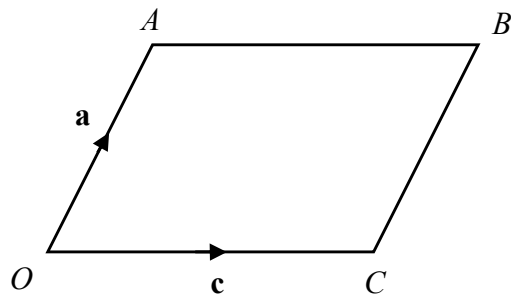


1



$OABC$ is a parallelogram.

$$\overrightarrow{OA} = \mathbf{a} \text{ and } \overrightarrow{OC} = \mathbf{c}$$

X is the midpoint of the line AC .

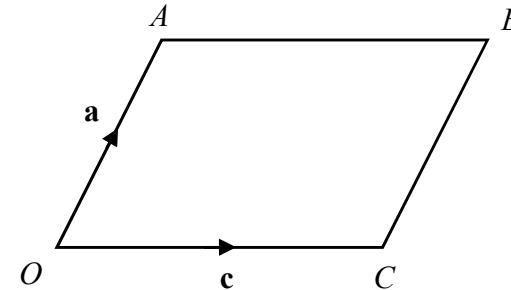
OCD is a straight line so that $OC : CD = k : 1$

Given that $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$ find the value of k .

$k =$

(Total for Question 1 is 4 marks)

1



$OABC$ is a parallelogram.

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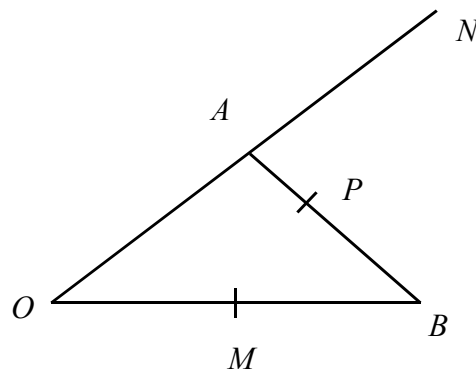
Given that $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$ find the value of k .

$k =$

(Total for Question 1 is 4 marks)



1



OAN , OMB and APB are straight lines.

$AN = 2OA$.

M is the midpoint of OB .

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

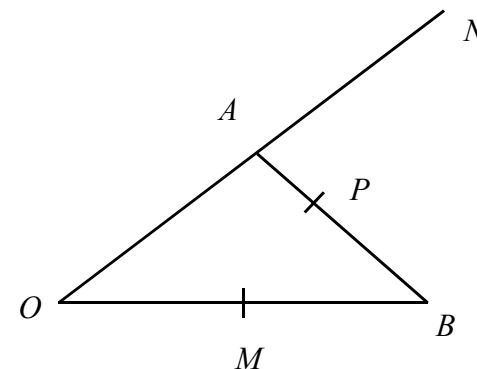
$$\overrightarrow{AP} = k\overrightarrow{AB} \text{ where } k \text{ is a scalar quantity.}$$

Given that MPN is a straight line, find the value of k .

(Total for Question 1 is 5 marks)



1



OAN , OMB and APB are straight lines.

$AN = 2OA$.

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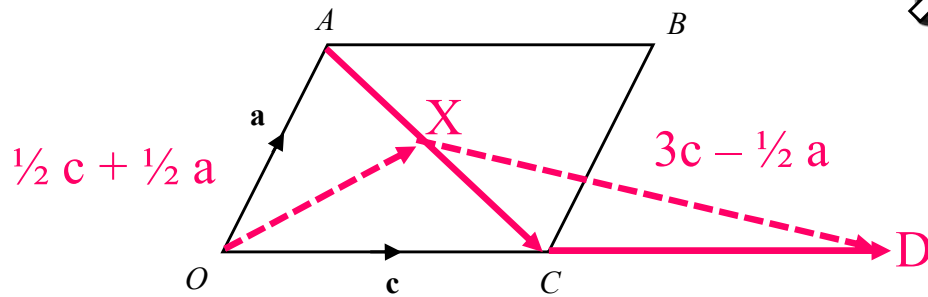
$$\overrightarrow{OA} = \mathbf{a} \quad \overrightarrow{OB} = \mathbf{b}$$

$$\overrightarrow{AP} = k\overrightarrow{AB} \text{ where } k \text{ is a scalar quantity.}$$

Given that MPN is a straight line, find the value of k .

(Total for Question 1 is 5 marks)

1



$OABC$ is a parallelogram.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$

X is the midpoint of the line AC .

OCD is a straight line so that $OC : CD = k : 1$

Given that $\overrightarrow{XD} = 3\mathbf{c} - \frac{1}{2}\mathbf{a}$ find the value of k .

$$\overrightarrow{AC} = \mathbf{c} - \mathbf{a} \quad \overrightarrow{AX} = \frac{1}{2}(\mathbf{c} - \mathbf{a}) = \frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a}$$

$$\overrightarrow{OX} = \mathbf{a} + (\frac{1}{2}\mathbf{c} - \frac{1}{2}\mathbf{a}) = \frac{1}{2}\mathbf{c} + \frac{1}{2}\mathbf{a}$$

$$\begin{aligned} \overrightarrow{OD} &= \overrightarrow{OX} + \overrightarrow{XD} = \frac{1}{2}\mathbf{c} + \frac{1}{2}\mathbf{a} + 3\mathbf{c} - \frac{1}{2}\mathbf{a} \\ &= 3\frac{1}{2}\mathbf{c} \end{aligned}$$

$$\overrightarrow{CD} = 2\frac{1}{2}\mathbf{c}$$

$$\begin{aligned} OC : CD \\ k : 1 \\ 1\mathbf{c} : 2\frac{1}{2}\mathbf{c} \end{aligned}$$

$$\begin{aligned} &1 : 2.5 \\ &\frac{1}{2.5} : 1 \quad (\div 2.5) \\ &\frac{10}{25} : 1 \\ &\frac{2}{5} : 1 \end{aligned}$$

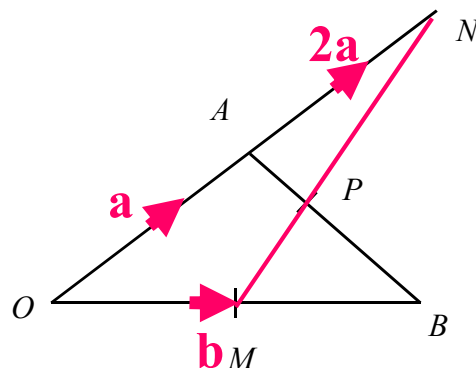
$$\frac{2}{5}$$

$$k = \dots\dots\dots$$

(Total for Question 1 is 4 marks)



1



OAN , OMB and APB are straight lines.
 $AN = 2OA$.
 M is the midpoint of OB .

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

$\overrightarrow{AP} = k\overrightarrow{AB}$ where k is a scalar quantity.

Given that MPN is a straight line, find the value of k .

$$\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$$

$$\overrightarrow{AP} = k(-\mathbf{a} + \mathbf{b})$$

$$\overrightarrow{NM} = -3\mathbf{a} + \frac{1}{2}\mathbf{b}$$

$$\overrightarrow{NP} = -2\mathbf{a} + k(-\mathbf{a} + \mathbf{b})$$

NPM is a straight line, so,

$$x \times \overrightarrow{NP} = \overrightarrow{NM}$$

$$k = \frac{2}{5}$$

$$x \times \overrightarrow{NP} = \overrightarrow{NM}$$

$$x(-2\mathbf{a} + k(-\mathbf{a} + \mathbf{b})) = -3\mathbf{a} + \frac{1}{2}\mathbf{b}$$

$$x(-2\mathbf{a} - k\mathbf{a} + k\mathbf{b}) = -3\mathbf{a} + \frac{1}{2}\mathbf{b}$$

$$-2x\mathbf{a} - kx\mathbf{a} + kx\mathbf{b} = -3\mathbf{a} + \frac{1}{2}\mathbf{b}$$

Split coefficients

$$\begin{matrix} \mathbf{a} \\ -2x - kx = -3 \end{matrix}$$

$$2x + kx = 3$$

Substitute to eliminate x

$$2\left(\frac{1}{2k}\right) + k\left(\frac{1}{2k}\right) = 3$$

$$\frac{2}{2k} + \frac{k}{2k} = 3$$

$$\frac{1}{k} + \frac{1}{2} = 3$$

$$\frac{1}{k} = 2.5 = \frac{5}{2}$$

$$k = \frac{2}{5}$$

$$\begin{matrix} \mathbf{b} \\ kx = \frac{1}{2} \\ x = \frac{1}{2k} \end{matrix}$$