RAJARATA UNIVERSITY OF SRILANKA

FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. (General) Degree

First Year Semester I Examination – May/June 2016

MAA 1302 – Probability and Statistics I

Answer **all** Questions. Time allowed: **Three Hours**

Calculators will be provided.

1.

A. Choose the best answer.

a. A pair of dice are rolled. What is the probability of rolling 10 or less?

[1]. 3/36 [2]. 33/36 [3]. 10/36 [4]. 6/36

b. The average score for a Mathematics test is 77 and the standard deviation is 8. Which percent best represents the probability that any one student scored between 61 and 93 on the test?

[1]. 99.5% [2]. 95% [3]. 68% [4]. 34%

c. If ${}_nC_r$ represents the number of combinations of n items taken r at a time, what is the value of

$$\sum_{r=1}^{3} {}_4C_r \ ?$$

[1]. 24 [2]. 14 [3]. 6 [4]. 4

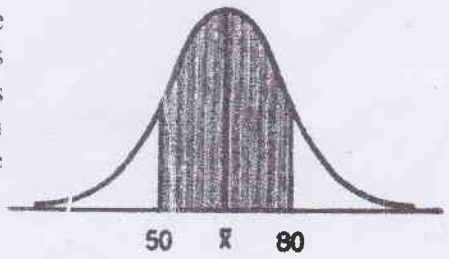
d. For the data shown at the right, find the population variance of the distribution, to the *nearest tenth.*

[1]. 134.0 [2]. 307.3 [3]. 17,967.7 [4]. 29,500

Score	100	200	300	400	500
Frequency	15	21	19	24	17

e. In the accompanying diagram, about 68% of the scores fall within the shaded area, which is symmetric about the mean $\overline{x}$. The distribution is normal and the scores in the shaded area range from 50 to 80. What is the standard deviation of the scores in this distribution?

[1]. 7.5 [2]. 15 [3]. 30 [4]. 65



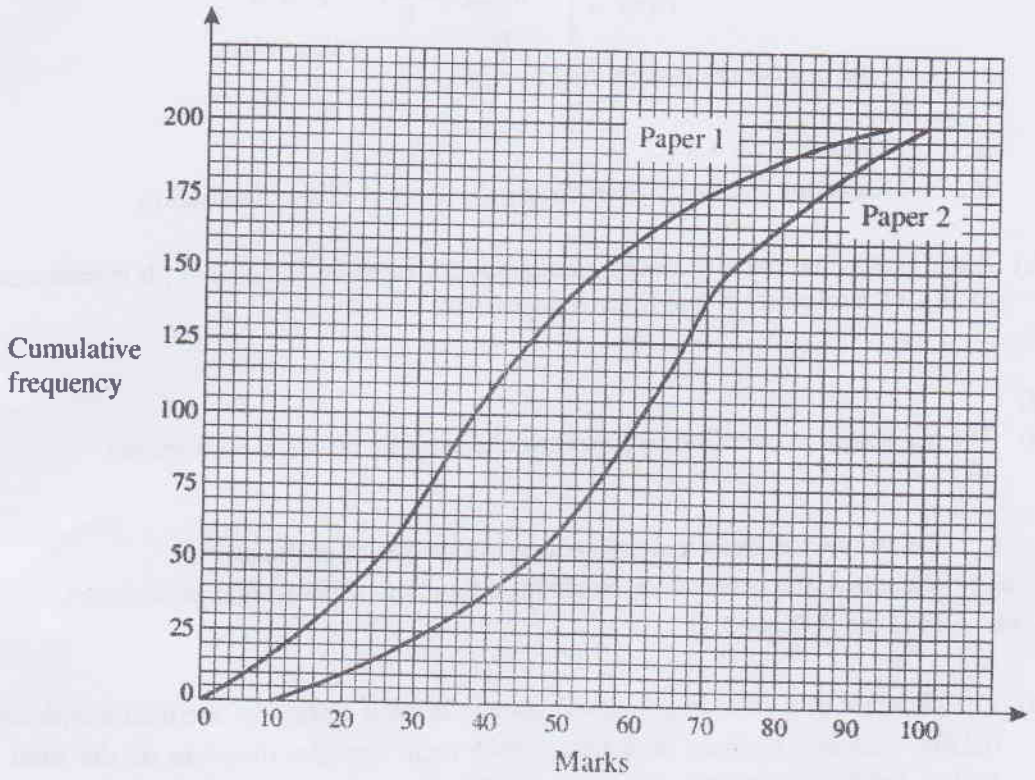
[P.T.O]

III. The probability distribution of a discrete random variable, x, is shown below.

x	0	2
P(X=x)	**a**	1-a

Find $E(X)$ in terms of a and Show that $Var(X) = 4a(1-a)$.

3. 200 candidates took each of two examination papers. The diagram shows the cumulative frequency graphs for their marks.



I. Estimate the median mark for each of the papers.

II. State, with a reason, which of the two papers was the easier one.

III. It is suggested that the marks on paper 2 were less varied than those on Paper 1. Use interquartile ranges to comment on this suggestion.

IV. The minimum mark for grade A, the top grade, on Paper 1 was 10 marks lower than the minimum mark for grade A on Paper 2. Given that 25 candidates gained grade A Paper 1, find the number of candidates who gained grade A in Paper 2.

V. The mean and standard deviation of the marks on Paper 1 were 36.5 and 28.2 respectively. Later, a marking error was discovered and it was decided to add 1 mark to each of the 200 marks on Paper 1. State the mean and standard deviation of the new marks on Paper 1.

{P.T.O}

4.

a) Let X be a continuous random variable.

i. Determine K such that the function

$$F(x) = \begin{cases} K\exp(-\frac{x}{6}) & X > 0 \\ 0 & otherwise \end{cases}$$

Is the probability density function of x.

ii. Compute P (x > 8)

iii. Determine the mean variance and the median of the distribution.

b) A and B are conditionally independent given Ci, for all i$\in${1,2,⋯,M} ; B is independent of all Ci's. Prove that A and B are independent.

5.

a) The net weight in pounds of a packaged chemical herbicide is uniform for 49.75 < x < 50.25 pounds.

i. Determine the mean and variance of the weight of packages.

ii. Determine the cumulative distribution function of the weight of packages.

iii. Find the P(X < 50.1)

b) The diameter of a shaft in an optical storage drive is normally distributed with mean 0.2508 inch and standard deviation 0.0005 inch. The specifications on the shaft are 0.2500 $\pm$ 0.0015 inch. What proportion of shafts conforms to specifications ?