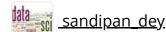


<u>Help</u>



<u>Unit 6: Joint Distributions and</u>
Course > Conditional Expectation

6.2 Interactives: Bivariate Normal, Patterns in Sequences, Bayesian

> Sequences

6.2.2 Interactive: Patterns in Sequences

In Example 6.5.8 of this unit, we encountered the following surprising result: flipping a fair coin repeatedly until the pattern HT appears requires 4 flips on average, but for the pattern HH we need 6 flips on average! This interactive provides a simulation for this problem, and allows you to explore what happens with much more general patterns in sequences with two possible symbols (taken here to be x and o rather than H and T).

6.2.2 Interactive: Patterns in

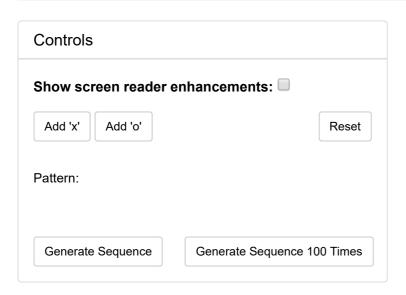
Patterns in Sequences - Directions for Use

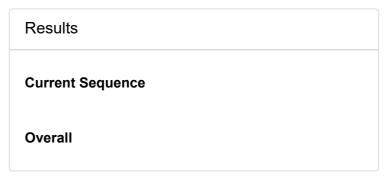
> <u>Updating</u>

- 1. Enter your desired pattern of x's and o's (with length between 1 and 15), using the "Add 'x'" and "Add 'o'" buttons.
- 2. Press "Generate Sequence" to generate a random sequence of x's and o's, where each term is x with probability 1/2 and o with probability 1/2, independently. Appearances of your pattern in the sequence are highlighted. If your pattern has not yet appeared for the first time in the sequence shown on screen, the sequence is lengthened (without being shown on screen) until your pattern appears.
- 3. Press "Generate Sequence 100 Times" to generate 100 such sequences (you can also press it repeatedly to accumulate a lot more data).
- 4. The Results panel gives summary statistics for how long it took for your pattern to appear. **The counts shown do not include the sequence itself.** For example, the theoretical expected value for the time until xo is 2 (rather than 4) and for the time until xx it is 4 (rather than 6).

You Should Try:

- Check that the mean and standard deviation make sense when the pattern has length 1 (just x or o).
- Check that the means make sense when the pattern has length 2 (in particular, comparing xo to xx).
- Which sequences of length 3 have the *smallest* possible average waiting time? Which sequences of length 3 have the *largest* possible average waiting time? Explore this via simulation.





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