Probability Distributions. Expectation.

1. *There are four agents at the travel agency. The distribution of a number of agents who are busy at a particular time is given by the following table*

X	0	1	2	3	4
p	0.1	0.2	0.4	0.1	0.2

(a) Find the probabilities that (i) all agents are busy; (ii) 2 or more are busy (iii) 3 or less are busy.
(b) Draw a probability histogram.
(c) Find the cumulative distribution function.
(d) Compute expected number of busy clerks.
(d) Find the standard deviation.

2. *An urn contains 3 red balls and 5 blue ones. A ball is chosen randomly without replacement until a blue ball appears. Let X be the number of trials needed.*
(a) Find the probability mass function of X.
(b) Find the cumulative distribution of X.
(c) Compute the expectation of X.

3. *An urn contains 3 red balls and 5 blue ones. A ball is chosen randomly with replacement until a blue ball appears. Let X be the number of trials needed.*
(a) Find the cumulative distribution of X and compute the probability that $2 \leq X \leq 5$.
(b) Compute EX.

4. *The cumulative distribution of X equals to*

$$F(x) = \begin{cases} 0 & \text{if } x < 1 \\ 0.2 & \text{if } 1 \leq x < 3 \\ 0.8 & \text{if } 3 \leq x < 4 \\ 1 & \text{if } x \geq 4 \end{cases}$$

Find the probability mass function.

5. *In a Fairpay company 3 employees get 20K per year, 3 get 30K, 2 get 60K, 1 gets 80K and 1 gets 2M.*
(a) What is the average salary in this company?
(b) What is the variance of the salary?

6. *A coin is tossed once, twice, three times, 1000 times. Compute the average number of heads.*

7. *A lottery ticket costs $1. 4 numbers are selected randomly from a set of 20 (the order is not important). If you have guessed all numbers correctly you get $4000. You will also get $10 for three correct answers. If you buy one ticket what is your expected payoff? Ten tickets?*