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$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

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$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1 \;\; (k+1)^4 - k^4$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$
2^4

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

2^4 $-$ 1^4

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$2^4 \quad - \quad 1^4 \quad = 4 \times 1^3$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$2^4 \quad - \quad 1^4 \quad = 4 \times 1^3 \quad +6 \times 1^2$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$2^4 \quad - \quad 1^4 \quad = 4 \times 1^3 \quad +6 \times 1^2 \quad + \quad 4 \times 1$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

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$2^4 \quad - \quad 1^4 \quad = 4 \times 1^3 \quad +6 \times 1^2 \quad + \quad 4 \times 1 \quad + \quad 1$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

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$2^4 \quad - \quad 1^4 \quad = 4 \times 1^3 \quad +6 \times 1^2 \quad + \quad 4 \times 1 \quad + \quad 1$

3^4

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$2^4 \quad - \quad 1^4 \quad = 4 \times 1^3 \quad + 6 \times 1^2 \quad + \quad 4 \times 1 \quad + \quad 1$

$3^4 \quad - \quad 2^4$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lllllll} 2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + \quad 4 \times 1 & + \quad 1 \\ 3^4 & - & 2^4 & = 4 \times 2^3 & & & \end{array}$$

$\sum_{k=1}^{n} k^3$

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$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{llllll} 2^4 & - \; 1^4 & = 4 \times 1^3 & + 6 \times 1^2 & + \; 4 \times 1 & + \; 1 \\ 3^4 & - \; 2^4 & = 4 \times 2^3 & + 6 \times 2^2 & & \end{array}$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$2^4 - 1^4 = 4 \times 1^3 + 6 \times 1^2 + 4 \times 1 + 1$$

$$3^4 - 2^4 = 4 \times 2^3 + 6 \times 2^2 + 4 \times 2$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{llllll} 2^4 - 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + \quad 1 \\ 3^4 - 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + \quad 1 \end{array}$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{ccccccc} 2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + \quad 4 \times 1 & + \quad 1 \\ 3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\ & & \vdots & & & & \end{array}$$

$\sum_{k=1}^{n} k^3$

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$$\begin{array}{cccccccc} 2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + \quad 1 \\ 3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + \quad 1 \\ & & \vdots & & & & & \\ n^4 & - & & & & & & \end{array}$$

$\sum_{k=1}^{n} k^3$

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$$\begin{array}{cccccccc} 2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + \quad 1 \\ 3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + \quad 1 \\ & & \vdots & & & & & \\ n^4 & - & (n-1)^4 & & & & & \end{array}$$

$\sum_{k=1}^{n} k^3$

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$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lllllll} 2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + \quad 4 \times 1 & + \quad 1 \\ 3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\ & & \vdots & & & & \\ n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & & & \end{array}$$

$\sum_{k=1}^{n} k^3$

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$$\begin{array}{llllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + \quad 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & & &
\end{array}$$

$\sum_{k=1}^{n} k^3$

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$$\begin{array}{llllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & &
\end{array}$$

$\sum_{k=1}^{n} k^3$

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$$\begin{array}{lcllllll} 2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + \quad 1 \\ 3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + \quad 1 \\ & & \vdots & & & & & \\ n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + \quad 1 \end{array}$$

$\sum_{k=1}^{n} k^3$

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$$\begin{array}{lcccccccc} 2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\ 3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\ & & \vdots & & & & & & \\ n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\ (n+1)^4 & & & & & & & & \end{array}$$

$\sum_{k=1}^{n} k^3$

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$$\begin{array}{lllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + \quad 4 \times 1 & + \quad 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + \quad 4 \times (n-1) & + \quad 1 \\
(n+1)^4 & - & n^4 & & & &
\end{array}$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $\quad (k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & & & & &
\end{array}$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lllllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & & & &
\end{array}$$

$\sum_{k=1}^{n} k^3$

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$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllcllcl}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & &
\end{array}$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lcclclclcl}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + \quad 4 \times 1 & + \quad 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + \quad 4 \times (n-1) & + \quad 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + \quad 4 \times n & + \quad 1
\end{array}$$

변변히 더하면

$(n+1)^4$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 \quad - \quad 1^4$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1 \quad (k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $\quad (k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{llllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + \quad 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + \quad 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + \quad 1
\end{array}$$

변변히 더하면

$$(n+1)^4 \quad - \quad 1^4 \quad = 4 \times \sum_{k=1}^{n} k^3 \quad +6$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + \quad 4 \times 1 & + \quad 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + \quad 4 \times (n-1) & + \quad 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + \quad 4 \times n & + \quad 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + \quad 4 \times 1 & + \quad 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + \quad 4 \times (n-1) & + \quad 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + \quad 4 \times n & + \quad 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{cccccccccc}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k + n$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

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 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k + n$$

$(n+1)^4$

$\sum_{k=1}^{n} k^3$

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2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k + n$$

$(n+1)^4 - 1^4$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1 \quad (k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

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2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + \; 1 \\
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 & & \vdots & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + \; 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + \; 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k + n$$

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3$$

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3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + \quad 4 \times (n-1) & + \quad 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + \quad 4 \times n & + \quad 1
\end{array}$$

변변히 더하면

$$(n+1)^4 \quad - \quad 1^4 \quad = 4 \times \sum_{k=1}^{n} k^3 \quad +6 \times \sum_{k=1}^{n} k^2 \quad + \quad 4 \times \sum_{k=1}^{n} k \quad + \quad n$$

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1 \quad (k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lllllll}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k + n$$

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \frac{n(n+1)(2n+1)}{6}$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $(k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lcclclclcl}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
\end{array}$$

변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k + n$$

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$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

$(k+1)^4 = k^4 + 4k^3 + 6k^2 + 4k + 1$ $\quad (k+1)^4 - k^4 = 4k^3 + 6k^2 + 4k + 1$

$$\begin{array}{lclllcllcl}
2^4 & - & 1^4 & = 4 \times 1^3 & +6 \times 1^2 & + & 4 \times 1 & + & 1 \\
3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + & 4 \times 2 & + & 1 \\
 & & \vdots & & & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + & 4 \times (n-1) & + & 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + & 1
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변변히 더하면

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \sum_{k=1}^{n} k^2 + 4 \times \sum_{k=1}^{n} k + n$$

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3^4 & - & 2^4 & = 4 \times 2^3 & +6 \times 2^2 & + \quad 4 \times 2 & + \quad 1 \\
 & & \vdots & & & & \\
n^4 & - & (n-1)^4 & = 4 \times (n-1)^3 & +6 \times (n-1)^2 & + \quad 4 \times (n-1) & + \quad 1 \\
(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + \quad 4 \times n & + \quad 1
\end{array}$$

변변히 더하면

$$(n+1)^4 \quad - \quad 1^4 \quad = 4 \times \sum_{k=1}^{n} k^3 \quad +6 \times \sum_{k=1}^{n} k^2 \quad + \quad 4 \times \sum_{k=1}^{n} k \quad + \quad n$$

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \frac{n(n+1)(2n+1)}{6} + 4 \times \frac{n(n+1)}{2} + n$$

$\sum_{k=1}^{n} k^3$

$$\sum_{k=1}^{n} k^3 = \left\{ \frac{n(n+1)}{2} \right\}^2$$

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(n+1)^4 & - & n^4 & = 4 \times n^3 & +6 \times n^2 & + & 4 \times n & + \quad 1 \\
\text{변변히} & & \text{더하면} & & & & & \\
(n+1)^4 & - & 1^4 & = 4 \times \sum_{k=1}^{n} k^3 & +6 \times \sum_{k=1}^{n} k^2 & + & 4 \times \sum_{k=1}^{n} k & + \quad n
\end{array}$$

$$(n+1)^4 - 1^4 = 4 \times \sum_{k=1}^{n} k^3 + 6 \times \frac{n(n+1)(2n+1)}{6} + 4 \times \frac{n(n+1)}{2} + n$$

Github:
https://min7014.github.io/math20200720001.html

Click or paste URL into the URL search bar, and you can see a picture moving.