**CHOGORIA - MURUGI PRE – MOCK**

**2023 END OF TERM 1 EXAM**

121/2

MATHS

PAPER 2

TIME: 2 ½ Hrs

**NAME: …………………………………………….ADM.NO: …………….CLASS: ..……….**

**CANDIDATE’S SIGNATURE: …………………………………DATE: …………………...**

**END OF TERM 1 2023**

**INSTRUCTIONS TO CANDIDATES.**

1. Write your name and admission number in the space provided at the top of this page.
2. This paper consists of two sections; section 1 and section II
3. Answer a;; questions in section 1 and only FIVE sections in section II
4. Show all the steps in your calculations; giving your answers at each stage in the spaces provided below each question.
5. Marks may be given for correct working even if the answer is wrong.
6. Non-programmable silent electronic calculators and KNEC mathematical tables may be used.

**For Examiners use only.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | total |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | TOTAL |
|  |  |  |  |  |  |  |  |  |

 GRAND TOTAL

**SECTION 1: ANSWER ALL QUESTIONS**

1. Make x the subject of the formula.

h = $\sqrt[3]{\frac{c- x^{2}}{b}}$ (3mks)

1. Given that cos x = $\frac{2}{\sqrt{5}}$. Without using tables or calculators find sin x leaving your answer in the form a $\sqrt{b}$ (3mks)
2. Use logarithm tables to evaluate. (4mks)

$$\sqrt[3]{\frac{45.3 x 0.00697}{0.534}}$$

1. Find the value of K such that Kx2 – 30x + 25 is a perfect square. (3mks)
2. Use matrix method to solve the simultaneous equation. (4mks)

5x + 3y = 21

2x + 7y = 20

1. The top of a table is a regular hexagon. Each side of the hexagon measures 50.0cm. Find the maximum percentage error in calculating the perimeter of the top of the table. (3mks)
2. Solve for x in the equation (3mks)

$log\_{10}$ (6x + 2) -1 = $log\_{10}$(x – 3)

1. Given that R = 2$\vec{a}$ – 3$\vec{b}$ where $\vec{a}$ = $\left(\begin{array}{c}s\\2\end{array}\right)$ and $\vec{b }$= $\left(\begin{array}{c}1\\3\end{array}\right)$
2. Find vector R (2mks)
3. Find R1 image of R under a translation vector $\left(\begin{array}{c}2\\-3\end{array}\right)$ (2mks)
4. (a) Expand (1 – 2x)5 in ascending power of x. (2mks)

(b) Hence find the value of (0.94)5 correct to the nearest whole number. (2mks)

1. Find the equation of a circle whose diameter has the end point (-2,5) and (4,1). Giving your answer in the form of x2 + y2 + ax + by + c = 0. (4mks)
2. In the figure below O is the centre of a circle chord AB and CD intersect at x. Ax = 9cm,xB=3cm,Cx=2cm and xD = 6cm. find the length of AB (2mks)

A

D

0

X

C

B

1. Simplify $\frac{\sqrt[3]{7} + 6\sqrt{2} }{4\sqrt{2} + 2\sqrt{7}}$ as far as possible, leave your answer in the sinmplified form possible.

(3mks)

1. Two brands of coffee Arabica and Robusta costs sh 4700 and sh 4200 per kilogram respectively. They are mixed to produce a blend that costs shs 4600 per kilogram. Find the ratio of the mixture. (3mks)
2. In a transformation an object of area 64cm2 is mapped onto image whose area is 32cm2. Given that the matrix of transformation is $\left(\begin{array}{c}x+4 x\\2 1\end{array}\right)$. Find the value of x. (3mks)
3. Find the 9th term of the sequence 2,5,8……….. (2mks)
4. The population growth of a colony of bacteria was recorded at intervals of 5 seconds as shown in the table below,

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ts | 0 | 5 | 10 | 15 | 20 | 25 |
| Number of bacteria | 5 | 7 | 11 | 16 | 24 | 36 |

1. On the grid provided, draw a graph of population of bacteria against time. (2mks)



b)Use the graph to determine, correct to 2 decimal places, the average rate of change of the population of bacteria between t = 5 seconds and t = 20 seconds. (2 marks)

**SECTION 11: ANSWER ANY FIVE QUESTIONS IN THIS SECTION.**

1. Three quantities X, Y and Z are such that X varies directly as the square root of Y and inversely as the fourth root of Z.

When x = 64, y = 16 and z = 625

1. Determine the equation connecting X,Y and Z. (4mks)
2. Find the value of Z and Y = 36 and X = 160. (2mks)
3. Find the percentage change in X and when Y is increased by 44%. (4mks)

1. A quadrilateral ABCD has vertices A(-3,1) B(-2,3), C(-3,4) and D (-4,3)
2. (i) Find the coordinates of$ A^{1}B^{1}C^{1}D^{1}$, the image of ABCD under a transformation whose matrix is$\left(\begin{array}{c}0 -1\\1 0\end{array}\right)$. (2mks)

(ii) On the grid provided, draw the quadrilateral ABCD and its image $A^{1}B^{1}C^{1}D^{1}$.

 (2mks)



1. $A^{111}B^{111}C^{111}D^{111}$ is the image of $A^{1}B ^{1}C^{1}D^{1}$under a transformation whose matrix is $\left(\begin{array}{c}0 -1\\-1 0\end{array}\right)$ followed by an enlargement scale factor 2, centre (0,0)
2. Determine the coordinates of $A^{111}B^{111}C^{111}D^{111}$ (2mks)
3. On the same grid (a) (ii) above, draw $A^{111}B^{111}C^{111}D^{111}$ (1mk)
4. Find a single transformation matrix that maps $A^{111}B^{111}C^{111}D^{111}$ onto ABC.

(3mks)

1. The figure below shows triangle OAB in which OA = $\vec{a}$ and OB = $\vec{b}$ points D and E are such that AD = $\frac{1}{3}$ AB and OE = $\frac{1}{3}$ OA.

 B

 b D

 x

A

O

 E a

1. Express in terms of $\vec{a}$ and $\vec{b}$
2. $\vec{OD}$ (2mks)
3. $\vec{BE}$ (2mks)
4. If $\vec{OX}$ = k$\vec{OD}$ and $\vec{BX}$ = h$\vec{BE}$, where k and h are constants, express OX in terms of
5. k, $\vec{a}$ and $\vec{b}$ (1mk)
6. h, $\vec{a}$ and $\vec{b}$ (1mk)
7. Find the value of h and k. (4mks)
8. James’ earning are as follows:-

Basic salary sh 38,000pm

House allowance sh 14000 pm

Travelling allowance sh 8500pm

Medical allowance sh 3300pm

The table for the taxable income is as shown below

|  |  |
| --- | --- |
| **Income tax in K**$£$ **p.a** | **Tax in sh per pound** |
| 1 – 60006001 – 1200012001 – 1800018001 – 2400024001 – 3000030001 – 3600036001 – 4200042001 – 48000Over 48000 | 2345678910 |

1. Calculate James’ taxable income in K£ p.a. (2mks)
2. Calculate James P.A.Y.E if he is entitled to a tax relief of sh 18000 p.a. (4mks)
3. James is also deducted the following per month

NHIF sh 320

Pension Scheme sh 1000

Co-operative shares sh 2000

Loan repayment sh 5000

Interest on loan sh 500

1. Calculate James’ total deduction per month in kshs (2mks)
2. Calculate his net salary per month (2mks)
3. (a) Use the mid ordinates rule with 5 strips to estimate the area bounded by the curve y = x2 + 1, the x – axis, lines x = 1 and x = 6. (4mks)

(b) Find the exact area of the region in (a) above. (3mks)

1. Calculate the percentage error in area when mid – ordination rule is used. (3mks)
2. Copy and complete the table below for the function y = 5 + 3x – 2x2. (2mks)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| y | -22 |  |  | 5 |  | 3 |  | -15 |

1. Use the values from the table to draw the graph of y = 5 + 3x – 2x2 on the grid provided. (3mks)



1. Use your graph to solve the quadratic equation
2. 5 + 3x – 2x2 = 0 (1mk)
3. 2x2 – 2x – 3 = 0 (2mks)
4. Determine the range of values of x which satisfy the inequality 5 + 3x – 2x2 $\geq $ -2
5. Two bags X and Y contain ten and eight balls respectively. Bag X has 6 green and 4 red balls while bag Y has 3 green and 5 red balls. A bag is selected at random and two balls selected without replacement.
6. Draw a tree diagram to represent the above information. (4mks)
7. Find the probability of selecting a green ball the first time. (2mks)
8. What is the probability of selecting at most one red ball? (2mks)
9. Find the probability of selecting two green balls. (2mks)
10. A particle moves along a straight line such that its displacement, S (m) from a given point is S = t3 – 3t2 + 5 where t is time in seconds. Find:
11. The displacement of the particle at t = 3. (2mks)
12. The velocity of the particle at t = 3. (3mks)
13. The values of t when the particle is momentarily at rest. (3mks)
14. The acceleration of the particle when t = 4. (2mks)