Generalized Fibonacci Project

MATH 242 • Fall 2025

Due: Monday, October 6

(Following the due date and initial grading, there will be an opportunity to revise and resubmit for a higher grade.)

In this project, you will explore your own generalized Fibonacci (or "gibonacci") sequence. Choose your own integers a, b, r, and s, and define your sequence:

$$\begin{aligned} G_0 &= a \\ G_1 &= b \\ G_n &= rG_{n-1} + sG_{n-2} \text{ for } n > 1 \end{aligned}$$

Make sure your sequence is not a multiple of the Fibonacci, Lucas, or Pell sequence. Your sequence also should not be a geometric sequence.

Search for identities involving your sequence, using Chapter 2 of our text as your guide. *State at least four conjectures*, supported by computational evidence. Your conjectures should be reasonably different from each other, not simply small variations of each other.

For projects in MATH 242, *communication* is as important as *computation*. You should turn in a well-organized notebook that clearly explains, using sentences and paragraphs, what you computed and what conclusions you can draw.

This project will be graded on the EMRN scale, as described in the syllabus. To receive a grade of *Meets Expectations*, your notebook should exhibit the following characteristics:

- You demonstrate computational exploration of your generalized Fibonacci sequence.
- You state four conjectures involving your sequence, supported by computational evidence.
- Your reasoning is explained using sentences, and your notebook is well-formatted and easy to read. Mathematical notation is typeset correctly, especially subscripts and superscripts.
- No significant gaps or errors are present.

To receive a grade of *Excellent*, your notebook should further exhibit all of the following:

- At least one of your identities involves two or more parameters. All of your conjectures are nontrivial, meaning they don't result from some simple algebraic operation.
- Computational methodology demonstrates mastery of the computational techniques that we have studied in this course.
- Mathematica code is of high quality, demonstrating skillful use of programming constructs (e.g., variables, lists, functions, modules).
- Exposition is clear and precise, thoroughly explaining your methodology and reasoning. Any assumptions necessary for the estimates are reasonable and clearly stated.
- The work extends beyond the project requirements in a creative or insightful direction. For example, you could prove one of your conjectures, thus obtaining a theorem about your sequence.