1. Consider the hashing example in class. Again, we pick a random \( m \)-element subset \( S \) of \( U = \{0, \ldots, N - 1\} \), and as discussed in class, we hash them into \( H = \{0, \ldots, n - 1\} \). Suppose that we pick \( u \) at random from \( S \) (therefore, we know that \( u \) is in the table). What is the expected number of comparisons needed to find \( u \)?

2. Suppose that a box is filled with \( n \) distinguishable coupons. We draw a coupon at random, and then replace it. Let \( X \) be the number of tries needed for all coupons to have been drawn at least once. What is \( E(X) \)?

3. Look at section 1.1.2 of the notes for this week’s lectures. Prove that:

\[
\sum_{k=0}^{n-1} E(T_1 | f(u) = k) = \sum_{k=0}^{n-1} E \left( \frac{X_k}{m} \frac{1 + X_k}{2} + \left( 1 - \frac{X_k}{M} \right) X_k \right)
\]