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

041 **BASIC MATHEMATICS**

(For Both School and Private Candidates)

Year: 2022

Time: 3 Hours

Instructions

1. This paper consists of sections A and B with a total of **fourteen (14)** questions.
2. Answer **all** questions.
3. Each question in section A carries **six (06)** marks while each question in section B carries **ten (10)** marks.
4. All necessary working and answers for each question must be shown clearly.
5. NECTA mathematical tables and non-programmable calculators may be used.
6. All communication devices and any unauthorised materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).

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SECTION A (60 Marks)

Answer **all** questions in this section.

1. (a) Find the percentage of numbers which are multiples of 5 from the set {1, 2, 3, 4, ... up to 52}. Write the answer correct to one decimal place.

   (b) (i) Arrange the following fractions in ascending order: $\frac{1}{2}$, $\frac{2}{9}$, $\frac{3}{8}$, $\frac{1}{12}$ and $\frac{2}{5}$.

   (ii) Simplify the expression $\frac{7\times10^4}{0.000035}$, hence write the answer in standard form.

2. (a) Find the value of x if $8^{x-1}=16$.

   (b) (i) Simplify the expression $\log_a\sqrt{a}+\log_a(a^2)$.

   (ii) Rationalise the denominator of the expression $\frac{5+\sqrt{2}}{\sqrt{6}-\sqrt{2}}$.

3. (a) (i) If P = {all multiples of 5 less than 35} and Q = {all odd numbers between 14 and 30}, find $P\cap Q$.

   (ii) In a village of 50 farmers, 25 grow cashew nut, and 16 grow both cashew nut and maize. If 10 farmers grow neither cashew nut nor maize, find the number of farmers who grow maize only. Do not use Venn diagram.

   (b) A farmer was given three seeds to germinate in a nursery. The probability that a seed will germinate is $\frac{1}{3}$. Using a tree diagram, find the probability that at least two seeds will germinate.

4. (a) If $\underline{a}=(4,3)$, $\underline{b}=(-4,1)$ and $\underline{c}=(2,5)$, determine which of the vectors $\underline{a}+2\underline{b}$ and $3\underline{a}+\underline{c}$ is longer than the other.

   (b) If a line passing through the point (4, 2) is perpendicular to another line whose equation is $2x+3y+14=0$, find the equation of the line.

5. (a) The sides of a triangle are 4 cm, 5 cm and 6 cm. If the longest side of a similar triangle is 18 cm, find the lengths of the other sides.

(b) (i) The perimeter of a regular hexagon inscribed in a circle is 72 cm. Find the radius of the circle.

(ii) The area of triangle ABC is $70\,cm^2$. If $\overline{AB} = 14\,cm$ and $\overline{AC} = 20\,cm$, find the angle BAC.

6. (a) Anna walks 24 km every day. Find, in metres, the distance she walks in 2 days.

(b) (i) A dealer sells mattresses whose cost price (C) is directly proportional to the selling price (s). If the selling price and the cost price of one mattress are Tsh. 20,000 and Tsh. 18,000, respectively, find the constant of proportionality.

(ii) By using the answer obtained in part (b) (i), determine the equation that relates the cost price and the selling price.

7. (a) A damaged table that costs Tshs. 20,000 was sold at a loss of 15%. Find the loss made and the selling price.

(b) Extract a Trial Balance from the following Mabala's cash account.

Debit				Credit			
Date	**Particular**	**Folio**	**Amount**	**Date**	**Particular**	**Folio**	**Amount**
5/8/2018	Capital		100,000	5/8/2018	Purchases		80,000
9/8/2018	Sales		43,000	15/8/2018	Telephone bills		28,000
11/8/2018	Sales		47,000				
				31/8/2018	Balance	c/d	82,000
			190,000				190,000
1/9/2018	Balance	b/d	82,000				

8. (a) The fifth and eleventh terms of an arithmetic progression are 8 and -34 respectively. Find the sum of the first ten terms.

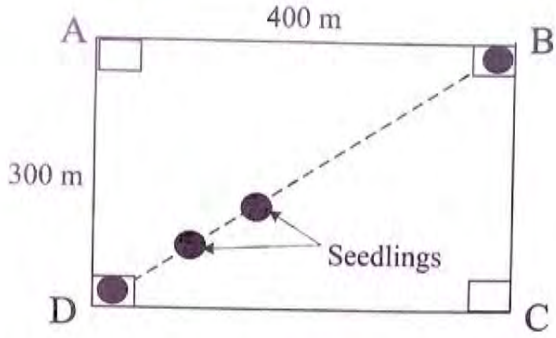
(b) A school wishes to invest Tshs. 100,000,000 in a bank which pays an interest rate of 2% compounded annually.

(i) Find the total amount of money that will be accumulated after two years.

(ii) Calculate the interest after two years.

9. (a) (i) Find the value of $\frac{\sin 690^\circ}{\cos 690^\circ}$ without using mathematical table.

(ii) A rectangular garden ABCD is 400 m long and 300 m wide. The seedlings are to be planted along the diagonal $\overline{BD}$ at equal intervals of 1.25 m as shown in the following figure.



Find the number of seedlings that were planted.

(b) From the top of a tower which is 50 m high, the angle of depression of a car parked on the ground is 30°. How far is the car from the base of the tower? Leave the answer in surd form.

10. (a) Express the equation $2t^{-10} - 3t^{-5} + 1 = 0$ in terms of x where $x = \frac{1}{t^5}$.

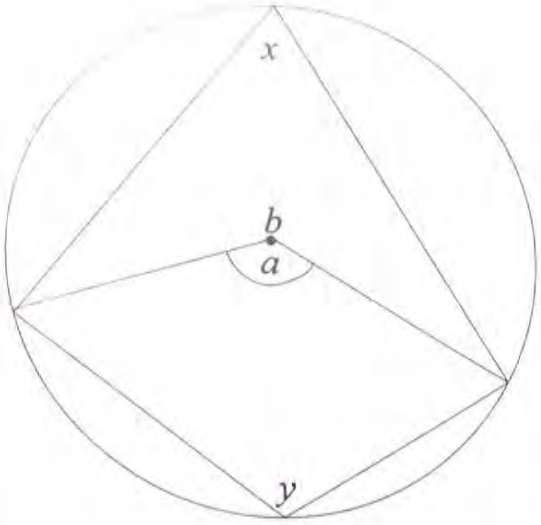
(b) From the equation you obtained in part (a), find the value(s) of x that satisfy it by using the quadratic formula.

SECTION B (40 Marks)

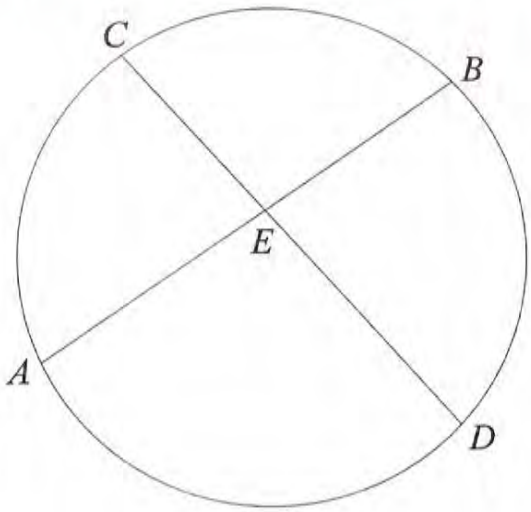
Answer **all** questions in this section.

11. (a) Find the central angle (in degrees) made by an arc of length 22 cm in a circle whose radius is 63 cm. Use $\pi = \frac{22}{7}$.

(b) In the following figure, prove that the angles x and y are supplementary given that a and b are the angles at the centre of the circle.

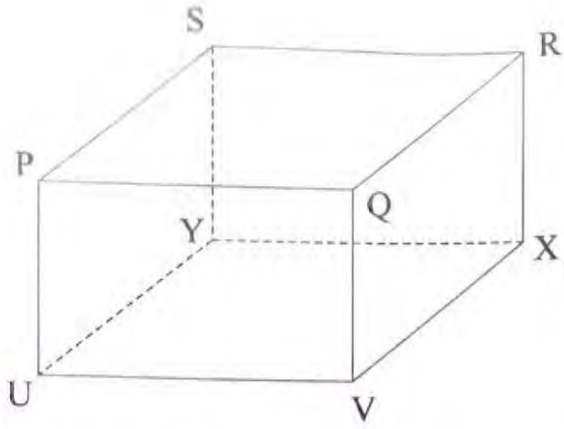


(c) In the following figure, $\overline{AE} = 8\,\text{cm}$, $\overline{BE} = 3\,\text{cm}$ and $\overline{CE} = 4\,\text{cm}$. Find the length of $\overline{DE}$.



12. (a) A bus leaves town A (3° S, 39° E) at a constant speed of 40 km/h. How many hours will the bus take to reach town B (12° S, 39° E)? Use $\pi = 3.14$ and radius of the Earth, R = 6,400 km.

(b) A box has a rectangular base UVXY with plane PQRS being vertically above UVXY as shown in the following figure.



If $\overline{UV} = 4.2$ cm, $\overline{VX} = 2$ cm and $\overline{XR} = 2.5$ cm, find;

(i) the length of $\overline{VR}$ and $\overline{UR}$, correct to one decimal place.

(ii) the angle between the diagonal $\overline{UR}$ and the base UVXY.

13. (a) Find the values of x, y, z and w in the following matrix equation:

$$\begin{pmatrix} x & 4 \\ 4 & y \end{pmatrix}\begin{pmatrix} -5 & -7 \\ 2 & z \end{pmatrix} = \begin{pmatrix} 38 & 46 \\ -10 & w \end{pmatrix}.$$

(b) By using the matrix method, find the image of the point $(3, -2)$ after a reflection in the line $y = -x$ followed by another reflection in the line $x = 0$.

(c) A translation takes point $(5, 5)$ to the point $(-7, -7)$. If it takes point (x, y) to $(-4, -4)$, find the values of x and y.

14. (a) Given the function $f(x) = \dfrac{1}{x-2}$, find;

(i) the domain and range.

(ii) $f^{-1}\left(\dfrac{1}{3}\right)$.

(b) Antony wishes to buy black shirts and white shirts. He intends to buy at most five black shirts. A black shirt costs Tsh. 24,000 while a white shirt costs Tsh. 30,000 and he is planning to spend up to Tsh. 180,000 for buying shirts.

(i) How many shirts of each kind should be bought so as to have maximum number of shirts?

(ii) Find the greatest number of shirts that should be bought.