

STATISTICS 2023

PRINT NAME IN INK \_\_\_\_\_

EXAM THREE

SIGNATURE IN INK \_\_\_\_\_

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CWID IN INK \_\_\_\_\_

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TRUE OR FALSE. Answer with a capital T or F.

(3 points each)

\_\_\_\_\_ 1. The center value of a confidence interval is called the standard error of the point estimate for the population parameter being estimated.

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

\_\_\_\_\_ 3. A point estimate is a single number used to estimate a population parameter.

\_\_\_\_\_ 4. The standard errors of point estimators increase in magnitude as the number of observations in the sample increases.

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

\_\_\_\_\_ 6. In a hypothesis test the decision is whether to reject the null hypothesis; the conclusion is whether the data support the idea stated in the alternative hypothesis.

\_\_\_\_\_ 7. The rejection region in a hypothesis test is the tail area cut off by the calculated value of the test statistic.

Questions on the t-table. Write your answer on the line.

(3 points questions)

\_\_\_\_\_ 8. What is the  $P(t > 2.467)$  if  $df = 28$ ?

\_\_\_\_\_ 9. State the value of  $t_o$ , if the  $P(t > t_o) = .975$  and the  $df = 13$ .

\_\_\_\_\_ 10. What is the  $P(-1.833 < t < 1.833)$  if  $df = 9$ ?

\_\_\_\_\_ 11. What is the right tail area associated with the value 2.552 in the t-distribution with 18 degrees of freedom?

\_\_\_\_\_ 12. If the sum of the data in a sample with 50 observations is 775 what is the numerical value of the point estimate for the mean of the population from which the sample was drawn?

\_\_\_\_\_ 13. What is the numerical value of the z-multiplier for a confidence interval to estimate the population mean with 99% confidence from a sample of 200 observations?

\_\_\_\_\_ 14. The magnitude of the z test statistic must be greater than what numerical value in order to reject the null hypothesis in a two-tail test with 10% significance level?

\_\_\_\_\_ 15. If the value of the z test statistic is -0.85 in a hypothesis test on the population mean and the researcher is seeking evidence in the data that the mean is more than some specific number, what is the p-value in this situation?

\_\_\_\_\_ 16. In a right-tail hypothesis test based on a random sample of only fourteen observations the null would be rejected at the error rate of 0.05 if the t test statistic value exceeds what number?

\_\_\_\_\_ 17. If a two-tail hypothesis test on the population mean based on a large sample provides a z test statistic value of 1.72, what is the p-value of the hypothesis test?

\_\_\_\_\_ 18. How many observations would be required to estimate the average miles per gallon for a certain type of car with 95% confidence interval that is 5 units wide if the variance in the miles per gallon for this type of car is known to be 38?

\_\_\_\_\_ 19. Assume a 95% confidence interval to estimate the proportion of students who commute to campus from outside the Stillwater city limits is (0.28, 0.44). What is the numerical value of the proportion of students who commute to campus from outside Stillwater that was observed in the sample from which the above confidence interval was calculated?

\_\_\_\_\_ 20. A sample of 16 red tail hawks had an average wingspan of 24.2 inches and a standard deviation of 0.8. Based on this sample, what is the 95% confidence interval to estimate the average wingspan of the population of hawks from which this sample was drawn? Round the upper and lower bounds on your interval to three digits past the decimal.

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 6.2 with a standard deviation of 2.2. 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 0.6, what is the bound of error for a 95% 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 95% confidence interval is 1.5, what is the 95% confidence interval to estimate the population mean based on the sample mean stated above? State the interval.

**Four hundred students were questioned** about whether or not they had ever been to Gallagher-Iba Arena for a sports event. Out of the four hundred students questioned 290 students stated that they had been to Gallagher-Iba Arena for a sports event. Use this information to answer the remaining questions on this page.

\_\_\_\_\_ 25. Based on this sample what is the numerical value of the point estimate for the proportion of students who have been to Gallagher-Iba Arena for a sports event?

\_\_\_\_\_ 26. What is the numerical value of the estimated standard error for the point estimate for the proportion of students who have been to Gallagher-Iba Arena for a sports event? Round your answer to four digits past the decimal.

\_\_\_\_\_ 27. Assume the estimated standard error of the point estimate for the proportion of students who have been to Gallagher-Iba Arena for a sports event is 0.02. Then, what is the numerical value of the z test statistic to check if the proportion is equal to 75% against an alternative that the proportion is less than 75%?

The mean number of pirate attacks per month within 300 miles of the coast of Somalia seems to be increasing. Prior to 2014 the mean number of pirate attacks was 4.2 per month. In the last 16 months the observed monthly average was 7.8 and the standard deviation was 3.6. Use these 16 monthly observations to answer the questions on this page.

\_\_\_\_\_ 28. State the appropriate alternative hypothesis if the research question is, "Do these 16 months of data provide evidence that the mean monthly number of pirate attacks has increased from 4.2?"

\_\_\_\_\_ 29. What is the numerical value of the test statistic to test the null hypothesis that the mean monthly number of pirate attacks is equal to 4.2 per month?

\_\_\_\_\_ 30. What is the name of the distribution of the test statistic if in fact the mean monthly number of pirate attacks is 4.2 per month?

\_\_\_\_\_ 31. If the numerical value of the test statistic in this case was 3.9 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 what value must the test statistic exceed in order to reject the null hypothesis?

\_\_\_\_\_ 33. If the p-value of this hypothesis test is between 0.005 and 0.01 and the significance level chosen by the researcher is 0.05 should the null hypothesis be rejected? Answer YES or NO.



# 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	<b>0.50</b>	<b>0.25</b>	<b>0.20</b>	<b>0.15</b>	<b>0.10</b>	<b>0.05</b>	<b>0.025</b>	<b>0.01</b>	<b>0.005</b>	<b>0.001</b>	<b>0.0005</b>
two-tails	<b>1.00</b>	<b>0.50</b>	<b>0.40</b>	<b>0.30</b>	<b>0.20</b>	<b>0.10</b>	<b>0.05</b>	<b>0.02</b>	<b>0.01</b>	<b>0.002</b>	<b>0.001</b>
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
<b>Z</b>	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%
	<b>Confidence Level</b>										