His money was safe — reversing two adjacent squares is mathematically impossible unless you remove tiles from the tray and put them back in.

When I approached the G4G15 logo, I knew that I wanted to base it on the 15 puzzle. The letters of GATHERING 4 GARDNER 15 fit well into the space, requiring only a few doubled letters. So far so good.

In keeping with the original puzzle, I reversed the final 2 letters of GARDNER, which makes the viewer want to reverse those two letters. But as most G4G attendees will know, that’s impossible. So my challenge became to design a visually attractive puzzle that DID allow for an interesting, unique solution.

I tried many ideas. To prototype my solutions, I used an online 15 puzzle generator (https://ruwix.com/online-puzzle-simulators/sliding-15-puzz/). But the early draft, shown above, allows many solutions (you can swap the final R and E if you, say, also swap the two G’s), and is visually dull.

The breakthrough came when I pondered how to include the number 15. I hit on the idea of making it cover the background. Then everything fell in place.

My challenge now was to design the 15 so the final R and E had identical, and therefore swappable, backgrounds, as did one other pair of tiles. It turned out that the best solution was to have three matching tiles. I would have preferred a second matching pair with a different background, but that didn’t work out. The puzzle requirements also drove me to use gradients on the background tiles. Thus are the ups and downs of driving a visual design with mathematics!