1. There are five green balls, four yellow balls, and two blue balls in a bin. You draw two of them out at random.

(a) Calculate the probability that both are green, the probability that just one is green, and the probability that neither one is green.

(b) Write a program to simulate the experiment 10,000 times, count how many times each outcome occurs, and report the result. You’ll want to start with

```python
from random import *
L = ["G","G","G","G","G","Y","Y","Y","Y","B","B"]
```

or if you’re feeling fancy, that second line could be

```python
L = ["G"]*5 + ["Y"]*4 + ["B"]*2
```

To pick two of them at random, you could either do `shuffle(L)` to shuffle the list and then examine `L[0]` and `L[1]`, or you could do `M = sample(L,2)` and then examine `M[0]` and `M[1]`.

(c) If your calculation and your program don’t agree, go back and correct the calculation, or the program, or both.

2. You draw two cards at random from a standard deck.

(a) Calculate the probability that they have the same rank (ace, 2, 3, ..., 10, jack, queen, king), and the probability that they have the same suit (clubs, diamonds, hearts, spades).

(b) Write a program to simulate the experiment 10,000 times and report the result. For the suit question, you can ignore the ranks and just start with something like

```python
L = ["C","D","H","S"]*13
```

Similarly, for the rank question you can ignore the suits.

(c) If your calculation and your program don’t agree, go back and correct the calculation, or the program, or both.
3. You roll two six-sided dice.

   (a) Calculate the probability that they add up to 9 or more.

   (b) Write a program to simulate the experiment 10,000 times and report the result. To get a random integer between 1 and 6, you can use either `randrange(1,7)` or `randint(1,6)`.

   (c) If your calculation and your program don’t agree, go back and correct the calculation, or the program, or both.

   (d) Challenge: What if it’s three dice adding up to at least 15?

4. You flip a coin ten times.

   (a) Calculate the probability that it comes up heads 7 or more times.

   (b) Write a program to simulate the experiment 10,000 times and report the result. You could do `L = ['H','T']` and then use `choice(L)` to get a random choice, but it would be slicker to let 0 represent tails, let 1 represent heads, and add up the random choices to get the number of heads.

   (c) If your calculation and your program don’t agree, go back and correct the calculation, or the program, or both.

5. Optional challenge problem: random walks. A bug starts at the origin on a number line. It flips a coin to decide whether to move one unit left or right. It does this many times.

   (a) What is the probability that after 20 steps, the bug is more than 10 units away from the origin? Don’t try to compute this by hand, but write a program to approximate the answer.

   (b) What is the average distance that the bug will end up at after 20 steps? Again write a program to approximate the answer.

   (c) What if the bug walks randomly in the xy-plane, each time moving either left, right, up, or down? Do you expect your answers to (a) and (b) to get bigger or smaller? Write a program to see if you were right.