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, 31st October 2017 a.m.**

Instructions

1. This paper consists of sections A and B with a total of **sixteen (16)** questions.
2. Answer **all** questions in sections A and **four (4)** questions from section B. Each question in section A carries **six (06) marks** while each question in section B carries **ten** (**10) marks**.
3. All necessary working and answers for each question done must be shown clearly.
4. Mathematical tables may be used.
5. Calculators, cellular phones 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) Round off:
   (i) 9.67 to ones,
   (ii) 0.205 to one decimal place
   (iii) 0.0197 to two decimal places.
   Hence, estimate the value of $\frac{9.67\times0.205}{0.0197}$.

   (b) Simplify the expressions:
   (i) $(3+\sqrt{2})(4-2\sqrt{2})$,
   (ii) $\sqrt{40}\times\sqrt{45}$.

   (c) Express 0.3636… in the form of $\frac{a}{b}$ where a and b are integers and $b \neq 0$.

2. (a) Simplify:
   (i) $27^{1/4}\times 3^{1/4}\times(\sqrt{3})^{-2}$,
   (ii) $\log_3 10 + \log_3 8.1$.

   (b) If $n\log_5 125 = \log_2 64$, find the value of n.

3. (a) Factorize the following expressions:
   (i) $16y^2 + xy - 15x^2$,
   (ii) $4-(3x-1)^2$.

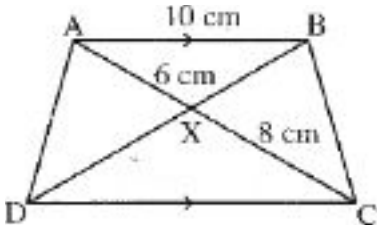
   (b) At Moiva's graduation ceremony 45 people drank Pepsi-Cola, 80 drank Coca-Cola and 35 drank both Pepsi-Cola and Coca-Cola. By using a Venn diagram, found out how many people were at the ceremony if each person drank Pepsi-Cola or Coca-Cola.

4. (a) Given the three vectors $\underline{a} = 4\underline{i} + 6\underline{j}$, $\underline{b} = 4\underline{i} + 10\underline{j}$ and $\underline{c} = 2\underline{i} + 4\underline{j}$ determine the magnitude of their resultant.

   (b) Camilla walks 5 km northeast, then 3 km due east and afterwards 2 km due south. Represent these displacements together with the resultant displacement graphically using the scale 1 unit = 1 km.

   (c) Show that triangle ABC is right-angled where $A = (-2,-1)$, $B = (2,1)$ and $C = (1,3)$.

5. (a) In the figure below, AB = 10 cm, AX = 6 cm, CX = 8 cm and AB is parallel to DC.



(i) Show whether triangles AXB and CXD are similar or not.
(ii) Find the length of CD.
(iii) Find the ratio of the areas of triangles AXB and CXD.

(b) Using a ruler and compass, construct an angle of 90°.

6. (a) In the preparation of fanta orange drink, a bottling filling machine can fill 1,500 bottles in 45 minutes. How many bottles will it fill in $4\frac{1}{2}$ hours?

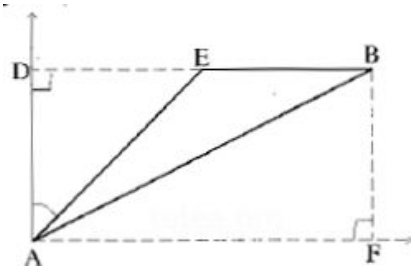
(b) If X varies directly as Y and inversely as W, find the values of *a* and *b* in the table below.

X	8	6	*b*
Y	4	*a*	2
W	2	3	4

7. A computer is advertised in a shop as having a list price of sh. 2,500,000 plus value added tax (VAT) of 20%. The sales manager offers a discount of 25% before adding the VAT. Calculate:
(a) The list price including VAT.
(b) The amount of discount before VAT is added.
(c) The reduced final price of the computer.

8. (a) If the sum of *n* terms of a geometric progression with first term 1 and common ratio $\frac{1}{2}$ is $\frac{31}{16}$, find the number of terms.
(b) How many integers are there between 14 and 1,000 which are divisible by 17?

9. In the figure below, AE = 20 m, EB = $20\sqrt{2}$ m and $DAE = 45°$.



Find:
(a) The length: DE, AD and AB.
(b) The area of triangle ABE, leaving the answer in surd form.

10. (a) Solve the equation $4x^2 - 32x + 12 = 0$ by using the quadratic formula.

(b) Anna is 6 years younger than her brother Jerry. If the product of their ages is 135, find how old is Anna and Jerry.

SECTION B (40 Marks)

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

11. Zelda wants to buy oranges and mangoes for her children. The oranges are sold at sh. 150 each and mangoes at sh. 200 each. She must buy at least two of each kind of fruit but her shopping bag cannot hold more than 10 fruits. If the owner of the shop makes a profit of sh. 40 on each orange and sh. 60 on each mango, determine how many fruits of each kind Zelda must buy for the shop owner to realise maximum profit.

12. The heights of 50 plants recorded by a certain researcher are given below:

56	82	70	69	72	37	28	96	52	88	41	42
50	40	51	56	48	79	29	30	66	90	99	49
77	66	61	64	97	84	72	43	73	76	76	22
46	49	48	53	98	45	87	88	27	48	80	73
54	79										

(a) Copy and complete this tally table for the data given above.

Height (cm)	Tally	Frequency
21-30		
31-40		
41-50		
51-60		
61-70		
71-80		
81-90		
91-100		

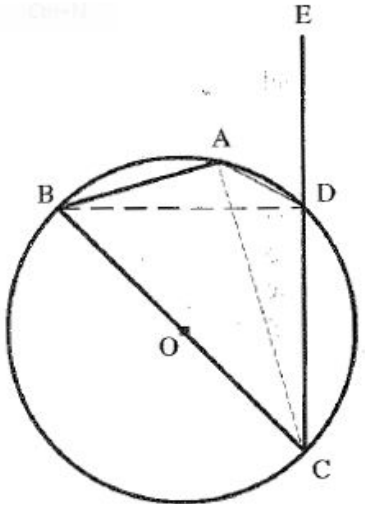
Use this table to:

(b) Draw a histogram for the height of the plants.

(c) Find the mean height of the plants (do not use the assumed mean method).

(d) Find the median of the heights of the plants.

13. In the figure below, BC is a diameter of the circle, O is the centre of the circle and side CD of the cyclic quadrilateral ABCD is produced to E.



(a) With reasons, name the right angles in this figure.
(b) Show that $AD\hat{E} = AB\hat{C}$.
(b) If $AD\hat{E} = 60$ and $C\hat{A}D = 25$, find:
(i) the value of $AB\hat{D}$,
(ii) the lengths AB and BD given that CB = 10cm.

14. (a) What is a trial balance and what is its main purpose.

(b) On January 1st 2015 Semolina Women Group started a business with a capital in cash of 2,000,000/=

January	2	Purchased goods for cash 1,400,000/=
	3	Sold goods for cash 1,000,000/=
	6	Purchased goods for cash 600,000/=
	15	Paid rent for cash 220,000/=
	26	Paid wages for cash 220,000/=
	15	Sold goods for cash 620,000/=

Prepare:
(i) The cash account and balance it.
(ii) The Trial Balance.

15. (a) Find the inverse and identity matrix of $A = \begin{pmatrix} 6 & 4 \\ -2 & 5 \end{pmatrix}$.

(b) Triangle OAB has vertices at O(0,0), A(2,1) and B(-1,3). If the triangle is enlarged by $E = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ and then translated by $T = \begin{pmatrix} -3 \\ -5 \end{pmatrix}$, find the vertices of the triangle.

(c) Draw on the same x - y plane triangle OAB and the images after being:
(i) enlarged
(ii) translated

16. (a) A function f is defined on the set of integers as follows:

$$f(x) = \begin{cases} 1 + x & 1 \le x \le 2 \\ 2x - 1 & 2 \le x \le 4 \\ 3x - 10 & 4 \le x \le 6 \end{cases}$$

(i) Draw a pictorial diagram for $f(x)$.

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

(b) Given that $f(x) = \frac{5x+7}{x+2}$, find $f^{-1}(4)$.

(c) In a yard there are 500 vehicles, of which 160 are cars, 130 are vans and the remaining are lorries. If every vehicle has an equal chance to leave, find the probability of:

(i) A van leaving first,

(ii) A lorry leaving first,

(iii) A car leaving second if either a lorry or van had left first.