UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION PAPER 2005

TITLE OF PAPER	:	**DESCRIPTIVE/INFERENTIAL STATISTICS**
COURSE CODE	:	**IDE-ST230-2**
TIME ALLOWED	:	**2 (TWO) HOURS**
REQUIRMENTS	:	**STATISTICAL TABLES AND CALCULATOR**
INSTRUCTIONS	:	**ANSWER ALL QUESTIONS FROM SECTION ONE AND ANSWER ANY FOUR (4) QUESTIONS FROM SECTION TWO. ALL QUESTIONS CARRY MARKS AS GIVEN WITHIN THE PARENTHESIS.**

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SECTION ONE

ANSWER BOTH QUESTIONS:

QUESTION ONE. [20 marks]

State the most correct answer for each of the following:

1.1 In the standard normal distribution, the area outside the range Z = -1.5 to Z = +1.5 is:

a. 0.8664
b. 0.1336
c. 0.9332
d. 0.0668

1.2 A bag contains 2 red, 5 white and 3 green balls. If two balls are selected without replacement the probability that the first ball is red and the second is green is:

a. 2/15
b. 1/15
c. 4/9
d. 8/10

1.3 Which of the following statements is not true about binomial distribution:

a. It is a probability distribution for a discrete random variable.
b. If the sample size is very large, we can use the normal distribution as an approximation to the binomial distribution.
c. The mean of a binomial distribution is npq.
d. Both (a) and (b).

1.4 Samples of 64 items are drawn from a population with $\mu = 144$ and $\sigma = 24$. The value of the standard error of the mean is

a. 144
b. 64
c. 24
d. 3

1.5 In the large sample case, the constant used in a 99% confidence interval is:

a. 1.645
b. 1.960
c. 2.326
d. 2.576

1.6 When a 95% confidence interval is calculated instead of a 99% confidence interval with ***n*** being the same, the maximum error of estimate will be

a. smaller
b. larger
c. the same
d. difficult to determine without additional information.

1.7 Two different investigators are working on a growth study. The first measures the heights of 100 children in inches. The second prefers the metric system, and changes the results to centimeters, using the conversion factor 2.54 cm/inch. If no mistakes are made in the conversion, what is the correlation between the two sets of measurements?

a. $0.5 < r < 1.0$
b. $r > 1.0$
c. $r = 1.0$
d. $r = 0$

1.8 Which is not a property of the normal distribution?

a. It is symmetric about the mean.
b. It is uniform.
c. It is bell-shaped.
d. It is unimodal.

1.9 The sample space for tossing two coins consists of how many outcomes?

a. 2
b. 4
c. 6
d. 8

1.10 The alternative hypothesis for the Chi-square test of independence is that the variables are

a. dependent.
b. not related.
c. independent.
d. none of the above.

QUESTION TWO. [10 marks]

State which of the following statements are **TRUE** and which are **FALSE**?

2.1 Binomial tables cannot be used to find the probability that the random variable has a particular value.

2.2 In any Poisson distribution, the mean is equal to the standard deviation.

2.3 A confidence interval converts a point estimate into an interval estimate.

2.4 If the largest possible samples are drawn, then the standard error of the sample statistics will have its maximum value.

2.5 Increasing the level of confidence involves narrowing the range for sample results.

2.6 The standard normal distribution has a mean of one.

2.7 Increasing the constant in the interval estimate increases the size of the sampling error.

2.8 The higher the level of significance, the more often the null hypothesis would be accepted.

2.9 The scatter diagram is a useful illustration of any relationship that may exist between variables.

2.10 If the null hypothesis is true, the value of the Chi-square Test Statistics is zero.

QUESTION THREE. [10 marks]

The mean score of a Statistics course was 65, with a standard deviation of 10. Assume that there are 100 students in the class of that Statistics course. If you do the following operations, what changes will occur to mean and standard deviation of the course.

3.1 Add 10 to each of 100 students' score.

3.2 Subtract 10 from each of 100 students' score.

3.3 Multiply each of 100 students' score by 10.

3.4 Divide each of 100 students' score by 10.

3.5 Increase each of 100 students' score by 10%.

SECTION TWO

ANSWER ANY THREE QUESTIONS: (You must show all your works in order to obtain full marks.)

QUESTION FOUR. [3 + 4 + 4 + 4 marks]

In a sample of 50 people, 21 had type O blood, 22 had type A blood, 5 had B blood and 2 had type AB blood. Find the probability that:

(a) A person has type O blood.
(b) A person has type A or type B blood.
(c) A person has neither type A nor type O blood.
(d) A person does not have type AB blood

QUESTION FIVE. [8 + 7 marks]

(a) A company manufactures steel rods of 500 cm length, each one having two flaws on average. The process ultimately divides these rods into 100 cm segments. What is the probability that a particular 100 cm segment will have no flaws?

(b) A buying department is considering an acceptance sampling scheme for incoming lots of a manufactured item that can be classified as either good or defective. The plan calls for a random sample of 50 items from each lot. If there is one or less defective items in the sample than the lot is accepted, otherwise it is rejected. Using the binomial distribution, find the probability of rejecting a lot that is 1% defective.

QUESTION SIX. [8 + 7 marks]

A motor car manufacturer purchases gear assemblies from a sub-contractor who undertakes to ensure that not more than 5% of his supplies will be defective. In order to provide a check on the quality of incoming supplies a random sample of 200 assemblies is selected of which 17 are found to be defective.

(a) Construct an interval estimate the proportion of all the sub-contractor's supplies that are defective. Use a confidence level of 95% .
(b) Does the sample evidence indicate that the sub-contractor is not maintaining the quality of his supplies at the agreed level? Use the significance level of 0.01 .

QUESTION SEVEN. [9 + 6 marks]

Consider the following results from a sample of size 7:

$\Sigma X = 57$ $\Sigma Y = 511$ $\Sigma X^2 = 579$ $\Sigma XY = 3745$ $\Sigma Y^2 = 38993$

(a) Estimate the linear regression line.
(b) Compute the coefficient of correlation (**r**) and interpret the answer.

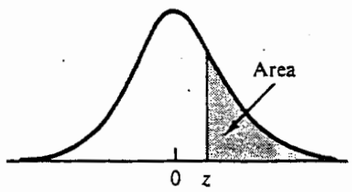
QUESTION EIGHT. [15 marks]

In an experiment to study the dependence of hypertension on smoking habits, the following data were taken on 180 individuals:

Hypertension	Smoking Habits		
	Heavy	Moderate	Nonsmokers
Yes	30	36	21
No	19	26	48

Test the hypothesis that the presence of hypertension is independent of smoking habits. Use a 0.05 level of significance.

Normal curve areas
Standard normal probability in right-hand tail (for negative values of z areas are found by symmetry)



	Second decimal place of z									
z	*.00*	*.01*	*.02*	*.03*	*.04*	*.05*	*.06*	*.07*	*.08*	*.09*
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0722	.0708	.0694	.0681
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.8	.0359	.0352	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
2.9	.0019	.0018	.0017	.0017	.0016	.0016	.0015	.0015	.0014	.0014
3.0	.00135									
3.5	.000 233									
4.0	.000 031 7									
4.5	.000 003 40									
5.0	.000 000 287									

Selected χ^2-values

$\chi^2_{.05}$	df	$\chi^2_{.05}$	df
3.84	1	11.07	5
5.99	2	12.59	6
7.81	3	14.07	7
9.49	4	15.51	8

From R. E. Walpole, *Introduction to Statistics* (New York: Macmillan, 1968).