$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2} = 1 + 2 + 3 + \dots + n$$

Base case: TRUE

$n=1$,

$$\sum_{i=1}^{1} i = 1 \quad \Bigg| \quad \frac{1(1+1)}{2} = \frac{1(2)}{2} = 1$$

Inductive step

Assume the statement holds (it's True!) for some k

$$\sum_{i=1}^{k} i = \frac{k(k+1)}{2}$$

what is the statement with $k+1$?

$$\sum_{i=1}^{k+1} i = 1 + 2 + 3 + \dots + k + (k+1)$$

$$= \left[\sum_{i=1}^{k} i\right] + (k+1)$$

$$= \frac{k(k+1)}{2} + (k+1)$$

$$= (k+1)\left(\frac{k}{2}+1\right)$$

$$= (k+1)\left(\frac{k+2}{2}\right)$$

$$= (k+1)\left(\frac{(k+1)+1}{2}\right)$$

with $n = k+1$

$$= \frac{n(n+1)}{2}$$

TRUE!

:)