ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

STATISTICS 6046/2

PAPER 2

SPECIMEN PAPER 3 hours

Additional materials:
- Answer paper
- Graph paper
- List of Formulae
- Electronic 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** 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 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.

The use of an electronic 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)

Answer all questions in this section.

1 A continuous random variable, X, has a probability density function defined as

$$f(x) = \begin{cases} 0.1x + k, & 4 \leq x \leq 6 \\ 0.3, & 6 \leq x \leq 8 \\ 0, & \text{otherwise.} \end{cases}$$

Find

(a) the value of constant k, [3]

(b) $P(5 \leq X \leq 7)$. [3]

2 The marks obtained by candidates in a mathematics examination were displayed as follows:

1	3
2	6
3	1
4	1 3
5	0 2 6 8
6	1 2 2 2 7
7	0 3 4 5 5 8 9
8	0 3 4 4 8
9	2 7 7 8

key 4|1 means 41 %

(a) **(i)** State the name given to this display. [1]

(ii) Calculate the range of the marks. [3]

(b) Comment on the skewness of the distribution. [2]

(c) State any **two** advantage of this type of display of information. [2]

3 The distribution table shows prizes corresponding to six values on a fair spinner used in a game. The spinner lands on only one of the six values.

value	1	2	3	4	5	6
prize in $	2	2	6	4	10	6

(a) Find the probability of the spinner landing on a

(i) prime value, [2]

(ii) value that gives a prize of not less than $4. [3]

(b) Calculate the expected prize for a single game. [3]

4 The masses of letters posted by a certain school are normally distributed with mean 15 g. It is found that the masses of 92 % of the letters are within 10 g of the mean.

Find the

(a) standard deviation of the masses of the letters, [4]

(b) probability that at least 2 out of a random sample of 8 letters have masses which are within 10 g of the mean. [5]

5 **(a)** Define the term **random sample** and state any **two** methods of obtaining such a sample. [3]

(b) A school was asked to send 10 students for an exchange programme with a sister school in another country. The head of the school was asked to supply the names of the 10 students within 3 days. The head then went on to choose 10 students from those who already had valid passports.

(i) Name, giving reasons, the sampling method used by the head of the school. [3]

(ii) State, giving reasons, whether the method used would give rise to a random sample. [3]

Section B (80)

Answer any **five** questions from this section.

Each question carries 16 marks.

6 An insurance company receives on average 3 claims on any given week.

Find the probability that the company receives

(a) at least 2 claims in any given week, [4]

(b) one claim in a day, assuming that the company works for 5 days in a week, [4]

(c) a total of 2 claims during 3 consecutive weeks, [4]

(d) at least 2 claims in exactly one of the 3 consecutive weeks. [4]

7 The amount of fuel used to cover 100 km on 10 occasions travelling at different average speeds using the same car was recorded as follows:

speed (km/hr)	**amount of fuel used** (l)
X	**Y**
80	8
100	10
130	15
110	12
90	9
60	8
70	8
80	9
140	17
95	10

(a) Find the equation of the regression line of the amount of fuel used (Y) on the speed (X). [6]

(b) Use your equation, in **(a),** to estimate where possible, the amount of fuel likely to be used when travelling at

(i) 105 km/hr, [3]

(ii) 50 km/hr. [3]

(c) Find the product moment correlation coefficient and comment on the relationship between the speed and the amount of fuel used. [4]

8 The number of passengers being ferried in each bus is known to follow a normal distribution. A random sample of 50 such buses gave a mean of 70 passengers with a standard deviation of 4.

(a) **(i)** Define the term confidence interval. [3]

(ii) Calculate a 95 % confidence interval for the mean number of passengers in each bus. [4]

(iii) Calculate the probability that a randomly chosen bus had less than 65 passengers. [4]

(b) Calculate the sample size, n, that should be taken so that one is 90 % confident that the sample mean will be within 0.8 of the true mean. [5]

9 **(a)** Distinguish between a 1 tailed test and a 2 tailed test. [4]

(b) A survey on newspaper readership was carried out in 3 provinces.

The results are shown in the table below

Province	**type of newspaper read**		
	today	**current**	**News**
Northern	55	65	30
Central	80	48	62
Southern	75	47	98

Test at 5 % level of significance whether there is an association between the province and newspaper preference. [12]

10 The mass, *M* g, of a randomly chosen key-holder is known to follow a normal distribution with mean 20 g and a standard deviation of 4 g. The mass, *m* grammes of a randomly chosen key is also known to follow a normal distribution with a mean of 12 g and variance of 9 grammes.

(a) Find the probability that the combined mass of

(i) 2 randomly chosen key-holders and 3 randomly chosen keys is greater than 78 g, [5]

(ii) 3 key-holders is greater than the combined mass of 6 keys. [5]

(b) Determine the probability that a randomly chosen key-holder is more than twice the mass of a randomly chosen key. [6]

11 76 motorists were asked to record, for the month of December 2009, the amount of money they spent on petrol. The data is summarised in the table.

petrol purchases ($)	**number of motorists**
$0 \leq x < 50$	4
$50 \leq x < 100$	11
$100 \leq x < 150$	8
$150 \leq x < 200$	16
$200 \leq x < 250$	22
$250 \leq x < 300$	15

(a) State the mid-points of the six classes of petrol purchases. [2]

(b) Calculate, correct to 2 decimal places the

(i) mean amount, [2]

(ii) median, [3]

(iii) standard deviation of money spent on petrol. [3]

(c) Draw on graph paper, a histogram, using a scale of 2 cm to represent $ 50 on the horizontal axis and 5 units on the vertical axis. [4]

(d) Use your diagram to estimate the mode of the given data. [2]

12 **(a)** Explain the concept

(i) seasonal variation, [2]

(ii) trend as used in time series analysis. [2]

(b) The following quarterly data represent the number of customers a certain pharmacy handled between 2007 and 2009.

year	**quarter**	**number of customers**
2007	1 2 3 4	1 700 3 450 2 800 2 300
2008	1 2 3 4	2 100 3 500 2 000 2 000
2009	1 2 3 4	2 600 4 600 3 850 3 800

(i) Plot a time series graph using a scale of 2 cm to represent 500 customers on the vertical axis and 2 quarters on the horizontal axis. [5]

(ii) Calculate the 4 - point moving averages of the data. [2]

(iii) Calculate the centred moving averages and plot them.

Hence draw the trend line. [3]

(iv) Comment on the trend. [2]

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