Correct solutions were submitted by:

Find a simple formula for:

\[ 1 \binom{n}{1} + 2 \binom{n}{2} + 3 \binom{n}{3} + \cdots + n \binom{n}{n}. \]

**SOLUTION:**

\[ n^{2^{n-1}} = 1 \binom{n}{1} + 2 \binom{n}{2} + 3 \binom{n}{3} + \cdots + n \binom{n}{n}. \]

**Proof:** The binomial theorem states:

\[ (x + y)^n = \sum_{k=0}^{n} \binom{n}{k} x^k y^{n-k}. \]

Substituting \( y = 1 \) gives:

\[ (x + 1)^n = \sum_{k=0}^{n} \binom{n}{k} x^k. \]

Differentiating we obtain:

\[ n(x + 1)^{n-1} = \sum_{k=1}^{n} k \binom{n}{k} x^{k-1}. \]

Letting \( x = 1 \) gives:

\[ n^{2^{n-1}} = \sum_{k=1}^{n} k \binom{n}{k}. \]