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

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

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MATHEMATICS

FORM 3 JANUARY 2023 TERM 1 OPENER EXAM

**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 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**

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

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| **17** | **18** | **19** | **20** | **21** |
|  |  |  |  |  |

 **Grand**

 **Total**

**SECTION I (50 Marks)**

1. Use tables of logarithms to evaluate; (3 marks)

1. The length, width and height of cuboid of mass 40g, are 10 cm, 5 cm and h cm respectively. If it has a density of , calculate the height of the Cuboid. (3 marks)
2. A man walks directly from point Q towards the foot of a vertical flag post 200 m away, after covering a distance of 140m , he observes the angle of elevation of the top of the flag post is . Calculate to 2 decimal places
3. The height of the flag post (2 marks)
4. The angle of elevation from point Q to the top of the flag post (2 marks)
5. Without using mathematical tables or calculator evaluate (3 marks)

1. Evaluate (2 marks)
2. In the figure below lines AB and XY are parallel and



If the area of the shaded region is .Find the area of the triangle CXY (3 marks)

1. Given that , without using mathematical tables express in fraction form the value of
2. (2 marks)
3. (1 mark)
4. Given that where and .Find:
5. Column vector **P**. (2 marks)
6. the image of P under a translation vector . (1 mark)
7. Simplify (3marks)
8. The figure below shows a circle centre **O** and **AOC** as its diameter .Chords **BD** and **AC** intersect at **F .** Given that angle and angle



.Find the size of

1. Angle **DAC** (1 mark)
2. Angle **BFC (**2 marks)

1. Find the value of x in the equation (3 marks)
2. Find the surface area of a cone whose diameter is 12cm and height 8cm (3 marks)
3. Three automatic electric bells A, B and C ring at intervals of 20 minutes, 30 minutes and 50 minutes respectively. If the bells ring together at 8.20 a.m, at what time will they ring simultaneously again for the first time. (3 marks)
4. The equation of a line is

Find the:

1. Gradient of the line. (1 mark)
2. Equation of a line passing through point and perperndicular to the given line. (2 marks)
3. The area of a rhombus is .If the shorter diagonal is 8cm ,Find the perimeter of the rhombus (4 marks)
4. State all the integral values of x that satisfy the following inequality. (3 marks)

**SECTION II (50 marks)**

**Attempt ALL questions in the spaces provided in this section**

1. The diagram below represents two vertical watch towers RS and TU on a level ground. P and Q are two points on a straight road SU. The height of the tower RS is 20 m and road SU is 200m.



1. A bus moves from S towards U. At point P, the angle of depression of the bus from point R is . Calculate the distance SP to 4 significant figures. (2 marks)
2. If the bus takes 5 seconds to move from P to Q at an average speed of 36 km/h, calculate the angle of depression of Q from R to 1 decimal place. (3 marks)
3. Given that QT = 50.9 m, calculate;
4. The height of TU in metres to 1 decimal place. (2 marks)
5. The angle of elevation of R from T to the nearest degree. (3 marks)
6. The diagram below represents a conical vessel which stands vertically .The vessel contains water to a depth of 30cm .The radius of the surface with water in the vessel is 21cm .(Take



1. Calculate the volume of the water in the vessel in (3 marks)
2. When a metal sphere is completely submerged in the water ,the level of water in the vessel rises by 6cm.Calculate
3. The radius of the new water surface in the vessel (2 marks)
4. The volume of the metal sphere in (3 marks)
5. The radius of the sphere (2 marks)
6. Using a pair of compasses and ruler only;
7. Construct triangle ABC such that AB = 8cm, BC = 6cm and angle ABC = 300.  (3 marks)
8. Measure the length of AC                                     (1 mark)
9. Draw a circle that touches the vertices A,B and C.                    (2 marks)
10. Measure the radius of the circle                                (1 mark)
11. Hence or otherwise, calculate the area of the circle  outside the triangle.        (3 marks)
12. The diagram below shows triangle ABC with and .



1. Draw the image of under a rotation of about . (2 marks)
2. Draw the image of under a reflection in the line . (2 marks)
3. Draw the image of under a rotation of about (2 marks)
4. State the coordinates of triangles and . (2 marks)
5. Write down the equation of the lines of symmetry of the quadrilateral . (2 marks)
6. The mass in kilograms of 30 patients who attended a clinic on a certain day were recorded as follows:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 38 | 52 | 46 | 60 | 39 | 62 | 73 | 49 | 54 | 49 |
| 41 | 57 | 58 | 79 | 62 | 58 | 54 | 65 | 56 | 69 |
| 72 | 58 | 42 | 41 | 67 | 49 | 51 | 54 | 59 | 60 |

1. Starting with a class width of …make a frequency distribution table for the data indicating the class and frequency (3 marks)
2. State the modal class (1 mark)
3. Calculate the median mark (3 marks)
4. Calculate the median mark (3 marks)