Mirosław Brozis

IBL in maths lesson

- is it possible?

Poland, bromir1@poczta.fm

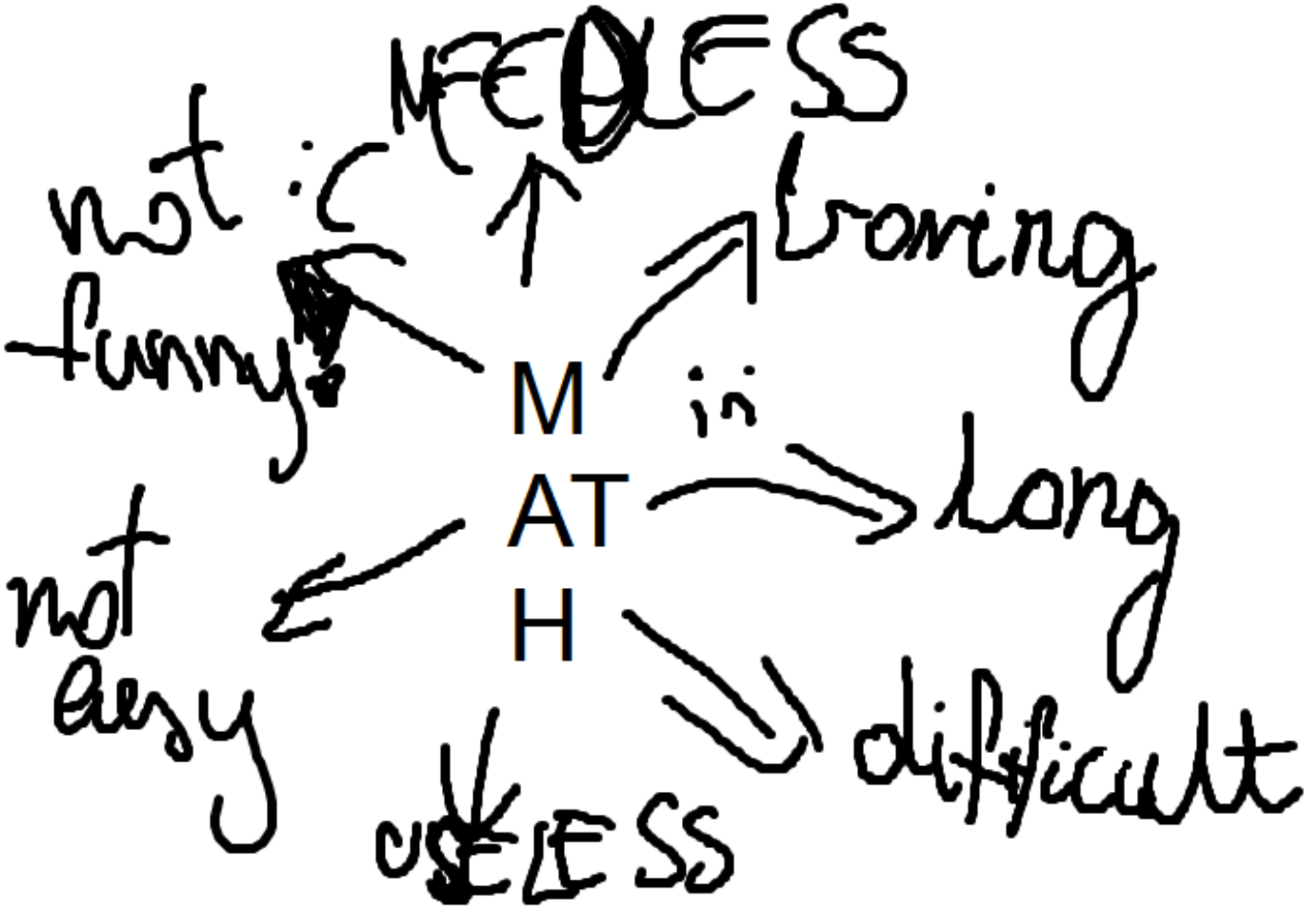
WHY ?

HOW ? - case study

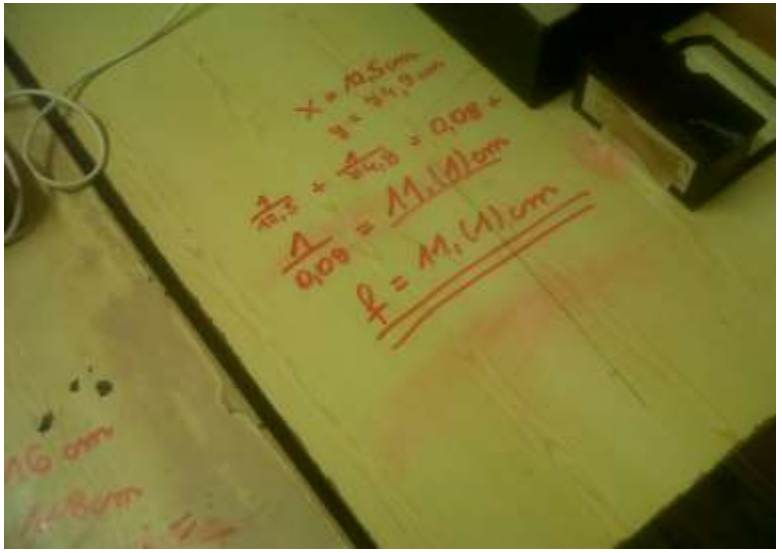
WHERE ?

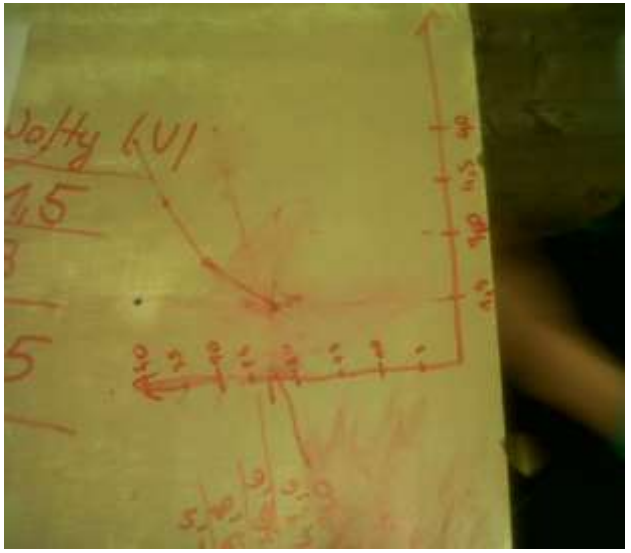
and what's next ?

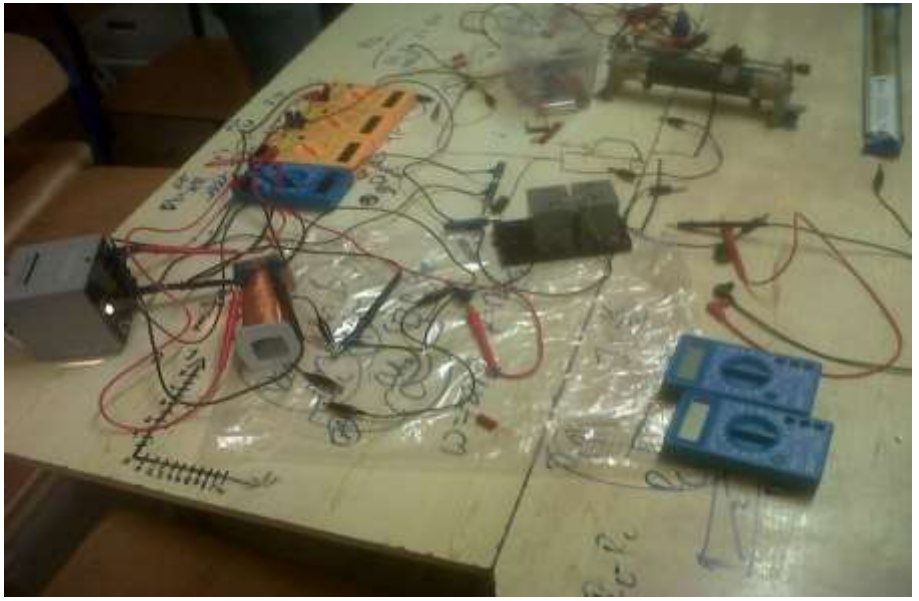
Why? – why not :-)


NEEDLESS
not :(
boring
funny
M
AT
H
in
long
not
easy
difficult
USELESS

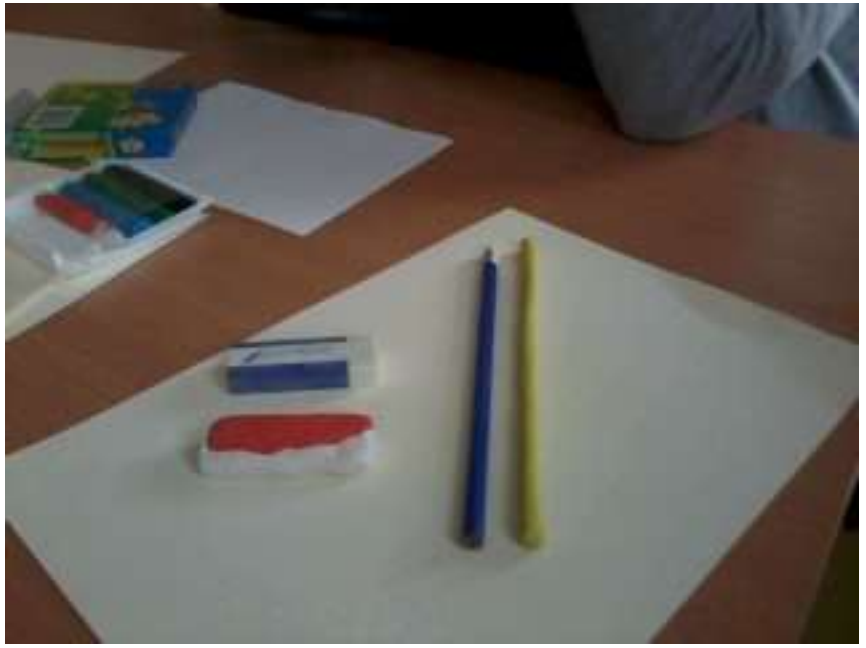
but sometimes …





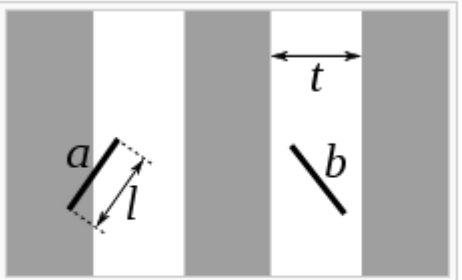


hope

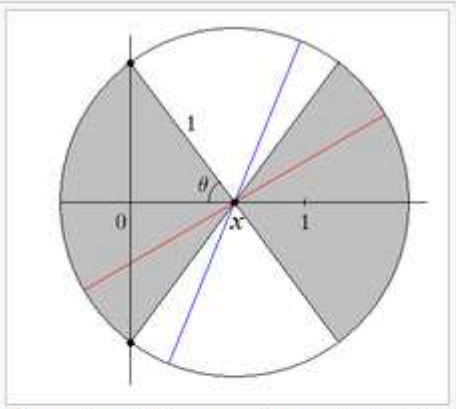


Inquiry-based learning on maths?

Georges-Louis Leclerc, Comte de Buffon's problem was the inspiration to find the number π. It can be solved using integral geometry. Experiment cover topics of probability, geometry, Monte Carlo method and good fun :-) Entertainment has become a good point to work on finding π with IBL



The *a* needle lies across a line, while the *b* needle does not.



The red and blue needles are both centered at x. The red one falls within the gray area, contained by an angle of 2θ on each side, so it crosses the vertical line; the blue one does not. The proportion of the circle that is gray is what we integrate as the center *x* goes from 0 to 1

$$P = \frac{\int_0^{\frac{\pi}{2}} l\cos\theta d\theta}{\int_0^{\frac{\pi}{2}} t d\theta} = \frac{l}{t}\frac{\int_0^{\frac{\pi}{2}} \cos\theta d\theta}{\int_0^{\frac{\pi}{2}} d\theta} = \frac{l}{t}\frac{1}{\frac{\pi}{2}} = \frac{2l}{t\pi}$$, as above.

In the first, simpler case above, the formula obtained for the probability P can be rearranged to: $\pi = \frac{2l}{tP}$. Thus, if we conduct an experiment to estimate P, we will also have an estimate for π.

Suppose we drop *n* needles and find that *h* of those needles are crossing lines, so P is approximated by the fraction h/n. This leads to the formula:

$$\pi \approx \frac{2l \cdot n}{th}.$$


π = 2N / x
BRAD
1,5%


All you need is PI!

Exploring the Internet

$$\pi \approx \frac{2l \cdot n}{th}$$

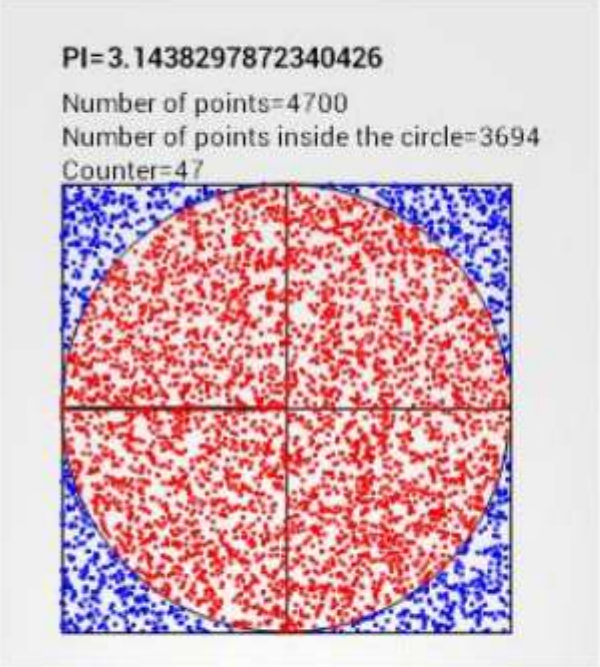
a ~~needle~~ shoe of length l

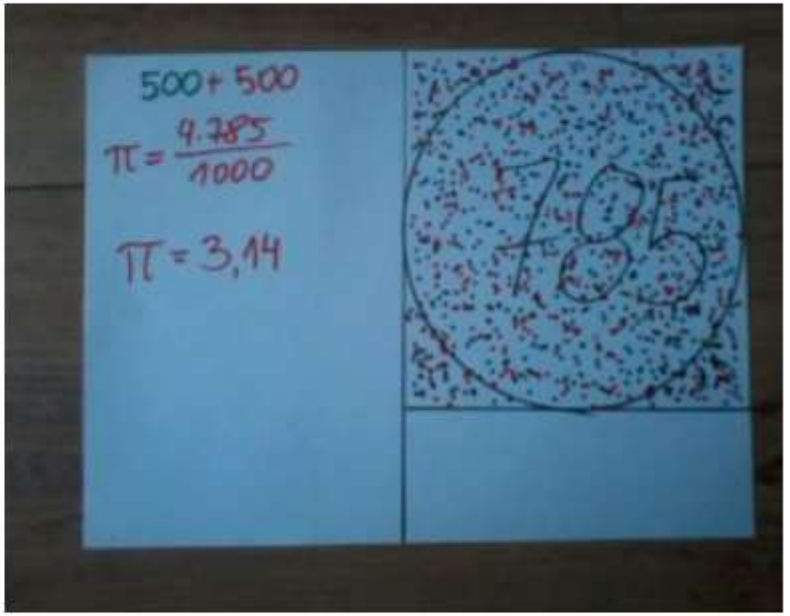
t - the width of the line
n -number of crossing lines

Pi determined from photos

π=16/5=3,2 ☺

… and more..

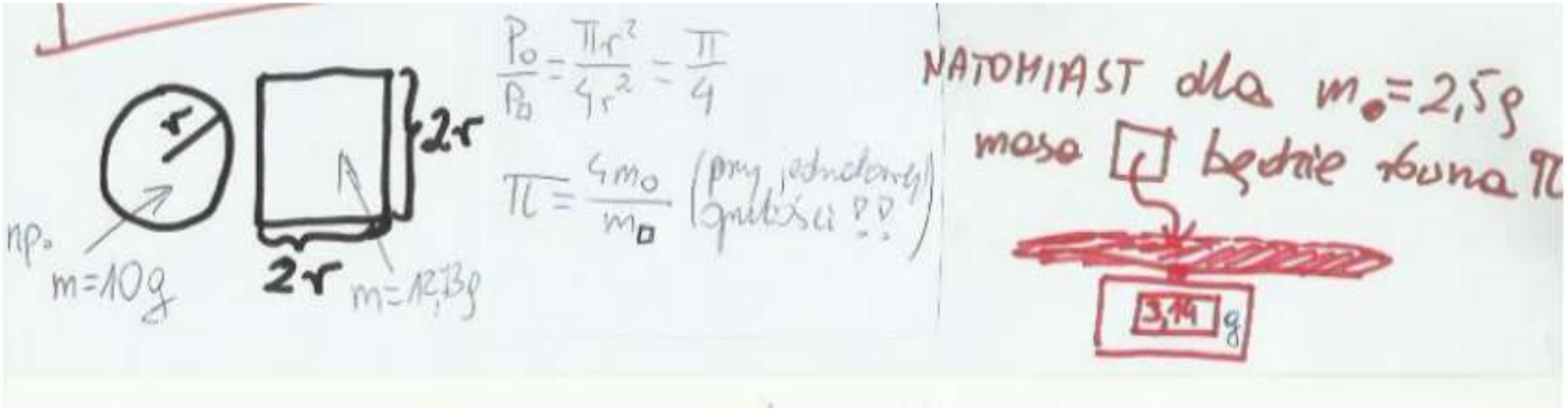




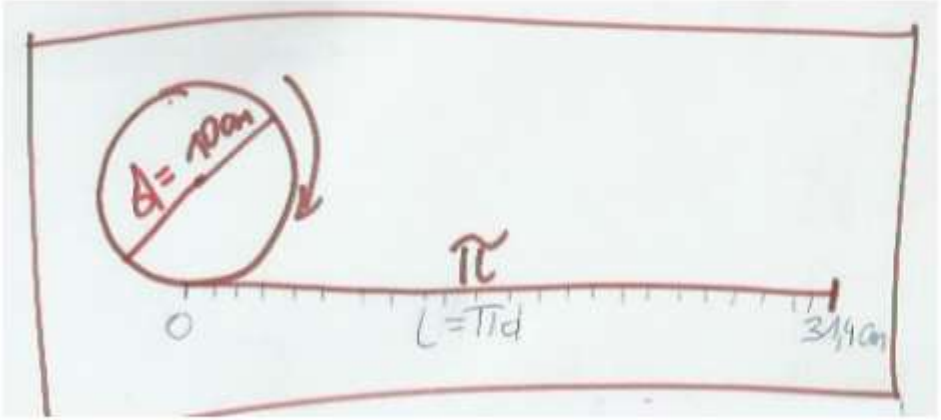
phone print screen vs. studens job

...simplification...

$$\frac{P_{kola}}{P_{kwadrat}} = \frac{\pi r^2}{4r^2} = \frac{\pi}{4}$$



...and more simple...



blueprint

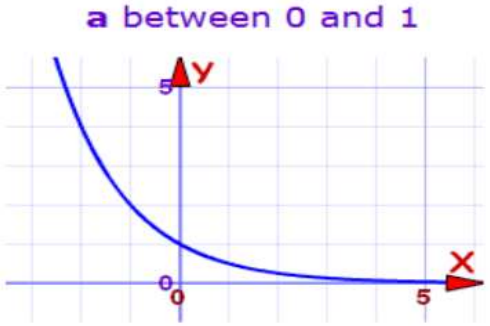
final product

Make things as simple as possible, but not simpler

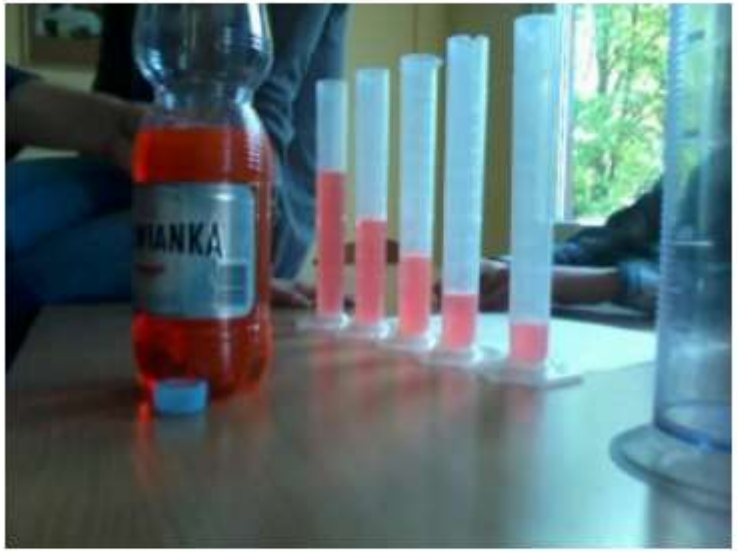
last measurements of pi

Future ??

Experiment helps find a exponential function.

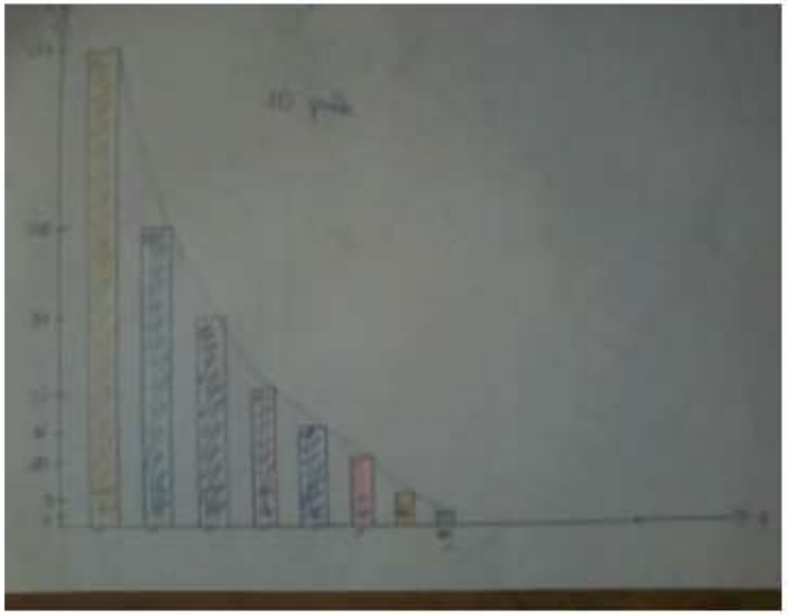


Each vessel is then filled half of the remaining water

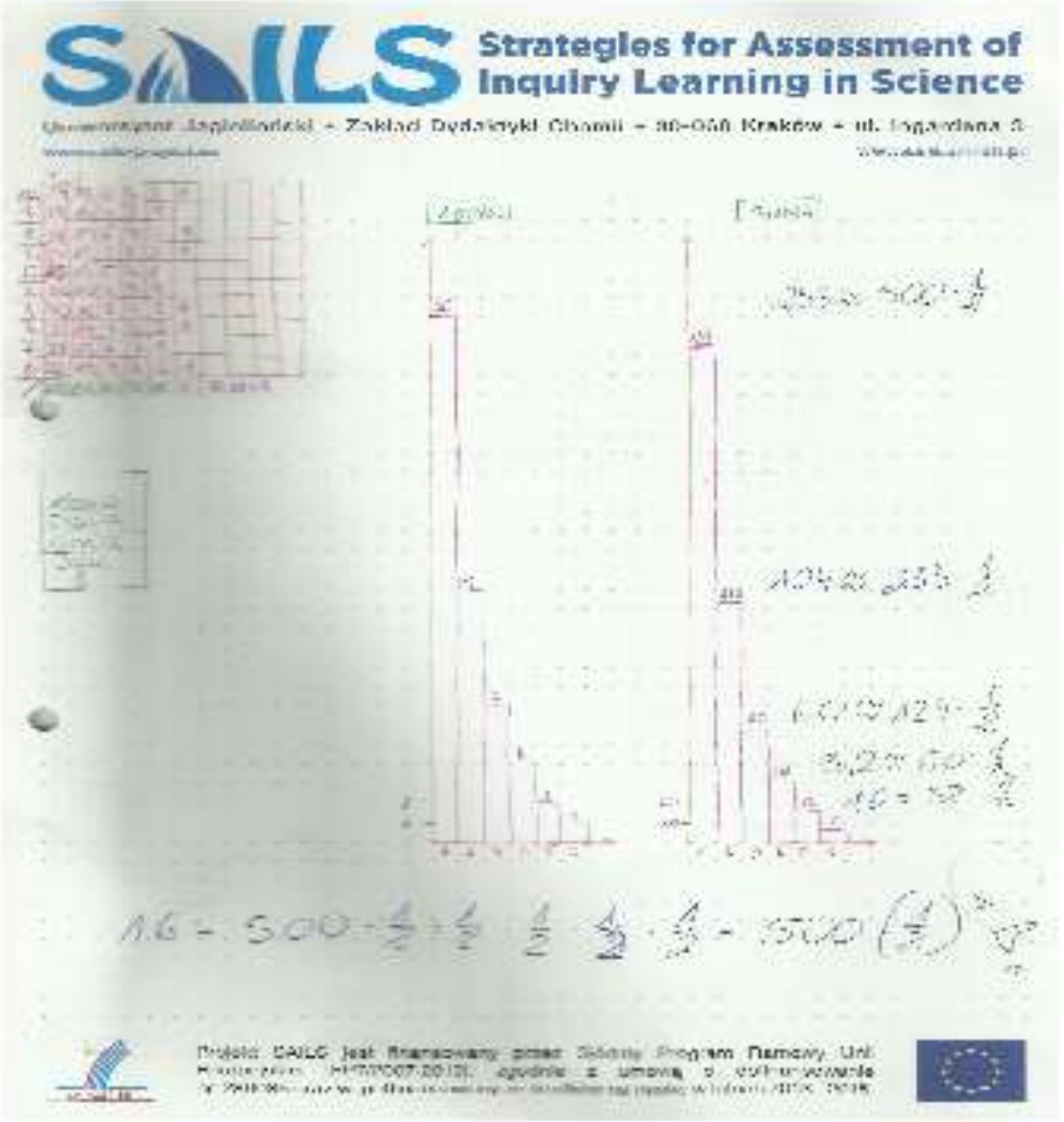


Effect of ten retries

Brainstorming



Experimentally obtained exponential function


SAILS
Strategies for Assessment of Inquiry Learning in Science

It's work !!!

Thanks a lot ...

bromir1@poczta.fm

SAILS
Strategies for Assessment of Inquiry Learning in Science

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 289085