

VECTORS (Q 2, PAPER 2)

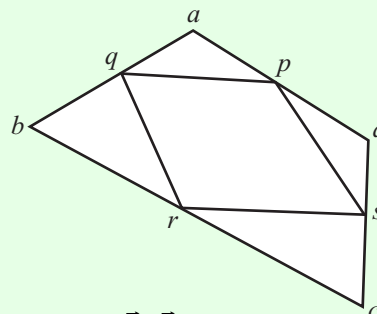
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2 (a) $\vec{r} = 7\vec{i} - 4\vec{j}$ and \vec{r}^\perp is its related vector $4\vec{i} + 7\vec{j}$.

$m\vec{r} + n\vec{r}^\perp = 5\vec{i} - 40\vec{j}$. Find the value of m and the value of n where m and $n \in \mathbf{R}$.

(b) p, q, r, s are the mid-points of the sides of a quadrilateral $abcd$.

Prove by vector methods that $pqrs$ is a parallelogram.



(c) o is the origin, $\vec{a} = 2\vec{i} + 2\vec{j}$, $\vec{b} = 4\vec{i} + 4\vec{j}$.

If $\vec{r} = \frac{1}{2}(\vec{a} + \vec{b}) + t(\vec{b} - \vec{a})^\perp$, $t \in \mathbf{R}$, express \vec{r} in terms of \vec{i} , \vec{j} and t .

Show that r lies on the perpendicular bisector of $[ab]$ for all $t \in \mathbf{R}$,

i.e. show that $|\vec{ra}| = |\vec{rb}|$.

ANSWERS

2 (a) $n = -4$, $m = 3$

(c) $\vec{r} = (3 - 2t)\vec{i} + (3 + 2t)\vec{j}$