CEMC at Home

## Grade 11/12 - Thursday, June 11, 2020
That Number Makes it Perfect

A *perfect square* is an integer that can be expressed as the product of two equal integers. The integer 25 is a perfect square since it can be expressed as the product 5×5 or 5^2.

The positive even integers 2 to 1600, inclusive, are each multiplied by the same positive integer, n. All of the products are then added together and the resulting sum is a perfect square.

Determine the value of the smallest positive integer n that makes this true.

$$1 \times 1 = 1^2 = 1 \quad 2 \times 2 = 2^2 = 4 \quad 3 \times 3 = 3^2 = 9 \quad 4 \times 4 = 4^2 = 16$$
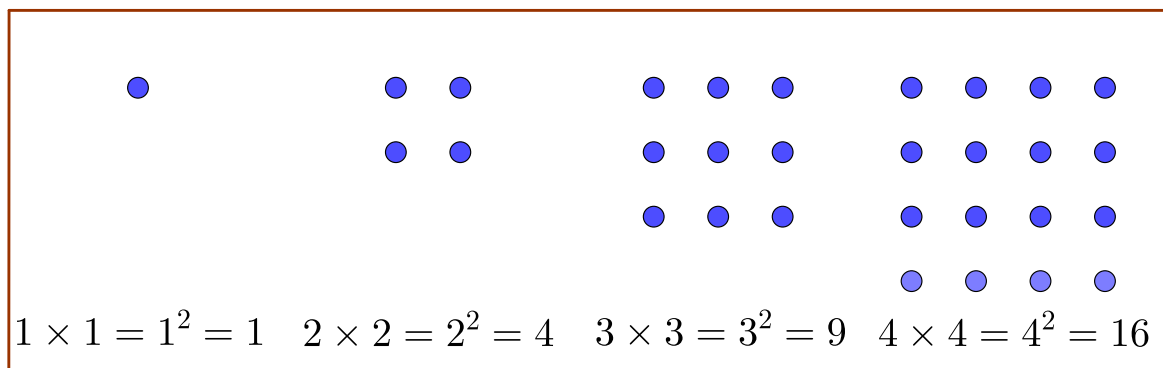
Did you know that the sum, S, of the positive integers from 1 to some positive integer n can be calculated using the formula $S = \dfrac{n \times (n+1)}{2}$?
For example,

$$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 = \frac{10 \times 11}{2} = 55.$$

This result may be helpful in this problem.

More Info:

Check out the CEMC at Home webpage on Friday, June 12 for a solution to That Number Makes it Perfect.