Worksheet 12 - probability simulation

Monday, October 21, 2024

DS 002R - Jo Hardin

Name: _____

Names of people you worked with: _____

Do you get enough exercise? What do you do?

Task: 10 people are at a party, and all of them are wearing hats. They each place their hat in a pile; when they leave, they choose a hat at random. What is the probability at least one person selected the correct hat?

Write R code to do the following steps:

- Step 1: create the hats
- Step 2: randomly assign hats
- Step 3: measure who got their original hat
- Step 4: repeat many times

Solution:

Step 1: representing the hats

```
hats <- 1:10
hats
```

```
 [1]  1  2  3  4  5  6  7  8  9 10
```

Step 2: everyone draws a hat

```
random_hats <- sample(hats, size = 10, replace = FALSE)
hats
```

```
 [1]  1  2  3  4  5  6  7  8  9 10
```

```
random_hats
```

```
 [1]  9  2  7  4  1 10  6  3  5  8
```

Step 3: who got their original hat?

```
hats == random_hats
```

```
 [1] FALSE  TRUE FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE
```

```
# TRUE is 1, FALSE is 0
sum(hats == random_hats)
```

```
[1] 2
```

```
# did at least one person get their hat?
sum(hats == random_hats) > 0
```

```
[1] TRUE
```

Step 4: repeat many times

Function

- remove the magic number 10

```
hat_match <- function(n){
  hats <- 1:n
  random_hats <- sample(hats, size = n, replace = TRUE)
  sum(hats == random_hats) > 0
}

hat_match(10)
```

```
[1] TRUE
```

Iterate

```
map_lgl(1:10, ~hat_match(n = 10))
```

```
 [1]  TRUE  TRUE FALSE  TRUE  TRUE FALSE FALSE  TRUE FALSE  TRUE
```

```
map_lgl(1:10, ~hat_match(n = 10)) |>
  mean()
```

```
[1] 0.7
```

Reproducible

```
set.seed(4747)
num_iter <- 1000

map_lgl(1:num_iter, ~hat_match(n = 10)) |>
  mean()
```

```
[1] 0.661
```