

### Problem Set-5

Q.1) During a laboratory experiment, the average number of radioactive particles passing through a counter in 1 millisecond is 4. What is the probability that 6 particles enter the counter in a given millisecond?

Ans >  $\text{dpois}(6,4)$

[1] 0.1041956

Q.2) In a certain industrial facility, accidents occur infrequently. It is known that the probability of an accident on any given day is 0.005 and accidents are independent of each other.

(a) What is the probability that in any given period of 400 days there will be an accident on one day?

Ans >  $\text{dpois}(1,2)$

[1] 0.2706706

(b) What is the probability that there are at most three days with an accident?

Ans >  $\text{dpois}(3,2)$

[1] 0.180447

Q.3) In a manufacturing process where glass products are made, defects or bubbles occur, occasionally rendering the piece undesirable for marketing. It is known that, on average, 1 in every 1000 of these items produced has one or more bubbles. What is the probability that a random sample of 8000 will yield fewer than 7 items possessing bubbles?

Ans >  $\text{ppois}(6,8)$

[1] 0.3133743

Q.4) On average, 3 traffic accidents per month occur at a certain intersection. What is the probability that in any given month at this intersection

(a) exactly 5 accidents will occur?

Ans > `dpois(5,3)`

[1] 0.1008188

(b) fewer than 3 accidents will occur?

Ans > `ppois(2,3)`

[1] 0.4231901

(c) at least 2 accidents will occur?

Ans > `ppois(1,3)`

[1] 0.1991483

Q.5) The potential buyer of a particular engine requires (among other things) that the engine starts successfully 10 consecutive times. Suppose the probability of a successful start is 0.990. Let us assume that the outcomes of attempted starts are independent.

(a) What is the probability that the engine is accepted after only 10 starts?

Ans > `dbinom(10,10,0.99)`

[1] 0.9043821

(b) What is the probability that 12 attempted starts are made during the acceptance process?

Ans > `dbinom(12,12,0.99)`

[1] 0.8863849

Q.6) The acceptance scheme for purchasing lots containing a large number of batteries is to test no more than 75 randomly

selected batteries and to reject a lot if a single battery fails.  
Suppose the probability of a failure is 0.001.

(a) What is the probability that a lot is accepted?

```
Ans > pbinom(0,75,0.001)
```

```
[1] 0.9277087
```

(b) What is the probability that a lot is rejected on the 20th test?

```
Ans > dpois(20,0.075)
```

```
[1] 1.209285e-41
```

(c) What is the probability that it is rejected in 10 or fewer trials?

```
Ans > x=1:75
```

```
> round(sum(dpois(x,0.001)),4)*10
```

```
[1] 0.01
```

Q.7) Plot the graph for Q. No. 2, 4, 5 and 6 for Random Variable against Probability Distribution function.

```
Ans > par(mfrow = c(1,4))
```

```
> x=2
```

```
> plot(x,dpois(1,2),type='o',col='blue')
```

```
> x<-3
```

```
> plot(x,dpois(5,3),type='o',col='red')
```

```
> plot(x,ppois(2,3),type='o',col='red')
```

```
> plot(x,ppois(1,3),type='o',col='red')
```

```
> x<-10
```

```
> plot(x,dbinom(10,10,0.99),type='o',col='purple')
```

```
> plot(x,dbinom(12,12,0.99),type='o',col='purple')
```

```
> x<-75
```

```
> plot(x,dbinom(0,75,0.001),type='o',col='green')
```

```
> plot(x,dpois(20,0,0.075),type='o',col='green')
```

