BINDURA UNIVERSITY OF SCIENCE EDUCATION

DIPLOMA IN SCIENCE EDUCATION

NOV 2024

MT002: Statistics 1/

DM002: Introduction to probability and descriptive statistics

Time: 2 hours

Candidates may attempt ALL questions in Section A and at most TWO questions in Section B. Each question should start on a fresh page.

SECTION A (40 marks)

Candidates may attempt ALL questions being careful to number them A1 to A5.

A1. X and Y are two events such that P(X/Y) = 0.4, P(Y) = 0.25 and P(X) =0.2.Find:

(a) P(Y/X),[3]
(b) P(X∩Y),[3]
(c) P(X∪Y).[4]

A2. The events A and B are such that P(A/B) = 0.4, P(B/A) =0.25 , P(A∩B) = 0.12

(a) Calculate the value of P (B).[3]
(b) Give a reason why A and B are not independent.[2]
(c) Calculate the value of P (A∩ B'). [5]

A3. Students were asked how long it took them to travel to college on a particular morning. A cumulative frequency distribution was formed.

Time taken (minutes)	Cumulative frequency
<5	28
<10	45
<15	81
<20	143
<25	280
<30	349
<35	374
<40	395
<45	400

(a) Draw a cumulative frequency polygon. [3]
(b) Estimate how many students took less than 18 minutes. [3]

(c) Taking equal class intervals of 0-, 5-, 10-, -----, construct a frequency distribution and draw a histogram. [6]

A4. Stateany three types of distributions. Sketch the graphs for each distribution.[6]

A5. State any two measures of dispersion. [2]

SECTION B(60 marks)

Candidates may attempt TWO questions being careful to number them B6 to B8

B6. (a) The discrete random variable W has p.d.f. as shown

W	-3	-2	-1	0	1
P(W = w)	0.1	0.25	0.3	0.15	d

Find

(i) The value of d [3]

(ii) P ($-3 \leq W < 0$) [3]

(iii) P ($W > -1$) [3]

(iv) the mode [2]

(v) P ($-1 < W < 1$)[3]

(b) Three faulty fuses are put in a box that containing two good fuses. The faulty and good fuses become mixed up and are indistinguishable by sight. Two fuses are picked from the box.

(i) Show the information on a tree diagram, and find the probability of picking [5]

(ii) No faulty fuses [2]

(iii) One faulty fuse [2]

(iv) Two faulty fuses [2]

(c) How many different permutations (ordered arrangements) of the word LONDONare possible? [5]

B7. (a) The random variable X has p.d.f. P(X=x) for x= 1, 2, 3 as shown

X	1	2	3
P(X=x)	0,1	0,6	0,3

Calculate

(i) E(X) [3]

(ii) E (3) [2]

(iii) E (5X) [2]

(iv) E (5X+3) [3]

(b) A manufacturer makes wring pens. The manufacturer employs an inspector to check the quality of this product. The inspector tested a random sample of the pens from a large batch and calculated the probability of any pen being defective as 0.025.Carmel buys two of the pens made by the manufacturer.

(v) Calculate the probability that both pens are defective. [5]
(vi) Calculate the probability that exactly one of the pens is defective. [5]

(c) A student finds that the average number of amoebas in 10ml of pond water from a particular pond is four. Assuming that the number of amoebas follows a Poisson distribution, find the probability that in a 10ml sample,
(i)there are exactly five amoebas. [3]
(ii) there are no amoebas, [3]
(iii) find the mean and the variance[4].

B8. At a supermarket, 60% of customers pay by credit card. Find the probability that the randomly selected sample of 10 customers,

(i) Exactly 2 pay by credit card [3]
(ii) More than 7 pay by credit card [3]
(iii)Find the mean and the variance [4]

b) The speed to the nearest *km/hr* of 115 bicycles passing a check point were recorded in the table below.

speed in km/hr	0-1	1-2	2-3	3-5	5-10
Frequency	10	15	25	40	25

Estimate

(i) the mean of this distribution. [3]
(ii) the variance [3]
(iii) the standard deviation [2]
(iv) the modal class [1]

(c) For the given data set: 20, 23, 23, 26, 27, 28. Find

(i) Range [2]
(ii) Interquartile range [3]
(iii) The median [1]
(iv) The mode [1]
(v) Draw a box plot [4]

END OF PAPER