



EXAMINATION NO.: _____
THE MALAWI NATIONAL EXAMINATIONS BOARD

2018 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

ADDITIONAL MATHEMATICS

Subject Number: M132/II

Friday, 13 July

Time Allowed: 2 h 30 mins

1:00 – 3:30 pm

PAPER II

(100 marks)

Instructions

1. This paper contains 15 printed pages. Please check.
2. Answer all the six questions in Section A and any two questions from Section B.
3. Section A carries 60 marks and Section B carries 40 marks.
4. All answers should be written in the spaces provided after every question.
5. The graph paper provided at the end of the question paper can be used if required.
6. Calculators may be used.
7. All necessary working should be shown and any numerical expression being evaluated by calculators must be clearly stated; otherwise marks for method may be lost.
8. The final answer to a question requiring the use of calculators should normally be given to three significant figures.
9. The marks allocated to each question (or part of a question) are shown in brackets at the end of each question (or part of a question).
10. Write your Examination Number on top of each page of your question paper.
11. 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			

Section A (60 marks)

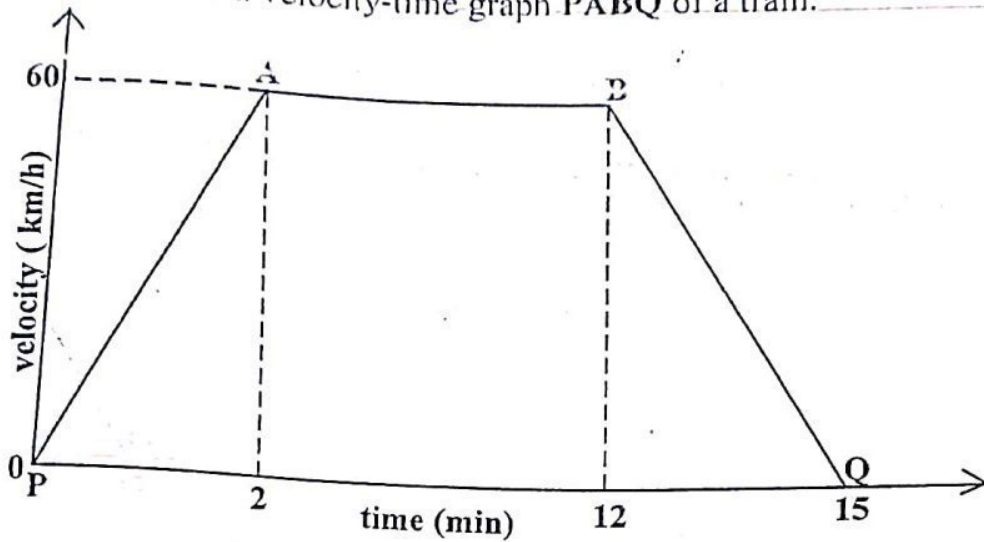
Answer all six questions in this section.

1. a. A fair coin is tossed 5 times. Calculate the probability of getting exactly 3 heads and 2 tails. (5 marks)
- b. A force of $15\mathbf{i} + 20\mathbf{j}$ acts on a particle of mass 5 kg. If its velocity is $24\mathbf{i} + 20\mathbf{j}$ after 8 seconds, calculate its initial velocity. (6 marks)

Continued ..

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2. The figure below shows a velocity-time graph PABQ of a train.



Calculate the:

a. Distance from P to Q in km (4 marks)

b. Average speed of the train in km/h (3 marks)

Continued/...

3. a. The vertices of a triangle ABC are given by the position vectors

$$\vec{OA} = (-3\hat{i} + \hat{j}), \vec{OB} = (-\hat{i} - 3\hat{j}) \text{ and } \vec{OC} = (5\hat{j}).$$

(6 marks)

Calculate angle ABC.

- b. Three forces $\mathbf{A} = (2\hat{i} + 3\hat{j})$, $\mathbf{B} = (4\hat{i} - \hat{j})$ and $\mathbf{C} = (-\hat{i} + \hat{j})$ are applied to a body of mass 10 kg for 5 seconds. Calculate the magnitude of the impulse.

(7 marks)

Continued/...



- * a. In a parallelogram $OABC$, the position vectors of A and C are $3\mathbf{i} + 6\mathbf{j}$ and $-2\mathbf{i} + 4\mathbf{j}$ respectively. If P is the midpoint of AB , find $\overrightarrow{OP}$. (7 marks)

4. (Continued)

- b. A circle P passes through a point $(2,6)$ and a circle Q whose equation is $x^2 + y^2 - 2x - 10y + 18 = 0$. If the two circles have the same centre, find the equation of the circle P . (7 marks)

Continued/...

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5. If points A (- 3, - 2), B (- 1, $a - 2$) and C (a , 7) are collinear, calculate the values of a .

(8 marks)

Continued/...



6. The Table below shows a grouped frequency distribution of marks for 40 students.

Class	4 – 8	9 – 13	14 – 18	19 – 23	24 – 28	29 – 33
Frequency	2	4	7	14	8	5

Calculate the mean mark, giving your answer correct to 1 decimal place.

(7 marks)

Continued ...

Section B (40 marks)

Answer any two questions from this section.

7. a.

Three forces: 6 Newtons in the direction 045° , F Newtons in the direction 180° and 8 Newtons in the direction 330° act on a particle. Given that the resultant of the forces is on the y -axis, calculate the:

(i) Value of F

(ii) Magnitude of the resultant force

(10 marks)

Continued/...

7. (Continued)

b. 50 students took an examination and the results were as follows:

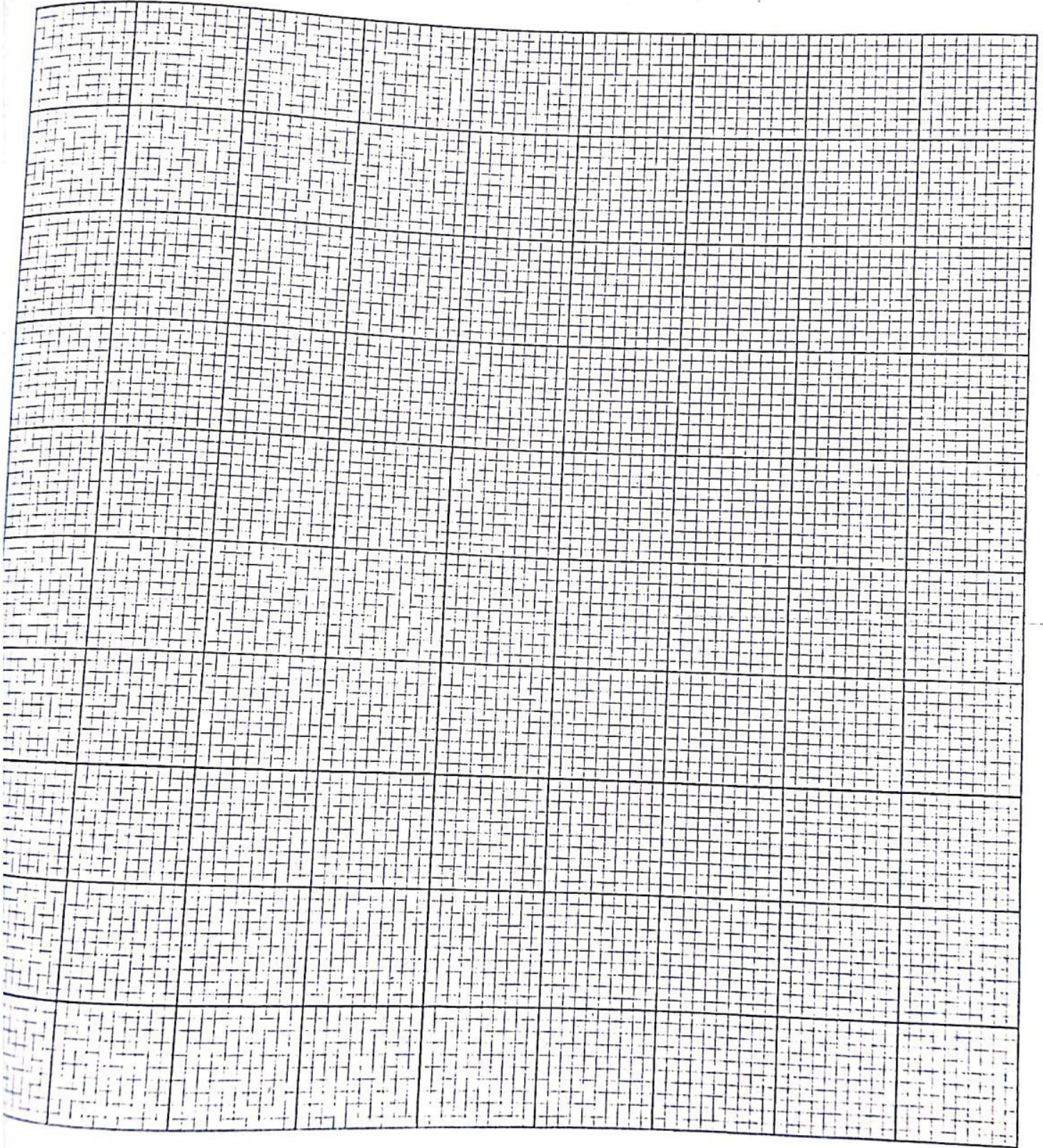
34	38	30	31	42	38	37	32	40	37
41	34	37	36	38	41	35	37	38	32
35	37	32	40	31	33	41	43	43	39
34	35	39	41	38	38	37	37	38	37
32	36	35	38	34	38	37	34	36	38

(i) Using **seven** equal class intervals, construct a grouped frequency table.

Continued

7. b. (Continued)

(ii) Using the frequency table in (i), draw a frequency polygon. (10 marks)



Continued/...

8. a. Find the equation of a perpendicular bisector of the line joining the points: P $(-3, 3)$ and Q $(1, -5)$.

(8 marks)

Continued

8. (Continued)

- b. A boy always either walks to school or goes by bus. If one day he goes by bus, then the probability that he goes by bus the next day is $\frac{7}{10}$. If one day he walks to school, the probability that he goes by bus the next day is $\frac{2}{5}$.
- (i) Given that he walks to school on Monday, draw a tree diagram.
- (ii) Use the tree diagram to calculate the probability that he will go to school by bus on Thursday of the same week. (12 marks)

Continued/...



9. a. Calculate the point of intersection of the line through points A (1, 3) and B (5, 6) and the line $r = \begin{pmatrix} 4 \\ 1 \end{pmatrix} + a \begin{pmatrix} -6 \\ 4 \end{pmatrix}$. (9 marks)

$$r_1 = \vec{OA} + b \vec{AB}$$

$$\vec{AB} = \vec{OB} - \vec{OA} = \begin{pmatrix} 5 \\ 6 \end{pmatrix} - \begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

Continued/...

9. (Continued)

- b. Given that the line $3y = 4x + c$ is a tangent to the circle $x^2 + y^2 + 4x - 10y - 7 = 0$, calculate the value of c .

(11 marks)

END OF QUESTION PAPER