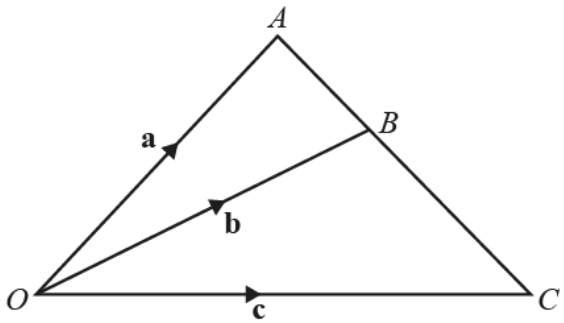
1. Nov/2021/Paper_12/No.7

(a)



The diagram shows triangle OAC, where $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = \mathbf{c}$. The point B lies on the line AC such that $AB:BC = m:n$, where m and n are constants.

(i) Write down $\overrightarrow{AB}$ in terms of **a** and **b**. [1]

(ii) Write down $\overrightarrow{BC}$ in terms of **b** and **c**. [1]

(iii) Hence show that $n\mathbf{a} + m\mathbf{c} = (m+n)\mathbf{b}$. [2]

(b) Given that $\lambda\begin{pmatrix}2\\1\end{pmatrix} + (\mu - 1)\begin{pmatrix}-4\\7\end{pmatrix} = (\lambda + 1)\begin{pmatrix}4\\-2\end{pmatrix}$, find the value of each of the constants λ and μ. [4]

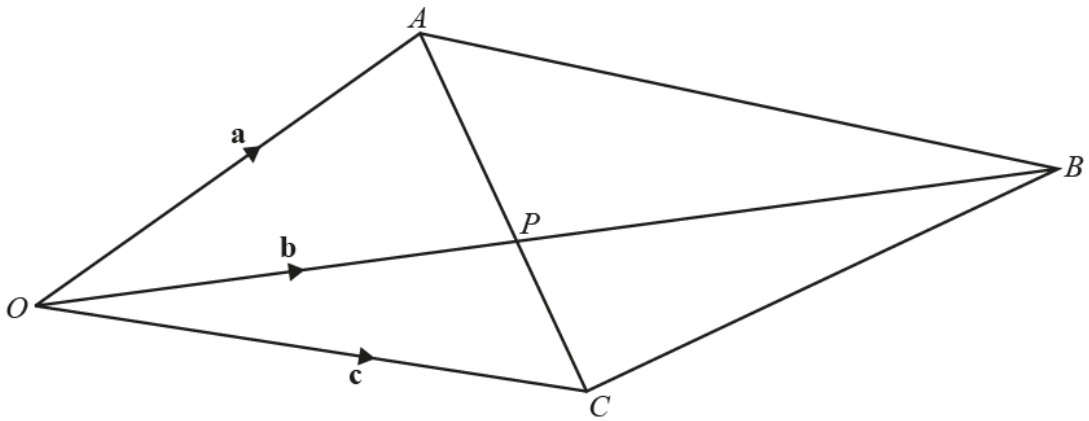
2. Nov/2021/Paper_23/No.7

The vector $\mathbf{p}$ has magnitude 39 and is in the direction $-5\mathbf{i}+12\mathbf{j}$. The vector $\mathbf{q}$ has magnitude 34 and is in the direction $15\mathbf{i}-8\mathbf{j}$.

(a) Write both $\mathbf{p}$ and $\mathbf{q}$ in terms of $\mathbf{i}$ and $\mathbf{j}$. [4]

(b) Find the magnitude of $\mathbf{p}+\mathbf{q}$ and the angle this vector makes with the positive x-axis. [4]

3. June/2021/Paper_12/No.3



The diagram shows the quadrilateral $OABC$ such that $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = \mathbf{c}$. The lines OB and AC intersect at the point P, such that $AP : PC = 3 : 2$.

(a) Find $\overrightarrow{OP}$ in terms of $\mathbf{a}$ and $\mathbf{c}$. [3]

(b) Given also that $OP : PB = 2 : 3$, show that $2\mathbf{b} = 3\mathbf{c} + 2\mathbf{a}$. [2]

4. June/2021/Paper_21/No.10

Relative to an origin O, the position vectors of the points A, B, C and D are

$$\overrightarrow{OA} = \begin{pmatrix} 6 \\ -5 \end{pmatrix}, \quad \overrightarrow{OB} = \begin{pmatrix} 10 \\ 3 \end{pmatrix}, \quad \overrightarrow{OC} = \begin{pmatrix} x \\ y \end{pmatrix} \text{ and } \overrightarrow{OD} = \begin{pmatrix} 12 \\ 7 \end{pmatrix}.$$

(a) Find the unit vector in the direction of $\overrightarrow{AB}$. [3]

(b) The point A is the mid-point of BC. Find the value of x and of y. [2]

(c) The point E lies on OD such that $OE : OD$ is $1 : 1 + \lambda$. Find the value of λ such that $\overrightarrow{BE}$ is parallel to the x-axis. [3]

5. June/2021/Paper_24/No.11

OAB is a triangle. The position vectors of points A and B relative to the origin O are $\mathbf{a}$ and $\mathbf{b}$ respectively.

The side AB is extended to point C such that $AB = \frac{1}{4}AC$.

(a) Show that $\overrightarrow{OC} = 4\mathbf{b} - 3\mathbf{a}$. [2]

(b) The point D lies on OA such that $OD : DA$ is $3 : 2$. The line CD meets OB at the point E. Find the position vector of the point E. [5]