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VECTORS (Q 2, PAPER 2)

1998

2 (a) *abcd* is a parallelogram where $\vec{a} = 2\vec{i} - 7\vec{j}, \vec{b} = -6\vec{i} - 11\vec{j}$ and $\vec{c} = -8\vec{i} + 4\vec{j}$.

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

(b) $\vec{p} = 9\vec{i} - 5\vec{j}, \vec{q} = 5\vec{i} + 3\vec{j}$ and $\vec{s} = -5\vec{i} - \frac{9}{2}\vec{j}$.

Let $\vec{m} = \frac{1}{2}(\vec{p} + \vec{q})$ and $\vec{n} = \frac{2}{5}(\overrightarrow{sq})$.

(i) Express $\vec{m}$ and $\vec{n}$ in terms of $\vec{i}$ and $\vec{j}$.

(ii) Find the measure of the angle between $\vec{m}$ and $\vec{n}$.

(c) $\vec{x} = -3\vec{i} + 4\vec{j}$ and $\vec{y} = 5\vec{i} + 12\vec{j}$.

(i) Find $|\vec{x}|$ and $|\vec{y}|$.

(ii) If $\vec{r} = (1-t)\vec{x} + t\vec{y}$, where $t = \dfrac{|\vec{x}|}{|\vec{x}| + |\vec{y}|}$,

express $\vec{r}$ in terms of $\vec{i}$ and $\vec{j}$.

(iii) If $k\left(\dfrac{\vec{x}}{|\vec{x}|} + \dfrac{\vec{y}}{|\vec{y}|}\right) = 18\vec{r}$, find the value of k, $k \in \mathbf{N}$.

ANSWERS

2 (a) $0\vec{i} + 8\vec{j}$

(b) (i) $\vec{m} = 7\vec{i} - \vec{j}$, $\vec{n} = 4\vec{i} + 3\vec{j}$ (ii) 45o

(c) (i) $|\vec{x}| = 5, |\vec{y}| = 13$ (ii) $t = \frac{5}{18}$, $\vec{r} = -\frac{7}{9}\vec{i} + \frac{56}{9}\vec{j}$ (iii) $k = 65$