Revision – Vectors 1

1.

OAB is a triangle.
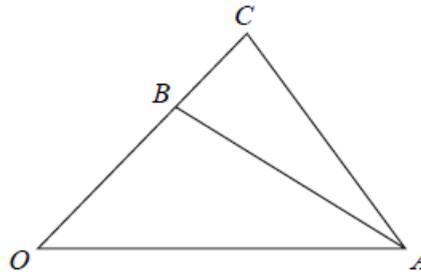
Diagram **NOT**
accurately drawn

$$\overrightarrow{OA} = 3\mathbf{a} \qquad \overrightarrow{OB} = 3\mathbf{b} \qquad \overrightarrow{OC} = \frac{4}{3}\overrightarrow{OB}$$

Q is the point on AC such that $AQ = \frac{3}{5}AC$

P is the point on BA such that $BP = \frac{1}{3}BA$

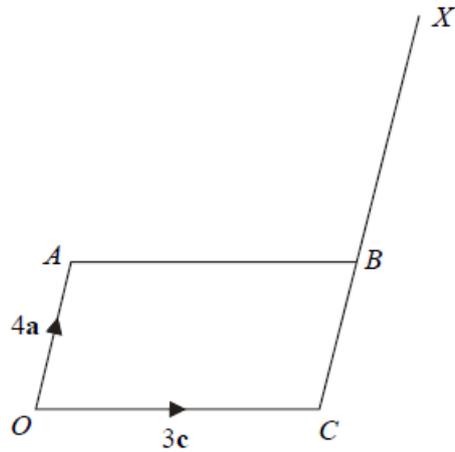Using a vector method, prove that OPQ is a straight line.

2.

Diagram **NOT** accurately drawn

$OABC$ is a parallelogram.

$\overrightarrow{OA} = 4\mathbf{a}$ $\overrightarrow{OC} = 3\mathbf{c}$

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

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

Find, in terms of $\mathbf{a}$ and $\mathbf{c}$, the vector $\overrightarrow{OY}$
Give your answer in its simplest form.
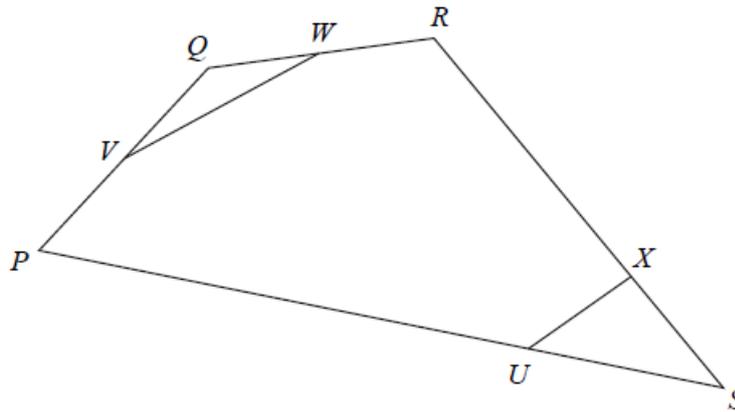
3.

PQRS is a quadrilateral.

Diagram **NOT** accurately drawn

$\overrightarrow{PQ} = 6\mathbf{a}$ $\overrightarrow{QR} = 4\mathbf{b}$ $\overrightarrow{RS} = 2\mathbf{c}$

V is the midpoint of PQ.
W is the midpoint of QR.

X is the point on RS such that $RX = \dfrac{3}{4} RS$.

U is the point on PS such that $PU = \dfrac{3}{4} PS$.

(a) (i) Find $\overrightarrow{PS}$ in terms of **a**, **b** and **c**

....

(ii) Find $\overrightarrow{VW}$ in terms of **a** and **b**

....

(2)

(b) Show, by a vector method, that VW is parallel to UX.

(3)

Given that $\overrightarrow{RS} = \begin{pmatrix} 6 \\ -5 \end{pmatrix}$

(c) calculate the magnitude of $\overrightarrow{RS}$.
Give your answer as a surd.

(2)

4.

A, C and D are points such that

$$\overrightarrow{AC} = \begin{pmatrix} 3 \\ -8 \end{pmatrix} \qquad \overrightarrow{DC} = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$$

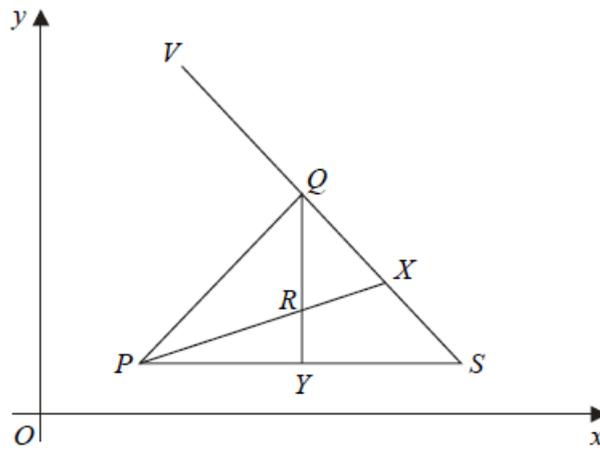Find $\overrightarrow{DA}$ as a column vector.

(2)

5.

Diagram **NOT** accurately drawn

PQS is a triangle.
X is the midpoint of QS and Y is the midpoint of PS.

R is the point of intersection of PX and QY.
V is a point so that $VQXS$ is a straight line.

$\overrightarrow{PQ} = \mathbf{a}$ $\overrightarrow{PS} = \mathbf{b}$

(a) Find, in terms of **a** and **b**,

  (i) $\overrightarrow{QS}$

  ....

  (ii) $\overrightarrow{QY}$

  ....

  (iii) $\overrightarrow{PX}$

  ....

  (3)

P has coordinates (3, 1) and $\overrightarrow{PR} = \dfrac{2}{3}\overrightarrow{PX}$

$\overrightarrow{PR} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$ and $\overrightarrow{XV} = \begin{pmatrix} -5 \\ 4 \end{pmatrix}$

(b) Work out the coordinates of V.

(......................... , ...)
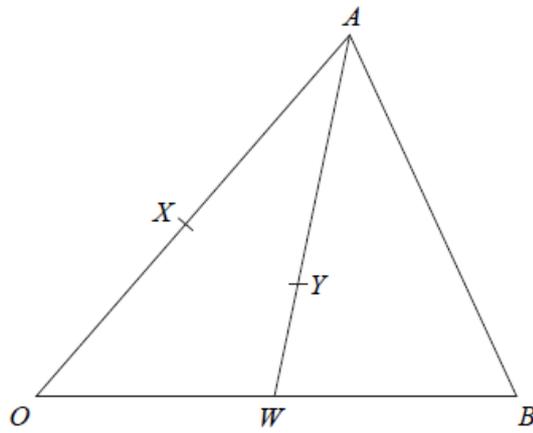 **(3)**

6.

Diagram **NOT** accurately drawn

OAB is a triangle.

X is the midpoint of OA and W is the midpoint of OB.

Y is the point on AW such that $AY : YW = 2 : 1$

$\overrightarrow{OX} = 3\mathbf{a}$ and $\overrightarrow{OW} = 3\mathbf{b}$

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

   (i) $\overrightarrow{AW}$

                                                   ....

   (ii) $\overrightarrow{AY}$

                                                   ....

   (iii) $\overrightarrow{XB}$

                                                   ....

                                                        (3)

(b) Show by a vector method that XYB is a straight line.

                                                        (2)