Step-1

In the parallelogram with corners at 0, *v, w* and $v+w$, we have to show that the sum of the squared lengths of the four sides equals the sum of the squared lengths of the two diagonals.

Step-2

The four corners of parallelogram are $0, v, w, v+w$.

That is, in vw-plane, the four points are

$O=(0,0),\ A=(1,0), C=(0,1)$ and $B=(1,1)$

Since *A* is a point on *v*-axis and *C* is a point on *w*-axis.

The four sides of parallelogram are *OA, AB, BC, CO* and the two diagonals are *, AC.*

Step-3

$$OA=\sqrt{(1-0)^2+(0-0)^2}$$
$$=1$$

$$AB=\sqrt{(1-1)^2+(1-0)^2}$$
$$=1$$

Step-4

$$BC=\sqrt{(0-1)^2+(1-1)^2}$$
$$=1$$

$$CO=\sqrt{(0-0)^2+(0-1)^2}$$
$$=1$$

Step-5

And

$$OB=\sqrt{(1-0)^2+(1-0)^2}$$
$$=\sqrt{2}$$

$$AC=\sqrt{(0-1)^2+(1-0)^2}$$
Â $=\sqrt{2}$

Step-6

The sum of the squared lengths of the four sides

$= OA^2 + AB^2 + BC^2 + CO^2$

$= 4$

The sum of the squared lengths of the two diagonals

$= OB^2 + AC^2$

$= 2 + 2$

$= 4$

Hence the sum of the squared lengths of the four sides is equals to the sum of the squared lengths of the two diagonals.