FORMATIVE ASSESSMENT 2

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R Markdown

Question Number 2

An experiment consists of tossing two fair coins. Use R to simulate this experiment 100 times and obtain the relative frequency of each possible outcome. Hence, estimate the probability of getting one head and one tail in any order.

```
number_of_tosses <- 100

HT <- 0
two_heads <- 0
two_tails <- 0

for (j in 1:number_of_tosses) {
  c1 <- sample(c("H", "T"), 1, replace = TRUE)
  c2 <- sample(c("H", "T"), 1, replace = TRUE)

  if (c1 == "H" && c2 == "T") {
    HT <- HT + 1
  } else if (c1 == "H" && c2 == "H") {
    two_heads <- two_heads + 1
  } else if (c1 == "T" && c2 == "T") {
    two_tails <- two_tails + 1
  }
}

cat("Number of times getting a one head and a one tail: " , HT, "\n")
```

```
## Number of times getting a one head and a one tail:  27
```

```
cat("Number of times getting two heads: " , two_heads, "\n")
```

```
## Number of times getting two heads:  19
```

```
cat("Number of times getting two tails: " , two_tails, "\n")
```

```
## Number of times getting two tails:  28
```

```
prob_HT <- HT / number_of_tosses
prob_two_heads <- two_heads / number_of_tosses
prob_two_tails <- two_tails / number_of_tosses

cat("Probability of getting a one head and one tail:", prob_HT, "\n")
```

```
## Probability of getting a one head and one tail: 0.27
```

Question Number 4

4. Amy and Jane are gambling together. A fair coin is tossed repeatedly. Each time a head comes up, Amy wins two euro from Jane, and each time a tail comes up, Amy loses two euro to Jane. Use R to simulate this game 100 times, and estimate:

- a. the number of times that Amy is ahead in these 100 tosses;
- b. how much Amy has won or lost after 100 tosses.

```
amy_wins <- 0
amy_loses <- 0
amy_winnings <- 0

for (i in 1:100) {
  toss <- sample(c("2", "-2"), 1)
  cat(toss, "   ")

  if (toss == "2") {
    amy_wins <- amy_wins + 1
    amy_winnings <- amy_winnings + 2  # Amy wins 2 euro
  } else {
    amy_loses <- amy_loses + 1
    amy_winnings <- amy_winnings - 2  # Amy loses 2 euro
  }
}
```

```
## -2    2    2    -2    2    -2    -2    -2    2    -2    2    -2    2    -2    -2    -2    2    2    2    -2
-2    2    -2    2    2    2    2    2    2    -2    2    2    -2    -2    2    2    -2    2    -2    -2
-2    -2    -2    2    2    -2    2    2    2    2    -2    2    2    -2    2    2    -2    2    -2    -2    2
-2    2    -2    2    2    -2    -2    2    2    2    2    2    2    -2    -2    -2    2    -2    2    -2    -2
2    -2    2    2    2    -2    2    2    2    2    2    2    -2    -2    -2    2    -2
```

```
amy_losses_total <- amy_loses * 2  # Amy loses 2 euro for each loss

times_ahead <- ifelse(amy_wins > 0, 1, 0)

cat("Number of times Amy is ahead in 100 tosses:", amy_wins, "\n")
```

```
## Number of times Amy is ahead in 100 tosses: 56
```

```
cat("Amy's number of loses after 100 tosses:", amy_loses, "\n")
```

```
## Amy's number of loses after 100 tosses: 44
```

```
cat("Amy's earnings after 100 tosses:", amy_winnings, "euro\n")
```

```
## Amy's earnings after 100 tosses: 24 euro
```

```
cat("Amy's total losses after 100 tosses:", amy_losses_total, "euro\n")
```

```
## Amy's total losses after 100 tosses: 88 euro
```

CONCLUSION

```
if (times_ahead == 1)
{
  cat("Amy wins", amy_winnings, "euro")
}else{
  cat("Amy lost ", amy_losses_total, "euro")
}
```

```
## Amy wins 24 euro
```