ECS 132 Quiz 2

This is the pdf for simulating question 5 from quiz 2.

Analytical solution:

P(Z=3) = P(Tails) * P(Z=3 | Tails) + P(Heads) * P(Z=3 | Heads)

```
   = (1/2) * (1/6) + (1/2) * (1/4)

   = 1/12 + 1/8

   = 2/24 + 3/24

   = 5/24

   = 0.2083333
```

```r
# Set the seed for reproducibility
set.seed(123)

# Set the parameters
n_simulations <- 1000000  # Number of simulations

# Function to simulate one game
simulate_game <- function() {
  coin_flip <- sample(c("Heads", "Tails"), 1)

  if (coin_flip == "Tails") {
    dice_roll <- sample(1:6, 1)
  } else {
    # Unfair die with 25% chance of rolling a 3
    unfair_probs <- c(0.15, 0.15, 0.25, 0.15, 0.15, 0.15)
    dice_roll <- sample(1:6, 1, prob = unfair_probs)
  }

  return(dice_roll == 3)
}

# Run simulations
results <- replicate(n_simulations, simulate_game())

# Calculate the probability
simulated_prob <- mean(results)

# Print the results
cat("Analytical probability:", 2/24 + 3/24, "\n")
```

```
## Analytical probability: 0.2083333
```

```r
cat("Simulated probability:", simulated_prob, "\n")
```

```
## Simulated probability: 0.207683
```