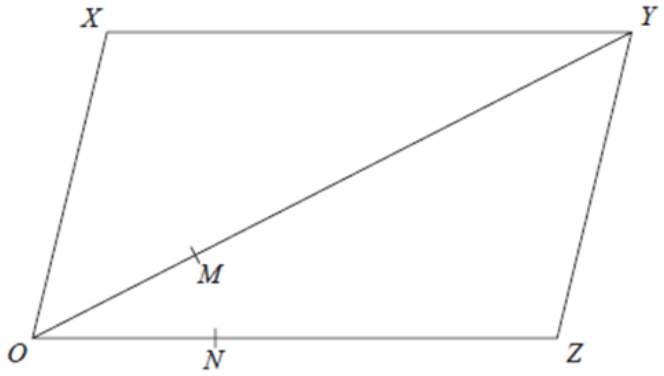
ELIJAH MATHS
GCSE and A Level Maths

VECTORS

QUESTION 1

$OXYZ$ is a parallelogram.



$\overrightarrow{OY} = \mathbf{a}$ and $\overrightarrow{OZ} = \mathbf{b}$

M is the point on OY such that $OM : MY = 1 : 4$
N is the point on OZ such that $ON : NZ = 1 : 3$

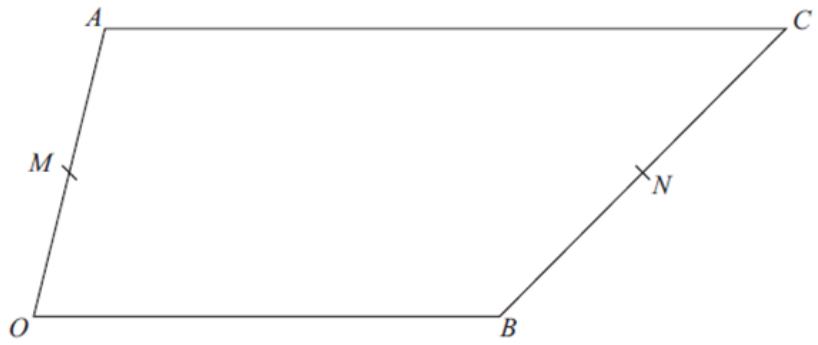
Work out the ratio $XN : MN$
You must show all your working.

.....

(4 marks)

QUESTION 2

The diagram shows quadrilateral $OACB$.



M is the midpoint of OA.
N is the point on BC such that $BN : NC = 5 : 6$

$\vec{OA} = \mathbf{a}$ $\vec{OB} = \mathbf{b}$ $\vec{AC} = k\mathbf{b}$ where k is a positive integer.

(a) Express $\vec{MN}$ in terms of k, **a** and **b**.
Give your answer in its simplest form.

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Give your answer in its simplest form.

.....

(4)

(b) Is MN parallel to OB?
Give a reason for your answer.

.....

.....

.....

(1)

Question 3

OAB is a triangle.

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

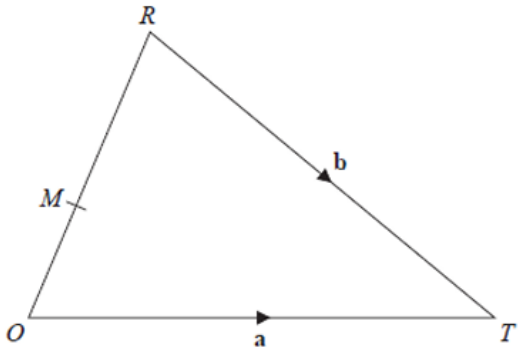
The point C lies on OA such that $OC : CA = 1 : 2$
The point D lies on OB such that $OD : DB = 1 : 2$

Using a vector method, prove that $ABDC$ is a trapezium.

(4)

Question 4

ORT is a triangle.



$\overrightarrow{OT} = \mathbf{a}$ $\overrightarrow{RT} = \mathbf{b}$

M is the point on OR such that $OM : MR = 3 : 4$

Express $\overrightarrow{MT}$ in terms of **a** and **b**.
Give your answer in its simplest form.

(4)

Question 5

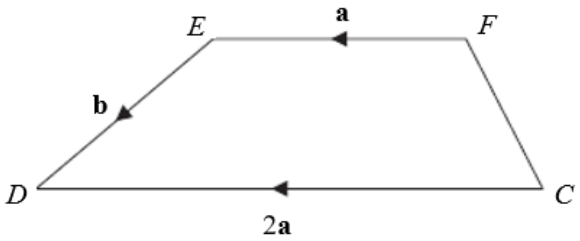
Given that the vector $p\begin{pmatrix}3\\5\end{pmatrix} + q\begin{pmatrix}4\\8\end{pmatrix}$ is parallel to the vector $\begin{pmatrix}26\\50\end{pmatrix}$

find an expression for q in terms of p.

.....(3)

Question 6

$CDEF$ is a quadrilateral.



$\overrightarrow{FE} = \mathbf{a}$ $\overrightarrow{ED} = \mathbf{b}$ $\overrightarrow{CD} = 2\mathbf{a}$

The point P is such that CEP is a straight line and that $CE = EP$

Use a vector method to prove that CF is parallel to DP.

(4)

Question 7

A, B and C are three points such that

$$\overrightarrow{AB} = 4\mathbf{a} + 5\mathbf{b}$$
$$\overrightarrow{AC} = 12\mathbf{a} + 15\mathbf{b}$$

(a) Prove that A, B and C lie on a straight line.

(2)

D, E and F are three points on a straight line such that

$$\overrightarrow{DE} = 2\mathbf{d} + 5\mathbf{e}$$
$$\overrightarrow{EF} = -9\mathbf{d} - 22.5\mathbf{e}$$

(b) Find the ratio

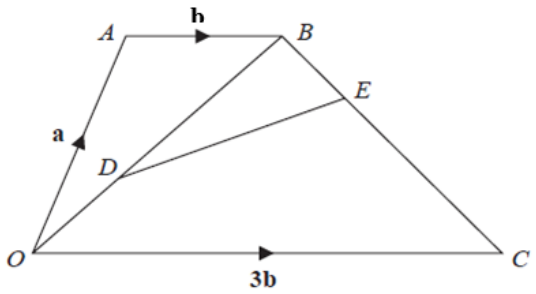
length of DF : length of DE

.....

(3)

Question 8

$OABC$ is a trapezium.



$\overrightarrow{OA} = \mathbf{a}$

$\overrightarrow{AB} = \mathbf{b}$

$\overrightarrow{OC} = 3\mathbf{b}$

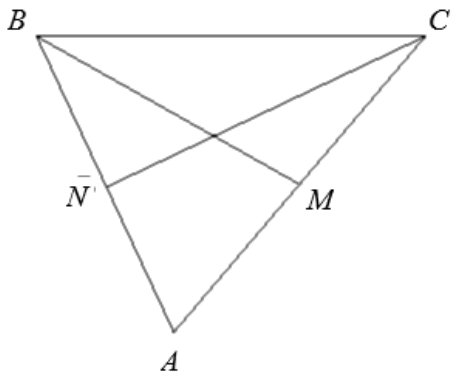
D is the point on OB such that $OD : DB = 3 : 4$
E is the point on BC such that $BE : EC = 2 : 5$

Work out the vector $\overrightarrow{DE}$ in terms of **a** and **b**.
Give your answer in its simplest form.

.....(4)

QUESTION 9

ABC is a triangle.



M is the midpoint of CA.
N is the midpoint of AB.

$\overrightarrow{CA} = \mathbf{a}$ and $\overrightarrow{CB} = \mathbf{b}$

Use a vector method to prove that MN is parallel to CB.

(4)