UGANDA MARTYRS' S.S NAMUGONGO
S4 MOCK (1) 2006 EXAMINATIONS
456/2 MATHEMATICS
PAPER 2
TIME: 2 HOURS 30 MINUTES

Instructions to candidates:

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

All necessary calculations must be done on the same page as the rest of the answer. No paper should be given for rough work.

Silent, non-programmable scientific calculators may be used where not prohibited.

SECTION A: (40 MARKS)

1. Without using tables or a calculator, evaluate:

$$\left(\frac{1}{16}\right)^{\frac{1}{4}} \div \left(64\right)^{-\frac{2}{3}}$$
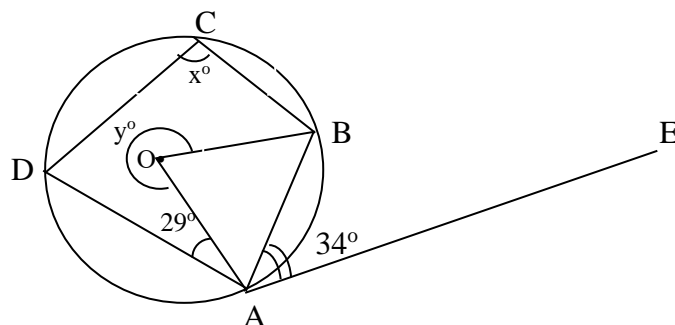
(04 marks)

2. If $\dfrac{4\sqrt{3}}{\sqrt{5} - \sqrt{3}} = a + b\sqrt{c}$

Find the values of a, b and c

(04 marks)

3. Factorise $p^5q^2 - 16\,pq^2$ completely

(04 marks)

4. A man takes 8 days to complete work on a garden. His young son would take 24 days to complete work on the same garden. How long would both take when working on the same garden together if they continue to work at their previous rates?

(04 marks)

5.

In the figure above AE is a tangent to a circle centre. ABCD is a cyclic quadrilateral. Given that angle BAE = 34º and angle DAO = 29º, calculate the angles marked x and y.

(40 marks)

6. Given that $\mathbf{OQ} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ and $\mathbf{OP} = \begin{pmatrix} 10 \\ -4 \end{pmatrix}$

   (a) Determine the column vector for **PQ**
   (b) Hence find the length of vector **PQ**

7. P and Q are two sets such that $n(\varepsilon) = 35$, $n(PnQ) = 8$, $n(P) = 17$ and $n(P^1nQ^1) = 5$.
   Find
   (i) $n(QnP^1)$
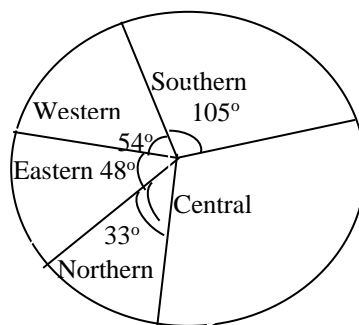   (ii) $n(P^1)$ (04 marks)

8. Without using tables or a calculator, evaluate:
   $\text{Log}_{10}16 - \log_{10}96 + \log_{10} \quad 6000$ (04 marks)

9. …

The pie chart above represents the number of students who come from the various
regions of Uganda in a certain secondary school. If the number of students who come
from the southern region are 315,

(a) Determine the student population at the secondary school
(b) Find the number of students who come from the central region   (04 marks)
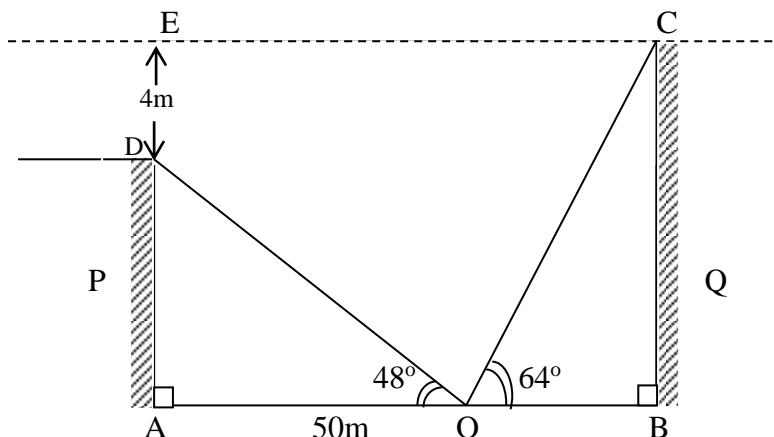
10. The headteacher of a secondary school with a population of 700 students bought
    enough food at the beginning of the term to last for 60 days. For how long will the
    food last if the headteacher admits 50 more displaced students to join the school at
    the beginning of the term?   (04 marks)

SECTION B: (60 MARKS)

11.

The figure above shows two buildings P and Q. From the point O on level ground AOB, between the two buildings P ;and Q, the angles of elevation of the tops of buildings P and Q are 48° and 64° respectively. Building Q is 4m higher than building P ; and AO = 50m. Calculate:

(i)   AD the height of building P
(ii)   How far building Q is from the point O.

(b) A ship is observed moving away in a straight line from the top of a cliff which is 120m high. Within a time span of 10s the angle of depression decreases from 40° to 30°. Determine the distance covered by the ship within this time range. Hence find the speed of the ship in metres per second (m/s)   (12 marks)

12. Four secondary schools football teams of Kibuli S.S., Lubiri S.S. Mvara S.s. and Nagaalama S.S. qualified for a football tournament, which was played in two round with other teams.

In the first round**:**
Kibuli S.S. won two matches, drew three and lost one match.
Lubiri S.S. won one match, drew two and lost three matches.
Mvara S.S. won four matches, drew one and lost one match.
Nagaalama S.S. won three matches, drew two and lost one match.

In the second round**:**
Kibuli S.s won three matches and lost three matches
Lubiri S.S. won two matches drew one and lost three matches.
Nvara S.s. won three matches drew two and lost one match.
Naggaalama S.s. won one match, drew one and lost four matches.

(a) Write down
    (i)   a 4 x 3 matrix to show the performance of the four teams in each of the two rounds

    (ii)   a 4 x 3 matrix which shows the overall performance of the teams in the two rounds

(b) If three points are awarded for a win, one point for a draw and no point for a loss, use matrix multiplication to determine the winner of the tournament.

(c) Given that MTN donated sh. 2,070,000 to be shared by the four teams according to the ratio of their points scored in the tournament, find how much money each team got. (12 marks)

13.
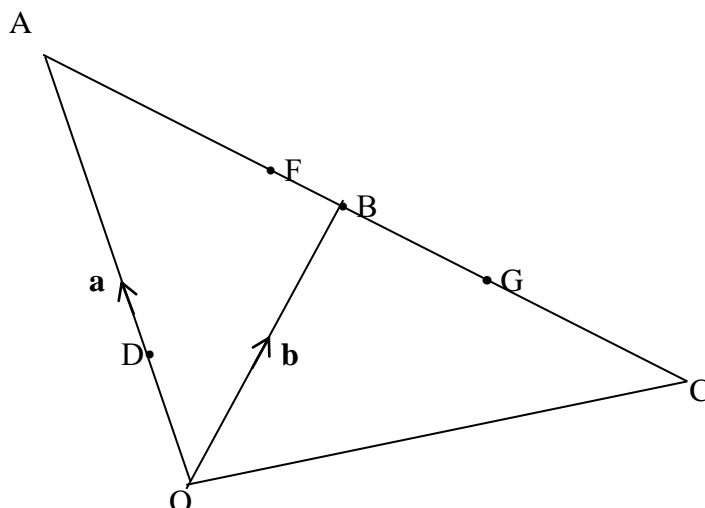
In the figure above **OA** = **a**, **OB** = **b**, F and G are points on $\overline{AC}$ such that $\overline{AF}$: AB = 3:4, $\overline{FB}$:$\overline{BG}$ = 1.2 and $\overline{AG}$:$\overline{AC}$ = 2:3 respectively. D is a point on $\overline{OA}$ such that $\overline{OD}$:$\overline{DA}$ = 1:2

(a) Express the following vectors in terms of **AB**
   (i)   **AG**
   (ii)   **AC**

(b) Hence find the following vectors in terms of **a** and **b**
   (i)   **AB**
   (ii)   **AC**
   (iii) **DG**
   (iv)   **OF**

(c) Determine the ratio of $\overline{DG}$: $\overline{OC}$ (12 marks)

14. Copy and complete the table below in which $y = x^2 - 6x + 2$

x	−1	0	1	2	3	4	5	6	7
x^2		0			9			36	49
− 6x	6	0	−6			−24			−42
+2		+2		+2					+2
y		2		− 6			−3		9

(a) Draw the graph of $y = x^2 - 6x + 2$ for $-1 \le x \le 7$

(b) Use your graph to estimate the roots of the equation $x^2 - 6x + 2 = 0$
(c) Using the same axes, draw the line $y = 4$
(d) Use your graphs to estimate the roots of the equation $x^2 - 6x - 2 = 0$.

(12 marks)

15. Gulu is 360 km away from Kampala. At 7:30 a.m. a taxi mini-bus leaves Gulu for Kampala travelling at a steady non stop speed of 50 kmh $^{-1}$. Two hours later a Gateway bus travelling at a steady non stop speed of 80 kmh $^{-1}$ left Kampala for Gulu.

   (a) Using a scale of 2 cm to represent 1 hour and 2 cm to represent 50 km, draw on the same axes graphs showing the journeys of the two vehicles

   (b) Using your graphs determine the:
   - (i)   distance from Gulu where the two vehicles met
   - (ii)   time when the two vehicles met
   - (iii)   times when the vehicles arrive at their stations
   - (iv)   difference in the times of arrivals of the vehicles at their respective stations.   (12 marks)

16. (a) A man is now six times as old as his daughter. Six years ago, the product of their ages was 144. Determine the present age of the daughter.

   (b) An increase of 15% in salaries makes the monthly wage bill for a factory to be sh 16,675,000. Find the:
   - (i)   monthly wage bill before the increase
   - (ii)   amount of increase in the monthly wage bill.

                                                                                 (12 marks)

17. The table below shows the tax structure on taxable income of workers of National water and Sewerage co-operations.

Income (sh) per month	Tax rate
0 – 60,000	12%
60,001 – 150,000	17%
150,001 – 250,000	22.5%
250,001 – 350,000	34%
350,001 – 500,000	48%
Above 500,000	50%

An employee of National water and Sewerage co-operations earns a gross salary of sh. 890,000 per month. The employee's allowances include the following:

Marriage allowance	one tenth of his gross monthly income
Electricity allowance	Sh. 35,000 per month
Insurance allowance	shs 360,000 per annum
Transport allowance	shs 25,000 per month
Medical allowance	shs 20,000 per month
Housing allowance	shs 60,000 per month

Family allowance for four children only. For children in the age bracket of 0 to 11 years shs 25,500 per child per month; between 11 and 18 years shs. 15,500 per child per month; and over 18 years shs 5, 500 per child per month.

   (a) Calculate the employees' taxable income and the income tax paid, given that the employee is a married person with three children who are 5 years, 9 years and 13 years old.
   (b) What percentage of the employee's gross income goes to tax?   (12 marks)

END