1.

a)
```
> dbinom(100,300,100/300)
[1] 0.04881277
>
```

b)
```
> pbinom(100,300,100/300)
[1] 0.5271102
>
```

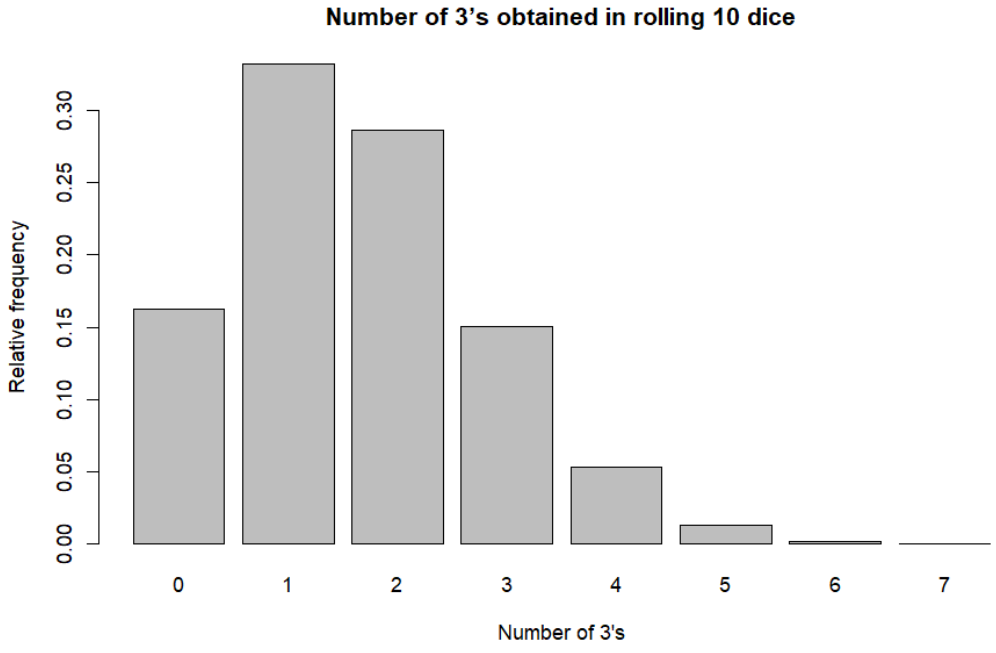
c)
```
> 1-pbinom(200,300,200/300)
[1] 0.4782974
```

d)
```
> pbinom(190,300,2/3)
[1] 0.1227525
```

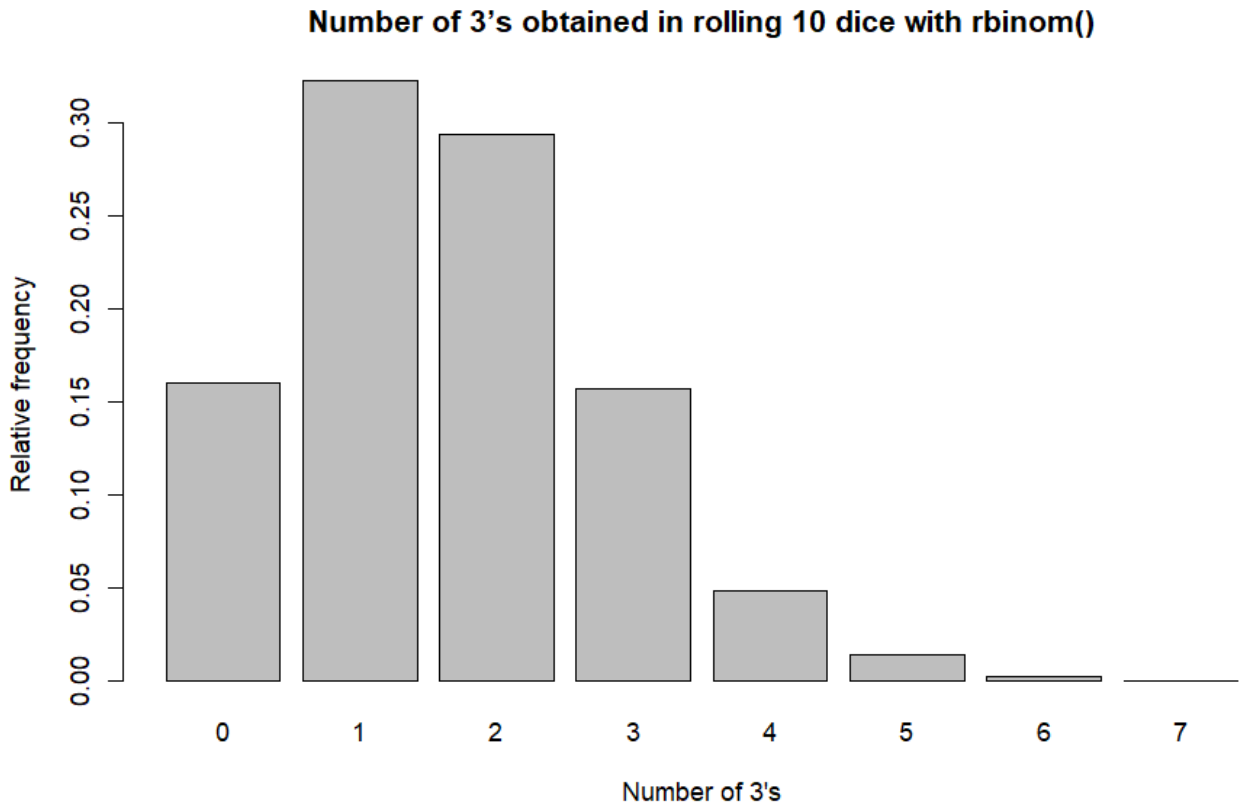
e)
```
> (1-pbinom(190,300,2/3))-(1-pbinom(210,300,2/3))+dbinom(190,300,2/3)
[1] 0.8017
```

2.

```
> RollSomeDice(10000,10)
numOf3s
     0      1      2      3      4      5      6      7
0.1627 0.3319 0.2862 0.1504 0.0536 0.0130 0.0020 0.0002
```

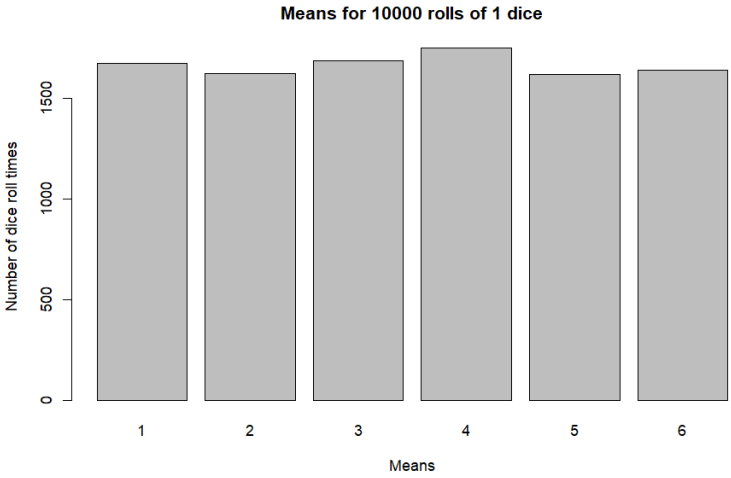


```
> RollSomeDiceRbinom(10000,10)
numOf3s
     0      1      2      3      4      5      6      7
0.1603 0.3228 0.2939 0.1571 0.0487 0.0145 0.0026 0.0001
```

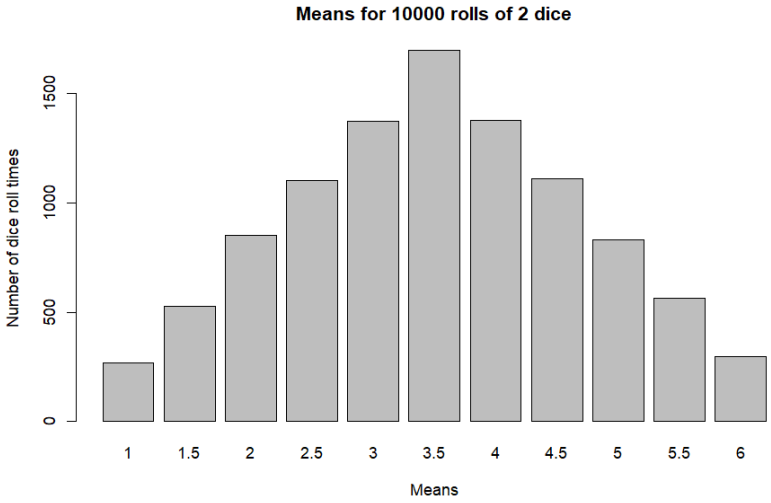



```r
# roll m dice n times using sample()
RollSomeDice=function(n,m){
  numOf3s<-c(1:n)
  for (i in 1:n){
    numOf3s[i]<-sum(sample(c(1,2,3,4,5,6),m,repl=T)==3)
  }
  # table of relative frequency
  numOf3sTable<-table(numOf3s)/n
  titleNumOf3s = paste("Number of 3's obtained in rolling",m, "dice")
  barplot(numOf3sTable, main=titleNumOf3s, xlab="Number of 3's", ylab="Relative frequency")
  return (numOf3sTable)
}

# roll m dice n times using rbinom()
RollSomeDiceRbinom=function(n,m){
  numOf3s<-rbinom(n,m,1/6)
  # table of relative frequency
  numOf3sTable<-table(numOf3s)/n
  titleNumOf3s = paste("Number of 3's obtained in rolling",m, "dice with rbinom()")
  barplot(numOf3sTable, main=titleNumOf3s, xlab="Number of 3's", ylab="Relative frequency")
  return (numOf3sTable)
}

```

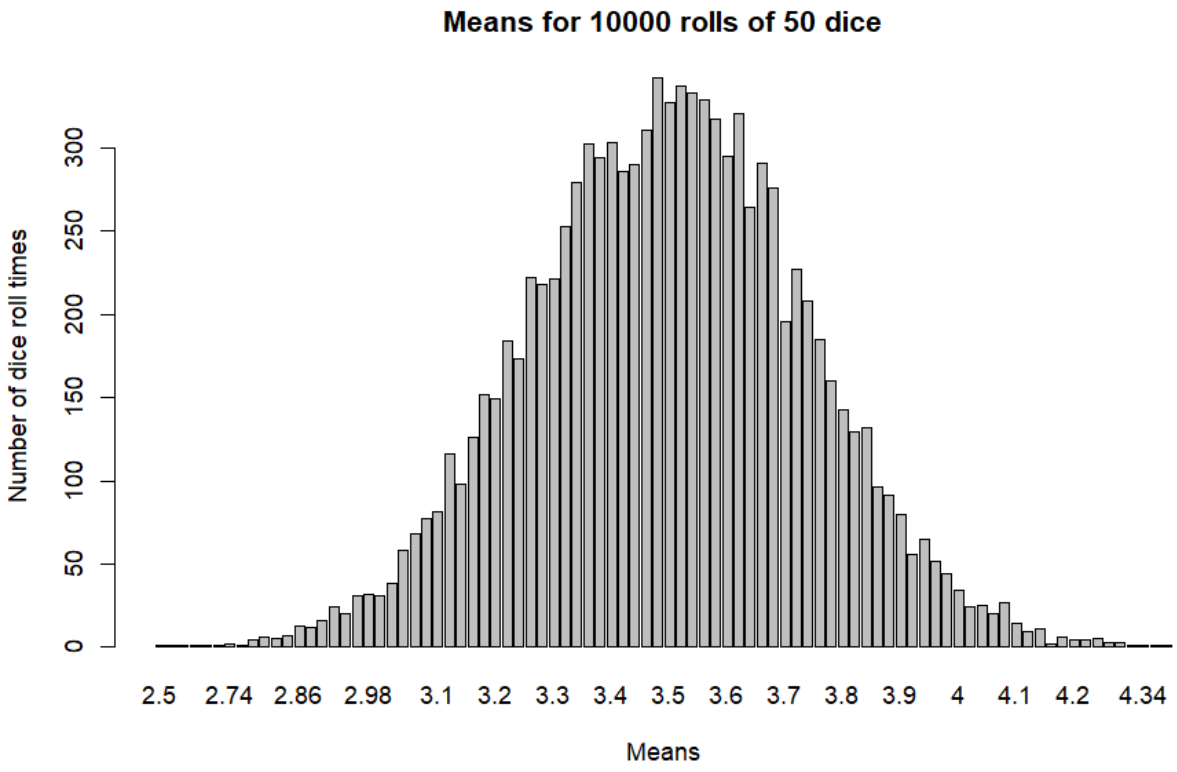
3.



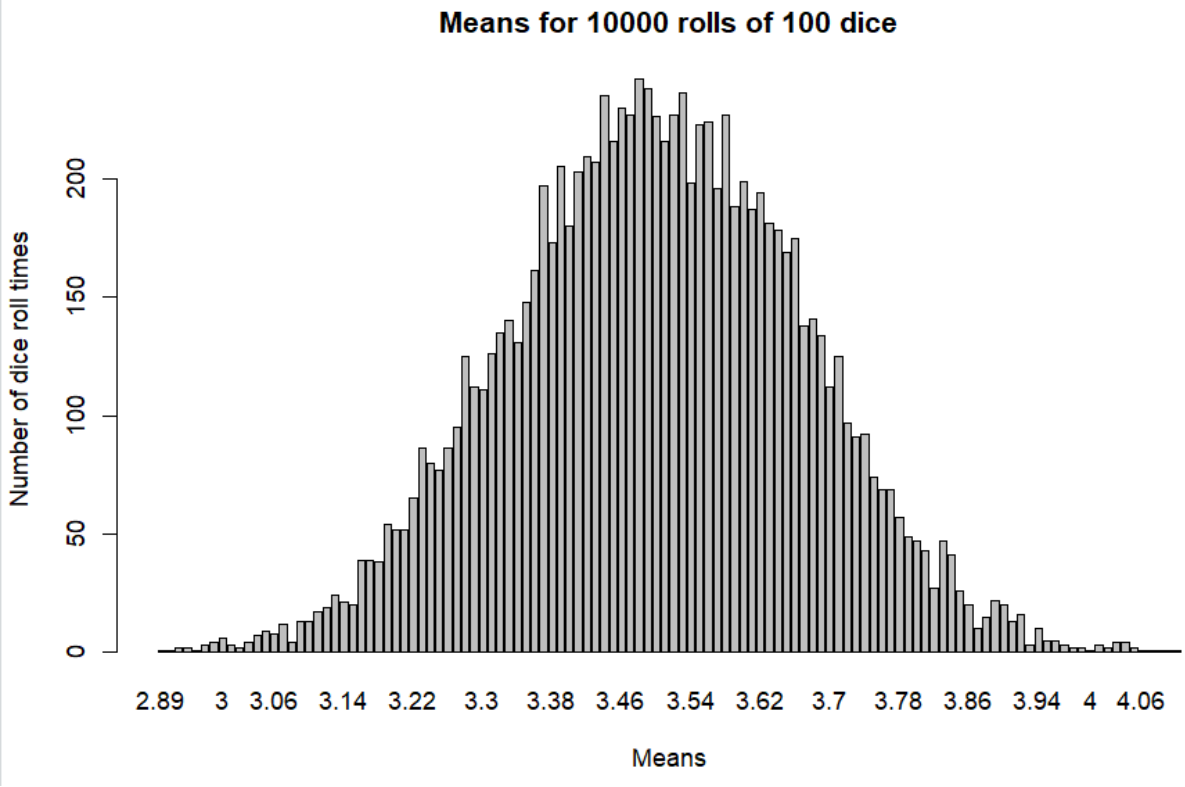

```
> DiceMeans(10000,1)
$means
[1] 3.4932

$sd
[1] 1.699601
```




```
> DiceMeans(10000,2)
$means
[1] 3.5125

$sd
[1] 1.208073
```




```
> DiceMeans(10000,50)
$means
[1] 3.496286

$sd
[1] 0.2399708
```




```
> DiceMeans(10000,100)
$means
[1] 3.499255

$sd
[1] 0.1701586
```

```
23
24 DiceMeans=function(n,m){
25   meansList<-c(1:n)
26   sdList<-c(1:n)
27   for (i in 1:n){
28     meansList[i]<-mean(sample(c(1,2,3,4,5,6),m,repl=T))
29     sdList[i]<-sd(sample(c(1,2,3,4,5,6),m,repl=T))
30   }
31   meansTable<-table(meansList)
32   titleMeans = paste("Means for",n,"rolls of",m, "dice")
33   Means = mean(meansList)
34   Sds = sd(meansList)
35   RollPlot = barplot(meansTable, main=titleMeans, xlab="Means", ylab="Number of dice roll times")
36   mylist = list("means" = Means, "sd" = Sds, RollPlot)
37   return (mylist)
38 }
```