

gPascal - Playing with the Triangle

2024-03-26

Introduction

This group assignment continues our class work with the **Pascal's Triangle** project. You will work, in your group, on some of the properties.

Assignment Goals

Learning Outcomes After completing this group assignment, each student is expected to be able to

- Write a *recursive* function for $T_{r,c}$ in the triangle.
- Do some induction proofs

Procedure

Assign Roles. Students should take roles they have not held recently (or, perhaps, ever):

Manager Move discussion forward.

Recorder Writes the report that will be turned in.

Reflector Monitor that everyone gets heard and is caught up. (This is a **group** obligation, really.)

Speaker (Combine w/ **Reflector** if there are not four group members.) Asks the facilitator questions and communicates what the team has done.

Answer these questions.

1. Draw the upper-left portion of Pascal's triangle, for rows 0 through 5 (and the same columns).
 - (a) Label the *rows* and *columns*.
 - (b) Put the *generator*, 1, in $T_{0,0}$.
 - (c) Use the rules of filling the triangle to fill the rest of the squares.
 - (d) What is the value in $T_{5,5}$?
 - (e) What are the values of $base_4$? In what order did you list them? (Give the triangle coordinates of the elements in the order you wrote them.)
 - (f) List the reciprocal pairs in $base_4$
2. Pascal's Seventh Consequence is *In every arithmetical triangle the sum of the cells of each base is double that of the preceding base.* **Prove** this by *induction* (use modern notation).
3. You know how to fill a given cell, $T_{r,c}$, in the triangle in terms of cells that have lower row or column coordinates. Turn this knowledge into a *recursive* Java function. The **only** base case you can use is that $T_{0,0}$ contains 1 (the generator).