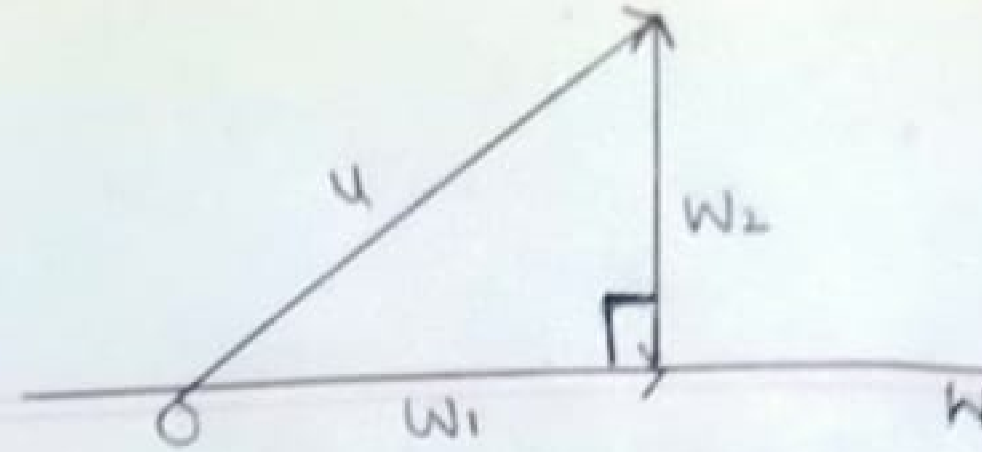

ORTHOGONAL PROJECTIONS:-

If W is a finite-dimensional subspace of an inner product space V then every vector u in V can be expressed in exactly one way as

$$u = w_1 + w_2$$

where w_1 is in W and w_2 is in W.

The vector w_1 is caled an orthogonal projection of u W and is denoted by $\mathrm{Proj}_W u$.

The vector w_2 is called the component of u orthogonal to W and it is denoted by $\mathrm{Proj}_{W^\perp} u$.

$$u = \mathrm{Proj}_W u + \mathrm{Proj}_{W^\perp} u$$

$$w_2 = u - w_1$$

$$\mathrm{Proj}_{W^\perp} u = u - \mathrm{Proj}_W u$$

$$u = \mathrm{Proj}_W u + (u - \mathrm{Proj}_W u)$$