IC252 Lab 3: Birthday paradox revisited

March 12, 2022

1. This question is derived from the birthday paradox. Let the number of people in the room be n. Estimate the probability p_n that out of n people, at least one match occurs (in other words, at least two people share a birthday.)

   Plot p_n versus n for $2 \le n \le 100$ for the following cases.

   (a) When each birthday is equally likely. In earth, the probability is about 0.5 for $n = 23$.
   (b) When the birthdays are computed on Mars. Each Martin year is 669 days. The probability is about 0.5 when $n = 31$.
   (c) When birthdays between 1-150 are twice as likely as 151-365.

Hint: The experiment is binary (outcome is success or failure.) We define success if there is a match. Determine if there is match by counting the number of occurrences for each birthday. If there is no match, then it is a failure. A useful Python class for counting is `Collections.counter`. Also, remember to repeat the experiment a large number of times (I did it 10000 times for each n.) The whole code is less than 50 lines! See the plot for parts (a) and (b) below:
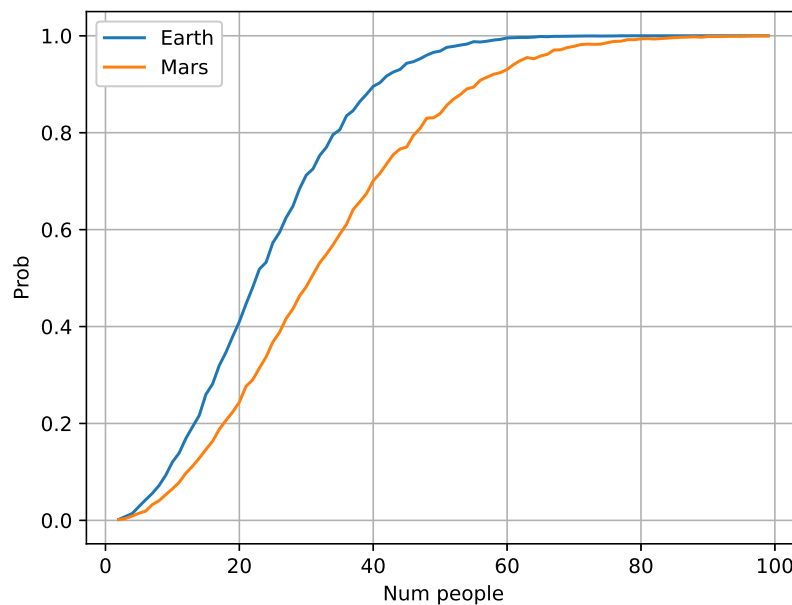

Figure 1: Plot for birthday paradox.