Stats Lab 1

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Task 1

In a biased coin toss model, we generate the relative frequency, which is the number of heads we get then divided by total trials. We can see that the more trials we have, the more graph trends to exactly $p(Tail) = 0.4$, $p(Head) = 0.6$

```
x<-runif(1000)
y<-as.double(x>0.4)
y1<-sum(y)/1000
y0<-1-y1
plot(c(0,1),c(y0,y1),type="p",xlim=c(0,1),ylim=c(0,1))
```

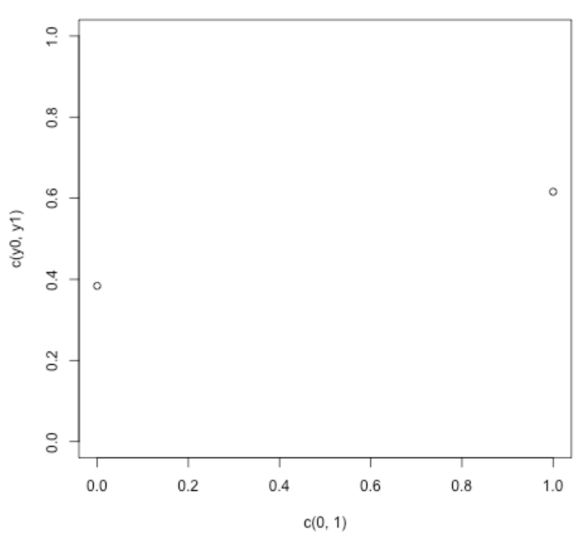


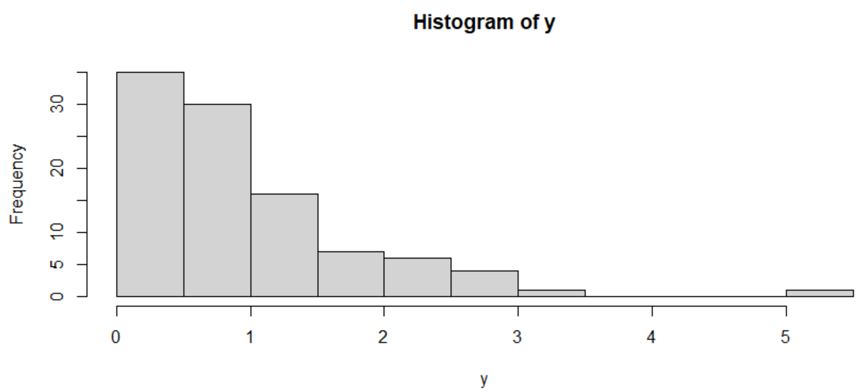
Figure 1: The relative frequency of 1000 trials

Task 2

Generate 100 random numbers having distribution $F(x) = 1 - e^{-x}, x \geq 0$.
For this task, the inverse function of F(x) was found and applied to a uniform distribution in the range [0,1]. This is called the inverse sampling technique.

The data appears to be distributed according to an exponential distribution.

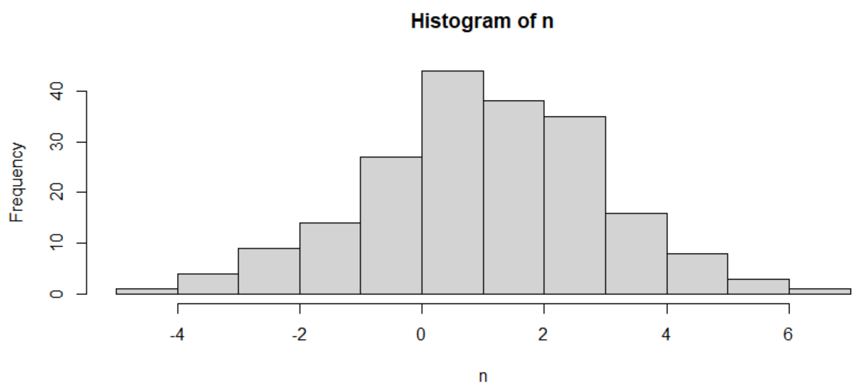
```
x <- runif(100)
y <- -log(1 - x)
hist(y)
```



Task 3

Generate 200 random numbers from N(1, 2) distribution.
For this task, The rnorm() function was implemented, using a mean of 1 and a standard deviation of 2 as inputs.

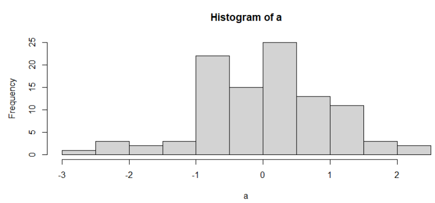
```
n <- rnorm(200, 1, 2)
hist(n)
```



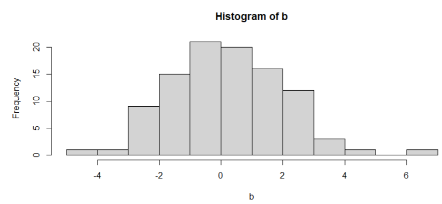
Task 4

Generate 100 random numbers from N(0, 1), N(0, 2) and N(0, 3) distributions. The histograms were generated in the same way in this task as the last, except with different means and standard deviations.
At first glance, the histograms seem very similar, but when looking at the horizontal axis, one can see that the histograms with higher standard deviations are more spread out.

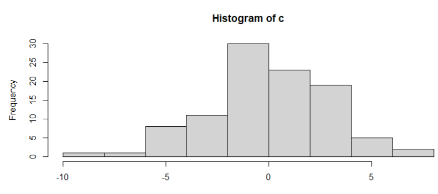
```
a <- rnorm(100, 0, 1)
b <- rnorm(100, 0, 2)
c <- rnorm(100, 0, 3)

hist(a)
hist(b)
hist(c)
```



(a) Standard deviation of 1



(b) Standard deviation of 2



(c) Standard deviation of 3