

2024 END-OF-SEMESTER EXAMS – MATHEMATICS (ELECTIVE) 2

MATHEMATICS (ELECTIVE)

SHS ONE

[70 MARKS]

Answer question **ONE** and any other **two** questions in section A

In each question, all necessary details of workings, including rough work **must** be shown with the answer.

Give answers as accurately as data and tables allow.

PAPER 1

[50 marks]

1. (a) In a class of 60 students, 47 study mathematics, 33 study mathematics and physics, 31 study Chemistry and mathematics, 29 study physics and chemistry and 20 study all the subjects. If the number of students who study only physics is equal to that of those who study only chemistry, illustrate the given information on a Venn diagram and find the number of students who study
- Only physics
 - Chemistry
 - Only one subjects
- b). Simplify $\frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}} - \frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}}$
2. A binary operation $\bullet$ is defined on the set R of real numbers by $a \bullet b = a + b - 2ab$, where $a, b \in R$,
- Calculate $(5 - 2\sqrt{5}) \bullet (6 + 5\sqrt{2})$, leaving your answer in the form $m + n\sqrt{2}$, where m and n are rational numbers.
 - Determine whether or not the operation $\bullet$ is commutative.
 - Find the identity element of R under the operation $\bullet$
3. (a) Express $\frac{2\sqrt{27}-3\sqrt{75}+2\sqrt{147}}{2\sqrt{12}+\sqrt{48}}$ in the form $q + r\sqrt{s}$, where q, r and s are rational numbers.
- (b) . If $\sqrt{m-3} + \sqrt{m+2} = 5$, find m.
4. (a). Find the positive square root of $11 - 4\sqrt{6}$
- (b). A binary operation $*$ is defined on the set of real numbers, R, by $p * q = \frac{p+q}{\sqrt{pq}}$.
- Evaluate $(-2) * (-1)$