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The task we do, the software we choose

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Some years ago in teaching of mathematics we have Dynamic Geometry Software (DGS) that offer some options in the design of teaching-learning activities.

We could choose the software according to the task and its objectives.

This is so because the construction philosophy is different for each application, and thus the knowledge they foster.

Today, the trend is that, in a few years, only one of such applications will be at hand, and the only reason is that it is for free.

We stand that there is not a DGS application better than the other, their use should depend on the task at hand and the learning objectives we want to achieve.

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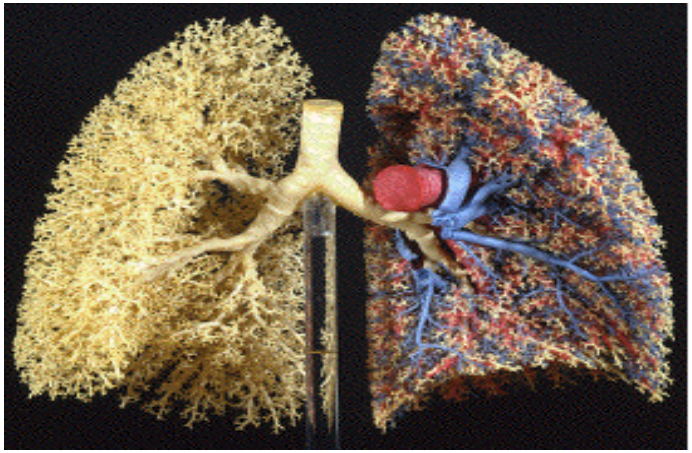
We will make our point comparing two DGS in a fractal construction activity:

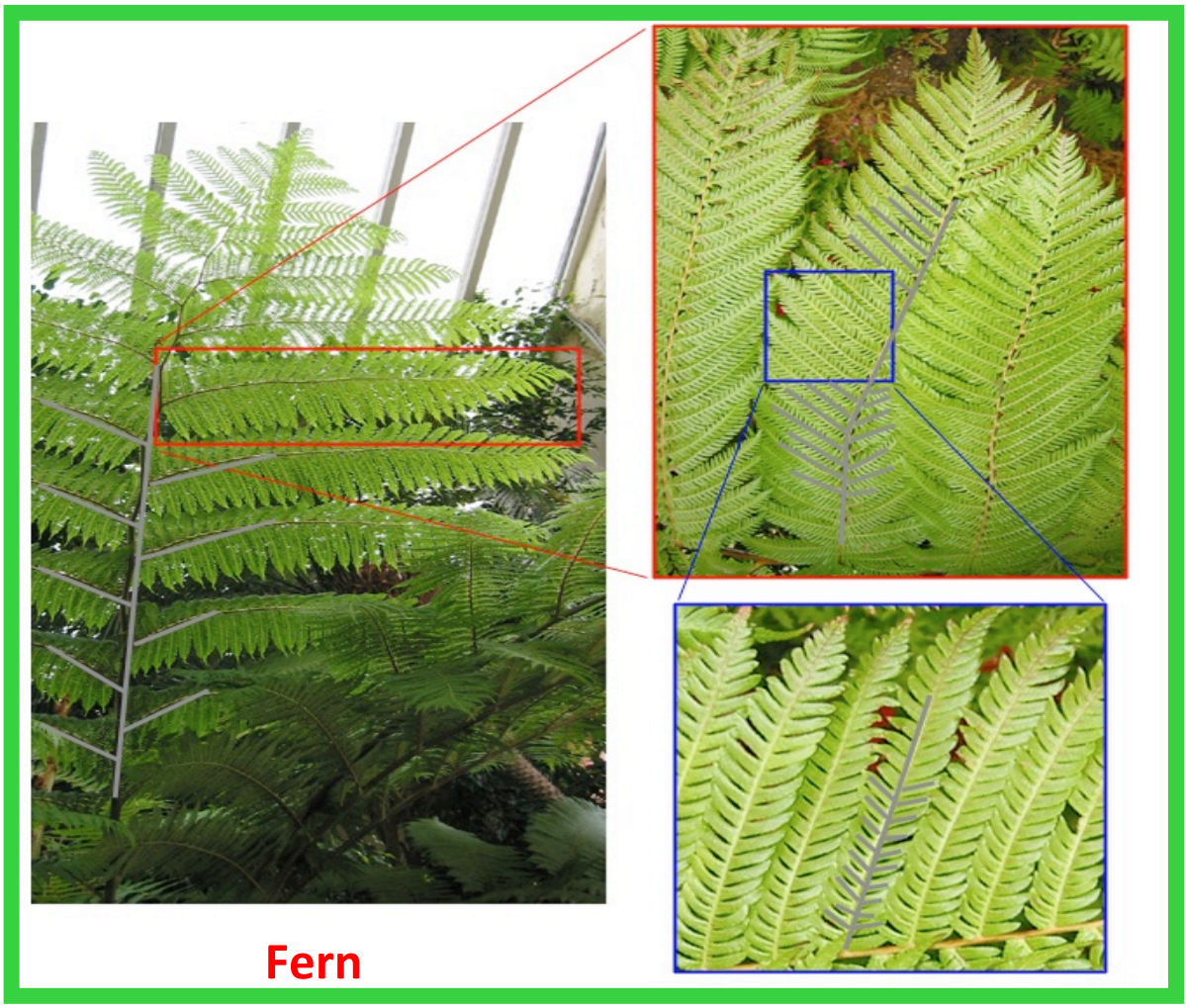
GeoGebra and The Geometer's Sketchpad.

Similarity Property

Kidney



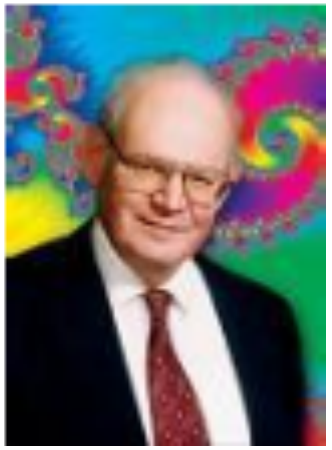
Lungs



Fern

Fractal definition

(Benoit Mandelbrot, 1970 s)



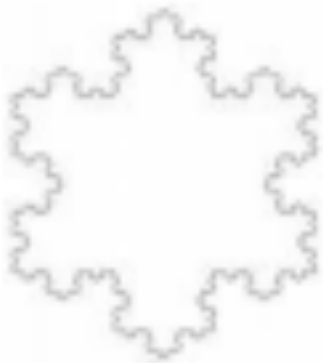
"Fractal" means: fragmented. A lot of pieces. Fractional dimension

Example: Perimeter

$Dim_{Fractal} = 1.2619...$

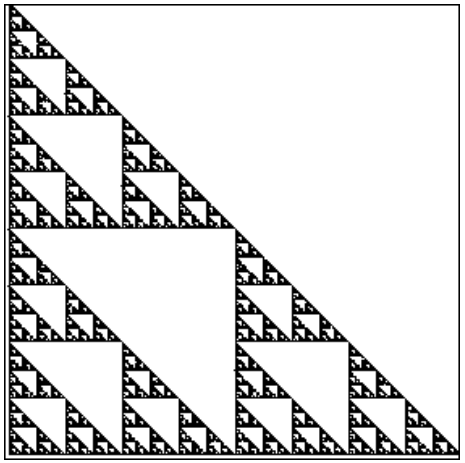
$Dim_{Topologica} = 1$

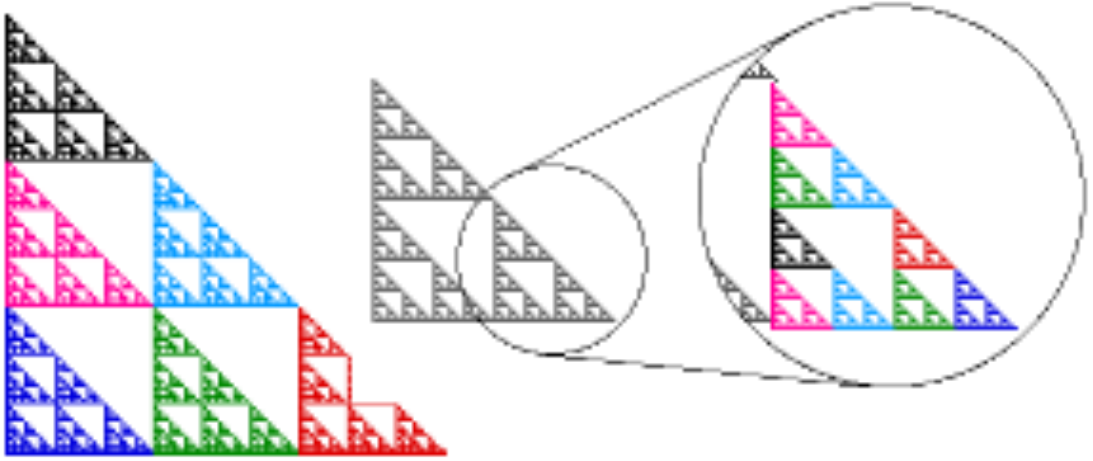
$\therefore Dim_{Fractal} > Dim_{Topologica}$



$$D_F = \frac{\ln \eta}{\ln \frac{1}{r}}$$

Pathological Object





It does made of little copies of itself

$$\eta r^{D} = 1$$

Power law

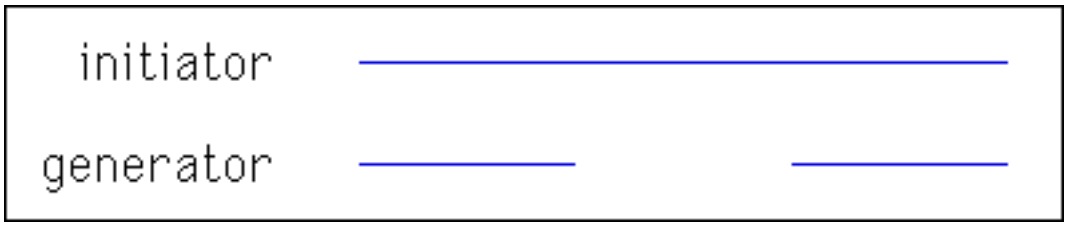
How usually does the fractal is defined?

It is defined as a limit of an iterative process

1) Start with a initiator
2) Give a rule (usually DELETE a part of the initiator and substitute for another)
3) Iterate as much as possible, and….

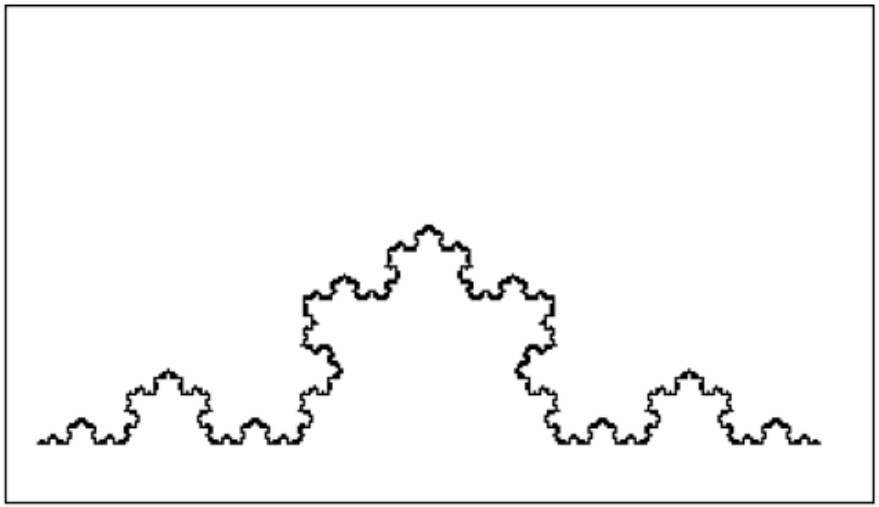
¡These iterations give a sequence of shapes converging to a fractal!

In other words: the limit curve is a fractal ➔ INFINITUM



Cantor dust

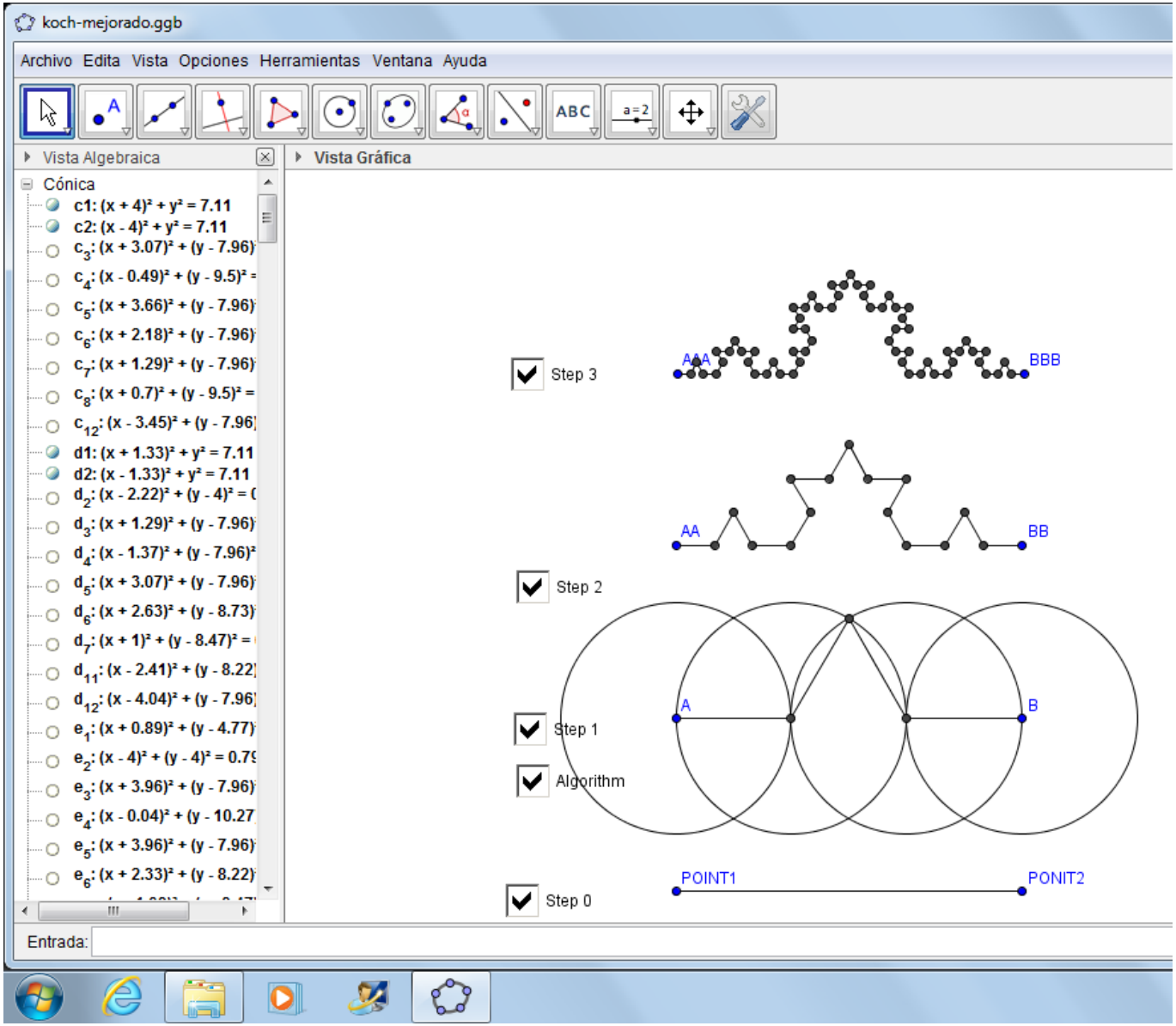
Koch Curve



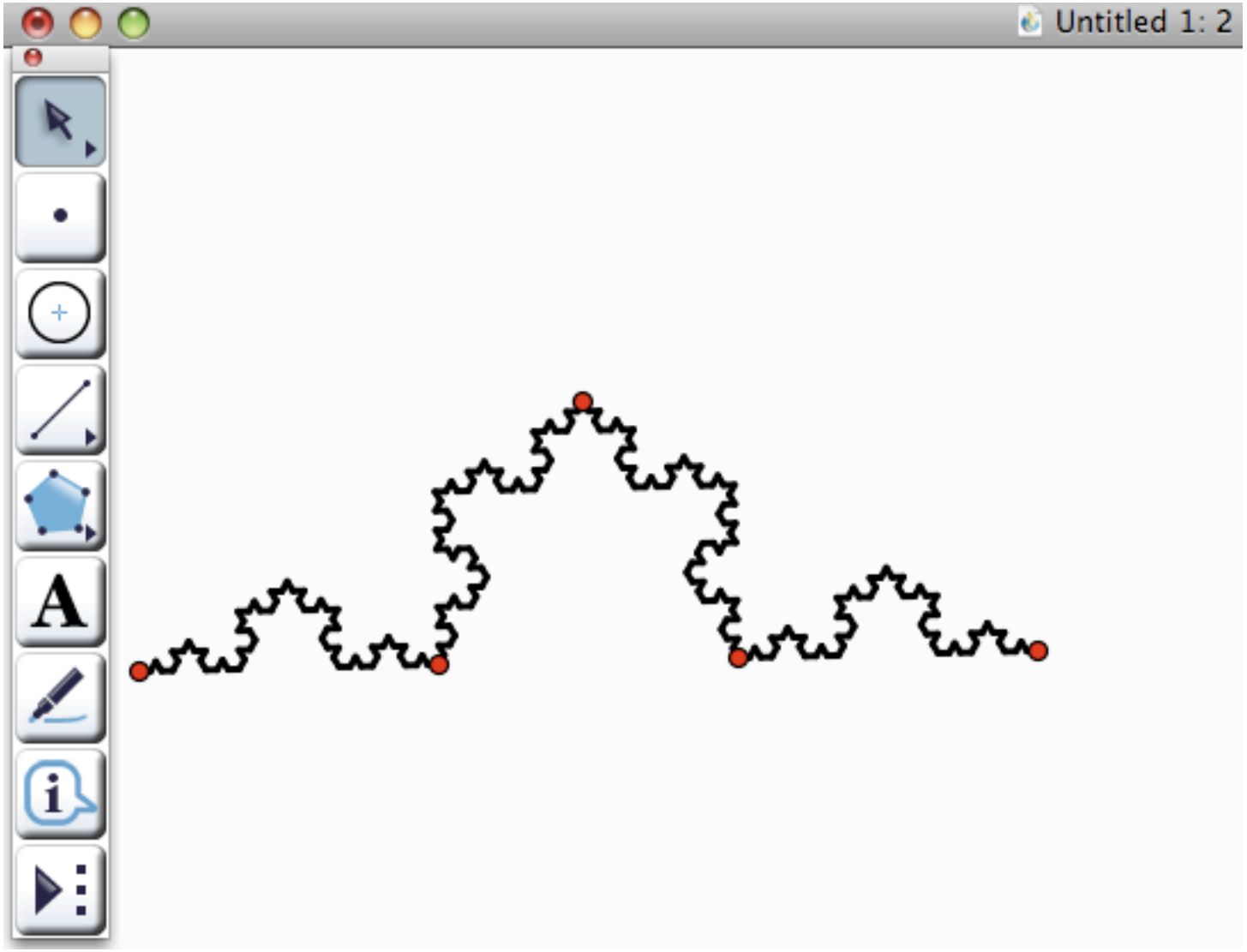
Helge Von Koch

1870-1924

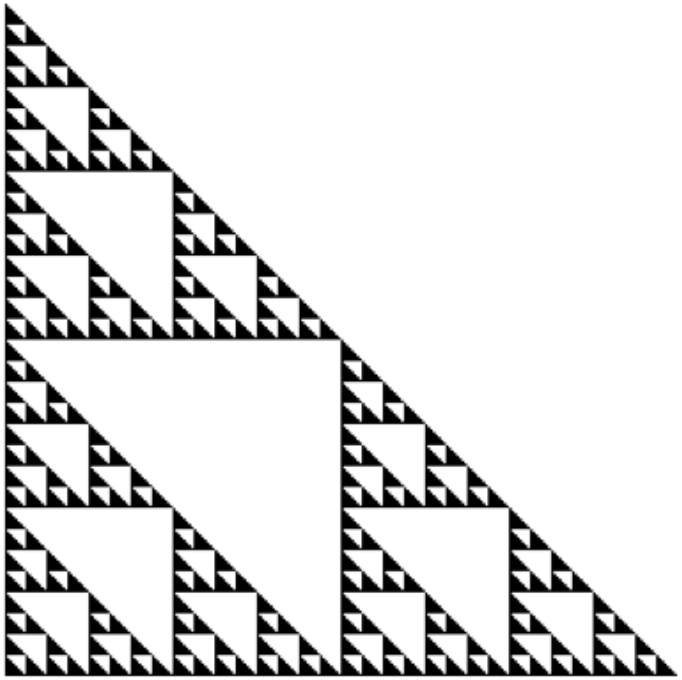
GeoGebra


koch-mejorado.ggb
Archivo Edita Vista Opciones Herramientas Ventana Ayuda
Vista Algebraica
Cónica
c1: (x + 4)² + y² = 7.11
c2: (x - 4)² + y² = 7.11
Vista Gráfica
Step 3
AAA
BBB
Step 2
AA
BB
Step 1
A
B
Algorithm
Step 0
POINT1
PONIT2
Entrada:

Sketchpad



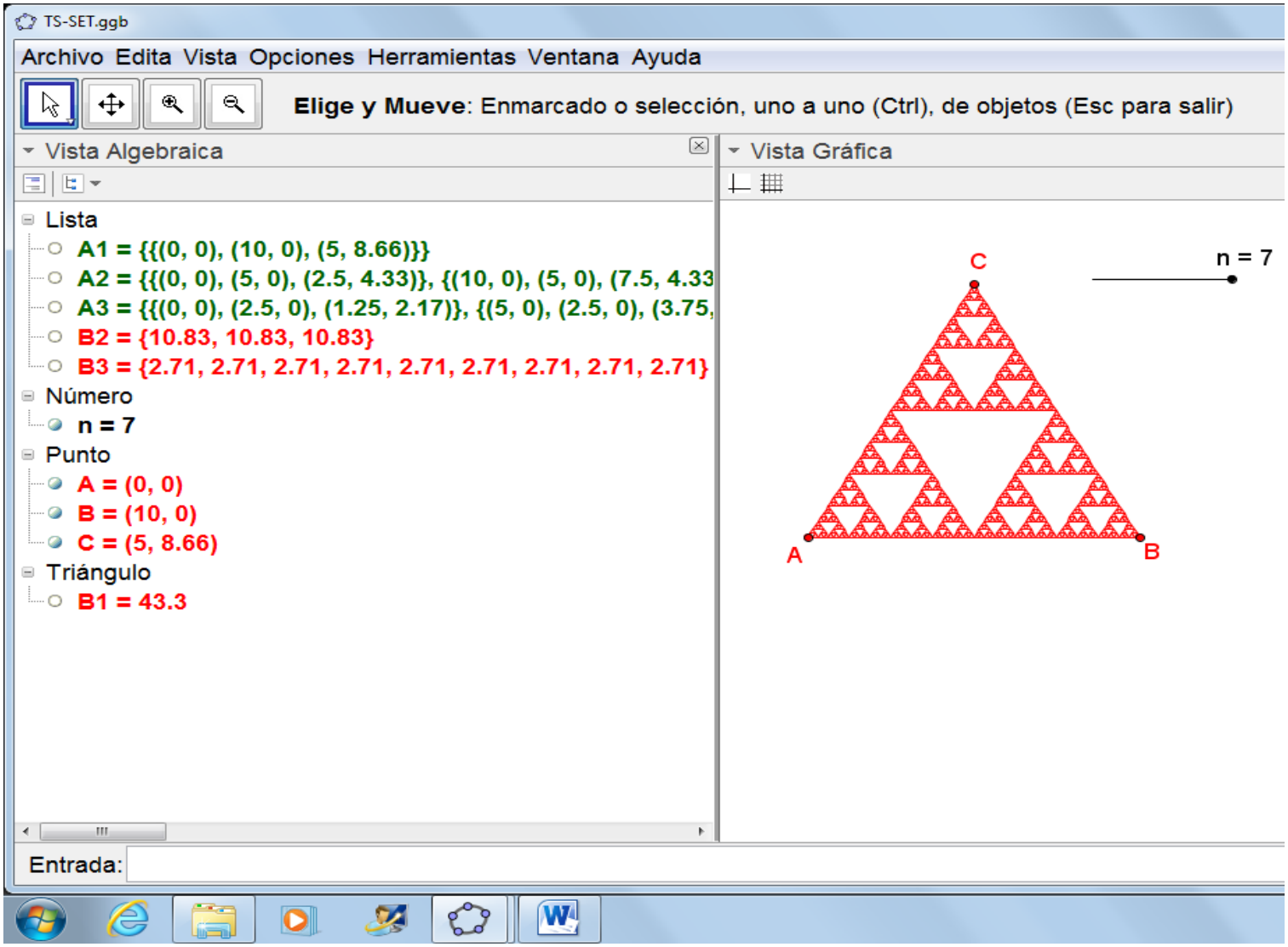
Sierpinski Triangle



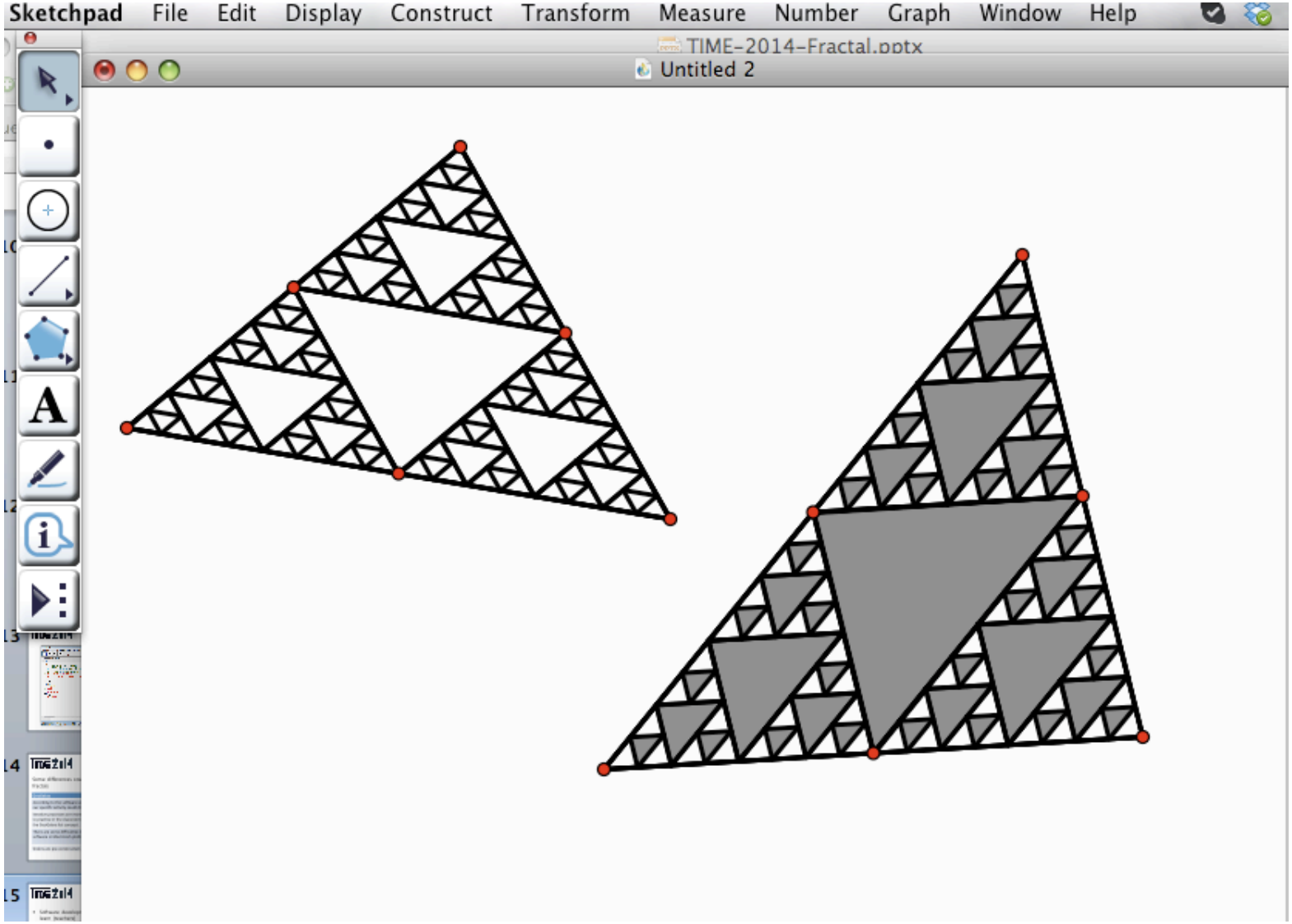
Wacław Sierpiński

1882-1969

GeoGebra


TS-SET.ggb
Archivo Edita Vista Opciones Herramientas Ventana Ayuda
Elige y Mueve: Enmarcado o selección, uno a uno (Ctrl), de objetos (Esc para salir)
Vista Algebraica
Lista
A1 = {{(0, 0), (10, 0), (5, 8.66)}}
A2 = {{(0, 0), (5, 0), (2.5, 4.33)}, {(10, 0), (5, 0), (7.5, 4.33
A3 = {{(0, 0), (2.5, 0), (1.25, 2.17)}, {(5, 0), (2.5, 0), (3.75,
B2 = {10.83, 10.83, 10.83}
B3 = {2.71, 2.71, 2.71, 2.71, 2.71, 2.71, 2.71, 2.71, 2.71}
Número
n = 7
Punto
A = (0, 0)
B = (10, 0)
C = (5, 8.66)
Triángulo
B1 = 43.3
Vista Gráfica
n = 7
C
A
B
Entrada:

Sketchpad


Sketchpad File Edit Display Construct Transform Measure Number Graph Window Help
TIME-2014-Fractal.pptx
Untitled 2

Comparisons

Some differences could be detected in order to construct fractals

GeoGebra	Sketchpad
According to the software version our specific activity could change.	Despite the software version the activity does not change.
Iterative processes are more difficult to practice in the classroom without the GeoGebra list concept.	It is easier to get the idea of iterative process in the classroom.
There are some difficulties to run the software in Macintosh platform.	There is not problem in running the software in either Macintosh or a PC platforms.
Sliders are pre-constructed.	Slider have to be constructed.

Reflections

- Software development goes much faster than we can learn (teachers) → There are some useful attributes that are lost in each transition.
- In the classroom, Sketchpad permits a more effective approach of, for instance,
  - ✓ Pattern searching
  - ✓ Review of the infinitum concept

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Danke schön
Thank you
Gracias