

1. June 2024 2H question 24

(KHDA APPROVED)

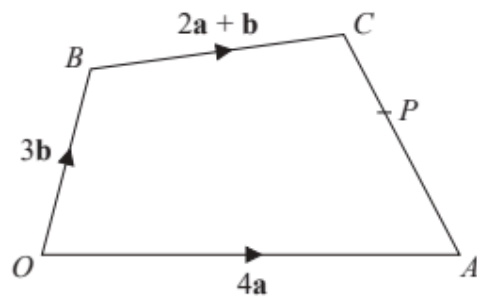


Diagram **NOT**  
accurately drawn

The diagram shows a quadrilateral  $OACB$  in which

$$\overrightarrow{OA} = 4\mathbf{a} \quad \overrightarrow{OB} = 3\mathbf{b} \quad \overrightarrow{BC} = 2\mathbf{a} + \mathbf{b}$$

- (a) Find  $\overrightarrow{AC}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Give your answer in its simplest form.

$$\overrightarrow{AC} = \dots\dots\dots$$

(2)

The point  $P$  lies on  $AC$  such that  $AP:PC = 3:2$

The point  $Q$  is such that  $OPQ$  and  $BCQ$  are straight lines.

- (b) Using a vector method, find  $\overrightarrow{OQ}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Give your answer in its simplest form.  
Show your working clearly.

$$\overrightarrow{OQ} = \dots\dots\dots (4)$$

2. June 2024 2HR question 25

$OPQR$  is a parallelogram.

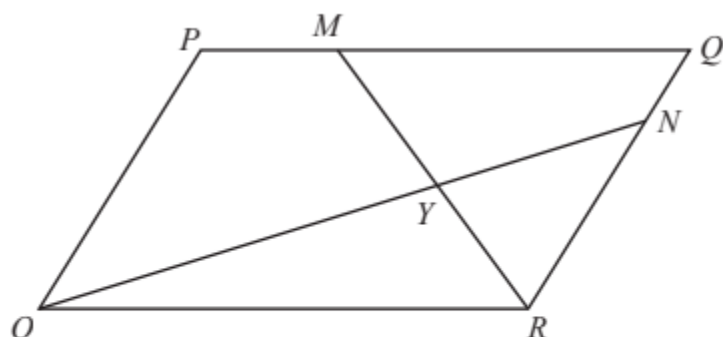


Diagram **NOT**  
accurately drawn

$$\overrightarrow{OP} = 2\mathbf{a} \quad \text{and} \quad \overrightarrow{OR} = 3\mathbf{b}$$

The point  $M$  lies on  $PQ$  such that  $PM = \frac{1}{4}PQ$

The point  $N$  lies on  $RQ$  such that  $RN = \frac{4}{5}RQ$

(a) Find, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , giving your answers in simplest form

(i)  $\overrightarrow{ON}$

.....  
(1)

(ii)  $\overrightarrow{MR}$

.....  
(1)

$MR$  and  $ON$  intersect at the point  $Y$

Given that

$$OY = k \times ON$$

(b) use a vector method to find the value of  $k$

3. Oct 2023 2H question 22

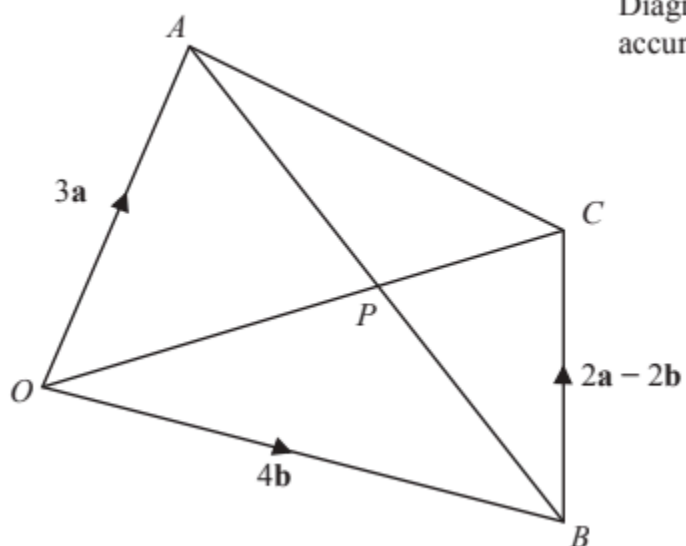


Diagram **NOT**  
accurately drawn

$OACB$  is a quadrilateral.

$$\overrightarrow{OA} = 3\mathbf{a} \quad \overrightarrow{OB} = 4\mathbf{b} \quad \overrightarrow{BC} = 2\mathbf{a} - 2\mathbf{b}$$

- (a) (i) Find the vector  $\overrightarrow{OC}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Simplify your answer.

$$\overrightarrow{OC} = \text{.....}$$

(1)

- (ii) Find the vector  $\overrightarrow{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$

$$\overrightarrow{AB} = \text{.....}$$

(1)

The point  $P$  lies on  $AB$  and on  $OC$

- (b) Using a vector method, find the ratio  $AP : PB$   
Show your working clearly.

---

(3)

4. June 2023 1H question 19

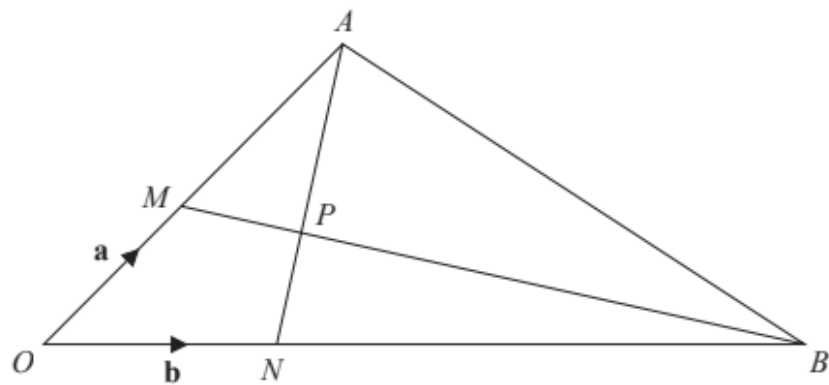


Diagram  
accurately d

$OMA$ ,  $ONB$ ,  $MPB$  and  $NPA$  are straight lines.

$M$  is the midpoint of  $OA$

$ON:NB = 1:5$

$$\vec{OM} = \mathbf{a} \quad \vec{ON} = \mathbf{b}$$

(a) Find in terms of  $\mathbf{a}$  and  $\mathbf{b}$  the vector  $\vec{AN}$

---

(1)

(b) Use a vector method to find the ratio  $AP:PN$

$$AP:PN = \text{.....}$$

(4)

5. June 2023 1hr question 19(5 marks)

The diagram shows a triangle  $ABC$  where  $A$ ,  $B$  and  $C$  represent the positions of three towns.

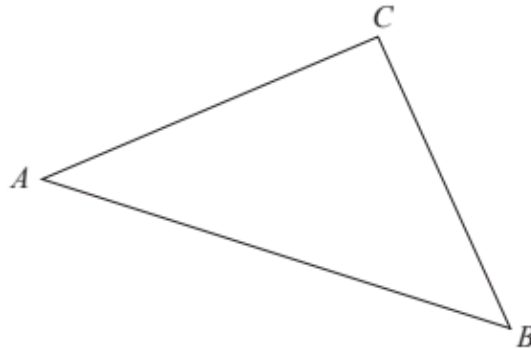


Diagram N  
accurately dra

$$\vec{AB} = \begin{pmatrix} 7 \\ -2 \end{pmatrix} \quad \vec{BC} = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$$

Pru travels directly from  $A$  to  $B$  and then directly from  $B$  to  $C$

Yang travels directly from  $A$  to  $C$

Given that the values for  $\vec{AB}$  and  $\vec{BC}$  are in kilometres,

work out how much further Pru travels than Yang travels.

Give your answer in km, correct to one decimal place.

..... km



6. Jan 2023 1H question 24(5 marks)

$OAED$  is a quadrilateral.

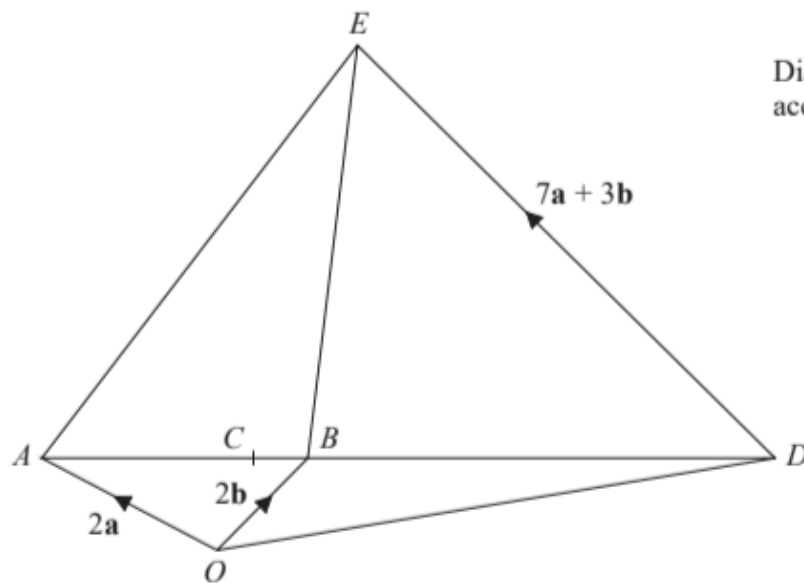


Diagram **NOT**  
accurately drawn

$$\vec{OA} = 2\mathbf{a} \quad \vec{OB} = 2\mathbf{b} \quad \vec{DE} = 7\mathbf{a} + 3\mathbf{b}$$

$$AB:BD = 1:2$$

The point  $C$  on  $AB$  is such that  $OCE$  is a straight line.

Use a vector method to find the ratio of  $OC:CE$

7. Jan 2023 1HR question 22

The diagram shows triangle  $OAB$  with  $OA$  extended to  $E$

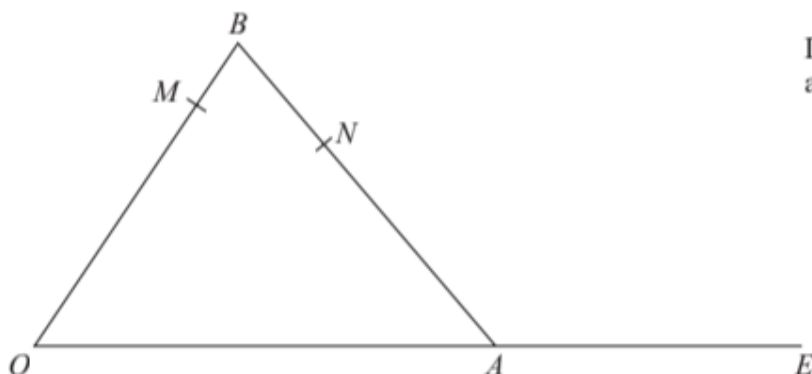


Diagram **NOT**  
accurately drawn

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

$M$  is the point on  $OB$  such that  $OM:MB = 4:1$

$N$  is the point on  $AB$  such that  $AN:NB = 3:2$

$$OA:AE = 5:3$$

- (a) Find an expression for  $\overrightarrow{ON}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Give your answer in its simplest form.

$$\overrightarrow{ON} = \dots\dots\dots (2)$$

(b) Use a vector method to show that  $MNE$  is a straight line.

(3)

---

8. Jan 2023 2HR question 16(2 marks)

Here are two vectors.

$$\vec{BA} = \begin{pmatrix} -5 \\ 4 \end{pmatrix} \quad \vec{BC} = \begin{pmatrix} 9 \\ 1 \end{pmatrix}$$

Find  $\vec{AC}$  as a column vector.

$$\vec{AC} = \begin{pmatrix} \phantom{0} \\ \phantom{0} \\ \phantom{0} \end{pmatrix}$$

9. Jan 2022 1H question 22(5 marks)

The diagram shows triangle  $OAB$

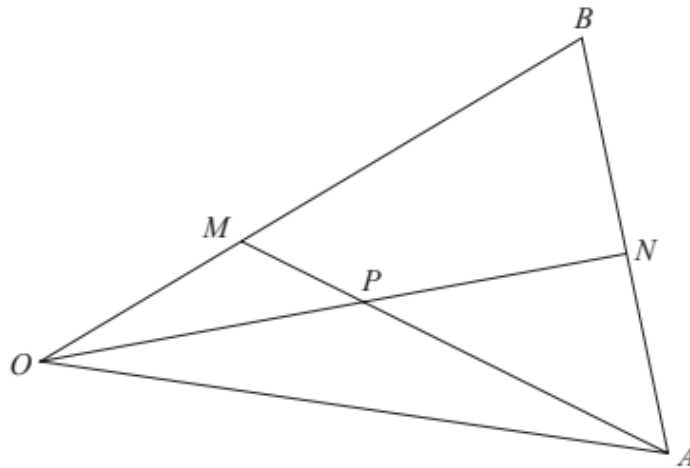


Diagram **NOT**  
accurately drawn

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

$M$  is the point on  $OB$  such that  $OM:MB = 1:2$

$N$  is the midpoint of  $AB$

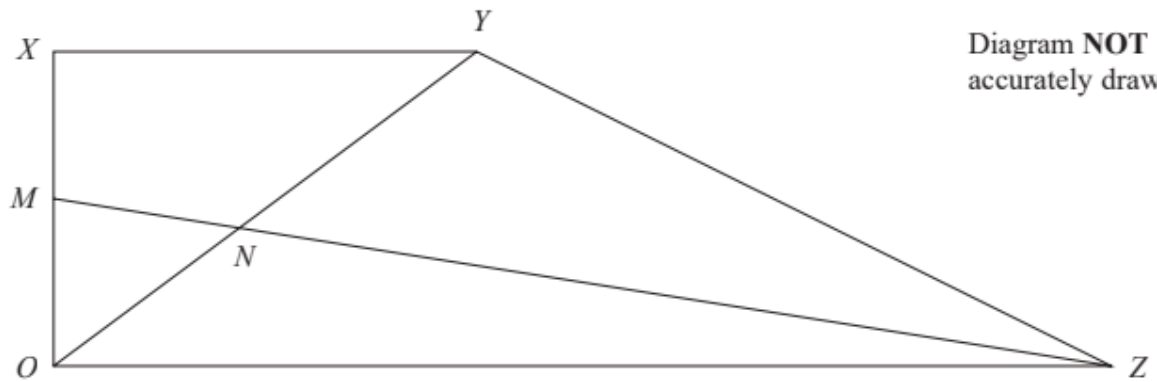
$P$  is the point of intersection of  $ON$  and  $AM$

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

$$\overrightarrow{OP} = \dots\dots\dots$$

10. Jan 2022 1HR question 24(5 marks)

$OXYZ$  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  $\lambda$

$$\lambda = \dots\dots\dots$$