

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

4 Forces

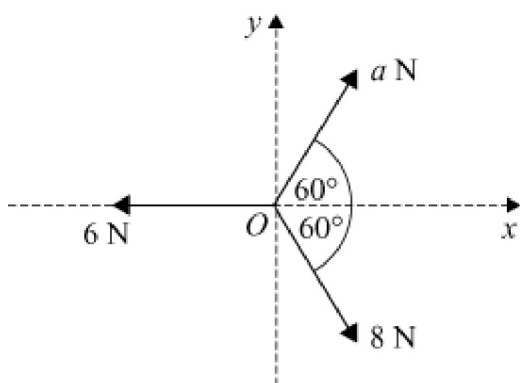
Exercise E, Question 19

Question:

A particle is at a point O on a smooth horizontal surface. It is acted on by three horizontal forces of magnitudes 6 N , 8 N and $a\text{ N}$. Relative to horizontal axes Ox and Oy , the directions of these three forces are shown in the diagram. The resultant, R , of these forces acts along the line Oy .

(a) Show that $a = 4$.

(b) Find the magnitude of R . [A]



Solution:

(a) Resultant is $0i + Rj$

$$\therefore (a \cos 60^\circ i + a \sin 60^\circ j) - 6i + (8 \cos 60^\circ i - 8 \sin 60^\circ j) \equiv 0i + Rj$$

$$\therefore (a \cos 60^\circ - 6 + 8 \cos 60^\circ) i + (a \sin 60^\circ - 8 \sin 60^\circ) \equiv 0i + Rj$$

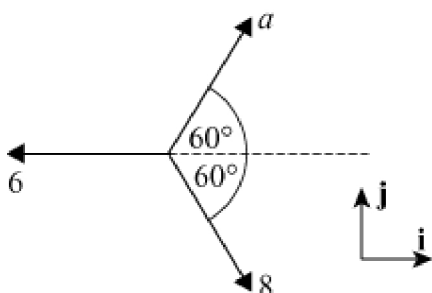
\therefore i components

$$a \cos 60^\circ - 6 + 8 \cos 60^\circ = 0$$

$$a \cos 60^\circ = 6 - 8 \cos 60^\circ$$

$$\therefore a = \frac{(6 - 8 \cos 60^\circ)}{(\cos 60^\circ)}$$

$$\text{i.e. } a = 4$$



(b) j components

$$a \sin 60^\circ - 8 \sin 60^\circ = R$$

$$4 \sin 60^\circ - 8 \sin 60^\circ = R$$

$$\therefore R = -4 \sin 60^\circ$$

$$R = -3.4641\dots$$

magnitude of R is 3.46 N (3 s.f.)

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