1. State, in complete grammatical sentences, the Peano Axioms for the natural numbers.

2. If $A$ and $B$ are subsets of $X$, prove that $X \setminus (A \cup B) = (X \setminus A) \cap (X \setminus B)$. (It may help to draw a Venn diagram first.)

3. Let $f : S \to T$ and $g : T \to U$ be functions. Prove that if $f$ and $g$ are bijective, then $g \circ f$ is bijective. (Recall that bijective means injective and surjective.)

4. Prove that for all natural numbers $m, n \in \mathbb{N}$, if $m \leq n$, then $m^2 \leq n^2$. (Here $m^2 = m \cdot m$ and $n^2 = n \cdot n$.)

5. On the set $\mathbb{Q}$ of rational numbers, define a relation $\sim$ by: $x \sim y$ if and only if $x - y \in \mathbb{Z}$. Is this an equivalence relation? Explain thoroughly why or why not.

6. Prove for all integers $a, b, c \in \mathbb{Z}$ that $a \mid b$ and $b \mid c$ imply $a \mid (a + b + c)$.

7. Prove for all $a, b, n \in \mathbb{Z}$ with $n > 0$ that $(a, n) = 1$ and $(b, n) = 1$ imply $(ab, n) = 1$. (Here $(a, n)$ denotes the greatest common divisor.)