

**VECTORS (Q 2, PAPER 2)**

**2007**

2 (a)  $\vec{x} = -2\vec{i} + 5\vec{j}$  and  $\vec{xy} = -6\vec{i} - 8\vec{j}$ . Express  $\vec{y}$  in terms of  $\vec{i}$  and  $\vec{j}$ .

(b)  $\vec{a} = 5\vec{i}$  and  $\vec{b} = \sqrt{3}\vec{i} + 3\vec{j}$ .

(i) Show that  $\vec{ab}$  is not perpendicular to  $\vec{b}$ .

(ii) Find the value of the real number  $k$ , given that  $\vec{c} = k\vec{b}$  and  $\vec{ac} \perp \vec{b}$ .

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

$\vec{r} = \frac{65t}{16} \left( \frac{\vec{p}}{|\vec{p}|} + \frac{\vec{q}}{|\vec{q}|} \right)$ , where  $t > 0$ .

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

(ii) Find  $\vec{p} \cdot \vec{r}$  and  $\vec{q} \cdot \vec{r}$ .

(iii) Hence, show that  $r$  is on the bisector of  $\angle poq$ , where  $o$  is the origin.

**ANSWERS**

2 (a)  $-8\vec{i} - 3\vec{j}$

(b) (ii)  $k = \frac{5\sqrt{3}}{12}$

(c) (i)  $\vec{r} = t(4\vec{i} + 7\vec{j})$       (ii)  $\vec{p} \cdot \vec{r} = 40t$ ,  $\vec{q} \cdot \vec{r} = 104t$