Épreuve de section européenne

1 General knowledge

What do you know about conditional probabilities ? Give a few formulas (you can use a probability tree).

2 Document

The *Game of Life* was devised in 1970 by British mathematician John Horton Conway. It is a zero-player game taking place in a grid made of square cells that can be filled or empty. An empty cell is said to be *dead*, while a filled cell is said to be *alive* or *living*.
The game starts with a set of living cells, the initial state. Each cell will interact with its 8 neighbours so that the status of each cell in the grid may change when moving to the next step (or next generation). Births and deaths occur following four precise rules.

1. A living cell with exactly two or three neighbours stays alive.

2. A living cell with less than two neighbours dies of loneliness.

3. A living cell with more than three neighbours dies of crowding.

4. A dead cell with exactly three living neighbours comes to life.

A *still life* is a static pattern, a pattern that does not change from one generation to the next.

An *oscillator* is a pattern that repeats itself after a number of generations. This number is called the *period* of the oscillator.

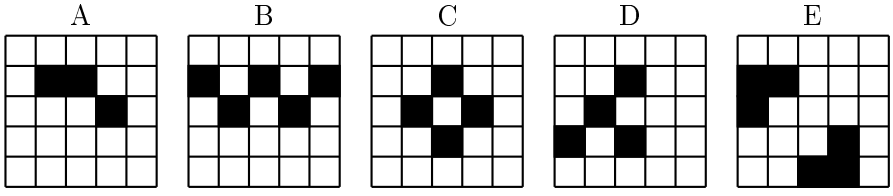
Adapted from various sources.

3 Questions

1. Who devised this game, and when ?

2. Explain the meaning of the sentence "It is a zero-player game".

3. Find, among the following patterns, the still-lifes and the oscillators.



4. Are there patterns that are neither still-lifes nor oscillators ?