1. If we want to simulate rolling a pair of dice and summing the spots (for say, playing Monopoly), will the following code do this correctly? Explain.

```r
# first create a vector with the possible sums of a pair of dice
dice <- c(2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12)
# then sample once from dice
sample(dice, 1)
```

2. If we are defining a box to simulate tossing a fair coin three times and counting the **number** of heads, would either of the methods below work? If not, why not? (Note that, for example, the box $\boxed{\boxed{0}\ \boxed{1}}$ would be represented by the `(0, 1)` in R, and we would then use the function `sample()`.

(a) $\boxed{\boxed{0}\ \boxed{1}}$ - Draw three times at random with replacement, and sum the draws.

(b) $\boxed{\boxed{0}\ \boxed{1}\ \boxed{2}\ \boxed{3}}$ - Draw once, the result is the number of heads.

3. One ticket will be drawn at random from each of the two boxes below:

$$A: \boxed{\boxed{1}\ \boxed{2}\ \boxed{3}} \qquad B: \boxed{\boxed{1}\ \boxed{2}\ \boxed{3}\ \boxed{4}}$$

(a) What is the probability the number drawn from A is greater than the one drawn from B?

(b) What is the probability that the number drawn from A is equal to the one drawn from B?

(c) What is the probability the number drawn from A is smaller than the one drawn from B?

4. I want to estimate the proportion of people in Berkeley who speak at least two languages. I stand at the corner of University and Shattuck and ask each person who goes by how many languages they speak, and keep a count of how many speak at least two. Is this a good way to estimate the proportion I am looking for?

5.

(a) Consider the box $\boxed{\boxed{1}\,\boxed{2}\,\boxed{2}\,\boxed{3}\,\boxed{4}}$. I draw two tickets at random **with** replacement. If my first draw is a 2, what is the probability that my second draw is a 3?

(b) Consider the box $\boxed{\boxed{1}\,\boxed{2}\,\boxed{2}\,\boxed{3}\,\boxed{4}}$. I draw two tickets at random **without** replacement. If my first draw is a 2, what is the probability that my second draw is a 3?

6. Consider an outcome space Ω and events A, B, C with $P(A) = 0.6$, $P(B) = 0.7$.

(a) What is the smallest possible value of $P(A \cap B) = P(A \textbf{ and } B)$

(b) What is the largest possible value of $P(A \cap B)$?

(c) What is the smallest possible value of $P(A \cup B)$?

(d) What is the largest possible value of $P(A \cup B)$?

7. Think about the two types of plots you saw in the notes: the empirical distributions and the actual probability distribution for the outcomes of rolling a fair six-sided die. Suppose we play a game now: we roll a die n times, and you get 5 dollars if the proportion of times you roll a 6 is greater than 20%. You get to choose n to be either 10 or 1000. Which one would you choose? Why?