

5.8.4

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Question

Half the perimeter of a rectangular garden, whose length is 4m more than its width, is 36m. Find the dimensions of the garden.

Formulating the Equations

Let length be l , breadth be b .

$$\text{Half perimeter: } l + b = 18 \quad (1)$$

$$\text{Length exceeds breadth by 4m: } l - b = 4 \quad (2)$$

Matrix form:

$$\begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} l \\ b \end{pmatrix} = \begin{pmatrix} 18 \\ 4 \end{pmatrix} \quad (3)$$

Solving Using Row Operations

Start with the augmented matrix:

$$\left(\begin{array}{cc|c} 1 & 1 & 18 \\ 1 & -1 & 4 \end{array} \right) \quad (4)$$

Apply row operations:

$$R_2 \rightarrow R_2 - R_1 \implies \left(\begin{array}{cc|c} 1 & 1 & 18 \\ 0 & -2 & -14 \end{array} \right) \quad (5)$$

$$R_2 \rightarrow -\frac{1}{2}R_2 \implies \left(\begin{array}{cc|c} 1 & 1 & 18 \\ 0 & 1 & 7 \end{array} \right) \quad (6)$$

$$R_1 \rightarrow R_1 - R_2 \implies \left(\begin{array}{cc|c} 1 & 0 & 11 \\ 0 & 1 & 7 \end{array} \right) \quad (7)$$

Solution:

$$\begin{pmatrix} l \\ b \end{pmatrix} = \begin{pmatrix} 11 \\ 7 \end{pmatrix} \quad (8)$$

Therefore:

$$\text{Length} = 11m \quad \text{Breadth} = 7m \quad (9)$$

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