How do we know recursion works?

//Assume i is a nonnegative integer
//returns 2^i.
public int CalculatesTwoToTheI(int i){
    if(i == 0)
        return 1;
    else
        return 2*CalculatesTwoToTheI(i-1);
}

Why does CalculatesTwoToTheI(4) calculate 2^4?
Convince the other people in your room

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More Induction

Induction doesn’t only work for code!

Show that $\sum_{i=0}^{n} 2^i = 1 + 2 + 4 + \cdots + 2^n = 2^{n+1} - 1$.

Let $P(n) = \sum_{i=0}^{n} 2^i = 2^{n+1} - 1$.

We show $P(n)$ holds for all $n$ by induction on $n$.

Base Case ( )

Inductive Hypothesis:

Inductive Step:

$P(n)$ holds for all $n \geq 0$ by the principle of induction.