



PSYC 315/2 02 Statistical Analysis I - Mid Term Exam # 2

Name: _____ ID#: _____

There are two sections to this exam: multiple choice (15 marks), and calculation and short answer questions (35 marks), for a total out of 50 marks. Along with your exam, a sheet of formulas, a normal curve table, and a t table have been provided. Failure to put your name on the exam will result in a zero grade.

SECTION I – MULTIPLE CHOICE. SELECT THE BEST ANSWER FOR EACH QUESTION. PLEASE INDICATE YOUR ANSWERS ON THE MULTIPLE CHOICE ANSWER SHEET PROVIDED. THE MULTIPLE CHOICE SECTION IS DOUBLE-SIDED; MAKE SURE YOU ANSWER ALL QUESTIONS

1) The range of raw scores contained in an 80% confidence interval will be _____ the range of raw scores contained in a 95% confidence interval.

- A) larger than
- B) smaller than
- C) the same size as
- D) None of these answers is correct.

2) With very few degrees of freedom, the test statistic:

- A) becomes more reliable.
- B) should be a z test rather than a t test.
- C) needs to be more extreme to reject the null hypothesis.
- D) needs to be less extreme to reject the null hypothesis.

3) Type I and Type II error are:

- A) inversely related.
- B) positively related.
- C) not related at all.
- D) related only to convenience sampling.

4) The concept of effect size is preferred over statistical significance testing alone because it:

- A) is directly influenced by sample size.
- B) assess the relative importance of results.
- C) it tells us the magnitude of the statistical effect
- D) tells us the degree to which a result is statistically significant

5) The average salary for all 27 Arizona Diamondbacks in the 2005 baseball season was \$2,308,488, with a standard deviation of \$3,427,508. The population, all National League baseball players in 2005, earned an average salary of \$2,585,804, with a standard deviation of \$3,500,708. Does the average salary of the Diamondbacks players differ from that of all players in the National League? What statistical analysis would we use to answer this question?

- A) single-sample t test
- B) z test
- C) standard deviation analysis
- D) dependent-samples t test

6) Hout, Duncan, and Sobel (1987) reported on the relative sexual satisfaction of married couples. They asked each husband and wife of 91 married couples to rate the degree to which they agreed with the statement "Sex is fun for me and my partner." What statistical test would we use to determine whether there is, on average, a difference in the sexual satisfaction of husbands and wives?

- A) single-sample t test
- B) z test
- C) effect size test
- D) paired-samples t test

7) If the expected direction of an effect is incorrect, then using a one-tailed hypothesis test instead of a two-tailed hypothesis test:

- A) slightly increases power.
- B) slightly decreases power.
- C) makes power 1.0.
- D) makes power 0.

8) When hypothesis testing, a conservative approach is to use a _____ rather than a _____.

- A) two-tailed test; one-tailed test
- B) one-tailed test; two-tailed test
- C) null hypothesis; research hypothesis
- D) research hypothesis; null hypothesis

9) In a study with 15 degrees of freedom, what would be your cutoff score for a t distribution using a two-tailed test, with an alpha level = .01?

- A) 2.603
- C) 2.132

- B) 1.753
- D) 2.947

10) If you know the sample's variance but not the population's variance:

- A) you can look up the population's variance on a table
- B) you can do a t test anyway, because you don't need variance to conduct a t test
- C) you should not be confident when making inferences to the population from your sample data
- D) you can estimate the population's variance from the scores in your sample

11) In the situation in which the null hypothesis is true, the population distribution from which the sample was taken is:

- A) the same as the known population's distribution
- B) to the right of the original population distribution
- C) to the left of the original population distribution
- D) either to the right or left of the original distribution, depending on whether the mean of the sample is higher or lower than the mean of the original population

12) Having a very small amount of overlap between the null distribution, and the predicted sample distribution:

- A) reduces power
- B) increases power
- C) does not affect power
- D) indicates that the two distributions cannot be effectively compared

13) The logic of hypothesis testing involves figuring out the probability of getting a particular result when:

- A) the research (alternative) hypothesis is true
- B) the research (alternative) hypothesis is false
- C) the null hypothesis is false
- D) the null hypothesis is true

14) The shape of the t distribution:

- A) is typically bimodal
- B) is positively skewed
- C) will vary according to the means of the population that you use to estimate sample standard deviation
- D) will vary according to the degrees of freedom that you calculate based on your sample size

15) The term _____ is used for the distribution of means in place of the term standard deviation.

- | | |
|----------------------|-------------------------------|
| A) standard variance | B) population variance |
| C) mean variance | D) standard error of the mean |

Student Name: _____ ID#: _____

SECTION II – CALCULATION AND SHORT ANSWER QUESTIONS (TOTAL OF 35 POINTS)

Show all your calculations. Write your answers clearly in the space provided. If you need more room for each question, continue your answer on the back.

- 1) A public relations (PR) firm was hired by the National Hockey League (NHL) to determine if a new set of advertisements would increase the amount of support that the fans have for the owners in the current NHL lockout (I didn't make this up, this seriously happened). The PR firm was planning to test a group of fans with the new advertisements and compare their measures of support for the owners with established support mean ratings. You are hired by the PR firm to ensure that the design of the study is powerful enough to detect a significant difference if one truly exists.
 - a. What would you tell the PR firm is the minimum level of power that they would require, and why? (2 marks)
 - b. Describe 4 things that you can do to ensure that the study has adequate power. That is, name and describe the statistical principle that affects power. Be sure to describe the limitations (if any) associated with each measure you describe. (8 marks)

2) The average age for all licensed drivers in a particular county is $\mu = 42.6$, $\sigma = 12$, and the distribution is approximately normal. A county police officer was interested in whether the average age of drivers receiving speeding tickets differed from the average age of all the drivers in the country. She obtained a sample of $N = 16$ drivers who received speeding tickets. The average age for this sample was $M = 34.4$. Answer the following to 2 decimal places:

a. Calculate the 90% confidence interval for this sample mean. Provide an explanation about what the confidence interval around the sample mean tells you (3 marks)

b. Based on this confidence interval, make a decision to reject, or fail to reject the null hypothesis, assuming an alpha = 0.10. Make sure to defend your answer. (2 marks)

- 3) Provide an example of a study that would utilize a t test for a single sample (e.g., one sample t test). Describe three differences between the one sample t test and the z test (5 marks)

4) A study tested the effects of science fiction movies on people's beliefs in the supernatural. A scale was designed to measure the degree that a person believes in the supernatural (high scores indicate high levels of belief). Seven participants completed the scale before and after watching a popular science fiction movie. Participants' scores are listed below. The estimated standard deviation of the population is: 2.12 and the mean of the difference between the scores is -1.47. Answer the following to 2 decimal places:
(9 marks)

- a. Identify the two populations involved
- b. State H_0 and H_1 in symbols
- c. Determine the appropriate critical value required to reject H_0 using the alpha level: 0.01
- d. Calculate your test statistic,
- e. State your statistical conclusion
- f. Compute the 99% confidence interval. Provide an explanation about what the confidence interval tells you

- 5) What is meant by the term effect size? How is the calculation for an effect size different between a z test and a t test? How are they the same? (6 marks)

Formulas:

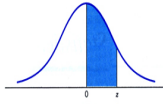
$$\sigma_M = \frac{\sigma}{\sqrt{N}} \quad z = \frac{(M - \mu)}{\sigma_M} \quad d = \frac{(M - \mu)}{\sigma}$$

$$M_{lower} = -z(\sigma_M) + M \quad M_{upper} = z(\sigma_M) + M$$

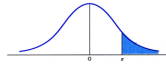
$$s = \sqrt{\frac{\sum (X - M)^2}{N - 1}} \quad S_M = \frac{s}{\sqrt{N}} \quad df = N - 1$$

$$t = \frac{(M - \mu)}{S_M} \quad d = \frac{(M - \mu)}{s}$$

$$M_{lower} = -t(S_M) + M \quad M_{upper} = t(S_M) + M$$



Area under the standard normal distribution between 0 and z									
z	0 to z	z	0 to z	z	0 to z	z	0 to z	z	0 to z
0	0.0000	0.52	0.1985	1.04	0.3508	1.56	0.4406	2.08	0.4812
0.01	0.0040	0.53	0.2019	1.05	0.3531	1.57	0.4418	2.09	0.4817
0.02	0.0080	0.54	0.2054	1.06	0.3554	1.58	0.4429	2.10	0.4821
0.03	0.0120	0.55	0.2088	1.07	0.3577	1.59	0.4441	2.11	0.4826
0.04	0.0160	0.56	0.2123	1.08	0.3599	1.60	0.4452	2.12	0.4830
0.05	0.0199	0.57	0.2157	1.09	0.3621	1.61	0.4463	2.13	0.4834
0.06	0.0239	0.58	0.2190	1.10	0.3643	1.62	0.4474	2.14	0.4838
0.07	0.0279	0.59	0.2224	1.11	0.3665	1.63	0.4484	2.15	0.4842
0.08	0.0319	0.60	0.2257	1.12	0.3686	1.64	0.4495	2.16	0.4846
0.09	0.0359	0.61	0.2291	1.13	0.3708	1.65	0.4505	2.17	0.4850
0.10	0.0398	0.62	0.2324	1.14	0.3729	1.66	0.4515	2.18	0.4854
0.11	0.0438	0.63	0.2357	1.15	0.3749	1.67	0.4525	2.19	0.4857
0.12	0.0478	0.64	0.2389	1.16	0.3770	1.68	0.4535	2.20	0.4861
0.13	0.0517	0.65	0.2422	1.17	0.3790	1.69	0.4545	2.21	0.4864
0.14	0.0557	0.66	0.2454	1.18	0.3810	1.70	0.4554	2.22	0.4868
0.15	0.0596	0.67	0.2486	1.19	0.3830	1.71	0.4564	2.23	0.4871
0.16	0.0636	0.68	0.2517	1.20	0.3849	1.72	0.4573	2.24	0.4875
0.17	0.0675	0.69	0.2549	1.21	0.3869	1.73	0.4582	2.25	0.4878
0.18	0.0714	0.70	0.2580	1.22	0.3888	1.74	0.4591	2.26	0.4881
0.19	0.0753	0.71	0.2611	1.23	0.3907	1.75	0.4599	2.27	0.4884
0.20	0.0793	0.72	0.2642	1.24	0.3925	1.76	0.4608	2.28	0.4887
0.21	0.0832	0.73	0.2673	1.25	0.3944	1.77	0.4616	2.29	0.4890
0.22	0.0871	0.74	0.2704	1.26	0.3962	1.78	0.4625	2.30	0.4893
0.23	0.0910	0.75	0.2734	1.27	0.3980	1.79	0.4633	2.31	0.4896
0.24	0.0948	0.76	0.2764	1.28	0.3997	1.80	0.4641	2.32	0.4898
0.25	0.0987	0.77	0.2794	1.29	0.4015	1.81	0.4649	2.33	0.4901
0.26	0.1026	0.78	0.2823	1.30	0.4032	1.82	0.4656	2.34	0.4904
0.27	0.1064	0.79	0.2852	1.31	0.4049	1.83	0.4664	2.35	0.4906
0.28	0.1103	0.80	0.2881	1.32	0.4066	1.84	0.4671	2.36	0.4909
0.29	0.1141	0.81	0.2910	1.33	0.4082	1.85	0.4678	2.37	0.4911
0.30	0.1179	0.82	0.2939	1.34	0.4099	1.86	0.4686	2.38	0.4913
0.31	0.1217	0.83	0.2967	1.35	0.4115	1.87	0.4693	2.39	0.4916
0.32	0.1255	0.84	0.2995	1.36	0.4131	1.88	0.4699	2.40	0.4918
0.33	0.1293	0.85	0.3023	1.37	0.4147	1.89	0.4706	2.41	0.4920
0.34	0.1331	0.86	0.3051	1.38	0.4162	1.90	0.4713	2.42	0.4922
0.35	0.1368	0.87	0.3078	1.39	0.4177	1.91	0.4719	2.43	0.4925
0.36	0.1406	0.88	0.3106	1.40	0.4192	1.92	0.4726	2.44	0.4927
0.37	0.1443	0.89	0.3133	1.41	0.4207	1.93	0.4732	2.45	0.4929
0.38	0.1480	0.90	0.3159	1.42	0.4222	1.94	0.4738	2.46	0.4931
0.39	0.1517	0.91	0.3186	1.43	0.4236	1.95	0.4744	2.47	0.4932
0.40	0.1554	0.92	0.3212	1.44	0.4251	1.96	0.4750	2.48	0.4934
0.41	0.1591	0.93	0.3238	1.45	0.4265	1.97	0.4756	2.49	0.4936
0.42	0.1628	0.94	0.3264	1.46	0.4279	1.98	0.4761	2.50	0.4938
0.43	0.1664	0.95	0.3289	1.47	0.4292	1.99	0.4767	2.51	0.4940
0.44	0.1700	0.96	0.3315	1.48	0.4306	2.00	0.4772	2.52	0.4941
0.45	0.1736	0.97	0.3340	1.49	0.4319	2.01	0.4778	2.53	0.4943
0.46	0.1772	0.98	0.3365	1.50	0.4332	2.02	0.4783	2.54	0.4945
0.47	0.1808	0.99	0.3389	1.51	0.4345	2.03	0.4788	2.55	0.4946
0.48	0.1844	1.00	0.3413	1.52	0.4357	2.04	0.4793	2.56	0.4948
0.49	0.1879	1.01	0.3438	1.53	0.4370	2.05	0.4798	2.57	0.4949
0.50	0.1915	1.02	0.3461	1.54	0.4382	2.06	0.4803	2.58	0.4951
0.51	0.1950	1.03	0.3485	1.55	0.4394	2.07	0.4808	2.59	0.4952



Area under the standard normal distribution above z									
z	above z	z	above z	z	above z	z	above z	z	above z
0	0.5000	0.52	0.3015	1.04	0.1492	1.56	0.0594	2.08	0.0188
0.01	0.4960	0.53	0.2981	1.05	0.1469	1.57	0.0582	2.09	0.0183
0.02	0.4920	0.54	0.2946	1.06	0.1446	1.58	0.0571	2.10	0.0179
0.03	0.4880	0.55	0.2912	1.07	0.1423	1.59	0.0559	2.11	0.0174
0.04	0.4840	0.56	0.2877	1.08	0.1401	1.60	0.0548	2.12	0.0170
0.05	0.4801	0.57	0.2843	1.09	0.1379	1.61	0.0537	2.13	0.0166
0.06	0.4761	0.58	0.2810	1.10	0.1357	1.62	0.0526	2.14	0.0162
0.07	0.4721	0.59	0.2776	1.11	0.1335	1.63	0.0516	2.15	0.0158
0.08	0.4681	0.60	0.2743	1.12	0.1314	1.64	0.0505	2.16	0.0154
0.09	0.4641	0.61	0.2709	1.13	0.1292	1.65	0.0495	2.17	0.0150
0.10	0.4602	0.62	0.2676	1.14	0.1271	1.66	0.0485	2.18	0.0146
0.11	0.4562	0.63	0.2643	1.15	0.1251	1.67	0.0475	2.19	0.0143
0.12	0.4522	0.64	0.2611	1.16	0.1230	1.68	0.0465	2.20	0.0139
0.13	0.4483	0.65	0.2578	1.17	0.1210	1.69	0.0455	2.21	0.0136
0.14	0.4443	0.66	0.2546	1.18	0.1190	1.70	0.0446	2.22	0.0132
0.15	0.4404	0.67	0.2514	1.19	0.1170	1.71	0.0436	2.23	0.0129
0.16	0.4364	0.68	0.2483	1.20	0.1151	1.72	0.0427	2.24	0.0125
0.17	0.4325	0.69	0.2451	1.21	0.1131	1.73	0.0418	2.25	0.0122
0.18	0.4286	0.70	0.2420	1.22	0.1112	1.74	0.0409	2.26	0.0119
0.19	0.4247	0.71	0.2389	1.23	0.1093	1.75	0.0401	2.27	0.0116
0.20	0.4207	0.72	0.2358	1.24	0.1075	1.76	0.0392	2.28	0.0113
0.21	0.4168	0.73	0.2327	1.25	0.1056	1.77	0.0384	2.29	0.0110
0.22	0.4129	0.74	0.2296	1.26	0.1038	1.78	0.0375	2.30	0.0107
0.23	0.4090	0.75	0.2266	1.27	0.1020	1.79	0.0367	2.31	0.0104
0.24	0.4052	0.76	0.2236	1.28	0.1003	1.80	0.0359	2.32	0.0102
0.25	0.4013	0.77	0.2206	1.29	0.0985	1.81	0.0351	2.33	0.0099
0.26	0.3974	0.78	0.2177	1.30	0.0968	1.82	0.0344	2.34	0.0096
0.27	0.3936	0.79	0.2148	1.31	0.0951	1.83	0.0336	2.35	0.0094
0.28	0.3897	0.80	0.2119	1.32	0.0934	1.84	0.0329	2.36	0.0091
0.29	0.3859	0.81	0.2090	1.33	0.0918	1.85	0.0322	2.37	0.0089
0.30	0.3821	0.82	0.2061	1.34	0.0901	1.86	0.0314	2.38	0.0087
0.31	0.3783	0.83	0.2033	1.35	0.0885	1.87	0.0307	2.39	0.0084
0.32	0.3745	0.84	0.2005	1.36	0.0869	1.88	0.0301	2.40	0.0082
0.33	0.3707	0.85	0.1977	1.37	0.0853	1.89	0.0294	2.41	0.0080
0.34	0.3669	0.86	0.1949	1.38	0.0838	1.90	0.0287	2.42	0.0078
0.35	0.3632	0.87	0.1922	1.39	0.0823	1.91	0.0281	2.43	0.0075
0.36	0.3594	0.88	0.1894	1.40	0.0808	1.92	0.0274	2.44	0.0073
0.37	0.3557	0.89	0.1867	1.41	0.0793	1.93	0.0268	2.45	0.0071
0.38	0.3520	0.90	0.1841	1.42	0.0778	1.94	0.0262	2.46	0.0069
0.39	0.3483	0.91	0.1814	1.43	0.0764	1.95	0.0256	2.47	0.0068
0.40	0.3446	0.92	0.1788	1.44	0.0749	1.96	0.0250	2.48	0.0066
0.41	0.3409	0.93	0.1762	1.45	0.0735	1.97	0.0244	2.49	0.0064
0.42	0.3372	0.94	0.1736	1.46	0.0721	1.98	0.0239	2.50	0.0062
0.43	0.3336	0.95	0.1711	1.47	0.0708	1.99	0.0233	2.51	0.0060
0.44	0.3300	0.96	0.1685	1.48	0.0694	2.00	0.0228	2.52	0.0059
0.45	0.3264	0.97	0.1660	1.49	0.0681	2.01	0.0222	2.53	0.0057
0.46	0.3228	0.98	0.1635	1.50	0.0668	2.02	0.0217	2.54	0.0055
0.47	0.3192	0.99	0.1611	1.51	0.0655	2.03	0.0212	2.55	0.0054
0.48	0.3156	1.00	0.1587	1.52	0.0643	2.04	0.0207	2.56	0.0052
0.49	0.3121	1.01	0.1562	1.53	0.0630	2.05	0.0202	2.57	0.0051
0.50	0.3085	1.02	0.1539	1.54	0.0618	2.06	0.0197	2.58	0.0049
0.51	0.3050	1.03	0.1515	1.55	0.0606	2.07	0.0192	2.59	0.0048

Critical Values of t						
df	Area in both tails		Area in one tail			
	0.50	0.20	0.10	0.05	0.02	0.01
	0.25	0.10	0.05	0.025	0.01	0.005
1	1.000	3.078	6.314	12.706	31.821	63.657
2	0.816	1.886	2.920	4.303	6.965	9.925
3	0.765	1.638	2.353	3.182	4.541	5.841
4	0.741	1.533	2.132	2.776	3.747	4.604
5	0.727	1.476	2.015	2.571	3.365	4.032
6	0.718	1.440	1.943	2.447	3.143	3.707
7	0.711	1.415	1.895	2.365	2.998	3.499
8	0.706	1.397	1.860	2.306	2.896	3.355
9	0.703	1.383	1.833	2.262	2.821	3.250
10	0.700	1.372	1.812	2.228	2.764	3.169
11	0.697	1.363	1.796	2.201	2.718	3.106
12	0.695	1.356	1.782	2.179	2.681	3.055
13	0.694	1.350	1.771	2.160	2.650	3.012
14	0.692	1.345	1.761	2.145	2.624	2.977
15	0.691	1.341	1.753	2.131	2.602	2.947
16	0.690	1.337	1.746	2.120	2.583	2.921
17	0.689	1.333	1.740	2.110	2.567	2.898
18	0.688	1.330	1.734	2.101	2.552	2.878
19	0.688	1.328	1.729	2.093	2.539	2.861
20	0.687	1.325	1.725	2.086	2.528	2.845
21	0.686	1.323	1.721	2.080	2.518	2.831
22	0.686	1.321	1.717	2.074	2.508	2.819
23	0.685	1.319	1.714	2.069	2.500	2.807
24	0.685	1.318	1.711	2.064	2.492	2.797
25	0.684	1.316	1.708	2.060	2.485	2.787
26	0.684	1.315	1.706	2.056	2.479	2.779
27	0.684	1.314	1.703	2.052	2.473	2.771
28	0.683	1.313	1.701	2.048	2.467	2.763
29	0.683	1.311	1.699	2.045	2.462	2.756
30	0.683	1.310	1.697	2.042	2.457	2.750
31	0.682	1.309	1.696	2.040	2.453	2.744
32	0.682	1.309	1.694	2.037	2.449	2.738
33	0.682	1.308	1.692	2.035	2.445	2.733
34	0.682	1.307	1.691	2.032	2.441	2.728
35	0.682	1.306	1.690	2.030	2.438	2.724
36	0.681	1.306	1.688	2.028	2.434	2.719
37	0.681	1.305	1.687	2.026	2.431	2.715
38	0.681	1.304	1.686	2.024	2.429	2.712
39	0.681	1.304	1.685	2.023	2.426	2.708
40	0.681	1.303	1.684	2.021	2.423	2.704
50	0.679	1.299	1.676	2.009	2.403	2.678
60	0.679	1.296	1.671	2.000	2.390	2.660
70	0.678	1.294	1.667	1.994	2.381	2.648
80	0.678	1.292	1.664	1.990	2.374	2.639
90	0.677	1.291	1.662	1.987	2.368	2.632
100	0.677	1.290	1.660	1.984	2.364	2.626
200	0.676	1.286	1.653	1.972	2.345	2.601
500	0.675	1.283	1.648	1.965	2.334	2.586

Multiple Choice Answer sheet

Name: _____ ID#: _____

1. _____

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