

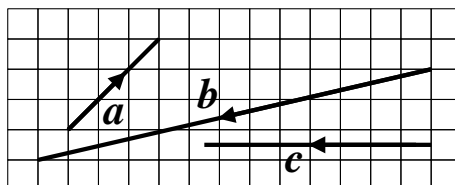
**10.1 Revision**

*Any solution based entirely on graphical or numerical methods is not acceptable.*

*Make the method used clear.*

Marks available : 50

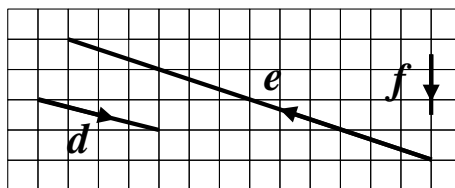
**Question 1**



Write the vectors  $a$ ,  $b$  and  $c$  in the form  $\begin{pmatrix} p \\ q \end{pmatrix}$  where  $p$  and  $q$  are integers.

[ 3 marks ]

**Question 2**



Write the vectors  $d$ ,  $e$  and  $f$  in the form  $p\mathbf{i} + q\mathbf{j}$  where  $p$  and  $q$  are integers.

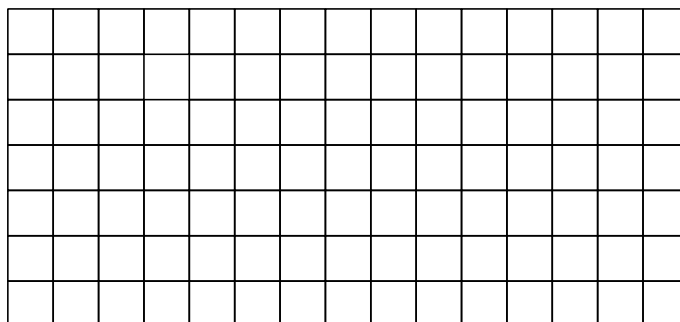
[ 3 marks ]

**Question 3**

On the grid draw the following vectors, labelling each with its letter and an arrow.

$$a = \begin{pmatrix} 8 \\ 3 \end{pmatrix}$$

$$b = \begin{pmatrix} -6 \\ 3 \end{pmatrix}$$



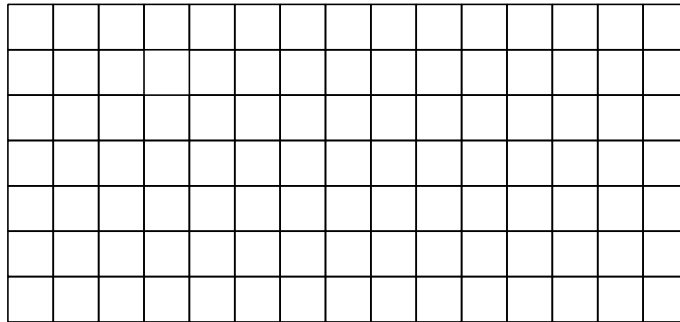
[ 2 marks ]

**Question 4**

On the grid draw the following vectors, labelling each with its letter and an arrow.

$$c = 2i - 3j$$

$$d = -5i + j$$



[ 2 marks ]

**Question 5**

(i) Find  $|p|$  giving the answer in surd form.

$$p = \begin{pmatrix} -7 \\ 10 \end{pmatrix}$$

[ 2 marks ]

(ii) Determine the direction in which the vector  $p$  acts.

[ 2 marks ]

**Question 6**

Circle the two vectors that are parallel;

$$\begin{pmatrix} 18 \\ 75 \end{pmatrix}$$

$$\begin{pmatrix} 36 \\ 60 \end{pmatrix}$$

$$\begin{pmatrix} -24 \\ -100 \end{pmatrix}$$

$$\begin{pmatrix} 20 \\ -80 \end{pmatrix}$$

$$\begin{pmatrix} -30 \\ -45 \end{pmatrix}$$

[ 1 mark ]

**Question 7**

Circle the two vectors that are perpendicular;

$$\begin{pmatrix} 5 \\ 12 \end{pmatrix} \quad \begin{pmatrix} 12 \\ 5 \end{pmatrix} \quad \begin{pmatrix} 0 \\ -18 \end{pmatrix} \quad \begin{pmatrix} 36 \\ -15 \end{pmatrix} \quad \begin{pmatrix} -24 \\ -10 \end{pmatrix}$$

[ 1 mark ]

**Question 8**

In polar form, a vector,  $\mathbf{v}$ , has a magnitude of 7.3, and direction  $310^\circ$

Express  $\mathbf{v}$  in rectangular form, that is, in the form

$$\mathbf{v} = \begin{pmatrix} p \\ q \end{pmatrix}$$

for some values of  $p$  and  $q$  which you should determine.

[ 3 marks ]

**Question 9**

Given that;

$$\mathbf{f} = \begin{pmatrix} 7 \\ 3 \end{pmatrix} \quad \mathbf{g} = \begin{pmatrix} 4 \\ -5 \end{pmatrix} \quad \text{and} \quad \mathbf{h} = \begin{pmatrix} -3 \\ 0 \end{pmatrix}$$

Calculate;

(i)  $4\mathbf{f} + 3\mathbf{g}$

(ii)  $\mathbf{h} - 5\mathbf{g} + \mathbf{f}$

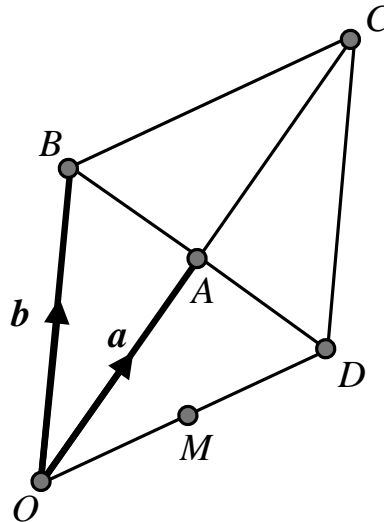
[ 2, 2 marks ]

**Question 10**

The diagram, which is not drawn to scale, shows a parallelogram  $OBCD$  with

$$\vec{OA} = \mathbf{a} \text{ and } \vec{OB} = \mathbf{b}$$

The point  $M$  is the mid-point of  $OD$ .



( a ) Express the following vectors in terms of  $\mathbf{a}$  and  $\mathbf{b}$ ;

( i )  $\vec{AB} =$     ( ii )  $\vec{BD} =$

( iii )  $\vec{OD} =$     ( iv )  $\vec{MA} =$

[ 4 marks ]

( b ) ( i ) Given that,

$$\mathbf{a} = \begin{pmatrix} 6 \\ 9 \end{pmatrix} \quad \text{and} \quad \mathbf{b} = \begin{pmatrix} 0 \\ 13 \end{pmatrix} \quad \text{and} \quad \vec{AB} = \begin{pmatrix} p \\ q \end{pmatrix}$$

determine the values of  $p$  and  $q$ .

[ 2 marks ]

( ii ) Hence, or otherwise, show that  $\angle OAB$  is a right angle.

[ 2 marks ]

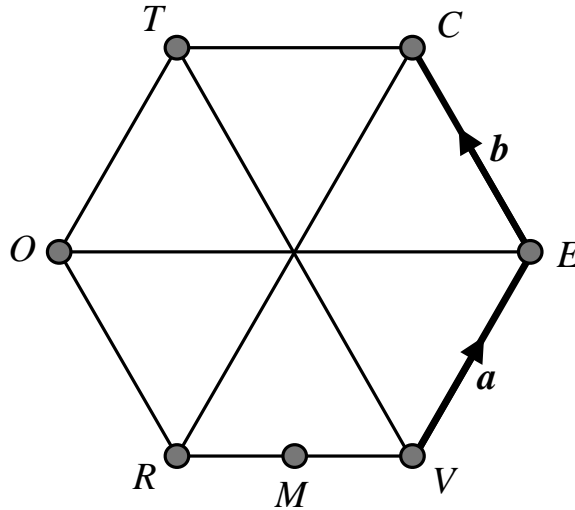
**Question 11**

The diagram, which is not drawn to scale, shows a regular hexagon *VECTOR*.

Each side of the hexagon is of length 4.6 cm.

The point *M* is the mid-point of *RV*.

Furthermore,  $\vec{VE} = \mathbf{a}$  and  $\vec{EC} = \mathbf{b}$



(a) Express the following vectors in terms of  $\mathbf{a}$  and  $\mathbf{b}$ ;

(i)  $\vec{VC} =$     (ii)  $\vec{VO} =$

(iii)  $\vec{VR} =$     (iv)  $\vec{MT} =$

[ 4 marks ]

(b) What is  $|\vec{MT}|$  ?

HINT : The Cosine Rule

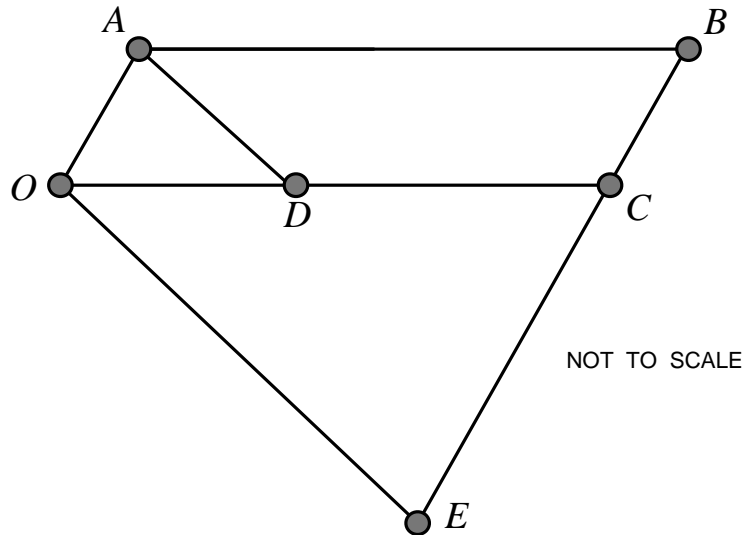
[ 2 marks ]

**Question 12**

$OABC$  is a parallelogram in which  $\vec{OA} = \mathbf{a}$  and  $\vec{OC} = \mathbf{c}$

$BCE$  is a straight line and  $\vec{BE} = 3\vec{BC}$

$D$  is the midpoint of  $OC$ .



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

(i)  $\vec{AD}$

(ii)  $\vec{OE}$

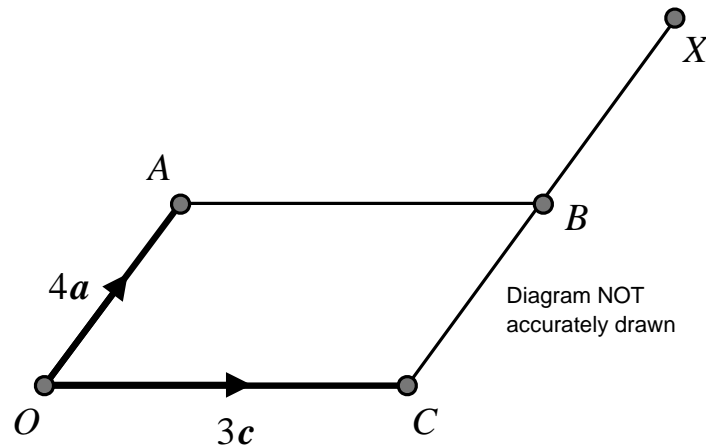
[ 2 marks ]

(b) Deduce the ratio of the lengths of  $AD : OE$

[ 2 marks ]

**Question 13**

GCSE Examination Question from January 2018, Paper 3H, Q24



$OABC$  is a parallelogram.

$OABC$  is a parallelogram with  $\vec{OA} = 4a$  and  $\vec{OC} = 3c$

The point  $X$  is such that  $CBX$  is a straight line and  $CB : BX = 2 : 3$

The point  $Y$  is such that  $\vec{CY} = 2\vec{AX}$

Find, in terms of  $a$  and  $c$ , the vector  $\vec{OY}$

Give your answer in its simplest form.

[ 3 marks ]

### Question 14

#VectorsFascinatingFact

Here is another fascinating fact about vectors !

A vector of magnitude 1 is called a *unit vector*.

- ( i ) Show that the following vector,  $\mathbf{X}$ , is a unit vector;

$$\mathbf{X} = \begin{pmatrix} 0.6 \\ 0.8 \end{pmatrix}$$

[ 2 marks ]

- ( ii ) By first working out the magnitude of the vector,  $\mathbf{Y}$ , write down a *unit vector* that is parallel to  $\mathbf{Y}$ .

$$\mathbf{Y} = \begin{pmatrix} 14 \\ 48 \end{pmatrix}$$

[ 2 marks ]

- ( iii ) Find a formulae that will take any vector,  $\mathbf{Z}$ , and convert it into a *unit vector*, where;

$$\mathbf{Z} = \begin{pmatrix} p \\ q \end{pmatrix}$$

[ 2 marks ]