**NAME** ……………………………………….…… **ADM NO**……….… **DATE** …….………

**SCHOOL**…………………………………………...……… **SIGNATURE** …………...……….

121

MATHEMATICS

FORM 4 PAPER 2

MAY 2022

TIME: 2 ½ HOURS

**MID TERM 1 EXAMINATION**

**Kenya Certificate of Secondary Education**

**INSTRUCTIONS TO CANDIDATES**

1. *Write your name and admission number in the spaces provided at the top of this page.*
2. *This paper consists of two sections:* **Section I and Section II.**
3. *Answer* ***al****l questions in* **section I** and any five questions in Section **II.**
4. *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*
5. *Marks may be given for correct working even if the answer is wrong.*
6. ***KNEC*** *Mathematical tables may be used.*

**For Examiner’s 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** |
|  |  |  |  |  |  |  |  |

 **Grand**

 **Total**

**SECTION I (50 marks)**

**Answer all the questions in the spaces provided in this section.**

1. Make d the subject of the formulae; (3 marks)
2. Use logarithm tables to evaluate (4 marks)
3. The base and perpendicular height of a triangle are measured as 8.2cm and 6.3cm respectively. Calculate the percentage error in calculating the area correct to 3 d.p. (4 marks)
4. A businesswoman borrowed Ksh. 240,000 from a financial institution that charges compound interest of 12% p.a for five years. She used the money to purchase a piece of land that appreciates at the rate of 15% p.a. If she sold the piece of land after five years, determine the amount of profit she made. (3 marks)
5. Simplify (2 marks)
6. (i) Expand and simplify up to the term in (1 mark)

(ii) Hence use your expansion to estimate correct to 4 d.p. (2 marks)

1. A quantity P varies partly as Q and partly as the square root of Q. When , and when , . State the equation connecting P and Q. (3 marks)
2. Solve for given that (3 marks)
3. Simplify hence use the quadratic formula to find the value of . (3 marks)
4. The equation of a circle is given as . Find the centre of the circle and its radius. (3 marks)
5. The region in the figure below is defined by the inequalities **L1**, **L2**, **L3** and **L4**



Form four inequalities that satisfy the unshaded region. (4 marks)

1. The three sides of a triangle ABC are , and . Using the Hero’s formula calculate to 2 decimal places the area of the triangle. (3 marks)
2. Given the column vectors , , and that **.**
3. Express as a column vector. (2 marks)
4. Determine the magnitude of **p.** (1 mark)
5. In the figure below DC is tangent to the circle at D and O is centre of the circle. AOBC is a straight line. Given that and



Calculate the length AC (3 marks)

1. The figure below shows a triangle ABC in which , and angle . Calculate to 2 decimal places the length of AC. (3 marks)



1. Use tables of reciprocals only to work out (3 marks)

**SECTION II (50 Marks)**

**Answer ONLY five questions from this section.**

1. In the figure below E is the midpoint of BC. and F is the meeting point of BD and AE. and



1. Express the following vectors in terms of **b** and **c**
2. (1 mark)
3. (2 marks)
4. If = and , Express AF in two different ways hence find the value of t and n (5 marks)
5. State the ratio in which F divides
6. BD (1 mark)
7. AE (1 mark)
8. Use a pair of compass and a ruler **only** for all constructions in this question.
9. Construct triangle PQR in which , and Angle (3 marks)
10. Measure line PQ. (1 mark)
11. Calculate the area of the triangle PQR. (3 marks)
12. Draw a circle passing through the vertices of the triangle. (3 marks)
13. The table below shows the income tax rates for the year 2021.

|  |  |
| --- | --- |
| Taxable income per annum per K£ | Tax rate Sh per K£ |
|  | 2 |
|  | 3 |
|  | 4 |
|  | 5 |
|  | 6 |

In the year 2021, Omondi’s monthly income was as follows:

Basic salary Ksh. 22 600

House allowance Ksh. 12 000

Medical allowance Ksh. 2 880

Transport allowance Ksh. 340

Omondi was entitled to a monthly personal relief of Ksh. 1156. Every month the following deductions are made:

NHIF Ksh. 1 500

SACCO share contribution Ksh. 3 000

Calculate:

1. Omondi’s taxable income in Kenyan pounds. (2 marks)
2. Total tax paid per year in shillings. (6 marks)
3. Net salary for the month. (2 marks)
4. (a) Solve the equation (4 marks)

 (b) The length of a floor of a rectangular hall is 9m more than its width .If the area of the floor is ,

1. Calculate the perimeter of the floor (3 marks)
2. A rectangular carpet is placed on the hall leaving an area of .If the length of the carpet is twice its width, determine the width of the carpet. (2 marks)
3. The probability that our school will host soccer and rugby tournament this year is 0.8. If we host, the probability of winning soccer is 0.7. If we don’t host the probability of winning soccer is 0.4. If we win soccer the probability of winning rugby is 0.8, otherwise if we lose the probability of winning rugby is 0.3.
4. Draw a tree diagram to represent this information. (2 marks)
5. Use the tree diagram to find:-
6. The probability that we lose both games (2 marks)
7. The probability that we will win only one game (3 marks)
8. The probability that we will host and lose both games (2 marks)
9. The probability that we win at least one game, if we host (1 mark)

1. The first, fifth and seventh terms of an Arithmetic Progression(A.P) form the first three terms of a decreasing Geometric Progression(G.P) respectively. Given that the first term of each progression is 64.
2. Write two equations involving common ratio of Geometric Progression (G.P) and find the common difference of Arithmetic Progression (A.P). (4 marks)
3. Find the sum of the first 24 terms of the Arithmetic Progression (AP) (3 marks)
4. Find the number of terms for which the sum of the Geometric Progression (G.P) is . (3 marks)
5. The figure below shows a belt passing round two wheels of centres P and Q respectively. The radii of the pulleys are 15cm and 9cm respectively. RS and UV are tangents to the circles. and . (Use )



Calculate

1. The length of RS (2 marks)
2. Arc length RWV (3 marks)
3. Arc length STU (3 marks)
4. The total length of the belt (2 marks)
5. (a) Complete the table below for the equation (2 marks)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 |  |
|  | 0 |  | 4 | 9 |  | 25 |  |  |
|  | 0 |  |  |  |  |  |  |  |
| 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |  |
|  | 5 |  |  |  |  | 0 |  |  |

1. Draw the graph of using values in the table (3 marks)
2. Use the graph to solve the equation
3. (1 mark)
4. (2 marks)
5. (2 marks)