THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
FORM TWO NATIONAL ASSESSMENT

042 **ADDITIONAL MATHEMATICS**

Time: 2:30 Hours **Year: 2023**

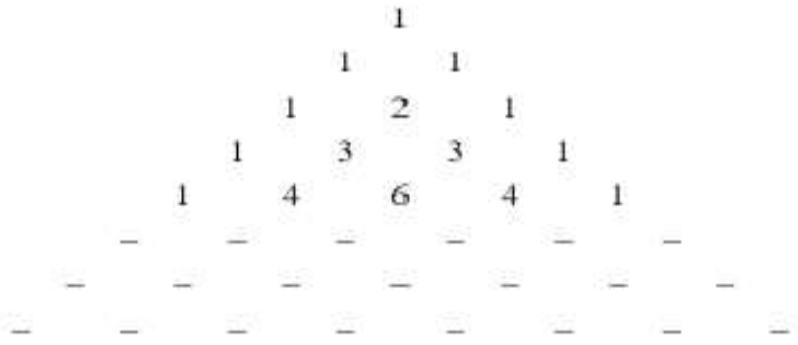
Instructions

1. This paper consists of **ten (10)** questions.
2. Answer **all** questions.
3. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil.
4. Cellular phones and any unauthorized materials are **not** allowed in the assessment room.
5. Write your **Assessment Number** at the top right-hand corner of every page.

1. (a) (i) Study the sequence -3, -2, -5, -7, -12 and -19, and then state a reason to verify that the sequence is Fibonacci.

(ii) Use the divisibility rule to determine whether the number 9655 is divisible by 3.

(b) Complete the blank spaces in the following pattern of numbers that obeys Pascal's triangle.



2. (a) Simplify the expression 18r-(2r +10) – 14r + 25 to its lowest term

(b) Expand completely the following expressions:

(i) $3(2c + 3)^2 – c^2$

(ii) $2x(x+4y) – x(8x + 14y) – 2(3 + 4y)$

(c) Write r in terms of x and y, given that $\frac{x}{y} = \frac{1+r^2}{1-r^2}$

3. The size of an exterior angle of a certain polygon is p and the size of its interior angle is three times the size of the exterior angle. Find

(a) The value of the expression $\frac{6p - 16^o}{2}$

(b) The size of the interior angle

(c) The sum of the interior angles

4. (a) Describe the locus when:
   (i) An orange is falling vertically from a tree at a height of 2 metres from the ground
   (ii) The centre of a wheel as a cyclist ride along the road on a horizontal plane.

   (b) Analyse the locus of the point P which is equidistant from the points L(-2,2) and (1, 1 ½).

   (c) The locus of point P moves along the plane and intersects the lines whose equations are $m(y - 3) = x + 1$ and $y = mx$ where, m is a variable. Find the equation of the locus of the point P.

5. (a) Calculate the height *h* given that the points A(2,5), B(*h*,-4) and C(1,2) are collinear.

   (b) Determine the equation of a line passing through the point (-4, -4) and parallel to the line whose equation is $2x + 6y - 9 = 0$

6. (a) State the number of lines of symmetry in each shape of the object when Chichi watched Drawing Art on Television, as she identified the following shapes of objects: (i) Circle (ii) tree (iii) flying kite (iv) cross shape (v) rectangular home mat.

   (b) State the order of rotational symmetry for each of the objects given in the table.

Name of the Object	**Order of Rotational Symmetry**
(i) A rectangle playing card	
(ii) A ten thousand Tanzania shillings	
(iii) A nonagon	
(iv) A pen	
(v) A soccer ball	

7. (a) Given the statement: "if 6 is an even number, then it is either divisible by 2 or 4." Represent the statement in symbolic form and test its validity by letting p represent "6 is even number," q represent "6 is divisible by 2," and r represent "6 is divisible by 4."

   (b) Copy and complete the following truth table;

p	q	$\sim p \rightarrow q$	$q \rightarrow p$	$(\sim p \rightarrow q) \wedge (q \rightarrow p)$

   (c) If P stands for "2 + 6 = 8" and Q stands for "6 x 5 = 11" write the symbolic form of the statement and draw an electric circuit;
   "either 2 + 6 = 8 or 6 x 5 = 11".

8. (a) The speed L of a certain particle moving on the surface of water is inversely proportional to the cube root of time n and $L = 3$ when $n = 27$. Determine the value of L when $n = 64$.

   (b) Determine the value of a when $b = 12$, given that $a \propto (b^2 + 3)$ and $a = 4$ when $b = 5$.

   (c) Suppose p is directly proportional to q^2 and inversely proportional to $\sqrt{r}$ such that $p = 10$ when $q = 6$ and $r = 16$. Find the value of p when $q = 2$ and $r = 64$.

9. The sales records of a certain fuel filling station were as follows; the total sales of six litres of diesel and five litres of petrol were Tsh. 6000, while the sales of seven litres of diesel and five litres of petrol were Tsh. 6800. Use elimination methos to find the price of a litre of diesel and litre of petrol.

10. Given that μ is the universal set and D, P and S are subsets such that:

    $\mu = \{x : x \text{ is an integer } 3 \leq x < 18\}$

    $D = \{x : x \text{ is an odd number}\}$

    $P = \{x : x \text{ is prime number}\}$

    $S = \{x : x \text{ is a perfect square}\}$

    (a) List the elements of each set

    (b) Represent these sets in Venn diagram

    (c) Find (i) $P \cap D$ (ii) $(P \cup D \cup S)'$