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

**DATE** ……………………………………………………………

**CANDIDATE’S SIGNATURE** …………………..

**121/1 MATHEMATICS PAPER 1 FORM 4**

**DECEMBER 2021 TIME:**

**END OF TERM TWO 2021 EXAMINATIONS**

**Kenya Certificate of Secondary Education**

**MATHEMATICS**

**PAPER 1**

**INSTRUCTIONS TO CANDIDATES**

1. Write your name, admission number and school in the spaces provided.
2. This paper consists of two sections; **Section I** and **Section II.**
3. Answer ALL the questions in Section I and **ONLY FIVE** questions in Section II.
4. All answers and working must be written on the question paper in the spaces provided below each question.
5. Show all the steps in your calculations, giving your answer at each stage in the space provided below each question.
6. Marks may be given for correct working even if the answer is wrong.
7. Non programmable silent electronic calculators and **KNEC** mathematical tables may be used except where stated otherwise.
8. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

FOR EXAMINORS USE ONLY

SECTION I

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Question** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **TOTAL** |
| **Marks** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

SECTION II

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Question** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **TOTAL** |
| **Marks** |  |  |  |  |  |  |  |  |  |

**Grand Total**

**SECTION I (50 Marks)**

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

1. Evaluate without using a calculator; (3 marks)
2. Solve for in the equation (3 marks)
3. A cylindrical tank of diameter 1.4 m and height 1.2 m is two – thirds full of water. The tank if filled using a cylindrical bucket of diameter 35 cm and diameter 20 cm. Find the number of buckets required to fill the tank. (3 marks)
4. The figure below shows a right pyramid with a square base of side 4 cm and a slant height of 3 cm. Draw the net of the pyramid. (3 marks)



1. A square room is covered by a number of whole rectangular slabs of sides 60 cm by 42 cm. calculate the least possible area of the room in square metres. (3 marks)
2. The distance from **A** to **B** is d km and that from **B** to **C** is x km. if a bus maintains an average speed of 50 km/h between **A** and **B** and 60 km/h between **B** and **C**, it takes 3 hours to travel from **A** to **C**. If it maintains 60 km/h between **A** and **B** and 50 km/h between **B** and **C**, the journey takes 8 minutes less. What is the distance from **A** to **C** via **B**? (4 marks)
3. (a) Using a ruler and a compass only, construct triangle ABC in which BC = 8 cm, angle ABC = and angle ACB = . (2 marks)

(b) At A drop a perpendicular to meet BC at D and measure AD. (2 marks)

1. The position vectors of A and B are and respectively. Find the magnitude of the vector (3 marks)
2. A man sets off by bus on a journey of km. after the bus has travelled 119 km at an average speed of , it breaks down and he is immediately given a lift by a passing cyclist who takes him to his destination at average speed of 66 km/h.

Calculate;

1. The time taken for the whole journey. (2 marks)
2. His average speed for the whole journey. (2 marks)
3. Find the area of the shaded region in the figure below given that AD = 15 cm, BE = 3 cm, AB = 3 cm, . (3 marks)



1. Write the expression below in surd form and rationalize the denominator. (3 marks)
2. Solve the equations below using matrix method. (3 marks)

1. Expand and simplify up to the expansion of the term in . (3 marks)
2. Use reciprocals tables to evaluate (3 marks)
3. At the end of his stay in Kenya, a French tourist had French francs which he decided to change into Euros. Given the exchange rate was;

1 French franc = Ksh. 11.25

1 Euro = Ksh. 72.50

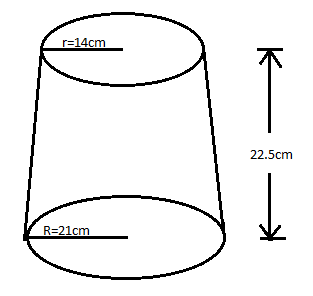
Calculate the number of Euros he received if the bank charged him 2% commission. (3 marks)

1. A number ***m*** is such that if its reciprocal is added to three times itself the result is 4. Form an equation in ***m*** and solve it. (3 marks)

**SECTION II (50 Marks)**

**Answer ONLY FIVE questions in the spaces provided.**

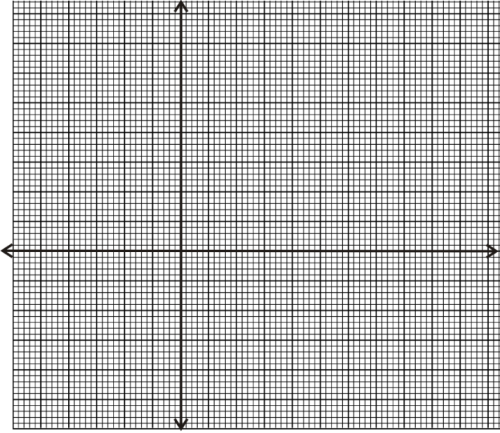
1. The diagram represents a solid frustum with base radius 21cm and top radius 14cm. The frustum is 22.5cm high and is made of a metal whose density is . (Take )



1. Calculate
   1. The volume of the metal in the frustum. (5 marks)
   2. The mass of the frustum in kg. (2 marks)
2. The frustum is melted down and recast into a solid cube. In the process 20% of the metal is lost. Calculate to 2 decimal places the length of each side of the cube. (3 marks)
3. A line passes through the points and and is perpendicular to at .
4. Find the equation of . (2 marks)
5. Find the equation of in the form where a, b and c are constants. (2 marks)
6. Given that another line is parallel to and passes through point , find the and intercepts of . (3 marks)
7. Find the point of intersection of and . (3 marks)
8. (a) Complete the table below for the function (2 marks)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | 0 | 0.5 |  |  |  |  |  |  |  |  |  |
|  | 38 |  | 21 |  | 10 |  | 5 |  | 6 |  | 13 |  | 26 |  | 45 |  | 70 |

1. Use the completed table and mid ordinate rule to estimate the area bounded by the curve, the axis and the lines and (3 marks)
2. Use calculus to calculate the actual area in part b above. (3 marks)
3. Calculate to 3 significant figure the percentage error when mid ordinate rule is used to estimate the area. (2 marks)
4. On the grid provided, draw the square whose vertices are



1. On the same grid, draw:
2. the image of ABCD, under an enlargement scale factor 3 centre (3 marks)
3. the image of under a reflection in the line (2 marks)
4. the image of under a rotation of about ).(2 marks)
5. Describe a single transformation that maps onto . (2 marks)
6. The figure below represent two neighboring plots with QR as their common boundary.



Find to 2 decimal places,

1. The length of boundary PQ. (3 marks)
2. The length of boundary RS. (3 marks)
3. The angle RQS. (1 mark)
4. Area of triangle QRS. (3 marks)
5. The velocity of a particle projected into space is given by the formula where is the time in seconds elapsed since projection.

Determine;

1. The acceleration of the particle when seconds. (3 marks)
2. The value of which minimizes the acceleration. (2 marks)
3. The velocity of the particle when acceleration is minimum. (2 marks)
4. The total distance covered by the particle between to seconds. (3 marks)
5. (a) The ratio of Juma’s and Akinyi’s earnings was Juma’s earnings rose to Ksh 8 400 after an increase of 12%. Calculate the percentage increase in Akinyi’s earnings given that the sum of their earnings was Ksh. 14 100 (6 marks)

(b) Juma and Akinyi contributed all the new earnings to buy maize at Ksh 1 175 per bag. The maize was then sold at ksh 1 762.50 per bag. The two shared all the money from the sales of the maize in the ratio of their contributions. Calculate the amount that Akinyi got. (4 marks)

1. The equation of a curve is given by .
2. Find the value of when (1 mark)
3. Determine the stationary points of the curve. (5 marks)
4. Find the equation of the normal to the curve at . (4 marks)