

Formative Assessnent 2

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Probability of getting 50%

1. Use R to illustrate that the probability of getting:
- a head is 0.5 if a fair coin is tossed repeatedly;

Let's say that the coin will be tossed 100 times. So, freq is equal to 100.

```
freq <- 100
coin_toss <- sample (c("H","T"), freq, replace = T)
coin_toss

## [1] "T" "T" "T" "H" "T" "H" "H" "T" "T" "H" "T" "H" "H" "H" "T" "H" "T" "T"
## [19] "T" "T" "H" "H" "H" "H" "T" "T" "H" "H" "T" "T" "T" "H" "T" "H" "T"
## [37] "H" "H" "H" "H" "T" "T" "H" "T" "H" "H" "H" "H" "T" "T" "H" "H" "T"
## [55] "H" "T" "T" "T" "H" "T" "T" "H" "H" "H" "T" "H" "H" "H" "T" "T"
## [73] "H" "T" "T" "T" "H" "H" "H" "T" "H" "H" "H" "T" "T" "T" "H" "T"
## [91] "T" "H" "T" "T" "H" "H" "T" "H" "H" "T"
```

The table shows the results of tossed coin 100 times.

```
table(coin_toss)/freq

## coin_toss
##      H      T
## 0.48 0.52
```

The table shows the percentage of getting head and tail. We can see that the results are near 0.5 or 50%. Now, let's try again and make the freq bigger.

The probability of getting head or tail with 5,000 toss:

```
table(coin_toss)/freq

## coin_toss
##      H      T
## 0.5028 0.4972
```

We can see at the table that the probability of getting head are getting nearer to 0.5.We can conclude that if a fair coin is tossed repeatedly, the probability of getting a head is 0.5.

+ a red card is 0.5 if cards are drawn repeatedly with replacement from a well-shuffled deck;

```
cards <- rep(c("red", "black"), times = c(26, 26))
freq <- 100000
drawn <- sample(cards, size = freq, replace = T)
get_red <- sum(drawn == "red") / freq
print(paste("Probability of getting a red card:", get_red))

## [1] "Probability of getting a red card: 0.50114"
```

+ an even number is 0.5 if a fair die is rolled repeatedly.

```
die <- rep(c("odd", "even"), times = c(3,3))
freq <- 100000
rolled <- sample(die, size = freq, replace = T)
get_even <- sum(rolled == "even") / freq
print(paste("Probability of getting an even number:", get_even))

## [1] "Probability of getting an even number: 0.50019"
```

Rolling a die

3. An experiment consists of rolling a die. Use R to simulate this experiment 600 times and obtain the relative frequency of each possible outcome. Hence, estimate the probability of getting each of 1, 2, 3, 4, 5, and 6.

```
freq <- 600
x <- sample (c(1,2,3,4,5,6), freq, replace = TRUE)
x

## [1] 6 6 6 5 6 2 2 1 6 1 1 4 5 4 5 5 4 3 6 1 3 6 3 3 4 3 2 1 4 6 1 2 1 4 5 3 5
## [38] 2 4 6 1 5 1 1 6 1 6 4 5 3 4 5 2 6 1 4 3 5 2 5 5 3 6 4 3 3 6 1 5 6 6 2 2 1
## [75] 5 4 3 4 1 5 4 3 5 5 1 5 4 2 5 2 3 1 6 3 4 2 5 2 4 2 1 4 6 5 1 5 1 3 3 4 6
## [112] 5 4 2 3 6 2 1 3 3 6 2 1 6 5 6 5 3 2 6 4 4 4 2 1 5 6 6 2 5 1 3 5 3 4 3 4 2
## [149] 3 5 6 4 6 1 1 2 3 6 5 2 4 2 4 3 4 6 1 4 5 6 3 1 6 2 6 5 3 3 5 4 1 1 3 4 1
## [186] 6 4 4 4 4 6 2 3 1 4 4 1 6 1 2 5 6 2 2 3 6 1 4 4 5 1 1 3 2 5 5 3 1 5 6 2 1
## [223] 6 5 3 6 2 3 1 5 6 3 4 5 6 4 1 6 1 5 2 5 2 2 3 4 5 6 6 5 5 6 2 2 1 1 6 3 5
## [260] 6 6 3 3 3 1 4 6 4 1 6 1 2 6 6 4 2 6 3 6 4 4 3 5 4 6 2 6 4 2 1 2 6 2 5 4 5
## [297] 5 4 2 4 2 4 5 6 1 2 3 4 1 5 1 2 6 2 2 2 4 3 3 6 6 6 1 2 5 4 3 3 5 1 4 6 3
## [334] 5 5 3 6 6 3 6 3 6 4 3 2 1 4 1 6 5 3 3 1 2 1 1 6 1 4 1 2 6 6 3 4 5 1 4 5 2
## [371] 3 4 6 5 5 5 5 1 2 4 1 2 5 4 5 3 2 6 3 3 3 1 4 3 2 1 4 2 2 3 4 5 3 3 1 4 6
## [408] 3 2 5 1 2 4 2 4 6 4 2 2 5 1 2 6 5 2 3 1 4 4 3 3 2 6 1 6 3 2 3 6 6 1 1 6 6
## [445] 1 3 4 1 4 5 5 3 1 4 4 2 4 5 3 5 6 3 3 2 4 4 4 1 6 5 1 5 4 3 1 3 1 6 5 4 4
## [482] 6 3 5 4 6 6 3 1 1 5 3 2 2 3 3 2 6 4 6 5 1 1 3 6 2 5 2 4 5 4 3 1 1 1 2 2 3
## [519] 1 3 5 3 2 4 4 6 3 3 2 6 2 2 5 4 2 6 6 5 4 6 5 6 3 6 6 3 2 2 3 5 5 2 5 3 6
## [556] 5 3 6 3 2 5 5 3 5 4 1 1 5 4 2 4 3 4 3 3 6 3 5 6 2 3 6 5 2 4 1 4 6 2 3 4 1
## [593] 6 1 3 3 6 6 6 4
```

Probability of getting one:

```
get_one <- sum(x==1)/freq
print(paste("Probability of getting one:", get_one))

## [1] "Probability of getting one: 0.153333333333333"
```

Probability of getting two:

```
get_two <- sum(x==2)/freq
print(paste("Probability of getting one:", get_two))

## [1] "Probability of getting one: 0.153333333333333"
```

Probability of getting three:

```
get_three <- sum(x==3)/freq
print(paste("Probability of getting three:", get_three))

## [1] "Probability of getting three: 0.178333333333333"
```

Probability of getting four:

```
get_four <- sum(x==4)/freq
print(paste("Probability of getting four:", get_four))

## [1] "Probability of getting four: 0.17"
```

Probability of getting five:

```
get_five <- sum(x==5)/freq
print(paste("Probability of getting five:", get_five))

## [1] "Probability of getting five: 0.16"
```

Probability of getting six:

```
get_six <- sum(x==6)/freq
print(paste("Probability of getting six:", get_six))

## [1] "Probability of getting six: 0.185"
```

Let's see if it equals to 1

```
total<- get_one + get_two +get_three + get_four + get_five + get_six
print(paste("The total is", total))

## [1] "The total is 1"
```