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Exercise 1

In [1]:
```
# Number of heads
head_n <- 6
```

In [14]:
```
n_tests <- 100000
headL <- rbinom(n=n_tests, size=9, prob=0.5)
head_count <- table(headL )
```

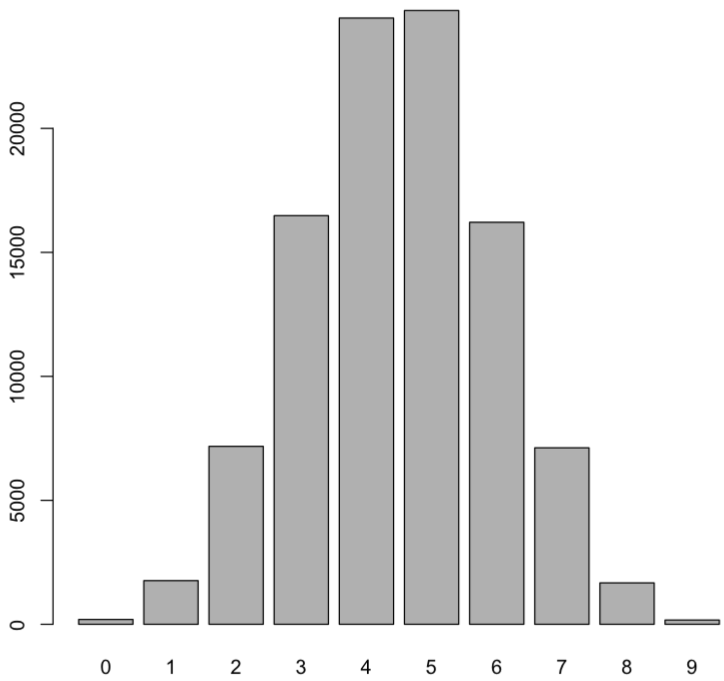
In [15]:
```
head_count
```

```
headL
    0     1     2     3     4     5     6     7     8     9 
  191  1717  7134 16116 24849 24630 16337  7027  1806   193 
```

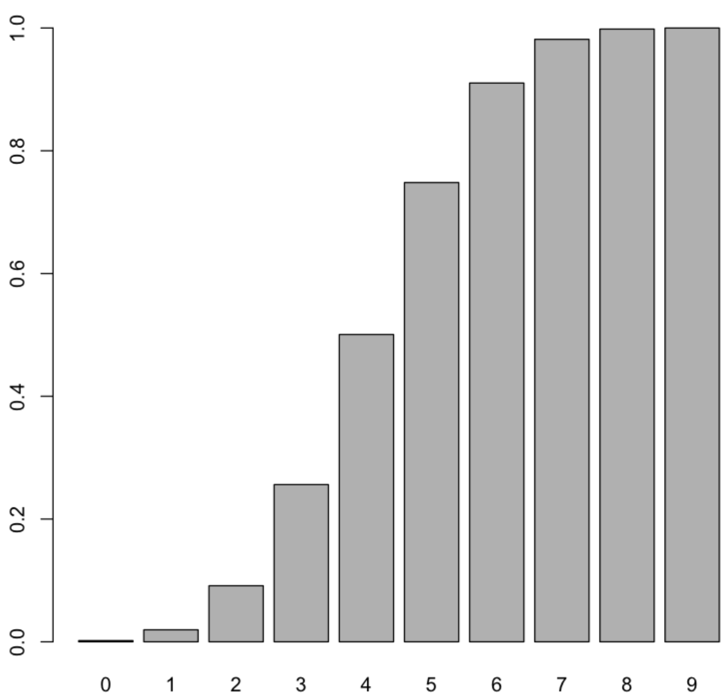
The results show how 4 and 5 heads is the most frequent result in the Binomial Distribution. This also shows how getting 0 or 9 heads is extremely unlikely as ~190/100,000 got 0 and 9, but it still highlights how it is possible. It highlights how the father you get from 4 and 5 heads, the least likely the event is to happen.

Exercise 2

In [10]:
```
barplot(head_count)
```



In [11]:
```
barplot(cumsum(head_prob))
```



In [16]:
```
head_prob <- head_count/n_tests
head_prob
```

```
headL
      0       1       2       3       4       5       6       7       8       9 
0.00191 0.01717 0.07134 0.16116 0.24849 0.24630 0.16337 0.07027 0.01806 0.00193 
```

In [17]:

```
summary(headL)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  0.000   3.000   4.000   4.503   6.000   9.000 
```

The results show how 4 and 5 heads is the most frequent result in the Binomial Distribution. This also shows how getting 0 or 9 heads is extremely unlikely, but possible. With the probability of getting heads is .5, then the barplots prove how getting 4/9 or 5/9 is the closest one can get to a .5 probability.

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Exercise 6

In [20]:

```
# Starting Point
stat <- matrix (c('na', 'na', 50, 'na', 'na', 50,80, 20, 100),ncol=3,byrow=TRUE)
colnames(stat) <- c("Pass","Fail","Margin")
rownames(stat) <- c("HS","College","Margin")
stat <- as.table(stat)
stat
```

```
        Pass Fail Margin
HS      na   na   50    
College na   na   50    
Margin  80   20   100   
```

In [21]:

```
# Given
stat <- matrix(c('na', 'na', 50, 'na', 3, 50,80, 20, 100),ncol=3,byrow=TRUE)
colnames(stat) <- c("Pass","Fail","Margin")
rownames(stat) <- c("HS","College","Margin")
stat <- as.table(stat)
stat
```

```
        Pass Fail Margin
HS      na   na   50    
College na   3    50    
Margin  80   20   100   
```

In [22]:

```
# Final
stat <- matrix(c(33, 17, 50, 47, 3, 50,80, 20, 100),ncol=3,byrow=TRUE)
colnames(stat) <- c("Pass","Fail","Margin")
rownames(stat) <- c("HS","College","Margin")
stat <- as.table(stat)
stat
```

```
        Pass Fail Margin
HS        33   17     50
College   47    3     50
Margin    80   20    100
```

We were able to find the rest of the empty cells since the are all connected by the margins. If there are 20 Total students that failed and three are college students, then the remaining 17 have to be HS students. If there are 3 College students that failed, and there is a total of 50 college students, then the remaining 47 college students passed.

In [25]:

```
# Probabilities
stat_prob <- matrix(c(33, 17, 47, 3),ncol=2,byrow=TRUE)
colnames(stat_prob) <- c("Pass","Fail")
rownames(stat_prob) <- c("HS","College")
stat_prob <- as.table(stat_prob)/100
stat_prob
```

```
        Pass Fail
HS      0.33 0.17
College 0.47 0.03
```

In [26]:

```
stat/50
```

```
        Pass Fail Margin
HS      0.66 0.34   1.00
College 0.94 0.06   1.00
Margin  1.60 0.40   2.00
```

The pass rate for High School students is 66%.

Exercise 7

In [36]:

```
# Starting Point
house <- matrix (c('na', 'na', 7, 'na', 5996, 99993,93935, 6065, 100000),ncol=3,
colnames(house) <- c("Pass","Fail","Margin")
rownames(house) <- c("Repossessed","Not Repossessed","Margin")
house <- as.table(house)
house
```

```
                Pass  Fail Margin
Repossessed     na    na   7
Not Repossessed na    5996 99993
Margin          93935 6065 1e+05
```

In [57]:

```
# Final
house <- matrix (c(2, 69, 71, 93933, 5996, 99929,93935, 6065, 100000),ncol=3,byr
colnames(house) <- c("Pass","Fail","Margin")
rownames(house) <- c("Repossessed","Not Repossessed","Margin")
house <- as.table(house)
house
```

```
                  Pass   Fail Margin
Repossessed          2     69     71
Not Repossessed  93933   5996  99929
Margin           93935   6065 100000
```

In [58]:

```
house/100000
```

```
                   Pass    Fail  Margin
Repossessed     0.00002 0.00069 0.00071
Not Repossessed 0.93933 0.05996 0.99929
Margin          0.93935 0.06065 1.00000
```

The probability of a customer to both pass and not get their house repossessed is 0.93933.

Exercise 8

In [62]:
```
house
```

	Pass	Fail	Margin
Repossessed	2	69	71
Not Repossessed	93933	5996	99929
Margin	93935	6065	100000

In [61]:
```
100*69/6065
```

1.13767518549052

Out of the 6065 customers that Failed the test, only 69 had their house repossessed. This means that the probability a house is repossessed if a customer fails the test is 69/6065 which equals to 1.14%.