1. Suppose you roll a 6-sided die 6 times.
   a. How many different outcomes are possible?
   b. What is the probability that all of the rolls show either 1, 2, or 3?
   c. What is the probability that all of the rolls show the same value?
   d. What is the probability that all of the rolls show unique values (none of them match)?
   e. What is the probability that the first two rolls match, the second two rolls match (and are different from the previous ones) and that the last two rolls match (and are different from any of the previous ones)?

2. Decide whether or not each of the following functions is injective. Prove your answer formally.
   a. $f : \mathbb{N} \to \mathbb{R}$ such that $f(n) = 3/(n + 5)$
   b. $f : \mathbb{N} \times \mathbb{N} \to \mathbb{N}$ such that $f(\langle a, b \rangle) = a^b$

3. Decide whether or not each of the following functions is surjective. Prove your answer formally.
   a. $f : \mathbb{N} \to \mathbb{R}$ such that $f(n) = 3/(n + 5)$
   b. $f : \mathbb{N} \times \mathbb{N} \to \mathbb{N}$ such that $f(\langle a, b \rangle) = a^b$

4. Let $f(x) = x^2$. Note that I have not specified the domain or co-domain. For this problem domains and co-domains are subsets of the reals. (You do not have to prove anything in this question, just specify domains and co-domains as instructed below.)
   a. Give a domain and co-domain such that $f$ is a bijection.
   b. Give a domain and co-domain such that $f$ is injective, but not surjective.
   c. Give a domain and co-domain such that $f$ is surjective, but not injective.
   d. Give a domain and co-domain such that $f$ is neither injective nor surjective.