Objective:

In this session, you will practice and solve some problems that involve identifying certain probability distributions and few applications of central limit theorem.

Key takeaways:

1. Computing distributions in Python
2. Identify probability distributions
   - Geometric: For estimating number of attempts before first success
   - Binomial: For estimating number of successes in '*n*' attempts
   - Poisson: For estimating '*n*' number of events in given time window when, on average we see '*m*' events
   - Exponential: Time between events

'p' – cumulative distribution; (area under the curve) p(x<'a')

'd' – probability density; p(x = 'a') height of the distribution

'q' – inverse of 'p'/ quantile; Value on x-axis corresponding to 'pnorm'

'r' – random number; random number generation for specified probability distribution

Problem statement 1:

1. Consider the favorite coin toss experiment. If you toss a biased coin, the probability of obtaining heads is 0.6. If you toss the coin 10 times, what is the probability of getting heads exactly 4 times?

2. You are fond of a particular flavor of ice-cream but it is rarely available in the shop. The probability of getting that ice-cream is only 0.15.
   a. Obtain a distribution table for getting ice-cream in 1st, 2nd,....., 10th visit and generate a plot.
   b. How many visits on an average are required to get your favorite ice-cream?

3. Customers arrive at a bus station at the rate of 5 per minute following Poisson distribution. What is the probability of 3 arrivals in a one-minute interval?

4. Average birth rate = 1.8 per hour. What is the probability that 5 people are born in a 2 hour interval.

5. The time required to repair a machine is an exponential random variable with rate $\lambda = 0.5$ jobs/hour.
What is the probability that a repair time exceeds 2 hours?

6. Compute Z score for the elements in the vector below

82, 72, 85, 14, 66, 15, 23, 78, 16, 38, 92, 17.

7. If player A gets a goal an average of 70% of the time with SD of 20%. Player B gets a goal an average of 40% of the time with SD of 10%. In a particular game, player A gets the goal 75% of time and player B gets the goal 55% of the time. Which of these two players have done better when compared to their personal track records?

8. A college basketball team has a shortage of one team member and a coach wants to recruit a player. To be selected for training the minimum height recruitment is 72 inches. The average height of the students is 67.2 inches with a variance of 29.34. What is the probability that the coach finds a player from that college?

9. A certain type of light bulb has an average life of 500 hours, with a standard deviation of 100 hours. The life of the bulb can be closely approximated by a normal curve. An amusement park buys and installs 10,000 such bulbs. Find the total number that can be expected to last for each period of time.

a. At least 500 hours
b. Less than 500 hours
c. Between 350 and 550 hours
d. More than 750 hours

10. Twelve volunteers were chosen for a blind-fold test to taste 2 soft-drinks A & B. What is the probability that 3 of them were able to correctly identify the drink that they had?