



## BAMAT207-Probability and Statistics

### Tutorial sheet-2A

#### Module2: Probability Distributions

##### Easy

- 1) The mean of a geometric distribution is 4. Determine the geometric distribution.

**Ans:**  $X \sim \text{Geometric}(1/4)$

- 2) Fit a Bernoulli distribution.

Outcome(x)	0	1
Frequency(f)	18	42

**Ans:**  $X \sim \text{Bernoulli}(0.7)$

- 3) If the number  $X$  of particles emitted during a 1-h period from a radioactive source has a Poisson distribution with parameter  $\lambda = 4$  and that the probability that any emitted particle is recorded is  $p = 0.9$ , find the probability distribution of the number  $Y$  of the particles recorded in a 1-h period and hence the probability that no particle is recorded.

**Ans:** 0.0273

##### Medium

- 1) The mean and variance of a binomial distribution are 4 and  $4/3$  respectively. Find  $P(X \geq 1)$ , if  $n = 6$ .

**Ans:** 728/729

- 2) Fit a Poisson distribution for the following distribution and hence find the expected frequencies.

x	0	1	2	3	4	5	6
f	314	335	204	86	29	9	3

**Ans:** 301, 362, 217, 87, 26, 6, 1

- 3) A set of 6 similar coins are tossed 640 times with the following results:

Number of heads	0	1	2	3	4	5	6
Frequency	7	64	140	210	132	75	12

Calculate the binomial frequencies on the assumption that the coins are symmetrical.

**Ans:** 10, 60, 150, 200, 150, 60, 10

- 4) Customers of an internet service provider initiate new accounts at the average of 10 accounts per day.
  - (a) What is the probability that more than 8 new accounts will be initiated today?
  - (b) What is the probability that more than 16 accounts will be initiated within 2 days?

**Ans:** a) 0.667, b) 0.779

- 5) It is known that the probability of an item produced by a certain machine will be defective is 0.05. If the produced items are sent to the market in packets of 20, find the number of packets containing at least, exactly and at most 2 defective items in a consignment of 1000 packets using binomial distribution.

**Ans:** 925

- 6) If the probability that an applicant for a driver's licence will pass the road test on any given trial is 0.8, what is the probability that he will finally pass the test (a) on the fourth trial and (b) in fewer than 4 trials?

**Ans:** (a) 0.0064, (b) 0.9984

## Hard

- 1) A and B shoot independently until each has hit his own target. The probabilities of their hitting the target at each shot are  $\frac{3}{5}$  and  $\frac{2}{7}$  respectively. Find the probability that B will require more shots than A.

**Ans:** 6/31

- 2) The probability that a particular stock gives profit on exactly 2 days out of 5 trading days is 0.2048.

Find:

- a) the probability that the stock gives profit on any given day

- b) the probability that the stock gives profit on at least 3 days

Answer: a)  $C(5,2)p^2(1-p)^3 = 0.2048 \Rightarrow p = 0.2,$

b)  $P(X \geq 3) = P(3) + P(4) + P(5)$

- 3) It is observed that the probability of no accident case arriving in an hour is 0.1353.

- a) Find the average number of accident cases per hour.
- b) Find the probability that exactly 2 accident cases arrive in an hour.
- c) Find the probability that at least one accident case arrives in an hour.

Answer: a)  $\lambda = 2$ , b)  $P(X=2) = 0.2707$ , c)  $P(X \geq 1) = 0.8647$

- 4) Establish the memoryless property of geometric distribution, that is, if  $X$  is a discrete RV following a geometric distribution, then

$$P(X > m + n | (X > m)) = P(X > n)$$

where  $m$  and  $n$  are any two positive integers. Prove the converse also, if it is true.