

Intermediate R Programming

POS6933: Computational Social Science

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Overview

- Random Number Generation in R
- Loops and Iteration
- Visualizing Data and Relationships Using `ggplot::()`

Coin Flips

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What about 1000 times?

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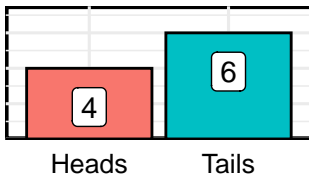
What about 100 times?

What about 1000 times?

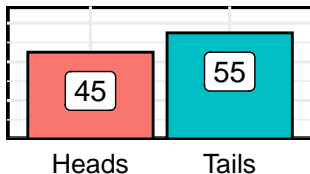
What about 10000 times?

Coin Flips (Cont.)

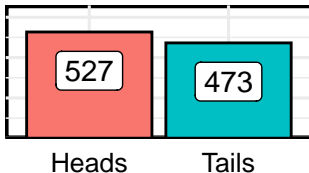
10 Flips



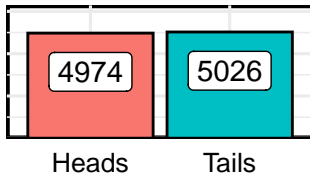
100 Flips



1k Flips



10k Flips



Coin Flips (Cont.)

- We can use `sample()` to randomly select elements from a vector
- In this case, a coin flip where $p(\text{heads}) = p(\text{tails}) = 0.5$

```
sides <- c("Heads", "Tails") # Flip Options
single_flip <- sample(sides, size = 1) # Single Draw
print(single_flip)
```

```
[1] "Heads"
```

6-Sided Die

- We can use the same approach to “roll” a six-sided die.

```
sides <- c(1:6)  # 1, 2, 3, 4, 5, 6  
single_roll <- sample(sides, size = 1)  # Single Roll  
message("Result of Single Roll: ", single_roll)
```

Result of Single Roll: 1

Poker Hands

- We can even use it to do more complex operations like simulate a random draw from 5-card Poker

```
cards <- as.character(c(2:10, "J", "Q", "K", "A"))  
# All Card Values  
suits <- c("Hearts", "Diamonds", "Spades", "Clubs")  
# Suits  
  
deck <- expand.grid(value = cards, suit = suits) |>  
  mutate(card = paste(value, "of", suit)) |>  
  pull(card) # Create a Full Deck  
  
random_draw <- sample(deck, size = 5, replace = F)  
# Random 5-Card Draw w/out Replacement
```

Poker Hands (Cont.)

Hand:

9 of Clubs

Q of Clubs

6 of Clubs

2 of Diamonds

6 of Hearts

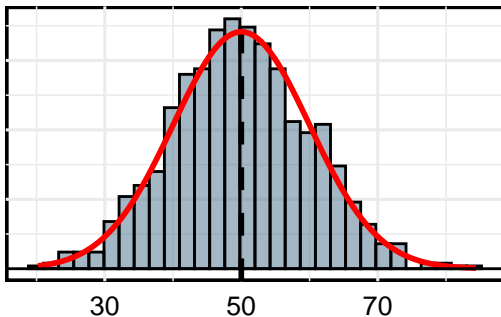
Generating Distributions

- What if we wanted to move beyond random selection where each draw or iteration exists with equal probability or within a uniform distribution?
- R is very flexible and capable of illustrating sampling distributions against expected outcomes

Generating Distributions (Standard Normal)

- Let's start with 1000 samples from a standard normal distribution where $\mu = 50$ and $\sigma = 10$

```
normal <- rnorm(1000, mean = 50, sd = 10)
```



Generating Distributions (Standard Normal)

- **Your Turn:** Generate 1000 draws from a standard normal distribution where $\mu = 25$ and $\sigma = 10$.