Set Seed

In order to obtain the same results

```
set.seed(1964)
```

HW1.2

Roll Blue and Red Die,what is the probability that Red Dice < Blue Dice

Creation of two independant die – a red and blue die.

```
red_dice_roll <- function(n){
rolls <- sample(1:6, size = n, replace = TRUE)
return(rolls)}

blue_dice_roll <- function(n){
rolls <- sample(1:6, size = n, replace = TRUE)
return(rolls)}
```

Determine the probability that the result from the blue die is larger than that of the red die.

```
roll_dice_B_Greater_R <- function(n){
blue_is_greater <- 0
    for (i in 1:n){
if(blue_dice_roll(1) > red_dice_roll(1)){
blue_is_greater <- blue_is_greater + 1
}}
  return(blue_is_greater/n)}

## The solution will be equivelent to
roll_dice_B_Greater_R(50000)
```

```
## [1] 0.41874
```

HW 1.3

One coin is drawn at random (two coins: One is 50% Heads and the second one is 60% Heads)

Coin A = 50%

Coin C = 60%

If you flip the coin twice and get heads both times what is the probability that this is the fair coin?

First we must create the functions for the fair and unfair coin

```r
#Function for the fair coin
coin_a <- function(n_flips){
  flips <- sample(c(1,0), size = n_flips, replace = TRUE,
                  prob = c(0.5, 0.5)) ##Fair chance for heads
        return(flips)
}

#Function for the unfair coin (60% heads bias)
coin_c <- function(n_flips){
  flips <- sample(c(1,0), size = n_flips, replace = TRUE,
                  prob = c(0.6, 0.4)) ##Unfair chance for Heads
        return(flips)
}
```

Second we must construct another function to count the number of heads obtained in a coin flips alongside a probability for the chance that the coin is the fair coin if Heads is seen twice (HH).

```r
#Function to detmermine of achieving Heads Heads
fair_coin_HH <- function(n_trials){
HH_on_flip <- 0
  for(i in 1:n_trials){
    if(coin_a(1) + coin_a(1) == 2){
      HH_on_flip <- HH_on_flip +1
    }}
  return(HH_on_flip/n_trials)}


prob_of_fair_coin = fair_coin_HH(100000) * 0.5
#getting two heads with a fair coin multiplied by the chance that the fair coin is selected
prob_of_fair_coin
```

```
## [1] 0.125675
```

After flipping the coin twice and seeing two heads, what is the probability that the next toss is also heads?

```r
#Addition of the probabilities of the next flip being heads
prob_next_flip_is_heads <-
  prob_of_fair_coin*0.5 + (1-prob_of_fair_coin)*0.6

prob_next_flip_is_heads
```

```
## [1] 0.5874325
```

HW1.4

Let A and C be events where . . .

P(A) = 0.4

P(A|C)= 0.1

Explain why it is not possible to have P(C) = 0.8 – more specifically can you prove an upper or lower bound on P(C)?

P(A|C) = P(A,C) / P(C) = P(C,A) / P(C)

P(C|A) = P(C,A) / P(A) ==> P(C,A) = P(C|A)*P(A)

∴ P(A|C) = P(C|A)