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

041 **BASIC MATHEMATICS**

(For Both School and Private Candidates)

Time: 3 Hours **Wednesday, 06th November 2019 a.m.**

Instructions

1. This paper consists of sections A and B with a total of **fourteen (14)** questions.
2. Answer **all** questions in sections A and B. Each question in section A carries **six (6) marks** while each question in section B carries **ten (10) marks**.
3. All necessary working and answers for each question must be shown clearly.
4. NECTA mathematical tables may be used.
5. Cellular phones, calculators and any unauthorised materials 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.

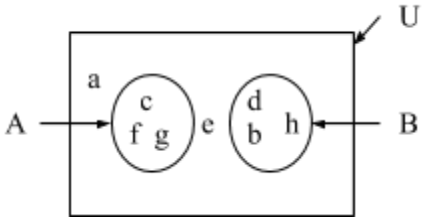
1. (a) Mangoes are to be exactly divided into groups of 20, 30 or 36. What is the minimum number of mangoes required?

   (b) Mary was given 60,000 shillings by her mother. She spent 35 percent of the money to buy shoes and 10 percent of the remaining money to buy books. How much money remained?

2. (a) Find the value of x if $\sqrt{5^{2x-3}} - 9 = 116$.

   (b) Find the value of the expression $\frac{3.143\times(0.81)^2}{\sqrt{35}}$ by using mathematical tables.

3. (a) Use the following Venn diagram to answer the questions that follow.



   (i) Find the number of subsets of set B'.

   (ii) Find the elements of set $A' \cap B$.

   (iii) If an element is picked at random from the universal set (U), find the probability that it is not an element of set B.

   (b) The Ministry of Business and Industries has planned to employ 54 people who will work in the business sector, 36 people who will work in industries sector only, 12 people who will work in both sectors and 21 people who will neither work in business sector nor in industries sector. How many people will be employed by the Ministry? (Use a Venn diagram).

4. (a) Find the equation of a line which passes through the point $A(-3, 4)$ and which is parallel to the line $3x + 4y - 15 = 0$.

   (b) The points P, Q and R are $(5, -3)$, $(-6, 1)$ and $(1, 8)$ respectively. Show that these points form an isosceles triangle.

5. (a) If $\overline{AB}$ is parallel to $\overline{CD}$ and $\overline{CD}$ is a transversal, sketch the line segments and label on the same diagram the following pairs of angles:
   (i) corresponding angles of a and g.
   (ii) alternate interior angles of f and g.
   (iii) vertically opposite angles c and d.

   (b) Given that triangle ABC is similar to triangle PQR, $\overline{AB} = 4$ cm, $\overline{BC} = 5$ cm, $\overline{PQ} = 18$ cm and angle PQR is 30°, find the area of triangle PQR.

6. (a) Mr. Ogango from Kenya visited Tanzania. He had 5,000 Kenya shillings (Kshs) and wanted to change the money into US dollars. If 1 US dollar was equivalent to 2500 Tanzania shillings (Tshs) and Ksh 1 was equivalent to Tshs 20, how much US dollars did he get?

   (b) A gardener has found the time t to cut the grass on a square field varies directly as the square of its length (L) and inversely as a number of men (m) doing that job. If 5 men cut grass on a field of side 50 m in 3 hours, how many more men are required to cut grass on a field of side 100 m in 5 hours? Assume that the men are working on the same pace.

7. (a) Misumbwi, Shuma and Kiyando contributed 770,000, 560,000 and 1,050,000 shillings respectively to start a business. Find the ratio of their contribution in its simplest form.

   (b) Use the following trial balance to prepare trading, profit and loss account of Mr. Rwaichi as at 31st December 2015.

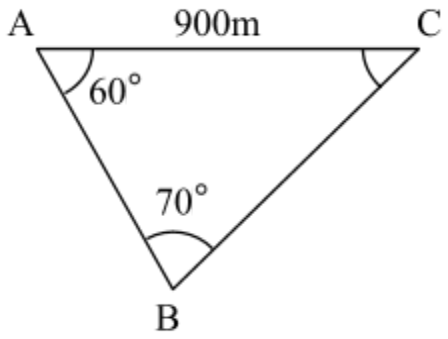
TRIAL BALANCE AS AT 31ST DECEMBER, 2015

Account name	Dr	Cr
Cash	1,750,000	
Capital		2,500,000
Purchases	2,300,000	
Rent	200,000	
Furniture	550,000	
Shelves	350,000	
Sales		3,000,000
Salary	250,000	
Wages	100,000	
	5,500,000	5,500,000

8. (a) Given that 49, x and 81 are consecutive terms of a geometric progression. Find:
   (i) the value of x.
   (ii) the geometric mean.

(b) A wall is in the shape of a trapezium. The first level of the wall is made up of 50 bricks where as the top level has 14 bricks. If the levels differ from each other by 4 bricks, determine the number of:
(i) levels of the bricks.
(ii) bricks used to make the wall.

9. (a) The following diagram shows the location of the houses A, B and C. How far is house A from house B? Give the answer to the nearest metre.



(b) A rectangular frame is made of wooden bars. The diagonal of the frame is 25 cm long and its width is 15 cm. Find the length of the frame.

10. (a) Factorise the quadratic expression $3x^2 - 11x - 20$ by splitting the middle term.

(b) Solve the equation $2x^2 - 3x - 5 = 0$ by completing the square.

SECTION B (40 Marks)

Answer **all** questions from this section.

11. The number of patients who attended maternity clinic daily in June 2017 in a certain village was recorded as follows:

52	61	42	27	38	44	56	36	73	22
41	48	77	30	46	43	72	63	43	76
47	53	38	55	60	51	47	58	33	37

(a) Make a frequency distribution by grouping the number of patients in the class intervals: 20 − 29, 30 − 39, 40 − 49, …

(b) By using the frequency distribution table obtained in part (a), calculate the mean number of patients per day.

(c) Construct a pie chart for the frequency distribution obtained in part (a).

12. (a) A ship sales form Pemba (4.5°S, 39.5°E) to Dar es Salaam (7.5°S, 39.5°E). If it leaves Pemba at 11:30 am and arrived in Dar es Salaam at 13:30 pm, use $\pi = 22/7$ and $R_E = 6370$ km to find the speed of the ship in km/h.

(b) Sketch a square pyramid whose base is PQRS, vertex is at W and centre is at N, then answer the questions that follow:

(i) State the projection of $\overline{RW}$ on PQRS.

(ii) Name the angle between $\overline{WS}$ and the plane PQRS.

(c) The volume of a square pyramid is 28.2 cm^3. If the sides of its base are 4 cm long, find the height of the pyramid correct to one decimal place.

13. (a) (i) Given the matrices $P = \begin{pmatrix} 2 & -3 \\ 5 & 4 \end{pmatrix}$ and $Q = \begin{pmatrix} 9 & 12 \\ -15 & 3 \end{pmatrix}$. Find $2P - \frac{1}{3}Q$.

(ii) If the matrix $\begin{pmatrix} 4k & 8 \\ 2 & 9k \end{pmatrix}$ is singular, find the possible values of k.

(b) Solve the following system of linear equations by using the inverse matrix method:

$$\begin{cases} 2x + 3y = 7 \\ y = \frac{1}{2}x \end{cases}$$

(c) By using the transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$, find the image of the point $A(-2,3)$. Hence, state the axis in which the point is reflected.

14. (a) Calculate the values of $f(1)$ and $f(-\pi)$ if f is defined by

$$f(x) = \begin{cases} x + 2 \text{ for } x < 0 \\ 2 \text{ for } 0 \leq x \leq 2 \end{cases}$$

(b) Using the information given in part (a), find $f^{-1}(-1)$.

(c) A trader has a space for 5 refrigerators. The trader plans to spend 2,400,000 shillings to buy refrigerators of two brands, Hitachi and Sony. Each Hitachi refrigerator costs 600,000 shillings whereas each Sony refrigerator costs 400,000 shillings. The unit profits for Hitachi and Sony refrigerators are 200,000 shillings and 150,000 shillings respectively. Denoting x and y as the number of Hitachi and Sony refrigerators respectively, determine the number of refrigerators for each brand that maximizes profit.