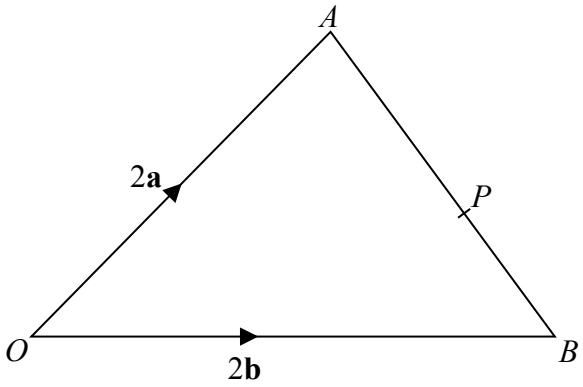
1



OAB is a triangle.
P is the point on AB such that $AP : PB = 5 : 3$

$\overrightarrow{OA} = 2\mathbf{a}$

$\overrightarrow{OB} = 2\mathbf{b}$

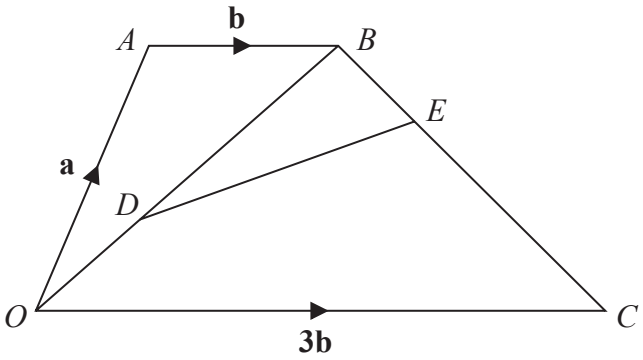
$\overrightarrow{OP} = k(3\mathbf{a} + 5\mathbf{b})$ where k is a scalar quantity.

Find the value of k.

.....

(Total for Question 1 is 4 marks)

2 $OABC$ is a trapezium.



$\overrightarrow{OA} = \mathbf{a}$
$\overrightarrow{AB} = \mathbf{b}$
$\overrightarrow{OC} = \mathbf{3b}$

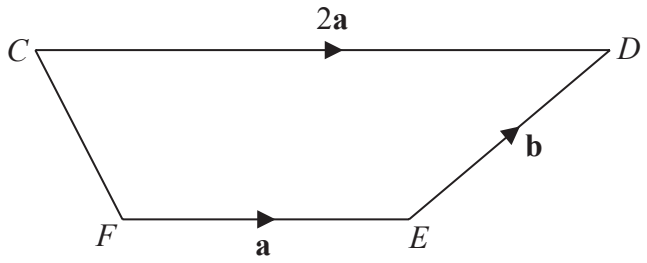
D is the point on OB such that $OD : DB = 2 : 3$
E is the point on BC such that $BE : EC = 1 : 4$

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

.....

(Total for Question 2 is 4 marks)

3 *CDEF* is a quadrilateral.



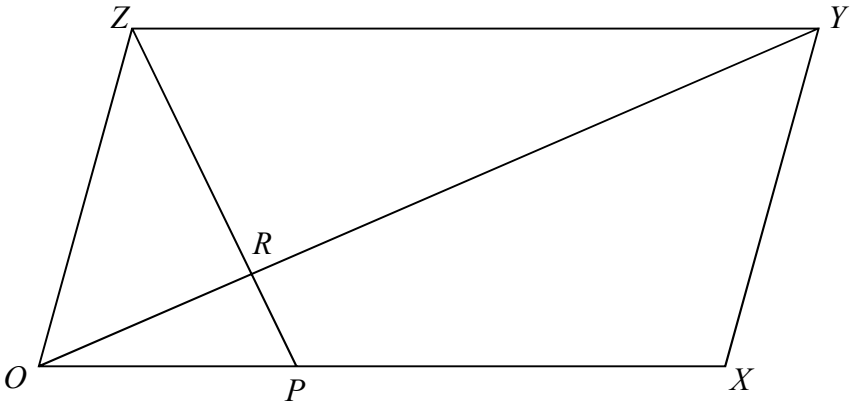
$\overrightarrow{FE} = \mathbf{a}$ $\overrightarrow{ED} = \mathbf{b}$ $\overrightarrow{CD} = 2\mathbf{a}$

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.

(Total for Question 3 is 4 marks)

4 $OXYZ$ is a parallelogram.



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

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

P is the point on OX such that $OP : PX = 1 : 2$
R is the point on OY such that $OR : RY = 1 : 3$

Work out, in its simplest form, the ratio $ZP : ZR$
You must show all your working.

.....

(Total for Question 4 is 5 marks)

5

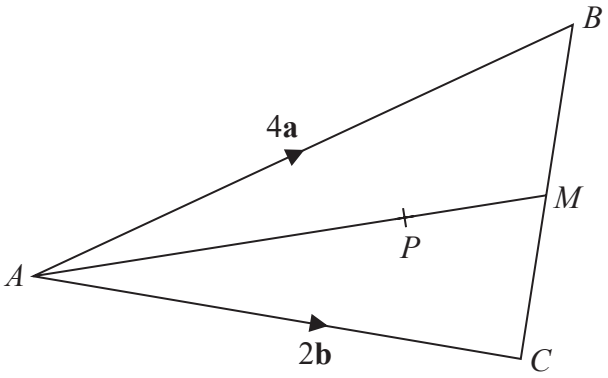


Diagram **NOT** accurately drawn

ABC is a triangle.
The midpoint of BC is M.
P is a point on AM.

$\overrightarrow{AB} = 4\mathbf{a}$

$\overrightarrow{AC} = 2\mathbf{b}$

$\overrightarrow{AP} = \frac{3}{2}\mathbf{a} + \frac{3}{4}\mathbf{b}$

Find the ratio $AP : PM$

.....

(Total for Question 5 is 3 marks)

6 OAB is a triangle.

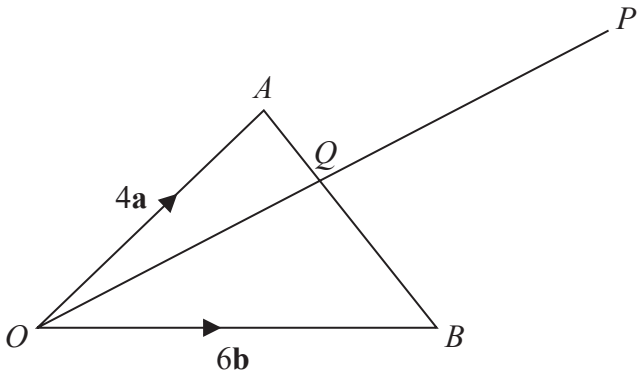
$\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$

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.

(Total for Question 6 is 3 marks)

7



OAB is a triangle.
Q is the point on AB such that OQP is a straight line.

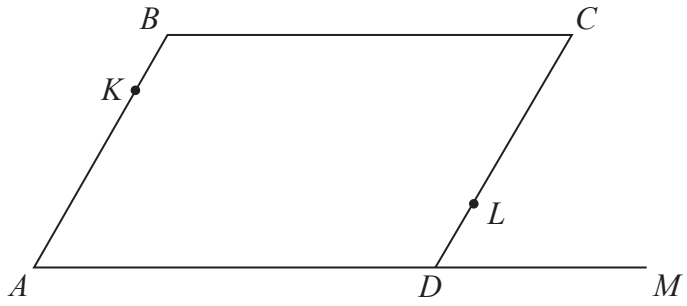
$\overrightarrow{OA} = 4\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$ $\overrightarrow{AP} = 2\mathbf{a} + 8\mathbf{b}$

Using a vector method, find the ratio $AQ : QB$

$AQ : QB =$ .....

(Total for Question 7 is 5 marks)

8 $ABCD$ is a parallelogram and ADM is a straight line.



$\overrightarrow{AB} = \mathbf{a}$ $\overrightarrow{BC} = \mathbf{b}$ $\overrightarrow{DM} = \frac{1}{2}\mathbf{b}$

K is the point on AB such that $AK : AB = \lambda : 1$
L is the point on CD such that $CL : CD = \mu : 1$
KLM is a straight line.

Given that $\lambda : \mu = 1 : 2$

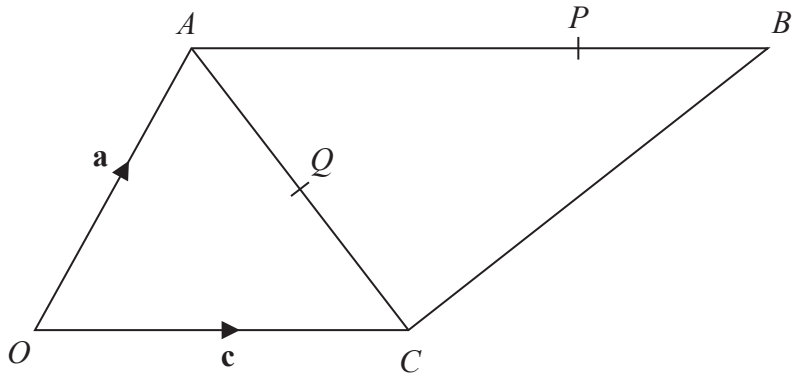
use a vector method to find the value of λ and the value of μ

$\lambda =$ .....

$\mu =$ .....

(Total for Question 8 is 5 marks)

9



$\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OC} = \mathbf{c}$ $\overrightarrow{AB} = 2\mathbf{c}$

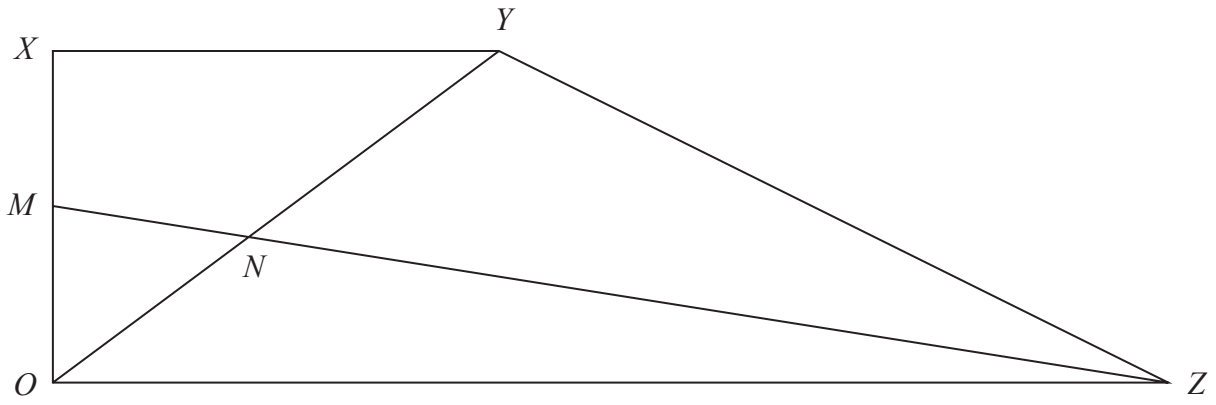
P is the point on AB such that $AP : PB = 3 : 1$
Q is the point on AC such that OQP is a straight line.

Use a vector method to find $AQ : QC$
Show your working clearly.

$AQ : QC =$ .....

(Total for Question 9 is 5 marks)

10 $OXYZ$ is a trapezium.



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

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

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

M is the midpoint of OX
N is the point such that MNZ and ONY are straight lines.

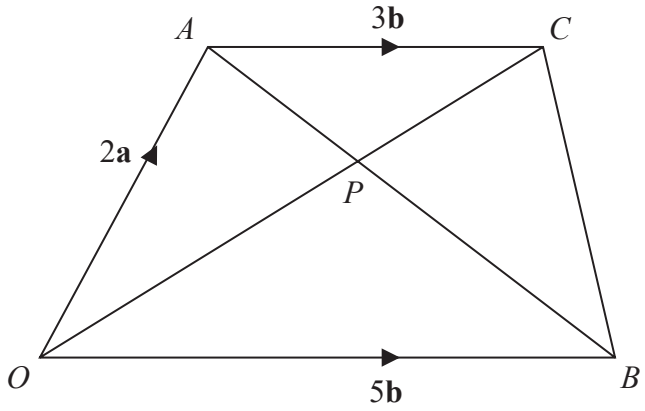
Given that $ON : OY = \lambda : 1$

use a vector method to find the value of λ

$\lambda =$ .....

(Total for Question 10 is 5 marks)

11 *OACB* is a trapezium.



$\overrightarrow{OA} = 2\mathbf{a}$ $\overrightarrow{OB} = 5\mathbf{b}$ $\overrightarrow{AC} = 3\mathbf{b}$

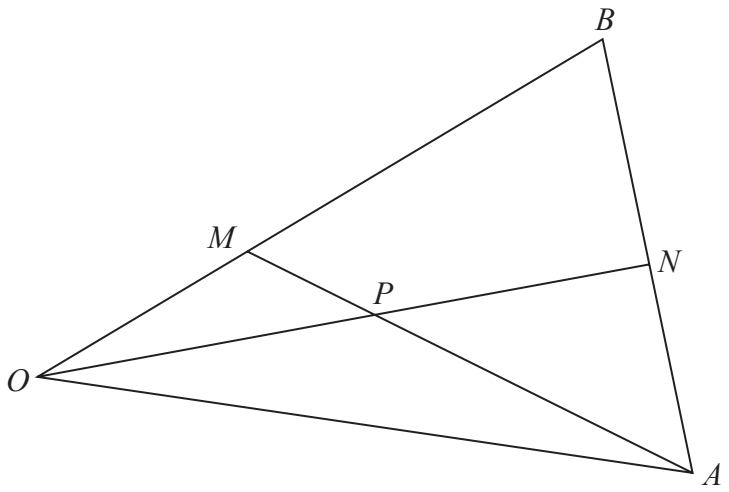
The diagonals, *OC* and *AB*, of the trapezium intersect at the point *P*.

Find and simplify an expression, in terms of **a** and **b**, for $\overrightarrow{OP}$
Show your working clearly.

$\overrightarrow{OP}$ = ...

(Total for Question 11 is 5 marks)

12 The diagram shows triangle OAB



$\overrightarrow{OA} = 8\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$

M is the point on OB such that $OM : MB = 1 : 2$
N is the midpoint of AB
P is the point of intersection of ON and AM

Using a vector method, find $\overrightarrow{OP}$ as a simplified expression in terms of **a** and **b**
Show your working clearly.

$\overrightarrow{OP}$ = ...

(Total for Question 12 is 5 marks)

13 OAB is a triangle.

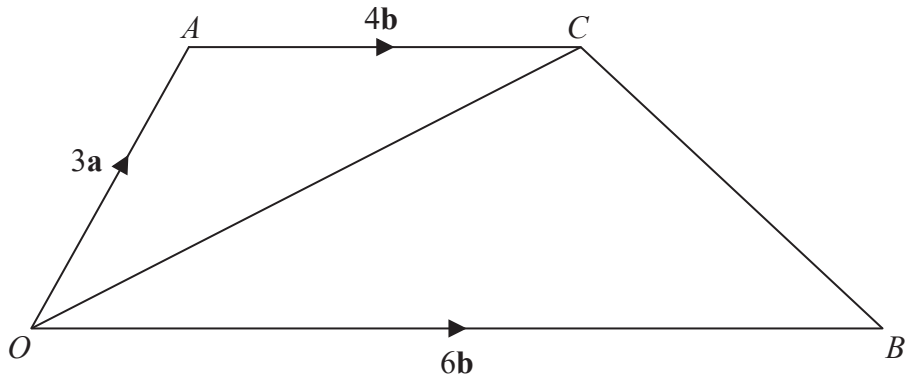
$\overrightarrow{OA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$

C is the midpoint of OA.
D is the point on AB such that $AD : DB = 3 : 1$
E is the point such that $\overrightarrow{OB} = 2\overrightarrow{BE}$

Using a vector method, prove that the points C, D and E lie on the same straight line.

(Total for Question 13 is 5 marks)

14 The diagram shows trapezium $OACB$.



$\overrightarrow{OA} = 3\mathbf{a}$ $\overrightarrow{OB} = 6\mathbf{b}$ $\overrightarrow{AC} = 4\mathbf{b}$

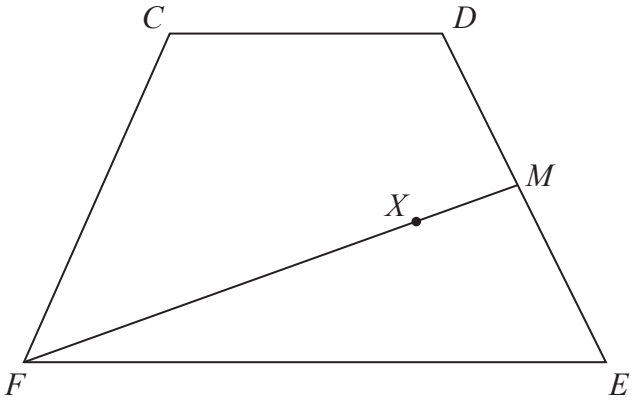
N is the point on OC such that ANB is a straight line.

Find $\overrightarrow{ON}$ as a simplified expression in terms of **a** and **b**.

.....

(Total for Question 14 is 5 marks)

15 *CDEF* is a quadrilateral.



$\overrightarrow{CD} = \mathbf{a}$, $\overrightarrow{DE} = \mathbf{b}$ and $\overrightarrow{FC} = \mathbf{a} - \mathbf{b}$.

(a) Express $\overrightarrow{FE}$ in terms of **a** and/or **b**.
Give your answer in its simplest form.

.....

(2)

M is the midpoint of *DE*.
X is the point on *FM* such that $FX : XM = n : 1$
CXE is a straight line.

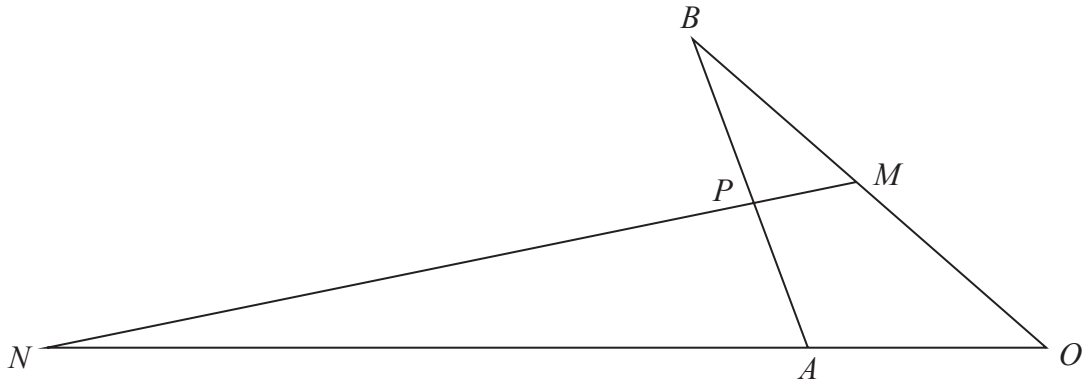
(b) Work out the value of *n*.

$n =$ .....

(4)

(Total for Question 15 is 6 marks)

16



OAN, *OMB*, *APB* and *MPN* are straight lines.

$OA : AN = 1 : 4$

$OM : MB = 1 : 1$

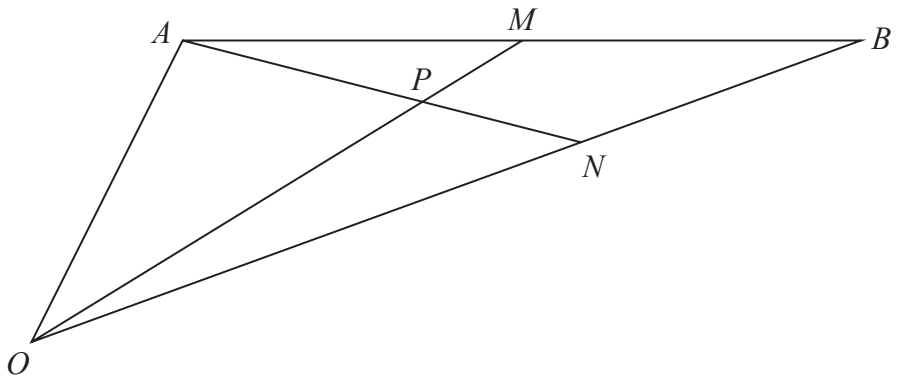
$\overrightarrow{OA} = 2\mathbf{a}$ $\overrightarrow{OB} = 2\mathbf{b}$

By using a vector method, find the ratio $AP : PB$
Give your answer in its simplest form.

.....

(Total for Question 16 is 5 marks)

17 OAB is a triangle.



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

M is the midpoint of AB.
N is the point on OB such that $ON : NB = 2 : 1$

P is the point on AN such that OPM is a straight line.

Use a vector method to find $OP : PM$
Show your working clearly.

.....

(Total for Question 17 is 6 marks)