VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Activity 6:

Name: Preyash **Date: 08/03/2022**

Registration Number: 20BPS1022

Aim: To get used to distribution syntax.

Tools Used: R Studio

Syntax/ Commands Used:

- **dbinom(x,size,prob)->** To find binomial distribution at value x
- **pbinom(x,size,prob)->** To find binomial distribution at value less than or equal to x
- **dpois(x,lambda)->** To find Possion distribution at value x
- **ppois(x,lambda,lower.tail)->** To find Possion distribution at value less than equal to x

Questions:

Task 1:

1. An automatic camera records the number of cars running a red light at an intersection (that is, the cars were going through when the red light was against the car). Analysis of the data shows that on average 15% of light changes record a car running a red light. Assume that the data has a binomial distribution. What is the probability that in 20 light changes there will be exactly three (3) cars running a red light?

Code:

```
dbinom(x=3,size=20,prob=0.15)
```

Output:

```
R 4.1.2 · ~/
> dbinom(x=3,size=20,prob=0.15)
[1] 0.2428289
>
```

Task 2:

2. The average number of accidents at a level crossing every year is 5. Calculate the probability that there are exactly 3 accidents there this year.

Code:

```
dpois(x=3,lambda=5)
```

Output:

```
> dpois(x=3,lambda=5)
[1] 0.1403739
>
```

Task 3:

3. The New Zealand Forestry Industry executives claim that only 5% of all old sawmills sites contain soil residuals of dioxin (an additive previously used for anti-sap-stain treatment in wood) higher than the recommended level. If Environment Canterbury randomly selects 20 old sawmill sites for inspection, assuming that the executive claim is correct: a) Calculate the probability that less than 1 site exceeds the recommended level of dioxin. b) Calculate the probability that less than or equal to 1 site exceeds the recommended level of dioxin. c) Calculate the probability that at most (i.e., maximum of) 2 sites exceed the recommended level of dioxin

Code:

a)

```
probs=dbinom(0,size=20,prob=0.05)
round(probs,4)
```

b)

```
probs=pbinom(1,size=20,prob=0.05)
round(probs,4)
```

c)

```
probs=pbinom(2,size=20,prob=0.05)
round(probs,4)
```

Output:

a)

```
> probs=dbinom(0,size=20,prob=0.05)
> round(probs,4)
[1] 0.3585
```

b)

```
> probs=pbinom(1,size=20,prob=0.05)
> round(probs,4)
[1] 0.7358
```

c)

```
> probs=pbinom(2,size=20,prob=0.05)
> round(probs,4)
[1] 0.9245
```

Task 4:

4. A radioactive source emits 4 particles on average for five seconds. a) Calculate the probability that it emits 3 particles during 5 seconds. b) Calculate the probability that it emits at least one particle during a 5-second period. c) During ten seconds, what is the probability that 6 particles are emitted?

Code:

a) dpois(x=3, lambda=4)

b) ppois(q=1, lambda=4, lower.tail= FALSE)+ dpois(1,lambda=4)

c) dpois(x=6, lambda=8)

Output:

a)

```
> dpois(x=3, lambda=4)
[1] 0.1953668
```

b)

```
> ppois(q=1, lambda=4, lower.tail= FALSE)+ dpois(1,l
ambda=4)
[1] 0.9816844
```

c)

```
> dpois(x=6, lambda=8)
[1] 0.1221382
>
```

Task 5:

5. A 5-liter bucket of water is taken from a swamp. The water contains 75 mosquito larvae. A 200mL flask of water is taken from the bucket for further analysis. What is a) the expected number of larvae in the flask? b) the probability that the flask contains at least one mosquito lava?

Code:

a)) Expected number is of larvae is 3 (as 75 mosquito 5L)

b) 1-dpois(x=0, lambda=3)

Output:

```
> 1-dpois(x=0,lambda=3)
[1] 0.9502129
```

Result: We successfully used distribution syntax in R.