1. Two urns contain balls numbered in the following way. Urn A contains balls numbered 1,2, and 4. Urn B contains balls numbered 3,5, and 6. A ball is drawn at random from urn A. If the ball is numbered 2 or 4, a second ball is drawn from the same urn (no replacement). If the ball has number 1, then the second ball is drawn from urn B. If X is the random variable which gives the total on the two balls, calculate its probability mass function p and its cumulative distribution function F.

   Ans: X can take on values 3,4,5,6,7. $p(3) = 1/6, p(4) = 1/9, p(5) = 1/6, p(6) = 4/9, p(7) = 1/9$.

$$F(x) = \begin{cases} 0 & x < 3 \\ 1/6 & 3 \leq x < 4 \\ 1/6 + 1/9 & 4 \leq x < 5 \\ 1/6 + 1/9 + 1/6 & 5 \leq x < 6 \\ 1/6 + 1/9 + 1/6 + 4/9 & 6 \leq x < 7 \\ 1 & 7 \leq x \end{cases}$$

2. It is estimated that 0.8% of a large shipment of eggs to a certain supermarket are cracked. The eggs are packaged in cartons, each with a dozen eggs, with the cracked eggs being randomly distributed. A customer who buys 10 cartons. Let X be the number of cartons in which she will find cracked eggs. Calculate the probability mass function p and Expected value of X ?

   Hint: Binomial with probability of success $p = (1 - 0.008)^{12}$

3. Suppose that an airplane engine will fail, when in flight, with probability $1 - p$ independently from engine to engine; suppose that the airplane will make a successful flight if atleast 50 percent of its engines remain working. For what values of p is a four-engine plane preferable to a two-engine plane ? *Ans:* $2/3 \leq p \leq 1$.

[1] **Office hours:** Monday:2:00-3:00pm, Tuesday:10:30-11:30 am, 3:30-4:30 pm