**NAME: ………………………….....………………….. INDEX NO: ………………….......**

 **CLASS: ……………………………**

 **DATE:……………………………..**

**121/2**

**MATHEMATICS**

**TERM3, 2021**

**JANUARY 2021**

**TIME: 2 ½ HOURS**

**MURANG’A EAST CLUSTER EXAMINATION**

**INSTRUCTIONS TO CANDIDATES:**

(a) Write your name and index number in the spaces provided above

(b) Sign and write the date of examination in the spaces provided above.

(c) This paper consists of ***TWO*** sections: ***Section I*** and ***Section II.***

(d) Answer ***ALL*** the questions in ***section I*** and only five from ***Section II***

(e) All answers and working must be written on the question paper in the spaces provided below each question.

(f) ***Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.***

(g) Marks may be given for correct working even if the answer is wrong.

(h) ***Non-programmable*** silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

**FOR EXAMINER’S USE ONLY**

**Section I**

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

**Section II**

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

 **Grand Total**

**SECTION 1:( 50 MARKS.) ANSWER ALL THE QUESTIONS**

1. Use logarithms to evaluate. **( 4mks)**

2. Calculate the percentage error in the volume of a cone whose radius is 9.0cm and slant length 15.0cm. **(3mks)**

3. Make **y** the subject of the formula. **(3mks)**

4. Solve for **x**: **tan 2 x – 2 tan x = 3** for the interval **0 x 180o** **(3 mks)**

5. Solve the equations **(4mks)**



6. Simplify  give the answer in the form **** where a, b and c are integers.  **(3mks)**

7. Kiprono buys tea costing sh 112 per kilogram and sh.132 per kilogram and mixes them, then sells the mixture at sh.150 per kilogram .If he is making a profit of 25% in each kilogram of the mixture, determine the ratio in which he mixes the tea. **(4mks)**

8. Find the value of x given that. **(3mks)**

9. The tangent to the curve y = ax2 + bx + c is parallel to the line y - 4x=0 at the point where x = 2. If the curve has a minimum value of –3 where x = 1, find the values of a, b and c. **(3 mks)**

10. The points **A, B and C** lie on a straight line. The position vectors of **A** and **C** are 2**i** + 3**j** + 9**k** and 5**i** – 3**j** + 4**k** respectively; B divides AC internally in the ratio 2:1. Find the

1. Position vector of **B**. **(2 mks)**

 (b) Distance of B from the origin. **(1 mk)**

11.(a) Find the inverse of the matrix **(1 mk)**

(b) Hence solve the simultaneous equation using the matrix method. **(2 mks)**

 **4x +3y = 6**

 **3x + 5y = 5**

12. Find the radius and the centre of a circle whose equation is. **(3mks)**

**3x2 + 3y2+18y -12x-9=0**

13. A model of the globe representing the earth has a radius of 0.2m. Point A and B are located at (60˚ N,140˚ E) and (60˚ N,120˚ W),respectively. If O is the centre of the latitude 60 N, find the area of the minor sector OBA, in square metres. **(3 mks).**

14.Find the length NX in the figure below that PQ = 9cm, PX = 12cm and MX = 15cm. **(2 mks)**



15. A colony of insects was found to have 250 insects at the beginning. Thereafter, the number of insects doubled every two days. Find the number of insects after 16 days. **(3 mks)**

16. The following data was obtained from the mass of a certain animal. Complete the table and the histogram below. **(3 mks)**

|  |  |
| --- | --- |
| Mass(kg) | frequency |
| 41-50 | 20 |
| 51-55 |  |
| 56-65 | 40 |



**SECTION II (50 MARKS)**

**Answer ONLY FIVE questions in this section**

17.The table below shows the rate at which income tax is charged for all income earned in a month in 2015.

 **Taxable Income p.m (Kenya pound) Rate in % per Kenya pound**

 1 -236 10%

 237 -472 15%

 473 -708 20%

 709 – 944 25%

 945 and over 30%

Mrs.mumanyi earns a basic salary of 18000.She is entitled to a house allowance of Ksh. 6,000 a person relief of Ksh. 1064 month

. Every month she pays the following.

1. Electricity bill shs.580
2. Water bill shs. 360
3. Co-operative shares shs. 800
4. Loan repayment Ksh. 3000

 (a) Calculate her taxable income in k£ p.m. **(2 mks)**

 (b)Calculate her P.A.Y.E **(6 mks)**

 (c) Calculate her net salary. **(2 mks)**

 18 (.a) Use the trapezium rule with six trapezia to calculate the areas bounded by the curve Y=2x2+ 3x +1, the axis and the ordinate x=0 and x=3**. (5mks)**

b) Calculate the exact axed in **(a) above by** **integration.** **(3mks)**

c) Assuming they are calculated in (a) above is an estimate, calculate the percentage error made when the trapezium rule is used leaving your answer to 2 decimal places. **(2mks)**

19. The figure below shows a cuboid.



Calculate

1. The length **BE.** (2 mks)
2. The angle between BE and plane ABCD. **(3 mks)**
3. The angle between FH and BC. **(2mks)**
4. The angle between place AGHD and plane ABCD. **(3 mks)**

20. The figure below shows two intersecting circles radii 8cm and 6cm respectively. The common chord AB = 9cm and P and Q are the centres as shown.



a. Calculate the size of angle

i. APB **(1mk)**

ii. AQB **(1mk)**

b. Calculate the area of

i. Minor segment of the circle centre P. **(2mks)**

ii. Minor segment of the circle centre Q **(2mks)**

iii. The quadrilateral APBQ **(2mks)**

iv. The shaded region  **(2mks)**

21. In the figure below DA is a diameter of the circle ABCDE centre O. TCS is a tangent to the circle at C, AB = BC and angle DAC = 380



Giving reasons, determine the following angles:

(a) **(2 mks)**

(b) **(2 mks)**

(c) **(2 mks)**

(d) **(2 mks)**

(e) **(2 mks)**

22. A flower garden is in the shape of a triangle ABC such that

 AB = 9M, AC=7.5M and angle ACB=75˚. Using a rule and a pair of compass only.

a) Construct ABC **(3mks)**

b) Construct a locus of P such that AP = PC. **(2mks)**

c) Construct locus of Q such that it is equal distance from AB and BC

 and locus of R which is 2m from AC. **(2mks)**

d) Flowers are to be planted such that they are nearer AC than AB and

 less than 5m from a shade the portion with flowers. **(3mks)**

23. Three variables p, q and r are such that p varies directly as q

 and inversely as the square of **r.**

* 1. When **p = 9, q = 12** and **r = 2** find **p** when **q = 15** and

**r = 5**  **(4mks)**

* 1. Express **q** in terms of **p** and **r**  **(1mk)**
	2. If p is increased by 20% and r is reduced by 10% find,
		1. A simplified expression for the change in q in terms of **q** and **r.** **(3mks)**
		2. The percentage change in **q.** **(2mks)**

24. The table below shows some values of the curve **y = 2cos x** and **y= 3 sin x.**

1. Complete the table for values **y=2cosx** and **y=3 sin x**, correct to 1 decimal places. **(3mks)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **X** | **0** | **300** | **600** | **900** | **1200** | **150o** | **1800** | **2100** | **2400** | **2700** | **3000** | **3300** | **3600** |
| **y=2cos x** | 2 |  | 1 | 0 |  |  | -1.7 | -1.7 | -1 |  | 1 | 1.7 | 2 |
| **y=3sin x** | 0 | 1.5 |  | 3 | 2.6 |  |  |  | -2.6 |  |  | -1.5 | 0 |

On the grid provided draw the graphs of **y=2cos x** and **y=3sin x** for **00 x 3600** on the same axis. **(5mks)**

1. Use the graph to find the values of x when **2cos x- 3sin x=0.** **(2mks)**
2. Use the graph to find the values of y when 2 cos x = 3sin x. **(1mk)**