University of Palestine

Course No: final exam
Course Title: applied statistics
Date:28/05/2013
No. of Questions: (5)
Time: 2 hours
Using Calculator (yes)

Final Exam
2012-2013
Total Grade:

Instructor Name: Nafez M. Barakat
Student No.: ________________
Student Name: ______________
College Name: ______________
Dep. / Specialist: _____________
Using Dictionary (No)

Question One: (10 Points):

1-( ) The Central Limit Theorem ensures that the sampling distribution of the sample mean approaches normal as the sample size decreases

2- ( ) Student grades (A to F) are an example of continuous numerical data.

3- ( ) A sample is the portion of the universe that is selected for analysis.

4-( ) when the data contains outliers we prefer to use median as a measure of central tendency measures

5-( ) The line drawn within the box of the boxplot always represents the median.

6-( ) If the null hypothesis is rejected for a two-tailed test, then it will also be rejected for a one- tailed hypothesis test.

7-( ) . The amount of water consumed by a person per week is an example of a continuous variable

8. -( ) The coefficient of determination can take on a value between -1 and +1

9. -( ) The measures of central tendency for a normal distribution are identical.

10. -( ) The null hypothesis states that a population parameter is equal to a desired value.

Question # 2 (20 Points): Choose the correct answer:

1- **The degrees of freedom in one sample t test equal** :

(a) sample size (b) sample size - 1 (c) sample size + 1 (d) sample size ± 1

2- **A ------ is a numerical quantity computed from the data of a sample and is used in reaching a decision on whether or not to reject the null hypothesis.**

a. significance level b. critical value c. test statistic d. parameter

3- **when the median in the middle of the Box plot graphs then the distribution of the data**

(a) skewed to the right (b) skewed to the left

(c) symmetry (d) Non of the above

4 .Which of the following statistics is not a measure of central tendency?

a) Arithmetic mean. b) Median. c) Mode. d) Q3.

5**. Which descriptive summary measures are considered to be resistant statistics?**

a) The arithmetic mean and standard deviation. b) The interquartile range and range.
c) The mode and variance. d) The median and interquartile range

6- **Using the same set of data, you compute a 95% confidence interval and a 99% confidence interval. Which of the following statement is correct?**

a) The intervals have the same width
b) The 99% interval is wider
c) The 95 % interval is wider
d) You cannot be determined which interval is wider unless you know n and s.

7- **Which of the following would be an appropriate alternative hypothesis?**
a. The mean of a population is equal to 55. b. The mean of a sample is equal to 55.
c. The mean of a population is greater than 55. d. The mean of a sample is greater than 55.

8- A Type II error is committed when
a. we reject a null hypothesis that is true. b. we don't reject a null hypothesis that is true.
c. we reject a null hypothesis that is false. d. we don't reject a null hypothesis that is false

9. If an economist wishes to determine whether there is evidence that average family income in a community exceeds $25,000
a. either a one -tailed or two-tailed test could be used with equivalent results.
b. a one-tailed test should be utilized. c. a two-tailed test should be utilized.
d. None of the above.

10- **Which of the following is a discrete quantitative variable?**
a) The Dow Jones Industrial average b) The volume of water released from a dam
c) The distance you drove yesterday. d) The number of employees of an insurance company

11- **In general, which of the following descriptive summary measures cannot be easily approximated from a boxplot?**
a) The variance. b) The range. c) The interquartile range. d) The median

12-. A Type I error is committed when
a. we reject a null hypothesis that is true. b. we don't reject a null hypothesis that is true.
c. we reject a null hypothesis that is false. d. we don't reject a null hypothesis that is false

13. If the p-value is less than α in a two-tailed test,
a. the null hypothesis should not be rejected. b. the null hypothesis should be rejected.
c. a one-tailed test should be used. d. no conclusion should be reached

14. If we are testing for the difference between the means of 2 related populations with samples of n1 = 20 and n2 = 20, the number of degrees of freedom is equal to
a. 39. b. 38. c. 19. d. 18.

15. If the correlation coefficient (r) = 1.00, then

a) all the data points must fall exactly on a straight line with a slope that equals 1.00.
b) all the data points must fall exactly on a straight line with a negative slope.
c) all the data points must fall exactly on a straight line with a positive slope.
d) all the data points must fall exactly on a horizontal straight line with a zero slope.

16. Constructing a mathematical model that can be used to predict one variable by another is called which of the following?

a. Statistical prediction b. Regression c. Hypothesis testing d. Correlation analysis

17. What does the Y intercept (b_0) represent?

a. The predicted value of Y
b. The variation around the line of regression
c. The predicted value of Y when X = 0
c. The estimated change in average Y per unit change in X.

18. In testing a hypothesis about two population means, it the *t* distribution is used, which of the following assumptions is required?

a. The standard deviations are not the same
b. Both population means are the same
c. The sample sizes are equal.
d. Both populations are normally distributed

19. When testing for differences between the means of two related populations, what is the null hypothesis?

a. The difference between the two population means is equal to 0.
b. The difference between the two population means is equal to 1.
c. The difference between the two population means is greater than 0.
d. The difference between the two population means is greater than 1.

20. What statistical distribution is used for testing the difference between two population variances?

a. levene's test b. scheffe test c. Wilcoxon test d. 1-sample K-S

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Question #3: [10 Points]

The average grades of 8 students in statistics and the number of absences they had during the semester are shown below

Number of absences(X)	1	2	2	1	3	4	8	3
Average Grade (Y)	94	78	70	88	68	40	30	60

$$\sum_{i=1}^{8} x_i = 24 \quad , \quad \sum_{i=1}^{8} y_i = 528 \quad , \quad \sum_{i=1}^{8} x_i^2 = 108 \quad , \quad \sum_{i=1}^{8} y_i^2 = 38288 \quad , \quad \sum_{i=1}^{8} x_i y_i = 1262$$

a) Compute the value of the coefficient of correlation. Interpret

b) Find the estimated regression equation of average grade on number of absences and interpret their coefficients?

c) If a student missed 7 classes , what is the estimated grade for him?

d) Compute the value of the coefficient of determination. Interpret

Question #4: [10 Points]

To test the effectiveness of a business school preparation course , 8 students took a general business test before and after the course . The results are given below

Scores before Course	**530**	**690**	**910**	**700**	**450**	**820**	**820**	**630**
Scores after course	**670**	**770**	**1000**	**710**	**550**	**870**	**770**	**610**

At 5% level of significance , test whether the business school preparation course is effective in improving exam. Scores ? Assume that the population of paired difference has a normal distribution.

- State H_o:

  H_a:

- Compute the test Statistic:

- Find the critical value:

- Construct a 90 % confidence interval for μ_D

- State your decision:

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Question #5: [10 Points]

Apolitical analyst was curious if younger adults were becoming more conservative . He decided to see if the mean age of registered Republicans was lower than that of registered Democrats . He selected an SRS of 128 registered Republicans from a list of registered Republicans and determined the mean age to be $\bar{X}_1 = 39$ years , with a standard deviation $S_1 = 8$ years. He also selected an independent SRS of 200 registered Democrats from a list of registered Democrats and determined the mean age to be $\bar{X}_2 = 40$ years , with a standard deviation $S_2 = 10$ years. Let μ_1 and μ_2 represent the mean ages of the populations of all registered Republicans and Democrats , respectively . Suppose that the distribution of age in the population of registered Republicans and of registered Democrats have the same Standard deviation

- state H_o:

  H_a:

- Compute the test Statistic:

- Compute the critical value by using a level of significance $\alpha = 0.05$

- State your decision:

- What is your final conclusion

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Formulas:

$$\hat{y} = b_0 + b_1 x \ , \quad b_1 = r\frac{S_y}{S_x}$$

$$b_0 = \bar{y} - b_1 \bar{x}$$

$$S_p^2 = \frac{(n_1-1)S_1^{\,2} + (n_2-1)S_2^{\,2}}{(n_1-1)+(n_2-1)}$$

$$\bar{D} = \frac{\sum_{i=1}^{n} D_i}{n}$$

$$Z_{STAT} = \frac{\bar{X}-\mu}{\frac{\sigma}{\sqrt{n}}}$$

$$\bar{X} \pm t_{\alpha/2}\frac{S}{\sqrt{n}}$$

$$t_{STAT} = \frac{\bar{X}-\mu}{\frac{S}{\sqrt{n}}}$$

$$t_{STAT} = \frac{\bar{D}-\mu_D}{\frac{S_D}{\sqrt{n}}}$$

$$\bar{D} \pm t_{\alpha/2}\frac{S_D}{\sqrt{n}}$$

$$Z_{STAT} = \frac{(p_1-p_2)-(\pi_1-\pi_2)}{\sqrt{\bar{p}(1-\bar{p})\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$$S_D = \sqrt{\frac{\sum (D_i-\bar{D})^2}{n-1}}$$

$$= 5.67$$

$$\bar{p} = \frac{X_1+X_2}{n_1+n_2}$$

$$b_1 = \frac{\sum_{i=1}^{n} X_i Y_i - n\bar{X}\bar{Y}}{\sum_{i=1}^{n} X_i^{\,2} - n\bar{X}^2}$$

$$\left(\bar{X}_1-\bar{X}_2\right) \pm t_{\alpha/2}\sqrt{S_p^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}$$

$$r = \frac{\sum_{i=1}^{n} x_i y_i - n\bar{x}\bar{y}}{\sqrt{\left(\sum_{i=1}^{n} x_i^{\,2} - n\bar{x}^2\right)\left(\sum_{i=1}^{n} y_i^{\,2} - n\bar{y}^2\right)}}$$

$$t_{STAT} = \frac{\left(\bar{X}_1-\bar{X}_2\right)-\left(\mu_1-\mu_2\right)}{\sqrt{S_p^2\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$

$$\bar{X} \pm Z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

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Table entry for z is the area under the standard normal curve left of z.

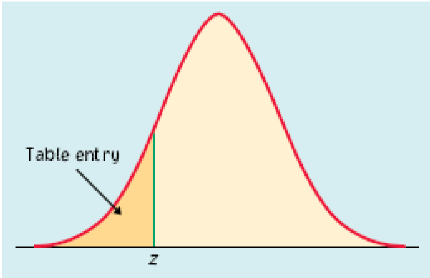

TABLE A Standard normal probabilities

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

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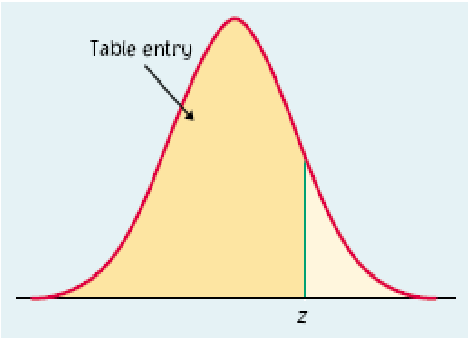

TABLE A Standard normal probabilities (*continued*)

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

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Table entry for p and C is the critical value t^* with probability p lying to its right and probability C lying between $-t^*$ and t^*.

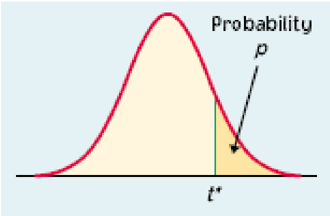

TABLE C t distribution critical values

	Upper tail probability p											
df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.000	1.376	1.963	3.078	6.314	12.71	15.89	31.82	63.66	127.3	318.3	636.6
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.09	22.33	31.60
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.21	12.92
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
80	0.678	0.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	0.677	0.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
z^*	0.674	0.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291
	50%	60%	70%	80%	90%	95%	96%	98%	99%	99.5%	99.8%	99.9%
	Confidence level C											