

$$\begin{aligned} \text{Q3. (a) } |p| &= \sqrt{2^2 + 3^2 + 4^2} \\ &= \sqrt{29} \\ &= \underline{\underline{5.4}} \end{aligned}$$

$$\begin{aligned} \text{(b) } |v| &= \sqrt{3^2 + 4^2 + (-7)^2} \\ &= \sqrt{74} \\ &= \underline{\underline{8.6}} \end{aligned}$$

$$\begin{aligned} \text{(c) } |r| &= \sqrt{1^2 + (-3)^2 + 2^2} \\ &= \sqrt{12} \\ &= \underline{\underline{3.5}} \end{aligned}$$

$$\begin{aligned} \text{(d) } |t| &= \sqrt{(-3)^2 + 0^2 + 4^2} \\ &= \sqrt{25} \\ &= \underline{\underline{5}} \end{aligned}$$

$$\begin{aligned} \text{(e) } |u| &= \sqrt{6^2 + (-1)^2 + (-4)^2} \\ &= \sqrt{53} \\ &= \underline{\underline{7.3}} \end{aligned}$$

$$\begin{aligned} \text{(f) } |q| &= \sqrt{1^2 + 1^2 + 1^2} \\ &= \sqrt{3} \\ &= \underline{\underline{1.7}} \end{aligned}$$

$$\begin{aligned} \text{(g) } |a| &= \sqrt{2^2 + (-1)^2 + (-2)^2} \\ &= \sqrt{9} \\ &= \underline{\underline{3}} \end{aligned}$$

$$\begin{aligned} \text{(h) } |b| &= \sqrt{5^2 + (-12)^2 + 0^2} \\ &= \sqrt{169} \\ &= \underline{\underline{13}} \end{aligned}$$

Q5.(i)

$$\text{(a) } p + q = \begin{pmatrix} 4 \\ 2 \\ -5 \end{pmatrix} + \begin{pmatrix} 1 \\ -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \\ -4 \end{pmatrix}$$

$$\begin{aligned} \text{(i) } |p+q| &= \sqrt{5^2 + (-1)^2 + (-4)^2} \\ &= \sqrt{42} \\ &= \underline{\underline{6.5}} \end{aligned}$$

$$\text{(b) } p - q = \begin{pmatrix} 4 \\ 2 \\ -5 \end{pmatrix} - \begin{pmatrix} 1 \\ -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 3 \\ 5 \\ -6 \end{pmatrix}$$

$$\begin{aligned} \text{(ii) } |p-q| &= \sqrt{3^2 + 5^2 + (-6)^2} \\ &= \sqrt{70} \\ &= \underline{\underline{8.4}} \end{aligned}$$

$$(c) \mathbf{q} - 2\mathbf{p} = \begin{pmatrix} 1 \\ -3 \\ 1 \end{pmatrix} - \begin{pmatrix} 8 \\ 4 \\ -10 \end{pmatrix} = \begin{pmatrix} -7 \\ -7 \\ 9 \end{pmatrix} \quad (ii) |\mathbf{q} - 2\mathbf{p}| = \sqrt{(-7)^2 + (-7)^2 + 9^2}$$

$$= \sqrt{179} = \underline{\underline{13.4}}$$

$$(d) 3\mathbf{p} + \mathbf{q} = \begin{pmatrix} 12 \\ 6 \\ -15 \end{pmatrix} + \begin{pmatrix} 1 \\ -3 \\ 1 \end{pmatrix} = \begin{pmatrix} 13 \\ 3 \\ -14 \end{pmatrix} \quad (ii) |3\mathbf{p} + \mathbf{q}| = \sqrt{13^2 + 3^2 + (-14)^2}$$

$$= \sqrt{374}$$

$$= \underline{\underline{4.4}}$$

$$(e) 3\mathbf{p} - 2\mathbf{q} = \begin{pmatrix} 12 \\ 6 \\ -15 \end{pmatrix} - \begin{pmatrix} 2 \\ -6 \\ 2 \end{pmatrix} = \begin{pmatrix} 10 \\ 12 \\ -17 \end{pmatrix} \quad (ii) |3\mathbf{p} - 2\mathbf{q}| = \sqrt{10^2 + 12^2 + (-17)^2}$$

$$= \sqrt{413}$$

$$= \underline{\underline{20.3}}$$

$$(f) 2\mathbf{q} - 3\mathbf{p} = \begin{pmatrix} 2 \\ -6 \\ 2 \end{pmatrix} - \begin{pmatrix} 12 \\ 6 \\ -15 \end{pmatrix} = \begin{pmatrix} -10 \\ -12 \\ 17 \end{pmatrix} \quad (ii) |2\mathbf{q} - 3\mathbf{p}| = \sqrt{(-10)^2 + (-12)^2 + 17^2}$$

$$= \sqrt{413}$$

$$= \underline{\underline{20.3}}$$

$$(g) 3\mathbf{p} + 4\mathbf{q} = \begin{pmatrix} 12 \\ 6 \\ -15 \end{pmatrix} + \begin{pmatrix} 4 \\ -12 \\ 4 \end{pmatrix} = \begin{pmatrix} 16 \\ -6 \\ -11 \end{pmatrix} \quad (ii) |3\mathbf{p} + 4\mathbf{q}| = \sqrt{16^2 + (-6)^2 + (-11)^2}$$

$$= \sqrt{413}$$

$$= \underline{\underline{20.3}}$$

$$(h) -2\mathbf{q} - 2\mathbf{p} = \begin{pmatrix} 2 \\ -6 \\ 2 \end{pmatrix} - \begin{pmatrix} 8 \\ 4 \\ -10 \end{pmatrix} = \begin{pmatrix} -6 \\ -10 \\ 12 \end{pmatrix} \quad (ii) |-2\mathbf{q} - 2\mathbf{p}| = \sqrt{(-6)^2 + (-10)^2 + 12^2}$$

$$= \sqrt{280}$$

$$= \underline{\underline{16.7}}$$