Samples **Normalize a vector SOLUTIONS**

1. Firstly, calculate the norm of $\mathbf{a}$:

$$\begin{aligned} |\mathbf{a}| &= \sqrt{5^2 + (-9)^2 + 8^2} \\ |\mathbf{a}| &= \sqrt{170} \end{aligned}$$

Now,

$$\begin{aligned} \hat{\mathbf{a}} &= \frac{1}{|\mathbf{a}|} \begin{pmatrix} 5 \\ -9 \\ 8 \end{pmatrix} \\ \hat{\mathbf{a}} &= \frac{1}{\sqrt{170}} \begin{pmatrix} 5 \\ -9 \\ 8 \end{pmatrix} \end{aligned}$$

2. Firstly, calculate the norm of $\mathbf{a}$:

$$\begin{aligned} |\mathbf{a}| &= \sqrt{1^2 + (-2)^2 + (-7)^2} \\ |\mathbf{a}| &= \sqrt{54} \\ |\mathbf{a}| &= 3 \times \sqrt{6} \end{aligned}$$

Now,

$$\begin{aligned} \hat{\mathbf{a}} &= \frac{1}{|\mathbf{a}|} \begin{pmatrix} 1 \\ -2 \\ -7 \end{pmatrix} \\ \hat{\mathbf{a}} &= \frac{1}{3 \times \sqrt{6}} \begin{pmatrix} 1 \\ -2 \\ -7 \end{pmatrix} \end{aligned}$$

3. Firstly, calculate the norm of $\mathbf{a}$:

$$\begin{aligned} |\mathbf{a}| &= \sqrt{7^2 + 5^2 + (-3)^2} \\ |\mathbf{a}| &= \sqrt{83} \end{aligned}$$

Now,

$$\begin{aligned} \hat{\mathbf{a}} &= \frac{1}{|\mathbf{a}|} \begin{pmatrix} 7 \\ 5 \\ -3 \end{pmatrix} \\ \hat{\mathbf{a}} &= \frac{1}{\sqrt{83}} \begin{pmatrix} 7 \\ 5 \\ -3 \end{pmatrix} \end{aligned}$$

4. Firstly, calculate the norm of $\mathbf{a}$:

$$\begin{aligned} |\mathbf{a}| &= \sqrt{(-1)^2 + 6^2 + (-2)^2} \\ |\mathbf{a}| &= \sqrt{41} \end{aligned}$$

Now,

$$\begin{aligned}\hat{\mathbf{a}} &= \frac{1}{|\mathbf{a}|}\begin{pmatrix} -1 \\ 6 \\ -2 \end{pmatrix} \\ \hat{\mathbf{a}} &= \frac{1}{\sqrt{41}}\begin{pmatrix} -1 \\ 6 \\ -2 \end{pmatrix}\end{aligned}$$

5. Firstly, calculate the norm of $\mathbf{a}$:

$$\begin{aligned}|\mathbf{a}| &= \sqrt{1^2 + (-5)^2 + (-3)^2} \\ |\mathbf{a}| &= \sqrt{35}\end{aligned}$$

Now,

$$\begin{aligned}\hat{\mathbf{a}} &= \frac{1}{|\mathbf{a}|}\begin{pmatrix} 1 \\ -5 \\ -3 \end{pmatrix} \\ \hat{\mathbf{a}} &= \frac{1}{\sqrt{35}}\begin{pmatrix} 1 \\ -5 \\ -3 \end{pmatrix}\end{aligned}$$