THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

NOVEMBER 1997

041 BASIC MATHEMATICS

(For Both School and Private Candidates)

TIME: 3 Hours.

INSTRUCTIONS TO CANDIDATES

1. This paper consists of Sections A and B.
2. Answer ALL questions in Section A and any FOUR (4) questions in Section B.
3. All necessary working and answers for each question from both Sections A and B MUST BE SHOWN CLEARLY.
4. All answers must be written in the answer book(s) provided.
5. Mathematical tables and Squared (graph) papers may be used, unless otherwise stated.
6. You are advised to spend not more than two (2) hours on Section A and not more than one (1) hour on Section B.

This paper consists of 5 printed pa es.

SECTION A 60 Marks

Answer ALL questions in this section.

1. (a) Given that $M = 4 \times 10^3$, express $\frac{1}{M}$ in standard form. (01½)

   (b) Express $0.8\dot{3}$ in the form $\frac{a}{b}$ where a and b are integers such that, $b \neq 0$. (03)

   (c) If $\log p = 1.813$ and $\log q = \bar{2}.513$, find the value of pq^2. (03)

2. (a) Make x the subject of the formula in the equation:
   $$y = \frac{ax + b}{cx + d}$$ (02½)

   (b) If $a * b = (a^2 - 2b)b$, find:

   (i) $3 * 2$ (02)

   and (ii) n if $4 * n = 0$. (03)

3. (a) The line passing through the point A(k, 4) and B(3, 2k) is parallel to the line $y + 3x - 4 = 0$. Find the value of k. (02½)

   (b) A function f is defined by: $f(x) = |x - 2|$

   (i) Evaluate $f(-3)$ (02)

   (ii) Find x if $f(x) = 6$. (03)

4. (a) Factorise $(x + 2)^2 - (x - 4)^2$ and hence find the exact value of $(10003)^2 - (9997)^2$. (02½)

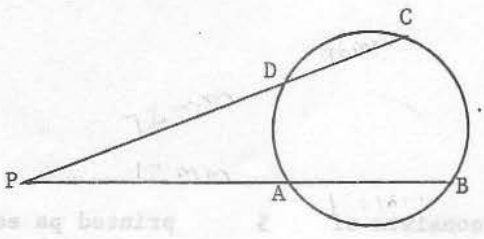
   (b) If $\tan A = 2\frac{2}{5}$ where A is an acute angle, find: (03)

   (i) sin A

   and (ii) cos A

   (c) Rationalize the denominator of: $\frac{2}{2\sqrt{3}+\sqrt{2}}$ (02)

5. (a) In the figure drawn here under, $\overline{AB} = 156$mm, $\overline{CD} = 96$mm and $\overline{PA}$ is 12mm shorter than $\overline{PD}$. Find the length of $\overline{PA}$. (02½)



(b) The interior angle of a regular polygon is 120° greater than the exterior angle. Find the number of sides of the polygon. (03)

(c) The area of two circles are in the ratio 16:9. Calculate the radius of the smaller circle when the radius of the larger one is 24 cm. (02)

6. (a) The distance between two villages P and Q is 160 km. A minibus left P at 6.30 a.m. travelling towards Q at an average speed of 50 km/h. An hour later a Landcruiser left Q travelling towards P at an average speed of 60 km/h. When would the vehicles pass each other. (02)

(b) If 5, x, y and 40 are in Geometrical Progression. Find x and y. (04)

(c) Find the remainder when $P(x) = x^4 - 6x^2 + 1$ is divided by: $S(x) = x - 3$. (1½)

7. (a) Given $\underset{\sim}{a} = (2, 1)$, $\underset{\sim}{b} = (-1, 3)$ and $\underset{\sim}{c} = (1, 11)$. Find scalars p and q such that; $p\underset{\sim}{a} + q\underset{\sim}{b} = \underset{\sim}{c}$ (05½)

(b) Find x and y given that;

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 & -1 \\ 2 & 0 \end{pmatrix}\begin{pmatrix} 3 \\ -2 \end{pmatrix} + \begin{pmatrix} 1 \\ 6 \end{pmatrix}$$ (02)

8. (a) If A is the set of prime factors of 42 and B is the set of prime factors of 330 find $n(A \cap B)$. (02½)

(b) An integer is selected at random from the numbers lying between 50 and 60 inclusive. Find the probability that the selected number is: (05)

(i) prime

(ii) a multiple of four

(iii) a multiple of five

(iv) a square of a whole number.

SECTION B (40 Marks)

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

9. The line defined by the equation: $x + y = 12$ crosses the y axis at A and meets the line $x = 6$ at B. If C is the point (0, 3) and M is the mid point of $\overline{AB}$, find:

(a) the co-ordinates of A, B and M (05)

(b) the equation of the line $\overleftrightarrow{CM}$ (02)

(c) the equation of the line which is perpendicular to the line $\overleftrightarrow{CM}$ passing through M. (03)

10. (a) If $f(x) = \dfrac{x+2}{x^2-x-6}$, find the values of x for which the function is not defined. (02)

(b) Given $f(x) = \begin{cases} -3 & \text{when } x < -2 \\ 1 & \text{when } -2 \leq x < 1 \\ 4 & \text{when } x \geq 1 \end{cases}$

(i) Sketch the graph of $f(x)$ (05)

(ii) State the domain and range of $f(x)$ (02)

(iii) Is $f(x)$ a one to one function? (01)

11. A girl wishes to buy skirts for herself. A white skirt costs 2,400/= per piece, while a coloured one costs 3,000/=. She intends to buy at most four white skirts. If she is prepared to spend upto 48,000/= in her shopping, find the largest number of skirts she can buy. (10)

12. The daily wages of one hundred men are distributed as shown below:

Wage in TShs. X 1000	3.0 - 3.4	3.5 - 3.9	4.0 - 4.4	4.5 - 4.9
Number of men	4	6	10	14

5.0 - 5.4	5.5 - 5.9	6.0 - 6.4	6.5 - 6.9
x	20	14	6

(a) Find x (02)

(b) Calculate the daily mean wage of the 100 men. (03)

(c) Draw a Histogram to represent this data. (05)

13. (a) What is a linear transformation? (02)

(b) Is a translation a linear transformation? (01)

(c) A translation takes the point (5, 8) to (12, -4). Find where it will take the point (8, 5). (03)

(d) A linear transformation T maps the point (x, y) onto (x^1, y^1) where $(x^1, y^1) = (x + y, -x + 2y)$. (04)

Determine the matrix T of this transformation. Find the determinant and inverse of T.

14. Draw the plan, front and side elevation of the figure drawn here under, in third angle projection. Hence determine its volume. (10)

