VECTORS (Q 2, PAPER 2)

2010

2 (a) A, B and C are points and O is the origin.

$\vec{a} = 2\vec{i} + 3\vec{j}$, $\vec{b} = -3\vec{i} - 6\vec{j}$, and $\overrightarrow{AC} = \overrightarrow{OB}$.

Express $\vec{c}$ in terms of $\vec{i}$ and $\vec{j}$.

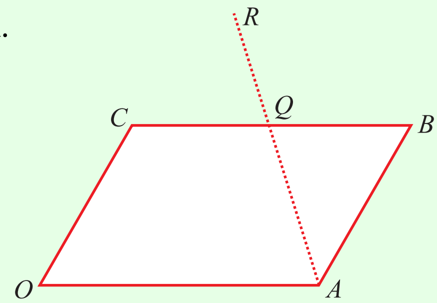
(b) $\vec{u} = 2\vec{i} + \vec{j}$ and $\vec{v} = -\vec{i} + k\vec{j}$ where $k \in \mathbf{R}$.

(i) Express $|\vec{v}|$ and $\vec{u}.\vec{v}$ in terms of k.

(ii) Given that $\cos\theta = -\frac{1}{\sqrt{2}}$, where θ is the angle between $\vec{u}$ and $\vec{v}$,

find the two possible values of k.

(c) $OABC$ is a parallelogram, where O is the origin.
Q is the midpoint of $[BC]$.
$[AQ]$ is extended to R such that $|AQ| = |QR|$.



(i) Express $\vec{q}$ in terms of $\vec{a}$ and $\vec{c}$.

(ii) Express $\overrightarrow{AQ}$ in terms of $\vec{a}$ and $\vec{c}$.

(iii) Show that the points O, C and R are collinear.

ANSWERS

2 (a) $\vec{c} = -\vec{i} - 3\vec{j}$

(b) (i) $|\vec{v}| = \sqrt{1+k^2}$, $\vec{u}.\vec{v} = -2 + k$ (ii) $k = -3, \frac{1}{3}$

(c)(i) $\vec{q} = \vec{c} + \frac{1}{2}\vec{a}$ (ii) $\overrightarrow{AQ} = \vec{c} - \frac{1}{2}\vec{a}$