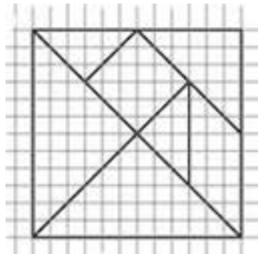
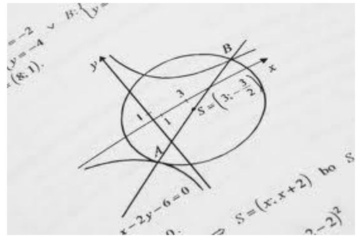
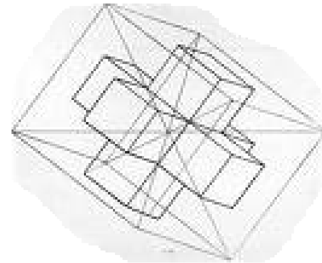
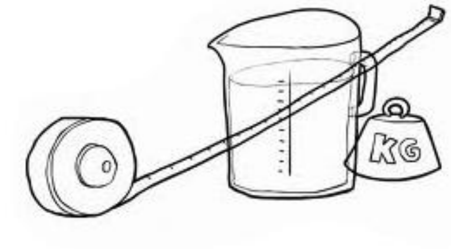







# GEOMETRIC PATTERNS AS A GAME OF DYNAMIC EXPLORATIONS

**Toni Chehlarova, Evgenia Sendova**

IMI-Bulgarian Academy of Sciences

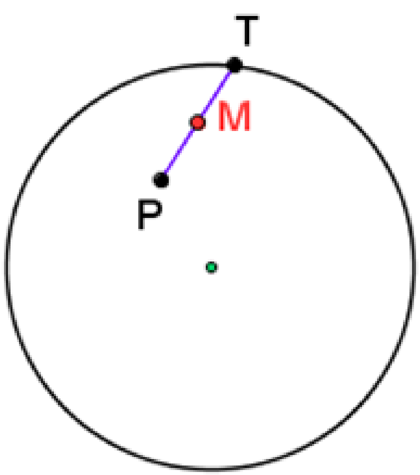
Lifelong Learning Programme

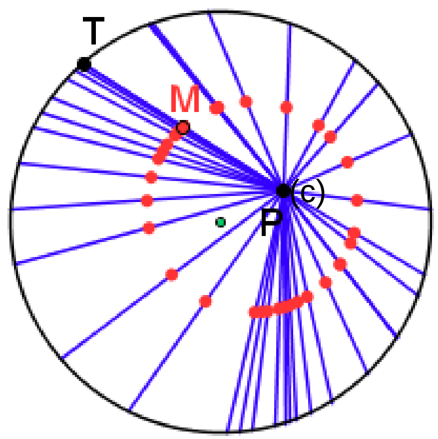
DynaMAT

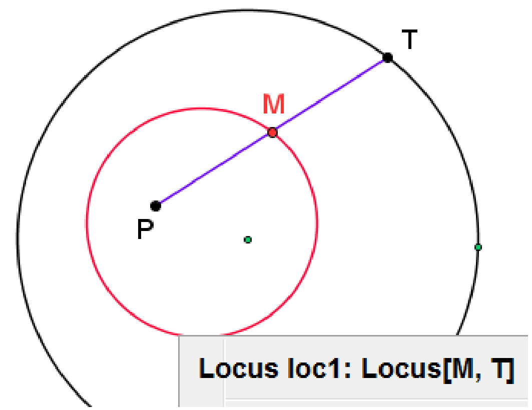
This project has been funded with support from the European Commission in its Lifelong Learning Programme (510028-LLP-1-2010-1-IT-COMENIUS-CMP). This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

# LOOKING AT THE CLASSICS WITH A DYNAMIC EYE

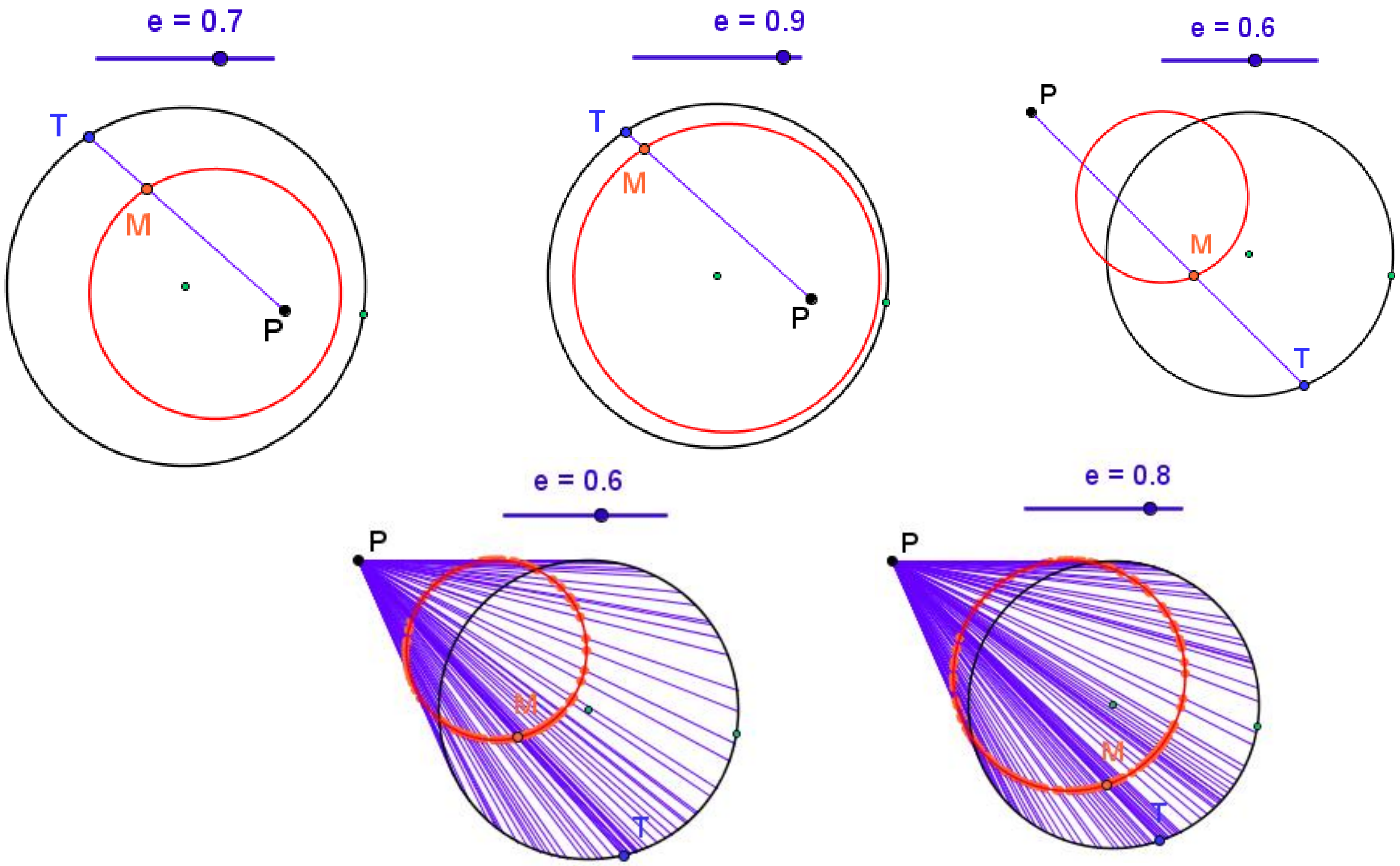
**A traditional geometry problem:** *What is the locus of the midpoints* ***M*** *of the segments joining a fixed point* ***P*** *within a circle with the points of that circle?*



# The *what-if* strategy in action



$\leq$

***n***.

# FROM A WELL KNOWN PROBLEM TO AN OPEN ONE

**A well-known problem:**

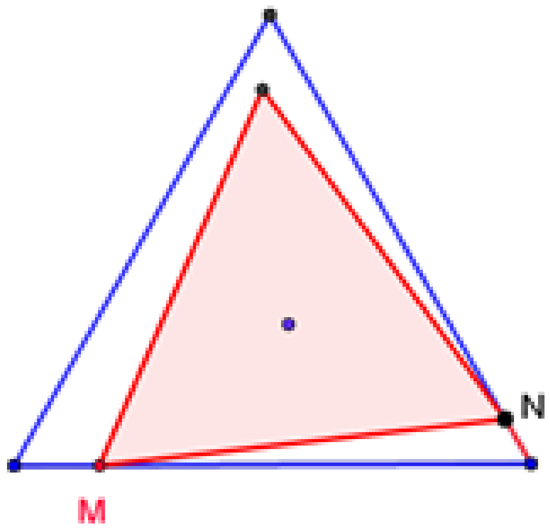
*Find the locus of the centers of the equilateral triangles inscribed in an equilateral triangle.*

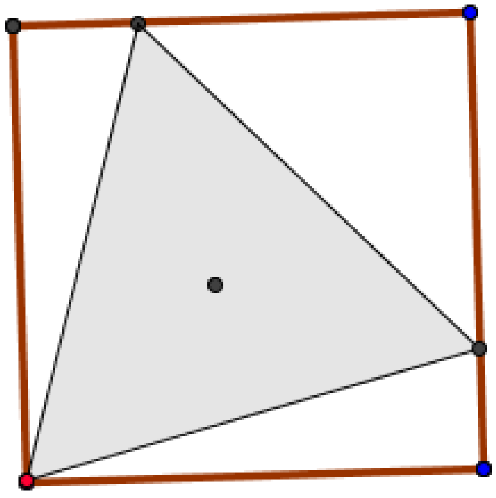
**An ambitious generalization:**

*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

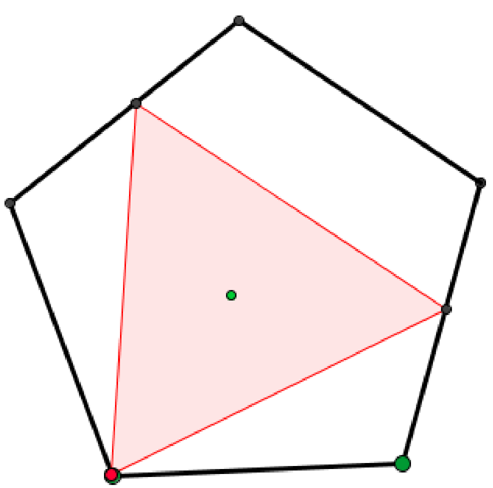


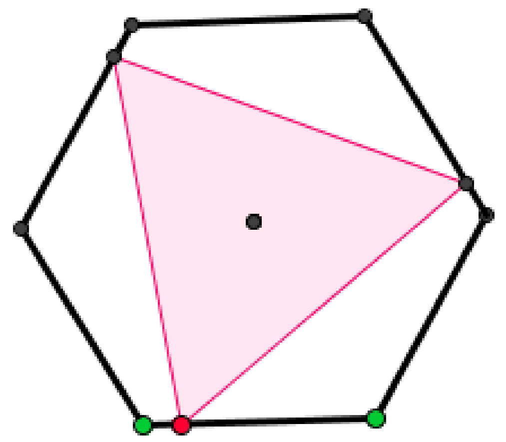
**(3;4)** construction

# (3;n)

(3;5) construction

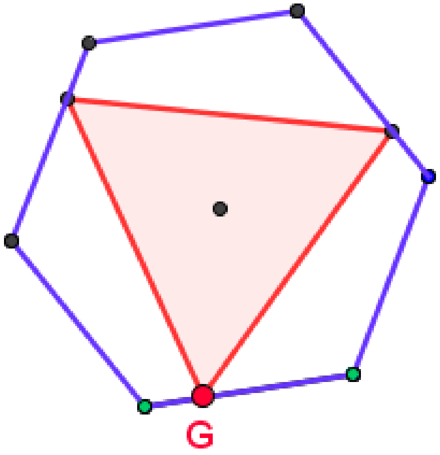


(3;6)

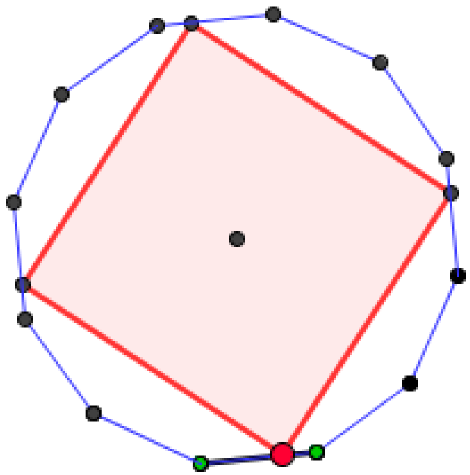


# (m;km)

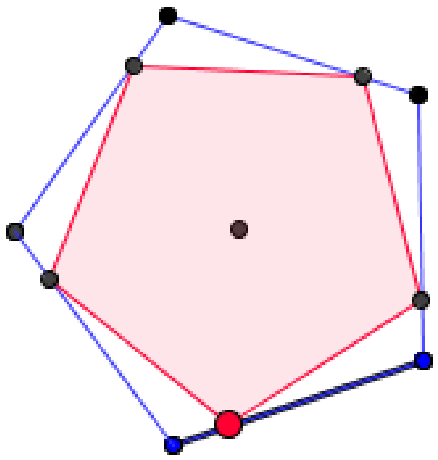
**(3;3k)**



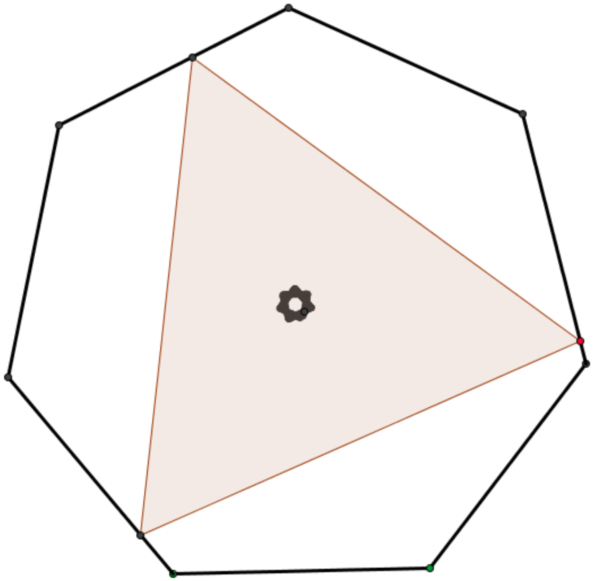

**(4;4*k*)**

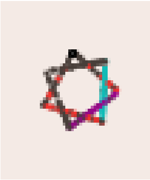


**(5;5*k*)**



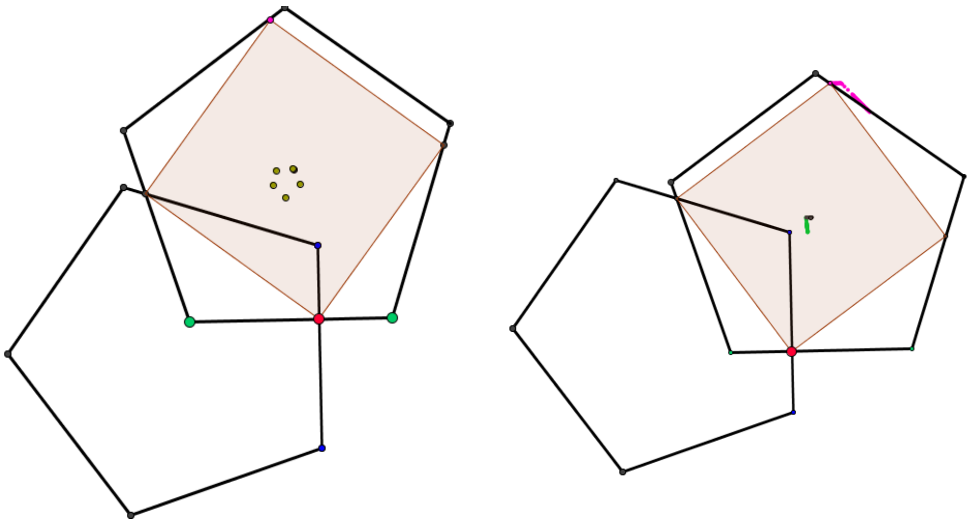
# (3;7) model



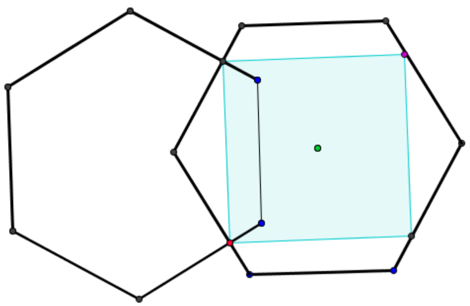


# (4;n)

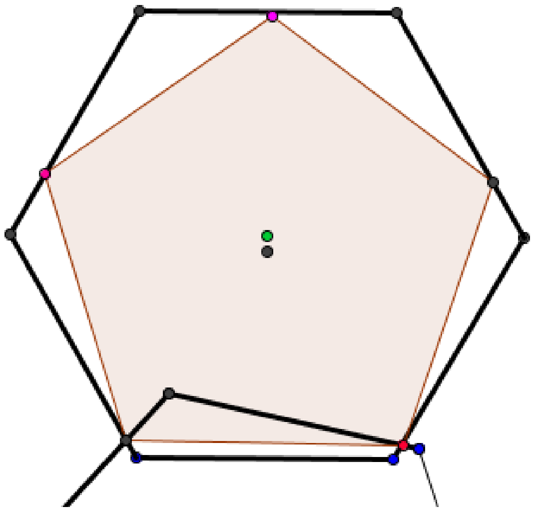
[(4;5) model]

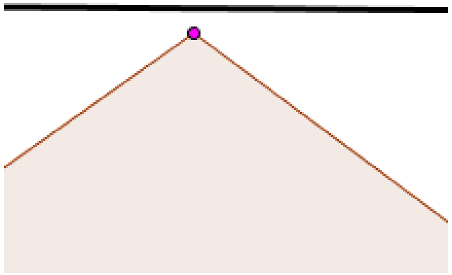


[(4;6) model]



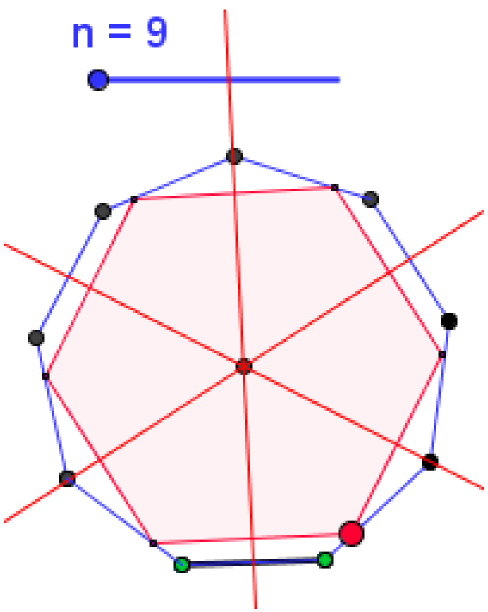
# **(5;6)** model

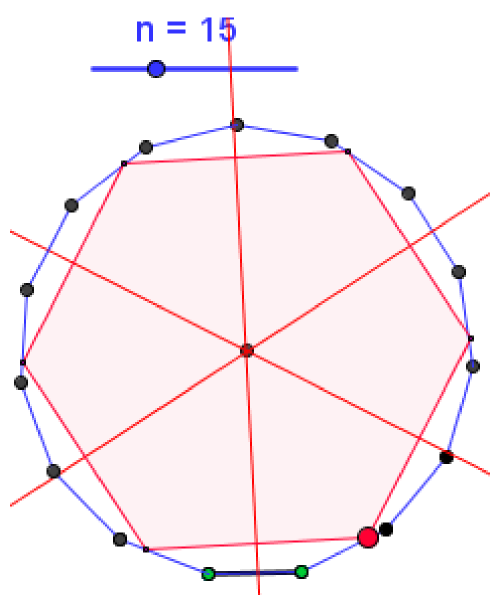




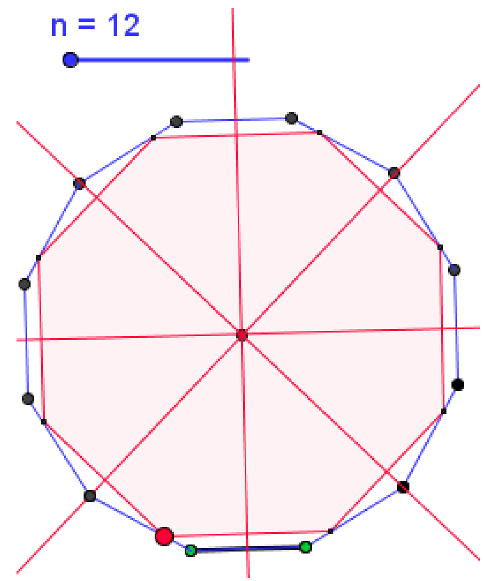
$$\left(m;\frac{m}{2}+km\right)$$

(6;3+6k)




(8;4+8k)

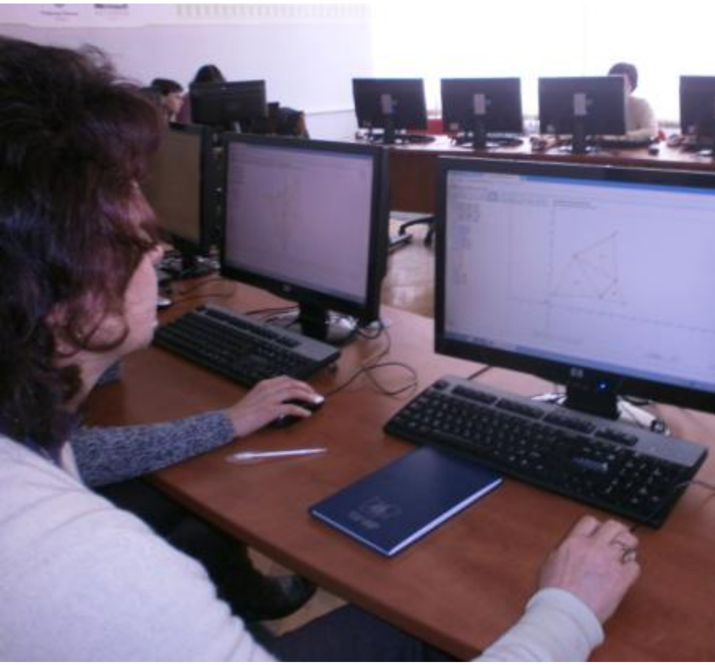


# Looking around

- Dilworth, Mane, 2010
- **Theorem.** *Suppose that* $m, n \geq 3$. *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) $m \geq 5$ *and* $m$ *divides* $n$;
- (d) $m \geq 6$ *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).*

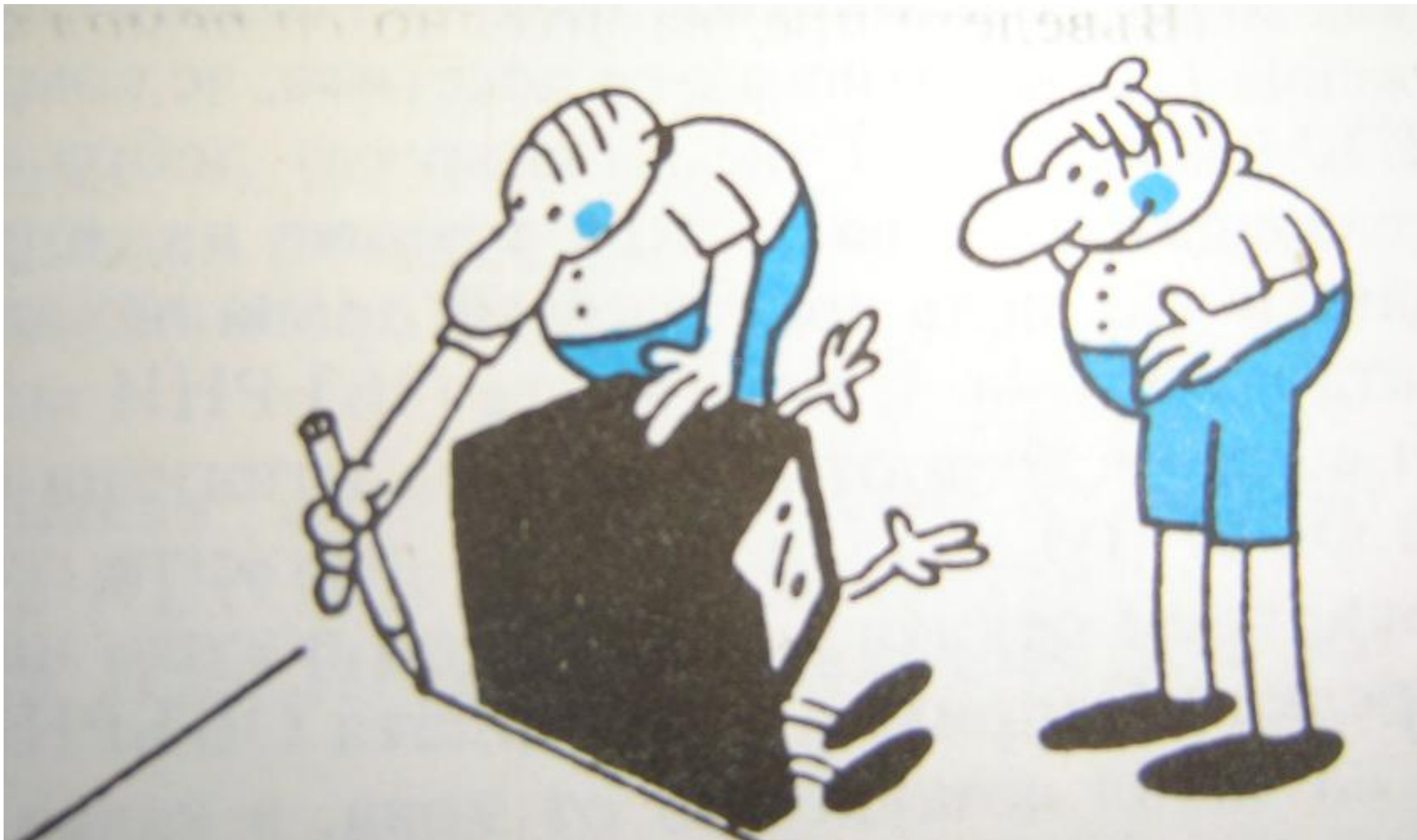
# National seminar, December 2012

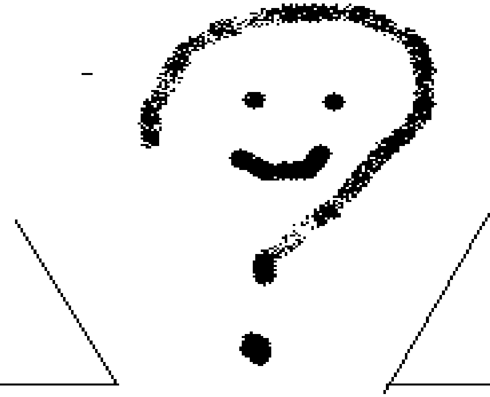
# TT Course in Gabrovo – 15-17 February



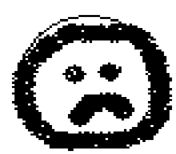
*There is a vast difference between what the computer can offer and what people choose to do with it…*

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!