

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

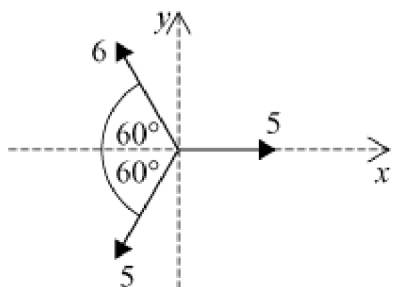
4 Forces

Exercise C, Question 1

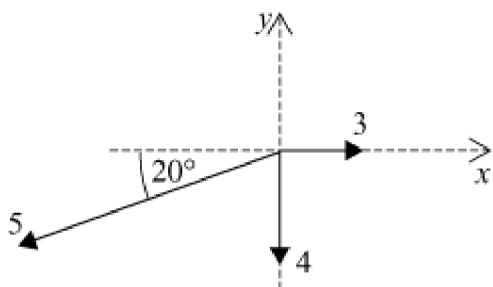
Question:

Find the magnitude of the resultant of the following sets of forces, by forming a quadrilateral of forces.

(a)

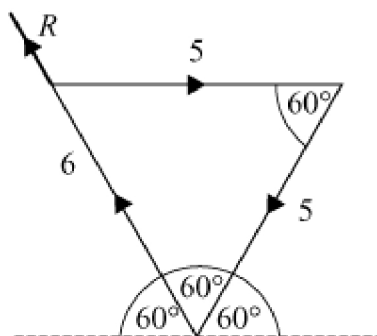


(b)

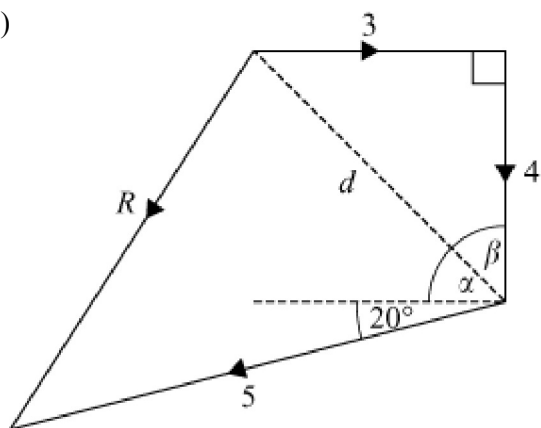


Solution:

(a) The sketch shows that the magnitude of R is 1N (since the basic triangle is equilateral).



(b)



By Pythagoras' theorem

$$d = \sqrt{3^2 + 4^2}$$

$$\therefore d = \sqrt{25}$$

$$\text{i.e. } d = 5$$

$$\text{then } \tan \beta = \frac{3}{4} \text{ gives } \beta = 36.869\dots^\circ$$

$$\therefore \alpha = 90^\circ - \beta$$

$$= 90^\circ - 36.869^\circ$$

$$\text{i.e. } \alpha = 53.130\dots^\circ$$

\therefore in the lower triangle, the angle between d and 5 is $20^\circ + \alpha = 20 + 53.130^\circ = 73.130\dots^\circ$

then the cosine rule gives

$$R^2 = d^2 + 5^2 - 2 \times d \times 5 \times \cos 73.130^\circ, \text{ but } d = 5$$

$$\therefore R^2 = 5^2 + 5^2 - 2 \times 5 \times 5 \times \cos 73.130^\circ$$

$$\text{i.e. } R^2 = 35.490\dots$$

$$\therefore R = 5.9573\dots$$

$$\text{i.e. } R = 5.96 \text{ N (3 s.f.)}$$