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MATHEMATICS
PAPER 2
2022
2 ½ hours

MATIGO MOCK EXAMINATIONS 2022

Uganda Certificate of Education

MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTION TO CANDIDATES:

Answer **all** *the questions in section* **A** *and any* **five** *from section* **B**

Any additional question(s) answered will **not** *be marked.*

All *necessary calculations must be shown clearly with the rest of the answer therefore, no paper should be given for rough work*

Graph paper is provided

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

Answer **all** *questions in this section.*

1. Without using tables or a calculator , evaluate *(4 marks)*

$\left(\frac{1}{16}\right)^{\frac{3}{4}} \div (8)^{\frac{-2}{3}}$

2. M and N are two intersecting sets such that $n(\varepsilon_e)$ = 38, n ($M^1 \cap N^1$) = 9, n (M) = 19 and n (N) = 17. Find *(4 marks)*

i) n (M ∩ N)

ii) n (N^1)

3. Given that $f(x) = \frac{3}{4x-5}$, find $f^{-1}(1)$ *(4 marks)*

4. Without using tables or a calculator, evaluate

$log_{10}^{1.5}$ - $log_{10}^{10.5}$+log_{10}^{7000} *(4 marks)*

5. Give that $\overline{OA} = \begin{pmatrix}3\\8\end{pmatrix}$ and $\overline{AB} = \begin{pmatrix}5\\-2\end{pmatrix}$ where O is the origin find

i) the position vector of B

ii) |OB| *(4 marks)*

6. A jet air craft moved at a speed of 1440kmh^{-1} for 2 hours and then increased its speed to 2160kmh^{-1} for the next 3 hours. Find the average speed of the jet air craft.

(4 marks)

7. Find the equation of the line through (0,3) and is perpendicular to the line 2x-5y = 10

(4 marks)

8. The exchange rates in a forex bureau in the month of May 2018 were as follows

£1 = 4500 $Ug.shs.$

$1 = 3600 Ug. shs

How much would James get in exchange in dollors for £8,500? *(4 marks)*

9. On a map drawn to a scale of 1:400,000, the forest is represented by a green area of $10.8cm^2$. What is the actual area of the forest in km^2? *(4 marks)*

10. Squares as large as possible and of equal size are to be cut from a rectangular board of dimensions 36cm by 60cm. Find

i) The size of each of the squares.

ii) The number of squares which are cut out. *(4 marks)*

SECTION B: (60 MARKS)

Answer any **five** *questions from this section. All questions carry equal marks.*

11. 100 people seated in a restaurant were asked if they had ordered for any of the following; Matooke (M), Rice (R) or Potatoes (P). 23 had ordered for none of the three foods. 45 had ordered for Matooke, 48 had ordered for Rice and 41 had ordered for Potatoes 26 had ordered for Matooke and Rice. 13 had ordered for Matooke and Potatoes and 11 had ordered for all the three foods. *(12 marks)*

a) Represent the information on a Venn diagram.

b) Find the number of people who had ordered for Rice and potatoes but not Matooke.

c) If a person is selected at random from those seated in the restaurant find the probability that he had ordered for at most two of the foods.

12. Given the functions $f(x) = \frac{1}{x^2-1}$ and $g(x) = 2x - 1$ *(12 marks)*

a) Find the values of x for which $fg(x)$ is meaningless.

b) Find the value of x for which $gf(x) = {}^{3}/_{5}$

13. The time taken to conduct a staff meeting partly varies as the number of members present and partly as the number of items on the agenda. When 20 members are present with an agenda of 5 items, the meeting lasts 70 minutes. When 30 members attend with only 4 items on the agenda, the meeting takes 98 minutes. *(12 marks)*

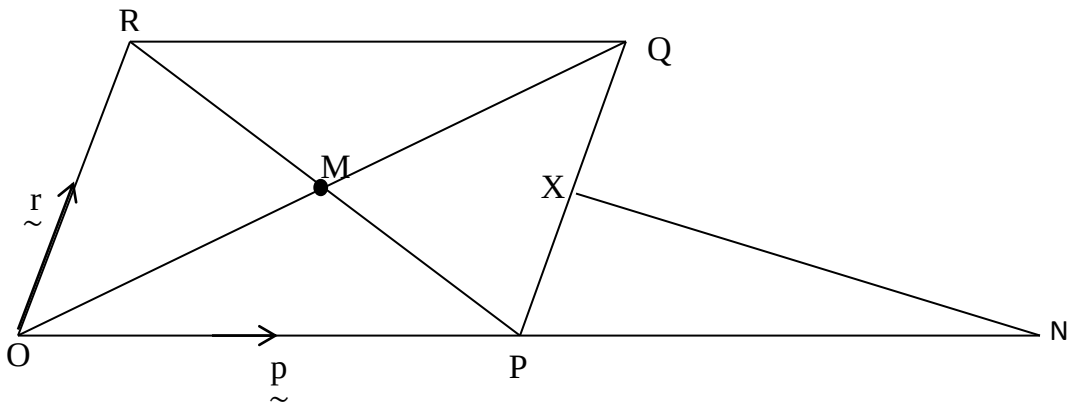
a) How long would a meeting with 10 items on the agenda attended by 20 members last?

b) How many items on the agenda for a meeting that lasts 160 minutes when 50 members attend?

c) How many members were present in a meeting that lasted 80 minutes in a meeting of 7 items on the agenda?

14. The diagram below is a parallegram . *(12 marks)*

$2\overline{PQ} = 3\overline{XQ}$, $\overline{ON} = 2\overline{OP}$, $\overline{OP} = \underset{\sim}{P}$ and $\overline{OR} = \underset{\sim}{r}$



a) Express in terms of $\underset{\sim}{P}$ and $\underset{\sim}{r}$, the vector

i) $\overline{OQ}$ ii) $\overline{PR}$ iii) $\overline{PX}$

iv) $\overline{OX}$ v) $\overline{XN}$

b) Show that the three points M, X and N are collinear.

15. Tom left Kampala for Kumi at a constant speed of $100kmhr^{-1}$ while Okello left Kumi for Kampala at a speed of $120kmhr^{-1}$. If Kumi and Kampala are 150km apart and Tom and Okello set off at 9:00 and 9:20am respectively and due to fog they had a head on collision. *(12 marks)*

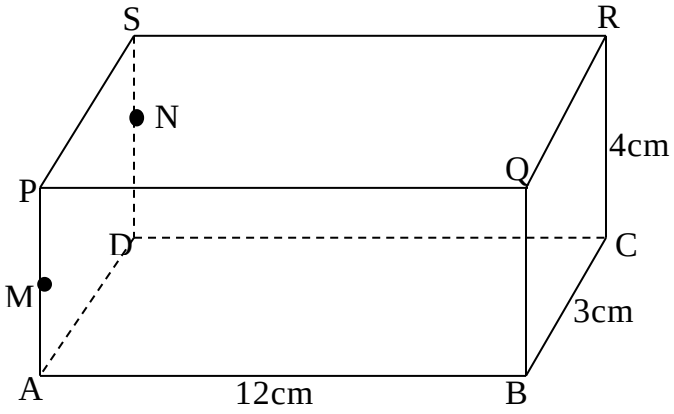
a) i) Draw a distance – time graph for the two journeys on the same axes using a scale of 1cm:10km and 1cm:10 mins

ii) Use your graph to find when the crash happened.

iii) How far from Kampala the two crashed.

b) After the crash, Okello and Tom spent 20 and 50 minutes respectively to put their vehicles right. Okello then continued his journey at a constant speed and arrived in Kampala at 11:30 am but Tom instead decided to drive back to Kampala and arrived 16 minutes earlier than Okello. Using the same graph in (a) above, find the time and distance from Kumi when Tom over took Okello on his way back to Kampala.

16. The figure below shows the open cuboidal box. *(12 marks)*



Calculate

a) The length $\overline{AR}$
b) The angle between $\overline{SB}$ and the base ABCD
c) The angle between plane BMNC and the base ABCD if M and N are mid points of $\overline{PA}$ and $\overline{SD}$ respectively
d) Find the volume and total surface area of the box.

17. In a certain country income tax is calculated after deducting the following allowances
Housing shs 14,500 per month
Marriage: One tenth of the gross annual income
Medical shs 30,000 per month
Transport shs 20,000 per month
Family allowance for only four children as follows;
Shs 3000 for each child above 18 years
Shs 4000 for each child above 10 but below 18 years and shs 5000 for each child below 10 years. Given that Michael's gross income is shs 1,800,000 per year and he has a family of five children three of them below the age of 8, one 16 years old and

the elder child 20 years. He also has to pay an insurance premium of the 68000 per annum. *(12 marks)*

Find;

a) his taxable income

b) the income tax he pays annually as a percentage of his gross income with the tax structure below.

Income shs P.a	**Tax rate (%)**
1st shs 80,000	8
80 ,0001 – 160,000	12
160,001 – 240,000	20
240,001 – 320,000	30
320,001- 400,000	35
400,001 – 480,000	45
480,001 and above	52

END