THE MALAWI NATIONAL EXAMINATIONS BOARD

2010 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

MATHEMATICS

Subject Number: M131/II

Time Allowed: 2 h 30 mins

Friday, 6 August   8.30 – 11.00 am

PAPER II
(100 marks)

Instructions:

1. **This paper contains 6 pages. Please check.**

2. Answer **all** the **six** questions in Section **A** and any **three** questions from Section **B**.

3. The maximum number of marks for each answer is indicated against each question.

4. Mathematical tables and answer books are provided.

5. Calculators may be used.

6. Used graph paper and/or supplementary sheets must be tied together inside the answer book with a string.

7. **All working must be clearly shown**; it should be done on the same sheet as the rest of the answers.

8. Write your **Examination Number** on top of each page of your Answer Book.

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QUESTIONS

Section A (55 marks)

1. a. The first term of an arithmetic progression is 5 and the last term is 43. If the sum of the terms is 480, calculate the number of terms. (3 marks)

    b. The **table** below shows the marks scored by learners in a test.

Marks	10	11	12	13	14	15
Frequency	2	3	4	12	5	4

    Calculate the mean mark. (4 marks)

2. a. The area of rectangle **ABCD** is 72 cm^2 and its width is 6 cm. Calculate the area of a similar rectangle **KLMN** that has a width 9 cm. (4 marks)

    b. Without using a calculator or a four – figure table, simplify $\dfrac{5+\sqrt{3}}{\sqrt{7}+\sqrt{5}}$, leaving your answer with a rational denominator. (4 marks)

3. a. Given that $f(y)=\dfrac{y^2}{3}+1$, calculate the value of y when $f(y)=4$. (4 marks)

    b. Given that matrix $P=\begin{pmatrix} 3 & 4 \\ 1 & -2 \end{pmatrix}$, $Q=\begin{pmatrix} 1 & 3 \\ 6 & 1 \end{pmatrix}$ and $R=\begin{pmatrix} 2 & 0 \\ -1 & 4 \end{pmatrix}$, find $3(Q-PR)$. (6 marks)

4. a. Make n the subject of the formula: $T=ar^n$. (5 marks)

    b. Calculate the distance between the x and y intercepts of the graph of $y=12-2.4x$. (5 marks)

5. a. Given that $\log_y 864 - \log_y 6 = 2$, find the value of y. (5 marks)

b. In **Figure** 1, **M** and **N** are midpoints of
$\overrightarrow{XZ}$ and $\overrightarrow{XY}$ respectively. $\overrightarrow{XM} = \underline{a}$ and $\overrightarrow{XN} = \underline{b}$.
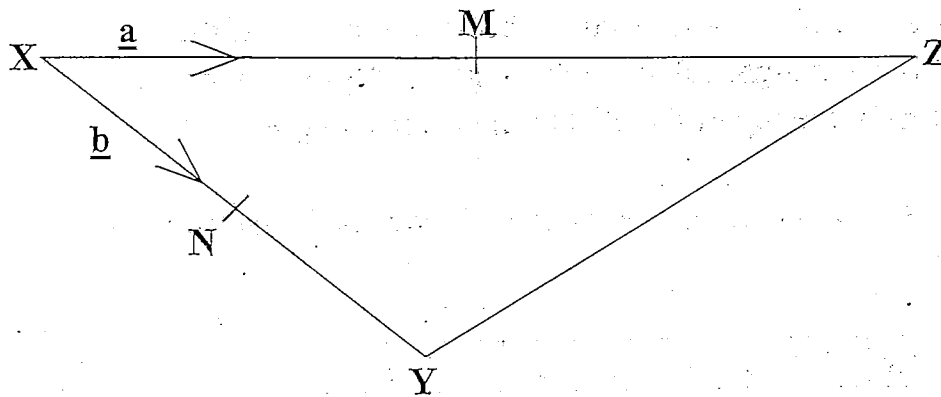
Figure 1

Show that $\overrightarrow{MN}$ and $\overrightarrow{ZY}$ are parallel.   (5 marks)

6.   a.   Simplify $\dfrac{v-a}{v+a} - \dfrac{v+a}{v-a}$.   (4 marks)

b. **Figure 2** shows a circle **BCDE** with centre **O**. **ABF** is a
tangent to the circle at **B**, angle **CBF** = 40°, angle
DOC = 70° and **AEOD** is a straight line.
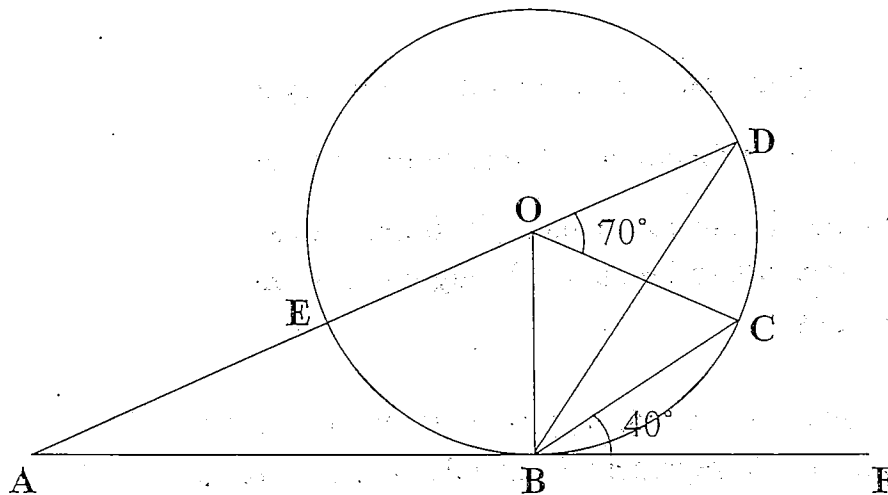

Figure 2

Calculate angle **OAB**.   (6 marks)

Section B (45 marks)
Answer any three questions from this section.

7. a. A boat is 100 m away from the bottom of a cliff. If the cliff is 16 m high, calculate the angle of depression of the boat from the top of the cliff to the nearest degree. (4 marks)

   b. (i) Copy and complete the table of values for the equation $y = 2x^2 - 5x - 5$.

x	-2	-1	0	1	2	3	4	5
y	13	2	-5		-7		7	20

   (ii) Using a scale of 2 cm to represent 1 unit on the horizontal axis and 2 cm to represent 5 units on the vertical axis,

   draw the graph of $y = 2x^2 - 5x - 5$.

   (iii) Use your graph to solve the equation $2x^2 - 3x - 10 = 0$. (11 marks)

8. a. Solve the equation $2^{2a} - 5(2^a) + 4 = 0$. (7 marks)

   b. An object starts from rest and accelerates uniformly at 5m/s^2 in 4 seconds. It further accelerates uniformly to a velocity of 90 m/s in the next 3 seconds. It maintains this velocity for 2 seconds and then it is brought to rest in another 5 seconds.

   (i) Using a scale of 2 cm to represent 20 m/s on the vertical axis and 2 cm to represent 2 seconds on the horizontal axis, draw a speed-time graph for the motion of the object.

   (ii) Using your graph, calculate the acceleration in the last 5 seconds. (8 marks)

9. a. Triangle **RSU** has vertices R(0, 6), S(2, 6) and U(2, 8).
Using a scale of 2 cm to represent 2 units on both axes, draw
on the graph paper provided, triangle **RSU** and its image

$\mathbf{R'S'U'}$ under a translation $\mathbf{T} = \begin{pmatrix} 4 \\ -4 \end{pmatrix}$. (5 marks)

b. Solve the following simultaneous equations:
$x - y = 3$

$x + \dfrac{x}{y} = 8$. (10 marks)

10. a. A cone with radius 8 cm is 15 cm high. Calculate the
total surface area of the cone. (*Take* $\pi = 3.14$). (5 marks)

b. In a form 4 class, students learn French, Latin and History.
20 students learn French, 55 learn Latin and 37 learn History.
7 students learn French and Latin only, 5 learn Latin and
History only, 2 learn French and History only, 10 do not
learn any of these subjects while x students learn all the three
subjects. If there are 100 students in the class,

(i) draw a Venn diagram to represent this information.

(ii) use your Venn diagram to calculate the number of
Students who learn Latin only. (10 marks)

11. a. A bag contains beans, groundnuts and maize seeds. The

probability of getting at random a bean seed is $\dfrac{1}{5}$, a

groundnut seed is $\dfrac{x}{15}$ and a maize seed is $\dfrac{1}{3}$. Find the

value represented by x. (4 marks)

b. Mala has K6000 to buy skirts and blouses: Skirts cost K600 each while blouses cost K300 each. She wants to spend at least K1200 more on skirts than on blouses. She would like to buy at least 4 skirts and 2 blouse.

   (i) If x represents the number of skirts and y represent the number of blouses, write down four inequalities in x and y.

   (ii) Using a scale of 2 cm to represent 2 units on both axes, draw the graphs to show the region which represents the four inequalities.

   (iii) Using your graph, find the maximum number of skirts and blouses she can buy. (11 marks)

12. a. The time, **T**, taken for students to finish discussing a topic in a group is partly constant and partly varies as the number of students in the group. A group of 5 students takes 120 minutes while a group of 9 students takes 180 minutes. Calculate the time a group of 12 students can take to finish discussing the topic. (7 marks)

   b. Solve the equation $a^3 + 5a^2 - a - 5 = 0$. (8 marks)

END OF QUESTIONS