R Scripting

Lab for unit 1 - R basics and data structures (I)

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Please solve the following problem!

Biased Roulette

1. In the game of European roulette, a wheel is spun in one direction, then a ball is spun in the opposite direction. The ball eventually falls into one of 37 colored and numbered pockets on the wheel. Numbers 1–36 are classified into groups of numbers in three different ways:

   1. Low (1-18) vs. high (19-36)
   2. Odd (1, 3, . . . , 35) vs. even (2, 4, . . . , 36)
   3. Red (1, 3, 5, 7, 9, 12, 14, 16, 18, 19, 21, 23, 25, 27, 30, 32, 34, 36) vs. black (2, 4, 6, 8, 10, 11, 13, 15, 17, 20, 22, 24, 26, 28, 29, 31, 33, 35)

   Players may choose to place bets on one of these groups (e.g., put their money on low, red, uneven, etc.) and get double their money back if they win. Number 37 is the green zero.

   a. Create a vector that can be used to simulate a biased roulette wheel, where the ball is three time more likely to fall on the 0 than on any other number.
   b. "Spin" the wheel $n = 30, 300, 3000$ times and record the results. Make sure that the results are replicable!
   c. Determine the indices for all the (green) zero results in each of the three simulations and assign them to three different objects.
   d. Identify the lengths of the three vectors created in c. above.
   e. Compute the *simulated* occurrence probabilities for the (green) zero results and save them in a vector of length 3 with appropriately named elements. Compare them with the *expected* occurrence probabilities of a **fair** roulette wheel. To what extent do the probabilities differ?
   f. Based on the results, is there evidence to say that the roulette wheel is biased? Does the number of replications have an influence on your assessment? (Note: Usually, we wouldn't base our judgment solely on descriptive statistics, but would perform a statistical test and/or compute a confidence interval.)

   Hint:

   - Use `?sample()` to find out how you can sample in the case of unequal probability weights.