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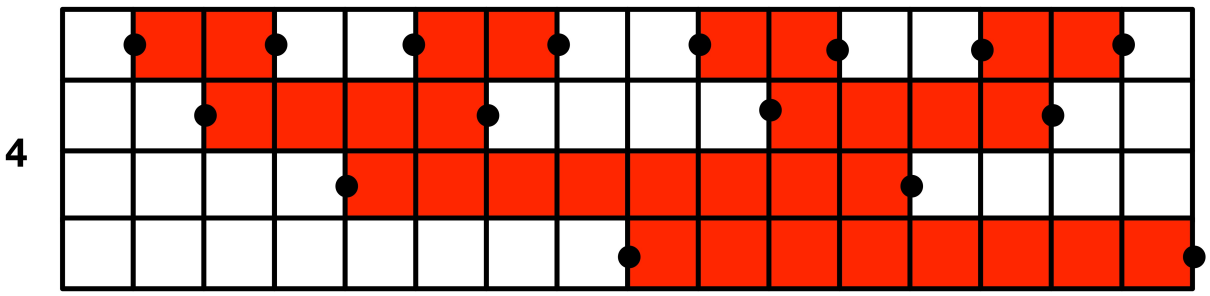
Data Pattern Puzzle 4: Solution



This algorithm is counting in a special binary code called Gray Code. The number gives the number of bits and each column is a binary number, with white meaning 0 and red meaning 1. The first column represents 0000 and one position after the last it has cycled back to 0000.

The special thing about Gray code is that it cycles through all the possibilities but unlike in normal base 2 counting, only one bit needs to be flipped on each step. This can be an advantage, for example in a hardware implementation of counting, as the circuitry to do it is much simpler.

The dots emphasise which bit is flipping to highlight the pattern in the flips.

The first row (known as the least significant bit) flips every second step. The other bits (rows) take turns to flip in between. The next bit (next row) flips on the second steps and then every 4th step, for example.

The pattern can be elegantly generated recursively (describing the algorithm in terms of a simpler version of itself). To create Gray code for n bits, generate the Gray code pattern for n-1 bits and then create a reflected version. To create the new (here bottom) row, place 0s in the original first half, and 1s to the reflected half.