

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 4 Forces

### Exercise E, Question 4

#### Question:

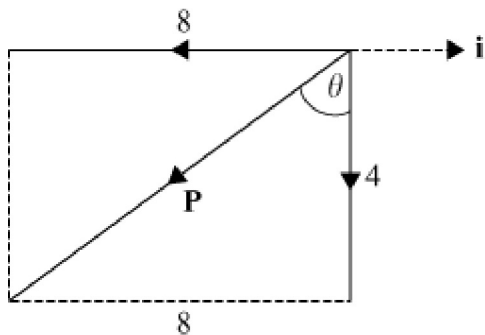
A particle is in equilibrium, subject to forces  $(6i + j)$  N,  $(2i + 3j)$  N and  $\mathbf{P}$ .

- (a) Find  $\mathbf{P}$  in terms of  $\mathbf{i}$  and  $\mathbf{j}$ .
- (b) Find the magnitude of  $\mathbf{P}$  and the angle between  $\mathbf{P}$  and  $\mathbf{i}$ .

#### Solution:

$$(a) \mathbf{P} + (6i + j) + (2i + 3j) = 0$$

$$\text{i.e. } \mathbf{P} = -8i - 4j$$



$$|\mathbf{P}| = \sqrt{8^2 + 4^2} = 8.9442\dots$$

$$\text{i.e. } |\mathbf{P}| = 8.94 \text{ N (3 s.f.)}$$

$$(b) \tan \theta = \frac{8}{4}$$

$$\theta = 63.434\dots^\circ$$

$$\text{i.e. at angle } 90^\circ + \theta = 90^\circ + 63.434\dots^\circ = 153.434\dots^\circ$$

i.e. at  $153^\circ$  (3 s.f.) below the positive  $\mathbf{i}$  direction.