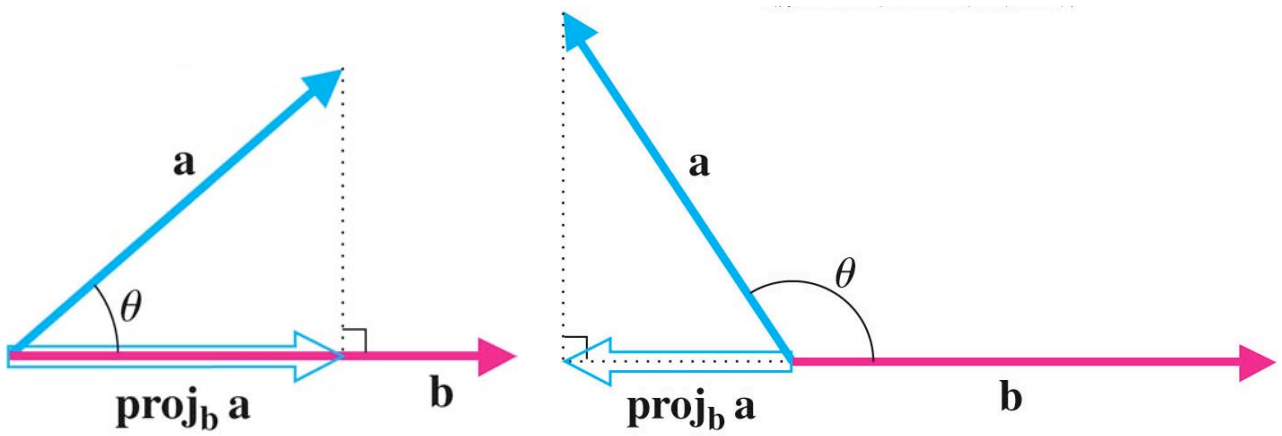
Projection of **a** onto **b**

This is a force vector parallel to **b** having the same component along **b** as **a**.



$\mathbf{proj_b\, a} \quad \left(0 < \theta < \dfrac{\pi}{2}\right)$ $\qquad$ $\mathbf{proj_b\, a} \quad \left(\dfrac{\pi}{2} < \theta < \pi\right)$

$$\mathbf{proj_b\, a} = \left(\text{comp}_{\mathbf{b}}\, \mathbf{a}\right)\frac{\mathbf{b}}{\|\mathbf{b}\|} = \left(\frac{\mathbf{a}\cdot\mathbf{b}}{\|\mathbf{b}\|}\right)\frac{\mathbf{b}}{\|\mathbf{b}\|} \Longrightarrow$$

$$\boxed{\mathbf{proj_b\, a} = \left(\frac{\mathbf{a}\cdot\mathbf{b}}{\|\mathbf{b}\|}\right)\frac{\mathbf{b}}{\|\mathbf{b}\|}}$$

is a vector.