Read Carefully. Give an answer in the form of a number or numeric expression where possible. Show all calculations. Use a value of 0.05 for any tests if α is not specified. Tables are provided. All multiple choice questions have one correct response unless "circle all that apply" is specified.

1) 3 points —Which of the following is NOT a measure of central tendency?

a) Median

b) Mode

c) Mean

d) Range

2) 3 points —Which of the following can be calculated by using logarithms?

a) Arithmetic mean

b) Geometric mean

c) Harmonic mean

d) Midrange

3) 3 points —What is the probability that a randomly selected value from a discrete uniform distribution ranging from 1 to 10 will yield a value of "5"?

a) 1.00

b) 0.00

c) 0.10

d) 0.01

4) 3 points —The empirical rule states that approximately what percent of a normal distribution will be between $\mu \pm 1\sigma$?

a) 50%

b) 68%

c) 74%

d) 84%

5) 3 points — Which of the following is closest to the meaning of the central limit theorem?

a) The estimate of the mean will become more reliable as the sample size increases

b) The sample mean is more nearly normal than the parent population.

c) The mean is an unbiased estimate of the population parameter μ.

d) The sample mean is a variable while the population mean is a constant.

6) 3 points — Which of the following is not a measure of dispersion?

a) variance

b) interquartile distance

c) midrange

d) standard deviation

7) 3 points — By definition, the 50^{th} percentile is also called which of the following?

a) midpoint

b) first quartile

c) median

d) mean

8) 3 points — When every observation in a dataset is multiplied by a constant "a" how is the standard deviation, σ, changed?

a) the new standard deviation is "a times σ"

b) the new standard deviation is "a plus σ"

c) the new standard deviation is "a^2 times σ"

d) the standard deviation would be unchanged

9) 27 points each — Answer the following as true (T) or false (F).

a) _____ A negatively skewed distribution will have a mean larger than the median.

b) _____ The use of parametric statistics assume that the data is normally distributed.

c) _____ Statistics are variables while parameters are constants.

d) _____ An event is certain to occur then its probability is one (1).

e) _____ If the mean is measured in inches the units on the standard deviation are also in inches.

f) _____ The corrected sum of squares are corrected for sampling error.

g) _____ When an estimate tends to be neither to large not to small in the long run, it is termed "unbiased".

h) _____ The inverse of the mean of the inverses of a sample of Y_i values is called the geometric mean of the sample.

i) _____ Power is the probability of NOT making a Type I (α) error.

10) 3 points What might you call a process that begins with observation and formulating an hypothesis and ends with evaluation and drawing a conclusion?

a) experimentation

b) trial and error

c) scientific method

d) statistical analysis

e) busy work

11) 8 points — Find the probabilities indicated by the expression below.

a) $P(Z \leq 0.51) = ?$ **P value = _____**

b) $P(-0.77 \leq Z \leq 1.32) = ?$ **P value = _____**

c) $P(t \leq -1.319) = ?$ **d.f. = 23** **P value = _____**

d) $P(|t| \leq 2.624) = ?$ **d.f. = 14** **P value = _____**

12) 12 points — Find the value of Z_0 or t_0 that yields the following probabilities.

a) $P(|Z| \leq Z_0) = 0.3030$ **Z_0 = _____**

b) $P(Z_0 \geq Z) = 0.3050$ **Z_0 = _____**

c) $P(Z_0 \leq Z \leq 1.96) = 0.8747$ **Z_0 = _____**

d) $P(t \leq t_0) = 0.200$ **d.f. = 4** **t_0 = _____**

e) $P(|t| \leq t_0) = 0.700$ **d.f. = 15** **t_0 = _____**

f) $P(|t| \geq t_0) = 0.200$ **d.f. = 9** **t_0 = _____**

13) 3 points — What percent of the observations in a sample would fall within the interquartile range (between Q1 and Q3)?

a) 25%

b) 50%

c) 75%

d) 100%

14) 6 points — The mean size of three-year-old Mud Sunfish is known to be 11 cm in North Carolina, and the variance is known to be 4.

a) What is the probability of picking a single Mud Sunfish at random that is equal to or over 15 cm in length?

b) A random sample of 25 Mud Sunfish from Louisiana were shown to have a mean size of only 9 cm. If the size in Louisiana is the same as North Carolina, what is the probability of taking 25 randomly chose fish and getting a mean as low or lower than 9 cm?

15) 5 points – A extensive study of hundreds of sites over many years has shown that the average maximum annual rainfall in Louisiana is 8 inches (known variance = 16). The maximum values for the last 9 years at LSU have averaged 10 inches. If LSU is not different from the other sampled stations, what is the probability of this occurrence (a mean of 10 inches or more of rainfall over 9 years)?

16) 12 points — A research biologist is studying the Blue Crabs in a Louisiana Bay. He has sampled 33 adult male crabs and found they have a mean size of 7 inches and a variance of 4 inches^2. A recent article that he read claimed that adult male crabs should have a mean of 8 inches. Test the sample he has taken to determine if it is different from the hypothesized value from the literature. Note that the student did not know in advance of taking his sample if the crabs in the area he is studying would be larger or smaller than the value cited in the literature.

1) H_0: $\mu = \mu_0$

Answer => **2)** Circle the one best choice: $\mathbf{H_1: \mu \neq \mu_0}$ $\mathbf{H_1: \mu > \mu_0}$ $\mathbf{H_1: \mu < \mu_0}$

3) Assume the sizes are normally distributed and the observations are independent.

4) $\alpha = 0.05$

5) A sample was taken and the results are given above.

Answer => 6) Give the calculated value of the test statistic? **b)** _____

Answer => Give the critical value of the statistic from the table? **c)** _____

Answer => 7) Conclusions (choose the one best statement below to summarize the results).

d) (1) - Fail to reject the null hypothesis. The results show that the sample does not differ from the result suggested by the literature.

(2) - Reject the null hypothesis. The results show that the sample is smaller than the hypothesized value.

Do not write in this space

Z-tables : Probability of a larger value

	0.00	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0.00	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.10	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.20	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.30	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.40	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.50	**0.3085**	**0.3050**	**0.3015**	**0.2981**	**0.2946**	**0.2912**	**0.2877**	**0.2843**	**0.2810**	**0.2776**
0.60	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.70	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.80	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.90	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.00	**0.1587**	**0.1562**	**0.1539**	**0.1515**	**0.1492**	**0.1469**	**0.1446**	**0.1423**	**0.1401**	**0.1379**
1.10	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.20	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.30	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.40	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.50	**0.0668**	**0.0655**	**0.0643**	**0.0630**	**0.0618**	**0.0606**	**0.0594**	**0.0582**	**0.0571**	**0.0559**
1.60	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.70	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.80	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.90	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.00	**0.0228**	**0.0222**	**0.0217**	**0.0212**	**0.0207**	**0.0202**	**0.0197**	**0.0192**	**0.0188**	**0.0183**
2.10	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.20	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.30	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.40	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.50	**0.0062**	**0.0060**	**0.0059**	**0.0057**	**0.0055**	**0.0054**	**0.0052**	**0.0051**	**0.0049**	**0.0048**
2.60	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.70	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.80	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.90	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.00	**0.0013**	**0.0013**	**0.0013**	**0.0012**	**0.0012**	**0.0011**	**0.0011**	**0.0011**	**0.0010**	**0.0010**
3.10	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.20	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.30	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.40	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.50	**0.0002**	**0.0002**	**0.0002**	**0.0002**	**0.0002**	**0.0002**	**0.0002**	**0.0002**	**0.0002**	**0.0002**
3.60	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.70	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.80	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.90	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.00	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

t - tables : Probability of a larger absolute value (two tailed test)											
d.f.	***0.500***	***0.400***	***0.300***	***0.200***	***0.100***	***0.050***	***0.020***	***0.010***	***0.002***	***0.001***	***d.f.***
1	1.000	1.376	1.963	3.078	6.314	**12.706**	31.821	**63.656**	318.289	636.578	**1**
2	0.816	1.061	1.386	1.886	2.920	**4.303**	6.965	**9.925**	22.328	31.600	**2**
3	0.765	0.978	1.250	1.638	2.353	**3.182**	4.541	**5.841**	10.214	12.924	**3**
4	0.741	0.941	1.190	1.533	2.132	**2.776**	3.747	**4.604**	7.173	8.610	**4**
5	**0.727**	**0.920**	**1.156**	**1.476**	**2.015**	**2.571**	**3.365**	**4.032**	**5.894**	**6.869**	**5**
6	0.718	0.906	1.134	1.440	1.943	**2.447**	3.143	**3.707**	5.208	5.959	**6**
7	0.711	0.896	1.119	1.415	1.895	**2.365**	2.998	**3.499**	4.785	5.408	**7**
8	0.706	0.889	1.108	1.397	1.860	**2.306**	2.896	**3.355**	4.501	5.041	**8**
9	0.703	0.883	1.100	1.383	1.833	**2.262**	2.821	**3.250**	4.297	4.781	**9**
10	**0.700**	**0.879**	**1.093**	**1.372**	**1.812**	**2.228**	**2.764**	**3.169**	**4.144**	**4.587**	**10**
11	0.697	0.876	1.088	1.363	1.796	**2.201**	2.718	**3.106**	4.025	4.437	**11**
12	0.695	0.873	1.083	1.356	1.782	**2.179**	2.681	**3.055**	3.930	4.318	**12**
13	0.694	0.870	1.079	1.350	1.771	**2.160**	2.650	**3.012**	3.852	4.221	**13**
14	0.692	0.868	1.076	1.345	1.761	**2.145**	2.624	**2.977**	3.787	4.140	**14**
15	**0.691**	**0.866**	**1.074**	**1.341**	**1.753**	**2.131**	**2.602**	**2.947**	**3.733**	**4.073**	**15**
16	0.690	0.865	1.071	1.337	1.746	**2.120**	2.583	**2.921**	3.686	4.015	**16**
17	0.689	0.863	1.069	1.333	1.740	**2.110**	2.567	**2.898**	3.646	3.965	**17**
18	0.688	0.862	1.067	1.330	1.734	**2.101**	2.552	**2.878**	3.610	3.922	**18**
19	0.688	0.861	1.066	1.328	1.729	**2.093**	2.539	**2.861**	3.579	3.883	**19**
20	**0.687**	**0.860**	**1.064**	**1.325**	**1.725**	**2.086**	**2.528**	**2.845**	**3.552**	**3.850**	**20**
21	0.686	0.859	1.063	1.323	1.721	**2.080**	2.518	**2.831**	3.527	3.819	**21**
22	0.686	0.858	1.061	1.321	1.717	**2.074**	2.508	**2.819**	3.505	3.792	**22**
23	0.685	0.858	1.060	1.319	1.714	**2.069**	2.500	**2.807**	3.485	3.768	**23**
24	0.685	0.857	1.059	1.318	1.711	**2.064**	2.492	**2.797**	3.467	3.745	**24**
25	**0.684**	**0.856**	**1.058**	**1.316**	**1.708**	**2.060**	**2.485**	**2.787**	**3.450**	**3.725**	**25**
26	0.684	0.856	1.058	1.315	1.706	**2.056**	2.479	**2.779**	3.435	3.707	**26**
27	0.684	0.855	1.057	1.314	1.703	**2.052**	2.473	**2.771**	3.421	3.689	**27**
28	0.683	0.855	1.056	1.313	1.701	**2.048**	2.467	**2.763**	3.408	3.674	**28**
29	0.683	0.854	1.055	1.311	1.699	**2.045**	2.462	**2.756**	3.396	3.660	**29**
30	**0.683**	**0.854**	**1.055**	**1.310**	**1.697**	**2.042**	**2.457**	**2.750**	**3.385**	**3.646**	**30**
32	0.682	0.853	1.054	1.309	1.694	**2.037**	2.449	**2.738**	3.365	3.622	**32**
34	0.682	0.852	1.052	1.307	1.691	**2.032**	2.441	**2.728**	3.348	3.601	**34**
36	0.681	0.852	1.052	1.306	1.688	**2.028**	2.434	**2.719**	3.333	3.582	**36**
38	0.681	0.851	1.051	1.304	1.686	**2.024**	2.429	**2.712**	3.319	3.566	**38**
40	**0.681**	**0.851**	**1.050**	**1.303**	**1.684**	**2.021**	**2.423**	**2.704**	**3.307**	**3.551**	**40**
45	0.680	0.850	1.049	1.301	1.679	**2.014**	2.412	**2.690**	3.281	3.520	**45**
50	0.679	0.849	1.047	1.299	1.676	**2.009**	2.403	**2.678**	3.261	3.496	**50**
75	0.678	0.846	1.044	1.293	1.665	**1.992**	2.377	**2.643**	3.202	3.425	**75**
100	0.677	0.845	1.042	1.290	1.660	**1.984**	2.364	**2.626**	3.174	3.390	**100**
∞	**0.674**	**0.842**	**1.036**	**1.282**	**1.645**	**1.960**	**2.326**	**2.576**	**3.090**	**3.290**	∞
d.f.	***0.250***	***0.200***	***0.150***	***0.100***	***0.050***	***0.025***	***0.010***	***0.005***	***0.001***	***0.0005***	***d.f.***
t - tables : Probability of a larger value (one tailed test)											