Homework 2

Rajat Mahesh Gupta

Problem 2 : The game is to toss a coin until we get r consecutive heads or reach a total of s tosses, whichever comes first.

Let X denote the number of tosses we make. We win $X. Find the minimum fee that should be charged for this game if r = 4 and s = 7.

```r
set.seed(123)
r <- 4
s <- 7
nreps <- 10000000

simulate_game <- function() {
  consecutive_heads <- 0
  tosses <- 0

  while (consecutive_heads < r && tosses < s) {
    toss <- sample(c(0, 1), size = 1, prob = c(0.5, 0.5))
    tosses <- tosses + 1
    if (toss == 1) {
      consecutive_heads <- consecutive_heads + 1
    } else {
      consecutive_heads <- 0
    }
  }

  return(tosses)
}

results <- replicate(nreps, simulate_game())
expected_winnings <- mean(results)

cat("Minimum fee to be charged for the game: $", expected_winnings, "\n")
```

```
## Minimum fee to be charged for the game: $ 6.718444
```