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 **Tuesday, 03rd November 2015 a.m.**

Instructions

1. This paper consists of sections A and B.
2. Answer **all** questions in sections A and **four (4)** questions from section B. Each question in section A carries **6 marks** while each question in section B carries **10 marks**.
3. **All** necessary working and answers for each question done must be shown clearly.
4. Mathematical tables may be used.
5. Calculators and cellular phones are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

SECTION A (60 Marks)

Answer **all** questions in this section.

1. (a) If $p = 6.4 \times 10^4$ and $q = 3.2 \times 10^5$, find the values of:
   (i) $p \times q$,
   (ii) $p + q$.
   Write the answers in standard form.

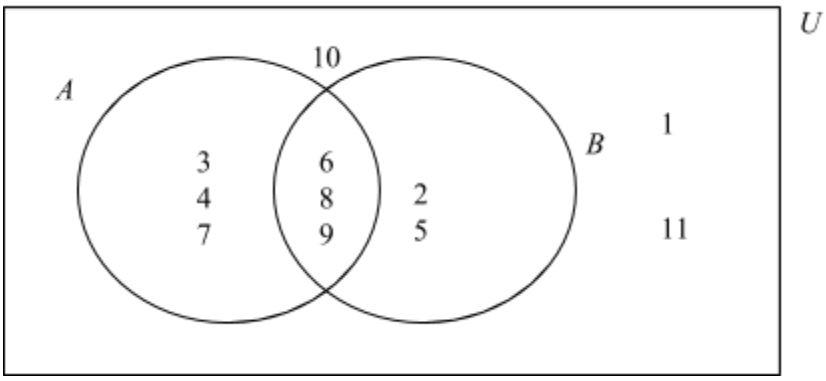
   (b) Evaluate $\sqrt{\frac{0.684^3 \times 43.7}{3.26}}$ using mathematical tables and write the answer correctly to 3 significant figures.

2. (a) Solve for x in the equation $4^{-2x} \times 8^2 = 4 \times 16^x$.

   (b) Find the value of $\log 900$ given that $\log 3 = 0.4771$.

3. (a) Find the solution set of the inequality $\frac{x}{3} - 1 \geq 2 - \frac{x}{2}$ and indicate it on a number line.

   (b) The Venn diagram below shows the universal set U and its two subsets A and B.



   Write down the elements of:
   (i) A',
   (ii) B',
   (iii) $A \cup B$,
   (iv) $A' \cup B'$.

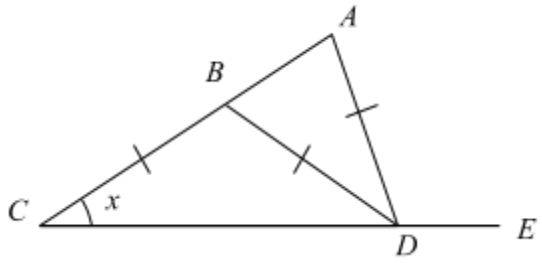
   (c) Verify that $n(A \cup B) = n(A) + n(B) - n(A \cap B)$ where A and B are the sets given in part 3(b).

4. (a) Given vectors $\underline{a} = 3\mathbf{i} + 2\mathbf{j}$, $\underline{b} = 8\mathbf{i} - 3\mathbf{j}$ and $\underline{c} = 2\mathbf{i} + 4\mathbf{j}$ find:
   (i) the vector $\underline{d} = 3\underline{a} - \underline{b} + \frac{1}{2}\underline{c}$,
   (ii) a unit vector in the direction of $\underline{d}$.

   (b) Find the equation of the line passing at point (6, -2) and it is perpendicular to the line that crosses the x-axis at 3 and the y-axis at -4.

5. (a) Two triangles are similar. A side of one triangle is 10 cm long while the length of the corresponding side of the other triangle is 18 cm. If the given sides are the bases of the triangles and the area of the smaller triangle is 40 cm^2, find the area and the height of the larger triangle.

(b) In the figure below $\overline{CB} = \overline{BD} = \overline{DA}$ and angle $ACD = x$.



(i) Show that angle $ADE = 3x$,

(ii) Calculate the measure of angle CDA if $x = 39°$.

6. (a) The variable v varies directly as the square of x and inversely as y. Find v when $x = 5$ and $y = 2$; given that when $v = 18$ and $x = 3$ the value of $y = 4$.

(b) The temperature (T_i) inside a house is directly proportional to the temperature (T_o) outside the house and is inversely proportional to the thickness (t) of the house wall. If $T_i = 32°C$ when $T_o = 24°C$ and $t = 9cm$, find the value of t when $T_i = 36°C$ and $T_o = 18°C$

7. (a) A shopkeeper makes a 20% profit by selling a radio for sh. 480,000.

(i) Find the ratio of the buying price to the selling price.

(ii) If the radio would be sold at 360,000, what would be the percentage loss?

(b) A farmer sold a quarter of his maize harvest and gave one third of the remaining to his relatives. If the farmer remained with 25 bags of maize find how many bags of maize did the farmer harvest.

8. (a) How many terms of the series $3 + 6 + 9 + 12 + \ldots$ are needed for the sum to be 630?

(b) Jennifer saved sh. 6 million in a Savings Bank whose interest rate was 10% compounded annually. Find the amount in Jennifer's savings account after 5 years.

9. (a) Find the value of $\frac{\sin(150°)\cos(315°)}{\tan(300°)}$ without using mathematical tables.

(b) Calculate the angles of a triangle which has sides $4m$, $5m$ and $7m$.

10. (a) Factorize completely $2x^2 + x - 10$ by splitting the middle term.

(b) Solve the equation $\sqrt{x^2 - 7} = 7 + x$.

SECTION B (40 Marks)

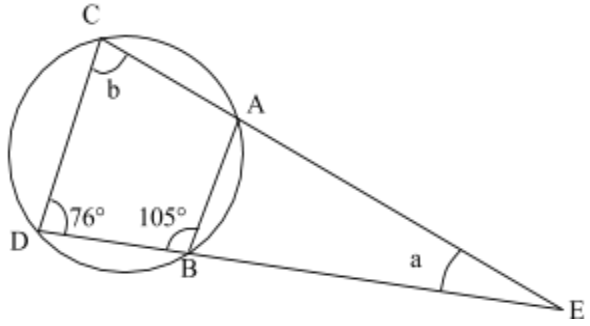
Answer **four (4)** questions from this section.

11. A small industry makes two types of clothes namely type A and type B. Each type A takes 3 hours to produce and uses 6 metres of material and each type B takes 6 hours to produce and uses 7 metres of material. The workers can work for a total of 60 hours and there is 90 metres of material available. If the profit on a type A cloth is 4,000 shillings and on a type B is 6,000 shillings, find how many of each type should be made for maximum profit.

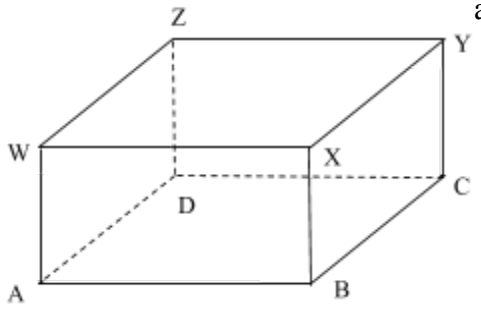
12. The following marks were obtained by 32 students in a physics examination:
32, 35, 42, 50, 46, 29, 39, 38, 45, 37, 48, 52, 37, 58, 52, 48, 36, 54, 37, 42, 64, 37, 34, 28, 58, 64, 34, 57, 54, 62, 48, 67.

(a) Prepare a frequency distribution table using the class intervals: 24 - 29, 30 - 35 etc.
(b) Draw the histogram.
(c) Draw the cumulative frequency curve and use it to estimate the median.
(d) Find the mean mark.

13. (a) Find the value of the angles a and b in the figure below.



(b) A rectangular box with top $WXYZ$ and base $ABCD$ has $AB = 9cm$, $BC = 12cm$ and $WA = 3cm$.



Calculate:
(i) The length of AC,
(ii) The angle between WC and AC.

(c) Two places P and Q both on the parallel of latitude $26°N$ differ in longitude by $40°$. Find the distance between them along their parallel of latitude.

14. The following trial balance was extracted from the businessman books' of Chericho Ramaji, at 31st December 2006.

S/N	Details	Dr (Tshs.)	Cr (Tshs.)
1.	Capital		830,000
2.	Purchases	1,200,000	
3.	Sales		1,750,000
4.	Return inwards	55,000	
5.	Return outwards		64,000
6.	Plant and machine	240,000	
7.	Furniture and fittings	75,000	
8.	Sundry debtors	137,000	
9.	Sundry creditors		86,000
10.	Wages	228,000	
11.	Bad debts	36,000	
12.	Discount received		27,000
13.	Opening stock	500,000	
14.	Insurance	16,000	
15.	Commission receivable		43,000
16.	Trade expenses	22,000	
17.	Cash in hand	17,000	
18.	Cash at bank	274,000	
Total		2,800,000	2,800,000

Prepare Trading, Profit and Loss account for the year ended 31st December 2006.

15. (a) Given matrices $Q = \begin{pmatrix} -3 & 1 \\ 0 & 2 \end{pmatrix}$ and $P = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ such that $QP = \begin{pmatrix} -2 & -2 \\ 2 & 2 \end{pmatrix}$, find the elements of matrix P.

(b) Determine the matrix A from the equation $\begin{pmatrix} 5 & 3 \\ 4 & 5 \end{pmatrix} - 2A = \begin{pmatrix} -2 & 1 \\ 3 & 5 \end{pmatrix}$

(c) Given a triangle with vertices $A(0,0)$, $B(3,0)$ and $C(3,1)$; find its image under:
(i) a translation by the vector $(2,3)$,
(ii) the enlargement matrix $\begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$

(d) Sketch the triangle and the images in parts (c)(i) and (ii) on the same pair of axes and comment on their sizes.

16. (a) The function f is defined as follows:

$$f(x) = \begin{cases} x & \text{if} \quad x > 2 \\ 2 & \text{if} \quad -2 < x \leq 2 \\ x + 4 & \text{if} \quad x \leq -2 \end{cases}$$

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

(ii) Determine the domain and range of $f(x)$.

(b) Jeremia has two shirts, a white one and a blue one. He also has 3 trousers, a black, green and a yellow one. What is the probability of Jeremia putting on a white shirt and a black trouser?

(c) If a number is to be chosen at random from the integers $1, 2, 3, \ldots, 11, 12$; find the probability that:

(i) It is an even number,

(ii) It is divisible by 3.

(d) If in part 16(c) above, E_1 is the set of even numbers and E_2 the set of numbers that are divisible by 3, show whether E_1 and E_2 are mutually exclusive events.