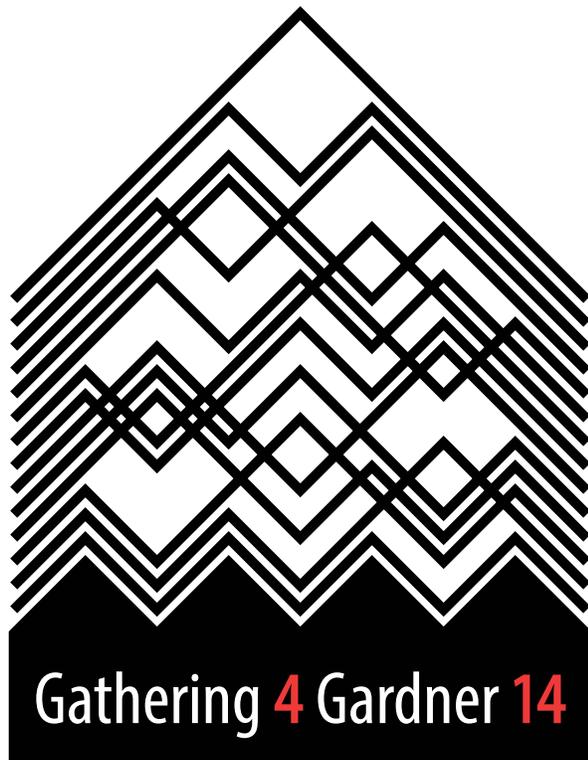# About the G4G14 logo

Scott Kim, April 27, 2020

Each Gathering 4 Gardner logo I've designed is based on the number of the Gathering. For G4G12 I used the 12 pentominoes; for G4G13 I used a design that expresses the fact that 13 is a Fibonacci number, a sequence that begins 0, 1, 1, 2, 3, 5, 8, 13. (The initial 0 is counted as the 0th term of the sequence — mathematicians like to count starting at 0.) For G4G14 I used the fact that 14 is a Catalan number — a sequence that starts 1, 1, 2, 5, 14, 42, 132.

G4G logos are meant to appeal to a mathematically sophisticated audience that enjoys challenge, so the logo is a question posed to the attendees — what does this diagram represent, and how does it relate to the number of the gathering?

Catalan numbers come up often in combinatorial mathematics involving counting problems, but are less familiar than their famous cousins, the Fibonacci numbers. Some of the many equivalent definitions of the nth Catalan number include:

- The number of trees with n terminal nodes
- The number of ways to properly nest n pairs of parentheses
- The number of ways to cut an (n+2) sided polygon into triangles by connecting vertices with non-crossing line segments. You can see diagrams of all these enumerations on the Wikipedia page on Catalan numbers.

To make the G4G14 logo, I searched for a visually appealing, compact interpretation of 14 as a Catalan number. After some experimentation, I settled on the interpretation of 14 as the number of paths from 0,0 to 4,4 on a cartesian grid, moving up or to the right one unit at a time, without crossing above the line x=y. Here's the diagram of this interpretation, from the Wikipedia page.
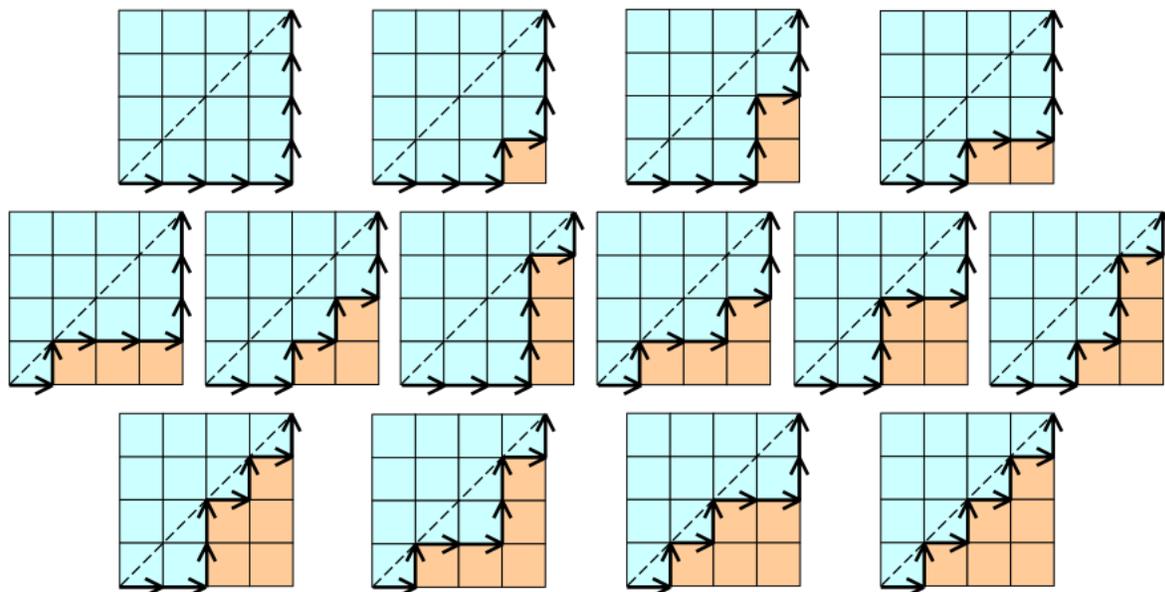
These diagrams are sequenced in a logical lexicographic order, enumerating the paths with 1, 2, 3, 4, 5 and 6 tan squares. For my logo I rotated and stacked the jagged paths to make a overlapping mountain ranges. I was pleased by the visual variety of the resulting design, and the way the zig zags deftly wove through each other without confusing coincidences. This is what I enjoy about mixing art and math — the math leads to a visually interesting design that I never would have found through artistic means alone.