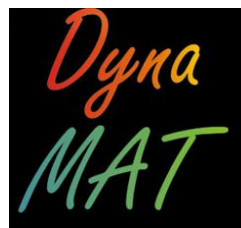# GEOMETRIC PATTERNS AS A GAME OF DYNAMIC EXPLORATIONS
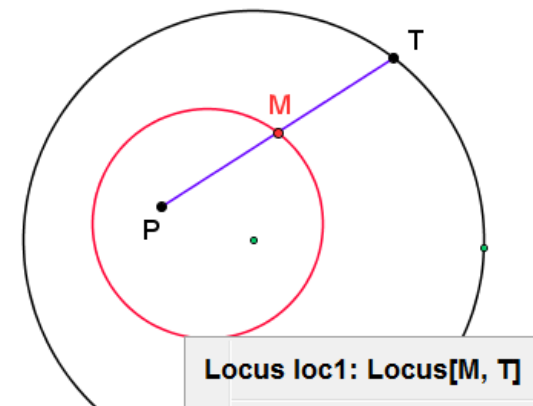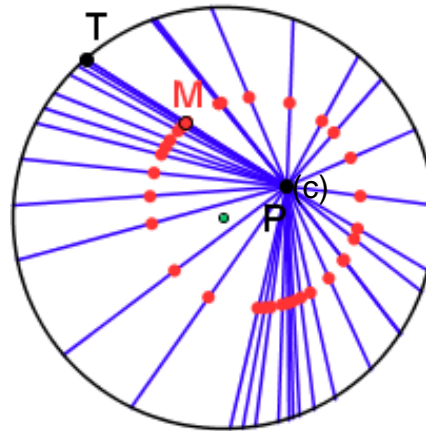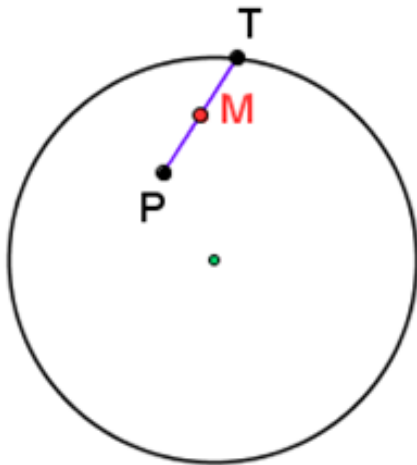
Toni Chehlarova, Evgenia Sendova
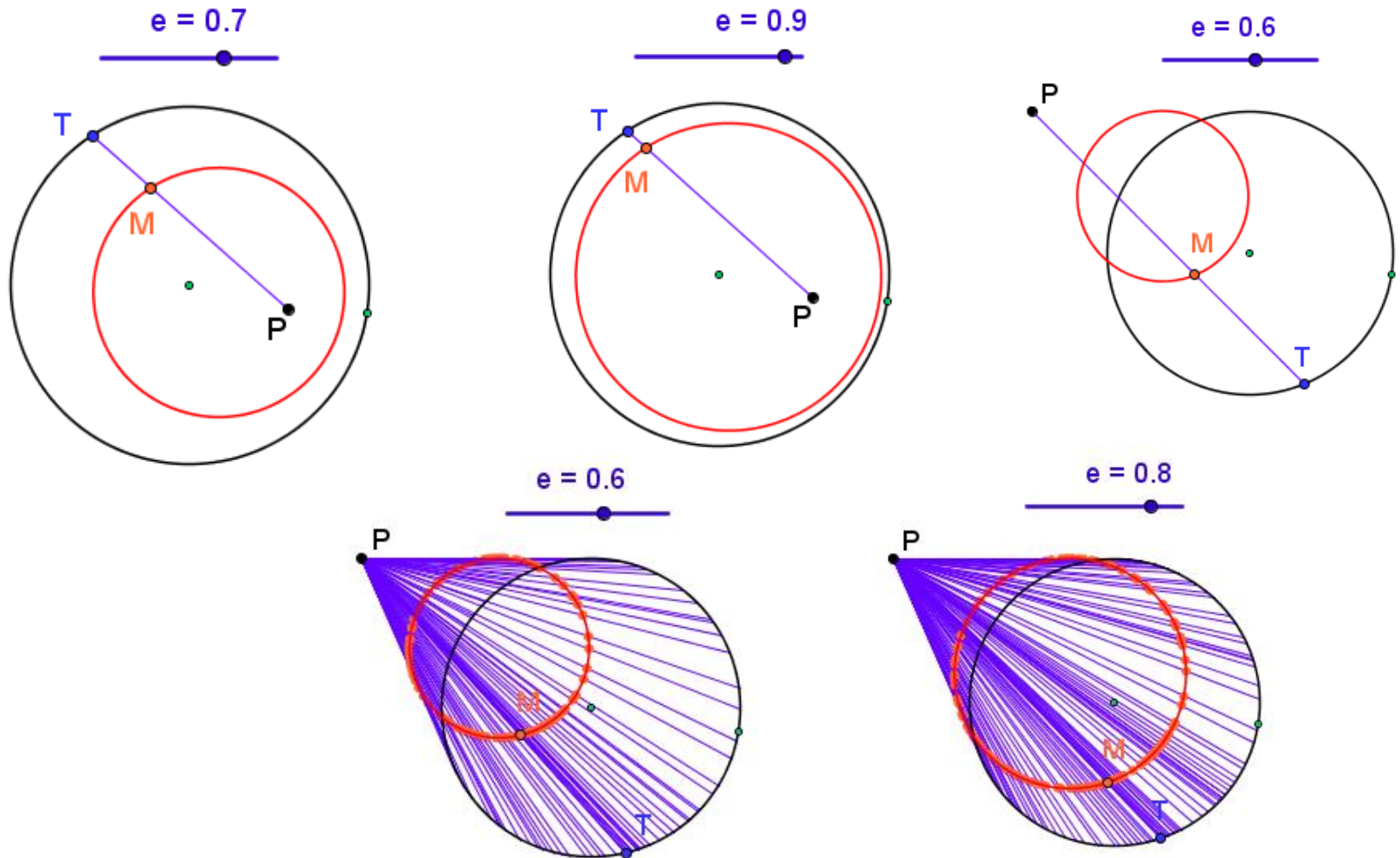
IMI-Bulgarian Academy of Sciences

LOOKING AT THE CLASSICS WITH A DYNAMIC EYE

A traditional geometry problem: *What is the locus of the midpoints **M** of the segments joining a fixed point **P** within a circle with the points of that circle?*

The *what-if* strategy in action

$\leq$
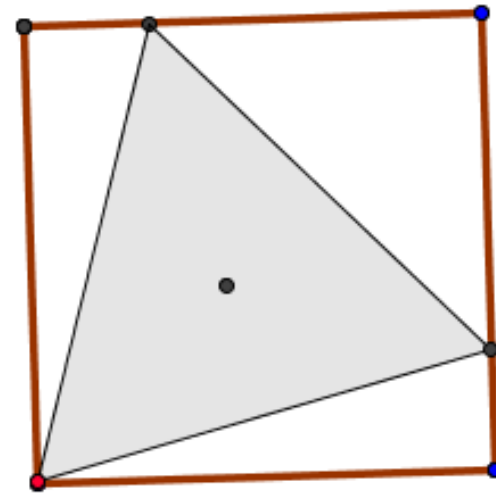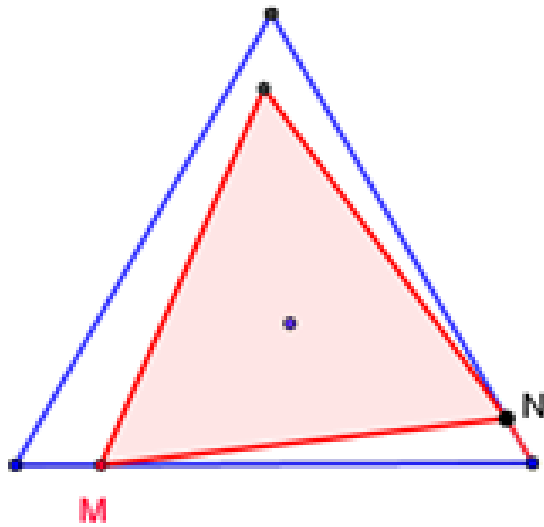
$n.$

A well-known problem:
Find the locus of the centers of the equilateral triangles inscribed in an equilateral triangle.

An ambitious generalization:
*Find the locus of the centers of the regular **m**-gons inscribed in a regular **n**-gon, **m***

(*m*;*n*) - the construction of a regular *m*-gon inscribed in a regular *n*-gon.

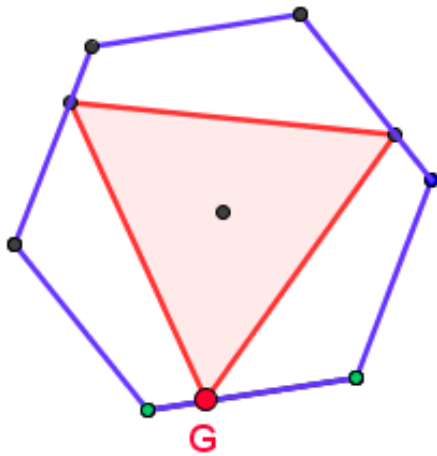# The first steps of ecploration

(3;4) construction

(3;n)

(m;km)

G

(3;7) model

(4;n)
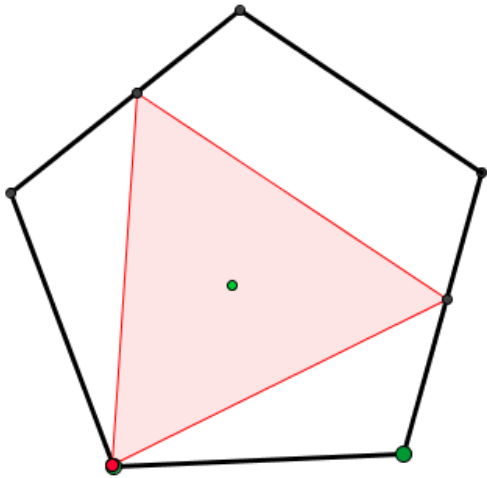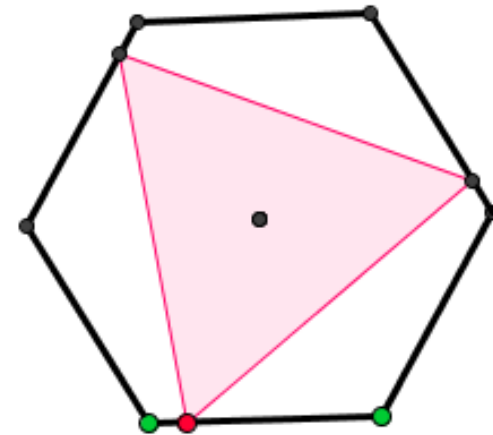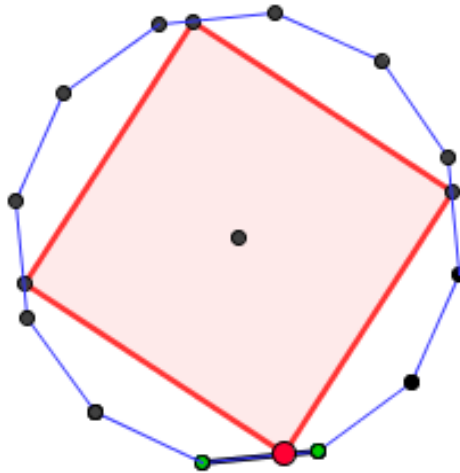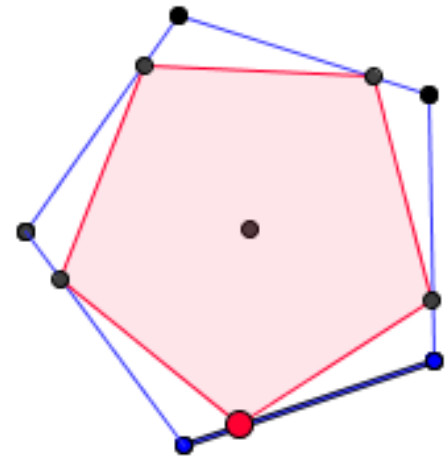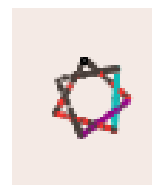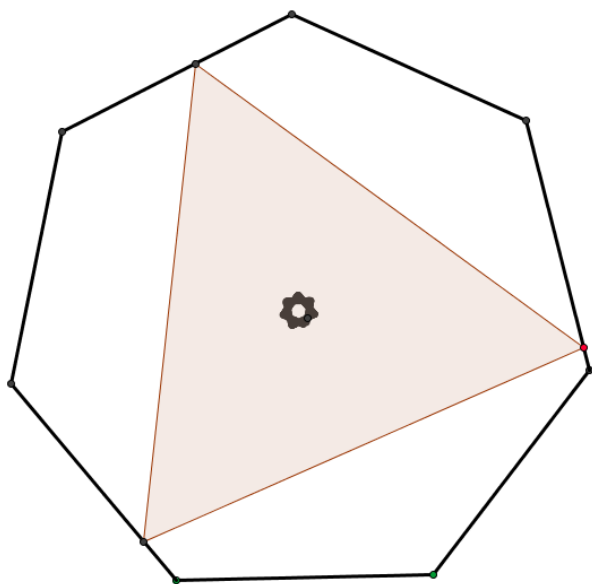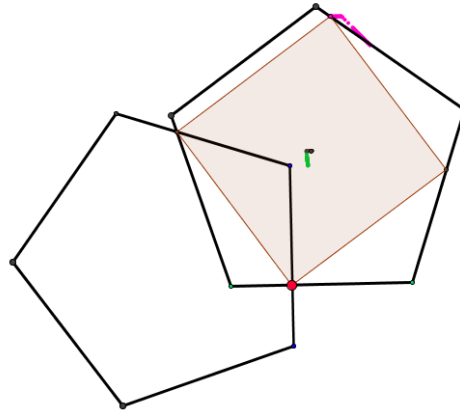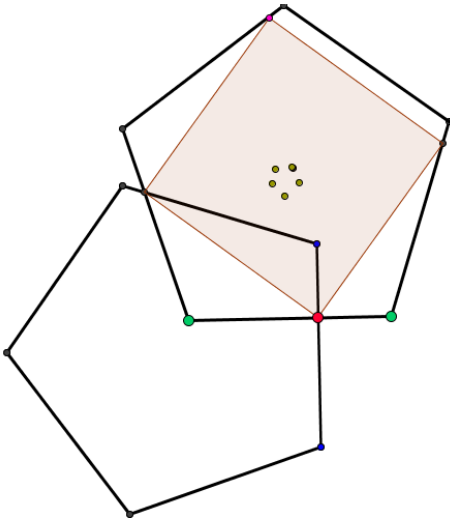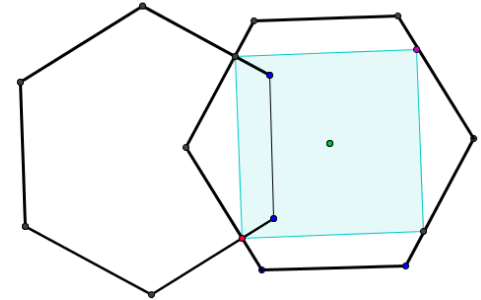
(5;6) model

$$\left(m; \frac{m}{2} + km \right)$$

(6;3+6k)

(8;4+8k)

n = 9

n = 12

n = 15
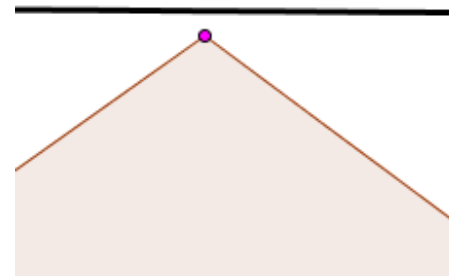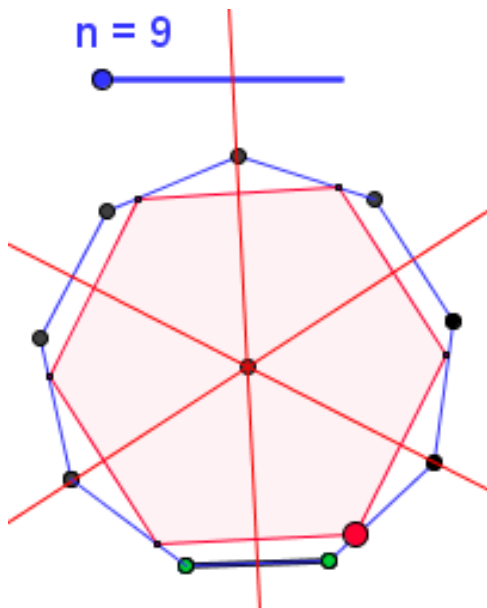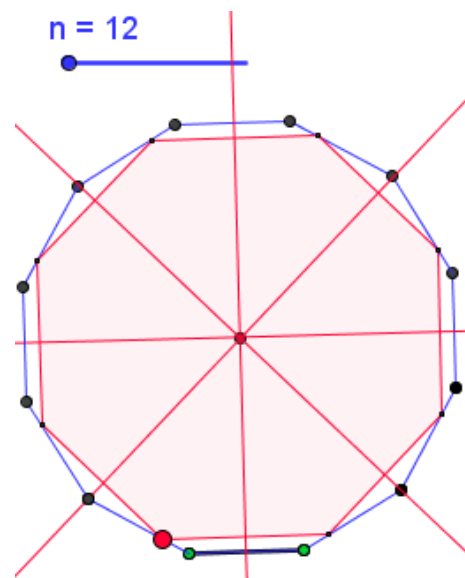
Looking around

- Dilworth, Mane, 2010

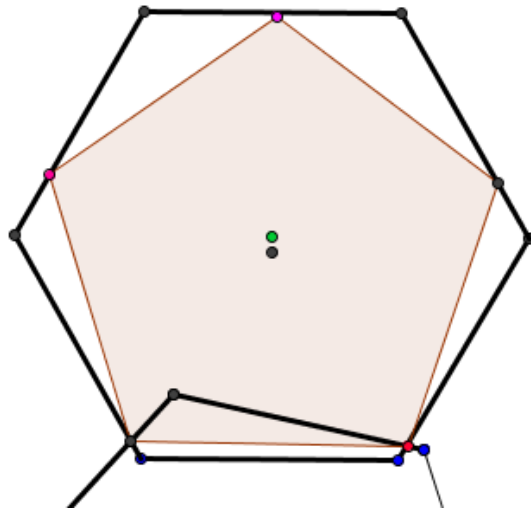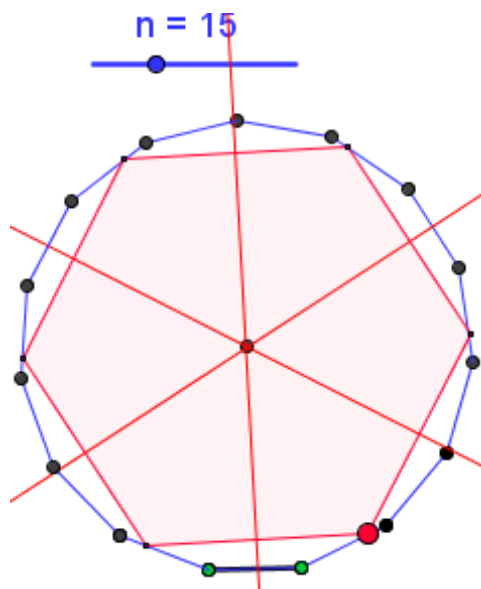- **Theorem.** *Suppose that m, n ≥ 3. A regular m-gon can be inscribed in a regular n-gon if and only if one of the following mutually exclusive conditions is satisfied:*

- (a) *m = 3;*

- (b) *m = 4;*

- (c) *m ≥ 5 and m divides n;*

- (d) *m ≥ 6 is even and n is an odd multiple of m/2. (Note that this includes the case n = m/2.)*

- *In (c) and (d) the polygons are necessarily concentric and in (d) they share a common axis of symmetry. In case (d) we insist that n be an odd multiple of m/2 because if n is an even multiple of m/2, then n is a multiple of m, which is already covered in case (c).*

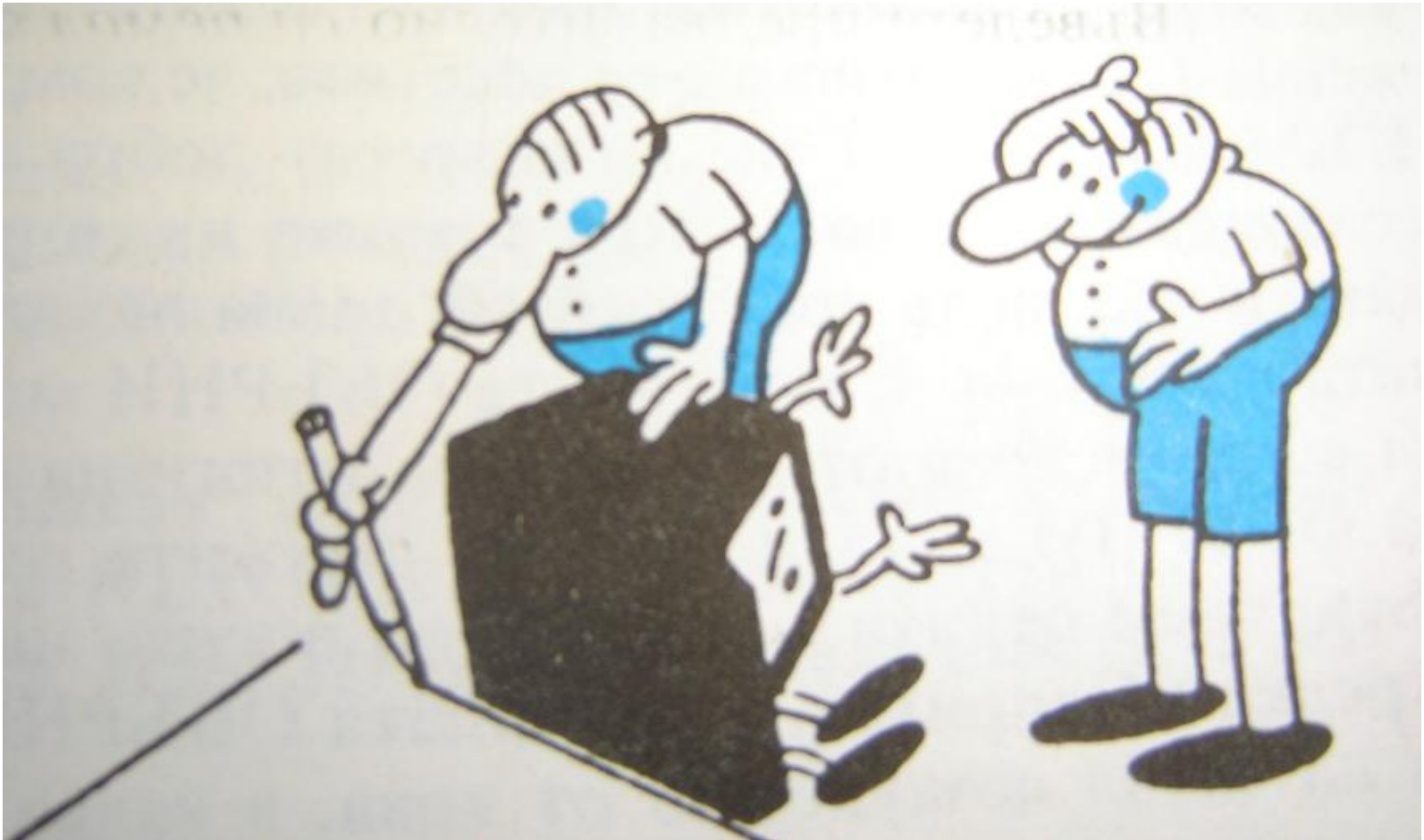# National seminar, December 2012

TT Course in Gabrovo – 15-17 February
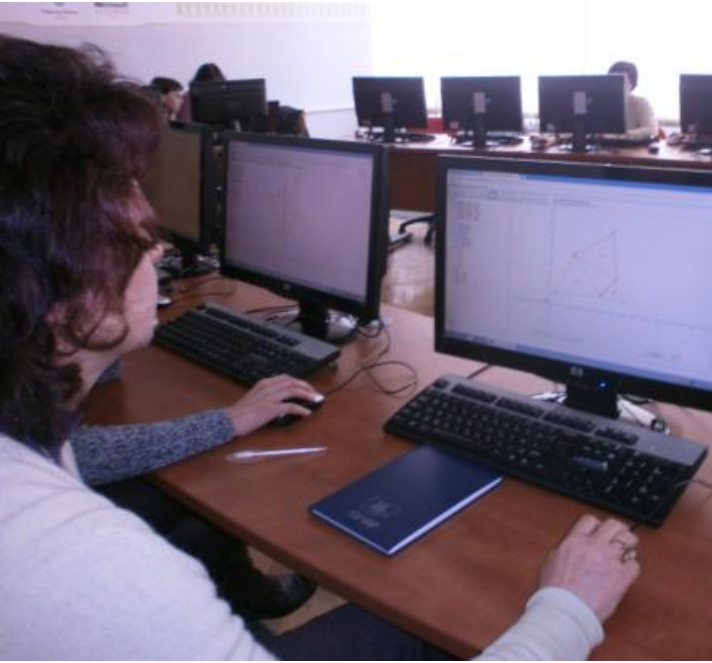
There is a vast difference between what the computer can offer and what people choose to do with it…

Seymour Papert

The school

The difference between the student and the scientist

Problems worthy of attack, prove their worth by hitting back.

Piet Hein

Thank you for your attention!