NAME: ……………………………………..   ADM. NO: ………………………………….

SCHOOL: ……...……………………………   DATE : …………………………………..

STUDENT'S SIGNATURE:…………………

FORM THREE 2020

MATHEMATICS

PAPER TWO

121/2

TIME ALLOWED: 2 ½ HOURS

Instructions to Candidates

1. *The paper contains two sections. Section I and Section II. Answer ALL Questions in Section I and only Five Questions from Section II.*

2. *All Answers and working must be written on the Question Paper in the spaces provided below each question.*

3. *Show all steps in your calculations, giving your answers at each stage in the spaces below each question.*

4. *Non-Programmable Silent Calculators and KNEC Mathematical Tables may be used except where stated otherwise.*

For Examiners Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	**Total**

Section II

17	18	19	20	21	22	23	24	**Total**

GRAND TOTAL

SECTION I (50 Marks)

Answer ALL Questions in this Section

1. Use logarithm tables to evaluate. (4 Marks)

$$\frac{32.95}{\sqrt{5.25 \times 0.0}}$$

2. A two digit number is such that the sum of its digits is 9. If the digits are reversed the new number formed exceeds the original number by 9. Find the number. (3 Marks)

3. The perimeter of a triangular field is 120m. Two of the sides are 21m and 40m. Calculate the largest angle of the field. (3 Marks)

4. Solve for **x** in the logarithmic equation.

$$\log_{10}(3x + 4) - \log_{10}(3 - x) = 1\log_{10}(3x + 4) - \log_{10}(3 - x) = 1$$

(3 Marks)

5. Given that $\underset{\sim}{x} = 2\underset{\sim}{i} - 3\underset{\sim}{j} + $, $\underset{\sim}{y} = 3\underset{\sim}{i} - 4 -$, and $\underset{\sim}{z} = \underset{\sim}{j} +$ and that

$OR = 3\underset{\sim}{x} - \underset{\sim}{y} -$. Find the magnitude of vector**OR** correct to 3 significant figures.
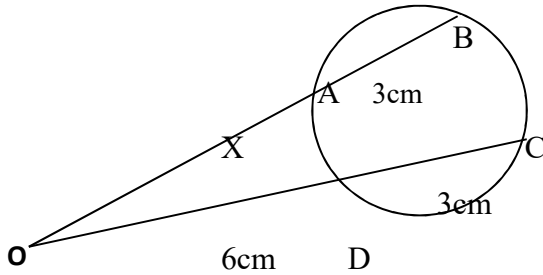
(3 Marks)

6. Make **X** the subject of the equation.

$$3y = y + \frac{-3y}{q} = y + \frac{-}{q}$$

(3 Marks)

3

7. Two letters are selected from the word ECONOMICS, find the probability that the letters are a constant and a vowel in that order" (2 Marks)

8. In the circle below, OA= Xcm, AB=3cm, OD=6cm and DC=3cm.

Find the value of x. (3 Marks)

9. Simplify and leave your answer in surd form. (3 Marks)

$$\frac{1+\sqrt{5}}{2+\sqrt{5}} + \frac{1-}{2-}$$

10. Omolo bought a new car for Ksh.800,000. After 5 years he sold it through a second hand car dealer. The dealer charged a commission of 4% for the sale of the car. If Omolo received Ksh.480,000, calculate the annual rate of depreciation of the car. (3 Marks)

11. Expand $(1 + 3x)^6(1 + 3x)^6$ upto the fourth term, hence evaluate $(1.3)^6(1.3)^6$ to 2 significant figures.

(4 Marks)

12. A trader has 3 grades of tea P, Q and R. Grade P costs Shs.140 per kg, grade Q costs Shs.160 per kg and grade R costs sh.256 per kg. The trader mixes grade P and grade Q in the ratio 5:3 to make a brand of tea which he sells at Shs.180 per kg. Calculate the percentage profit he makes. (3 Marks)

13. Each exterior angle of a regular polygon of **n** sides exceeds each exterior angle of regular polygon of **3n** sides by 8^0. Find the value of **n**. (3 Marks)

14. A quantity P is partly constant and partly varies as the square root of Q.

    i)   Using constants **k** and **m**, write down an equation connecting P and Q. (1 Mark)

    ii)   If Q = 25 when P = 20 and Q = 49, when Q = 30; find the values of **k** and **m**.

                                                             (2 Marks)

15. Use matrix method to find the point of intersection of lines $5x - 1 = 7y$ and $2 - 5y = 4x$. (3 Marks)

16. The equation of a circle centre (a, b) is $2x^2 + 2y^2 - 12x - 20y + 60 = 0$. Find the value of a and b.

(3 Marks)

Answer any <u>FIVE</u> Questions in this Section.

17. A church has a sitting capacity of 468 people with the members sitting in rows which have 3 long benches and 2 short ones. The long bench takes 2 people more than the short bench. Let the number of people sitting on the short bench be **x**.

   a) Form an expression in **x** for the number of rows of benches.   (2 Marks)

   b) A new pastor finds this arrangement crowded and decides that by having one more person on each long bench, he can take out some rows and still sit the same number of people. Find an expression in x for the new number of rows of benches.   (2 Marks)

   c) If one row of benches was taken out, find the original number of people per row.

   (6 Marks)

18. A form three class has 32 students. They are distributed between four houses as follows: -

House	Boys	Girls
Chania	6	2
Athi	3	3
Tana	4	6
Mara	5	3

Two students are selected at random from the class. Find the probability that both students will be: -

a) From Chania

b) Girls

c) Boys of Tana House

d) Either boys or from Mara House

19. A tank is filled by tap A in 16 minutes. Tap B can empty the same tank in 24 minutes. Starting with an empty tank, both taps are turned on for 8 minutes and then tap B is turned off. Find: -

a) The time taken to fill the tank.   (6 Marks)

b) The capacity of the tank if A delivered 18400 litres.   (4 Marks)

20. In the diagram below TA and TB are tangents to the circle at A and B respectively. TBR is a straight line. The straight lines AB and QP intersect at K. ∠QAB=38°, ∠PBT=44° and ∠ATB=62°.
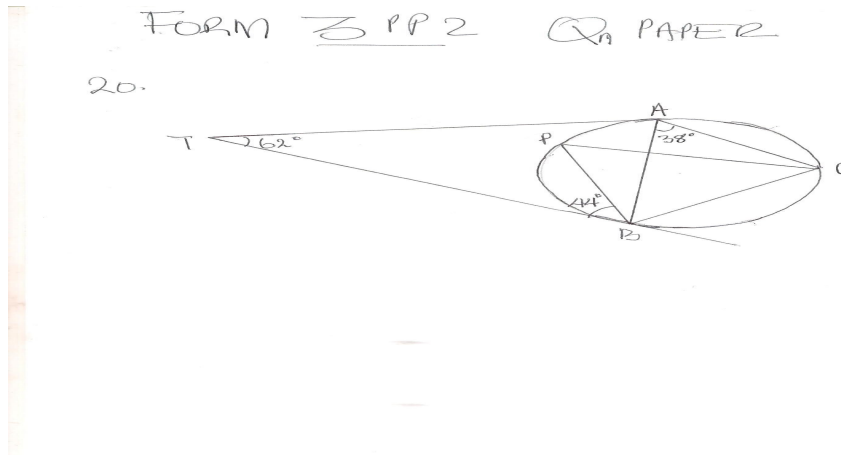
Calculate:

i)   ∠PAB   (1 Mark)

ii)   ∠PBA   (2Marks)

iii)   ∠ABQ   (2 Marks)

iv)   ∠AKP   (3 Marks)

v)   If AK=KB=3cm and KQ=2cm, calculate the length QP.   (3 Marks)

21. The data collected from an experiment involving two variables X and Y was recorded as shown below.

X	1.1	1.2	1.3	1.4	1.5	1.6
Y	-0.3	0.5	1.4	2.5	3.8	5.2

The variables are known to satisfy a relation of the form $y = ax^3 + by = ax^3 + b$ where **a** and **b** are constants.

a) For each value of **x** in the table above, write down the value of **x3**.   (2 Marks)

b) By drawing a suitable straight line graph, estimate the value of **a** and **b**   (6 Marks)

c) Write down the relationship connecting y and x.   (2 Marks)

22. The table below shows income tax rates for the year 2011.

Taxable Income (Sh. p.a.)	Tax Rate (%)
1 – 121 968	10
121 696 – 236 880	15
236 881 – 351 792	20
351 793 – 466 704	25
Above 466704	30

In the year 2011, Ole Sayeye's monthly earnings were as follows: -

Basic salary   Sh.42,800

House allowance   Sh.15,000

Medical allowance   Sh.2,880

Transport allowance Sh.2,664

Hardship allowance   30% of Basic salary

Mr. Ole Sayeye was entitled to a monthly tax relief of Sh.1,162. Calulate: -

a) His annual taxable income. (2 Marks)

b) The monthly tax paid by Ole Sayeye. (5 Marks)

c) Ole Sayeye got a salary increament equal to 50% of the year 2011 allowances. Calculate the percentage increase in the tax paid. (3 Marks)

23. a) The first term of an arithmetic progression (AP) is 2. The sum of the first 8 terms of the AP is 156.

  i) Find the common difference of the AP.   (2 Marks)

  ii) Given that the sum of the first n terms of the AP is 416, find n.   (4 Marks)

  b) The 3rd, 5th and 8th terms of another AP form the first three terms of geometric progression (GP). If the common difference of the AP is 3, find: -

     The 1st term of the G.P.   (4 Marks)

24. a) The weight of a metal rod varies jointly as the square of its length and inversely as the square root of its radius. Given that the length of the metal rod was increased by 5% and the radius decreased by 36%, what was the percentage change in weight.　　　(6 Marks)

b) If the weight of the metal rod is 6N when the length is 12cm and radius 25cm, find the weight of the metal rod when the length is 15cm and radius 81cm.　　　(4 Marks)