# THE MALAWI NATIONAL EXAMINATIONS BOARD

EXAMINATION NO.: _____

## 2023 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

# MATHEMATICS

**Wednesday, 5 July**

**Subject Number: M131/I**

**Time Allowed: 2 hours**
**8:00 – 10:00 am**

399

## PAPER I

(100 marks)

**Instructions**

1. **This paper contains 14 printed pages. Please check.**
2. Answer **all** the **20** questions in this paper.
3. The maximum number of marks for each answer is indicated against each question.
4. Scientific calculators may be used.
5. The graph paper and the blank answer sheet at the end of the question paper can be used if required. Do **not** tear them off.
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.
9. At the end of the examination, hand in your paper to the invigilator.

| Question Number | Tick if answered | Do not write in these columns | |
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Answer **all** the **twenty** questions in the spaces provided.

1. Factorise completely $2x^2 - 11x - 21$. **(3 marks)**

2. Without using a calculator, rationalise the denominator of $\frac{4}{\sqrt{7}-2}$. **(5 marks)**

3. Calculate the sum of terms of the first 12 even numbers of an Arithmetic Progression: 1, 2, 3, 4,... **(4 marks)**

4. The range of a function $g(x) = 2x - 1$ is $\{-3, -1, 3, 0\}$. Draw an arrow diagram showing the mapping with its domain. **(5 marks)**

Continued/...

5. Make $a$ subject of the formula $t = \sqrt{\frac{b}{y-a}}$ (5 marks)

6. Find the remainder when $x^3 - 5x - 7$ is divided by $x + 1$. (4 marks)

7. The volumes of two similar cylinders, A and B are 125 cm³ and 27 cm³ respectively. Calculate the area of cylinder B. **(5 marks)**

8. Given that $y = 2^a x + 6$ and $4 + 2y = 16x$ are two parallel lines, find the value of $a$.

**(5 marks)**

9. **Figure 1** shows triangle **PQR** on a graph paper.

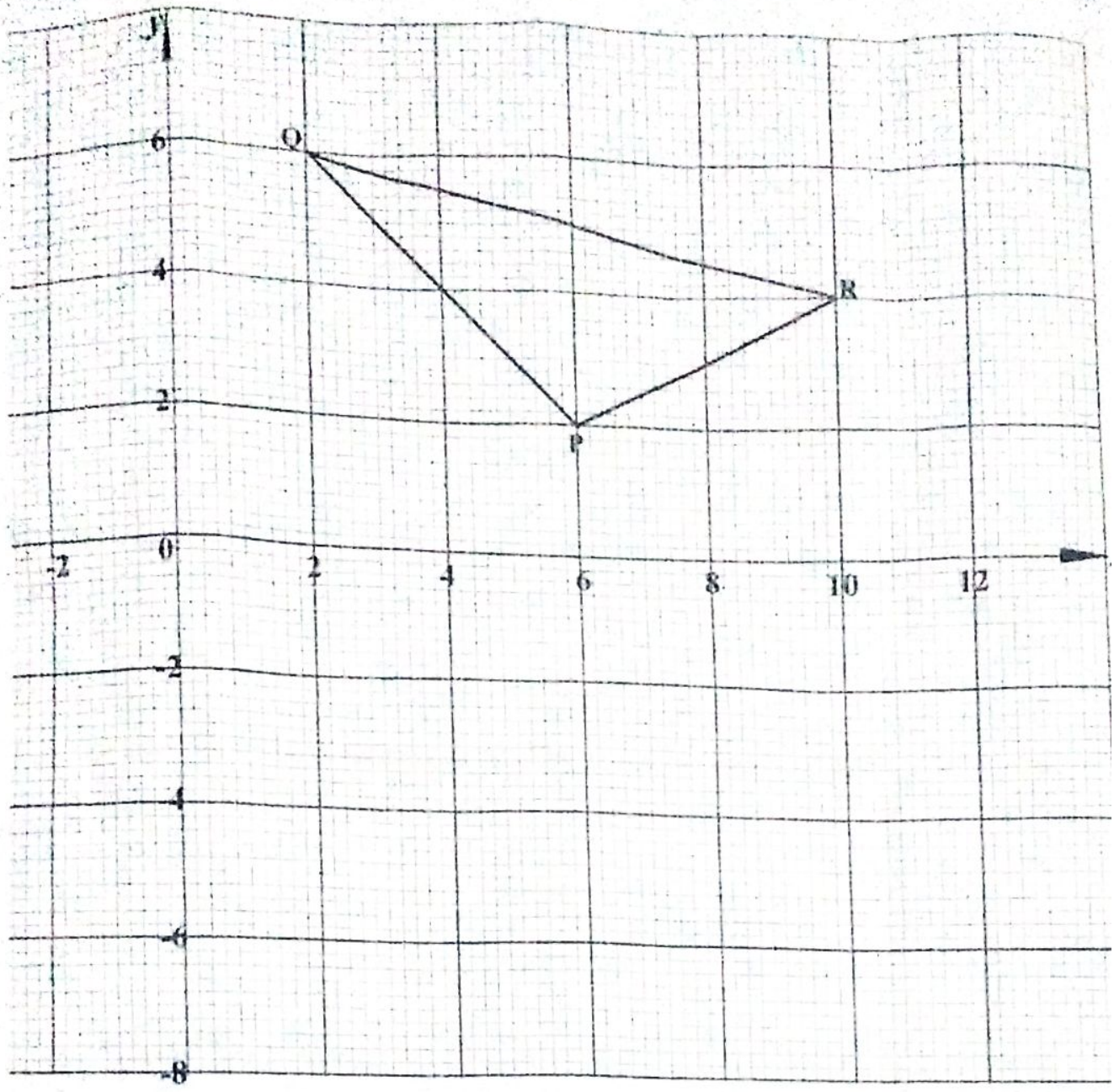



**Figure 1**

On the same graph paper, draw triangle $P'Q'R'$ after a rotation of $-45°$ about (0, 0). **(5 mark**

10. Solve the equation $2x^2 - 4x - 3 = 0$, giving the answer to 2 decimal places. **(7 marks)**

11. Given that the following two sets of numbers 0, 1, 3, 2, 3, 9, 5, 5, 5, 7 and 2, $x$, 7, 1 have equal mean, calculate the value of $x$. **(4 marks)**

Continued/...

12. The distance between two points **A** and **B** is 13. Given that the points are **A** $(n, 2)$ and **B** $(2, 14)$, find the value of $n$. **(6 marks)**

13. A ladder 4 m long leans against a wall making an angle of 30° with the ground. Calculate the distance between the ladder and the wall. **(4 marks)**

14. **Figure 2** shows two parallel chords **AB** and **CD** that lie on the same side of a circle centre **O**.

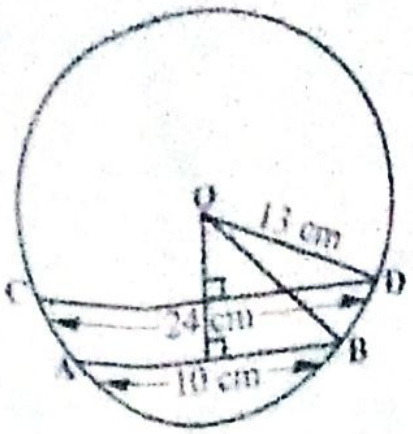



**Figure 2**

If **AB** = 10 cm, **CD** = 24 cm and **OD** = 13 cm, find the distance between the chords.
**(6 marks)**

15. Given that matrices $\mathbf{A} = \begin{bmatrix} 4 & 6 \\ 5 & 7 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$, find matrix $(\mathbf{A} - \mathbf{B})^2$.

**(5 marks)**

16. The quantity $q$ varies directly as the cube of $x$ and inversely as the square root of $z$. If $w = 16$, $x = 2$ and $z = 9$, find the value of $z$ when $x = 3$ and $q = 18$.

**(6 marks)**

17. On the same axes, draw the graphs to show the region bounded by the following inequalities on the graph paper below. Shade the unwanted region.

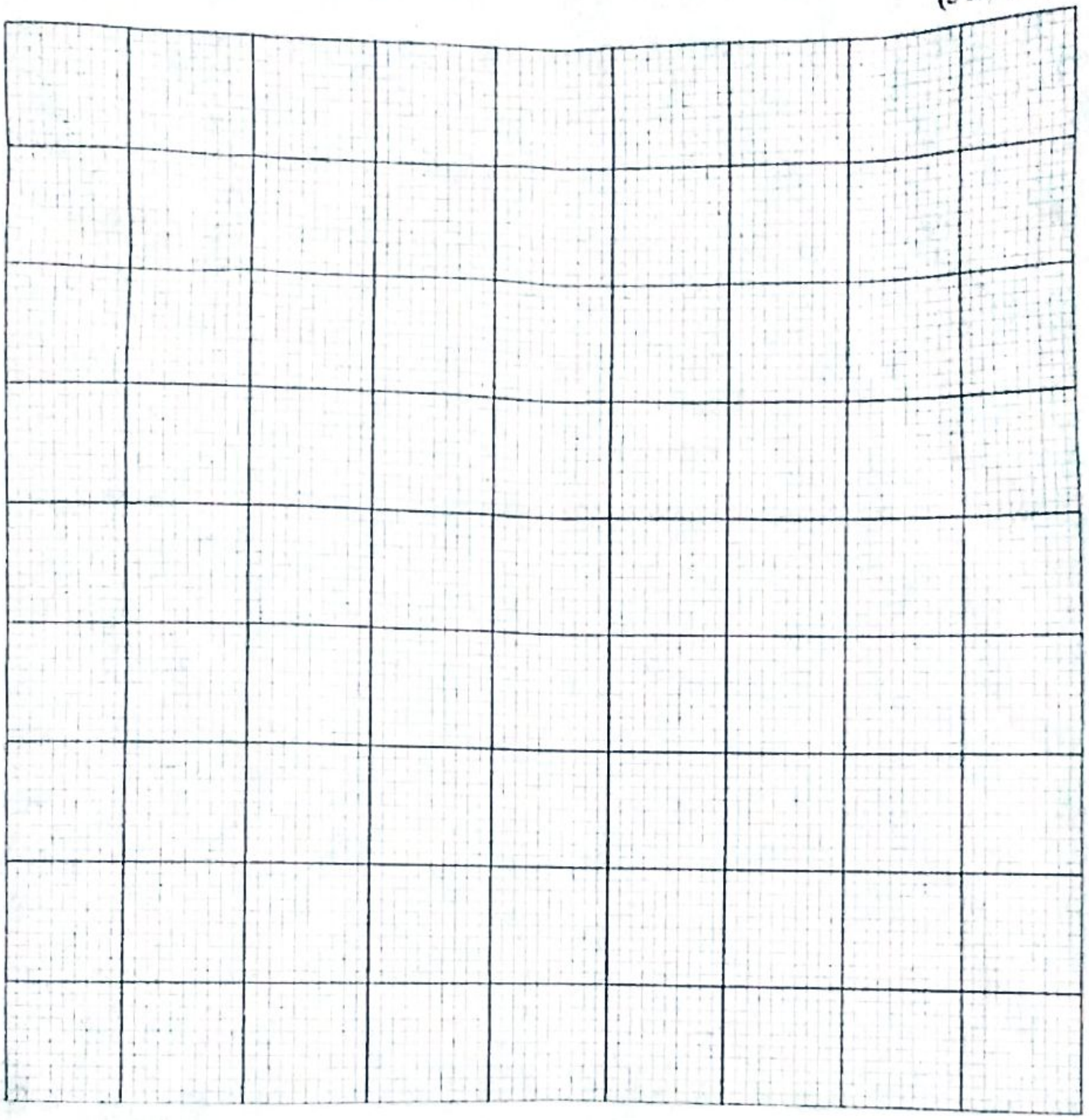
$$x \geq 0$$

$$y \leq 2.5$$

$$4x \leq 12 + 3y$$

$$y > -\frac{1}{2}y$$

**(5 marks)**



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18. Figure 3 shows a velocity-time graph of a moving object.

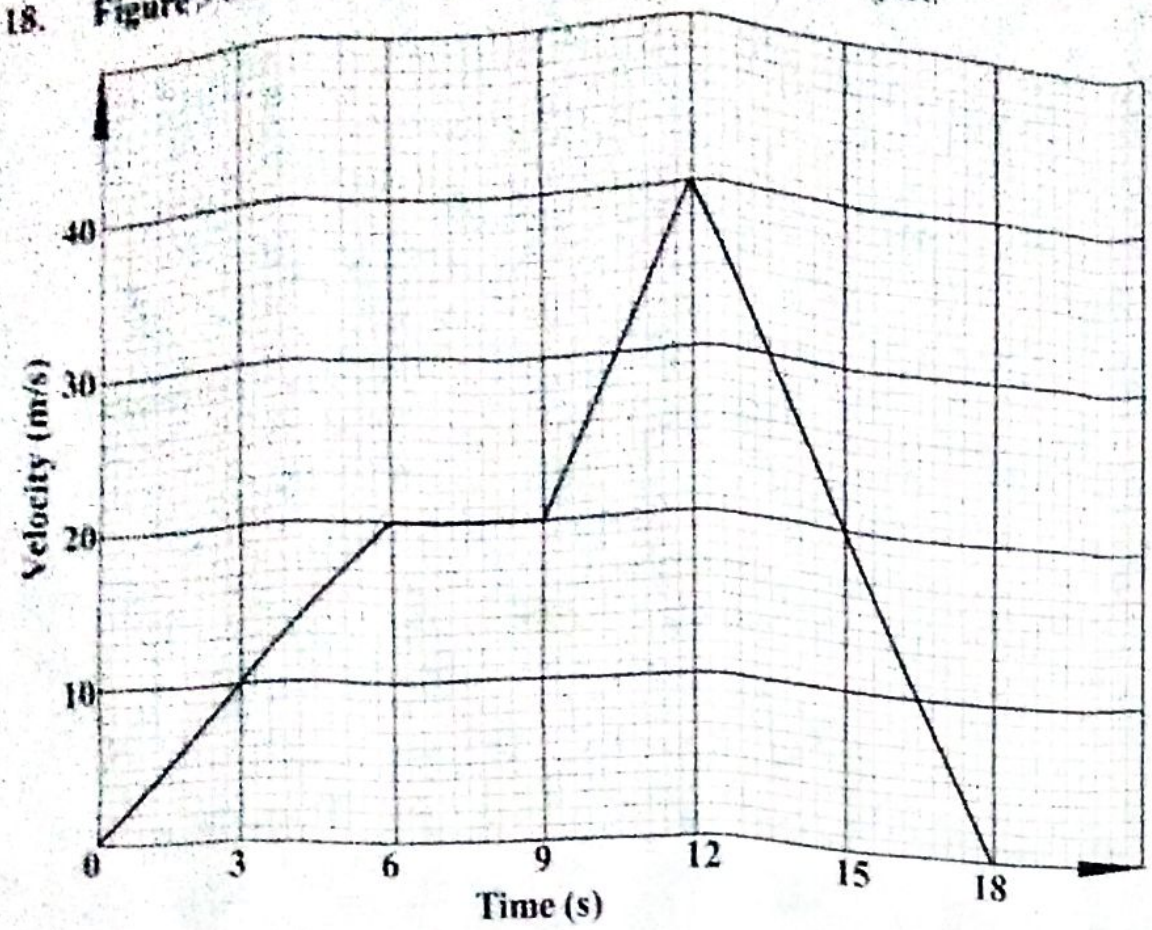


**Figure 3**

Calculate the total distance travelled by the object. **(6 marks)**

9. Figure 4 is a circle ABCD in which ABE and DCE are straight lines.

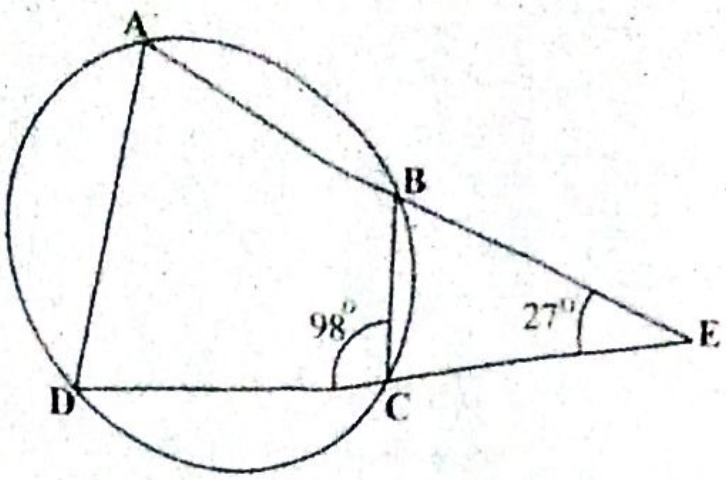


Figure 4

If angle BCD = 98° and angle AED = 27°, calculate angle CDA. (4 marks)

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20. **Figure 5** shows a solid cone of base diameter XY and a perpendicular height OV.

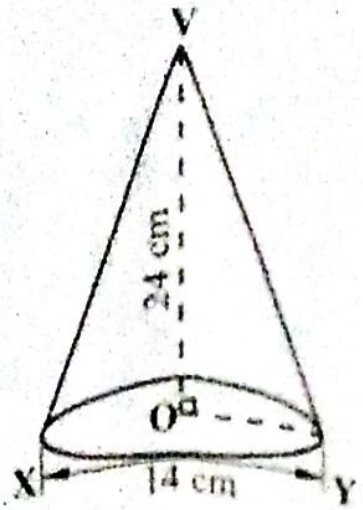


**Figure 5**

If **XY** = 14 cm and **OV** = 24 cm, calculate the total surface area of the cone.

**(6 marks)**

## END OF QUESTION PAPER

**NB: This paper contains 14 printed pages.**