Why

The squared norm of a sum of orthogonal vectors is the sum of their squared norms.

Result

Proposition 1. *Let (V, F) be an inner product space with induced norm $\|\cdot\|$. Let $x, y \in V$ be orthgonal vector. Then*

$$\|x + y\|^2 = \|x\|^2 + \|y\|^2.$$