

Tutorial-3

- Define random variable. In each of the following, identify the variable as discrete or not discrete:
 - T: the turnaround time of a computer
 - M: the number of meteorites hitting a satellite per day
 - X: the number of power failures per month in the SVNIT hostels.

- A die is tossed thrice. A success is 'getting 1 or 6' on a toss. Find the probability distribution for given data.
- Grafting, the uniting of the stem of one plant with the stem or root of another is widely used commercially to grow the stem of one variety that produces fine fruit on the root system of another variety with a hardy root system. Let X denotes the number of grafts that fail. The density for X is given:

x	0	1	2	3	4	5
f(x)	0.7	0.2	0.05	0.03	0.01	?

- Find $E[X]$
 - Find μ_X
 - Find $E[X^2]$
 - Find $\text{Var}X$
 - Find σ_X^2
 - Find the standard deviation for X.
 - What physical unit is associated with σ_X ?
- From above example 1 find table for cumulative distribution function. Using this table find the probability that at most three grafts fails. Also use c.d.f. to verify that the probability of exactly three failure in 0.03.
 - A random variable X has the following probability distribution:

x:	0	1	2	3	4	5	6	7	8
p(x):	a	3a	5a	7a	9a	11a	13a	15a	17a

- Determine the value of a.
 - Find $P(X < 3)$, $P(X \geq 3)$, $P(2 \leq X < 5)$.
 - What is the smallest value of x for which $P(X \leq x) > 0.5$?
- A drug is used to maintain steady heart rate in patients who have suffered a mild heart attack. Let X denotes the number of heart beats per minutes obtained per patients. Consider a new drug with Y nos. of heart beats per minutes obtained per patients. The hypothetical density function for both drugs is given as;

X/Y	40	60	68	70	72	80	100
f(x)	.01	.04	.05	.80	.05	.04	.01
f(y)	.4	.05	.04	.02	.04	.05	.4

- Find $E[X]$, $E[Y]$
 - Find μ_X , μ_Y
 - Find $E[X^2]$, $E[Y^2]$
 - Find $\text{Var}X$, $\text{Var}Y$
 - Find σ_X , σ_Y
 - What unit is associated with σ_X , σ_Y . Which drug you think is more efficient?
- Define Binomial random variable X. Also find moment generating function, mean and variance of Binomial variate X.

8. The probability that Abhinav hits a target at any time is $\frac{1}{3}$. Suppose he fires at the target 7 times, find the probability that he hits the target (a) exactly 3 times, (b) at least 1 time.
9. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is $\frac{5}{6}$. What is the probability that he will knock down fewer than 2 hurdles.
10. Discuss Poisson Random variables. Derive Poisson distribution as an approximation of Binomial distribution for very large number of experiments and success probability $p \rightarrow 0$.
11. Let probability of exposure to a certain infectious disease be 0.3, then find
- (a) The probability that eighth child is the third one to catch the disease.
 - (b) Expected number of children catching the disease.