

# Vectors

## Difficulty: Hard

### Question Paper 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Vectors and transformations
Sub-Topic	Vectors
Paper	Paper 2
Difficulty	Hard
Booklet	Question Paper 3

**Time allowed:** 39 minutes

**Score:** /30

**Percentage:** /100

#### Grade Boundaries:

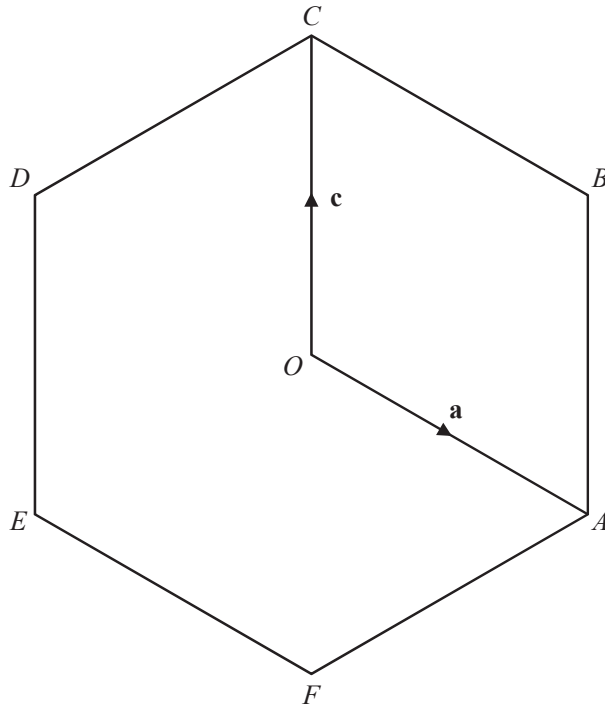
##### CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

##### CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

# Question 1



$O$  is the origin.  
 $ABCDEF$  is a regular hexagon and  $O$  is the midpoint of  $AD$ .

$$\vec{OA} = \mathbf{a} \text{ and } \vec{OC} = \mathbf{c}.$$

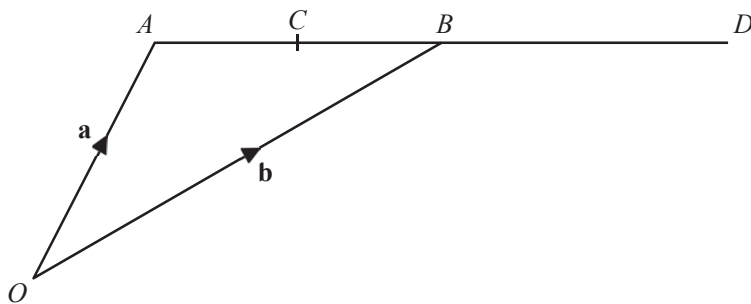
Find, in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in their simplest form

(a)  $\vec{BE}$ , [2]

(b)  $\vec{DB}$ , [2]

(c) the position vector of  $E$ . [2]

## Question 2



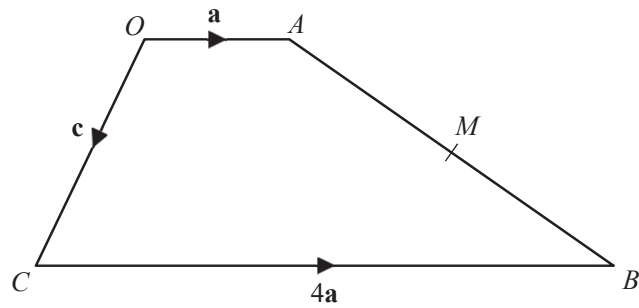
$A$  and  $B$  have position vectors  $\mathbf{a}$  and  $\mathbf{b}$  relative to the origin  $O$ .  
 $C$  is the midpoint of  $AB$  and  $B$  is the midpoint of  $AD$ .

Find, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , in their simplest form

(a) the position vector of  $C$ , [2]

(b) the vector  $\vec{CD}$ . [2]

### Question 3



$O$  is the origin,  $\vec{OA} = \mathbf{a}$ ,  $\vec{OC} = \mathbf{c}$  and  $\vec{CB} = 4\mathbf{a}$ .  
 $M$  is the midpoint of  $AB$ .

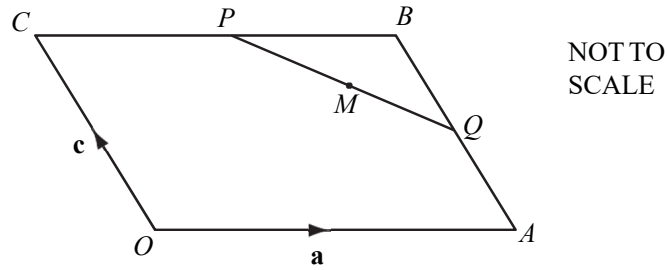
(a) Find, in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in their simplest form

(i) the vector  $\vec{AB}$ , [2]

(ii) the position vector of  $M$ . [2]

(b) Mark the point  $D$  on the diagram where  $\vec{OD} = 3\mathbf{a} + \mathbf{c}$ . [2]

## Question 4



$O$  is the origin and  $OABC$  is a parallelogram.  
 $CP = PB$  and  $AQ = QB$ .

$\vec{OA} = \mathbf{a}$  and  $\vec{OC} = \mathbf{c}$ .

Find in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in their simplest form,

(a)  $\vec{PQ}$ , [2]

(b) the position vector of  $M$ , where  $M$  is the midpoint of  $PQ$ . [2]

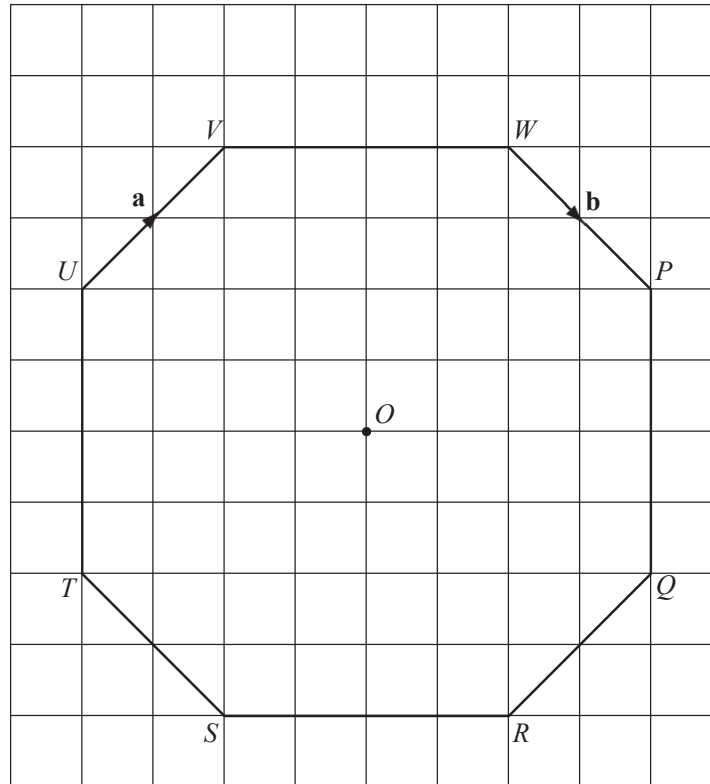
## Question 5

$\vec{AB} = \mathbf{a} + t\mathbf{b}$  and  $\vec{CD} = \mathbf{a} + (3t - 5)\mathbf{b}$  where  $t$  is a number.

Find the value of  $t$  when  $\vec{AB} = \vec{CD}$ .

[2]

## Question 6



The origin  $O$  is the centre of the octagon  $PQRSTUWV$ .

$\vec{UV} = \mathbf{a}$  and  $\vec{WP} = \mathbf{b}$ .

(a) Write down in terms of  $\mathbf{a}$  and  $\mathbf{b}$

(i)  $\vec{VW}$ , [1]

(ii)  $\vec{TU}$ , [1]

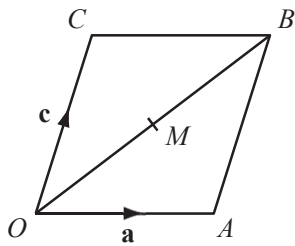
(iii)  $\vec{TP}$ , [2]

(iv) the position vector of the point  $P$ . [1]

(b) In the diagram, 1 centimetre represents 1 unit.

Write down the value of  $|\mathbf{a} - \mathbf{b}|$ . [1]

## Question 7



$OACB$  is a parallelogram.  $\vec{OA} = \mathbf{a}$  and  $\vec{OC} = \mathbf{c}$ .  
 $M$  is the mid-point of  $OB$ .  
Find  $\vec{MA}$  in terms of  $\mathbf{a}$  and  $\mathbf{c}$ .

[2]