

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

4 Forces

Exercise C, Question 7

Question:

The forces $F_1 = \begin{bmatrix} a \\ -2a \end{bmatrix}$ and $F_2 = \begin{bmatrix} 2 \\ 4 \end{bmatrix}$ act on a particle. The resultant of F_1 and F_2 has magnitude 4 N. Find the possible values of a .

Solution:

$$R = \begin{bmatrix} a \\ -2a \end{bmatrix} + \begin{bmatrix} 2 \\ 4 \end{bmatrix}$$

$$\text{i.e. } R = \begin{bmatrix} a+2 \\ 4-2a \end{bmatrix} \quad \text{but } |R| = 4$$

$$\therefore (a+2)^2 + (4-2a)^2 = 4^2$$

$$a^2 + 4a + 4 + 16 - 16a + 4a^2 = 16$$

$$\therefore 5a^2 - 12a + 4 = 0$$

$$\therefore (5a-2)(a-2) = 0$$

$$a = \frac{2}{5} \quad \text{or} \quad a = 2$$

