Name:	Teacher Assessment		Topic 36 - H Vectors
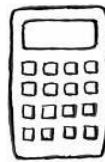
Section A	**Finding Vectors**	**Grade A / A***

1. *PQRSTU* is a regular hexagon and *O* is the centre of the hexagon.

$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$
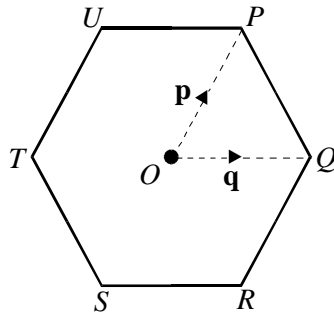
Express each of the following vectors in terms of **p** and **q**

(a) $\overrightarrow{PQ}$

....

Answer ....

(1)

(b) $\overrightarrow{SP}$

....

Answer ....

(1)

(c) $\overrightarrow{SQ}$

....

Answer ....
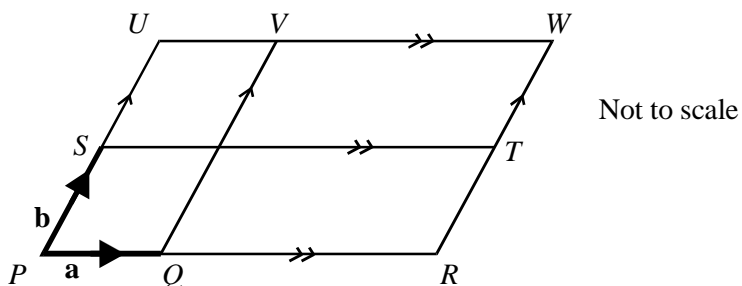
(2)
(Total 4 marks)

2.   The diagram shows two sets of parallel lines.

Vector $\overrightarrow{PQ} = \mathbf{a}$ and vector $\overrightarrow{PS} = \mathbf{b}$

$\overrightarrow{PR} = 3\overrightarrow{PQ}$ and $\overrightarrow{PU} = 2\overrightarrow{PS}$

Not to scale

(a)   Write the vector $\overrightarrow{PV}$ in terms of $\mathbf{a}$ and $\mathbf{b}$

....

Answer ....

(1)

(b)   Write the vector $\overrightarrow{RU}$ in terms of $\mathbf{a}$ and $\mathbf{b}$

....

Answer ....

(1)

(c)   Find **two** vectors that can be written as $3\mathbf{a} - \mathbf{b}$

....

Answer .... and ....

(2)
(Total 4 marks)

3. *ABCDEF* is a regular hexagon with centre *O*.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{AB} = \mathbf{b}$

Diagram drawn accurately
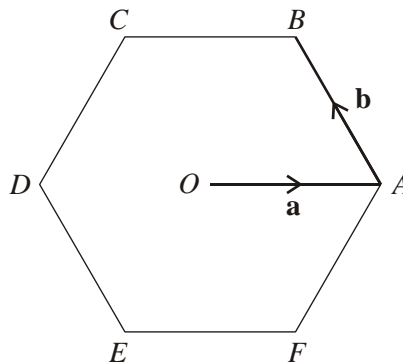
(a) Find expressions, in terms of **a** and **b**, for

(i) $\overrightarrow{OB}$

Answer ....

(1)

(ii) $\overrightarrow{AC}$

Answer ....

(1)

(iii) $\overrightarrow{EC}$

Answer ....

(1)

(b) The positions of points *P* and *Q* are given by the vectors

$\overrightarrow{OP} = \mathbf{a} - \mathbf{b}$ $\qquad\qquad\qquad$ $\overrightarrow{OQ} = \mathbf{a} + 2\mathbf{b}$

(i) Draw and label the positions of points *P* and *Q* on the diagram.

(2)

(ii) Hence, or otherwise, deduce an expression for $\overrightarrow{PQ}$.

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....

Answer ....

(1)
(Total 6 marks)

4. In the diagram *OACD, OADB* and *ODEB* are parallelograms.

$\overrightarrow{OA} = $ a and $\overrightarrow{OB} = $ b
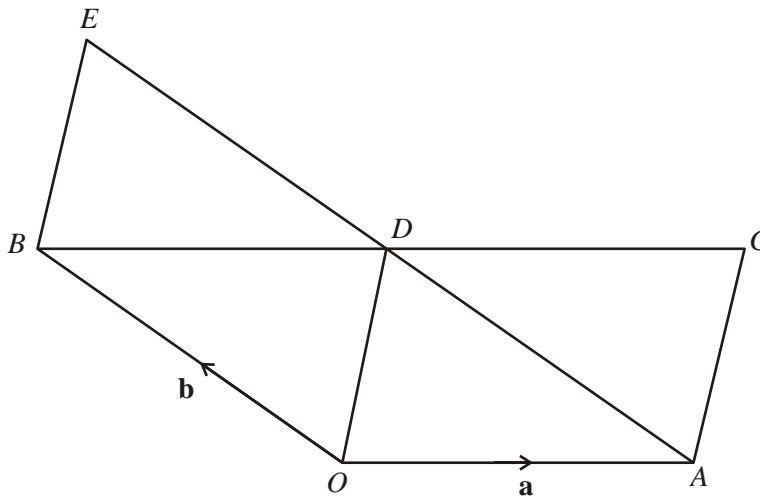
(a) Express, in terms of **a** and **b**, the following vectors.
Give your answers in their simplest form.

(i) $\overrightarrow{OD}$

Answer...

(1)

(ii) $\overrightarrow{OC}$

Answer...

(1)

(iii) $\overrightarrow{AB}$

....

Answer...

(1)

(b) The point *F* is such that *OCFE* is a parallelogram.

Write the vector $\overrightarrow{CF}$ in terms of **a** and **b**.

....

....

Answer...

(2)

(c) What geometrical relationship is there between the points *O, D* and *F*? Justify your answer.

....

....

....

(2)
(Total 7 marks)

5. In the diagram $\overrightarrow{OP} = 4\mathbf{a}$, $\overrightarrow{PA} = \mathbf{a}$, $\overrightarrow{OB} = 5\mathbf{b}$, $\overrightarrow{BR} = 3\mathbf{b}$ and $\overrightarrow{AQ} = \frac{2}{5}\overrightarrow{AB}$
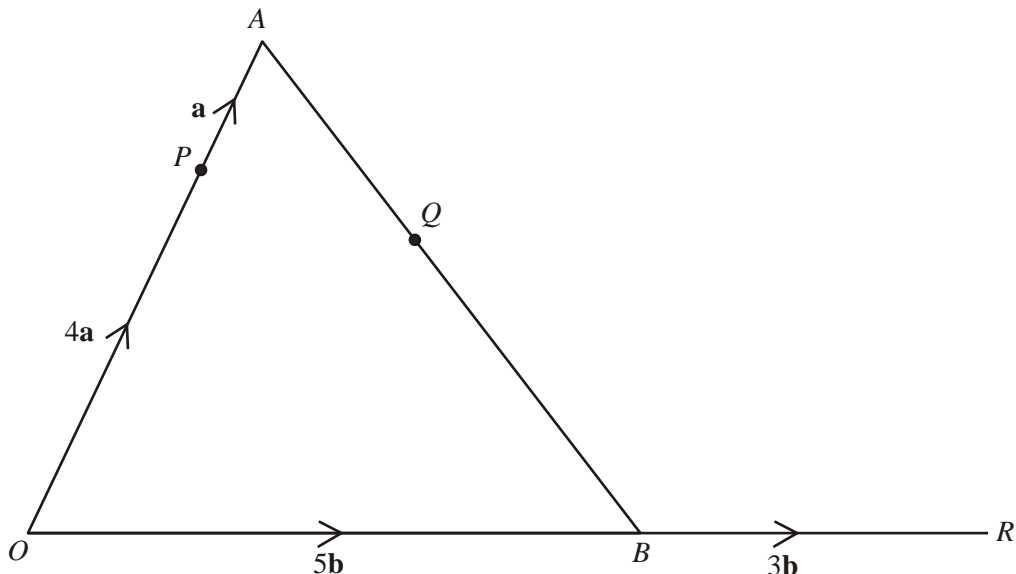
Not drawn accurately

(a) Find, in terms of **a** and **b**, simplifying your answers,

(i) $\overrightarrow{AB}$

....

....

Answer ……………………………………………………

(1)

(ii) $\overrightarrow{PQ}$

....

....

....

Answer ……………………………………………………

(2)

(b) Show clearly that points *P, Q* and *R* lie on a straight line.

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(3)
(Total 6 marks)

6.   *OAB* is a triangle.
  X is the midpoint of *AB*.
  Y is the midpoint of *OB*.
  Z is the point on *OX* such that *OZ* : *ZX* = 2 : 1

  $\overrightarrow{OA}$ = 3**a**, $\overrightarrow{OB}$ = 3**b**

3**a**

3**b**

O

Y

Z

A

X

B
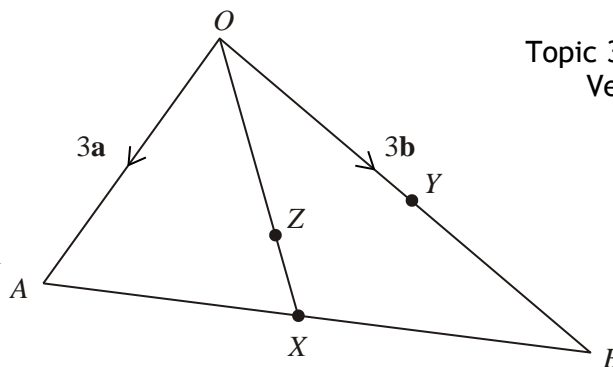
(a)   Find, in terms of **a** and **b**, the vectors

(i) $\overrightarrow{AY}$

....

....

Answer ....

(1)

(ii) $\overrightarrow{OX}$

....

....

....

Answer ....

(2)

(iii) $\overrightarrow{AZ}$

....

....

....

Answer ....

(2)

(b)   *A*, *Z* and *Y* are on a straight line.

Find the ratio   *AZ* : *ZY*

....

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....

....

Answer ....

(2)(Total 7 marks)

7. $\overrightarrow{OP} = -4\mathbf{a} + 5\mathbf{b}$ and $\overrightarrow{OQ} = 5\mathbf{a} - \mathbf{b}$.

P

$-4\mathbf{a} + 5\mathbf{b}$

O

$5\mathbf{a} - \mathbf{b}$

Q
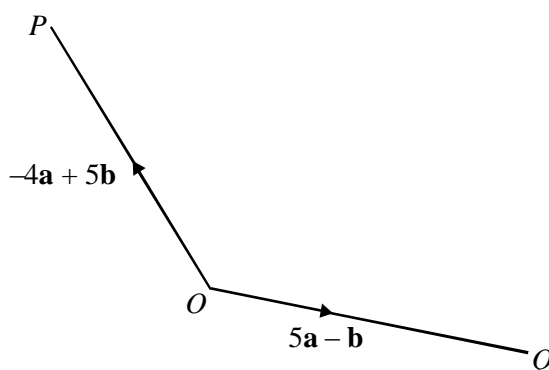
R is a point on $\overrightarrow{PQ}$ such that $PR : RQ = 1 : 2$.

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

....

....

....

....

Answer ....

(3)

(b) $\overrightarrow{PS} = \mathbf{a} + 4\mathbf{b}$

Express $\overrightarrow{OS}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.

....

....

Answer ....

(2)

(c)   What **two** facts do $\overrightarrow{OR}$ and $\overrightarrow{OS}$ indicate about the points O, R and S?

Give a reason for each of your answers.

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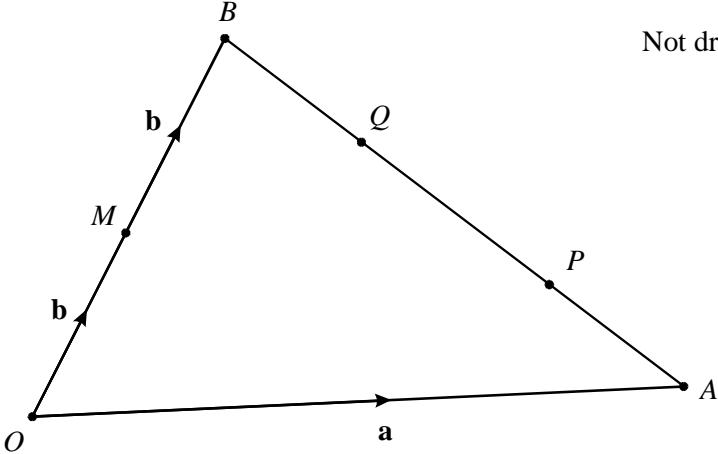
(2)
(Total 7 marks)

Not drawn accurately

8.

OAB is a triangle where *M* is the mid-point of *OB*.

P and *Q* are points on *AB* such that $AP = PQ = QB$.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = 2\mathbf{b}$

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

(i) $\overrightarrow{BA}$

....

....

Answer ....

(1)

(ii) $\overrightarrow{MQ}$

....

....

Answer ....

(2)

(iii) $\overrightarrow{OP}$

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....

....

Answer ....

(2)

(b)   What can you deduce about quadrilateral *OMQP*?
Give a reason for your answer.

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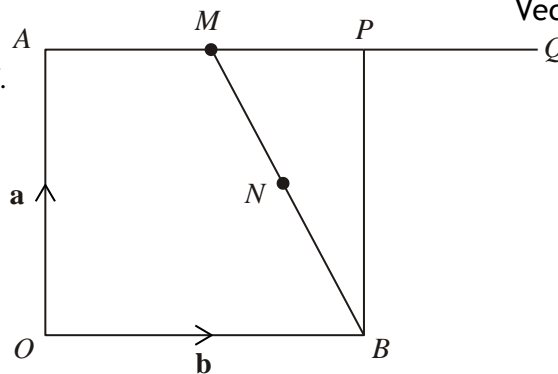
(2)(Total 7 marks)

9. The diagram shows a square *OAPB*.
M is the mid-point of *AP*. *N* is the mid-point of *BM*.

AP is extended to *Q* where $AQ = 1\frac{1}{2} AP$

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

Not drawn accurately

(a) Write these vectors in terms of **a** and **b**.
Give your answers in their simplest form.

(i) $\overrightarrow{OQ}$

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……………………………………………………………………………………

Answer ……………………………………………………………

(1)

(ii) $\overrightarrow{BM}$

……………………………………………………………………………………

……………………………………………………………………………………

Answer ……………………………………………………………

(1)

(iii) $\overrightarrow{BN}$

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……………………………………………………………………………………

Answer ……………………………………………………………

(1)

(iv) $\overrightarrow{ON}$

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……………………………………………………………………………………

Answer ……………………………………………………………

(2)

(b) What can you deduce about points *O*, *N* and *Q*?
Give a reason for your answer.

………………………………………………………………………………………

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(2)(Total 7 marks)

10. *OPQR* is a parallelogram.
M is the mid-point of the diagonal *OQ*.

$\overrightarrow{OP} = 2\mathbf{p}$ and $\overrightarrow{OR} = 2\mathbf{r}$
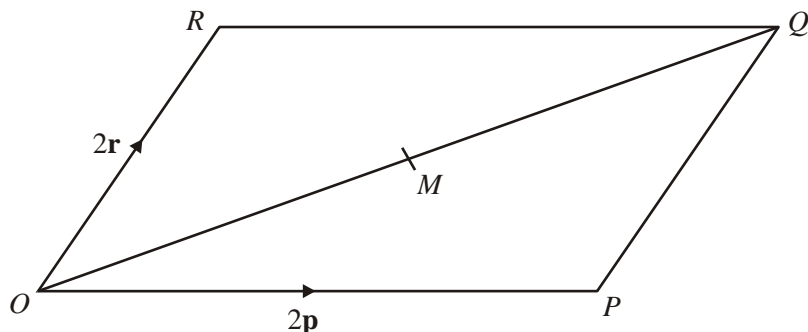
(a) Express $\overrightarrow{OM}$ in terms of **p** and **r**.

....

....

Answer $\overrightarrow{OM}$ = …………………………………..

(1)

(b) Use vectors to prove that M is also the mid-point of *PR*.

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(3)
(Total 4 marks)

11. *OACB* is a parallelogram and *M* is the mid-point of *BC*.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$

Not drawn accurately
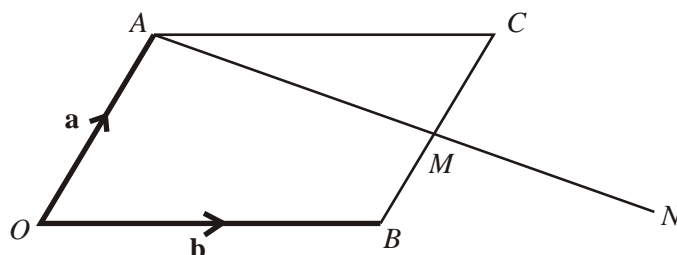
(a)   Express the following vectors in terms of **a** and **b**

(i) $\overrightarrow{BA}$

Answer ....

(1)

(ii) $\overrightarrow{AM}$

Answer ....

(1)

(b)   *AM* is extended to *N*, where $\overrightarrow{AN} = 2\overrightarrow{AM}$.

Show that $\overrightarrow{BN} = \mathbf{b}$

....

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....

(2)

(c)   What does this tell you about the position of *N*?

....

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....

(1)
(Total 5 marks)

12. In triangle *ABC*, *M* is the mid-point of *BC*.

$\overrightarrow{AB} = \mathbf{s}$ and $\overrightarrow{AC} = \mathbf{t}$
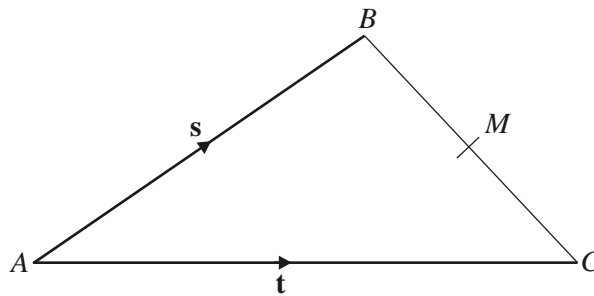
(a) Find $\overrightarrow{AM}$ in terms of **s** and **t.**
Give your answer in its simplest form.

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....

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....

....

Answer ....

(3)

(b) $\overrightarrow{AD} = \mathbf{s} + \mathbf{t}$
The length of *AB* is **not** equal to the length of *AC*.

(i) Write down the name of the shape *ABDC*.

Answer ....

(1)

(ii) Write down one fact about the points *A*, *M* and *D*.
Explain your answer.

Fact ....

Explanation ....

....

(2)
(Total 6 marks)

Success:

Target: