VECTORS (Q 2, PAPER 2)

2011

2. **(a)** Find the value of s and the value of t that satisfy the equation

$$s(\vec{i} - 4\vec{j}) + t(2\vec{i} + 3\vec{j}) = 4\vec{i} - 27\vec{j}.$$

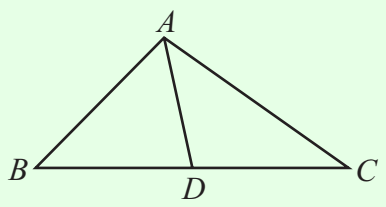
(b) $\overrightarrow{OP} = 3\vec{i} - 4\vec{j}$ and $\overrightarrow{OQ} = 5(\overrightarrow{OP}^{\perp})$, where O is the origin.

(i) Find $\overrightarrow{OQ}$ in terms of $\vec{i}$ and $\vec{j}$.

.

(ii) Find $\cos|\angle OQP|$, in surd form.

(c) ABC is a triangle and D is the mid-point of $[BC]$.



(i) Express $\overrightarrow{AB}$ in terms of $\overrightarrow{AD}$ and $\overrightarrow{BC}$ and express $\overrightarrow{AC}$ in terms of $\overrightarrow{AD}$ and $\overrightarrow{BC}$.

(ii) Hence, prove that $|AB|^2 + |AC|^2 = 2|AD|^2 + \frac{1}{2}|BC|^2$.

ANSWERS

2 (a) $t = -1,\ s = 6$

(b) (i) $20\vec{i} + 15\vec{j}$ (ii) $\dfrac{5}{\sqrt{26}}$

(c) (i) $\overrightarrow{AB} = \frac{1}{2}\overrightarrow{BC} - \overrightarrow{AD},\ \overrightarrow{AC} = \overrightarrow{AD} + \frac{1}{2}\overrightarrow{BC}$