Problems

Multiples of 3 and 5

If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23.

Find the sum of all the multiples of 3 or 5 below 1000.

Even Fibonacci numbers

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Largest palindrome product

A palindromic number reads the same both ways. The largest palindrome made from the product of two 2-digit numbers is 9009 = 91 99.

Find the largest palindrome made from the product of two 3-digit numbers.

Smallest multiple

2520 is the smallest number that can be divided by each of the numbers from 1 to 10 without any remainder.

What is the smallest positive number that is evenly divisible by all of the numbers from 1 to 20?

Game of Life

The game of life simulates something like bacterial life. It is modeled as a two dimentional grid. Each cell within the grid may be alive or dead. Whether a cell is alive or dead will depend only on the state of itself and it's neighbours in the last iteration of the game.

1. Any live cell with fewer than two live neighbours dies, as if caused by under-population.
2. Any live cell with two or three live neighbours lives on to the next generation.
3. Any live cell with more than three live neighbours dies, as if by overcrowding.
4. Any dead cell with exactly three live neighbours becomes a live cell, as if by reproduction.

To illustrate:

```
|-----|              |-----|
|     |              |  X  |
| XXX |   BECOMES    |  X  |
|     |              |  X  |
|-----|              |-----|
```

The center cell will experience rule 2. The cells to it's right and left will die from rule 1. But the cells above and below it will come to life with rule 4.

Implement a function that will take a sequence of coordinates of live cells and return a sequence of coordinates of cells that will be be alive next time. For instance our above example would be:

```
(game-of-life [[1 2] [2 2] [3 2]])
    => [[2 1] [2 2] [2 3]]
```

For animations and further information see the wikipedia page.