

### Problem 3.

Let  $G$  be some  $n \times m$  grid as in Figure 1, where each cell has two opposite diagonals connected (uniformly at random). A cell is chosen (also uniformly at random), and the segment given by the path of diagonals that goes through the selected cell is inspected.

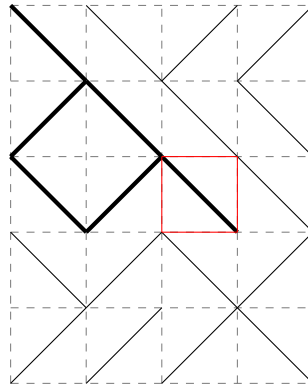


Figure 1: An example of a  $4 \times 5$  grid, where a segment of size 6 has been selected.

**Question.** What is the expected length of the selected segment?

**Related.**

1. What is the expected number of segments in an  $n \times m$  grid?
2. How long is the longest segment expected to be?
3. How does this change if the grid is toroidal, on a cylinder, on a Möbius strip, etc?