Chapter 19: More Histograms

Worksheet to accompany

David Feldman, *Chaos and Fractals: An Elementary Introduction*,
Oxford University Press, 2012

In this exercise you will convert playing cards into numbers as follows. Number cards have a value equal to their number. Aces count as one. And face cards (king, queen, jack), all count as ten.

1. Give your deck of cards a quick shuffle and pull a card from the deck. Write that number down. Put that card back in the deck.

2. Repeat the above process four more times, so that you have a list of five numbers.

3. Add the numbers together and write the number on a post-it.

4. Repeat the above three steps a few more times so that you have around ten post-its with numbers on them.

5. Then take your post-its and stick them on the histogram on the board.

Suppose the probability that a branch of a tree has length x is given by

$$p(x) = 0.61\frac{1}{x^2} \ . \tag{1}$$

1. What is the probability that a branch has length 2?
2. What is the probability that a branch has length 4?
3. What is the probability that a branch has length 8?
4. How many times more likely are branches of length 2 compared to branches of length 4?
5. How many times more likely are branches of length 4 compared to branches of length 8?

Now suppose that in a different tree, the probability of that a branch has length x is given by

$$p(x) = \left(\frac{1}{3}\right)\left(\frac{2}{3}\right)^{x-1} \ . \tag{2}$$

Answer the above five questions for this other tree.