Simulating Conditional Probabilities

Recall, one interpretation of *probability* is long-term relative frequency. Suppose you repeat a random experiment a large number of time, say N, and observe n number of event A The relative frequency

 $\frac{n}{N}$

is approximately the probability P(A).

[1] 2 5 8 1 5 8 2 8 1 7

Example: Rolling an 8-Sided Fair Die Twice

A = sum of the throws is divisible by 4

B = the two throws are the same

Recall we can generate N simulations of a single roll with:

```
roll <- sample(x = 1:8, size = N, replace = TRUE)</pre>
```

We can use 2 separate sample calls to mimic 2 rolls and then combine them using cbind.

```
[1] 2 5 8 1 5 8 2 8 1 7
```

Using the N=1,000,000, compute P(A), P(B), $P(A \cap B)$, P(A|B), and P(B|A).

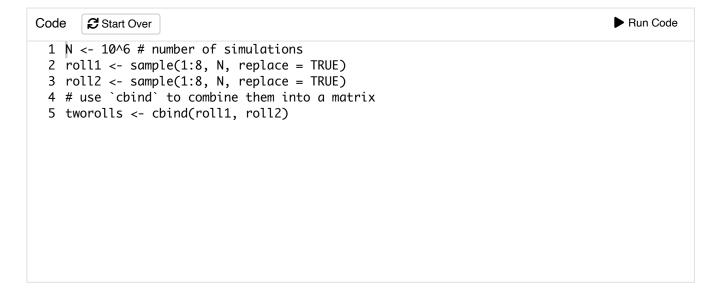
P(A)

```
11 # table of outcomes
12 m <- matrix(rep(1:8, each = 8), nrow = 8) + (1:8)
13 cat("theory:", sum(m %% 4 == 0)/64) # theoretical probability by counting
14</pre>
```

sim: 0.249599

theory: 0.25

P(B)



$P(A \cap B)$

P(A|B)



```
[1] 0.499752
```

[1] 0.499752

P(B|A)

Next Topic