

VECTORS (Q 2, PAPER 2)

2009

2 (a) If $\vec{a} = 2\vec{i} + \vec{j}$, $\vec{b} = -\vec{i} + 5\vec{j}$, find the unit vector in the direction of \vec{ab} .

(b) In the triangle abc , p is a point on the side $[bc]$.

The point q lies outside the triangle such that $\vec{pq} = \vec{pb} + \vec{pc} - \vec{pa}$.

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

(ii) Hence show that $abqc$ is a parallelogram.

(c) (i) $\vec{p} = 12\vec{i} + 5\vec{j}$ and $\vec{q} = 3\vec{i} + 4\vec{j}$.

Find the value of the scalar k such that $k|\vec{p}^\perp - \vec{q}| = |\vec{p}^\perp| - |\vec{q}|$.

(ii) Prove that for all vectors \vec{r} and \vec{s}

$$(\vec{r} - \vec{s})^\perp = \vec{r}^\perp - \vec{s}^\perp.$$

ANSWERS

2 (a) $\frac{3}{5}\vec{i} + \frac{4}{5}\vec{j}$

(b) (i) $\vec{q} = \vec{b} + \vec{c} - \vec{a}$

(c) (i) $k = \frac{1}{\sqrt{2}}$