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 **01 November 2002 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. Electronic calculators are not allowed in the examination room.
6. You are advised to spend not more than 2 hours on section A and the remaining time on section B.
7. Cellular phones are not allowed in the examination room.
8. Write your Examination Number on every page of your answer booklet(s).

This paper consists of 5 printed pages.

SECTION A (60 marks)

Answer **ALL** questions in this section

1. (a) By using mathematical tables evaluate the expression $\frac{237.8 \times 0.0873}{67890}$.

Give the answer to four figures. (03 marks)

(b) Round each of the numbers $x = 2.354$, $y = 4.843$ and $z = 1.789$ to one decimal place and then use the results obtained to find the value of A to two significant figures given that

$$A = \frac{xy}{z}.$$

(03 marks)

2. (a) In a class of 30 students, 17 participate in English debate, 12 participate in English debate and sports. If every student is required to participate in at least one of these two events, find the number of students who participate in

(i) English debate only (ii) sports only. (03 marks)

(b) If $A = \{a, b, c\}$, $B = \{b, c, d\}$ and $C = \{c, d, e\}$, show that

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$. (03 marks)

3. (a) If $\underline{a} = (3,5)$, $\underline{b} = (2, -7)$ and $\underline{c} = (1, -4)$ evaluate $|2\underline{a} - 3\underline{b} + \underline{c}|$. (03 marks)

(b) If $5 \cos A = 3$ find the values of

(i) $\sin A$ (ii) $\tan A$. (03 marks)

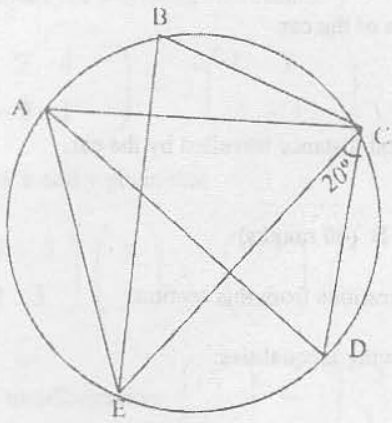
4. (a) If $\log_a x = 7$, what is $\log_a \left(\frac{1}{x}\right)$? (03 marks)

(b) Express as a single logarithm the expression

$\frac{1}{2} \log_c x - 7 \log_c y + \log_c Z$. (03 marks)

5. (a) Prove that the angles in the same segment of a circle are equal. (02 marks)

(b)



In the figure above ACD is an equilateral triangle and ABCD is a cyclic quadrilateral.
Given that $E\hat{C}D = 20°$, find the size of angle $E\hat{B}C$. (04 marks)

6. (a) A, B and C are to share TShs. 120,000/= in the ratio 2:3:5 respectively. How much will each get? (03 marks)

(b) A radio is sold at TShs. 40,500/=. This price includes 20 % Value Added Tax (V.A.T). Calculate the amount of V.A.T. (03 marks)

7. (a) Find the equation of a line through the point (2, 3) perpendicular to the line whose equation is $4y - 3x + 1 = 0$. (03 marks)

(b) Determine the slope of the line $\frac{7}{2}x - \frac{5}{3}y - 4 = 0$. (03 marks)

8. (a) The volume of a rectangular box is 1008 cm^3. If its length is 14 cm and its breadth is 9 cm, find its height. (03 marks)

(b) The curved surface area of a cylinder is 264 cm^2. If the height of the cylinder is 14 cm, calculate its volume and radius. (03 marks)

9. (a) Find the solution set of the following inequality and show on separate number lines the solution of each inequality.

$$2 < |x - 3| < 5$$ (03 marks)

(b) Solve the following system of equations:

$$2x + y - z = 3$$

$$x + 2z = 7 + y$$

$$y = x - 5$$ (03 marks)

10. A car travelling at a uniform speed of 24 m/s for 10 seconds stops after decelerating for 4 seconds.

(a) Draw a velocity-time graph for the motion of the car. (2 marks)

(b) Calculate the deceleration of the car. (2 marks)

(c) From the graph in 10. (a) calculate the total distance travelled by the car. (2 marks)

SECTION B (40 marks)

Answer **FOUR (4)** questions from this section.

11. (a) Draw using the same set of axes the following inequalities:

$2x + y \leq 16$

$x + 2y \leq 11$

$x + 3y \leq 15$

$x \geq 0$

$y \geq 0$ ($6\frac{1}{2}$ marks)

(b) From the graph in (a) find the points which will make the function

$f(x, y) = 3x + 5y$ either a maximum or minimum. ($3\frac{1}{2}$ marks)

12. A random sample of 100 students was chosen from a school. Each student's blood pressure was measured to the nearest millimetres of mercury as shown in the table below.

Blood pressure in (mm Hg)	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79	80 - 84	85 - 89
Number of students	1	3	8	17	30	25	16

(a) Calculate the mean and mode of blood pressure (05 marks)

(b) Construct a cumulative frequency table and draw the ogive. From the ogive estimate

(i) the median blood pressure

(ii) the percentage of students with blood pressure between 67 mmHg and 76 mmHg. (05 marks)

13. (a) Calculate the volume and surface area of a sphere of radius 210 cm. (04 marks)

(b) A sphere is cut by a horizontal plane so that the area of the cross section is 81π cm^2. If the distance from the plane to the centre is 15 cm, find the radius of the sphere. (06 marks)

14. (a) Evaluate the following expression:

$$3\begin{pmatrix} 2 & 4 \\ -3 & 1 \end{pmatrix} - 2\begin{pmatrix} 1 & 7 \\ 2 & -3 \end{pmatrix} + 4\begin{pmatrix} 2 & -3 \\ 1 & -2 \end{pmatrix}$$ (02 marks)

(b) Find x and y given that

$$\begin{pmatrix} 4 & 5 \\ 2 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$$ (05 marks)

(c) The transformation $\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} 5 & 2 \\ 1 & 4 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix}$

maps the triangle A(3, 2), B(7, 2) and C(3, 8) onto the triangle $A'B'C'$.
Find the coordinates of A', B' and C'. (03 marks)

15. The function f is defined as

$$f(x) = \begin{cases} 3x-5 & \text{when } x \geq 2 \\ 4 & \text{when } -2 \leq x < 2 \\ x & \text{when } x < -2 \end{cases}$$

(a) Sketch the graph of f (03 marks)

(b) From the graph determine the domain and range of f (03 marks)

(c) Find the value of (i) $f(-3)$ (ii) $f(0)$ (iii) $f(5)$ (iv) $f(f-2)$). (04 marks)

16. (a) A fair die is tossed once and the number showing up is recorded. What is the probability of an even number grater than two showing up? ($5\frac{1}{2}$ marks)

(b) A box contains 4 white balls and 5 black balls. Two balls are drawn at random from the box. Find the probability that both balls drawn are ($3\frac{1}{2}$ marks)

(i) white (ii) black.

(c) It is known that ${}^nC_r = {}^nC_{n-r}$.
Find x given that $20C_{18} = 20C_x$. (01 mark)