Untitled

```
library(purrr)
```

```
win_set <- matrix(c(1,2,3,4,5,6,7,8,9,1,4,7,2,5,8,3,6,9,1,5,9,3,5,7),   #matrix of all possible winning
                  byrow = F,nrow = 3)


rand_strategy <- function(){
  #creating the flag of 9 spots to check whether the spot is occupied or not
  flag <- rep(0,9)
  code <- 0
  players <- matrix(data=0,nrow = 5,ncol = 2)
  for(i in 1:9){
    play <- sample(1:9,1)
    while(flag[play]==1){
      play <- sample(1:9,1)
    }
    players[((i-1)/2+1),ifelse((i%%2)==1,1,2)] = play;
    flag[play]=1;
    if(i>4){
      result <- check_win(players,i)
      if(result$code != 0){
        return(result)
      }
    }
  }
  return(result)
}



check_win <-function(players,ind){
  code <- 0
  ifelse(ind%%2==1,index <- 1,index <- 2)
  player_i <- sort(players[,index])
  player_i <- player_i[! player_i %in% c(0)]
  player_i_matrix <- combn(player_i,3)
  if(length(player_i) == 3){
    player_i_matrix <- matrix(player_i,ncol = 1)
  }
  for(i in 1:dim(win_set)[2]){
    for(j in 1:dim(player_i_matrix)[2]){
      match_vector <- match(win_set[,i],player_i_matrix[,j])
      if(any(is.na(match_vector)) == FALSE){
        ifelse(ind%%2==1,code <- 1,code <- -1)
        return(data.frame(code=code,index=ind))
      }
    }
  }
  return(data.frame(code=code,index=ind))
}
```

```
##############################
```

```
win_rate <- rerun(100,rand_strategy())
win_matrix_100 <- data.frame(matrix(unlist(win_rate), nrow=100, byrow=T))
(t <- table(win_matrix_100))
```

```
##     X2
## X1    5  6  7  8  9
##   -1  0  8  0 22  0
##   0   0  0  0  0 16
##   1   8  0 25  0 21
```

```
rate100 <- rowSums(t)[3]/sum(rowSums(t))
win_rate <- rerun(1000,rand_strategy())
win_matrix_1000 <- data.frame(matrix(unlist(win_rate), nrow=1000, byrow=T))
(t <- table(win_matrix_1000))
```

```
##     X2
## X1     5   6   7   8   9
##   -1   0  88   0 198   0
##   0    0   0   0   0 134
##   1   77   0 266   0 237
```

```
rate1000 <- rowSums(t)[3]/sum(rowSums(t))
win_rate <- rerun(10000,rand_strategy())
win_matrix_10000 <- data.frame(matrix(unlist(win_rate), nrow=10000, byrow=T))
(t <- table(win_matrix_10000))
```

```
##     X2
## X1      5    6    7    8    9
##   -1    0  833    0 1970    0
##   0     0    0    0    0 1268
##   1   920    0 2674    0 2335
```

```
rate10000 <- rowSums(t)[3]/sum(rowSums(t))
```

```
win_matrix <- data.frame(matrix(unlist(win_rate), nrow=1000, byrow=T))
names(win_matrix) <- c('result','index')
```

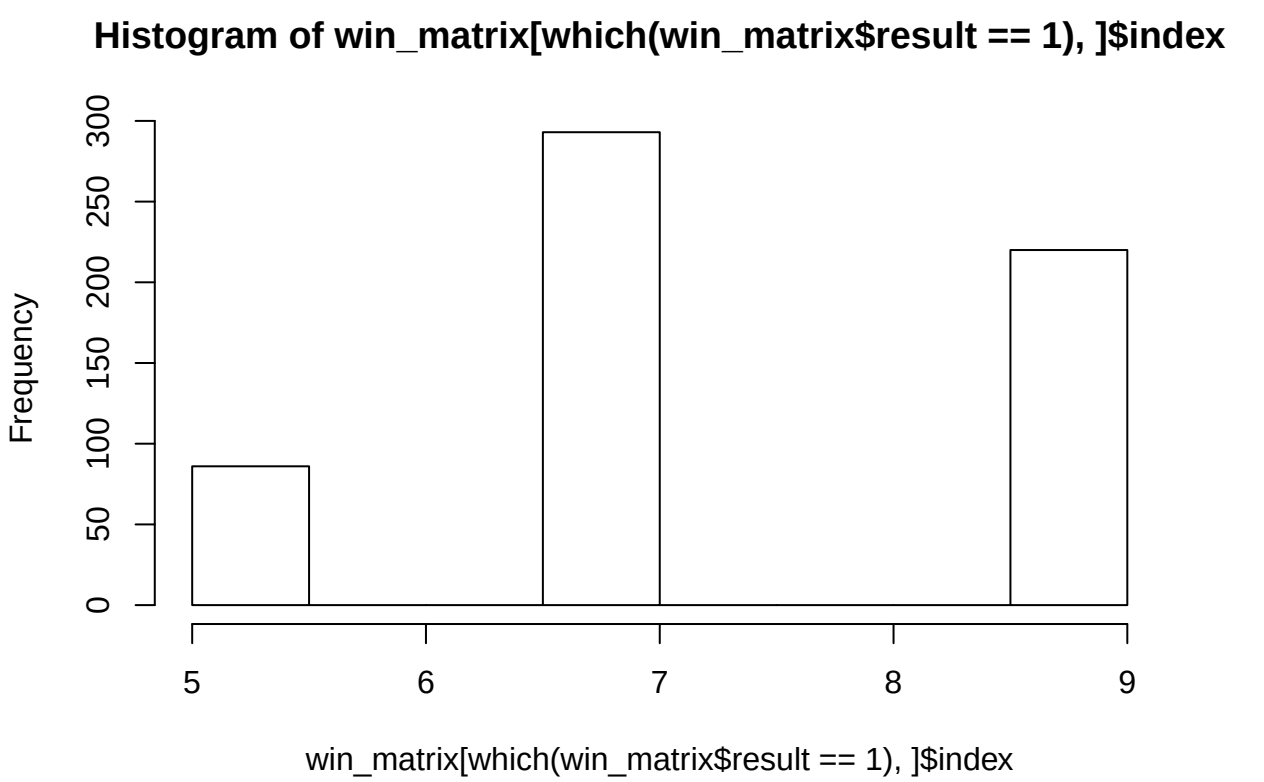
```r
table(win_matrix[which(win_matrix$result==1),]$index)
```

```
##
##   5   7   9
##  86 293 220
```

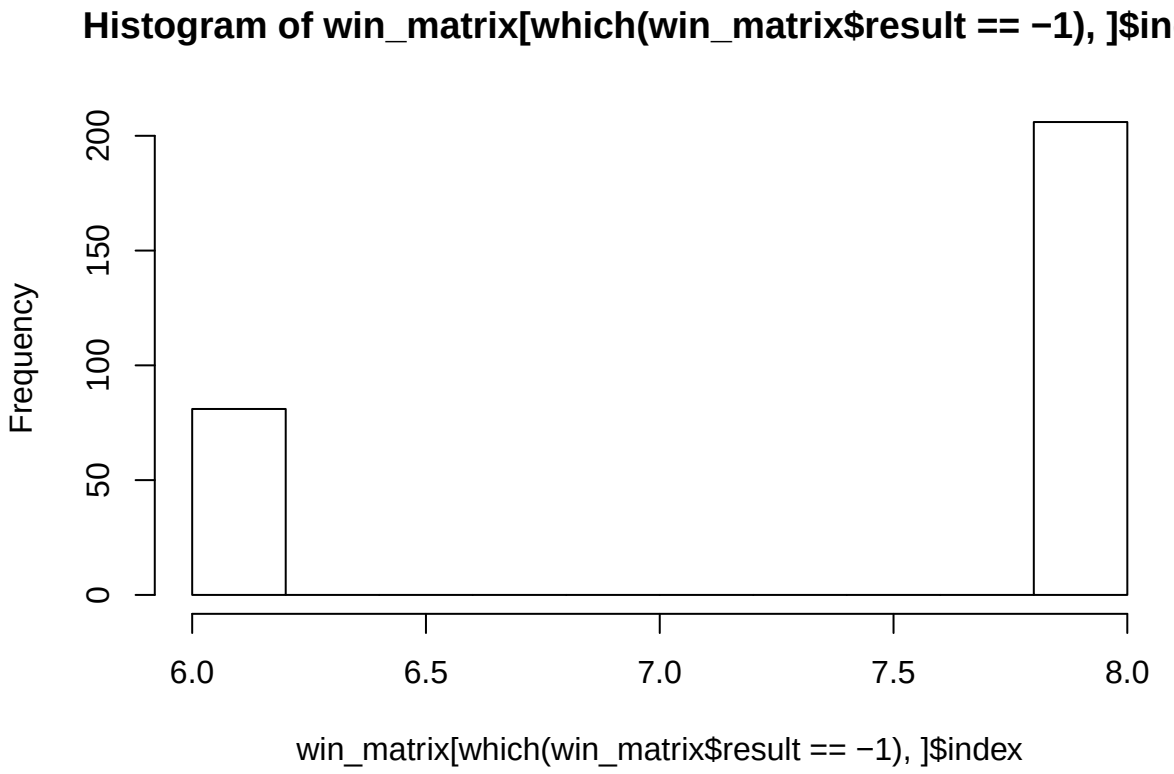
```r
table(win_matrix$result)
```

```
##
##  -1   0   1
## 287 114 599
```

```r
hist(win_matrix[which(win_matrix$result==1),]$index)
```




```r
hist(win_matrix[which(win_matrix$result==-1),]$index)
```


Histogram of win_matrix[which(win_matrix$result == −1),]$index
Frequency
0
50
100
150
200
6.0
6.5
7.0
7.5
8.0
win_matrix[which(win_matrix$result == −1),]$index