EXAMINATION NO.: _____

THE MALAWI NATIONAL EXAMINATIONS BOARD

2011 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

MATHEMATICS

Subject Number: M131/II

Monday, 11 July

Time Allowed: 2 h 30 mins
8:30 – 11:00 am

PAPER II

(100 marks)

Instructions

1. **This paper contains 20 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. Write your answers in the spaces provided on the question paper.
5. Calculators may be used.
6. **All working must be clearly shown.**
7. Write your **Examination Number** at the top of each page of your question paper in the spaces provided.
8. In the table provided on this page, **tick** against the question number you have answered.

Question Number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Section A (55 marks)

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

1. a. Factorise $2y^2 - 18$. **(3 marks)**

b. Without using four-figure tables or a calculator evaluate $\log_a 2 - \log_a 6 + \log_a 3$. **(4 marks)**

Continued/…

2. a. Given that two sets of numbers 2, 3, 5, 7, 7, 8, 10 and x, 4, 6, 6, 8, 8 have equal mean, calculate the value of x. **(4 marks)**

b. A point P has been translated by the translation vector $T = \begin{pmatrix} -3 \\ -11 \end{pmatrix}$ to $P'\begin{pmatrix} -1 \\ -4 \end{pmatrix}$. Find the coordinates of the point P. **(4 marks)**

Continued/...

3. a. Given that $A = \begin{pmatrix} 2 & 1 \\ -3 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & -10 \\ 8 & 14 \end{pmatrix}$.

Calculate $A + \frac{1}{2}B$. **(4 marks)**

b. Given that $g(x) = ax^2 + bx$, find values of a and b if $g(1) = -1$ and $g(3) = 15$. **(5 marks)**

Continued/...

4. a. Simplify $\frac{3\sqrt{2}+1}{\sqrt{3}+\sqrt{6}}$ without using four-figure tables or a calculator. (6 marks)

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4. (Continued)

b. **Figure 1** shows a circle **ABC** with centre **O**.

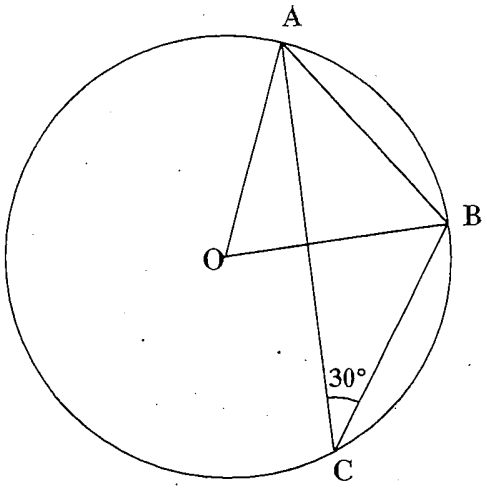

Figure 1

Given that angle **ACB** = 30°, calculate angle **ABO**. **(5 marks)**

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5. a. Make k the subject of the formula $r = \left(\sqrt{k} + 1\right)^2$. **(4 marks)**

b. Given that the 1st term of an AP is –8 and the 11th term is 22, calculate the 7th term. **(5 marks)**

Continued/...

6. a. Two cyclists X and Y are 10 km apart. Cyclist X is due North of cyclist Y. A traffic officer at point P found that cyclist X is on bearing 031° and Y is on bearing 064°. How far is the traffic officer from cyclist X? (6 marks)

Continued/...

6. (Continued)

b. **A, B, C** and **D** are four points on the cartesian plane such that **A** (-6,4), **C** (6,2), $\overrightarrow{AB} = \begin{pmatrix} 8 \\ 2 \end{pmatrix}$ and $\overrightarrow{AD} = \begin{pmatrix} 8 \\ -8 \end{pmatrix}$. Calculate the coordinates of points **B** and **D**. **(5 marks)**

Continued/...

Section B (45 marks)

Answer any **three** questions from this section.

7. a. In **Figure 2** **PQ** = 2 cm, **BC** = 3 cm and the area of trapezium **PQCB** = 10 cm^2.

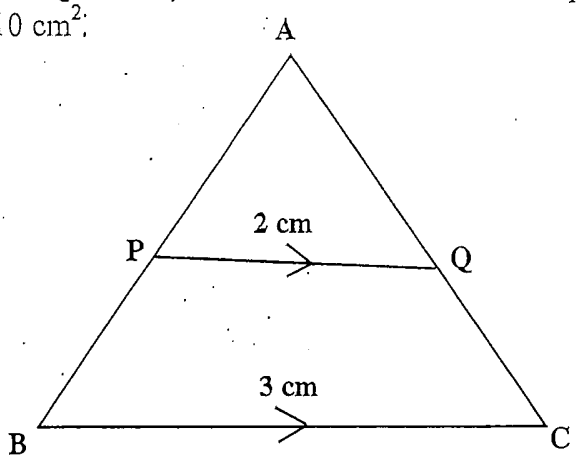

Figure 2

If the area of triangle **APQ** = x cm^2. Calculate the value of x. **(6 marks)**

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7. (Continued)

b. **Figure 3** shows a cuboid which is 2.3 m long, 1 m wide and 1.3 m high.

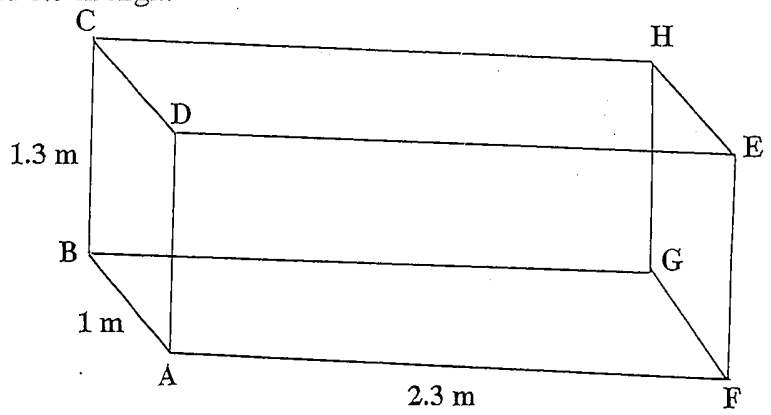

Figure 3

Calculate:

(i) the length of **EB**.

(ii) the angle between **EB** and the base of the cuboid. (Giving your answer correct to 1 decimal place in both cases) **(9 marks)**

Continued/...

8. a. Solve the following simultaneous equations:

$$x^2 - y^2 = 0$$
$$x - 2y = 1$$

(10 marks)

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8. (Continued)

b. **Figure 4** shows the speed-time graph of a moving object.

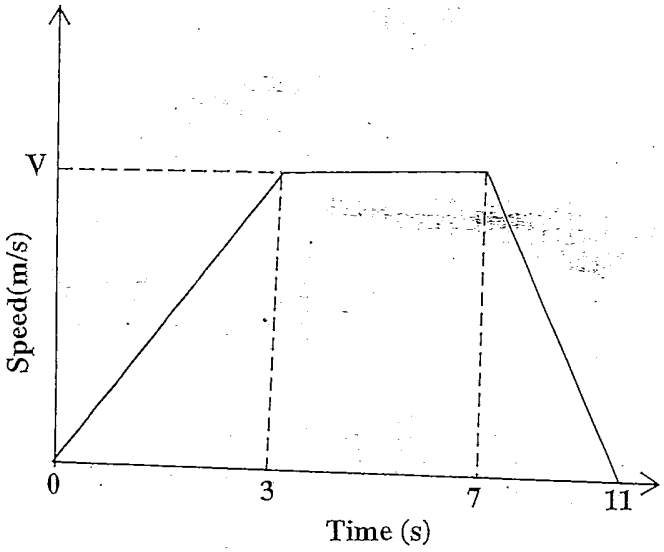

Figure 4

If the total distance travelled by the object was 90 m, calculate the speed **V** of the object. **(5 marks)**

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9. a. A line parallel to $2y = 3x - 4$ passes through y – axis at 3. Find its equation in the form $y = mx + c$. **(4 marks)**

b. A vendor decides to spend up to K600 to buy packets of sweets and biscuits. She does not want to buy more than 10 packets altogether but wants to buy at least 2 packets of each. A packet of sweets costs K40, and that of biscuits costs K80. The profit on each packet of sweets is K10 and on each packet of biscuits is K15.

(i) By taking x to represent the number of packets of sweets and y to represent the number of packets of biscuits, write down **four** inequalities that satisfy the above information.

(ii) Using a scale of 2 cm to represent 2 units on both vertical and horizontal axes, draw graphs on **Page 15** to show the region represented by the inequalities.

(iii) Use your graph to find the number of packets of sweets and biscuits respectively for the vendor to get the maximum profit. **(11 marks)**

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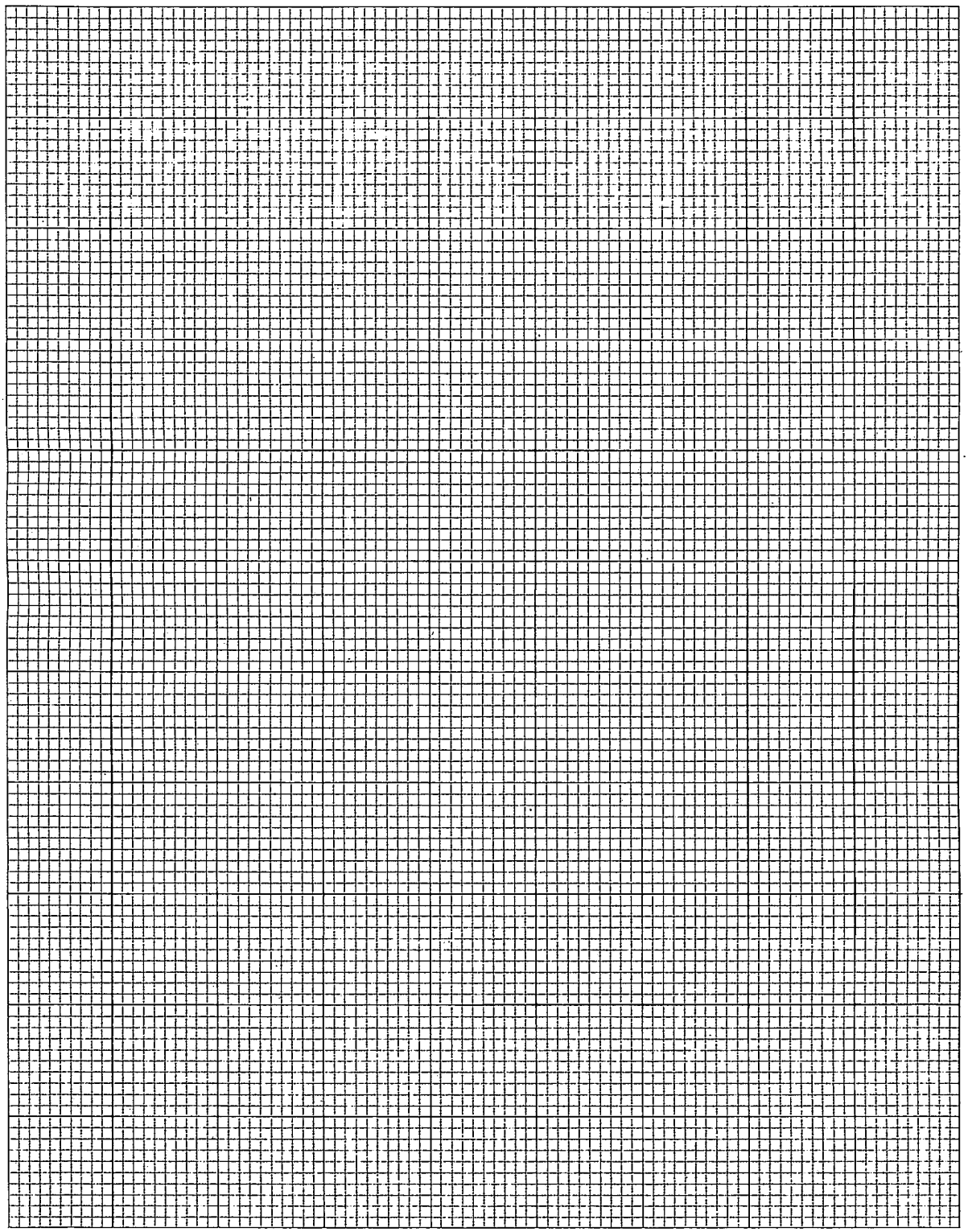

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10. a. A quantity a is the sum of two parts, one of which is constant while the other varies inversely as the square of n. When $n = 1$, $a = -1$ and when $n = 2$, $a = 2$. Find the value of a when $n = 4$. (8 marks)

Continued/...

10. (Continued)

b. In Ziweto village, families are allowed to keep three types of animals: chickens, goats and pigs. The probability that a family will keep a chicken, a goat and a pig is $\frac{1}{2}, \frac{1}{5}$, and $\frac{1}{10}$ respectively.

(i) Draw a tree diagram to illustrate this information.

(ii) Calculate the probability that a family will keep only one type of animal. **(7 marks)**

Continued/...

11. a. (i) Complete the table of values for the equation:

$y = x^3 - 4x$

x	-3	-2	-1	0	1	2	3
y	-15	0		0	-3		15

(ii) Using a scale of 2 cm to represent 1 unit on x – axis and 2 cm to represent 5 units on y – axis, draw the graph of $y = x^3 - 4x$ on **Page 19.**

(iii) Use your graph to solve the equation:

$x^3 - 7x - 6 = 0$. **(12 marks)**

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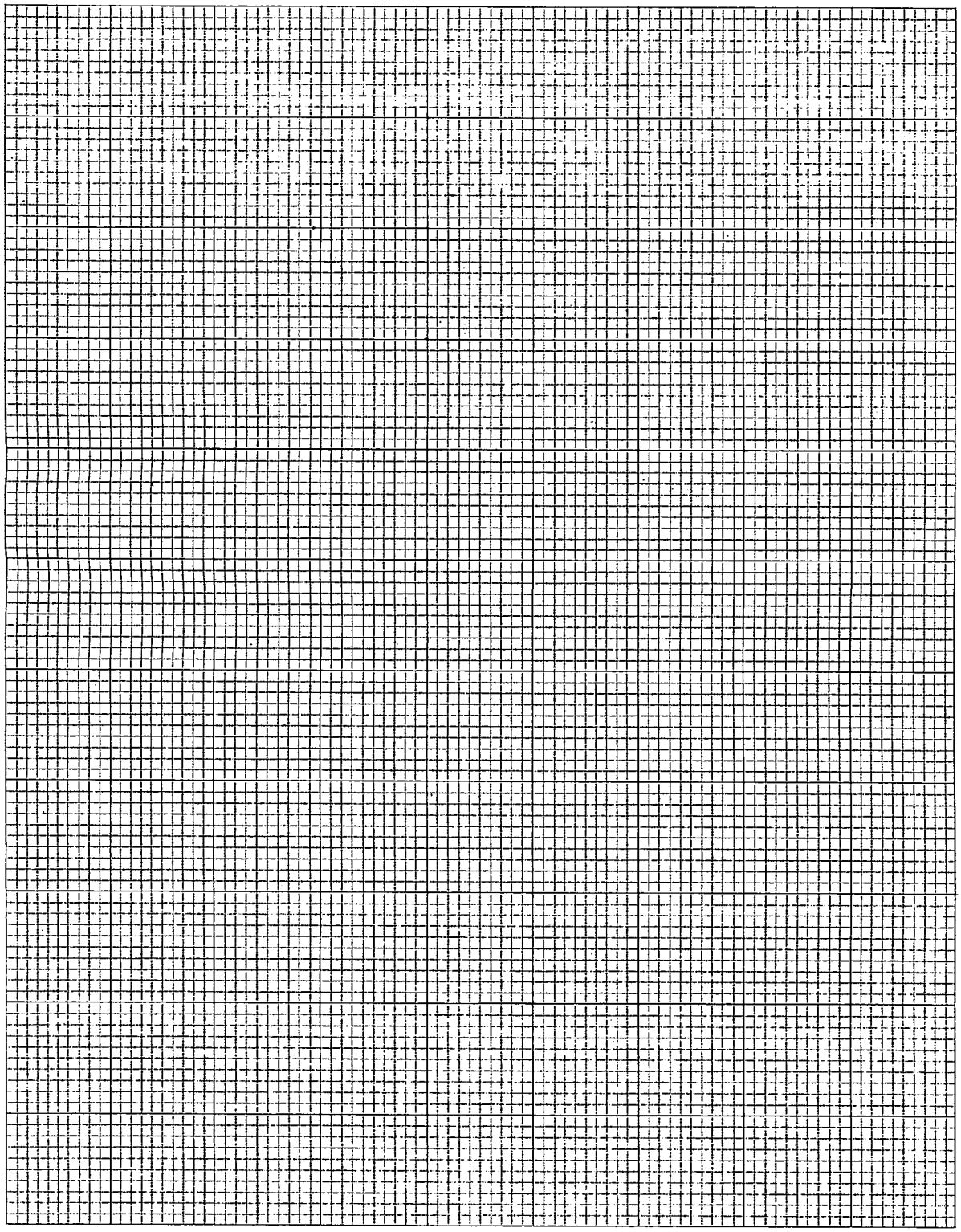

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11. (Continued)

b. **Figure 5** shows a venn diagram of sets **A**, **B** and **C**.

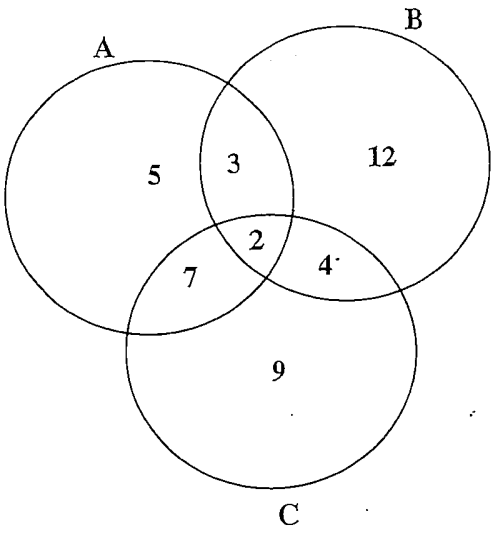

Figure 5

Find $A' \cup (B \cap C)$. **(3 marks)**

END OF QUESTION PAPER

NB: This paper contains 20 pages.