東海大學 101 學年度碩士班招生入學考試試題

考試科目：統計學方法　　應考系所：統計系乙組

本試題共 2 頁：第 1 頁　　(如有缺損或印刷不清者，應即舉手請監試人員處理)

1. (10 %) Compute the sample variance of the following 8 observations

$$2, 2, 4, 5, 7, 8, 10, 10.$$

2. (15 %) An urn contains 3 black balls and 2 white balls. If 2 balls are selected *without replacement*,

   (a) (5 %) Find the conditional probability that the 2nd ball is white, given that the 1st one is white.

   (b) (5 %) Find the conditional probability that the 2nd ball is white, given that the 1st one is black.

   (c) (5 %) Find the probability that the 2nd ball is white.

3. (10 %) The average number of pounds of meat that a person in the US consumes a year is 218.4 pounds. Assume that the standard deviation is 25 pounds and the distribution is approximately normal. Find the probability of the following events

   (a) (5%) A randomly selected person consumes less than 220 pounds a year.

   (b) (5%) 25 people are randomly selected and the sample average is between 210 and 220 pounds.

4. (20 %) Full-time Ph.D. students receive an average salary of $12,837\$$ according to the U.S Department of Education. The dean of graduate studies at a large state university feels that *Ph.D. students in his state earn more than* $12,837\$$. He surveys 44 randomly selected students and finds $\bar{x} = 14,445\$$ and $s^2 = 1500^2\$^2$.

   (a) (5%) State the dean's hypotheses.

   (b) (10%) With $\alpha = 0.05$ test the hypothesis.

   (c) (5%) p-value=?

5. (10%) A survey at a park shows this selection of snacks purchased. Under $\alpha = 0.05$, test if the snack chosen independent of the gender of the consumer ($\chi_{0.05}(2) = 5.991$).

	Hot dog	Peanuts	Popcorn
Male	12	21	19
Female	13	8	27

6. (25%) A medical researcher wants to determine the relationship between the price per dose of prescription drugs in the US and the price of the same dose in Australia. The data are shown as follows

US price (X)	3.31	3.16	2.27	3.13	2.54	1.98	2.22
Australian price (Y)	1.29	1.75	0.82	0.83	1.32	0.84	0.82

($\sum x_i = 18.61$, $\sum y_i = 7.67$, $\sum x_i^2 = 51.1919$, $\sum y_i^2 = 9.2083$ and $\sum x_i y_i = 21.0956$)

(a) (5%) Find the sample correlation coefficient.

(b) (5%) Under the model $y_i = \beta_0 + \beta_1 x_i + \epsilon_i, (\epsilon_i \sim iidN(0, \sigma^2))$ find the least-squares estimate of β_0 and β_1.

(c) (5%) Determine the coefficient of determination R^2.

(d) (10%) Provide an ANOVA table for testing the hypothesis $H_0 : \beta_1 = 0$ vs $H_1 : \beta_1 \neq 0$. ($F_{0.05}(1, 5) = 6.61$).

7. (10%) A research wishes to see whether there is any difference in the weight gains of athletes following one of three special diets. Athletes are randomly assigned to three groups and placed on the diet for 6 weeks. The weight gains (in pounds) are shown here.

Diet A	Diet B	Diet C
3	10	8
6	12	3
7	11	2
4	14	5

Provide an ANOVA table for testing if there exists any difference in the mean weight gaining for the three diets ($F_{0.05}(2, 9) = 4.26$).

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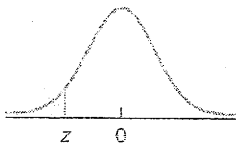

Areas under the standard normal curve

Second decimal place in z										
0.09	*0.08*	*0.07*	*0.06*	*0.05*	*0.04*	*0.03*	*0.02*	*0.01*	*0.00*	*z*
									0.0000†	*−3.9*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.8*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	*−3.7*
0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	*−3.6*
0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	*−3.5*
0.0002	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	*−3.4*
0.0003	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005	0.0005	0.0005	*−3.3*
0.0005	0.0005	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	*−3.2*
0.0007	0.0007	0.0008	0.0008	0.0008	0.0008	0.0009	0.0009	0.0009	0.0010	*−3.1*
0.0010	0.0010	0.0011	0.0011	0.0011	0.0012	0.0012	0.0013	0.0013	0.0013	*−3.0*
0.0014	0.0014	0.0015	0.0015	0.0016	0.0016	0.0017	0.0018	0.0018	0.0019	*−2.9*
0.0019	0.0020	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0025	0.0026	*−2.8*
0.0026	0.0027	0.0028	0.0029	0.0030	0.0031	0.0032	0.0033	0.0034	0.0035	*−2.7*
0.0036	0.0037	0.0038	0.0039	0.0040	0.0041	0.0043	0.0044	0.0045	0.0047	*−2.6*
0.0048	0.0049	0.0051	0.0052	0.0054	0.0055	0.0057	0.0059	0.0060	0.0062	*−2.5*
0.0064	0.0066	0.0068	0.0069	0.0071	0.0073	0.0075	0.0078	0.0080	0.0082	*−2.4*
0.0084	0.0087	0.0089	0.0091	0.0094	0.0096	0.0099	0.0102	0.0104	0.0107	*−2.3*
0.0110	0.0113	0.0116	0.0119	0.0122	0.0125	0.0129	0.0132	0.0136	0.0139	*−2.2*
0.0143	0.0146	0.0150	0.0154	0.0158	0.0162	0.0166	0.0170	0.0174	0.0179	*−2.1*
0.0183	0.0188	0.0192	0.0197	0.0202	0.0207	0.0212	0.0217	0.0222	0.0228	*−2.0*
0.0233	0.0239	0.0244	0.0250	0.0256	0.0262	0.0268	0.0274	0.0281	0.0287	*−1.9*
0.0294	0.0301	0.0307	0.0314	0.0322	0.0329	0.0336	0.0344	0.0351	0.0359	*−1.8*
0.0367	0.0375	0.0384	0.0392	0.0401	0.0409	0.0418	0.0427	0.0436	0.0446	*−1.7*
0.0455	0.0465	0.0475	0.0485	0.0495	0.0505	0.0516	0.0526	0.0537	0.0548	*−1.6*
0.0559	0.0571	0.0582	0.0594	0.0606	0.0618	0.0630	0.0643	0.0655	0.0668	*−1.5*
0.0681	0.0694	0.0708	0.0721	0.0735	0.0749	0.0764	0.0778	0.0793	0.0808	*−1.4*
0.0823	0.0838	0.0853	0.0869	0.0885	0.0901	0.0918	0.0934	0.0951	0.0968	*−1.3*
0.0985	0.1003	0.1020	0.1038	0.1056	0.1075	0.1093	0.1112	0.1131	0.1151	*−1.2*
0.1170	0.1190	0.1210	0.1230	0.1251	0.1271	0.1292	0.1314	0.1335	0.1357	*−1.1*
0.1379	0.1401	0.1423	0.1446	0.1469	0.1492	0.1515	0.1539	0.1562	0.1587	*−1.0*
0.1611	0.1635	0.1660	0.1685	0.1711	0.1736	0.1762	0.1788	0.1814	0.1841	*−0.9*
0.1867	0.1894	0.1922	0.1949	0.1977	0.2005	0.2033	0.2061	0.2090	0.2119	*−0.8*
0.2148	0.2177	0.2206	0.2236	0.2266	0.2296	0.2327	0.2358	0.2389	0.2420	*−0.7*
0.2451	0.2483	0.2514	0.2546	0.2578	0.2611	0.2643	0.2676	0.2709	0.2743	*−0.6*
0.2776	0.2810	0.2843	0.2877	0.2912	0.2946	0.2981	0.3015	0.3050	0.3085	*−0.5*
0.3121	0.3156	0.3192	0.3228	0.3264	0.3300	0.3336	0.3372	0.3409	0.3446	*−0.4*
0.3483	0.3520	0.3557	0.3594	0.3632	0.3669	0.3707	0.3745	0.3783	0.3821	*−0.3*
0.3859	0.3897	0.3936	0.3974	0.4013	0.4052	0.4090	0.4129	0.4168	0.4207	*−0.2*
0.4247	0.4286	0.4325	0.4364	0.4404	0.4443	0.4483	0.4522	0.4562	0.4602	*−0.1*
0.4641	0.4681	0.4721	0.4761	0.4801	0.4840	0.4880	0.4920	0.4960	0.5000	*−0.0*