

Q. 10. Approximately 7 cm due East.

Q. 11. 13 cm.

Exercise 1B

Q. 1. (i) $\sqrt{29}$, E $21^\circ 48'$ N.

(ii) $\sqrt{8}$, NE.

(iii) 5, E $36^\circ 52'$ S.

(iv) 13, W $67^\circ 23'$ S.

(v) $\sqrt{20}$, W $26^\circ 34'$ N.

(vi) $\sqrt{2}$, NE.

(vii) $\frac{1}{\sqrt{2}}$, SE.

(viii) 1, W $53^\circ 8'$ S.

(ix) 2, W 30° N.

(x) $\sqrt{12}$, E 30° N.

(xi) 4, due West.

Q. 2. (i) $\vec{a} + \vec{b} = (3\vec{i} - \vec{j}) + (2\vec{i} - 3\vec{j})$
 $= 5\vec{i} - 4\vec{j}$

(ii) $\vec{a} - \vec{b} = (3\vec{i} - \vec{j}) - (2\vec{i} - 3\vec{j})$
 $= \vec{i} + 2\vec{j}$

(iii) $\vec{b} - \vec{a} = (2\vec{i} - 3\vec{j}) - (3\vec{i} - \vec{j})$
 $= -\vec{i} - 2\vec{j}$

(iv) $2\vec{a} - 3\vec{b} = 2(3\vec{i} - \vec{j}) - 3(2\vec{i} - 3\vec{j})$
 $= 7\vec{j}$

Q. 3. $\vec{x} + \vec{y} = (2\vec{i} + 3\vec{j}) + (10\vec{i} + 2\vec{j})$
 $= 12\vec{i} + 5\vec{j}$

(i) $\sqrt{13}$

(ii) $\sqrt{104}$

(iii) $|\vec{x} + \vec{y}| = \sqrt{12^2 + 5^2} = 13$

(iv) $|\vec{x}| + |\vec{y}| = \sqrt{13} + \sqrt{104}$
 $= 3.606 + 10.20$
 $= 13.806$

$\therefore |\vec{x} + \vec{y}| < |\vec{x}| + |\vec{y}|$
 (since $13 < 13.806$)

Q. 4. (i) $4\vec{i} + 8\vec{j}$

(ii) $\sqrt{16 + 64} = \sqrt{80} = 8.944$

(iii) $\sqrt{80} < \sqrt{10} + \sqrt{50}$
 since $8.944 < 10.233$

Q. 5. $\sqrt{5} \geq \sqrt{20} - \sqrt{5}$
 since $2.236 \geq 4.472 - 2.236$

Q. 6. (i) Magnitude = $\sqrt{3^2 + 4^2} = 5$
 \therefore Unit vector = $\frac{1}{5}(3\vec{i} + 4\vec{j})$

(ii) $\frac{1}{\sqrt{5}}(\vec{i} + 2\vec{j})$

(iii) $\frac{1}{\sqrt{2}}(\vec{i} - \vec{j})$

(iv) $\frac{1}{\sqrt{10}}(-3\vec{i} - \vec{j})$

(v) $\frac{1}{2}(\sqrt{3}\vec{i} + \vec{j})$

Q. 7. $k(2\vec{i} - \vec{j}) + l(4\vec{i} + 3\vec{j}) = 2\vec{i} - 11\vec{j}$
 $\therefore 2k + 4l = 2$ and $-k + 3l = -11$
 Solving gives $l = -2, k = 5$

Q. 8. $4\vec{i} - 2\vec{j} + t(7\vec{i} + 5\vec{j}) = k\vec{i} + 0\vec{j}$
 $\therefore 4 + 7t = k$ and $-2 + 5t = 0$
 $\therefore t = 0.4$

Q. 9. $\sqrt{65} = \sqrt{49 + k^2}$
 $\therefore k = \pm 4$

Q. 10. $\sqrt{50} = \sqrt{2p^2}$
 $\therefore p = \pm 5$

Q. 11. $\sqrt{121 + k^2} = \sqrt{125}$
 $\therefore k = \pm 2$

Q. 12. $\sqrt{2k^2} = \sqrt{50}$
 $\therefore k = \pm 5$

Q. 13. $\frac{3}{4} \times \frac{-8}{6} = \frac{-24}{24} = -1$
 $\therefore \perp$

Q. 14. $\frac{-2}{5} \times \frac{20}{8} = \frac{-40}{40} = -1$
 $\therefore \perp$

Q. 15. $\frac{3}{1} \times \frac{-2}{6} = \frac{-6}{6} = -1$
 $\therefore \perp$

Q. 16. $\frac{-t}{9} \times \frac{6}{2} = -1$
 $\therefore t = 3$

Q. 17. $\frac{p}{4} \times \frac{-2}{p+1} = -1$
 $\therefore 4p + 4 = 2p$
 $\therefore p = -2$