ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Advanced Level

STATISTICS 6046/1

PAPER 1

NOVEMBER 2021 SESSION 3 hours

Additional materials:
- Answer paper
- Graph paper
- List of Formulae MF 7
- Scientific calculator [Non - programmable]

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.

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 a non – programmable scientific calculator is expected, where appropriate.

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

This question paper consists of 8 printed pages.

Copyright: Zimbabwe School Examinations Council, N2021.

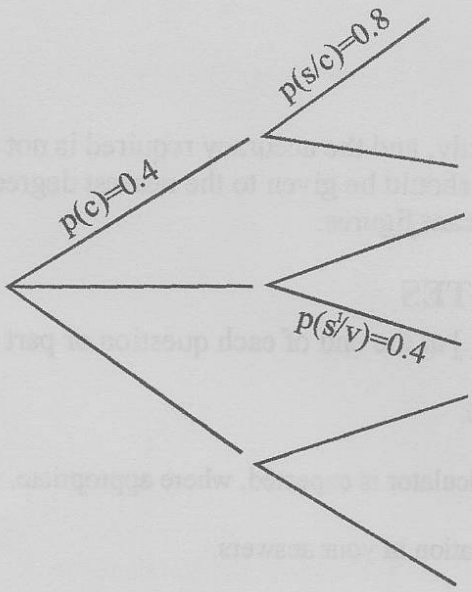
1 **(a)** State the Central Limit Theorem. [2]

(b) 120 bags of mealie-meal of a particular brand are weighed and the mean mass is found to be 750g with standard deviation 3,9g.

Find a 95% confidence interval for the mean mass of bags of mealie-meal of this brand. [3]

2 A street ice cream vendor sells three types of ice creams of flavours, chocolate, vanilla and peach. Of the sales, 40% is chocolate, 35% is vanilla and 25% is peach.
Sales are by cone or cup. The percentage of cone sales for chocolate, vanilla and peach are 80%, 60% and 40% respectively. Let C, V and P represent the sales of chocolate, vanilla and peach flavours respectively.

(a) Copy and complete the tree diagram to illustrate the relevant probabilities of a randomly selected sale of ice cream.



[3]

(b) Find the probability of selling ice cream by cone. [2]

3 A committee of 5 people is to be chosen from 3 men and 6 women.

Calculate the

(a) number of ways the committee can be chosen, [2]

(b) probability of choosing a committee with at least 2 men. [3]

4 In manufacturing a certain metal tube, there are three distinct processes X, Y and Z. The mean time for each process and the standard deviation of these times are given in the table below.

	Mean times (in seconds)	Standard deviation
Process X	30	3
Process Y	10	1
Process Z	20	2

During the course of its manufacturing, each metal tube is subjected to processes X and Z only once and to process Y three times. Assuming that the times spent on each stage are independently and normally distributed,

find the

(a) probability that the metal tube would take less than 75 seconds to manufacture, [3]

(b) percentage of metal tubes which would take more than 87 seconds to manufacture. [3]

5 **(a)** Give an example of each of the following components of a time series:

(i) trend
(ii) cyclical
(iii) seasonal
(iv) irregular / random [4]

(b) State **one** advantage of using a 5-point moving average compared to a 3-point moving average. [2]

6 **(a)** Define the following terms, giving examples:

(i) measures of location

(ii) measures of dispersion [4]

(b) The following data represents the number of goals scored over a season by 30 players of a local football club.

17	21	35	64	2	0	20	44	52	81	47	21	14	10	0
2	1	1	3	1	5	2	1	18	0	1	19	1	2	0

(i) Construct a grouped frequency distribution table with equal class intervals.

(ii) Deduce the shape of the distribution of goals. [3]

7 Data about employment of males and females in a town are shown in the table below.

Sex	Unemployed	Employed	Total
Male	412	206	618
Female	305	358	663
Total	717	564	1 281

A person from the town is chosen at random. Let A be the event, "the person is male" and let B be the event, "the person is employed."

(a) Find

(i) P(A)

(ii) P (A and B)

(iii) Are events A and B independent? Justify your answer. [4]

(b) Given that the person is unemployed, find the probability that the person is female. [3]

8 **(a)** Distinguish between correlation and regression. [2]

(b) An electric oven was switched on and the temperature of the oven was noted at five minute interval.

Time (x) minutes from switching of oven	0	5	10	15	20	25	30	35	40
Temperature	0,4	1,5	3,4	5,5	7,7	9,7	11,7	13,5	15,5

(iv) Calculate the summary statistics that would be used to find the product moment correlation coefficient. [2]

(v) Hence, find the product moment correlation coefficient and comment on its value. [4]

9 Five independent measurements of the diameter of a ball bearing were made using a certain instrument. The results obtained in millimetres were

8.1; 9.1; 8.9; 8.9; 9.1

Given that true diameter of the ball bearing is 9.0 mm,

(a) calculate the unbiased estimates of the mean and variance of the measurement error of the instrument, [5]

(b) assuming that the measurement errors are independent and normally distributed, find the 90% confidence interval of the mean measurement error. [3]

10 (a) Define the following terms, using examples:

(i) parameter

(ii) statistic [4]

(b) A teacher recorded the test marks (x), of 15 students. It was found that $\sum x = 820$ and that the standard deviation of x was 6.3.

Calculate the value of

(i) $\sum(x - 53)$,

(ii) $\sum(x - 53)^2$. [4]

11 (a) Customers arrive randomly at a supermarket at an average rate of 3,6 per minute.
Assuming that, the arrivals form a Poisson distribution,

calculate the probability that

(i) no customer arrives in any particular minute,

(ii) one or more customers arrive in any 30 seconds. [5]

(b) An exponential distribution has probability density function (pdf), f given by

$f(t) = \frac{1}{5}e^{\frac{1}{5}t}$, where $t \geq 0$.

Find E(T). [4]

12 **(a)** Masses of bags of oranges are normally distributed with mean 5kg and standard deviation 0,2kg. Five hundred bags of oranges are delivered to a supermarket.

Find the

(i) probability that a randomly delivered bag weighs more than 5,5 kg,

(ii) number of bags from a single delivery that would be expected to weigh more than 5,5kg. [4]

(b) 20% of the bolts manufactured by a machine are known to be faulty. A random sample of 200 such bolts is taken.
Use a suitable approximation to find the probability that more than 50 bolts will be faulty. [5]

13 **(a)** Most discrete random variables assume whole number values. Write down two examples of discrete data which do not take up whole numbers only. [2]

(b) A continuous random variable x has probability density function given by

$$f(x) = \begin{cases} k(x-1)(3-x), & 1 \leq x \leq 3 \\ 0, & otherwise \end{cases}$$

(i) Show that $k = \frac{3}{4}$.

(ii) Find $E(x)$.

(iii) Find $P(x > 2{,}5)$. [8]

14 Learners from schools X, Y and Z sat for a Mathematics examination. The results were as follows:

	School X	School Y	School Z
Passed	76	60	40
Failed	15	25	20

Test at 5% level of significance whether there is an association between results and school. [13]