PSTAT 10 Worksheet 6

Due 7/12/22

Problem 1: Estimating a binomial expectation

Let X be the r.v. that indicates the number heads after flipping a *biased* coin $n = 10$ times, where the probability of heads is $p = 0.3$.

1. In mathematical notation, write down the distribution of X. It should include the $\sim$ symbol.
2. Estimate the expectation of X through simulating $10,000$ replications

Problem 2: Plotting the binomial pmf

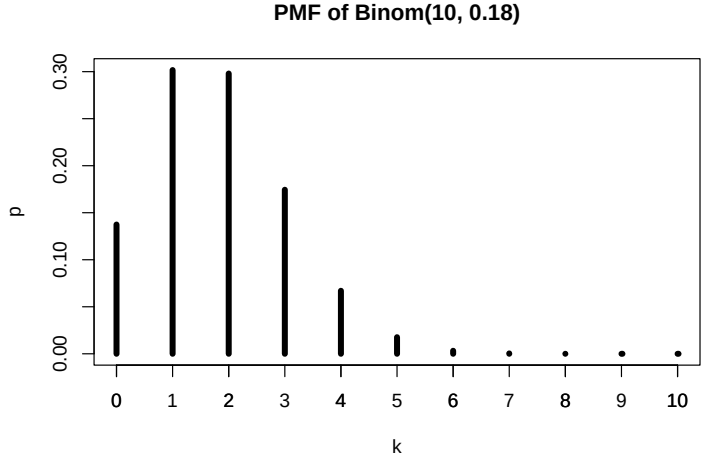
Recall the pmf of a discrete r.v. X is given by

$$f(k) = \mathbb{P}(X = k).$$

Just to reiterate the notation, f is a function of k, the outcome of a random experiment of which X is a numerical value (e.g. number of heads); f is the pmf of X.

The plot of a pmf gives a good idea of the "shape" of a distribution; it is often informative to look at the plot.

Recreate the following plot of the pdf of $X \sim \text{Binom}(10, 0.18)$.



Hint: `dbinom` is vectorized. I used the parameters `type = "h"` and `lwd = 5` in my plot.

Problem 3: Rolls until 15

Roll a fair six-sided die 15 times. How many rolls did it take until the cumulative sum of scores equals or exceeds 15?

For example: I rolled

```
##  [1] 2 6 3 1 2 6 4 6 6 4 6 2 3 2 5
```

After 5 rolls, my cumulative score is $2+6+3+1+2 = 14$. But after 6 rolls, my cumulative score is $14+6 = 20$. It took me 6 rolls for a score that equals or exceeds 15.

What is the expected number of rolls it takes for the score to equal or exceed 15? Estimate using $10,000$ replications.

Hint: My solution uses the `cumsum` function along with `which`.