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1. Show that $\sum_{i=1}^{n}(i+1)2^i = n2^{n+1}$ for all positive integers n.

2. Let n be a positive integer and $A_1, \ldots, A_n$ be some sets. Let us define union of these sets as follows:

1. $\cup_{i=1}^{1} A_i = A_1$,
2. $\cup_{i=1}^{k+1} A_i = (\cup_{i=1}^{k} A_i) \cup A_{k+1}$.

Show that $\cup_{i=1}^{n} [i] = [n]$.

3. Let Ω, A_1, $\ldots$, $A_n \subseteq \Omega$ be some sets. Show that $\cup_{i=1}^{n} A_i = \{x \in \Omega \; : \; \exists i \in [n] \; x \in A_i\}$.