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

041 **BASIC MATHEMATICS**
(For Private Candidates Only)

TIME: 3 Hours *Monday, 5th October 2009 a.m.*

Instructions

1. This paper consists of sections **A** and **B**.
2. Answer **all** questions in section **A** and **four (4)** questions from section **B**.
3. **All** necessary working and answers for each question done must be shown clearly.
4. Mathematical tables may be used unless otherwise stated.
5. Electronic calculators and cellular phones are **not** allowed in the examination room.
6. You are advised to spend not more than **two (2)** hours on section **A** and the remaining time on section B.
7. Write your **Examination Number** on every page of your answer booklet(s).

This paper consists of 7 printed pages.

SECTION A (60 Marks)

Answer **all** questions in this section showing all necessary working and answers.

1. (a) Given that $l = 2\sqrt{\frac{a}{k}}$ find the value of l in standard form when

$a = 4.5\times10^{12}$ and $k = 5\times10^{7}$

(b) The value of a car, after each year's use, decreases by a fixed percentage of its value at the beginning of that year. If a car costs shs. 12,800,000 when new and its value after one year is 10,400,000:

(i) By what percentage has the value decreased?

(ii) Calculate the value of the car after another one year's use.

(6 marks)

2. Without using mathematical tables evaluate:

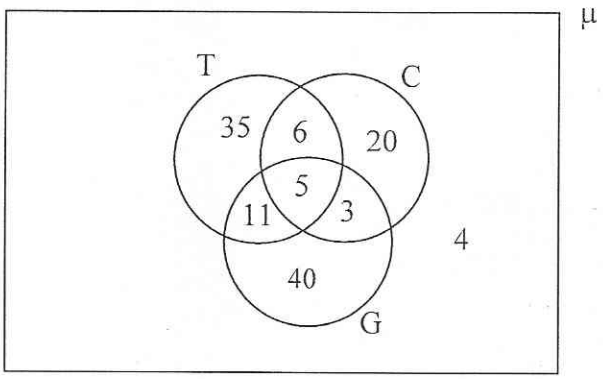
(a) $\sqrt{\frac{(0.00004)(25,000)}{(0.02)^5(0.125)}}$

(b) $\frac{\log\sqrt{27}+\log\sqrt{8}-\log\sqrt{125}}{\log 6-\log 5}$ **(6 marks)**

3. (a) (i) Simplify the expression $\left[\frac{49 - 9x^2}{3x - 7}\right] \div (7+3x)$.

(ii) Solve the inequality $10x+3<2\frac{1}{2}x-12$ and show the result on a number line.

(b) In the Venn diagram below μ is the universal set {houses in the street}, C is the set {houses with air-conditioning}, T is the set {houses with a colour T.V} and G is the set {houses with a garden}



(i) How many houses have gardens?

(ii) How many houses have a garden but not a T.V. or air-conditioning

(iii) How many houses have a garden and a T.V. but not air-conditioning

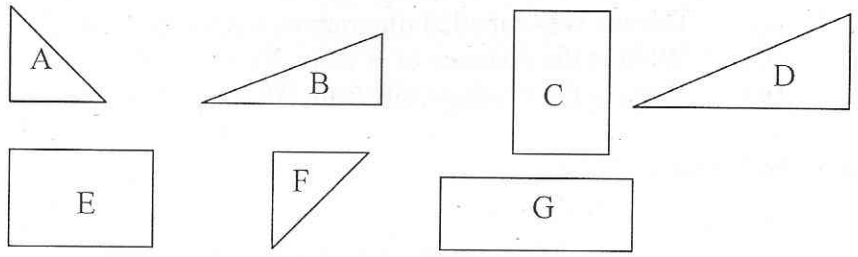
(6 marks)

4. (a) Given $\overrightarrow{LM} = -3i + 4j$, $\overrightarrow{MN} = -15i + pj$, find a value of p such that $\left|\overrightarrow{MN}\right| = 3\left|\overrightarrow{LM}\right|$

(b) Find the coordinates of the foot of the perpendicular from (4, -2) to the line $2x - 3y - 4 = 0$

(6 marks)

5. (a) Identify pairs of congruent shapes from the given figures below. Give reasons.



(b) Triangle LMN is isosceles with LM = LN; X and Y are points on LM, LN respectively such that LX = LY. Show that triangles LMY and LNX are congruent.

(6 marks)

6. (a) The area of a circular sector containing a given angle varies as the square of the radius of the circle. If the area of the sector is 2 cm^2 when the radius is 1.6 cm, find the area of the sector containing the same angle when the radius of the circle is 2.7 cm.

(b) Express the following equations as two statements each, using the words 'varies' and 'proportional'.

(i) $V(r) = \frac{4}{3}\pi r^3$ (ii) $T(l) = \frac{\pi}{2\sqrt{2}}\sqrt{l}$ (iii) $z(t) = \frac{1}{t^2}$

(6 marks)

7. (a) A map is drawn to a scale of 1 : 50,000. Find:

(i) the distance in km between two schools which appear on the map 24 cm apart

(ii) the area in square km of a school which has an area of 6 cm^2 on the map.

(b) How much money will you have to lend in order to get shs. 48,000/= interest at 6% , if you lend it for 6 months?

(6 marks)

8. (a) (i) Explain with examples the relationship between sequences and series.

(ii) Show that the sum of the first n natural numbers is given by the formula $S_n = \frac{1}{2}n(n+1)$

(iii) By using the formula in (a) (ii) above calculate the sum of the first 100 natural numbers.

(b) Identify whether the series 5 + 10 + 20 +.....is an arithmetic progression or a geometric progression and hence find;

(i) the sum of the 8^{th}, 9^{th} and 11^{th} terms.

(ii) the value of n for which the n^{th} term is 2560. **(6 marks)**

9. A ship sails 22 km from A on a bearing of 042°, and a further 30 km on a bearing of 090° to arrive at B.

(i) Draw a well labelled diagram to represent the given information.

(ii) What is the distance of B from A?

(ii) What is the bearing of B from A? **(6 marks)**

10. (a) Solve the following quadratic equations:

(i) $x^2 - 21x + 108 = 0$ (use factorization method)

(ii) $x^2 + 2x - 15 = 0$ (use method of completing the square).

(b) A farmer makes a profit of x cents on each of the $(x + 5)$ eggs her hen lays. If her total profit was 84 cents, find the number of eggs the hen lays. **(6 marks)**

SECTION B (40 Marks)

Answer **four (4)** questions from this section. Extra questions will not be marked.

11. A dairy company wanted to promote its cheese products by saying that, you could slim by living on bread and cheese only and still have a healthy diet. Such a healthy diet requires 72 gm of protein, 68 gm of fats and 240 gm of carbohydrates per day. The nutritional details for a whole meal of bread and cheese are given in the table below:

Grams (gm) per 10 oz. of food				Number of calories per 10 oz. of food
Meal/food	protein	fat	carbohydrates	
Bread	2.0	0.5	10.0	40
cheese	6.0	8.0	0.0	100

What is the lowest daily calorie intake that produces a healthy diet? **(10 marks)**

12. The information on age of employees of certain organization is given in the frequency table below:

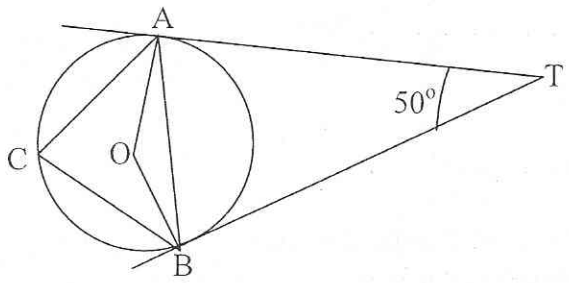
Age	15 – 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 – 54	55 -59
Freq.	5	23	58	104	141	98	43	19	6

(a) Draw on the same axes to represent the given information:
(i) a histogram
(ii) a frequency polygon

(b) Calculate the mean, mode and median.

(c) Comment on the results in parts (a) and (b) above. **(10 marks)**

13. (a) In the figure below, TA and TB are tangents to the circle having centre O. Given that $A\hat{T}B = 50^\circ$, find
(i) $A\hat{B}T$
(ii) $O\hat{B}A$
(iii) $A\hat{C}B$



(b) A sphere of radius 5 cm is melted down and made into a solid cube. Find the length of a side of the cube given that the volume (V) and surface area (A) of the sphere are given by $V = \frac{4}{3}\pi r^3$ and $A = 4\pi r^2$

(10 marks)

14. The following Trial Balance was extracted from the books of XY Company.

Trial Balance as at 31st December 2008

S/N	Details	Dr Amount Tshs	cts	Cr Amount Tshs	cts.
1.	Capital			50,000	00
2.	Cash	36,000	00		
3.	Stock at start	25,000	00		
4.	Purchases	80,790	00		
5.	Sales			111,790	00
6.	Wages	12,000	00		
7.	Rent	5,000	00		
8.	Rates	3,000	00		
		161,790	00	161,790	00

You are required to:

(a) Prepare trading and profit and loss account as at 31st December 2008

(b) Extract balance sheet as at 31st December 2008

N.B: Stock at close – Tshs. 26,000.00

(10 marks)

15. (a) If $A=\begin{pmatrix}1 & 2\\ 1 & 1\end{pmatrix}$; $B=\begin{pmatrix}3 & 2\\ 4 & 5\end{pmatrix}$ find

(i) $A+B$

(ii) $A\times B$

(iii) the inverse of B

(b) Using the inverse of B in (a) (iii) above find the solution of the simultaneous equations:

$$\begin{cases}3x+2y=12\\ 4x+5y=23\end{cases}$$

(c) The transformation T which is given by $\begin{pmatrix}x'\\ y'\end{pmatrix}=\begin{pmatrix}2 & 0\\ 0 & 2\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}+\begin{pmatrix}5\\ -2\end{pmatrix}$ is composed of two single transformations

(i) Describe each of the transformation.

(ii) Find the image of the point (3, -1) under T.

(iii) Find the point which is mapped by T onto the point (7, 4).

(10 marks)

16. (a) If f is defined by $f(x)=\dfrac{3x-5}{x+2}$, find

(i) an expression for $f^{-1}(x)$

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

(iii) the domain and range of $f^{-1}(x)$

(b) Plot the graph of $y=2x^2$ for $-2\le x\le 4$ and use it to solve the equation $2x^2-3x-2=0$

(c) Ali, Ben and Caro work independently on solving a crossword puzzle. The probability that Ali will solve the problem is 2/3, the probability that Ben will solve it is 3/4 and the probability that Caro will solve it is 4/5. If A is the event 'Ali will solve the puzzle', B the event 'Ben will solve the puzzle' and C the event 'Caro will solve the puzzle'; find

(i) $P(A')$

(ii) $P(B')$

(iii) $P(C')$

and hence determine the probability (P) that the puzzle will be solved.

(10 marks)