Step-1

If Q is an orthogonal matrix, so that $Q^T Q = I$, we have to prove that $\det Q$ equals to $+1$ or -1 and we have to find that what kind of box is formed from the rows (or columns) of Q.

Step-2

We have $Q^T A = I$ (since Q is an orthogonal matrix)

$\Rightarrow \det\left(Q^T Q\right) = \det I$

$\Rightarrow \det Q^T . \det Q = 1 \quad (\text{since } \det I = 1)$

$(\text{since } \det(AB) = \det A \det B \text{ for any 2 matrices A,B})$

Step-3

$\Rightarrow \det Q . \det Q = 1$

$(\text{since } \det\left(A^{\mathrm{T}}\right) = \det A \text{ for any matrix } A)$

$\Rightarrow (\det Q)^2 = 1$

$\Rightarrow \det Q = \sqrt{1} = \boxed{\pm 1}$

Thus, $\det Q = \pm 1$, where Q is an orthogonal matrix.

A $\boxed{\text{box of volume 1}}$ is formed from rows of Q.