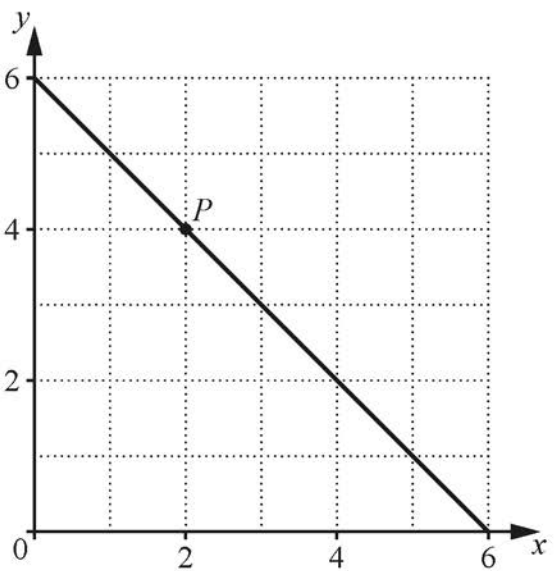
2 **(a)** The points A, B and C have position vectors $\begin{pmatrix}-4\\3\end{pmatrix}$, $\begin{pmatrix}-3\\6\end{pmatrix}$ and $\begin{pmatrix}-1\\12\end{pmatrix}$ respectively.

(i) Show that B lies on AC. **[2]**

(ii) Find the ratio $AB : BC$. **[1]**

(b) The diagram shows the line $x+y=6$ and the point $P(2, 4)$ that lies on the line.

A copy of the diagram is given in the Printed Answer Booklet.



The distinct point Q also lies on the line $x+y=6$ and is such that $|\overrightarrow{OQ}| = |\overrightarrow{OP}|$, where O is the origin.

Find the magnitude and direction of the vector $\overrightarrow{PQ}$. **[3]**

(c) The point R is such that $\overrightarrow{PR}$ is perpendicular to $\overrightarrow{OP}$ and $|\overrightarrow{PR}| = \frac{1}{2}|\overrightarrow{OP}|$.

Write down the position vectors of the **two** possible positions of the point R. **[2]**