

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

SSC1103

FACULTY OF APPLIED SCIENCES
BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS
DEPARTMENT OF SPORTS SCIENCE AND COACHING
SUPPLEMENTARY: SSC1103: STATISTICS IN SPORTS

JULY 2005

3 HOURS (100 MARKS)

INSTRUCTIONS

This paper has TWO sections. Candidates should attempt ALL questions from Sections A and ANY THREE questions from Section B. Statistical tables and graph papers are provided.

SECTION A

Answer ALL questions in this section (40 marks)

- A1. X is a random variable such that it follows a binomial distribution with parameters p and n . Given that $\mu = 2.4$ and $q = 0.7$, find n and the standard deviation. (3 marks)
- A2. The mean of the numbers 3, 6, 7, b , 14 is 8. Find the standard deviation of the set of numbers. (6 marks)
- A3. 21 students in a sport academy each recorded the number of whole minutes, x , spent exercising each morning during a given day. The results are summarized below
 $\Sigma x = 1\ 091$, $\Sigma x^2 = 57\ 363$
- a) Calculate μ (to the nearest minute) and σ for these data. (3 marks)
- b) Two other students' times were 64 and 40. Without conducting further calculation, explain the effect on the mean of including these two students' times. (5 marks)
- A4. If the number of accidents occurring in a gym is a random variable having the Poisson distribution with $\theta = 2$ per month, find the probability that;
- a) 10 or more accidents happen in 7 months. (5 marks)
- b) 12 or less accidents happen in $4\frac{1}{2}$ months. (5 marks)
- A5. The number of accidents occurring in a gym is assumed to be a Poisson Distribution with $\theta = 1.4$ per month
- (a) Show that the probability of no accidents in the next month is 0.2466. (2 marks)
- (b) Find the probability of
- (i) Exactly 7 accidents in the next 7 month period (4 marks)
- (ii) At least 6 accidents in 5 months. (4 marks)
- A6. In each of the following instances, determine the null and alternative hypotheses, and state whether you would perform a one-tailed or a two-tailed test:
- a) A sports science student planning to take a statistics course wishes to determine whether there has been a decrease in the 25% failure rate for this course. (3 marks)

- b) In the past, 23% of all potential military recruits have failed their physical exam. A recruiter wishes to determine whether this percentage has changed. (3 marks)
- c) A health insurance company wishes to find out whether there has been an increase in the \$162 500 average payment per claim.

SECTION B

Answer any THREE questions (60 marks)

- B7. a) Explain what each of the following terms mean; population, sample, random sample. (3 marks)
- b) Calculate the mean and standard deviation for the following data:
50.2, 53.8, 51.4, 52.2, 50.8, 59.1, 52.8, 57.7, 51.1, 54.3, 55.5, 52.1, 57.6, 55.9, 50.9, 54.7 (5 marks)
- c) (i) Explain what a confidence interval is? (2 marks)
- (ii) A 99% confidence interval is to be constructed such that \bar{x} is within 1.5 units of the mean (on either side of the mean) of a normal population. Assuming that the population variance is 30, what sample size would be necessary to achieve this maximum error? (5 marks)
- d) Using intervals of unit length construct a frequency table for the data in (b) above. (5 marks)
- B8. a) The mean time to complete the 5 000m race by college athletes is estimated to be 14 minutes. A random sample of 150 athletes' times gave $\sum x = 2130$ and $\sum x^2 = 37 746$, where x is the time in minutes to complete the race.
- (i) Calculate unbiased estimates of the population mean and variance. (3 marks)
- (ii) Stating the null hypothesis and alternative hypothesis, use a 10% significance level to test whether the estimated time for completing the race is consistent with the data. (6 marks)
- b) For the data shown in the following table, test for independence between a person's ability in vaulting and his or her interest in gymnastics. Use the 0.01 level of significance.

INTEREST IN GYMNASTICS	ABILITY IN VAULTING		
	LOW	AVERAGE	HIGH
LOW	63	42	15
AVERAGE	58	61	31
HIGH	14	47	29

(11 marks)

B9. The following are the cholesterol contents (in milligrams per package) which four laboratories obtained for packages of three very similar diet foods.

LABORATORY	DIET FOOD		
	A	B	C
1	3.4	2.6	2.8
2	3.0	2.7	3.1
3	3.3	3.0	3.4
4	3.5	3.1	3.7

- a) A Sports and Exercise nutritionist at the University of Zimbabwe decides that there are no systematic differences among the four laboratories and she therefore ignores the effect of laboratory in her analysis to determine whether significant differences exist in cholesterol content of the three diet foods. Carry out this analysis at the 5% level of significance. (9 marks)
- b) A Sports and Exercise nutritionist at NUST, however, suspects that there may be systematic differences among the four laboratories and she, therefore, includes this source of variation in her analysis to determine whether there are any significant differences in cholesterol content of the three diet foods. Carry out this analysis at the 5% level of significance. (11 marks)

B10. Suppose you are interested in using past expenditure on development for various Sports Clubs. You obtain the following data by taking a random sample of clubs, where X is the amount spent on development (in ten million of dollars) 2 years ago and Y is the amount spent on development (in ten million of dollars) in the current year.

X: 3 5 2 8 1 2 2 4
Y: 5 8 3 11 2 2 4 5

- a) Draw a scatter plot of y against x. Fit the least squares straight line to these data and draw your fitted line on your scatter plot. (10 marks)
- b) Carry out an analysis of variance (ANOVA) to test at the 5% level of significance whether the slope is significantly different from zero. From the ANOVA table, calculate the coefficient of determination, r^2 , and interpret. (8 marks)
- c) Predict y when $x = 4$. (2 marks)

END OF EXAMINATION QUESTION PAPER