

## Activity 2

Name here

### Q1.

In the context of the rolling a die, sketch a prior belief on the probabilities for the die resulting in a 6.

### Q2.

Now, try to find a probability distribution that matches your sketch. Note, you might want to explore the beta distribution (`rbeta()`).

### Q3.

In the context of the rolling Andy's black die, sketch a prior belief on the probabilities for the die resulting in a 6.

### Q4.

Now, try to find a probability distribution that matches your sketch. Note, you might want to explore the beta distribution (`rbeta()`).

### Q5

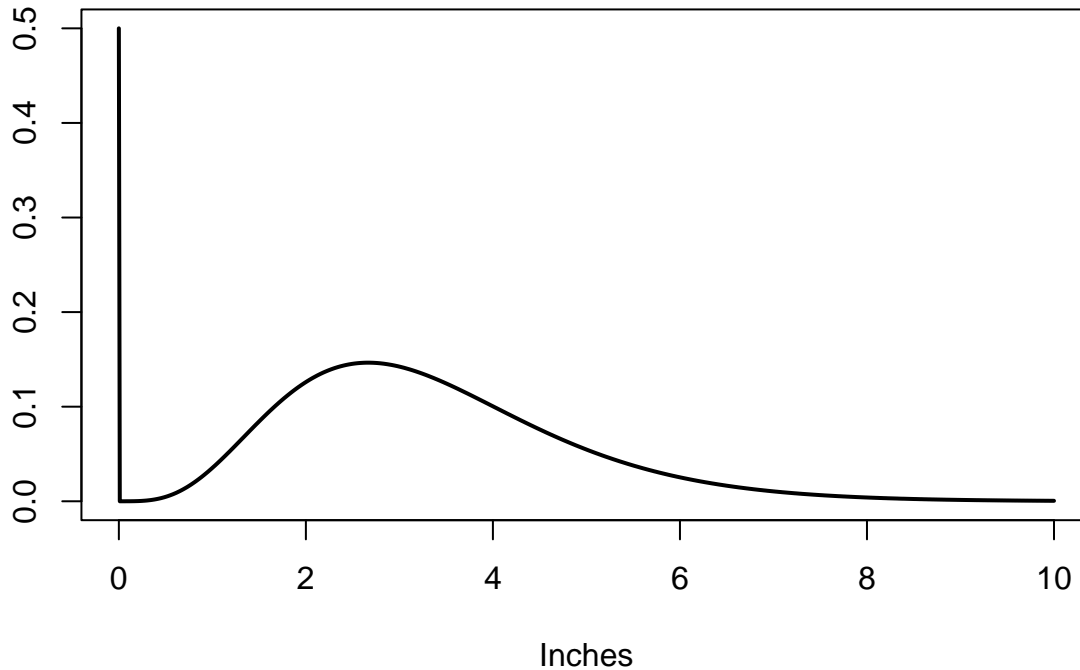
Suppose you are interested in learning the about the average wait time for the Sunnyside chair lift at Bridger Bowl on Saturday mornings at 9:00 AM. Outline the first three steps of a Bayesian inference:

1. Identify the data relevant to the research question.
2. Define a descriptive model for the relevant data. Identify the statistical parameters in the analysis.
3. Specify (sketch and identify a distribution) a prior distribution for the parameters in the model.

### Q6

Interpret the following figure which specifies a prior distribution on the snowfall total for tomorrow.

## Probability of Snow Tomorrow



**Q7**

DBDA Exercise 2.1. [Purpose: To get you actively manipulating mathematical models of probabilities.] Suppose we have a four-sided die from a board game. On a tetrahedral die, each face is an equilateral triangle. When you roll the die, it lands with one face down and the other three faces visible as a three-sided pyramid. The faces are numbered 1-4, with the value of the bottom face printed (as clustered dots) at the bottom edges of all three visible faces. Denote the value of the bottom face as  $x$ . Consider the following three mathematical descriptions of the probabilities of  $x$ . Model A:  $p(x) = 1/4$ . Model B:  $p(x) = x/10$ . Model C:  $p(x) = 12/(25x)$ . For each model, determine the value of  $p(x)$  for each value of  $x$ . Describe in words what kind of bias (or lack of bias) is expressed by each model.

**Q8**

DBDA Exercise 2.2. [Purpose: To get you actively thinking about how data cause credibilities to shift.] Suppose we have the tetrahedral die introduced in the previous exercise, along with the three candidate models of the die's probabilities. Suppose that initially, we are not sure what to believe about the die. On the one hand, the die might be fair, with each face landing with the same probability. On the other hand, the die might be biased, with the faces that have more dots landing down more often (because the dots are created by embedding heavy jewels in the die, so that the sides with more dots are more likely to land on the bottom). On yet another hand, the die might be biased such that more dots on a face make it less likely to land down (because maybe the dots are bouncy rubber or protrude from the surface). So, initially, our beliefs about the three models can be described as  $p(A) = p(B) = p(C) = 1/3$ . Now we roll the die 100 times and find these results: #1's = 25, #2's = 25, #3's = 25, #4's = 25. Do these data change our beliefs about the models? Which model now seems most likely? Suppose when we rolled the die 100 times we found these results: #1's = 48, #2's = 24, #3's = 16, #4's = 12. Now which model seems most likely?