# 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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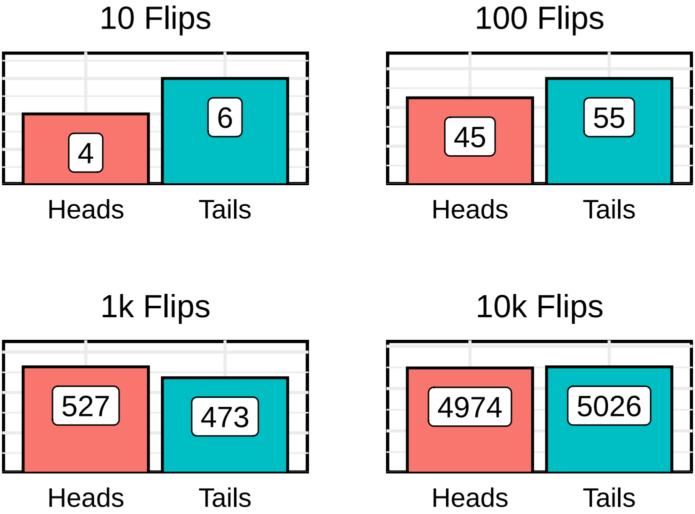
**Does this change if I flip 50 times?**

**What about 100 times?**

**What about 1000 times?**

**What about 10000 times?**

## Coin Flips (Cont.)



## Coin Flips (Cont.)

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

```r
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

```r
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
```

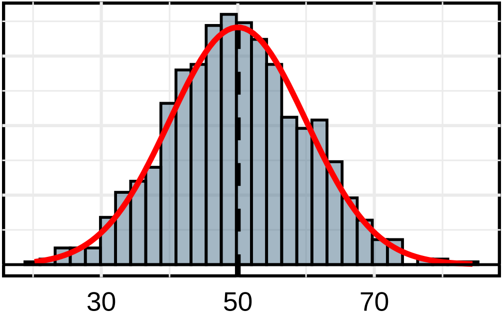
## Generating Distributions

- 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)
```

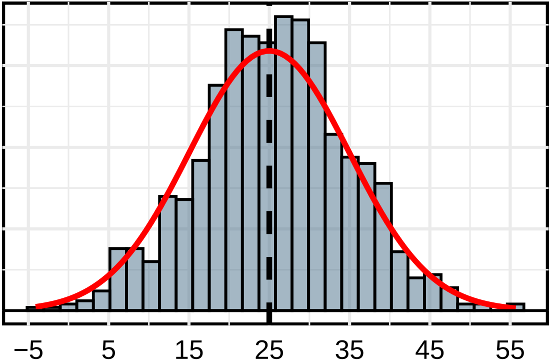


# Generating Distributions (Standard Normal)

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

# Generating Distributions (Standard Normal – Ex)

```r
normal <- rnorm(1000, mean = 25, sd = 10)
```



## Generating Distributions (Exponential – Ex)

- **Your Turn**: Generate 1000 draws from an exponential distribution where `rate` $= 2$

# Generating Distributions (Exponential – Ex)

```
exp <- rexp(1000, rate = 2)
```