1. Show that if the difference between two integers is a multiple of 7, then so is the difference between their squares.

2. Let $m$ and $n$ be positive integers with $m > n$. Show that if $m$ objects are distributed among $n$ boxes, then some box must contain at least two objects.

3. Show that for any real number $a \geq 4$, there exist two real numbers whose sum and product is both $a$.

4. Let $A$, $B$, and $C$ be sets. Prove that $A \cup C \subseteq B \cup C$ if and only if $A \setminus C \subseteq B \setminus C$. 