

Proof Without Words: Perfect Squares

Md. Shouvik Iqbal

Theorem. Let $n, m \in \mathbb{N}$, where $n \geq m$, then n^2 can be expressed as,

$$n^2 = 4m^2 \quad \text{if } n \text{ is even}$$

$$n^2 = 4m^2 + 4m + 1 \quad \text{if } n \text{ is odd}$$

Proof.

The top diagram illustrates the case where n is even. It shows a large square of side n divided into four smaller squares of side m . The equation is $n^2 = 4 \times m^2$.

The bottom diagram illustrates the case where n is odd. It shows a large square of side n divided into four smaller squares of side m , plus four rectangles of side m and one small square of side 1. The equation is $n^2 = 4 \times m^2 + 4 \times m + 1$.

□