Exercise 3

In the previous exercise, you wrote a program in Lua that calculates topological relations between lines, points and areas. In this exercise, you will use these functions to answer questions about real data sets.

Evolution of provinces in China

Consider the differences between the provinces in China as they were in 1820 and the situation in 1997, shown below. The 1820 borders are drawn in blue in the background and the 1997 borders are superimposed as red lines in the foreground. Each province was reduced to a single polygon, to simplify your task.


Considering the data, please answer the following questions:

1. Which provinces existed in 1827 that are no longer part of China today?
2. Which provinces did not exist in 1827 that are part of China today?
3. Which provinces increased their size from 1827 to 1997?
4. Which provinces decreased their size from 1827 to 1997?
5. Which provinces remain the same?

Roads in the state of Acre, Brazil

In the previous exercise, you wrote a program that changes the OGC 9-intersection dimension-extended model for topological operations between a line and a polygon, so as to distinguish between the two cases below:
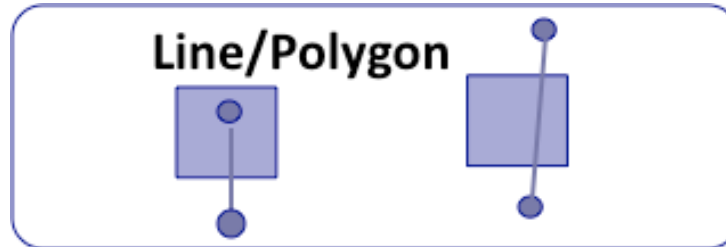
For OGC, these two cases are examples of "a line crosses a polygon". Your new definition of the 9-intersection dimension-extended model is able to distinguish between "enter/leaves" (first case) and "crosses" (second case).

Use your program to classify the relationship between roads and municipalities in the state of Acre, Brazil, which is shown below.