4.)
Prove:

$(1)^3 + (2)^3 + (3)^3 + \ldots + (n)^3 = \{ (n^2) * [(n + 1)^2] \}/ 4$

Base Case:

Pick some small, trivial, usually degenerate values to start process
Base cases start at minimal value

$N = 1$

$(1)^3 = \{ (1^2) * [(1 + 1)^2] \}/ 4$

$1 = 1$

Inductive Hypothesis:

Theorem assumed true up until some value, usually k + 1

1.) Statement with k

$(1)^3 + (2)^3 + (3)^3 + \ldots (k)^3 = \{ ((k)^2) * [((k+ 1)^2] \}/ 4$

2.) Proof of k + 1 by substitution of the right hand value of above equation for k

$(1)^3 + (2)^3 + (3)^3 + \ldots (k)^3 + (k+1)^3 \quad = \{ ((k+1)^2) * [((k+1) + 1)^2] \}/ 4$

$\{ \{ ((k)^2) * [((k + 1)^2] \}/ 4 \} + (k+1)^3 \quad =$ // substitute statement with k

$\{ (k^2)*[(k + 1)^2] + 4[(k+1)^3] \} / 4 \quad =$ // common denominators to combine into one fraction

$\{ [(k + 1)^2] * [(k^2) + 4[(k+1)^3]] \} / 4 \quad =$ // factor out (k + 1)^ 2

$\{ [(k + 1)^2] * [(k^2) + 4k + 4] \} / 4 \quad =$ // foil inside

$\{ [(k + 1)^2] * [(k + 2)^2] \} / 4 \quad =$ // reverse foil inside

$\{ [(k + 1)^2] * [(k + 2)^2] \} / 4 \quad =$ // original statement, with k + 1 substituted in for k

$\{ [(k + 1)^2] * [((k + 1) + 1)^2] \} / 4 \quad =$ // expanded the squared term to make it clean, this is
// the exact original from the first line of this section