MATH WITH STATISTICS 3
0770

CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

JUNE 2018 **ADVANCED LEVEL**

Subject Title	**Mathematics With Statistics**
Paper No.	3
Subject Code No.	0770

THREE HOURS

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

Mathematical formulae and tables produced by the GCE Board are allowed.

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

Electronic calculators may be used.

Start each question on a new page.

1. The frequency distribution below shows the masses of 400 pupils, measured to the nearest kilogram.

Mass (kg)	31 - 35	36 - 40	41 - 45	46 - 50	51 - 55	56 - 60	61 - 65	66 - 70	71 - 75
No. of pupils	0	15	42	65	92	75	67	37	7

For this distribution calculate, to two decimal places,
(a) the mean,
(b) the standard deviation,
(c) the median
(d) the mode.

(4, 3, 3, 3 marks)

2. (i) Two events A and B are such that

$$P(A) = \frac{1}{3},\ P(B) = \frac{2}{5} \text{ and } P(A/B) = \frac{1}{12}$$

Find:
(a) $P(A \cap B)$.
(b) $P(B / A)$.
(c) $P(A \cap B')$.

(2, 2, 3 marks)

(ii) In a certain village, one-quarter of the population has a particular disease. If a person has the disease, the probability that a laboratory test will show a positive result as $\frac{19}{20}$. If a person does not have the disease, the probability that a laboratory test will show a negative result is $\frac{9}{10}$. A person is selected at random from the village and tested.
Find the probability that:
(a) the test result is positive,
(b) the person has the disease or the test result is positive.

(3, 3 marks)

3. A continuous random variable X has probability density function f defined by

$$f(x) = \begin{cases} kx(3 - x), & \text{for } 0 \leq x \leq 3, \\ 0, & \text{otherwise.} \end{cases}$$

Calculate, for this distribution,
(a) the value of the constant k,
(b) the mean,
(c) the variance,
(d) the mode.

(3, 3, 4, 3 marks)

4. (i) State two conditions under which the normal distribution may be used as an approximation to the binomial distribution.

(1 mark)

(ii) In a particular community, the probability that a man has brown eyes is $\frac{1}{6}$. A random sample of 180 men is taken from the community. Using the normal distribution as an approximation to the binomial distribution, find the probability that the number of men with brown eyes is:
(a) exactly 35,
(b) less than 35,
(c) between 29 and 32 inclusive.

(6, 2, 4 marks)

5. The probability mass function of a discrete random variable X is given by

$$P(X = x) = \begin{cases} k(7 - x)(x + 1), & \text{for } x = 0, 1, 2, 3, 4, 5, 6 \\ 0, & \text{otherwise.} \end{cases}$$

Calculate:

(a) The value of the constant k.

(b) The mean of X.

(c) The variance of X.

(d) $P(1 \leq X < 4)$.

(e) The mean and variance of $3X - 4$.

(2 , 2 , 3 , 2 , 4 marks)

6. (i) On the basis of the results obtained from a random sample of 64 adult males taken from a population with standard deviation σ, the 95 % confidence interval for the mean blood pressure in the adult males is found to be

$$(115.55 \text{ Nm}^{-2}, \ 120.45 \text{ Nm}^{-2}).$$

Find:

(a) the values of $\bar{x}$, the sample mean, and σ, the population standard deviation,

(b) the 99 % confidence interval for the mean blood pressure of the adult males.

(5 , 4 marks)

(ii) Two independent random variables X and Y are such that

$X \sim N(200, 144)$ and $Y \sim N(175, 81)$.

Find the distribution of:

(a) $X + Y$,

(b) $X - Y$.

(2 , 2 marks)

7. (i) In a certain busy airport, planes leave at an average rate of 4 per minute. Use the Poisson distribution to find, to 4 decimal places, the probability that:

(a) no plane leaves during a particular one minute period,

(b) at least one plane leaves during a particular 30-second period.

(4 , 3 marks)

(ii) Two independent random variable X and Y are such that

$X \sim N(40, 25)$ and $Y \sim N(34, 18)$.

If from each of the distributions, a random sample of size 10 is taken, find the distribution of $\bar{X} - \bar{Y}$

(2 , 4 marks)

8. The relationship between two variables x and y is as shown in the table below.

x	15	16	18	20	25	27	30	32	35	40
y	9	3	8	10	1	5	7	2	6	4

(a) Calculate, to 2 decimal places, the product moment correlation coefficient for the data.

(b) Determine the least squares regression line of y on x.

(c) Estimate the value of y when $x = 38$.

(9 , 2 , 2 marks)