THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
DIPLOMA IN SECONDARY EDUCATTION EXAMINATION

740 **MATHEMATICS**

Time: 3 Hours **Year: 2023**

Instructions.

1. This paper consists of sections A and B with a total of **Fourteen (14)** questions.
2. Answer **all** questions from section A and **four (4)** questions from section B.
3. Section A carries **forty (40)** marks and section B Carries **sixty (60)** marks.
4. Cellular phones are **note** allowed in the examination room.
5. Write your **examination Number** on every page of your answer booklet(s).

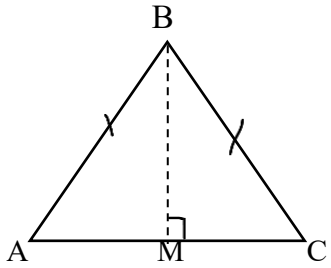
SECTION A (40 Marks)

Answer all questions from this section. Each question carries 4 marks.

1. (a) Find the value of a
   (b) Use a non-programmable calculator to find the mean and standard deviation of the scores from the following data of 80 students:

class mark	90.5	80.5	70.5	60.5	50.5	40.5	30.5	20.5
Frequency	4	17	16	8	a	7	12	3

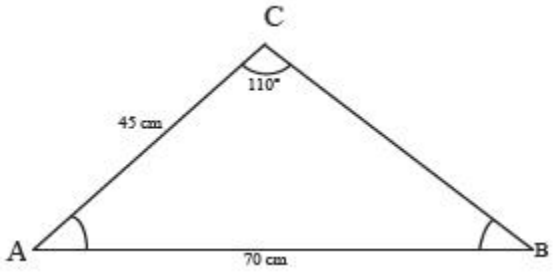
2. Prove that the perpendicular line from the vertex B to the base AC of an isosceles triangle ABC bisects the base and the angle ABC.



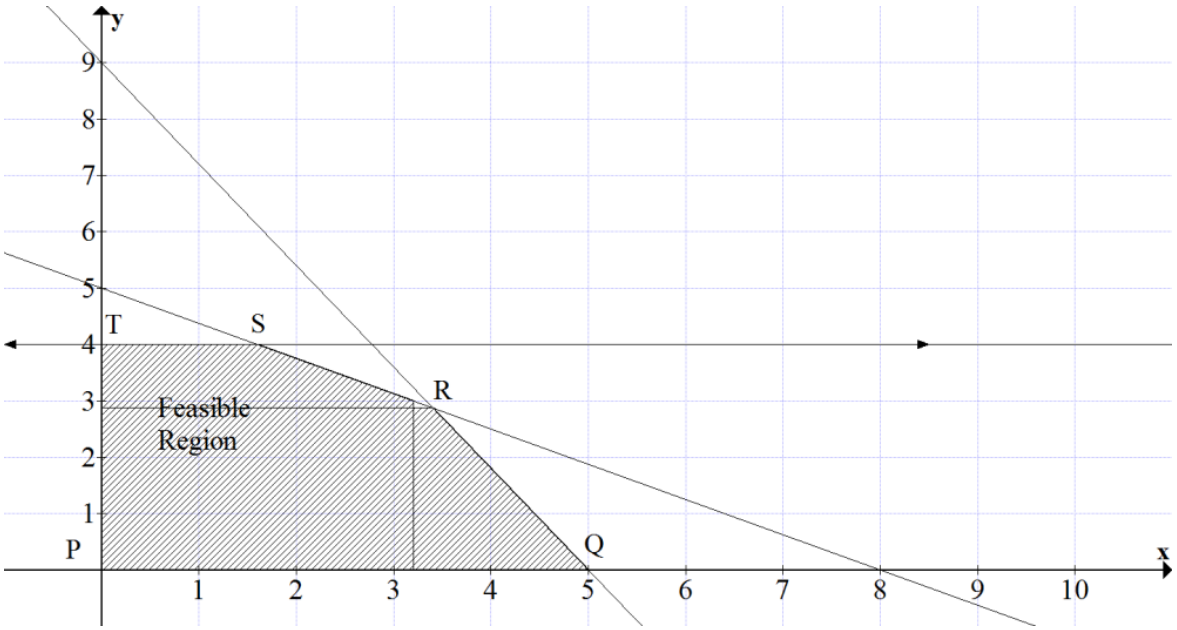
3. Prove the condition that, the line $y = x - c$ touches the ellipse if the discriminant is equal to zero. Also, find the possible value(s) of c and the coordinates of the point(s) of contact, if the line $y = x - c$ touches the ellipse $9x^2 + 16y^2 = 144$.

4. Briefly explain the steps to follow in order to guide Form Three students on how to find the domain of the rational function $f(x) = \frac{1}{x-1}$

5. Find the area of the following triangular field ABC in square meters, correct to the nearest whole numbers.



6. Formulate the constraints representing the feasible region shown in the following graph.



7. Support briefly by giving four reasons the statement that; "Students' progressive report keeping is an important aspect for motivation in learning Mathematics".

8. (a) Given that, the roots of the quadratic equation $ax^2 + bx + c$ differ by 2, then show that $4ac = b2 - 4a$
   (b) Given that; $x + 2$ and $2x - 1$ are factors of the quadratic equation $ax^2 + x - c$. Find the values of a and c.
9. Given the function $f(x) = \cosh^{-1} x$
   (a) sketch the locus of the function using the table of values such that 1<=x<=4
   (b) determine for the values of x and y where the function is defined.

10. Find the value of a in surd form if $\int_1^a (x + \frac{1}{2})\ dx = \int_0^{\frac{\pi}{4}} sin^2 x\ dx$

SECTION B (60 Marks)

Answer all questions from this section. Each question carries 15 marks.

11. (a) Determine the values of λ and μ such that the points (-1, 3, 2), (-4, 2, -2) and (5, λ, μ) lie on a straight line.
    (b) Given that; if $|\underline{A} + \underline{B}| = 60$, $|\underline{A} - \underline{B}| = 60$, *and* $|\underline{B}| = 46$, find $|\underline{A}|$
    (c) Find the angle between the vectors $2\underline{i} + 6\underline{j} + 3\underline{k}$ *and* $12\underline{i} - 4\underline{j} + 3\underline{k}$ giving your answer in correct to two decimal places.

12. An open rectangular box with square ends is fitted with an overlapping lid, which covers the top and front face. Determine the maximum volume of the box if $6m^2$ of metal are used to make it.

13. Suppose you are preparing to teach a topic on Sequence and Series to Form Two students, prepare a detailed 80 minutes lesson plan to teach the concept about the sum of first n terms of an arithmetic progression.

14. If the head of a school intends to purchase Mathematics reference books, then analyse five factors he/she should consider before purchasing suitable books.