Problem 1. Let S be a set with n elements and let k be an integer such that $0 \leq k \leq n$. Let T be the set of k-element subsets of S and let U be the set of $(n-k)$-element subsets of S. Construct a bijection between T and U and conclude that $\binom{n}{k} = \binom{n}{n-k}$.

Problem 2. Let S be a finite set. Prove that the number of subsets of S is the same as the number of functions from S to a fixed set with 2 elements.

Problem 3. If $f : A \to B$ is one-to-one then $|A| \leq |B|$.
A) True B) False

Problem 4. If $f : A \to B$ is injective but not surjective then $|A| < |B|$.

Problem 5. If $f : A \to B$ is onto then $|A| \geq |B|$.
A) True B) False

Problem 6. Let A and B be finite sets. How many functions are there from A to B?
A) $|A| + |B|$ B) $|A| \times |B|$ C) $|B|^{|A|}$ D) $|A|^{|B|}$ E) None of these

Problem 7. Let A and B be finite sets. How many *bijections* are there from A to B?
A) $|B|^{|A|}$ B) $|A|^{|B|}$ C) $|A|!$ D) $|B|!$ E) None of these

Problem 8. Let A and B be sets. There is an injection from A to B if and only if there is a surjection from B to A.
A) True B) False

Problem 9. Explain the concept of number using only ideas from set theory. What does it mean for one number to be larger than another? What does it mean to be infinite? What is addition? Multiplication? Exponentiation?