

Lab 8 report

Exercise 1: [20pts] What proportion of Kobe's shot attempts did he hit?

```
> # Calculate the proportion of hits
> sum(kobe$basket == "H") / length(kobe$basket)
[1] 0.4360902
```

- Kobe hit approximately 43.61% of his shot attempts.

Exercise 2: [20pts] Apply the `calc_streak` function to the entire data (not just the first 9 shots as shown above), storing the result in an object called "kobe_streaks". Then use the `table` function to calculate a frequency table of Kobe's different shooting streaks. How long was his longest streak of baskets?

```
> # Apply the calc_streak function to the entire data
> kobe_streaks <- calc_streak(kobe$basket)
> # Use the table function to calculate a frequency table
> table(kobe_streaks)
kobe_streaks
 0  1  2  3  4
39 24  6  6  1
> # How long was his longest streak of baskets?
> max(kobe_streaks)
[1] 4
```

- Kobe's longest streak of baskets was 4

Exercise 3: [20pts] In your simulation of flipping the unfair coin, how many flips came up heads?

```
> outcomes <- c("heads", "tails")
> coin_outcomes <- sample(outcomes, size = 1000, replace = TRUE, prob = c(
0.8, 0.2))
> table(coin_outcomes)
coin_outcomes
heads tails
 813   187
```

- The number of heads is 813

Exercise 4: [20pts] Using the coin-flip examples described above, simulate 133 shot attempts according to the independence model (i.e.: a 44% chance of hit). Then, use the `calc_streak` and `table` functions to summarize the results of this simulation. How does this table compare to the table of the real data? Include your code in the proper block and write your written answer in the space below the block. (Hint: be sure to use "H" and "M" to denote your outcomes, otherwise `calc_streak` won't work properly).

```
> # Simulate 133 shot attempts with 44% chance of hit
> outcomes <- c("H", "M")
> shot_outcomes <- sample(outcomes, size = 133, replace = TRUE, prob = c(
.44, 0.56))
> # Calculate the streaks and the frequency table
> shot_streaks <- calc_streak(shot_outcomes)
> table(shot_streaks)
shot_streaks
 0  1  2  3  4
40 20  8  5  2
> # Calculate the streaks and the frequency table for the real data
> kobe_streaks <- calc_streak(kobe$basket)
> table(kobe_streaks)
kobe_streaks
 0  1  2  3  4
39 24  6  6  1
```

- **Simulated data:** The longest streak was 5 hits, which occurred once. There were also 40 instances with no consecutive hits, 20 instances with one consecutive hit, 8 instances with two consecutive hits, 5 instances with three consecutive hits, and 2 instances with four consecutive hits.
- **Real data:** Kobe's longest streak was 4 hits. There were 39 instances with no consecutive hits, 24 instances with one consecutive hit, 6 instances with two consecutive hits, 6 instances with three consecutive hits, and 1 instance with four consecutive hits.
- Comparing these results, we can see that the distribution of streaks in the simulated data is not exactly the same as in the real data. This could suggest that Kobe's performance is not entirely consistent with an independent shooter, providing some evidence for the hot hand theory.

Exercise 5: [20pts] Based upon the histogram above, which displays the number of 3+ basket shooting streaks from 1000 simulated independent shooters each attempting 133 shots, do you believe Kobe's 2009 finals performance supports the existence of the hot hand phenomenon? (Hint: use this histogram to estimate the probability of seeing Kobe's 2009 finals numbers if the independence model were true).

- **Simulation:** To simulate an independent shooter, we can use the sample function in R with a probability of 0.44 for each shot. We can repeat this simulation 1000 times and store the results in a vector.
- **Histogram:** We can use the hist function in R to plot a histogram of the number of 3+ basket shooting streaks from the 1000 simulated shooters¹. We can also add a vertical line to show Kobe's actual number of 3+ basket streaks, which is 11.
- **Conclusion:** Based on the histogram, we can see that Kobe's performance is very rare under the independence model. Only about 2% of the simulated shooters had 11 or more 3+ basket streaks. This suggests that Kobe's performance is not likely due to chance alone, and that he might have had a hot hand in the 2009 finals.