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

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

Time: 3 Hours **Monday, 4th October 2010 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. 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 6 printed pages.

SECTION A (60 Marks)

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

1. (a) Write 624.3278 correct to:
   (i) five (5) significant figures
   (ii) three (3) decimal places.

   (b) A mathematics teacher bought 40 expensive calculators at shs.16,400 each and a number of other cheaper calculators costing shs.5,900 each. She spent a total of shs. 774,000. How many of the cheaper calculators did she buy?

   (6 marks)

2. (a) Evaluate without using mathematical tables $2\log 5 + \log 36 - \log 9$.

   (b) Simplify $\dfrac{27^{n+2} - 6\times 3^{3n+3}}{3^n \times 9^{n+2}}$

   (6 marks)

3. (a) Given that $A = \{x : 0 \le x \le 8\}$
   $B = \{x : 3 \le x \le 11\}$

   where x is an integer, in the same form, represent in a Venn diagram
   (i) $A \cup B$
   (ii) $A \cap B$
   and hence find the elements in each set.

   (b) In a school of 75 pupils, 42% of the pupils take Biology but not Chemistry, 32% take both subjects and 10% of them take Chemistry but not Biology. How many pupils do not take either Biology or Chemistry?

   (6 marks)

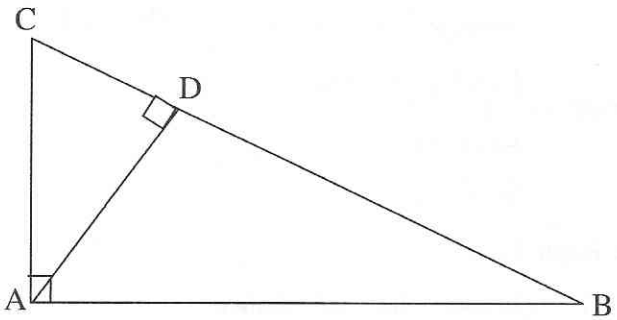
4. (a) (i) Without using mathematical tables, find the numerical value of
   $$\frac{1}{\sin^2 45^\circ} + \frac{2}{\cos^2 45^\circ} + \frac{3}{\tan^2 45^\circ}$$

   (ii) Write down the equation of the line which passes through (7, 3) and which is inclined at 45° to the positive direction of the x – axis.

   (b) The position vectors of the points A, B and C are $4\underset{\sim}{i} - 3\underset{\sim}{j}$, $\underset{\sim}{i} + 3\underset{\sim}{j}$ and $-5\underset{\sim}{i} + \underset{\sim}{j}$ respectively. Find the vectors $\overrightarrow{AB}$, $\overrightarrow{BC}$ and $\overrightarrow{AC}$ hence verify that $\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$ **(6 marks)**

5. (a) The volume of two similar cylinders is 125 cm^3 and 512 cm^3. If the radius of the larger cylinder is 8cm, find the radius of the smaller cylinder.

(b) In the diagram below, show that $\frac{AD}{AB} = \frac{CD}{AC}$



(6 marks)

6. (a) Juma bought motor vehicle spare parts from Japan worth 5,900,000 Japanese Yen. When he arrived in Tanzania he was charged custom duty of 25% on the spare parts. If the exchange rates were as follows:
1 US dollar = 118 Japanese Yen
1 US dollar = 76 Tanzania Shillings
Calculate the duty he paid in Tanzania shillings.

(b) The distance of the horizon d km varies as the square root of the height h m of the observer above sea level. An observer at a height of 100m above sea level sees the horizon at a distance of 35.7 km.

Find (i) the distance of the horizon from an observer 70m above sea level.

(ii) an equation connecting d and h. **(6 marks)**

7. (a) An amount of Tshs. 12,000 is to be shared among Ali, Anna and Juma in the ratio 2:3:5 respectively. How much will each get?

(b) A certain worker used his salary as follows: 20% on house rent, 45% on food, 10% on refreshment and 15% on school fees. If he/she was left with Tsh.22,000, determine:

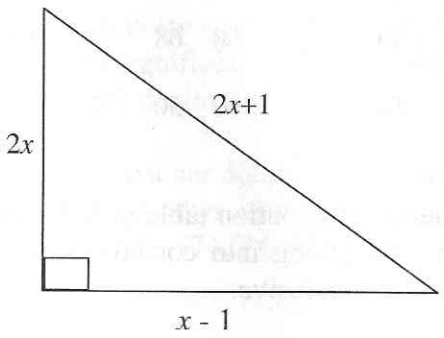
(i) The salary of this worker.
(ii) The amount of money which he/she spent on food. **(6 marks)**

8. (a) Find the general term and hence the 30^{th} term of the sequence
1, -2, 4, -8, ...

(b) Given the series 100 + 92 + 84 + ...
Find
(i) the 20^{th} term
(ii) the sum of the first 20 terms. **(6 marks)**

9. (a) If $\tan A = \frac{3}{4}$ and A is acute, find $\cos A$, $\sin A$ and hence verify the identity $\cos^2 A + \sin^2 A = 1$

(b)



Given the right angled triangle above whose sides are measured in centimeter determine:

(i) the value of x

(ii) the area of the triangle **(6 marks)**

10. (a) Factorize each of the following expressions:

(i) $3a^2c - 5a^2d - 3b^2c + 5b^2d$

(ii) $3(2 - y^2) - 17y$

(b) Find the value of y which satisfies the equation $3(2 - y^2) - 17y = 0$

(6 marks)

SECTION B (40 Marks)

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

11. (a) Maximize $f = 2y - x$ subject to the following constraints:

$x \geq 0$

$y \geq 0$

$2x + y \leq 6$

$x + 2y \leq 6$

(b) Sara had 300 shillings to buy erasers and pencils. An eraser cost 20 shillings while a pencil costs 30 shillings. If the number of erasers bought is at least twice the number of pencils, formulate the inequalities that represent this information. **(10 marks)**

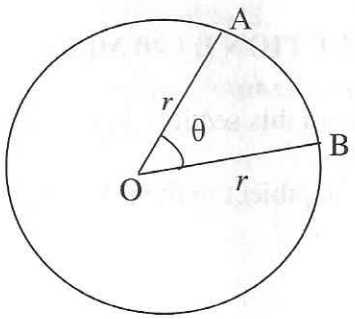
12. The data below represent masses in kg of 36 men.

51	61	60	70	75	71	75	70	74	73	72	82
70	71	76	74	50	68	68	66	65	72	69	64
83	63	83	58	80	90	50	89	55	62	62	61

(i) Prepare a frequency distribution table of class interval of size 5 beginning with the number 50 taking into consideration that both lower limit and upper class limits are inclusive.

(ii) Calculate the mean and mode from the frequency distribution table prepared in (i) above by using assumed mean from the class mark of the modal class. **(10 marks)**

13. (a) Below is a circle with centre O and radius r units. By considering the circumference of the circle, the area of the circle, the given angle θ and the degree measures of a circle (360°), develop the formula for finding:
(i) arc length AB
(ii) area of sector AOB.



(b) Find (i) the length of arc AB
(ii) the area of the sector AOB
if θ is 57° and r is 5.4 cm $\left(\text{use } \pi = \frac{22}{7}\right)$ **(10 marks)**

14. From 1st January to 29th January 2006 Mr. Bin decided to keep records of his business as follows:

Jan.	1	Mr. Bin started a business with capital in cash	500,000.00
	5	Purchased goods	254,000.00
	6	Sold goods	290,000.00
	9	Purchased goods	204,000.00
	10	Expenses	24,000.00
	29	Sold goods	320,000.00

You are required to:

(a) prepare the trial balance

(b) open capital and cash account.

N.B All payments and receipts were made in cash. **(10 marks)**

15. (a) A transformation T has the matrix $T = \begin{bmatrix} 1 & x \\ r & -2 \end{bmatrix}$. Under the same transformation T, the point (-4, 1) is mapped onto the point (6, 3). Find x and r.

(b) For what values of n will the matrix $\begin{pmatrix} n-1 & n+3 \\ 1 & 6n \end{pmatrix}$ be non-singular?

(10 marks)

16. (a) If $f(x) = -2x + 3$ find $f^{-1}(3)$

(b) Draw the graph of $f(x) = |x-1|$ for $-4 \le x \le 4$

(c) State the domain and range of $f(x) = |x-1|$

(d) The probability that Rose and Juma will be selected for A – level studies after completing their O – level studies are 0.4 and 0.7 respectively. Calculate the probability that:

(i) both of them will be selected.

(ii) either Rose or Juma will be selected.

(10 marks)