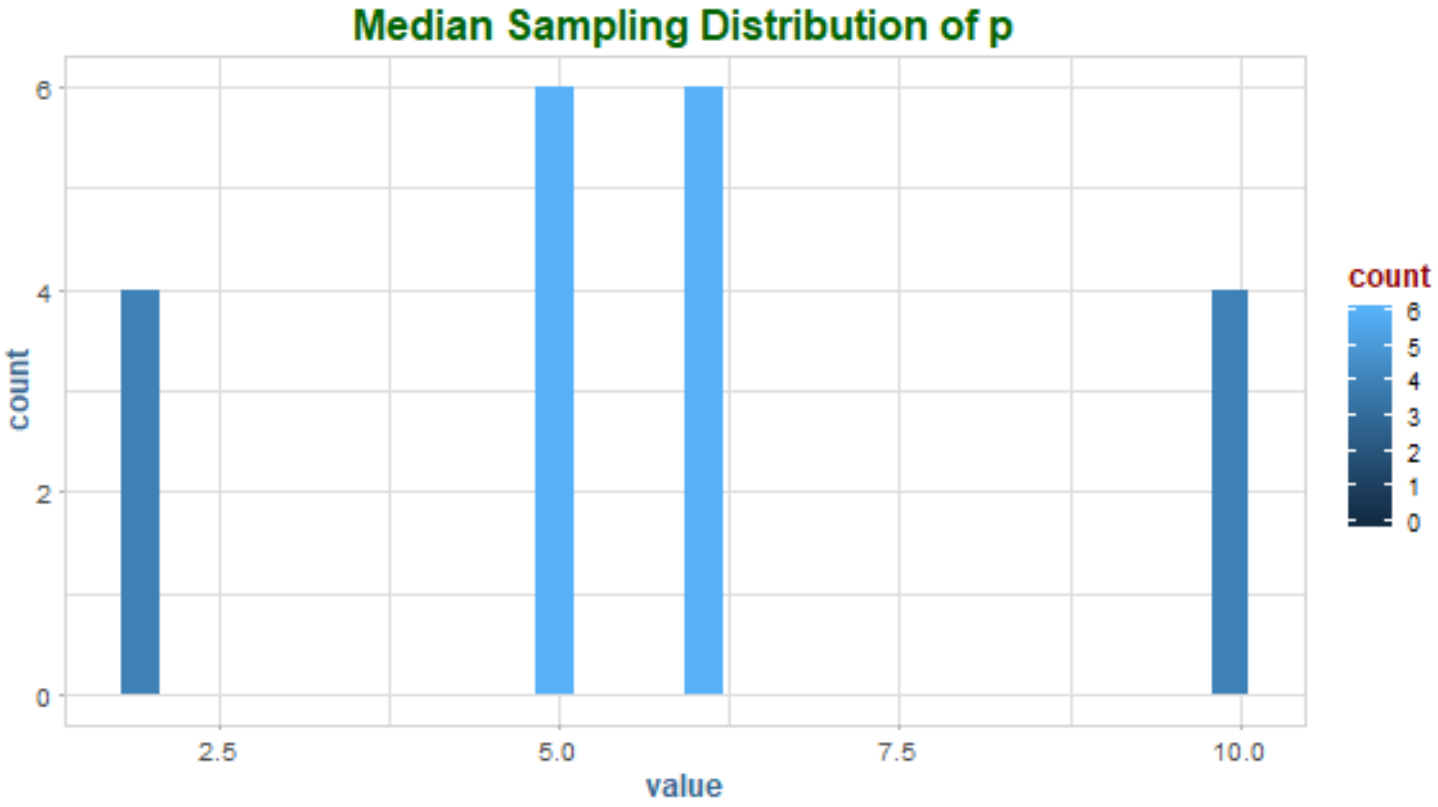
4.1

Consider the population {1, 2, 5, 6, 10, 12}.

Find (and plot) the sampling distribution of medians for samples of size 3 without replacement.

```
p <- c(1, 2, 5, 6, 10, 12)
c <- combinations(v = p, n = 6, r = 3)
t <- apply(c, 1, median)

ggplot(data.table(value = t), aes(value, fill = ..count..)) +
   geom_histogram(bins = 30) +
   labs(title = "Median Sampling Distribution of p")
```



Compare the median of the population to the mean of the medians.

Median of p = **5.5**. Mean of Medians of p = **5.7**

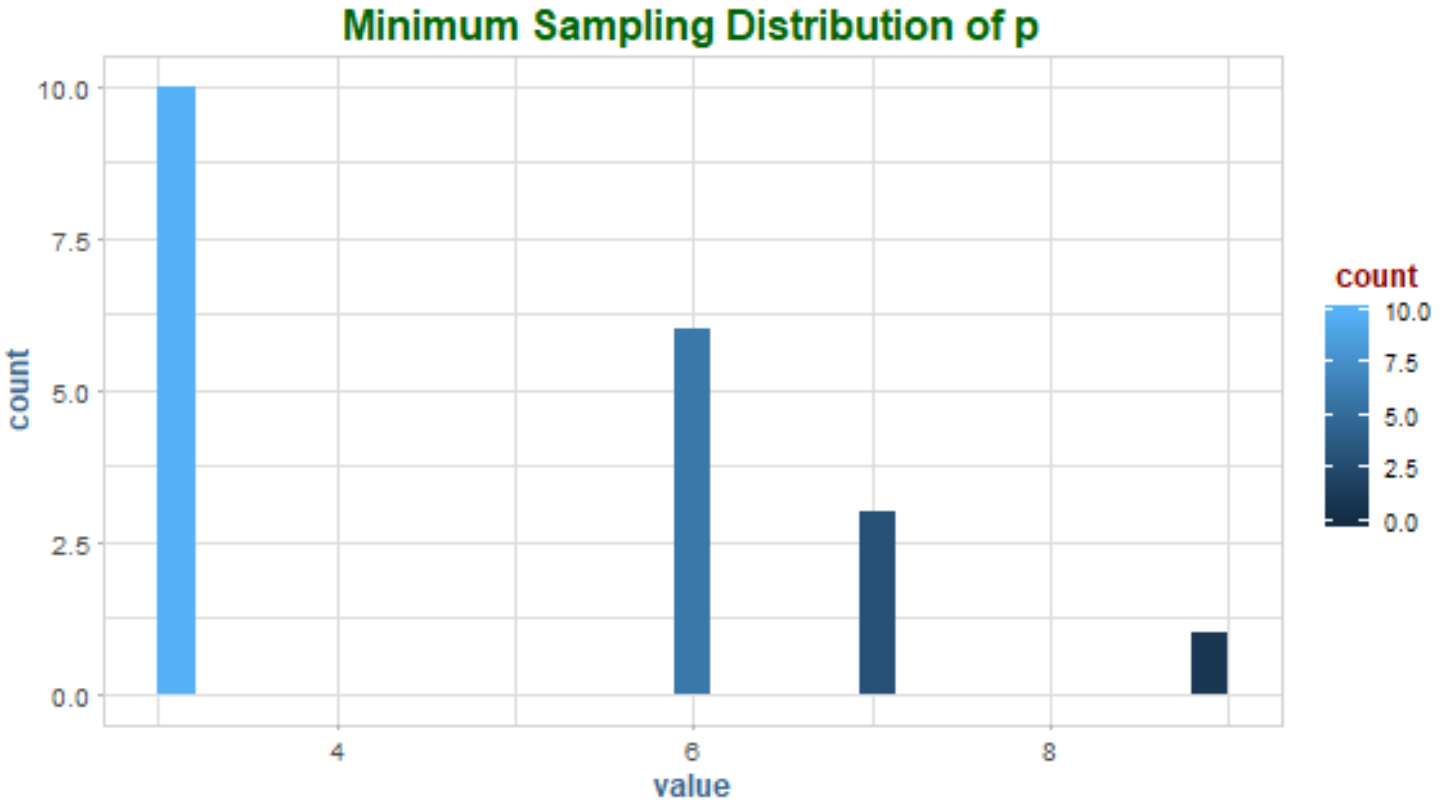
4.2

Consider the population {3, 6, 7, 9, 11, 14}.

For samples of size 3 without replacement, find (and plot) the sampling distribution for the minimum.

```
p <- c(3, 6, 7, 9, 11, 14)
c <- combinations(v = p, n = 6, r = 3)
t <- apply(c, 1, min)

ggplot(data.table(value = t), aes(value, fill = ..count..)) +
   geom_histogram(bins = 30) +
   labs(title = "Minimum Sampling Distribution of p")
```



What is the mean of the sampling distribution? **4.8**

The statistic is an estimate of some parameter - what is the value of that parameter?

This is an estimation of the minimum, which is: **3**

4.3

Let *A* denote the population {1, 3, 4, 5} and *B* the population {5, 7, 9}.

```
A <- c(1, 3, 4, 5)
B <- c(5, 7, 9)
```

Let *X* be a random value from *A*, and *Y* and random value from *B*.

a.) Find the sampling distribution of *X* + *Y*.

```
p <- c(A, B)
c <- combinations( v = p, n = 6, r = 2)
```

b.) In this example, does the sampling distribution depend on whether you sample with or without replacement?

No.

Why or why not?

Because 5 in is both sets.

c.) Compute the mean of the values for each of *A* and *B* and the values in the sampling distribution of *X* + *Y*.

How are the means related?

d.) Suppose you draw a random value from *A* and a random value from *B*.

What is the probability that the sum is 13 or larger?