$$f_4(c_1) = c_7 = \frac{9478657}{2298192}.$$

Iterating once produces

$$f_4(c_7) = c_{31} = \frac{64576903826545426454350012417}{15662199732482357532660158592}.$$

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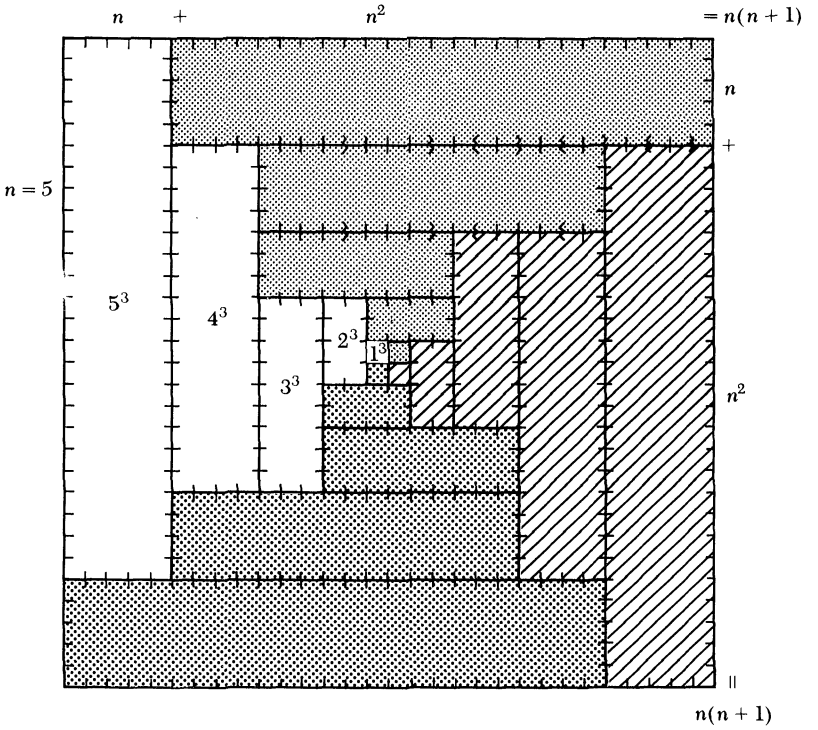
Proof without Words:

$$1^3 + 2^3 + 3^3 + 4^3 + \cdots + n^3 = \frac{\{n(n+1)\}^2}{4}$$



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