

MATH 113: DISCRETE STRUCTURES
MONDAY WEEK 1 HANDOUT

Question 1 (Non-attacking rooks). Rooks are chess pieces which move vertically and horizontally. We say that two rooks are attacking each other if they are in the same rank (*i.e.* row) or file (*i.e.* column). Is it possible to place 8 rooks on a standard 8×8 chessboard so that no two rooks are attacking each other? In how many different ways can non-attacking rooks be placed on the board? What if the chessboard is $n \times n$ and you have n rooks?

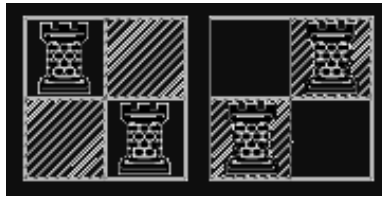


FIGURE 1. Pacifist rooks on a 2×2 chessboard.

Question 2 (Monotonic paths). A path on a square grid is called *monotonic* if it proceeds only by single steps right or up. On a 4×4 (or $n \times k$) grid, how many distinct monotonic paths go from the bottom left corner to the top right corner? What does this have to do with Figure 2?

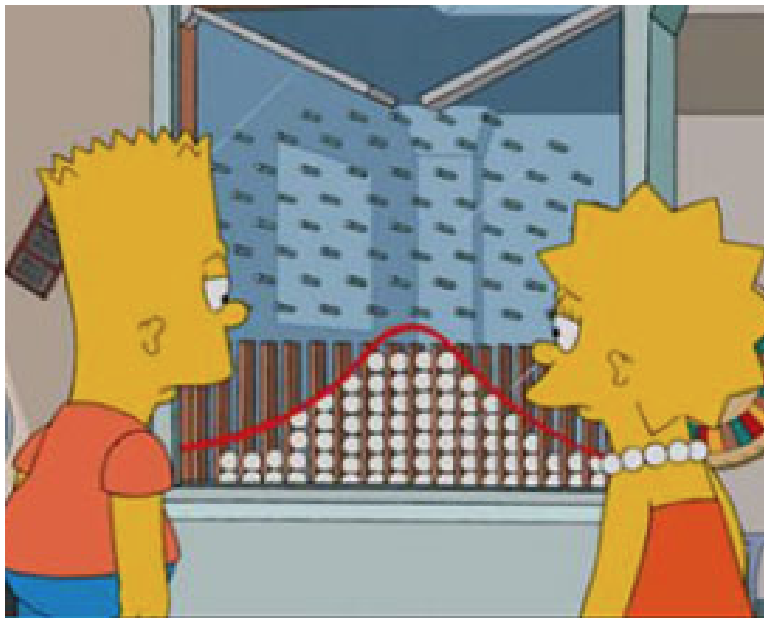


FIGURE 2. Bert and Lisa experience the Galton board