## Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

**2.1**

$|\mathbf{v}| = 3$; $\frac{1}{3}\begin{pmatrix} 2 \\ -1 \\ 2 \end{pmatrix}$

**2.2**

scalar product $2 + 4 - 16 = -10$; $\cos\theta = \dfrac{-10}{3 \times 9}$; $\theta = \mathbf{111.7}^\circ$

**2.3**

$3p + 2p - 4 = 0$; $p = \mathbf{0.8}$

**3.1**

(a) $\begin{pmatrix} 2 \\ 1 \\ -1 \end{pmatrix}$ is not a multiple of $\begin{pmatrix} 1 \\ -2 \\ 3 \end{pmatrix}$ (R1)

(b) $1 + 2\lambda = 3 + \mu$ and $2 + \lambda = -1 - 2\mu$; $\lambda = 0.2$, $\mu = -1.6$; $z$: $-0.2$ and $4 - 4.8 = -0.8$; not equal, and not parallel, so skew (R1)

(c) $\dfrac{|2 - 2 - 3|}{\sqrt{6}\sqrt{14}}$; $\mathbf{70.9}^\circ$

(d) $\lambda = 3$; $(\mathbf{7}, \mathbf{5}, -\mathbf{3})$

**3.2**

(a) $\sqrt{3^2 + 4^2} = \mathbf{5}$ km h$^{-1}$

(b) $2 + 3t = 10 - t$, $t = 2$; $y$: $1 + 8 = 9$ and $-3 + 12 = 9$, so they are at the same place at the same time (R1); at $(\mathbf{8}, \mathbf{9})$

(c) $\begin{pmatrix} 3 \\ 4 \end{pmatrix} \cdot \begin{pmatrix} -1 \\ 6 \end{pmatrix} = 21$; $\cos\theta = \dfrac{21}{5\sqrt{37}}$; $\theta = \mathbf{46.3}^\circ$



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