GOVERNMENT BILINGUAL HIGH SCHOOL YAOUNDE
MOCK GCE

APRIL 2021   **ADVANCED LEVEL**

Subject Title	PURE MATHS WITH STATISTICS
Paper Number	PAPER 3
Subject Code	0770

THREE HOURS

Full marks may be obtained for answers to ALL questions. All questions carry equal marks

Mathematical formulae booklets published by the CGCE Board are allowed

In calculations, you are advised to show all the steps in your working, giving answers at each stage

Calculators are allowed

Start each question on a fresh page.

1. (i) A discrete random variable X has the following probability distribution

$X = x$	0	1	2	3	4
$P(X = x)$	0.12	p	0.4	q	0.08

Given that $E(X) = 2.02$, find

   a.   The values of p and q

   b. $Var(X)$

   c.   The mean and variance of Y, where $Y = 3X - 2$

(ii) The random variable M is given by the sum of the scores when two ordinary dice are thrown. Find

   d.   The cumulative distribution of M

   e.   P(M > 8) and P(M being an even number)

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2. (i) A continuous random variable X has probability density function $f(x)$ defined by:

$$f(x) = \begin{cases} k(px + 2), & 0 \leq x \leq 4 \\ 0, & otherwise \end{cases}$$

Given that the median of X is $2\frac{2}{3}$, find

   a.   The values of the constants k and p

   b.   The mean of X

   c.   The variance of X

   d.   Sketch the graph of $f(x)$ and determine the mode

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3. (i) Two events A and B are such that $P(A) = \frac{1}{3}$, $P(B) = \frac{2}{5}$, $P(A/B) = \frac{1}{12}$ find;

   a. $P(A \cap B)$

   b. $P(B/A)$

   c. $P(A \cap B')$

(ii) Three Cooks Anna, Brenda and Cathy sort rice for cooking. Anna sorts 45% of, Brenda sorts 25% and Cathy sorts 30%. The probability that what Anna sorted contains stones is 0.5 and the respective probabilities for Brenda and Cathy are 0.3 and 0.2. What is the probability that a rice container with stones found by a quality assurance person was sorted by Anna?

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4. The number of telephone calls arriving per minute, at a small telephone exchange has a Poisson distribution with mean 2.25. Find the probability that:

   a.   Exactly two calls arrive in a minute

c. Estimate the amount of drug that should be used so that 7 offspring are expected.

d. Find also the Spearman rank correlation coefficient for the data.

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7. State clearly the meaning of the following terms as used in hypothesis testing:

a. Null and alternative hypothesis

b. Type 1 and Type 11 errors

The same English test is given to random samples of lower sixth students in two high schools. The results obtained are summarized as follows:

$$n_1 = 30, \quad \bar{x} = 41, \quad \sum(x - \overline{X})^2 = 1196$$

$$n_2 = 35, \quad \bar{y} = 47, \quad \sum(y - \overline{y})^2 = 1520$$

Assuming that the distribution of marks is normal with a common population variance and treating the samples as large, test at the 5% level of significance, whether there is a difference in the English ability of lower sixth students in the two schools

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8. The marks of candidates in a certain examination are normally distributed with mean μ and standard deviation σ. 6.68% of the candidates had marks more than 75 and 2.28% of the candidates had marks less than 40.

a. Find the values of μ and σ

b. Find the probability that a candidate chosen at random scored more than 70 marks

Anthony, an addicted PMUC player, visits the local PMUC shop most days. The total time taken to drive to the PMUC shop and back is modeled by a normal variable with mean 25 minutes and standard deviation 3 minutes. The time spent at the local PMUC shop is also modeled by a normal variable with mean 120 minutes and standard deviation 10 minutes. Describe the distribution and find the probability that on a certain evening Anthony is away from home for

c. More than 2hours 30minutes.

d. Between 1hour 30minutes to 2hours

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b. At most two calls arrive in a minute

c. More than two calls arrive in a period of two minutes, giving your answers correct to 3 decimal places.

In the holidays Martin spends **25%** of the day playing computer games. Martin's friend phones him once a day at a randomly chosen time.

d. Find the probability that, in one holiday period of 8 days, there are exactly 2 days on which Martin is playing computer games when his friend phones.

e. Another holiday period lasts for 12 days. State with a reason whether it is appropriate to use a normal approximation to find the probability that there are fewer than 7 days on which Martin is playing computer games when his friend phones.

f. Find the probability that there are at least 13 days of a 40-day holiday period on which Martin is playing computer games when his friend phones.

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5. A random set of 90 observations of a variable X, is recorded in the group frequency distribution table below.

Observation (x)	$20 - 24$	$25 - 29$	$30 - 34$	$35 - 39$	$40 - 44$	$45 - 49$	$50 - 54$
Frequency (f)	8	15	25	18	12	7	5

a. Calculate the mean, standard deviation, and the mode of the set of observations, giving your answers correct to 2 decimal places.

Another independent variable, Y, has 40 observations with mean 32.50 and variance 85.42, find

b. The mean and variance of the combined set of 130 observations, correct to two decimal places.

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6. A new fertility drug was tried on rabbits. The table below shows the number of offspring (Y) delivered within a given period and the amount of drug (X), in grams, used.

X	18	12	10	8	7	5
Y	2	4	5	6	8	11

a. Calculate the variance of X, the variance of Y and the covariance of X and Y. Hence, find the product moment correlation coefficient between the number of offspring delivered and the amount of drug used.

b. Determine the regression line of X on Y