

0770/3/2023
P.M.S. A/L

**SOUTH WEST REGIONAL MOCK EXAMINATION
GENERAL EDUCATION**

THE TEACHERS' RESOURCE UNIT (TRU)

IN COLLABORATION WITH

THE REGIONAL INSPECTORATE OF PEDAGOGY FOR SCIENCE

AND

THE SOUTH-WEST ASSOCIATION OF MATHEMATICS TEACHERS

(SWAMT)

WEDNESDAY: 29/03/2023-AFTERNOON

ADVANCED LEVEL

Subject Title	Pure Mathematics With Statistics
Paper Number	Paper 3
Subject Code Number	0770

THREE HOURS

INSTRUCTIONS TO CANDIDATES:

Answer ALL questions.

For your guidance, the approximate mark allocation for parts of each question is indicated in brackets.

You are reminded of the necessity for good English and orderly presentation in your answers.

Mathematical formulae and tables published by the CGCE Board and noiseless, non-programmable calculators are allowed.

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

- 1(i) Two events A and B are such that $P(A) = \frac{1}{2}$, $P(B/A) = \frac{3}{5}$, $P(B/A') = \frac{4}{5}$. Find,
- (a) $P(A \cap B)$ (2 marks)
- (b) $P(B)$ (3 marks)
- (c) $P(A/B')$ (3 marks)
- (ii) The papers of an engineering exam are Mathematics, Physics and Chemistry. The probabilities that John will succeed in these papers are $\frac{9}{10}$, $\frac{3}{5}$ and $\frac{4}{5}$, respectively. If he passes in all the papers, he will succeed in the exam. If he fails in just one paper, his name will be on the waiting list. Find the probability that
- (a) he succeeds in the exam, (2 marks)
- (b) his name is on the waiting list. (3 marks)

- 2 The marks, out of 50, scored by 100 students in a mathematics examination are summarized in the table below

Marks (x)	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44
No. of students (f)	4	9	21	25	20	14	7

- (a) Calculate, to 2 decimal places, the mean and standard deviation of the marks. (7 marks)
- (b) Draw a cumulative frequency curve for this distribution. (2 marks)
- (c) To obtain an "A" grade, a student must score at least 36. Using the curve, determine the percentage of students who scored an A grade. (4 marks)

- 3 A discrete random variable X has the following distribution:

x	1	3	k	6	8
$P(X = x)$	t	$\frac{3}{10}$	$\frac{1}{4}$	$\frac{3}{20}$	$2t$

- (a) Find the value of t , (2 marks)
- Given that $E(X) = 4.5$, find,

- (b) the value of k , (2 marks)
- (c) the variance of X (4 marks)
- (d) the mean and the variance of $Y = 4X - 3$ (4 marks)
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4 A continuous random variable X has probability density function f defined by

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

Find,

- (a) the value of the constant c , (3 marks)
- (b) the mean and variance of the distribution, using the value of c above, (7 marks)
- (c) an equation that is satisfied by the median, m . (3 marks)
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5(i) In a class, 20% of the students are shortsighted. 5 students are selected at random from the class. Find the probability that

- (a) exactly two are shortsighted, (2 marks)
- (b) at least one is shortsighted. (3 marks)

(ii) In a dialysis center, it is known that on the average, 3 patients die every week. In a particular week, find the probability that,

- (a) no patient dies, (2 marks)
- (b) at least one patient dies, (3 marks)
- (c) in a period of two weeks, exactly two patients die. (3 marks)
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6(i) (a) State two properties of a suitable estimator. (2 marks)

(b) A sample of scores 3, 4, 5, 7, 2 is drawn from a population. Use this sample to find unbiased estimates for the population mean and variance. (4 marks)

(ii) A detergent producing company claims that the packets of their product have a mean mass of 480 grams, with standard deviation 18 grams. In a particular week, their machine developed a fault and it is thought that this affected the masses of their packets. A sample of 225 packets was taken and the mean mass found to be 483 grams. Carry out a test at the 5% level of significance, to verify whether the company's claim is justified. (7 marks)

7(i) The grapes harvested from a given tree have masses X , mean mass 400 grams and standard deviation δ . It is known that 93.32% of the grapes have masses less than 403 grams.

(a) Find the value of δ . (3 marks)

Hence, find

(b) $P(X > 397)$, (2 marks)

(c) $P(398 < X < 404)$

(3 marks)

- (ii) 144 bags of rice from a particular factory are weighed and found to have mean mass is 50 kg and standard deviation 2.4 kg.

(a) Find the 90% confidence interval of the mean mass.

(2 marks)

(b) Given that the 95% confidence interval of a sample is (49.6472, 50.3528), find the sample size.

(3 marks)

8. The marks obtained by 10 students in Chemistry and Physics were recorded as follows:

Physics (x)	16	18	21	23	24	28	30	32	33	35
Chemistry (y)	32	31	36	39	37	43	42	49	54	52

You may assume $\sum(X) = 260$, $\sum(Y) = 415$, $\sum(X^2) = 7148$, $\sum(Y^2) = 17805$, and $\sum(XY) = 11245$.

(a) Calculate, to 3 decimal places, the product moment correlation coefficient for the Physics and Chemistry marks.

(9 marks)

(b) Find the equation of the regression line of Physics on Chemistry.

(2 marks)

(c) Estimate the Physics marks of a student who scored 40 in Chemistry.

(2 marks)

END