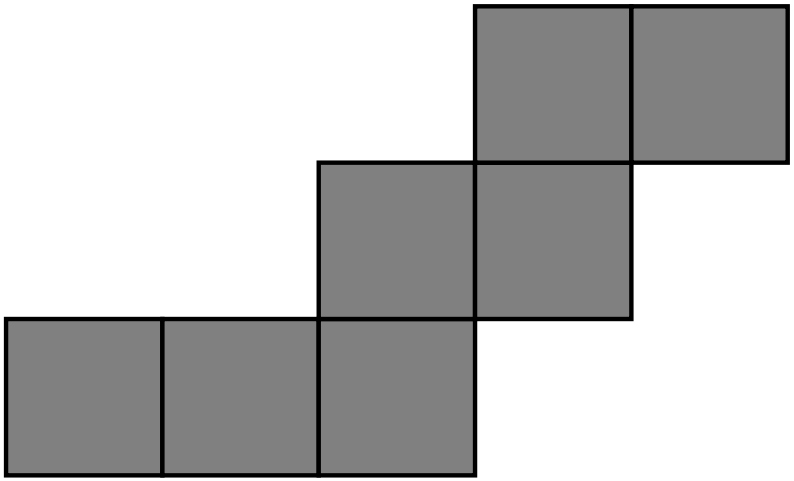
Episode 13 – Polyominoes

European section – Season 2

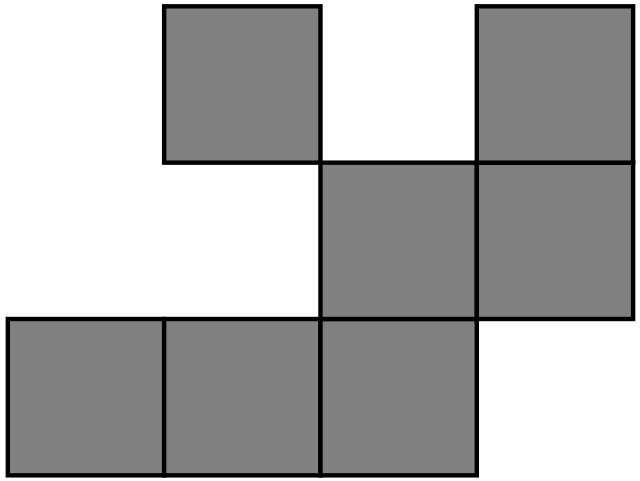
Polyomino, a general definition

Définition Polyomino

A *polyomino* is a polyform with the square as its base form. It is a connected shape formed as the union of one or more identical squares in distinct locations on the plane, such that every square can be connected to every other square through a sequence of shared edges (i.e., shapes connected only through shared corners of squares are not permitted).



This is a polyomino.



This is not a polyomino.

The various types of polyominoes

Définition Small polyominos

A *monomino* is made of just one square, *domino* is made of two, a *triomino* of three and so on for *tetrominoes*, *pentominoes*, *hexominoes*, etc.

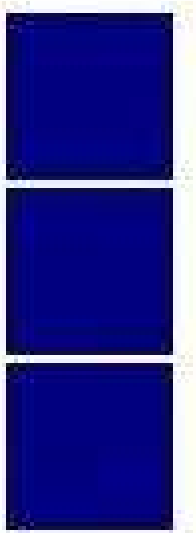
In this lesson, we will work on *free* polyominoes, that are considered different from each other as long as none is a translation, rotation, or reflection of another.

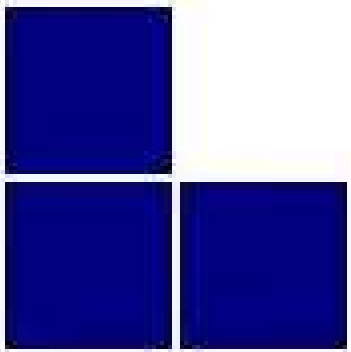
The various types of polyominoes

Problem 1

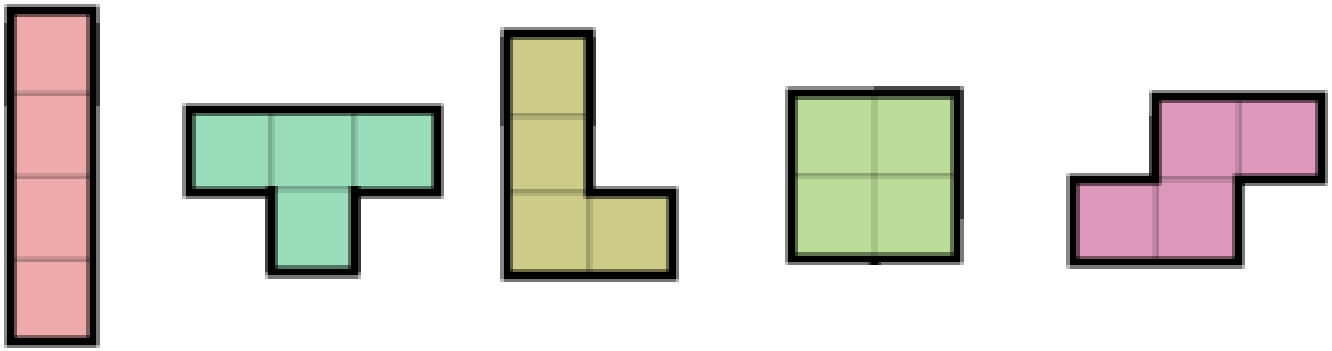
It's easy to see that there is only one free monomino and one free domino. Enumerate and draw all the triominoes, tetrominoes and pentominoes.

The 2 free triominoes

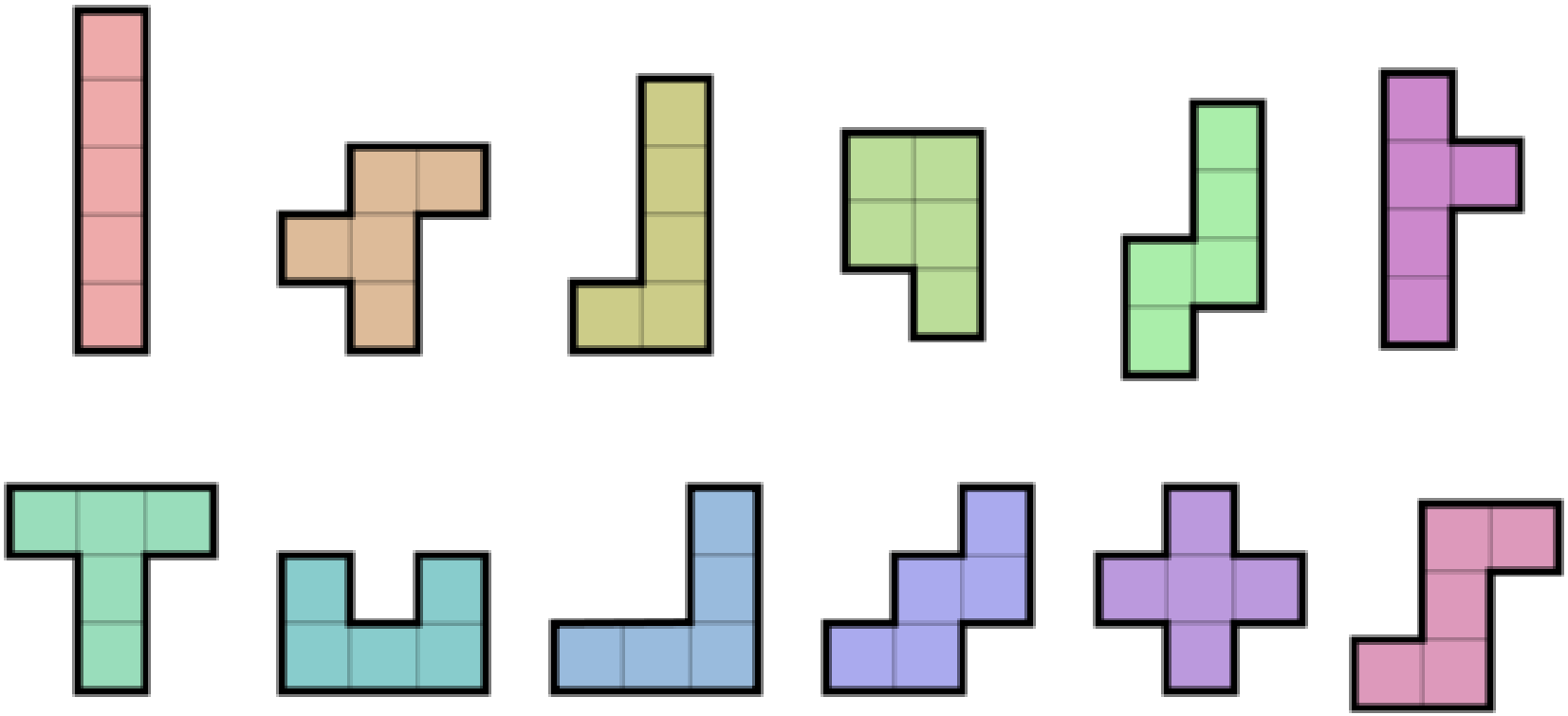




The 5 free tetrominoes



The 12 free pentominoes



Order

Définition Order of a polyomino

The *order* of a polyomino is the number of copies of itself you need to build a rectangle.

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Problem 2

The monomino, the domino and the I-triomino are clearly of order 1.
Find out the orders of all the others triominoes, tetrominoes and pentominoes.

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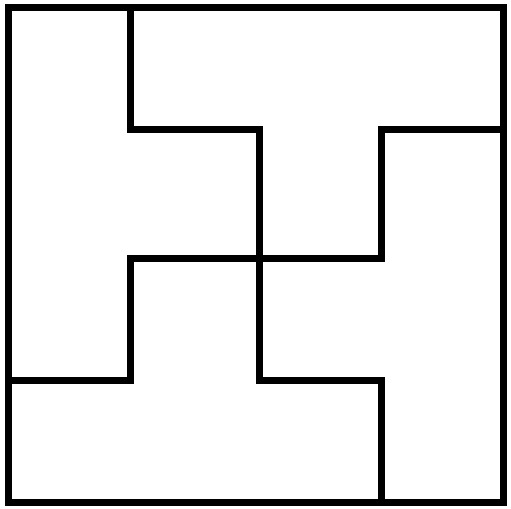
Problem 3

Can you think of a polymino of order 3 ?

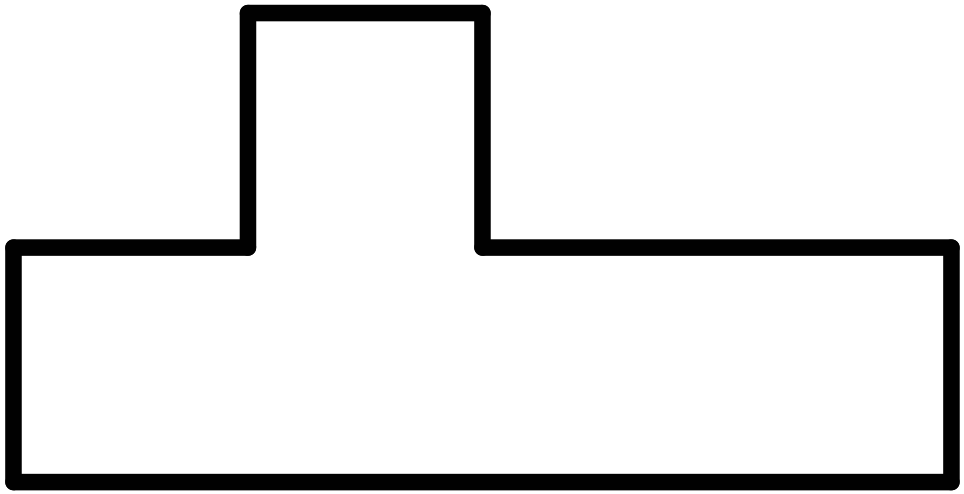
Some obvious orders

- The I-tetromino has order 1.
- The O-tetromino has order 1.
- The L-tetromino has order 2.
- The S-tetromino has an infinite order.
- The P-pentomino has order 2.
- The L-pentomino has order 2.

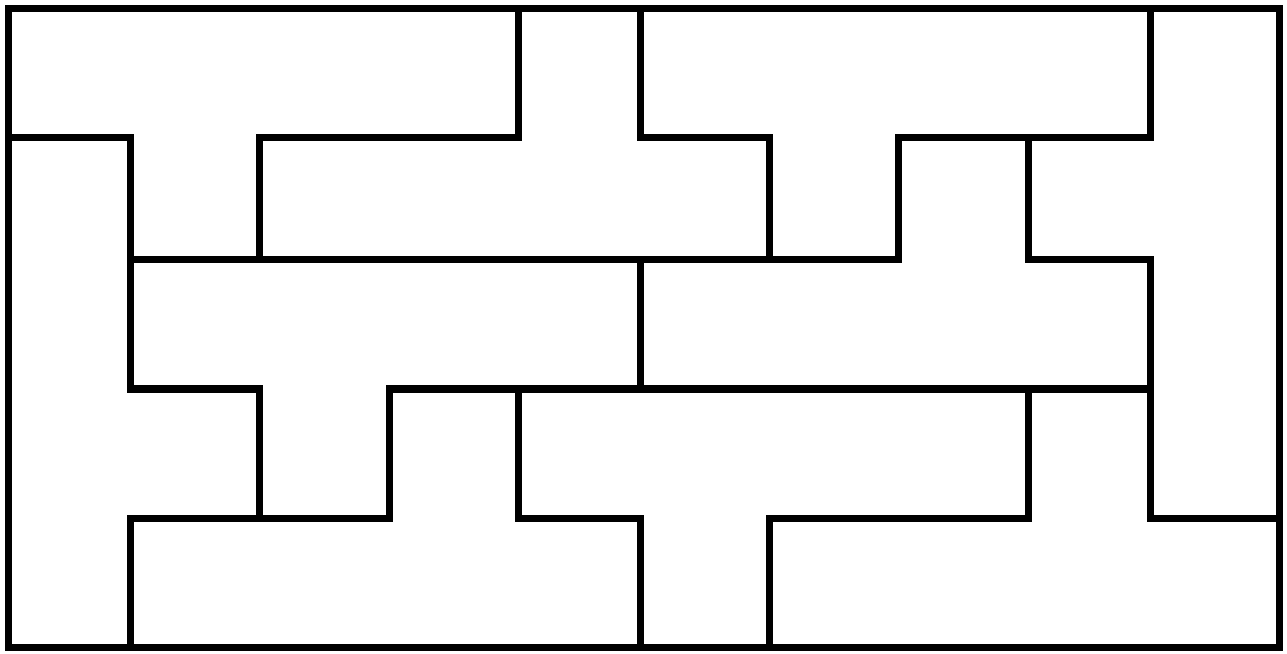
The T-tetromino has order 4.



What is the order of the Y-pentomino ?



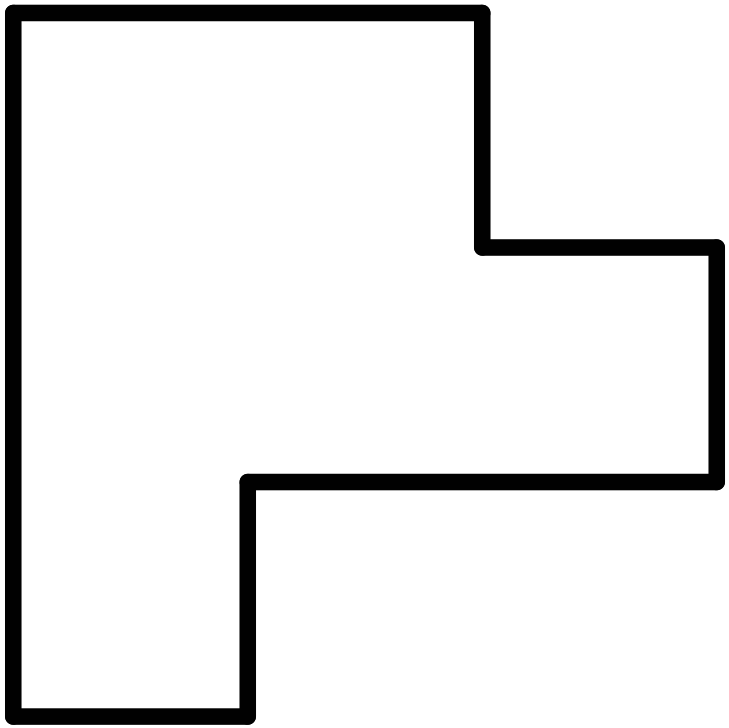
The Y-pentomino has order 10.



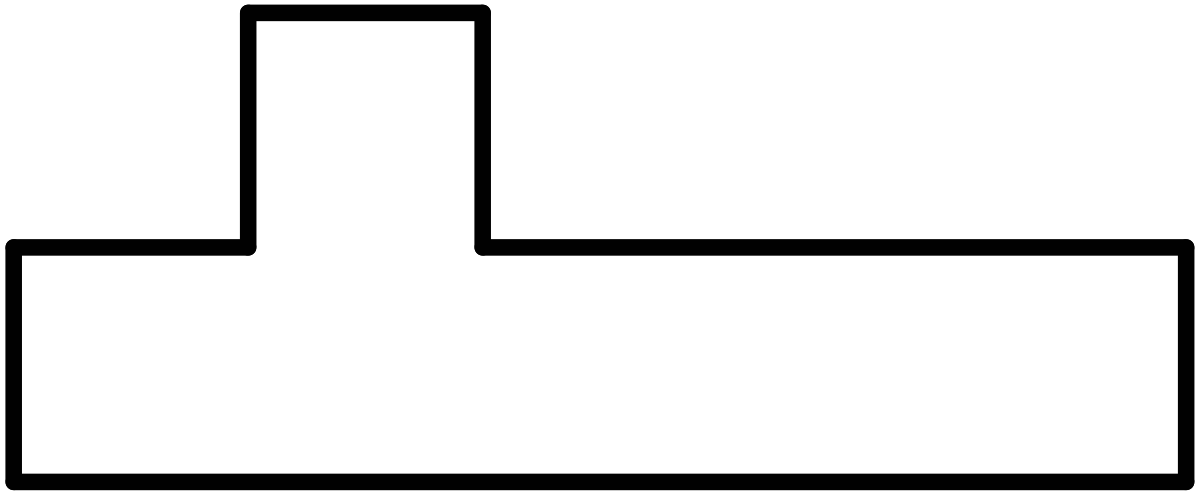
What about the others ?

All the other pentominoes have an infinite order.

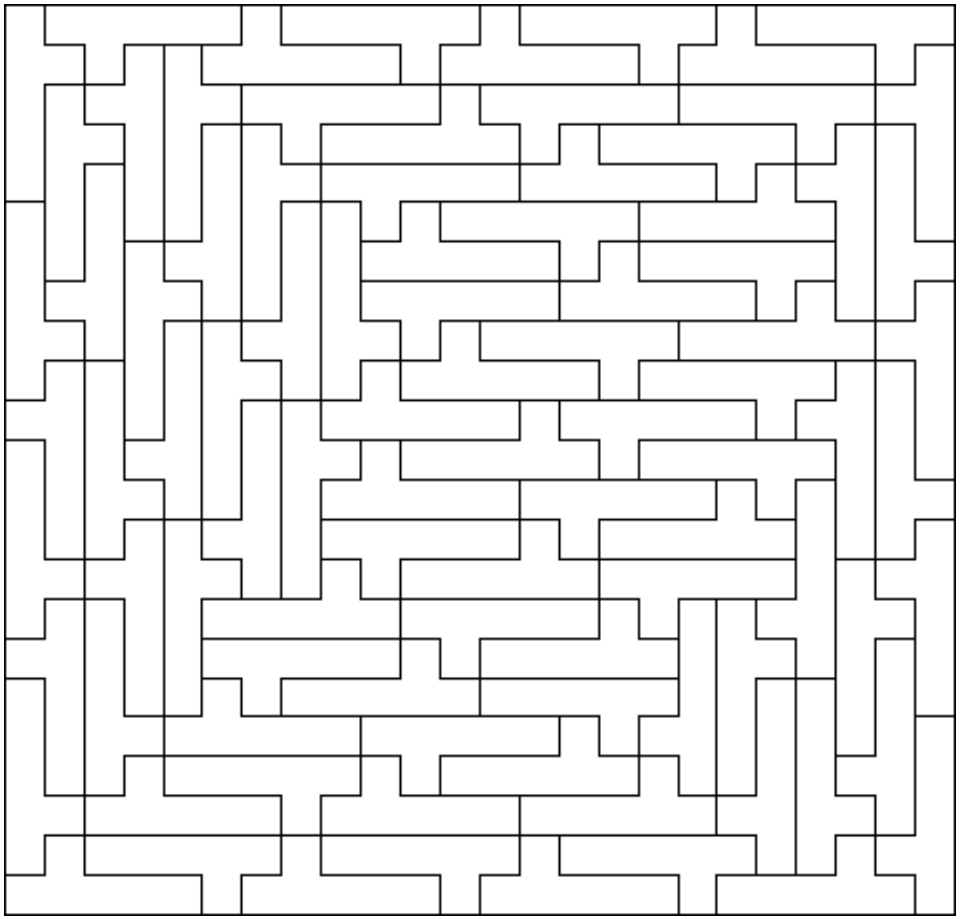
What is the order of the G-hexomino ?



What is the order of the Y-hexomino ?



The Y-hexomino has order 92.



No known polymino has order 3

Did you find one ?