**Name…………………………………Index No:…………………….ADM:…..........................**

**School……………………………… Date ………………..………. Class: ………………….**

**121/2**

**MATHEMATICS**

**PAPER 2**

**JULY, 2024**

**TIME: 2½ HOURS**

**NAKURU NORTH SUB -COUNTY JOINT MOCK 2024**

**Kenya Certificate of Secondary Education**

**INSTRUCTION TO CANDIDATE’S:**

1. Write your **name**, **index number Adm. Number** and **school** in the spaces provided at the top of

 this page.

2. **Sign** and write the **date** of examination in spaces provided above.

3. This paper consists of **two** Sections; Section **I** and Section **II**.

4. Answer all the questions in Section **I** and any **FIVE** questions from Section **II**.

5. All answers and working must be written on the question paper in the spaces provided

 **below** each question.

6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided

 **below** each question.

7. Marks may be given for correct working even if the answer is wrong.

8. Non-programmable silent electronic calculators and **KNEC** Mathematical tables **may be** used,

 except where stated otherwise.

9. Candidates should check the question paper to ascertain that all the pages are printed as indicated

 and that no questions are missing.

**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 |
|  |

***This paper consists of 16 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no pages are missing.***

**SECTION I: (50 MARKS)**

Answer all the question in this section in the spaces provided:

1. Using logarithm tables only, evaluate

  (4 marks)

2. The transformation represented by the matrix

 M = 0 1 maps a triangle **ABC** onto another triangle **A1 B1 C1** of area 36cm2.

 3 1

 Find the area of triangle **ABC** (3mks)

3. Simplify  and hence evaluate  to 3 significant figures given

 . (3 marks)

4. If (M + n) : (M – n) = 8: 3. Find the ratio M: n. (3 marks)

5. Find the values of x if; (3 mks)

log16 (7x – 14) – log16 (6 – 3x) = $\frac{3}{2}$

6. Make q the subject of the formula:

  (3 marks)

7. The 3rd term of a geometric sequence is 20 and the 16th term is -160 Calculate the 8th term the sequence (3mks)

8. If A = 2.3, B = 8.7 and C = 2.0 find the % error in. (3 marks)

9. Simplify:

  (3 marks)

10. Obtain the binomial expansion of (1 - 2χ)5 and use your expansion to evaluate [0.98]5 correct

to 5d.p. (3 marks)

11. After being given a discount of sh.5 on every book James bought, he was able to buy 2 more books than before he was given the discount, with sh.200. What was the price of one book before the discount?

 (4 marks)

12. Find the centre and radius of a circle with equation:

 χ² + y² - 6χ + 8y – 11 = 0 (3 marks)

13. A car was valued at Ksh.3000000 in January 2000. Each year its value decreased by 12% of its

value at the beginning of the year. Find the value of the car in January 2004 giving your

answer correct to 4s.f. (3 marks)

14. The figure below is a pyramid of a rectangular base PQRS of length 12cm and width 9cm.

The slanting edge has a length of 19.5cm. Determine the angle PO makes with base PQRS

**O**

**R**

**Q**

**S**

**P**

19.5cm

9cm

12cm

15. A point (-5, 4) is mapped onto (-1, -1) by a translation T. Find the image of (-4, 5) under the same translation. (3 marks)

16. The gradient of the curve y = aχ² + bχ at the origin is equal to 8. Find the value of a and b

if the curve has a maximum turning point at χ = 4. (3 marks)

**SECTION II: (50 MARKS)**

*Attempt* ***ONLY FIVE*** *questions from this section.*

1. Mr. Karambu is a civil servant in a ministry. He earns a monthly salary of sh.**N** and allowance of sh.1271.all taxable. He is entitled to a monthly relief of sh.1056. The table below shows the rates of taxation.

|  |  |
| --- | --- |
|  **K£ P.a** | **Rates %** |
|  1 - 5808 | 10 |
| 5.809 – 11280 | 15 |
| 11281 - 16752 | 20 |
| 16753 – 22224 | 15 |
| 22225 and above | 30 |

When his salary was increased by 50% the net tax increased by 66.25 % to sh.9036 per month.

 (a) What was his net tax in K£ p.a before the salary increase (2mks)

 (b) Calculate his salary before the increase (5mks)

 (c) Calculate the percentage increase in his net pay after the salary increase (3mks)

1. A transporter wishes to transfer 1000 bags of sugar to a go down. He has two types of lorries to use. FTR with a capacity of 80 bags and a canter with the capacity of 20 bags. The canter has to make at most twice as many trips as the FTR makes. The total number of trips made by both lorries must be less than 30, and the canter has to make more than 10 trips.

(a) Write down all the possible inequalities to represent this information (take trips made by FTR be **x** and trips made by canter be **y**) (4mks)

(b) Represent the information above on the grid provided (3mks)

(c) The transporter makes a profit of sh 1800 per trip on FTR and sh 1000 per trip on canter.

 Determine his maximum profit. (3 mks)



1. A plane S flies from a point P(40°N, 45°W) to a point Q(35°N, 45°W) and then onto a point

T((35°N, 135°E).

 (a)Given that the radius of the earth is 6370km, find the distance from P to Q in km. (2 marks)

1. Find in nm;

 (i) the shortest distance between Q and T. (2 marks)

 (ii) the longest distance between Q and T (to the nearest tens). (2 marks)

1. Find the difference in time taken when S flies along the shortest and longest

routes if its speed is 420 knots. (4 marks)

1. The data **below** shows the masses in grams of 50 potatoes.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Mass (g) | 25 - 34 | 35 - 44 | 45 - 54 | 55 - 64 | 65 - 74 | 75 - 84 | 85 - 94 |
| No. of potatoes | 3 | 6 | 16 | 12 | 8 | 4 | 1 |

 (a) On the grid provided draw a cumulative frequency curve for the data.(4 marks)



1. Use the graph in (a) above to determine:

 (i) The 60th percentile mass. (2 marks)

 (ii) Percentage of potatoes whose masses lie in the range 53g to 68g. (3 marks)

 (iii) Median mass. (1 mark)

1. Matrix P is given by 

 (a) Find the inverse of P. (2 marks)

1. Two Schools Theri and Kimathi purchased beans at sh.B per bag and maize at sh.M per

bag. Theri purchased 8 bags of beans and 14 bags of maize for sh.47,600. Kimathi

purchased 10 bags of beans and 16 bags of maize for sh.57,400.

 (i) Form a matrix equation to represent the information above. (2 marks)

 (ii) Use the inverse matrix of P to find the prices of one bag of each item. (4 marks)

1. The price of beans later went up by 5% and that of maize remained constant. Theri bought

the same quantity of beans but spent the same total amount of money as before

on the two items. State the new ratio of beans to maize. (2 marks)

1. Mr. Karanja owns a bicycle which he sometimes rides to go to work. Out of the 21 working days in a month he only rides to work for 18 days. If he rides to work the probability that he is bitten by a rabid dog is  otherwise it is only . When he is bitten by the dog the probability that he will get treatment is  and if he does not get treatment the probability that he will get rabies is .

(a) Draw a tree diagram to show the events. (3 marks)

1. Using the tree diagram in (a) above determine the probability that

 (i) Karanja will not be bitten by a rabid dog. (2 marks)

 (ii) He will get rabies. (2 marks)

 (iii) He will not get rabies. (3 marks)

1. In the figure **below** (not drawn to scale) AB = 8cm, AC = 6cm, AD = 7cm, CD = 2.82cm and

 angle CAB = 50°.

50°

6cm

7cm

8cm

2.82cm

A

D

C

B

Calculate (to 2d.p.)

(a) the length BC. (3 marks)

(b) the size of angle ABC. (2 marks)

(c) size of angle CAD. (3 marks)

(d) Calculate the area of triangle ACD. (2 marks)

24. Complete the table below for the functions y = sin 3 θ and y = 2 Cos (θ + 400) (2 Marks)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| θ0 | 00 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 |
| 3 Sin 3θ | 0 | 1.50 |  | 3.00 |  |  | 0.00 |  |  | -3.0 |
| 2 Cos (θ + 400) | 1.53 | 1.29 |  |  | 0.35 |  |  | -0.69 |  | -1.29 |

1. On the grid provided, draw the graphs of Y = 3 Sin 3 θ and y = 2 Cos (θ + 400) on the same axis. Take 1 cm to represent 100 on the x-axis and 4 cm to represent 2 unit on the y – axis. (5 marks)





(b) From the graph find the roots of the equation.

 (i) $ \frac{3}{4}$ Sin 3θ = $\frac{1}{2}$ Cos (θ + 400) (2 Marks)

 (ii) 2 Cos (θ + 400) = 0 in the range 0 ≤ θ≤ 900 (1 Mark)