ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

STATISTICS 6046/2

PAPER 2

NOVEMBER 2018 SESSION 3 hours

Additional materials:
- Answer paper
- Graph paper
- List of Formula
- Scientific calculator

TIME 3 hours

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and Candidate number in the spaces provided on the answer paper/answer booklet.

Answer **all** questions in Section A and **any five** questions from Section B.

If a numerical answer cannot be given exactly, and the accuracy required is not specified in the question, then in the case of an angle it should be given correct to the nearest degree, and in other cases it should be given correct to 2 significant figures.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is 120.

Questions are printed in the order of their mark allocations.

The use of a scientific calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

This question paper consists of 7 printed pages and 1 blank page.

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Section A [40 marks]

*Answer **all** questions in this section.*

1 **(a)** List any **3** advantages of using telephone interviews as a way of collecting data. [3]

(b) 30 learners were asked to give the average time (in minutes) each one took to travel to school. The results were as follows.

12	10	16	8	14
18	28	33	8	40
17	27	17	22	42
7	6	43	35	20
37	19	8	47	26
16	13	11	23	46

(i) Illustrate the results on a stem and leaf diagram. [4]

(ii) State **one** advantage of using a stem and leaf diagram as a way of presenting data. [1]

2 **(a)** State the differences between a permutation and a combination. [2]

(b) Two fuses are selected simultaneously and at random from a packet containing 5 good and 3 faulty fuses.

Find the number of ways of selecting

(i) the 2 fuses from the packet. [2]

(ii) one good and one faulty fuse from the packet. [2]

(iii) Hence or otherwise find the probability that exactly one faulty fuse is selected. [2]

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3 Whenever there is a power-cut, a school is equally likely to switch on one of its 3 generators A, B or C. On any given day, the independent probabilities of a breakdown are 0,2 for A, 0,3 for B and 0,25 for C.

(a) Show the above information by means of a probability tree diagram. [3]

(b) For a randomly chosen day, when there was a power-cut, find the probability that,

(i) there was a generator breakdown, [2]

(ii) given that there was a generator breakdown, then it was generator C. [3]

4 An unbiased die with faces marked 1,2,2,3,3,3 is rolled twice. If X is the random variable, "the total score on the two rolls'.

(a) Construct the probability distribution of X. [3]

(b) Calculate the probability that the total score is a prime number. [1]

(c) Find

(i) E(X)

(ii) Var(X). [4]

5 The probability density function of the mass (in kg) of fish caught by a fisherman in a month is given by

$$f(x) = \begin{cases} k\,e^{-\frac{x}{3}} & x \geq 0 \\ 0 & otherwise \end{cases}$$

Find the

(a) value of k, [2]

(b) E(X), [4]

(c) probability that the fisherman will catch at least 60 kg of fish, leaving the answer in exact form. [2]

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Section B (64 marks)

*Answer any **five** questions in the section.*

Each question carries 16 marks.

6 **(a)** In a certain school, 90 % of the learners are right handed.

Find the probability that in a random sample of

(i) 8 learners, exactly 6 will be right handed. [3]

(ii) 20 learners, fewer than 18 will be right handed. [4]

(iii) 200 learners, at most 182 will be right handed. [4]

(b) A discrete random variable X has a Geometric distribution with parameter P. Given that the variance of X is 12.

Calculate the

(i) value of P, [3]

(ii) probability that X is greater than 3. [2]

7 The following table shows two sets of data **D** and **M**.

D	0	5	10	15	20	25	30	35
M	90	82	56	68	58	46	30	20

(a) **(i)** Draw a scatter diagram for the data

(ii) Comment on the relationship between the two sets of data. [4]

(b) **(i)** Calculate the product moment correlation coefficient,

(ii) Comment on the product moment correlation value. [4]

(c) **(i)** Find the equation of the regression line **M** on **D.** [4]

(ii) Use the regression equation to estimate the value of **M** when **D** is

1. 12
2. 45

[4]

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8 (a) A random sample of 100 observations from a population with mean μ and standard deviation σ gave the following

$$\sum(x - 50) = 123{,}5 \qquad \sum(x - 50)^2 = 238{,}4$$

(i) Calculate the unbiased estimates of the population mean μ and variance, σ^2. [4]

(ii) Find a 97 % confidence interval for μ. [4]

(iii) Find $P(\bar{x} > 51)$. [2]

(b) A company receives on average 6 orders per day.

Find the probability that

(i) no more than 2 orders will be received on a given day, [3]

(ii) on a given half day, no orders will be received. [3]

9 The mass of a large loaf of bread is a normal variable with mean 420 g and standard deviation 30 g. The mass of a small loaf of bread is also a normal variable with mean 220 g and standard deviation 10 g.

Find the probability that

(a) 5 large loaves weigh more than 2,1 kg, [3]

(b) 5 large loaves weigh less than 10 small loaves, [4]

(c) the total mass of 5 large loaves and 10 small loaves lies between 4,25 kg and 4,4 kg, [4]

(d) a large loaf weighs twice as much as a small loaf. [5]

10 (a) Distinguish between a

(i) one tailed test and a two tailed test, [2]

(ii) statistic and a parameter, [2]

(iii) sample and a population. [2]

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(b) A machine is supposed to produced toothpicks of length 5 cm. A sample of 10 toothpicks was taken and their lengths measured. The following results were obtained.

4.99	4.96	5.00	4.98	5.01
4.95	4.96	4.97	4.99	4.97

Assuming that the lengths are normally distributed, test at the 1 % level of significance whether the machine is in good working order. [10]

11 **(a)** Define the term

(i) *time-series,*

(ii) *trend.* [3]

(b) The following are monthly sales (in $ dollars) for a company for the months of January to October.

Month	**Sales ($)**
January	700
February	200
March	300
April	800
May	400
June	500
July	1 000
August	500
September	600
October	1 200

(i) Plot a time-series graph.

[4]

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11 (b) (ii) Describe the trend. [2]

(iii) Calculate the 3 point moving average and plot it on the same graph. [6]

(iv) Name any **one** method used to isolate the trend. [1]

12 The heights (in cm) of pupils were measured and the results are shown in the table below.

Height	Frequency
151 – 155	4
156 – 160	18
161 – 165	40
166 – 170	20
171 – 175	3

Test at 5 % level of significance whether the data follows a normal distribution with mean 163 cm and standard deviation 4.4 cm. [16]

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