

Binomial

```
dbinom(x, size, prob)
pbinom(x, size, prob)
qbinom(p, size, prob)
rbinom(n, size, prob)
```

```
# Create a sample of 50 numbers which are incremented by 1.
```

```
x <- seq(0,50,by = 1)
```

```
# Create the binomial distribution.
```

```
y <- dbinom(x,50,0.5)
```

```
# Plot the graph for this sample.
```

```
plot(x,y)
```

```
# Probability of getting 26 or less heads from a 51 tosses of a coin.
```

```
x <- pbinom(26,51,0.5)
```

```
print(x)
```

```
# How many heads will have a probability of 0.25 will come out when a coin
```

```
# is tossed 51 times.
```

```
x <- qbinom(0.25,51,1/2)
```

```
print(x)
```

```
x <- rbinom(8,150,0.4)
```

```
print(x)
```

```
#Binom(n = 5, p = 0.5) probabilities
```

```
> n <- 5; p<- 0.5; x <- 0:n
```

```
> dbinom(x,n,p)
```

```
#To verify the total probability is 1
```

```
> sum(dbinom(x,n,p))
```

```
> x <- 0:12
```

```
> prob <- dbinom(x,12,.5)
```

```
> barplot(prob,col = "red",ylim = c(0,.2),names.arg=x,
  main="Binomial Distribution\n(n=12,p=0.5)")
```

```
n = 10; p = 0.4; x = 0:n;
```

```
> prob = dbinom(x,n,p)
```

```
> cdf = pbinom(x,n,p)
> distTable = cbind(x,prob,cdf)
> distTable
```

```
barplot(height = dbinom(0:20, size = 20, p = 0.7),
         names.arg = 0:20,
         main = "Binomial PDF", xlab = 'X', ylab = 'Probability')
barplot(height = pbinom(0:20, size = 20, p = 0.7),
         names.arg = 0:20,
         main = "Binomial CDF", xlab = 'X', ylab = 'Probability')
```

Poisson

```
dpois(x, lambda, log = FALSE)
ppois(q, lambda, lower.tail = TRUE, log.p = FALSE)
qpois(p, lambda, lower.tail = TRUE, log.p = FALSE)
rpois(n, lambda)
```

note:

log, log.p: logical; if TRUE, probabilities p are given as log(p).

lower.tail: If TRUE then left tail is considered otherwise if the FALSE right tail is considered

Problem

If there are twelve cars crossing a bridge per minute on average, find the probability of having seventeen or more cars crossing the bridge in a particular minute.

Solution

The probability of having sixteen or less cars crossing the bridge in a particular minute is given by the function ppois.

```
> ppois(16, lambda=12)    # lower tail
[1] 0.89871
```

Hence the probability of having seventeen or more cars crossing the bridge in a minute is in the upper tail of the probability density function.

```
> ppois(16, lambda=12, lower=FALSE)    # upper tail
[1] 0.10129
```

Exercise

1. The probability of entering students in chartered accountant will graduate is 0.5. Determine the probability that out of 10 students
 - i. None
 - ii. One
 - iii. At least one will graduate

Write a R program for above problem.

2. Find binomial distribution if the mean is 5 and variance is $10/3$.

Write a R program for above problem. Also write a R program to plot probability distribution and cumulative probability distribution.

3. The number of traffic accidents that occur on a particular stretch of road during a month follows a Poisson distribution with a mean of 7.6. Find the probability that
 - i. less than three accidents will occur next month on this stretch of road.
 - ii. Exactly three accidents will occur next month on this stretch of road.

Write a R program for above problem.

4. Find 8 random values from a sample of 150 with probability of 0.4.
5. How many heads will have a probability of 0.25 will come out when a coin is tossed 51 times. What is the Probability of getting 26 or less heads from a 51 tosses of a coin?