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

740

MATHEMATICS

Time: 3 Hours **Tuesday, 07th May 2019 a.m.**

Instructions

1. This paper consists of sections A, B and C with a total of **sixteen (16)** questions.
2. Answer **all** questions in section A and **two (2)** questions from each of sections B and C.
3. Section A carries **forty (40)** marks and sections B and C carry **thirty (30)** marks each.
4. Non-programmable calculator, mathematical and statistical tables may be used.
5. All communication devices and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

SECTION A (40 Marks)

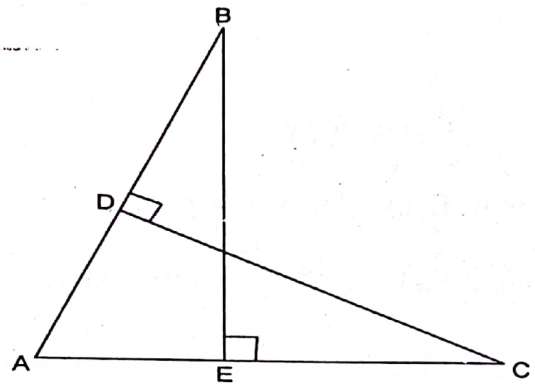
Answer **all** questions in this section.

1. Identify four great Mathematicians in mathematics history and briefly explain the contribution of each one.

2. Briefly explain Zoltan Dienes view in learning of mathematics.

3. Given a statement that; "If I am under nine years old, then I will go to school". Write its Converse, Inverse and Contrapositive.

4. In the following figure, $\overline{AB} = \overline{AC}$, D and E are mid points of $\overline{AB}$ and $\overline{AC}$ respectively. Prove that triangles ABE and ACD are congruent.



5. Mention four curriculum materials applied in teaching and learning of mathematics subject.

6. A die is thrown twice and the sum of the numbers appearing is observed to be 8. What is the probability that number 5 has appeared at least once?

7. Find the equation of the tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the point $(a\cos\theta, b\sin\theta)$.

8. Consider a point P which divides the line joining points (4, 2, 2) and (10, 6, 4) in the ratio 1:1 internally. Find the coordinates of point P.

9. Differentiate $\cosh^{-1}(\sqrt{x^2+1})$ with respect to x.

10. By using the cross product of vectors, find the angle between vector $\underline{a} = 2\underline{i} + \underline{j} - 2\underline{k}$ and $\underline{b} = \underline{i} - 2\underline{j} + \underline{k}$.

SECTION B (30 Marks)

Answer **two (02)** questions from this section.

11. (a) Given that $\sum r^2 = \frac{n}{6}(n+1)(2n+1)$ and $\sum r = \frac{n}{2}(n+1)$.

Evaluate $\sum_{4}^{10} n^2 + 3n$.

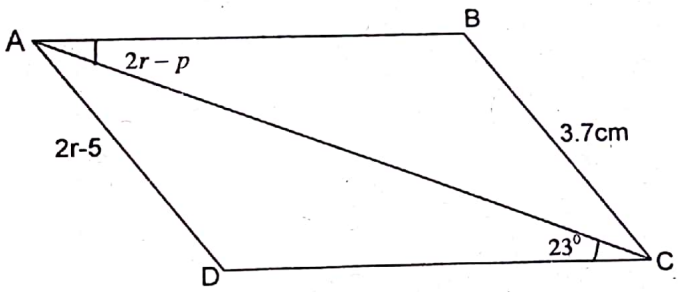
(b) The roots of polynomial equation $ax^3 + bx^2 + cx + d = 0$ are in geometric progression. Show that $ac^3 = db^3$.

(c) The roots of quadratic equation $2x^2 - 7 = 0$ are α and β. Find an equation whose roots are $\alpha^2\beta$ and $\alpha\beta^2$.

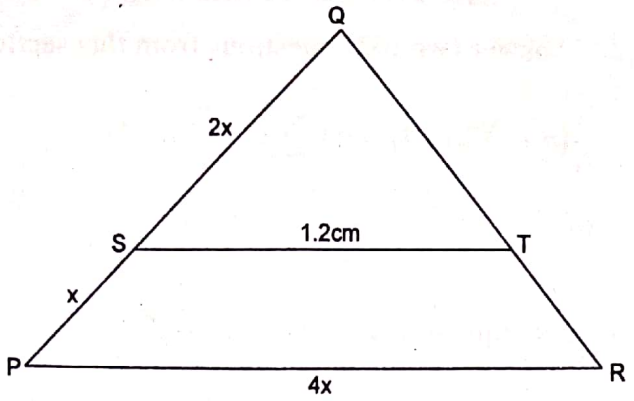
12. (a) Draw an electrical network of the simplified form of the following compound statement; $\sim[(P \wedge \sim Q) \vee (\sim P \wedge Q) \vee (\sim P \wedge \sim Q)]$.

(b) Using the laws of algebra of propositions, determine the validity of the following argument; "If it rains, the seedlings will survive. If seedlings survive well, animals will not die. But animals are dying. Therefore it is not raining".

13. (a) In the following figure, $\triangle ABC$ is congruent to $\triangle CDA$. Find the value of r and p.



(b) In the following figure; $\triangle PQR \sim \triangle SQT$. Find the value of x.



SECTION C (30 Marks)

Answer **two (02)** questions from this section.

14. "Mathematics is a mother of various disciplines". Justify the statement by giving five points.

15. Describe five criteria for selection of teaching and learning techniques in the teaching and learning of Mathematics.

16. Briefly describe three functions of an effective mathematics teacher.