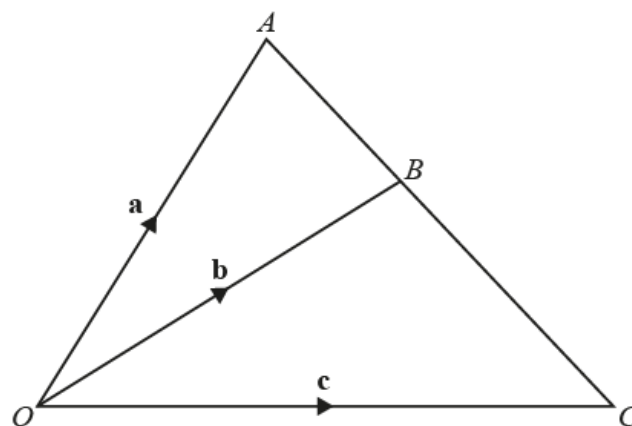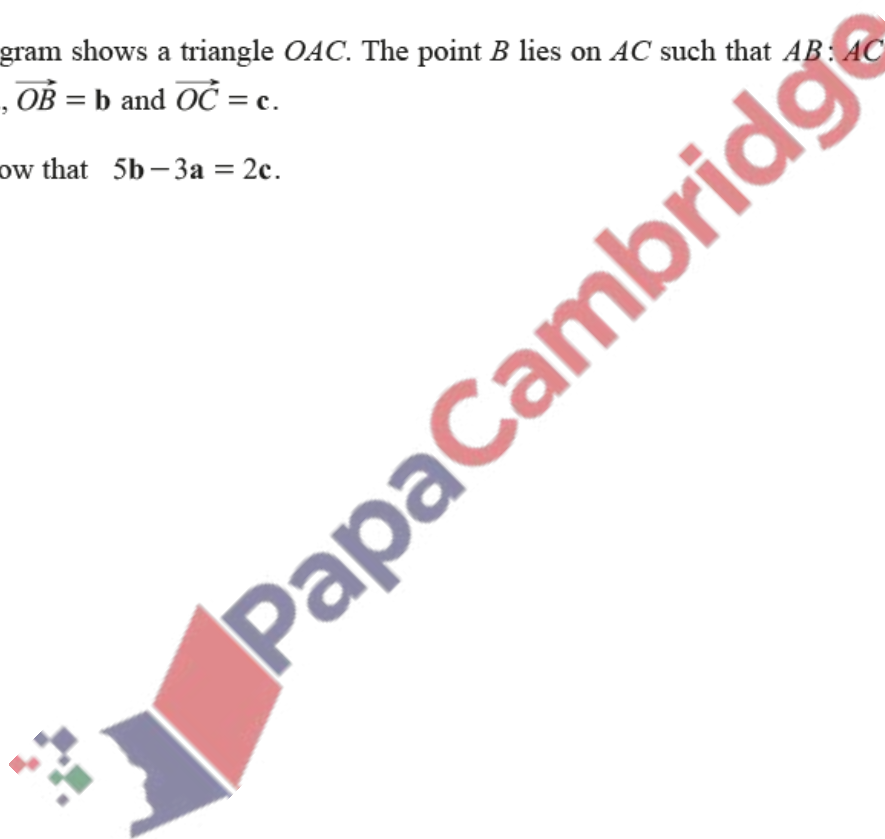1. Nov/2022/Paper_0606_11/No.11
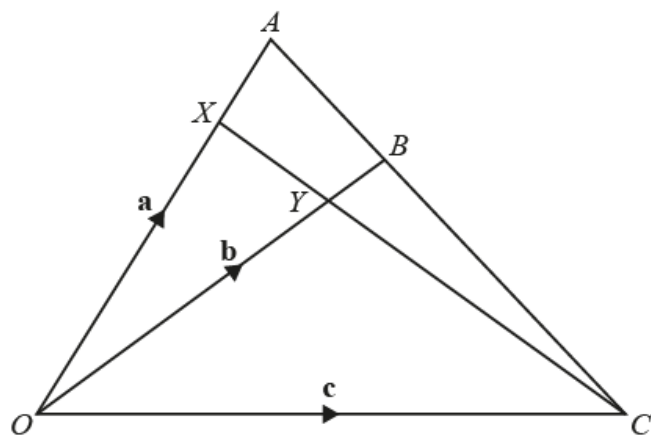

The diagram shows a triangle OAC. The point B lies on AC such that $AB : AC = 2 : 5$. It is given that $\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $\overrightarrow{OC} = \mathbf{c}$.

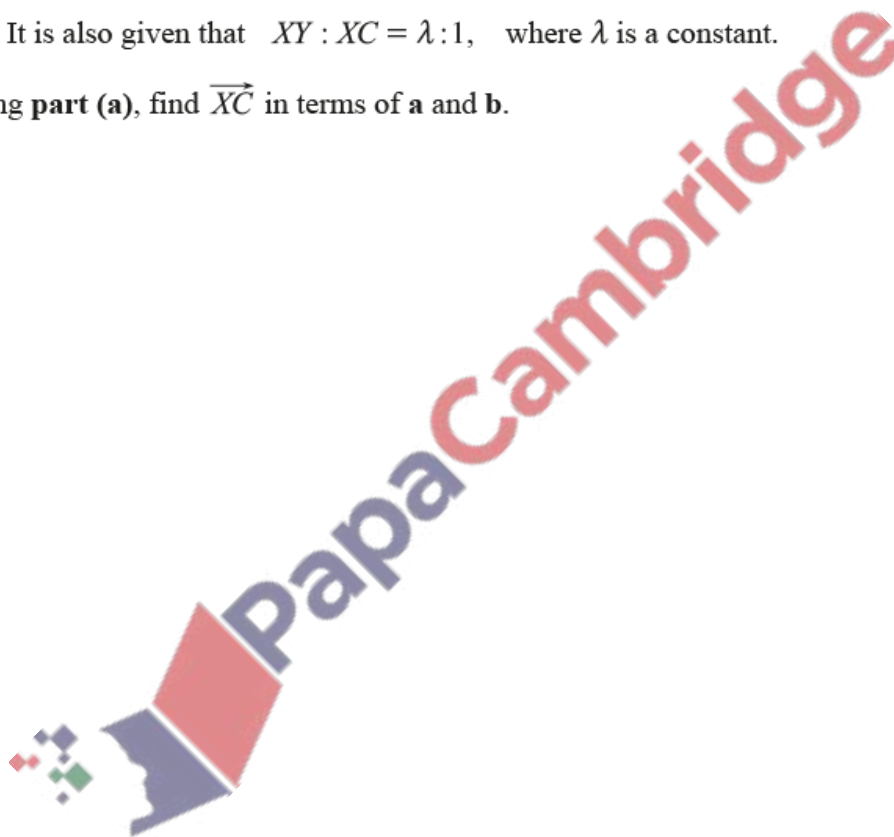**(a)** Show that $5\mathbf{b} - 3\mathbf{a} = 2\mathbf{c}$. [4]

The diagram now includes points X and Y, such that $\overrightarrow{OX} = \frac{3}{4}\overrightarrow{OA}$ and $\overrightarrow{OY} = m\overrightarrow{OB}$, where m is a constant. It is also given that $XY : XC = \lambda : 1$, where λ is a constant.

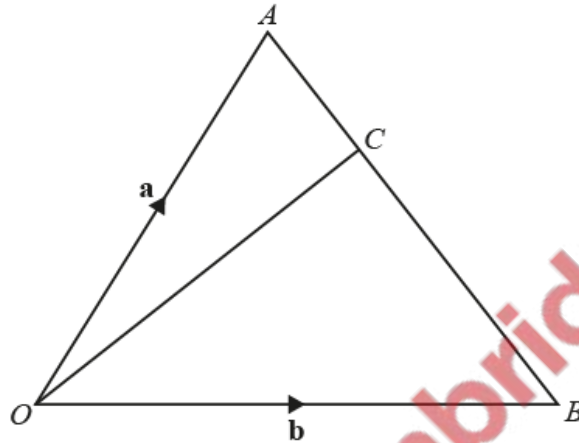**(b)** Using **part (a)**, find $\overrightarrow{XC}$ in terms of **a** and **b**. [2]

2.

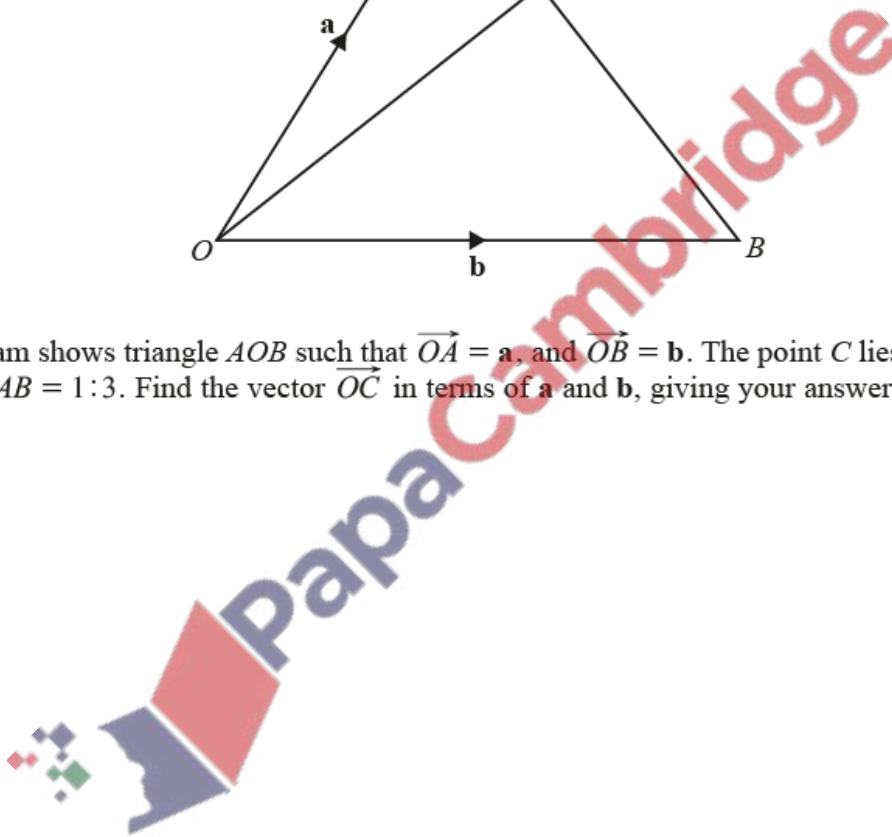(a) Find the vector with magnitude 200 in the direction of $\begin{pmatrix} 7 \\ -24 \end{pmatrix}$. [2]

(b)

The diagram shows triangle AOB such that $\overrightarrow{OA} = \mathbf{a}$, and $\overrightarrow{OB} = \mathbf{b}$. The point C lies on the line AB such that $AC : AB = 1 : 3$. Find the vector $\overrightarrow{OC}$ in terms of $\mathbf{a}$ and $\mathbf{b}$, giving your answer in its simplest form. [3]

(a) Particle A starts from the point with position vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ and travels with speed $26\,\mathrm{ms}^{-1}$ in the direction of the vector $\begin{pmatrix} 12 \\ 5 \end{pmatrix}$. Find the position vector of A after t seconds. [3]

(b) At the same time, particle B starts from the point with position vector $\begin{pmatrix} 67 \\ -18 \end{pmatrix}$. It travels with speed $20\,\mathrm{ms}^{-1}$ at an angle of α above the positive x-axis, where $\tan\alpha = \dfrac{3}{4}$. Find the position vector of B after t seconds. [4]

(c) Hence find the time at which A and B meet, and the position where this occurs. [3]