these data as a random sample to answer the questions on this page.

_____ 27. What is the value of the point estimate for the mean fill of CNG per hour based on these data?

_____ 28. State the appropriate alternative hypothesis if the research question is, "Do these 25 observed fill times provide evidence that this new fill system has a mean injection of more than 0.5 gallon of CNG per hour?

_____ 29. What is the value of the test statistic to test the null hypothesis that the mean fill amount of CNG with this new type of home fill system is 0.5 gallon per hour?

_____ 30. What is the name of the distribution of the test statistic if in fact the average fill amount of CNG with this new type of home fill system is 0.5 gallon per hour?

_____ 31. If the value of the test statistic is 1.9, then based on the t table, the p-value is between what two values?

_____ 32. If the researcher in this situation cannot tolerate more than a 1% chance of rejecting a true null hypothesis, then what value must the test statistic exceed in order to reject the null hypothesis?

_____ 33. Assume the p-value of this hypothesis test is 0.041. Do the data support the idea that the mean fill amount exceeds 0.5 gallon per hour at the 0.05 level of significance? 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										