1. In a box there are 30 long, 12 medium and 10 short pegs. Four pegs are selected at random and used in 4 different projects (one per project). What is the expected number of projects that receive long pegs?

2. The number of cars passing through a toll gate during any time period of length \( t \) is an RV with the pmf
   \[ p_N(n) = a \frac{(2t)^n}{n!}, \quad n = 0, 1, 2, \ldots \]
   Find \( a \) and compute \( P(X < 4) \) and \( P(X > 1) \).

3. Let \( N \) be the random number of failures in a sequence of \( t \) independent Bernoulli experiments with probability of success \( p \). Let \( X \) be the number of successes appearing before the first failure. Find the joint pmf \( p_{N,X}(n,x) \).

4. Suppose that \( X \) and \( Y \) are independent RVs with pmf
   \[ p_X(k) = p_Y(k) = p(1-p)^{k-1}, \quad k = 1, 2, \ldots \]
   Find the conditional pmf \( p_{X|A_n}(k|A_n) \), where \( A_n = \{ X + Y = n \} \), \( n = 2, 3, \ldots \).

5. Let \( X \) be an RV such that \( p_X(n) > 0 \) for all \( n \in \mathbb{Z} \). Find \( E[\cos(X\pi)] \), \( E[\sin(X\pi)] \).

6. We are rolling a 6-sided die several times. What is the expected number of rolls before each of the possible outcomes appears at least once?