

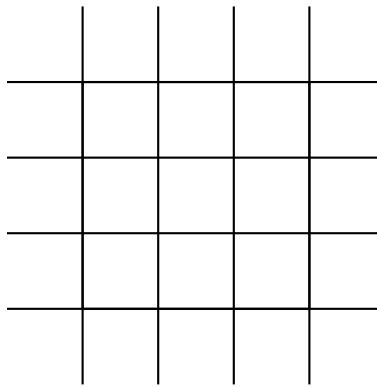
The Game of Life

UNL Math Ambassadors

The Game of Life was created by the mathematician John Conway (1937–2020) in 1970.

The rules of the game

The Game of Life happens on an infinite grid:



Each day, each of the cells (squares) in the Game of Life is either dead or alive.

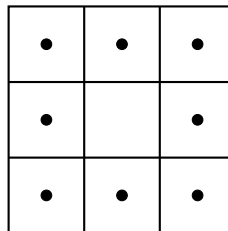


dead



alive

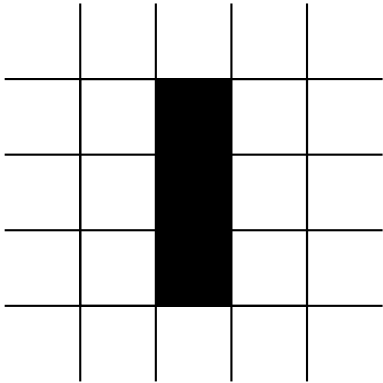
What determines whether a cell will be alive or dead on the next day is what is going on with the neighbors of that cell. Each cell has 8 neighbors; the picture below shows the 8 neighbors of the cell in the center.



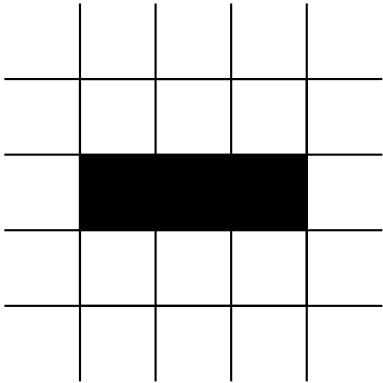
Each day:

- Any **live** cell with **two or three** (no fewer than two and no more than three) live neighbors survives, and otherwise it dies.
- Any **dead** cell with **exactly three** live neighbours becomes a live cell, and otherwise it stays dead.

Here is an example:

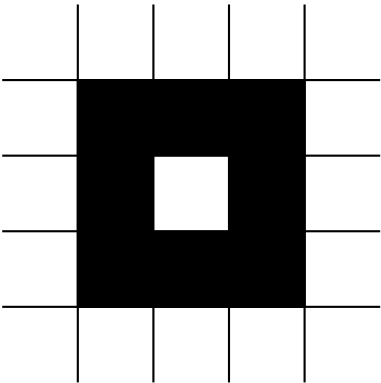


Day 1

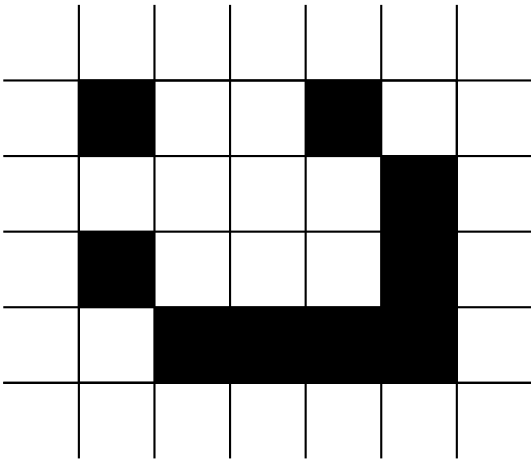


Day 2

Fun examples to try out and see what happens over a few days:



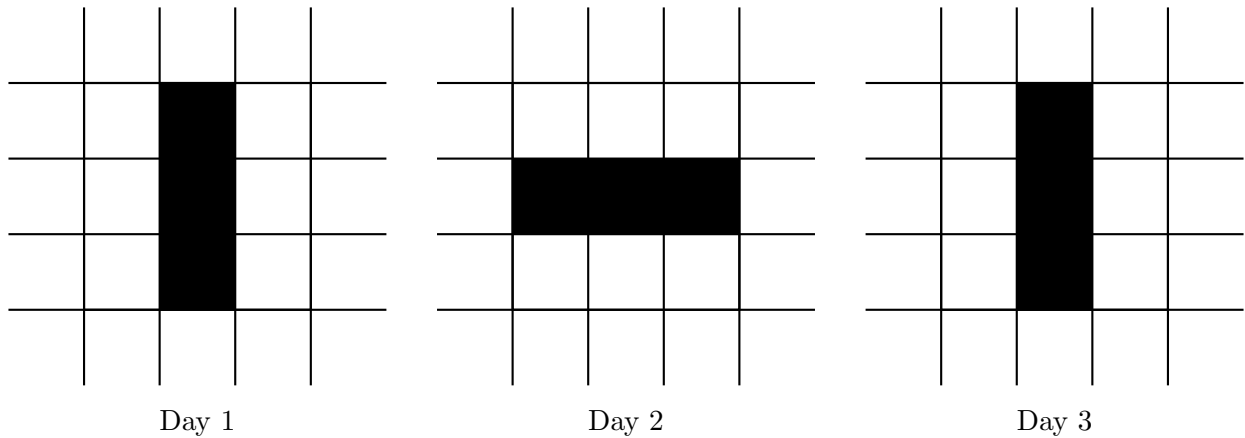
Blinker



Spaceship

Special patterns

Some patterns repeat themselves eventually. For example:



This is a pattern with period 2, because every two days it **repeats itself** — it doesn't merely *look* the same after 2 days, but the *exact same cells* are alive/dead after two days. In contrast, notice that in Day 2, the pattern looks the same as in Day 1, but *different* cells that are alive/dead. This is why this has period 2 and not period 1.

Can you find...

- 1) A still life? A still life is a pattern that never changes.
- 2) Another pattern with period 2?
- 3) A period pattern with period higher than 2?
- 4) A pattern that **never** repeats?
- 5) A pattern that changes for a few days and then becomes a still life?
- 6) A pattern that changes for a few days and then becomes periodic?