**NAME ADMNO CLASS**

**121/1**

**MATHEMATICS**

**Paper 1**

**2½ Hours**

MECS CLUSTER JOINT EXAMINATION

***FORM FOUR END OF THE TERM TWO EXAMINATION 2021***

 **MATHEMATICS**

**INSTRUCTIONS TO CANDIDATES**

1. Write your name, index number and class in the spaces provided above.
2. The paper contains two sections: **Section I** and **Section II**.
3. This paper contains **14 PRINTED** pages make sure all **PAGES ARE PRINTED** and **NON IS MISSING**
4. Answer **ALL** the questions in **Section I** and **ANY FIVE** questions from **Section II**.
5. All working and answers must be written on the question paper in the spaces provided below each question.
6. Marks may be awarded for correct working even if the answer is wrong.
7. Negligent and slovenly work will be penalized.
8. Non-programmable silent electronic calculators and mathematical tables are allowed for use.

**For examiners use only**

**Section I**

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

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| --- |
|  |

**Section II**

**Grand**

**Total**

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

**SECTION I (50 MARKS)**

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

1. (a) Evaluate 94344 – 36425 ÷ 5 $\left[1mark\right]$

 (b) Write the total value of the digit in the thousands place of the result obtained in (a) above $\left[1mark\right]$

1. In a game park $\frac{1}{5}$ of the animals are rhinos and ¾ of them are zebras. $\frac{2}{3}$ of the remaining animals are lions and the rest are warthogs. Find the fraction of warthogs in the game park. $\left[3marks\right]$
2. The volume of a cube is $2744cm^{3}$. Calculate the length of the diagonal of a face of the cube giving your answer in surd form. $\left[3marks\right]$

1. Without using mathematical tables or a calculator, evaluate

 $27^{\frac{2}{3}}×\left(\frac{81}{16}\right)^{-\frac{3}{4}}$ $\left[3marks\right]$

1. Using ruler and a pair of compasses only, construct triangle ABC in which AB = 6cm and angle ABC = 1050 and angle BAC = 450. Measure length of BC. $\left[3marks\right]$
2. An empty specimen bottle has a capacity of $300ml$ and a mass of $280g$. Calculate the mass of the bottle when it is full of a liquid whose density is $1.2g/cm^{3}$. $\left[3marks\right]$
3. The figure below shows a sketch of a solid cuboid EFGHIJKL. Complete the sketch. $\left[2marks\right]$

E

H

G

L

K

J

I

1. Find the rate per annum at which a certain amount doubles after being invested for a period of 5 years compounded semi-annually $\left[3marks\right]$

1. The sum of the interior angles of a regular polygon is 40 times the size of the exterior angle.

 (a) Find the number of sides of the polygon. $\left[3marks\right]$

 (b) Name the polygon $\left[1mark\right]$

1. The data below shows the number of pupils in Nairutia Primary School

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 42 | 43 | 48 | 40 | 46 | 42 | 44 | 48 | 39 | 40 | 42 |
| 41 | 47 | 46 | 45 | 49 | 45 | 42 | 40 | 38 | 39 | 40 |
| 46 | 47 | 42 | 40 | 41 | 43 | 44 | 45 | 46 | 48 |  |

1. Using a class size of 2 organize the data in a grouped frequency table. $\left[2marks\right]$
2. Determine the mean of the data. $\left[2marks\right]$
3. Given that q = 5t – 3f where t = $\left(\begin{matrix}-2\\-3\end{matrix}\right)$ and f = $\left(\begin{matrix}1\\-2\end{matrix}\right)$ find:

˜

˜

˜

˜

˜

 (a) the column vector q $\left[2marks\right]$

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 (b) Given that TI (3,2) is the image of T (0,-2) under a translation, find the translation. $\left[1mark\right]$

1. Given that a = -5 b = 3 and c = -$\frac{1}{3}$, evaluate: $\frac{5a^{2}- 2b-4c}{\frac{1}{3}\left(b^{2}+2a\right)}$ $\left[3marks\right]$

1. Find the value of x in the equation  in the range listed below.

0o ≤ x ≤ 180o  $\left[3marks\right]$

1. Simplify the expression

 $\frac{4t^{2}-25a^{2}}{6t^{2}+9at-15a^{2}}$ $\left[3marks\right]$

1. The figure below represents the speed-time graph of a tuktuk. Use it to answer the questions (a) and (b)

10

20

10

20

30

Time (s)

Speed (m/s)

1. Calculate the acceleration of the tuktuk. $\left[2marks\right]$
2. Find the total distance travelled for the whole journey $\left[2marks\right]$

1. A farmer has a piece of land measuring 840m by 396m. He divides it into square plots of equal size. Find the maximum area of one plot. $\left[3marks\right]$

**SECTION (50 MARKS)**

*Answer any five questions in this section in the spaces provided.*

1. In the year 2001 the price of a sofa set in a shop was KSh. 12,000

 (a) Calculate the amount received from the sales of 240 sofa sets that year. $\left[2marks\right]$

 (b) In the year 2002 the price of each sofa set increased by 25% while the number of sets sold decreased by 10%.

 (i) Calculate the percentage increase in the amount received from the sales $\left[3marks\right]$

 (ii) If at the end of the year 2002, the price of each sofa set changed in the ratio 16:15.

 Calculate the price of each sofa set in the year 2003. $\left[2marks\right]$

1. The number of sofa sets sold in the year 2003 was p% less than the number sold in the year 2002. Calculate the value of P given that the amount received from the sales in the year were equal $\left[3marks\right]$
2. A line L passes through points (-2,3) and (-1,6) and is perpendicular to a line P at (-1,6)

 (a) Find the equation of L. $\left[2marks\right]$

 (b) Find the equation P in the form ax + by = c where a, b and c are constants. $\left[2marks\right]$

1. Given that another line Q is parallel to L and passes through point (1,2), find the x and y - intercepts of Q. $\left[3marks\right]$
2. Find the point of intersection of lines P and Q. $\left[3marks\right]$
3. In the figure below (not drawn to scale) AB = 8cm, AC = 6cm, AD = 7cm, CD = 2.82cm and angle CAB = 500.

D

C

A

B

7cm

8cm

2.82cm

500

6cm

 Calculate to 2 decimal places

1. the length BC $\left[3marks\right]$
2. the size of angle ABC $\left[2marks\right]$
3. the size of angle CAD $\left[3marks\right]$
4. the area of triangle ACD $\left[2marks\right]$
5. The coordinates of a triangle ABC are A(1, 1) B(3, 1) and C (1, 3).

(a) Plot the triangle ABC. $\left[1 mark\right]$

(b) Triangle ABC undergoes a translation vector$ \left(\begin{matrix}2\\2\end{matrix} \right)$. Obtain the image of A' B' C ' under the transformation, write the coordinates of A' B' C'. $\left[ 2 marks\right]$

(c) A' B' C' undergoes a reflection along the line X = 0, obtain the coordinates and plot on the graph points A" B" C", under the transformation. $\left[2 marks\right]$

(d) The triangle A" B" C" , undergoes an enlargement scale factor -1, centre origin. Obtain the coordinates of the image A'" B"' C"'. $\left[2 marks\right]$

(e) The triangle A"' B"' C"' undergoes a rotation centre (1, -2) angle 1200. Obtain the coordinates of the image Aiv Biv Civ. $\left[ 2 marks\right]$

(f) Which triangles are directly congruent. $\left[1 mark\right]$

1. Three warships $P, Q and R$ leave port X at 9:00am, ship P sails at a steady speed on a bearing of 070⁰, 100km from port X, while ship Q sails on a bearing of 320⁰, 80km from X. Ship R is on a bearing of 150⁰ from port X and due south of ship P.
2. Use scale drawing to show the position of $P,Q,R and X$ $\left[4marks\right]$

b) Use the scale drawing to determine

 i) The distance and bearing of ship P from ship Q $\left[2marks\right]$

 ii) The distance of ship R from port X $\left[2marks\right]$

 iii) The distance of ship R from ship P $\left[2marks\right]$

1. A rectangular tank whose internal dimensions are $2.04m by 1.68m by 26.4 m$ is $\frac{7}{8} $full of milk
2. If the tank is made of metal of thickness $3mm.$ Calculate the external volume of

 the tank in $m^{3}$ when closed.

 $\left[3marks\right]$

1. Calculate the volume of milk in the tank in cubic metres. $\left[2marks\right]$

1. The milk is to be packed in small packets. Each packet is in the shape of a

Right - Pyramid on an equilateral triangular base of side $19.2cm$. The height of each packet is $13.6 cm$. Full packets obtained are sold at $kshs. 35$ per packet. Calculate;

 i) The volume of milk, in cubic centimeters contained in each packet to 4 significance figures. Hence find the number of full packets. $\left[3marks\right]$

 ii)The exact amount that will be realized from the sale of all the packets of

 milk. $\left[2marks\right]$

1. (a) Find the inverse of the matrix $\left[2marks\right]$ $\left[\begin{matrix}2&5\\4&3\end{matrix}\right]$

 (b) A transport company has two types of vehicles for hire: Lorries and buses. The vehicles

 are hired per day. The cost of hiring two lorries and five buses is Sh. 156,000 and that

 of hiring 4 lorries and three buses is Sh. 137,000.

 (i) Form two equations to represent the above information. $\left[2marks\right]$

 (ii) Use matrix method to determine the cost of hiring a lorry and that of hiring a bus.

 $\left[3marks\right]$

 (c) Find the value of x given that $\left[\begin{matrix}2x-1&1\\x^{2}&1\end{matrix}\right]$ is a singular matrix $\left[3marks\right]$

24. a) (i) Find the co-ordinates of the stationary points of the curve y = x3 – 3x + 2. $\left[4marks\right]$

 (ii) For each stationary point determine its nature $\left[2marks\right]$

 (b) Determine the y-intercept $\left[2marks\right]$

 (c) In the space provided sketch the graph of the function y = x3 – 3x + 2 $\left[2marks\right]$