

```

# Lists of sorted small straights and large straights
small_straights <- list(c(1, 2, 3, 4), c(2, 3, 4, 5), c(3, 4, 5, 6))
large_straights <- list(c(1, 2, 3, 4, 5), c(2, 3, 4, 5, 6))

# Function to check if a roll is a small straight but not a large straight
is_small_straight <- function(roll) {
  sorted_roll <- sort(unique(roll))
  for (ss in small_straights) {
    if (all(ss %in% sorted_roll)) {
      # Check against large straights
      for (ls in large_straights) {
        if (all(ls %in% sorted_roll)) {
          return(FALSE) # It's a large straight, not a small one
        }
      }
      return(TRUE) # It's a small straight
    }
  }
  return(FALSE)
}

# Number of simulations
num_simulations <- 100000

# Counter for small straights
num_small_straights <- 0

# Simulate rolls
for (i in 1:num_simulations) {
  # Roll five 6-sided dice
  roll <- sample(1:6, 5, replace = TRUE)

  # Check for small straight
  if (is_small_straight(roll)) {
    num_small_straights <- num_small_straights + 1
  }
}

# Calculate the proportion of small straights
proportion_small_straights <- num_small_straights / num_simulations

# Print the result

```

```
cat("Proportion of small straights (excluding large straights) in the simulation:", proportion)
```

Proportion of small straights (excluding large straights) in the simulation: 0.12398

```
# Total possible outcomes when rolling five 6-sided dice
total_outcomes <- 6^5

# Favorable outcomes for the end small straights (1-2-3-4 and 3-4-5-6)
# 4! permutations for each straight and 5 possibilities for the fifth die each
favorable_outcomes_end_straights <- factorial(4) * 5 * 2 # Two end straights

# Favorable outcomes for the middle small straight (2-3-4-5)
# 4! permutations and 4 possibilities for the fifth die
favorable_outcomes_middle_straight <- factorial(4) * 4

# Total favorable outcomes
total_favorable_outcomes <- favorable_outcomes_end_straights + favorable_outcomes_middle_straight

# Calculate the probability
probability_small_straight <- total_favorable_outcomes / total_outcomes

# Round the result to three decimal places
rounded_probability <- round(probability_small_straight, 3)

# Print the probability
rounded_probability
```

0.043