Lab 2

Duke STA 240 Fall 2025

replace this text with your name

Task 1

- **Scenario**: roll three *fair* dice;
- **Event**: all three dice show different numbers.

This code simulates 7,500 trials and computes the proportion of the time the event occurs:

```
set.seed(37367)
nreps <- 7500
counter <- 0

for(i in 1:nreps){
  rolls <- sample(1:6, 3, replace = TRUE)

  if( length(unique(rolls)) == 3 ){
    counter <- counter + 1
  }

}

counter / nreps # proportion
```

```
[1] 0.558
```

In order to do the math, we apply $P(A) = \#(A)/\#(S)$ directly. The sample space S is the set of all three-dice rolls. Thought of as three experiments in the sense of the counting principle, the number of ways we could mix-and-match the rolls is $\#(S) = 6 \times 6 \times 6 = 6^3 = 216$. The target event A is the set of all three-dice rolls where all numbers are different (ie sampling without replacement), and so $\#(A) = 6 \times 5 \times 4 = 120$. Putting it into `R` gives:

```
120 / 216
```

```
[1] 0.5555556
```

We conclude then that

$$P(A) = \frac{6 \times 5 \times 4}{6^3} = \frac{120}{216} \approx 0.555,$$

which agrees with our simulation.

Task 2

You can write text here.

```
# You can add code here
```

```
# You can add code here
```

You can type math here:

$$P(A) = 1 - P(A^c) = 1 - \frac{\binom{48}{5}}{\binom{52}{5}} \approx 0.34.$$

Task 3

You can write text here.

```
# You can add code here
```

```
# You can add code here
```

You can type math here:

$$P(A) = 1 - P(A^c) = 1 - \frac{\binom{48}{5}}{\binom{52}{5}} \approx 0.34.$$