E-MATHS 001-1 & 2
MOCK 2023
Theory

ELECTIVE MATHEMATICS 2

Name: …….
Class: ……

MOCK 2023

PARKOSO COMM. SENIOR HIGH SCHOOL, KUMASI

FORM THREE A1, SCI, AGRIC & BUS *2 HRS 30MIN*

*Do **not** open this booklet until you are told to do so. While you are waiting, read and observe the following instructions carefully. Write your **FULL NAME** and **CLASS** in **INK** in the space above.*

*This booklet consists of **two** sections, **A** and **B**. Answer **ALL** questions in section **A** and **FOUR** questions in section **B**, in your answer booklet. Marks will be given for clarity and orderly presentation.*

SECTION A

[48 Marks]

Answer **all** *the questions in this section.* **All** *questions carry equal marks.*

1. Solve the equation: $\begin{vmatrix} 2x & -6 \\ x+1 & -2 \end{vmatrix} = \begin{vmatrix} x+3 & x+2 \\ 0 & 4-x \end{vmatrix}$

2. Given that $\sqrt{3m+4} - \sqrt{m-3} = 3$, find the values of m.

3. The inverse of a function f is given by $f^{-1}(x) = \frac{7x-2}{3-x}$, $x \neq 3$. Find the
   a) the function $f(x)$.
   b) the value of m for which $f(m+1) = -\frac{4}{5}$

4. The **first term** of an Arithmetic Progression (*AP)* is -8, the **last term** is 52 and the **sum of terms** is 286. Find
   a) the number of terms.
   b) the common difference.

5. The table shows the distribution of heights (cm) of 60 seedlings in a vegetable garden.

Heights (cm)	0.1−0.3	0.4−0.6	0.7−0.9	1.0−1.4	1.5−1.9	2.0−2.2	2.3−2.5
Frequency	6	9	12	15	3	6	9

   a) Draw a histogram for the distribution.
   b) Use the histogram to estimate the **modal** height of the seedlings.

6. There 6 Christians and 8 Muslims in a club. If **five** persons are selected at random, find the probability that;
   a) **equal** number Christians as Muslims will be selected.
   b) **more Muslims** than Christians will be selected

7. In triangle ONM, P is the mid-point of $\overrightarrow{NO}$. If $\overrightarrow{MN} = 8\boldsymbol{i} + 3\boldsymbol{j}$ and $\overrightarrow{MO} = 14\boldsymbol{i} - 5\boldsymbol{j}$, find $\overrightarrow{MP}$

8. Find, correct to three significant figures, the magnitude of the resultant vectors $F_1 = (12N, 150°), F_2 = (20\text{N}, 180°)$ and $F_3 = (15\text{N}, 300°)$

SECTION B

[52 Marks]

Answer **four** *questions* **only** *from this section with at least* **one** *question from each part.* **All** *questions carry* **equal** *marks.*

PART I
PURE MATHEMATICS

9. a) If ${}^{9}C_x = 4[\,{}^{7}C_{x-1}\,]$, find the values of x.

   b) Find the derivates of $f(x) = x^2 - 3x$ from the first principle.

10. a) Find the equation of the line through $(2, -1)$ and $(1, -5)$.

    b) Express $\frac{1-8x-x^2}{(x+1)(x-1)^2}$ in partial fractions.

11. a) If α and β are the roots of $x^2 + kx + 11 = 0$ and $\alpha^2 + \beta^2 = 27$, find the possible values of k.

    b) A quadratic polynomial, $f(x)$ and has $(2x + 1)$ as a factor. If $f(x)$ is divided by $(x - 1)$ and $(x - 2)$, the remainders are -6 and -5 respectively. Find
    i) $f(x)$
    ii) the zeros of $f(x)$.

PART II
STATISTICS AND PROBABILITY

12. a) The mean of $4, 7, x, y, 18$ and 21 is 12. When y is removed from the distribution, the mean becomes $12\frac{3}{5}$. Find the values of x and y.

    b) In an examination the students were ranked in Mathematics and English as shown in the table below

Mathematics	9	6	7	2	5	1	8	3	10	4
English	5	7	1	4	10	3	2	8	6	9

    i) Calculate the Spearman's rank correlation coefficient.
    ii) Interpret your results.

13. a) The probabilities that three men A, B and C, win their respective races are $\frac{1}{3}$, $\frac{3}{5}$ and $\frac{3}{4}$. What is the probability that
    i) **all** of them win the races?
    ii) **only one** of them wins the race?

    b) A book club sends 4 science fiction and 6 history books to Samuel. He chooses 4 of these books at random to take for vacation. What is the probability that he chooses;
    i) **exactly 2** history books.
    ii) an **even number** of history books.

PART III

VECTORS AND MECHANICS

14. The vectors of M, N and R relative to the origin are $m = \boldsymbol{i} - 2\boldsymbol{j}$, $n = 3\boldsymbol{i} + 2\boldsymbol{j}$ and $r = -\boldsymbol{i} - 2\boldsymbol{j}$.
    a) Find, correct to **one decimal** place, angle MNR.
    b) Find, correct to **three significant figures**, the perimeter of triangle MNR.

15. a) A uniform plank XY of mass 40kg and length 30m rests horizontally on two supports P and Q, where $|PX| = 8\text{m}$ and $|QX| = 18\text{m}$. Objects 10kg and 5kg are hanged at points M and N respectively, where $|MX| = 10\text{m}$ and $|NY| = 6\text{m}$. If the system remains in an equilibrium under the action of these forces, calculate the reaction at the supports P and Q.

    b) Three forces $F_1 = (48\mathbf{N}, 060°)$, $F_2 = (12\mathbf{N}, 120°)$ and $F_3 = (18\mathbf{N}, 240°)$ act on a body. Find, correct to **one** decimal place, the magnitude of the force F_4, that will keep the system in equilibrium.

END OF THE PAPER