VECTOR QUESTIONS

1) In this diagram, D is the midpoint of AB and E is the midpoint of AC.

AD = **v** and **AE** = **w**.
Express the following vectors in terms of **v** and **w:**
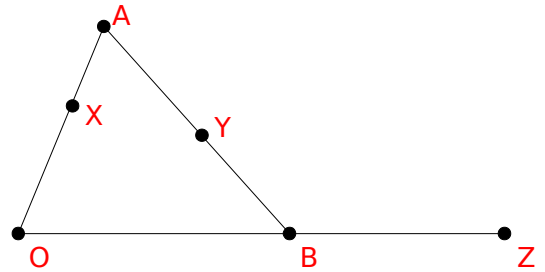(a) **AB** (b) **AC** (c) **DE** and (d) **BC**

What can you deduce about BC and DE?
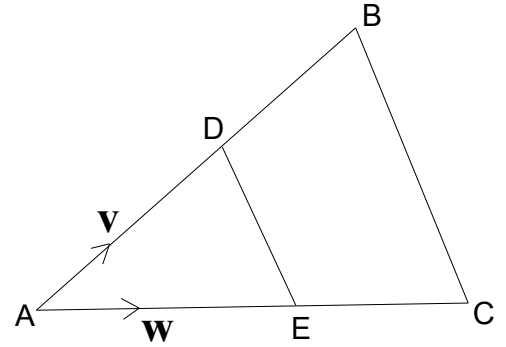
2) In the diagram, X is the point on OA such that OX = 2XA, Y is the midpoint of AB and B is the midpoint of OZ. **OA** = **a** and **OB** = **b**.
Express **OX, OY, OZ, XY** and **YZ** in terms of **a** and **b**.
What can you deduce about the point X, Y and Z?

3) On a coordinate system with origin at O, $\overrightarrow{OA} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$
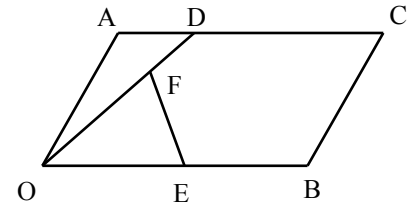
(a) Find the magnitude of $\overrightarrow{OA}$
(b) C is the point (1,3), and $\overrightarrow{CB} = \overrightarrow{OA}$. Find the coordinates of B.
(c) Write $\overrightarrow{AC}$ as a column vector, and find $|\overrightarrow{AC}|$
(d) What shape is OABC?

4) In this diagram, OACB is a parallelogram. $\overrightarrow{OA}$ = **a** , $\overrightarrow{OB}$ = **b**
E is the midpoint of OB, AD = $\frac{1}{4}$ AC, and OF:OD = 2:3.

Express the following vectors in terms of **a** and **b** :

(a) $\overrightarrow{AC}$ (b) $\overrightarrow{OE}$ (c) $\overrightarrow{OD}$ (d) $\overrightarrow{OF}$ (e) $\overrightarrow{AF}$ (f) $\overrightarrow{FE}$
(g) Explain why your answers to (e) and (f) demonstrate that A, F and E lie in a straight line.
(h) What is the ratio AF:FE ?

5) In the diagram on the right,
$\overrightarrow{OA} = a$ and $\overrightarrow{OB} = b$, P is the midpoint of OB, and AQ:QB = 1:2
(a) Express $\overrightarrow{AB}$ in terms of **a** and/or **b**.
(b) Express $\overrightarrow{PQ}$ in terms of **a** and/or **b**.
(c) OA is extended to a point R, such that OA:OR=1:4.
    Express $\overrightarrow{BR}$ in terms of **a** and/or **b**.
(d) What two facts can you deduce by comparing your answers to (b) and (c)
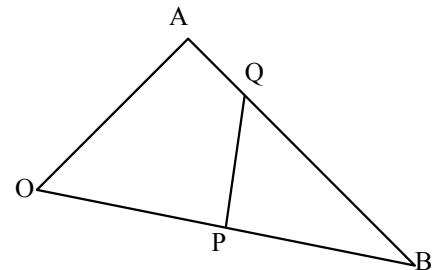
6) In this diagram, A divides OC in the ratio 1:2 and E divides BC in the ratio 1:3. OF = 3OB. **OA** = **a** and **OB** = **b**.

Express in terms of A and B the vectors:
(a) **BC**   (b) **BE**   (c) **AB**   (d) **AE**   (e) **EF**   (f) **CF**

State what you can deduce about:
(g) the lines AB and CF   (h) the points A, E and F
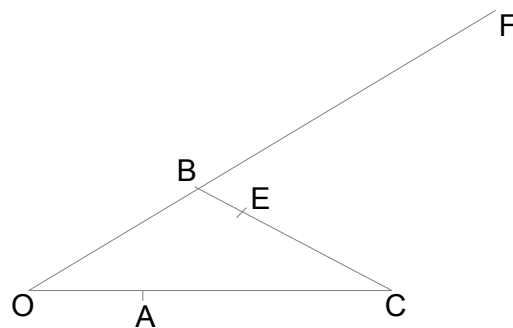
7) Draw triangle ABC. Mark M and N as the midpoints of BC and AC respectively. Draw AM and BN, and extend BN to D such that BD:BN = 4:3. **AB** = **p** and **BM** = **q**. Express **AM, AC, NC, NB, DB** and **DC** in terms of **p** and **q**. What can you deduce about AM and DC? What is the ratio AM:DC?