Jeffrey_exercise1_hw4

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Birthday Simulation

```
set.seed(1)
n <- 100 # number of simulations
match <- 0 # count for if three birthdays are aligned
# simulate a random sample of 1000 birthdays and check for matches of shared birthdays
sam = 10000
# i = 1
for(i in 1: sam){
  # loop the simulation of trials
  birthdays <- sample(365, n, replace = TRUE)
  # assigns birthdays to individuals, TRUE allows repeats
  if(any(table(birthdays) >= 3)){ # determines if three people have been assigned identical b
    match <- match +1
  }
}
# Estimate the probability of match

p_match <- match / sam # how many matches are there
print(p_match)
```

```
[1] 0.6495
```

approximately 65% of the time in a room of 100 people 3 people will share the same birthday

Monty Hall Simulation

```
set.seed(123)
n_trials <- 10000  # number of simulations
stick_wins <- 0    # count for wins if you stick
switch_wins <- 0   # count for wins if you switch
# loop the simulated trials
for (i in 1:n_trials) {
  # Randomly place the car behind one of the 3 doors
  car_door <- sample(1:3, 1)

  # Randomly choose a door
  chosen_door <- sample(1:3, 1)

  if (chosen_door == car_door) {
    opened_door <- sample(setdiff(1:3, chosen_door), 1)
     # If the chosen door is the car door, the host opens one of the other two doors which bo
  } else {
    opened_door <- setdiff(1:3, c(chosen_door, car_door))
    # if the chosen door is not the car door, the host must open the remaining door which is
  }
  switch_door <- setdiff(1:3, c(chosen_door, opened_door))[1]
   # Choose the remaining unopened door to switch to
  # Print trial details for the first few iterations to examine process
  if (i <= 10) {
    cat("Trial:", i, "\n")
    cat("Car Door:", car_door, "\n")
    cat("Chosen Door:", chosen_door, "\n")
    cat("Opened Door:", opened_door, "\n")
    cat("Switch Door:", switch_door, "\n\n")
  }
  # prints the door options, the chosen door, and the trial number
  if (chosen_door == car_door) {
    stick_wins <- stick_wins + 1
  }
  # Check if car is behind the original choice (sticking)
```

```
  if (switch_door == car_door) {
    switch_wins <- switch_wins + 1
      # Check if car is behind the switched choice (switching)
  }
}
```

```
Trial: 1
Car Door: 3
Chosen Door: 3
Opened Door: 1
Switch Door: 2

Trial: 2
Car Door: 2
Chosen Door: 3
Opened Door: 1
Switch Door: 2

Trial: 3
Car Door: 2
Chosen Door: 2
Opened Door: 3
Switch Door: 1

Trial: 4
Car Door: 3
Chosen Door: 1
Opened Door: 2
Switch Door: 3

Trial: 5
Car Door: 2
Chosen Door: 2
Opened Door: 1
Switch Door: 3

Trial: 6
Car Door: 2
Chosen Door: 3
Opened Door: 1
Switch Door: 2
```

```
Trial: 7
Car Door: 1
Chosen Door: 3
Opened Door: 2
Switch Door: 1

Trial: 8
Car Door: 3
Chosen Door: 1
Opened Door: 2
Switch Door: 3

Trial: 9
Car Door: 1
Chosen Door: 1
Opened Door: 2
Switch Door: 3

Trial: 10
Car Door: 3
Chosen Door: 2
Opened Door: 1
Switch Door: 3
```

```r
# Calculate stick wins divided by number of trials and switch wins by number of trials to gi
p_stick <- stick_wins / n_trials
p_switch <- switch_wins / n_trials

# View the results
cat("Probability of winning by sticking:", p_stick, "\n")
```

```
Probability of winning by sticking: 0.3425
```

```r
cat("Probability of winning by switching:", p_switch, "\n")
```

```
Probability of winning by switching: 0.6575
```

if the player sticks with original choice they have a 34% chance of getting the door with the car, if the player switches to the unopened door they have a 66% chance of opening the door with the car.