

## (62) Application of Vectors

### WORKING AT D/E

(1) Alan travels 6m due west from a fixed point  $O$  to the point  $A$ . Alan then moves directly south from  $A$  8m to the point  $B$ .

(a) Find the position vectors  $\overrightarrow{OA}$  and  $\overrightarrow{AB}$  using  $\mathbf{i}$  and  $\mathbf{j}$  notation.

(b) Hence, find  $\overrightarrow{OB}$ .

(c) Show that  $|\overrightarrow{OB}| = 10\text{m}$ .

(d) Find the bearing of  $B$  from  $O$ .

The point  $C$  is 22m due east of  $B$ .

(e) Find  $\overrightarrow{OC}$  using  $\mathbf{i}$  and  $\mathbf{j}$  notation.

Alan walks the perimeter of the triangle  $OBC$ .

(f) Find the distance he walks in total in exact form.

Beryl is standing 14m due north of the point  $C$ .

(g) Find the bearing of  $C$  from  $O$ .

Beryl now walks back to  $O$  from  $C$  at a constant speed of  $2.4\text{ms}^{-1}$ .

(h) Show that it will take approximately 7 seconds for Beryl to reach  $O$  from  $C$ .

### WORKING AT B/C

(1) Alan walks from the fixed point  $O$  to the point  $A$  where  $\overrightarrow{OA} = \begin{pmatrix} 5\sqrt{3} \\ 5 \end{pmatrix} \text{m}$

(a) Show that the bearing of  $A$  from  $O$  is  $060^\circ$ .

(b) Find the distance Alan walks.

Alan now walks directly south to the point  $B$ .

(c) Given that  $B$  is directly east of  $O$ , write down  $\overrightarrow{OB}$  in the form  $a\mathbf{i}$ .

From  $B$ , Alan walks to the point  $C$ .

(d) Given that  $\overrightarrow{BC} = \begin{pmatrix} -12\sqrt{3} \\ 10 \end{pmatrix} \text{m}$ , find the bearing of  $C$  from  $O$ .

(e) Alan now walks back to  $O$ . Find the distance  $OC$  to 3 significant figures.

### WORKING AT A\*/A

(1) Beryl walks 20m on a bearing of  $045^\circ$  from a fixed point  $O$  to the point  $A$ .

(a) Find  $\overrightarrow{OA}$  in the form  $\begin{pmatrix} p \\ q \end{pmatrix}$  where  $p$  and  $q$  are exact values.

Beryl now walks from the point  $A$  to the point  $B$ .

(b) Given that  $B$  is 10m from  $A$  and on a bearing of  $135^\circ$  from  $A$ , find  $\overrightarrow{OB}$  in column form.

(c) Find  $|\overrightarrow{OB}|$ .

(d) Find the bearing of  $B$  from  $O$ .

Point  $D$  is 1m from  $O$ .

(e) Given that  $\overrightarrow{OD}$  is in the direction of the vector  $-3\mathbf{i} - 4\mathbf{j}$ , find  $\overrightarrow{OD}$  in the form  $(a\mathbf{i} + b\mathbf{j})\text{m}$  where  $\mathbf{a}$  and  $\mathbf{b}$  are simplified fractions.

The point  $E$  is due east of  $D$  and south of  $O$ .

(f) Write down  $\overrightarrow{OE}$  using  $\mathbf{i}$  and  $\mathbf{j}$  notation.