

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

4 Forces

Exercise C, Question 3

Question:

The resultant of the forces $(2\mathbf{i} + \mathbf{j})\text{ N}$, $3\mathbf{j}\text{ N}$, $(2\mathbf{i} + 4\mathbf{j})\text{ N}$, $(6\mathbf{i} + b\mathbf{j})\text{ N}$ and $(a\mathbf{i} + \mathbf{j})\text{ N}$ is $(3\mathbf{i} + 4\mathbf{j})\text{ N}$, where \mathbf{i} and \mathbf{j} are perpendicular unit vectors. Find a and b .

Solution:

$$(2\mathbf{i} + \mathbf{j}) + (3\mathbf{j}) + (2\mathbf{i} + 4\mathbf{j}) + (6\mathbf{i} + b\mathbf{j}) + (a\mathbf{i} + \mathbf{j}) = 3\mathbf{i} + 4\mathbf{j}$$

$$\therefore (a + 10)\mathbf{i} + (b + 9)\mathbf{j} = 3\mathbf{i} + 4\mathbf{j}$$

$$\text{comparing } \mathbf{i} \text{ components } a + 10 = 3$$

$$\therefore a = -7$$

$$\text{comparing } \mathbf{j} \text{ components } b + 9 = 4$$

$$b = -5$$