

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

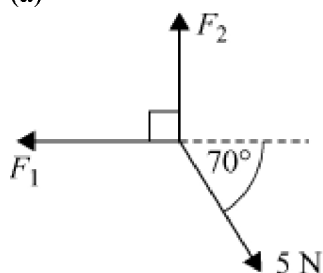
## 4 Forces

### Exercise E, Question 1

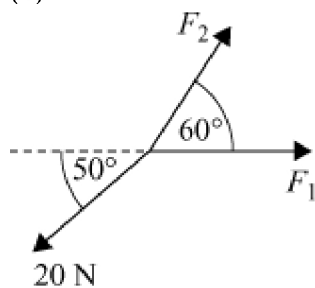
#### Question:

Each of the following sets of forces is in equilibrium. Find the magnitudes  $F_1$  and  $F_2$ .

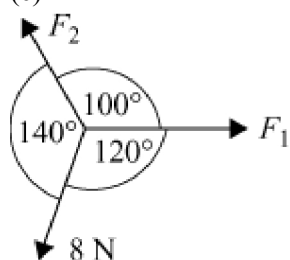
(a)



(b)



(c)



#### Solution:

$$\text{Resolving } \leftarrow F_1 = 5 \cos 70^\circ$$

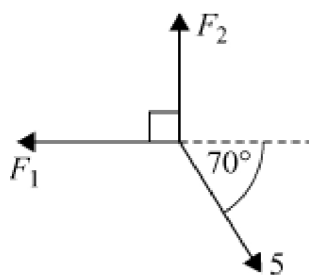
$$F_1 = 1.7101\dots$$

$$\text{i.e. } F_1 = 1.71 \text{ N (3 s.f.)}$$

(a) Resolving  $\uparrow F_2 = 5 \sin 70^\circ$

$$F_2 = 4.6984\dots$$

$$F_2 = 4.70 \text{ N (3 s.f.)}$$



$$\text{Resolving } \uparrow F_2 \sin 60^\circ = 20 \sin 50^\circ$$

$$\therefore F_2 = \frac{20 \sin 50^\circ}{\sin 60^\circ}$$

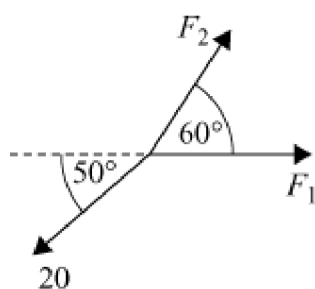
$$F_2 = 17.691\dots$$

(b) i.e.  $F_2 = 17.7 \text{ N (3 s.f.)}$

$$\text{Resolving } \rightarrow F_1 + F_2 \cos 60^\circ = 20 \cos 50^\circ$$

$$\therefore F_1 = 20 \cos 50^\circ - 17.691 \times \cos 60^\circ = 4.0102\dots$$

$$\therefore F_1 = 4.01 \text{ N (3 s.f.)}$$



$$\text{Resolving } \uparrow F_2 \sin 80^\circ = 8 \sin 60^\circ$$

$$\therefore F_2 = \frac{8 \sin 60^\circ}{\sin 80^\circ}$$

$$= 7.0350\dots$$

(c)  $F_2 = 7.04 \text{ N (3 s.f.)}$

$$\text{Resolving } \rightarrow F_1 = F_2 \cos 80^\circ + 8 \cos 60^\circ$$

$$F_1 = 7.0350 \times \cos 80^\circ + 8 \cos 60^\circ$$

$$F_1 = 5.2216\dots$$

i.e.  $F_1 = 5.22 \text{ N (3 s.f.)}$

