1. We prove that $\forall n \geqslant 2, 2^n + 3^n < 4^n$, using simple induction.

   Base Case: $2^2 + 3^2 = 4 + 9 = 13 < 16 = 4^2$.

   Ind. Hyp.: Assume $n \in \mathbb{N}$ and $n \geqslant 2$ and $2^n + 3^n < 4^n$.

   Ind. Step:
   $$\begin{aligned} 2^{n+1} + 3^{n+1} &= 2 \cdot 2^n + 3 \cdot 3^n \\ &< 4 \cdot 2^n + 4 \cdot 3^n \\ &= 4 \cdot (2^n + 3^n) \\ &< 4 \cdot 4^n && \text{(by the I.H.)} \\ &= 4^{n+1} \end{aligned}$$

   Hence, by induction, $\forall n \geqslant 2, 2^n + 3^n < 4^n$.

2. **Predicate:** Let $P(n)$ be the statement: "any n squares can be dissected and rearranged to form one square".

   Base Case: Any one square is already a square. Hence, $P(1)$.

   Ind. Hyp.: Assume $n \geqslant 1$ and $P(n)$ (any n squares can be dissected and rearranged to form one square).

   Ind. Step: Suppose $S_1, S_2, \ldots, S_n, S_{n+1}$ are $n + 1$ squares.

   Since $n + 1 \geqslant 2$ (because $n \geqslant 1$) and $P(2)$ is true (given), S_n and S_{n+1} can be dissected and rearranged to form one new square S'.

   Then, $S_1, S_2, \ldots, S_{n-1}, S'$ is a collection of n squares. By the inductive hypothesis, they can be dissected and rearranged into one square.

   During this dissection, S' will be cut by a finite number of straight lines, which adds a finite number of further cuts to the original squares S_n and S_{n+1}.

   Hence, $S_1, \ldots, S_{n+1}$ can be dissected and rearranged to form one square.

   Since $S_1, \ldots, S_{n+1}$ were arbitrary, $P(n + 1)$.

   Conclusion: By induction, $\forall n \geqslant 1, P(n)$.

   NOTE: There were many other correct ways to prove the induction step, *e.g.*, we could have used the induction hypothesis first, to conclude that $S_1, S_2, \ldots, S_n$ can be dissected and rearranged to form one square S', then $P(2)$ to conclude that S', S_{n+1} can be dissected and rearranged to form one square.