THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

NOVEMBER 1998

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 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.
7. The following constants may be used where necessary:

$\pi = \frac{22}{7}$

$g = 10 m/s^2$

Radius of the earth = 6400km.

This paper consists of 4 printed pages.

SECTION A [60 Marks]

Answer ALL questions in this section.

1. (a) (i) Compute 0.678 x 145 and express the answer in standard form. (02)

   (ii) Evaluate $24 \times (10 + 54) \div 8 - 2$ (02)

   (b) Tea leaves are packed in packets of 20g, 50g and 90g. Find the smallest amount of tea leaves needed to give a whole number of packets of each size. (03½)

2. (a) If it is known that x:y = 5:1 find the value of

$$\frac{x + y}{3x - 4y}$$ (03½)

   (b) Given that p varies directly proportional to q but inversely proportional to r and that, when p = 35, q = 7 and r = 6. Find the value of p when q = 2 and r = 5. (04)

3. If A and B are subsets of S where

   $S = \{x : x \text{ is a natural number less than } 20\}$

   $A = \{x : x \text{ is an even number}\}$

   $B = \{x : x \text{ is a multiple of } 3\}$

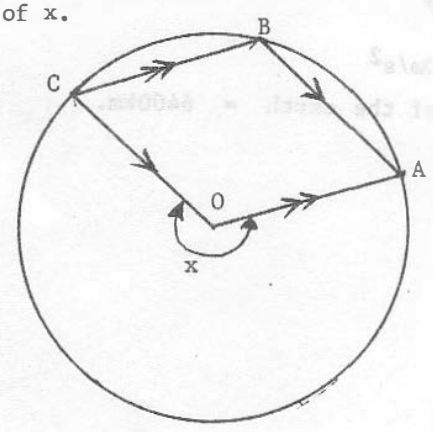
   Find: (a) $n(A \cap B)$ (b) $n(A' \cup B')$ (07½)

4. Solve for x if:

   (a) $2^x = 0.25$ (02)

   (b) $\log_{10}(x^2 - 3x - 44) = 1$ (05½)

5. (a) In the figure below, O is the centre of the circle. Find the value of x. (03½)



   (b) If $\underset{\sim}{a} = (2,3)$ and $\underset{\sim}{b} = (-2,6)$ are two position vectors, find the magnitude of $\underset{\sim}{c}$ where $\underset{\sim}{c} = 3\underset{\sim}{a} + \frac{1}{2}\underset{\sim}{b}$. (04)

6. (a) Find $g^{-1}(x)$ and hence evaluate $g^{-1}(18)$ given that $g(x) = 2^x + 2$. (03½)

(b) Use the remainder theorem to find the remainder when

$f(x) = x^3 + 2x^2 - 4x + 10$ is divided by $3x + 6$. (04)

7. (a) The following table shows data for the distance travelled by a car in a given time at constant speed. Fill in the missing values: (03)

Distance (km)	0	120	240	400	600
Time (hrs)	0	3	6	10	15

(b) A ball is dropped from the top of a cliff and takes 3 seconds to reach ground. Find:

(i) the velocity with which it hits ground. (02)

(ii) the height of the cliff. (02½)

8. (a) Find the equation of a line passing through the point (-3,8) which is perpendicular to the line defined by the equation, $y = 3x - 4$. (03)

(b) Find the value of:

(i) sin A

(ii) cos A, if $\tan A = \frac{-5}{12}$ and it is known that A is obtuse. (04½)

(iii) Hence show that $13\sin A + 13\cos A = -7$.

SECTION B [40 Marks]

Answer any four questions from this section.

9. (a) Find the maximum value of $2x + 3y$ in the region defined by: (04½)

$$x + y \leq 12$$

$$y \leq 6$$

$$x \geq 0, \text{ and } y \geq 0$$

(b) Siti is thinking of two whole numbers x and y. Twice the first is greater than or equal to 3. But the first number is greater than three times the second. Furthermore, three times the first number is at most equal to 6 plus the second number. Find the two numbers. (05½)

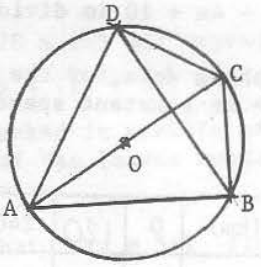
10. (a) (i) Reflect the vector (1,2) in the line $y = -x$. (03)

(ii) What is the image of vector (-2,1) under the transformation matrix $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ followed by $\begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$? (01)

(b) A linear transformation T maps $\underset{\sim}{u} = (3, -4)$ into $(-5,3)$ and $\underset{\sim}{v} = (3,1)$ into $(5,18)$. (06)
Find (i) the matrix T; (ii) $T[3\underset{\sim}{u} - 2\underset{\sim}{v}]$

11. (a) In the figure below, AC is the diameter of the circle ABCD and $m(\hat{DBC}) = 25°$,

Find $m(\hat{ACD})$. (03½)



(b) (i) Find the distance in km between Mbeya (9°S,33°E) and Tabora (5°S,33°E) (03)

(ii) An aeroplane takes off from Tabora (5°S,33°E) to Tanga (5°S,39°E) at a speed of 332km/h. If it leaves Tabora at 3:00 p.m., at what time will it arrive at Tanga airport? (03½)

12. (a) (i) The nth term of a certain sequence is $\frac{5}{2}n-1$. Find the sum of the first five terms of the corresponding series. (04)

(ii) Calculate the Geometric mean and Arithmetic mean of $3+\sqrt{5}$ and $3-\sqrt{5}$. (03)

(b) If the sum of n terms of a G.P. having first term 1 and common ratio ½ is $\frac{31}{16}$, find the number of terms. (03)

13. ABCDV is a right square pyramid where ABCD is the square base with BC and AD being diagonals and V the vertex which is 6cm vertically above the centre E of the base.

(a) Draw a three dimensional diagram of the pyramid. (01)

(b) Calculate:

(i) the length BV (04)

(ii) the angle between the planes AVC and BVD (03)

(iii) the volume of the pyramid. (02)

14. (a) The mean of n numbers is 20. If the same numbers together with 30 give a new mean of 22, find n. (04)

(b) The following table shows the grade points scored by 50 students in a Mathematics test.

Grade points	0	1	2	3	4	5
Frequency	1	12	14	15	7	1

(i) Represent this information by a frequency polygon. (03)

(ii) Find the mode and median. (02)

(iii) Find the probability that, if a student is chosen at random, then her grade point score will be greater than or equal to 3. (01)