THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

041 BASIC MATHEMATICS
(For Both School and Private Candidates)

TIME: 3 Hours 1 November 2000 A.M.

Instructions

1. This paper consists of sections A and B.
2. Answer ALL questions in section A and any FOUR (4) questions from section B.
3. All necessary working and answers for each question done must be shown clearly.
4. Mathematical tables and graph papers may be used unless otherwise stated.
5. You are advised to spend not more than 2 hour on section A and the remaining time on section B.
6. Write your Examination Number on every page of your answer booklet(s).

This paper consists of 4 printed pages

SECTION A (60 marks)

Answer ALL questions in this section.

1. (a) Evaluate $\frac{2569 \times 0.0064}{0.000035}$ expressing your answer in standard form correct to four significant figures. (2½ marks)

   (b) (i) If $n*m = (n + m)^2 - m$, find the value of $(3*1)*2$ (3 marks)

   (ii) Evaluate $(1825)^2 - (175)^2$ (2 marks)

2. (a) If $\xi = \{a, b, c, d, e\}$, $A = \{a, b, c\}$ and $B = \{e, d\}$

   Find

   (i) $A' \cap B'$ (1½ marks)

   (ii) $(A \cap B)'$ (2 marks)

   (b) In a class of 42 students, 31 students study History and 26 study Physics. Using Venn diagrams or otherwise, find the number of students who study Physics only. (4 marks)

3. (a) The distance between two towns on a map of scale 1:5,000,000 is 9 cm. Find the actual distance between the towns in kilometres. (3½ marks)

   (b) Three classes working 8 hours a day take 5 days to harvest maize from school shamba. How long will it take if there were only two classes, but working for 10 hours a day? (4 marks)

4. The second, fifth and eleventh terms of an arithmetical progression are in geometrical progression, and the seventh term is 4. Find

   (a) the common ratio of the geometrical progression. (5 marks)

   (b) the common difference of the arithmetical progression. (2½ marks)

5. (a) A function is defined by $f(x) = x^2 - 2$

   Find

   (i) the inverse, $f^{-1}(x)$ of this function. (2 marks)

   (ii) the value of $f^{-1}(-2)$. (1 mark)

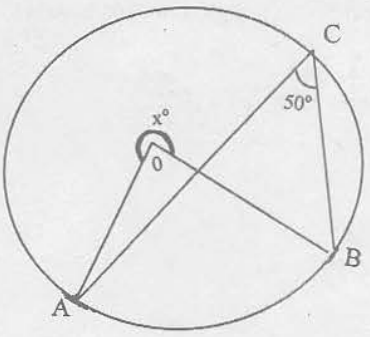
   (iii) the domain of $f^{-1}(x)$. (1 mark)

   (b) Rewrite $|2x + 3| < 7$ without the absolute value sign and hence sketch a graph of the resulting inequality. (3½ marks)

6. (a) Find the values of x and y given that
   $3x - y = 3$ and $9x^2 - y^2 = 45$. (4½ marks)

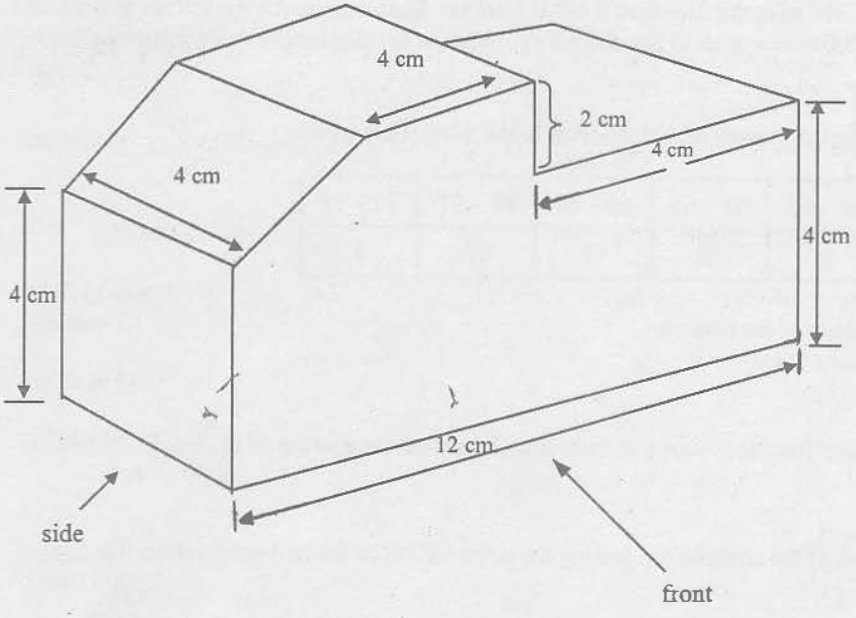
   (b) Make W the subject of the formula
   $$T = W + \frac{WV^2}{gx}$$ (3 marks)

7. (a) Determine the value of x in the figure below where O is the centre of the circle (3½ marks)



(b) Prove that the two tangents from an external point to a circle are equal. (4 marks)

8. Draw the plan, front and side elevations of the figure shown below 7½ marks)



SECTION B (40 marks)

Answer any FOUR (4) questions from this section. Show ALL your necessary steps and answers clearly.

9. (a) Find the image of (7, 6) under a rotation through 180° followed by another rotation of 90°. (5 marks)

(b) A translation T maps the point (-3, 2) onto (4,3). Find where T maps

(i) the point (0,0).

(ii) the point (7,4). (5 marks)

10. A manufacturer has 150 and 90 kilograms of wood and plastic respectively. Product A requires 1 kg of wood and 2 kg of plastic. Product B requires 3 kg of wood and 1 kg of plastic. If A is sold for Tsh. 4000/= and B for Tsh. 6000/=, how many of each should be made to obtain the maximum gross income? (10 marks)

11. (a) If $A = \begin{pmatrix} 9 & 7 \\ 8 & 6 \end{pmatrix}$ and $B = \begin{pmatrix} 6 & -1 \\ -2 & 5 \end{pmatrix}$, find

(i) AB

(ii) BA. (3 marks)

(b) If the matrix $A = \begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$ find $(A^2)^{-1}$ (3 marks)

(c) Solve the simultaneous equations below using the matrix method:

$$\begin{cases} 4x + 2y = 40 \\ x + 3y = 35 \end{cases}$$ (4 marks)

12. (a) If $\mathbf{u} = 4\mathbf{i} + 3\mathbf{j}$, and $\mathbf{v} = 2\mathbf{i} + 4\mathbf{j}$ find

(i) $2\mathbf{u} + 3\mathbf{v}$ (ii) $7|\mathbf{u}|$ (iii) t if $\frac{\mathbf{u}}{|\mathbf{u}|} = t\,\mathbf{u}$ (4 marks)

(b) A student walks 500 m in the direction S 45° E from the classroom to the basketball ground, and then she walks 200 m due west to her dormitory. What is her displacement from the classroom? (6 marks)

13. The table below shows the masses of 100 students to the nearest kilogram.

Mass (kg.)	60 – 62	63 – 65	66 – 68	69 – 71	72 – 74
Frequency	5	18	42	27	8

(a) Determine the mean of the masses (3 marks)

(b) Find the mode (3 marks)

(c) Draw a cumulative frequency curve and use it to determine the median of the masses. (4 marks)

14. (a) Find the equation of the straight line joining the point O(0,0) to the mid-point of the line joining A(3, 2) and B(5, -1). (3½ marks)

(b) Find the coordinates of the point of intersection P of the two straight lines $4x + 3y = 7$ and $3x - 4y = -1$. (3½ marks)

(c) Determine the equation of a line which passes through the point N(5,0) and is parallel to the line $3x + 4y = 12$. (3 marks)