# Vectors

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### 1) June 2010 V1

- 19 The position vector **r** is given by  $\mathbf{r} = 2\mathbf{p} + t(\mathbf{p} + \mathbf{q})$ .
  - (a) Complete the table below for the given values of *t*.Write each vector in its simplest form.One result has been done for you.

t	0		2	3
r		1000	4 <b>p</b> + 2 <b>q</b>	

[3]

- (b) *O* is the origin and **p** and **q** are shown on the diagram.
  - (i) Plot the 4 points given by the position vectors in the table.



[2]

- (ii) What can you say about these four points?
  - Answer(b)(ii) [1]

2) June 2010 V3





Answer(a)  $\overrightarrow{HG}$  = [1]

(b)  $\overline{ON}$ 

Answer(b)  $\vec{ON} =$ [2]

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3) November 2010 V2

 $\overrightarrow{AB} = \mathbf{a} + t\mathbf{b}$  and  $\overrightarrow{CD} = \mathbf{a} + (3t - 5)\mathbf{b}$  where t is a number. 7

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





[3]

### 5) June 2011 V2





С

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 $\overrightarrow{OA} = \mathbf{a}$  and  $\overrightarrow{OC} = \mathbf{c}$ . Find in terms of  $\mathbf{a}$  and  $\mathbf{c}$ , in their simplest form,

(a)  $\overrightarrow{PQ}$ ,

Answer(a)  $\overline{PQ}$  = [2]

NOT TO SCALE

(b) the position vector of M, where M is the midpoint of PQ

0

Answer(b) [2]

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6) November 2011 V1
13 $A \xrightarrow{C} B \xrightarrow{D} D$ $A \xrightarrow{D} D$ A  and  B  have position vectors a and b relative to the origin  O.
C is the midpoint of $AB$ and $B$ is the midpoint of $AD$ . Find in terms of a and <b>b</b> in their simplest form
<ul><li>(a) the position vector of C,</li></ul>
(b) the vector $\vec{CD}$ . [2]
<i>Answer(b)</i> [2]
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$\Omega = 0.00$ $\Omega = 0.00$ $\Omega = 0.00$

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8) November 2011 V2	
17 $ \begin{array}{c}  & & & & \\  & & & & \\  & & & & \\  & & & &$	
(a) Find, in terms of a and c, in their simplest form	
(i) the vector $\overrightarrow{AB}$ ,	
Answer(a)(i) $\overrightarrow{AB} =$	[2]
(ii) the position vector of <i>M</i> .	
(b) Mark the point D on the diagram where $\overrightarrow{OD} = 3\mathbf{a} + \mathbf{c}$ .	[2] [2]
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9) June 2012 V1

19



O is the origin and OPQRST is a regular hexagon.

$$\overrightarrow{OP} = \mathbf{p}$$
 and  $\overrightarrow{OT} = \mathbf{t}$ 

Find, in terms of **p** and **t**, in their simplest forms,

(a)  $\overrightarrow{PT}$ ,

Answer(a)  $\overrightarrow{PT} =$  [1]

(b)  $\overrightarrow{PR}$ ,

Answer(b)  $\overrightarrow{PR} =$  [2]

(c) the position vector of R. Q

Answer(c) [2]

R Q М NOT TO X SCALE 0 P р O is the origin and OPRQ is a parallelogram. The position vectors of  $\tilde{P}$  and  $\tilde{Q}$  are **p** and **q**. X is on PR so that PX = 2XR. Find, in terms of **p** and **q**, in their simplest forms (a)  $\vec{QX}$ , Answer(a)  $\vec{QX} =$ [2] (b) the position vector of *M*, the midpoint of *QX*. www.Q8Maths.com Answer(b) [2]

NOT TO SCALE

D

Ε

C

In the diagram, *O* is the origin.  $\overrightarrow{OC} = \mathbf{c}$  and  $\overrightarrow{OD} = \mathbf{d}$ . *E* is on *CD* so that *CE* = 2*ED*.

0

Find, in terms of **c** and **d**, in their simplest forms,

d

Ċ

(a)  $\overrightarrow{DE}$ ,

Answer(a)  $\overrightarrow{DE} =$  [2]

(b) the position vector of E.

*Answer(b)* [2]

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19	C
<ul><li><i>OABCDE</i> is a regular polygon.</li><li>(a) Write down the geometrical name for the second se</li></ul>	or this polygon.  Answer(a)
( <b>b</b> ) $O$ is the origin. $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = \mathbf{c}$ .	
Find, in terms of <b>b</b> and <b>c</b> , in their si	mplest form,
(i) $\overrightarrow{BC}$ , (ii) $\overrightarrow{OA}$ ,	Answer(b)(i) $\vec{BC} = \dots$ [1 8 Maths.com
	Answer(b)(ii) $\overrightarrow{OA} =$
(iii) the position vector of $E$ .	

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### 15) November 2013 V2



С

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

$$\overrightarrow{OA} = \mathbf{a}$$
 and  $\overrightarrow{OC} = \mathbf{c}$ 

Find, in terms of a and c, in their simplest form

(a)  $\overrightarrow{BE}$ ,

(**b**)  $\overrightarrow{DB}$ ,

Answer(b)  $\overrightarrow{DB} = \dots$  [2]

(c) the position vector of E

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## 18) November 2014 V3 14 Р Q A **.** B NOT TO SCALE b 0 The diagram shows two points, P and Q, on a straight line ABP is the midpoint of AB and Q is the midpoint of PB. *O* is the origin, $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$ . Write down, in terms of **a** and **b**, in its simplest form (a) $\overrightarrow{AP}$ , (b) the position vector of Q[2] *Answer*(*b*) ..... . . . . . . . . . www.Q8Maths.com

19) June 2015 V1	
14 $P_{QRS} = a \ QRS = b \ ad \ \overline{SQ} = a - 2b.$ (a) Show that $\overline{PS} = 2b.$ Answer(a)	
(b) Write down the mathematical name for the quadrilateral <i>PQRM</i> , giving reasons for your answer.  Answer(b) because	[1]  [2]
www.Q8M aths.com	20





In the diagram, *O* is the origin,  $\overrightarrow{OA} = \mathbf{a}$  and  $\overrightarrow{OB} = \mathbf{b}$ . *C* is on the line *AB* so that *AC*: *CB* = 1:2.

b

0

a

Find, in terms of **a** and **b**, in its simplest form,

В

(a)  $\overrightarrow{AC}$ ,

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A

(b) the position vector of C.

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A b В NOT TO SCALE 0 ć C In the diagram, O is the origin,  $\overrightarrow{OA} = \mathbf{a}$ ,  $\overrightarrow{OC} = \mathbf{c}$  and  $\overrightarrow{AB} = \mathbf{b}$ . *P* is on the line *AB* so that AP : PB = 2 : 1. Q is the midpoint of BC. Find, in terms of **a**, **b** and **c**, in its simplest form (a)  $\overrightarrow{CB}$ ,  $\overrightarrow{CB} = \dots$ ... [1] (b) the position vector of Q, ......[2] (c)  $\overrightarrow{PQ}$ . www.Q8Maths.com

 $\overrightarrow{PQ}$  = ......[2]



GHJK is a quadrilateral.  $\overline{GH} = \mathbf{a}, \overline{JH} = \mathbf{b} \text{ and } \overline{KJ} = \mathbf{c}.$ L lies on GK so that LK = 3GL.

Find an expression, in terms of **a**, **b** and **c**, for  $\overrightarrow{GL}$ .

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### 26) November 2017 V3

14 (a) *D* is the point (2, -5) and  $\overrightarrow{DE} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$ .

Find the co-ordinates of the point *E*.

**(b)**  $\mathbf{v} = \begin{pmatrix} t \\ 12 \end{pmatrix}$  and  $|\mathbf{v}| = 13$ .

Work out the value of *t*, where *t* is negative.

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(.....) [1]

.....[2]

t =

### 27) June 2018 V2

#### 22



In the diagram, O is the origin,  $\overrightarrow{OC} = -2\mathbf{a} + 3\mathbf{b}$  and  $\overrightarrow{OD} = 4\mathbf{a} + \mathbf{b}$ .

(a) Find  $\overrightarrow{CD}$ , in terms of a and b, in its simplest form.

 $\overrightarrow{CD}$  = ......[2]

### (b) $\overrightarrow{DE} = \mathbf{a} - 2\mathbf{b}$

Find the position vector of E, in terms of **a** and **b**, in its simplest form.

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