Q. 4. $\vec{i} = -10\cos 70°\,\vec{i} + 10\sin 70°\,\vec{j}$

$= -3.420\vec{i} + 9.397\vec{j}$

Let $|\vec{s}| = x \Rightarrow \vec{s} = x\vec{i}$

$\therefore \vec{r} + \vec{s} = (-3.420 + x)\vec{i} + 9.397\vec{j}$

No $\vec{i}$-component $\Rightarrow x = 3.420$

i.e. $|\vec{s}| = 3.420$

Q. 5. $\vec{a} = 10\cos\theta\,\vec{i} + 10\sin\theta\vec{j}$

$= 10\left(\frac{4}{5}\right)\vec{i} + 10\left(\frac{3}{5}\right)\vec{j}$

$= 8\vec{i} + 6\vec{j}$

Let $|\vec{b}| = x \Rightarrow \vec{b} = -x\vec{j}$

$\therefore \vec{a} + \vec{b} = 8\vec{i} + (6 - x)\vec{j}$

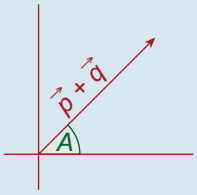
$= k\vec{i} + 0\vec{j}$

$\therefore x = 6$ and $k = 8$

Q. 6. (i) $\vec{p} = 35\cos\alpha\vec{i} + 35\sin\alpha\vec{j}$

$= 35\left(\frac{3}{5}\right)\vec{i} + 35\left(\frac{4}{5}\right)\vec{j}$

$= 21i + 28\vec{j}$



$\vec{q} = 13\cos\beta\vec{i} + 13\sin\beta\vec{j}$

$= 13\left(\frac{12}{13}\right)\vec{i} + 13\left(\frac{5}{13}\right)\vec{j}$

$= 12\vec{i} + 5\vec{j}$

(ii) $\therefore \vec{p} + \vec{q} = 21\vec{i} + 28\vec{j} + 12\vec{i} + 5\vec{j}$

$= 33\vec{i} + 33\vec{j}$

$\therefore \tan A = \frac{33}{33} = 1$

$\Rightarrow A = 45°$

Q. 7. $\vec{r} = -3.42\vec{i} + 9.397\vec{j}$

Let $|\vec{s}| = x$

$\therefore \vec{s} = x\cos 10°\vec{i} + x\sin 10°\vec{j}$

$= 0.9848x\vec{i} + 0.1736x\vec{j}$

$\therefore \vec{r} + \vec{s} = (-3.42 + 0.9848x)\vec{i} + (9.397 + 0.1736x)\vec{j}$

Since $(\vec{r} + \vec{s})$ is in a NE direction, the $\vec{i}$ and $\vec{j}$ components must be equal.

$\therefore -3.42 + 0.9848x = 9.397 + 0.1736x$

$\Rightarrow x = 15.8$

Q. 8. (i) $|\vec{p}| = \sqrt{8^2 + 1^2} = \sqrt{65}$

$|\vec{q}| = \sqrt{(-7)^2 + 4^2} = \sqrt{65}$

$\therefore |\vec{p}| = |\vec{q}|$

(ii) "Slope" of $p = \frac{\vec{j}\text{-bit}}{\vec{i}\text{-bit}} = \frac{1}{8} = m_1$

"Slope" of $q = \frac{4}{-7} = -\frac{4}{7} = m_2$

$m_1 \times m_2 = -\frac{1}{14} \neq -1$

$\therefore$ Not perpendicular

Q. 9. $|-7\vec{i} + \vec{j}| = \sqrt{49 + 1} = \sqrt{50}$

$|p(\vec{i} + \vec{j})| = |p\vec{i} + p\vec{j}|$

$= \sqrt{p^2 + p^2} = \sqrt{2p^2}$

$\therefore 2p^2 = 50$

$\Rightarrow p = 5$ (since $p > 0$)

Q. 10. $\vec{a} = 10\cos 80°\vec{i} + 10\sin 80°\vec{j}$

$= 1.736\vec{i} + 9.848\vec{j}$

Let $|\vec{b}| = x$

Therefore, $\vec{b} = x\vec{i}$

$\therefore \vec{a} + \vec{b} = (1.736 + x)\vec{i} + 9.848\vec{j}$

Since the direction of $(\vec{a} + \vec{b})$ is 21° 48′,

the slope of $(\vec{a} + \vec{b})$ must equal tan 21° 48′.

$\therefore \frac{9.848}{1.736 + x} = 0.4$

$\Rightarrow x = 22.88$