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 **Year: 2020**

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.
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 calculator 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).

SECTION A (60 Marks)

Answer **all** questions in this section.

1. (a) Simplify the expression $\frac{0.25\times8.85\times25}{0.00625\times0.5}$ without using mathematical tables, expressing the answer correct to two significant figures.

   (b) (i) Mr. Magani set an examination weighing a total of 96 marks with the following distributions: 20% of the marks were awarded for reading. 40% for writing, 15% for practical and the remaining percentage for spelling. Find the marks that were awarded for spelling.

   (ii) Three airplanes arrived at Kilimanjaro International Airport (KIA) at the intervals of 30 minutes, 40 minutes and 55 minutes. If all three airplanes arrived at KIA at 2:00 p.m. on Saturday, when and at what time would they arrive together again?

2. (a) If $\frac{\sqrt{3}}{2+\sqrt{3}} = a + b\sqrt{c}$, find the values of a, b and c.

   (b) (i) Solve the equation $\left(\frac{9}{\sqrt{3}}\right)^{2x} = \frac{1}{81}$.

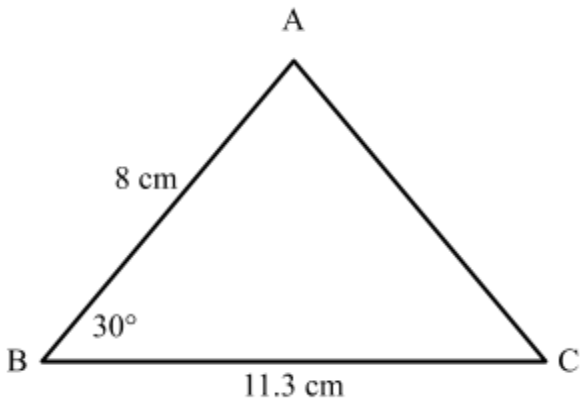
   (ii) Given that log2 = 0.3010 and log3 = 0.4771, find the value of log(2¼) without using mathematical table.

3. In a certain school, 40 students were asked about whether they like tennis or football or both. It was found that the number of students who like both tennis and football was three times the number of students who like tennis only. Furthermore, the number of students who like football only was 6 more than twice the number of students who like tennis only. However, 4 students like neither tennis nor football.
   (a) Represent this information in a Venn diagram, letting x be the number of students who like tennis only.
   (b) Use the results obtained in part (a) to determine the probability that a student selected at random likes;
      (i) football only.
      (ii) both football and tennis.

4. (a) (i) A line whose gradient is $\frac{3}{2}$ has the x-intercept of -3. Find the equation of the line in the form $y = mx + c$, where m and c are constants.
   (ii) Find the length of a line segment joining the points $(3,-2)$ and $(15,3)$.

   (b) A boat sails due North at a speed of 120 km/h and a wind blows at a speed of 40km/h due East. Find the actual speed of the boat. Use $\sqrt{10} = 3.16$.

5. (a) In the following triangle ABC, $\overline{AB} = 8$cm, $\overline{BC} = 11.3$cm and $A\widehat{B}C = 30°$. Find the area of the triangle.



(b) (i) Find the perimeter of a regular hexagon inscribed in a circle whose radius is 100 m.

(ii) Given that $\frac{\overline{AB}}{\overline{KL}} = \frac{\overline{BT}}{\overline{LC}} = \frac{\overline{TA}}{\overline{CK}} = 3$, where $\overline{AB}$, $\overline{BT}$ and $\overline{TA}$ are the sides of the triangle ABT and $\overline{KL}$, $\overline{LC}$ and $\overline{CK}$ are the sides of triangle KLC; what does this information imply?

6. (a) The variables t and z in the following table are related by the formula $z = at^n$ where a is a constant and n is a positive integer.

(i) Use the data from the table to determine the values of a and n.

(ii) Use the values of a and n obtained in part (a) (i) to complete the following table.

t	1	2	3	4	5
z	0.5	4	13.5		

(b) If v varies directly as the square of x and inversely as $\sqrt{y}$, given that $v = 18$ when $x = 3$ and $y = 16$, find the value of v when $x = 5$ and $y = 4$.

7. (a) (i) A school has 2,000 students, of whom 1,500 are boys. What is the ratio of boys to girls in the school?

(ii) Matiku bought a book for Tshs. 120,000. A year later, he sold the book at a profit of 20%. What was the selling price of the book?

(b) Halima started a business on 1st September, 2018 with a capital of Tshs. 25,000/= in cash.

September 2, bought goods for cash 15,000/=
3, sold goods for cash 3,000/=
5, sold goods for cash 5,000/=
6, paid carriage on goods 500/=

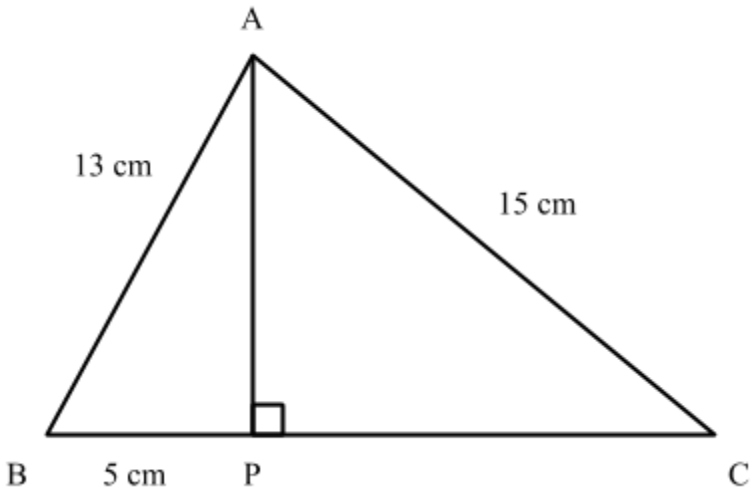
9, sold goods for cash 14,000/=
15, bought goods for cash 1,000/=
19, paid rent 2,000/=
20, purchased goods 6,000/=
27, paid wages 5,000/=
28, sold goods on credit 1,000/=

By using these transactions, prepare the cash account.

8. (a) Find the first term and the common difference of an arithmetic progression whose 5^{th} term is 21 and 8^{th} term is 30.

(b) Find the 10^{th} term of a sequence whose first three consecutive terms are 5, 15 and 45. (Leave the answer in exponent form.)

9. (a) In the following figure, $\overline{AP}$ is perpendicular to $\overline{BC}$, $\overline{AB}$ = 13cm, $\overline{BP}$ = 5cm and $\overline{AC}$ = 15cm.



Calculate the lengths of $\overline{AP}$ and $\overline{CP}$.

(b) From the top of a building 75 m high, John sees a lorry and a minibus along the road, both being on one side of the building at the angles of depression of 30° and 60° respectively.

(i) Sketch a diagram representing this information.

(ii) Determine the distance between the cars, leaving the answer in surd form.

10. (a) Rachel is three years older than her brother John. Three years to come, the product of their ages will be 130 years. Formulate a quadratic equation representing this information. Hence, by using the quadratic formula, find their present ages.

(b) The sum of the squares of two consecutive positive numbers is 61. Find the numbers.

SECTION B (40 Marks)

Answer **all** questions from this section.

11. The following data represent the marks scored by 36 students of a certain school in Geography examination:

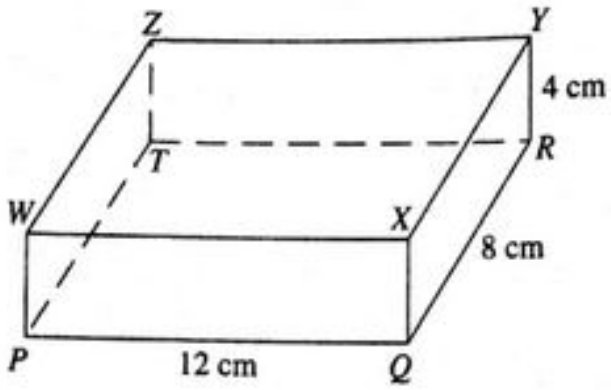
72	76	90	89	74	82	63	74	70	73	58	71
55	62	65	74	71	64	71	85	70	61	64	75
51	83	50	61	83	68	70	80	50	60	66	68

(a) Prepare a frequency distribution table representing the given data by using the class intervals: 50 − 54, 55 − 59, 60 − 64, and so on.

(b) Use the frequency distribution table obtained in part (a) to:
(i) draw a histogram.
(ii) calculate the median. Write the answer correct to 2 decimal places.

12. (a) Two towns, A and B, are located at (10°S, 38°E) and (10°S, 43°E) respectively.
(i) Find the distance between the two towns in kilometres. (Use radius of the Earth, R = 6400km and $\pi = 3.14$). Give the answer to the nearest whole number.
(ii) Suppose a ship is sailing at 50 km/h from town A to town B. Using the answer obtained in part (a) (i), find how long will the ship take to reach town B.

(b) The following figure represents a rectangular prism in which $\overline{PQ}$ = 12cm, $\overline{QR}$ = 8 cm and $\overline{RY}$ = 4 cm.



Find;
(i) The total surface area.
(ii) the angle between the planes *PTZW* and *QRZW*.

(c) Calculate the volume of a cone whose base radius is 12 cm and slant height is 20 cm. (Use $\pi = 3.14$).

13. (a) The inverse of a matrix A is $\begin{pmatrix} 4 & 3 \\ 5 & 2 \end{pmatrix}$. Find the matrix A.

(b) Amani and Asha bought Coca-cola and Pepsi drinks for a farewell party. Amani spent Tshs. 9950 to buy 12 bottles of Coca-cola and 5 bottles of Pepsi drinks. Asha spent Tshs. 8150 to buy 9 bottles of Coca-cola and 5 bottles of Pepsi drinks. Formulate a system of linear equations and hence apply the matrix method to find the price of one bottle of each type of the drinks.

(c) Point A(4,2) is reflected in the line $y + x = 0$ followed by an anticlockwise rotation through 90° about the origin. Find the final image of point A.

14. (a) Suppose a function f is defined by $f(x) = (x + 2)^2$, find the domain and range of the inverse of the function f.

(b) A businessman plans to buy at most 210 sacks of Irish and sweet potatoes. Irish potatoes cost shs. 30,000 per sack and sweet potatoes cost shs. 5,000 per sack. He can spend up to shs. 2,500,000 for his business. The profit on a single sack of Irish potatoes is shs. 12,000 and for sweet potatoes is shs. 10,000. How many sacks of each type of potatoes the businessman will buy in order to realize the maximum profit?