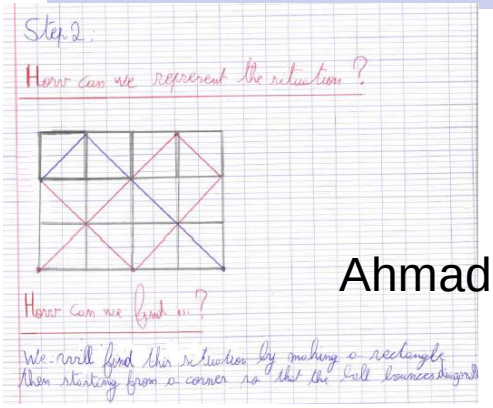
Research report:« Billards »

In tribute to
Myriam Mirzakhani



Ahmad

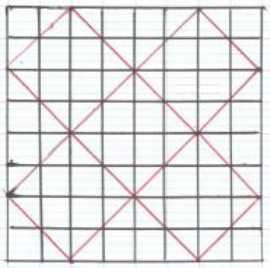
- Experimentation :

- I can say if dimensions are L and $\frac{L}{2}$, so the area of the created rectangle are equals to $(\frac{L}{2})^2$

- And, if the rectangle has other sides, all squares are crossed.

Rayane

il y a 19 carré traversé pour les dimenstion 5 et 4
Conclution: Je constate que sa peut formé des forme ect..



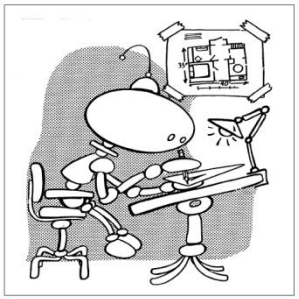
il y a 32 carré traversé pour les dimenstion 8 et 8
Conclution: je remaque que l'on peut le faire de tout les maniere

Omnya

Un billar matematico es un sistema dinamico en el que una partícula alterna movimiento libre sobre una superficie y rebotes sobre una pared sin perdidas de velocidad. El angulo reflejo es identico al angulo de incidencia en el momento del impacto.

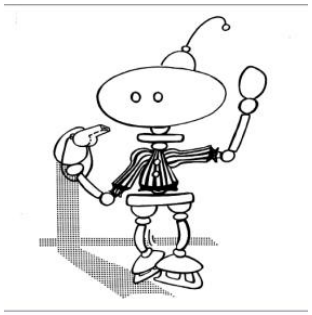
Djamel

For successful research, we implement all the jobs of Reflecto / Reflecta

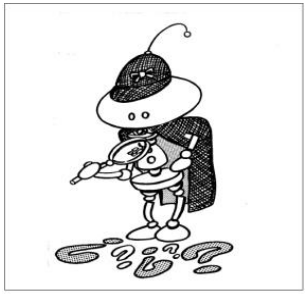


L'architecte

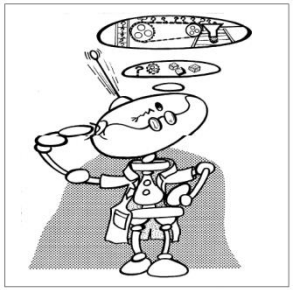
Le contrôleur



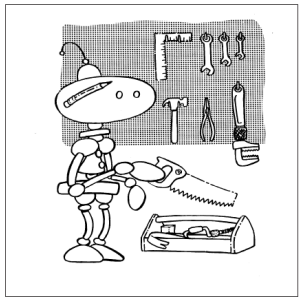
L'arbitre



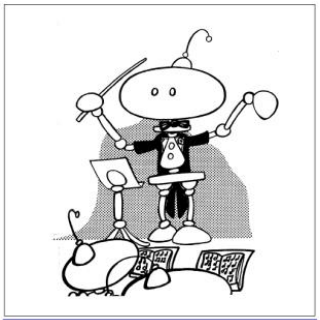
Le détective



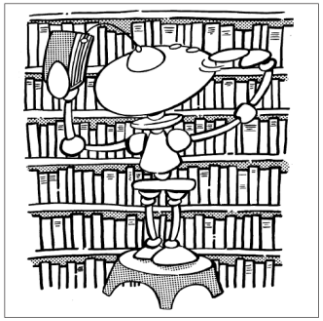
L'explorateur



Le menuisier



Le chef d'orchestre



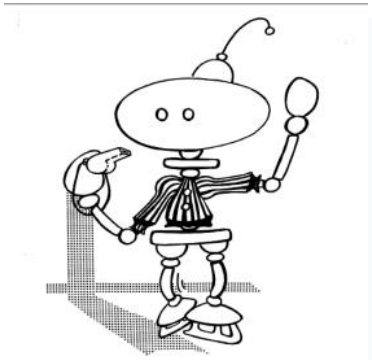
Le bibliothécaire

Le mathématicien

Le traducteur

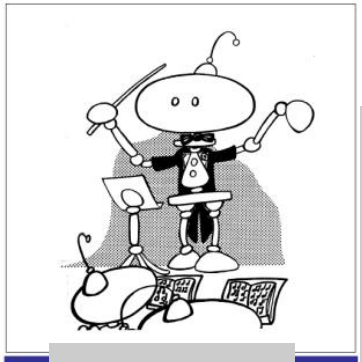
Controlor

Check calculations
Control errors
Revise details
Corected



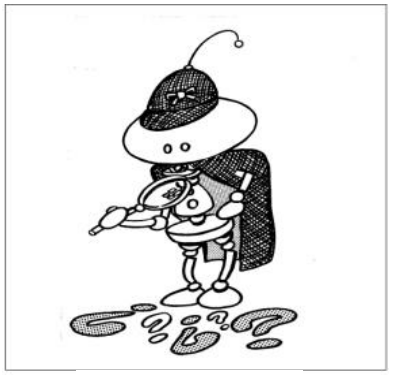
Arbitrator

Check steps
arbitrate
Repeat the sequence of reasonings
Révise steps
Restart at the beginning experiment approach



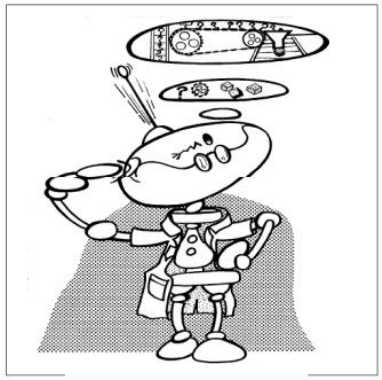
Conductor

Organize tasks
Verify tasks organization
Listen ideas
Synthesize



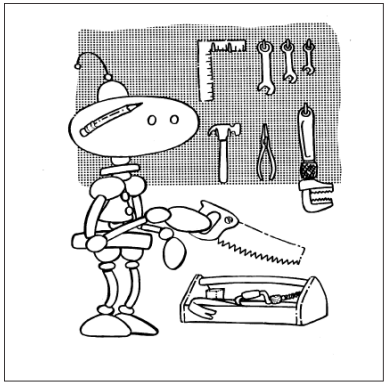
Detective

Understand the situation
Look for index
Ask questions
Identify task purpose
Watch
Analyse



Explorator

Look for
Try
Invent
Discover
Explore
Create

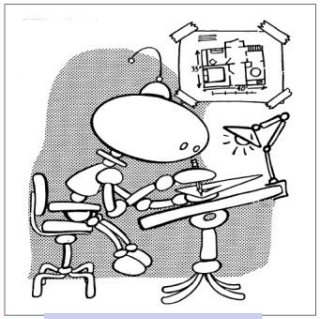


Carpentor

Draw
Construct
Place
Trace
Connect
Cut
Execute
Apply

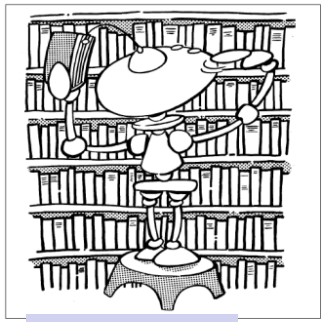
Mathematician

Calculate
Reasoning
Connect ideas
Work in several semiotic register
Conceptualise
Demonstrate
Argues
Explain



Architect

Planify
Organise steps
Prepare
Anticipe
Purpose conjectures
Design



Librarian

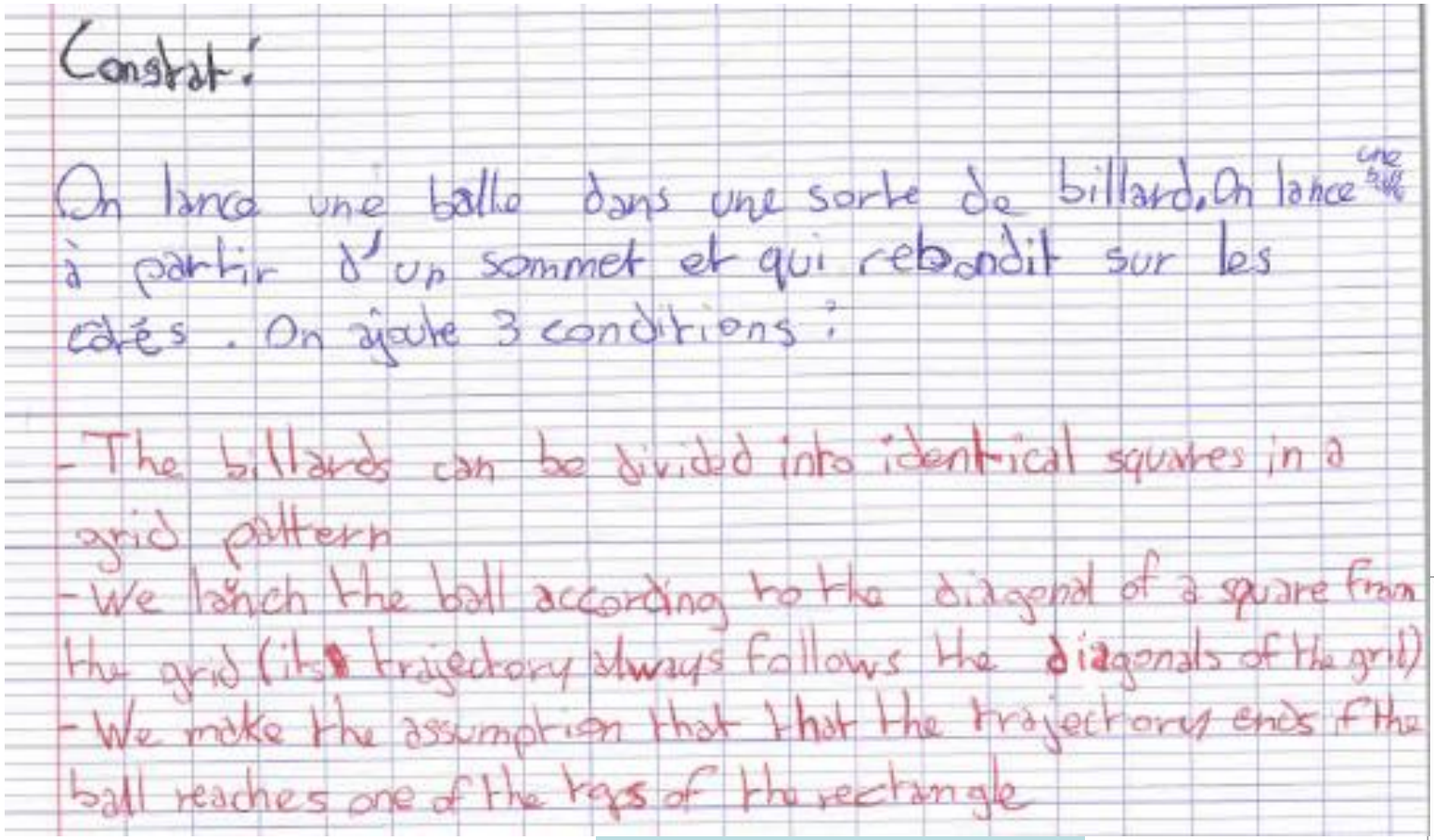
Give knowledge
Remember
convene knowledge
Memorise

Traductor

Code from one semiotic to another one

- Symbolic
- Linguistic
- Figuratif
- Graphic
- Instrumental
- Algorithmic

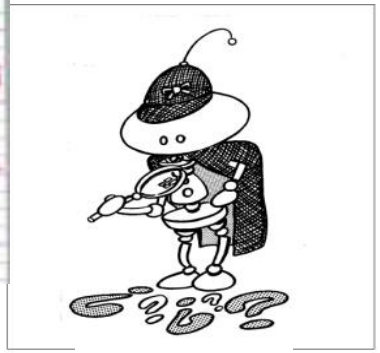
the mathematical problem


Constat:

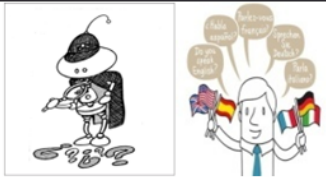
On lance une balle dans une sorte de billard. On lance une balle à partir d'un sommet et qui rebondit sur les côtés. On ajoute 3 conditions :

- The billards can be divided into identical squares in a grid pattern
- We lanch the ball according to the diagonal of a square from the grid (its trajectory always follows the diagonals of the grid)
- We make the assumption that that the trajectory ends if the ball reaches one of the tops of the rectangle

Yanis
(ancien élève de 4e)



Detective

Steps	Tracks/aids	Skills
STEP 1 : FINDING (mathematical hypothesis)	Describe what you seen indicates the information collected	 Detective- Semiotic translator

Etape 2 : Les problèmes
Les questions

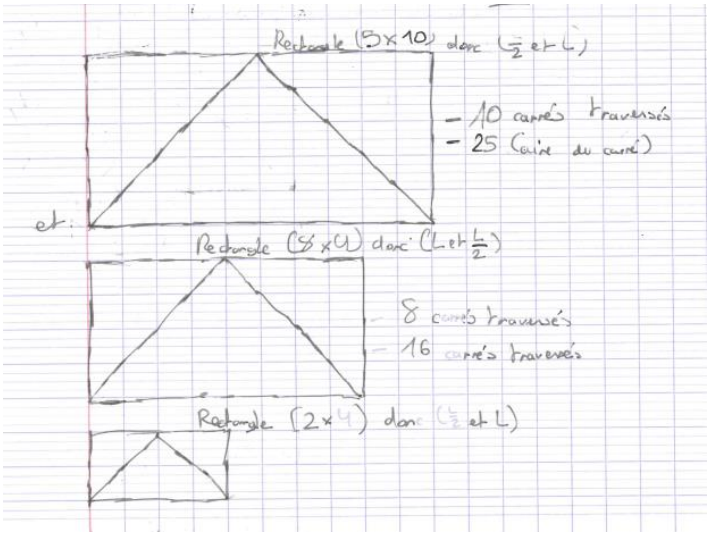
Combien de carré traverse la balle ? De quelle mesure doit être le rectangle ? Est-ce que ça peut être un carré ? Par quel côté commence et est ce que ça change quelquechose

Rogette

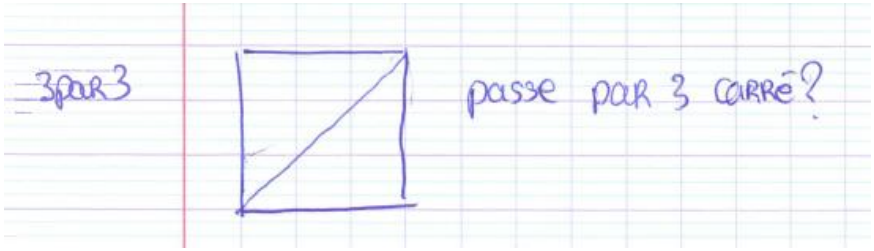
STEP 2:
Questions and problems

how to represent the situation ?
how can we find?
how can we demonstrate?
How calculate ?

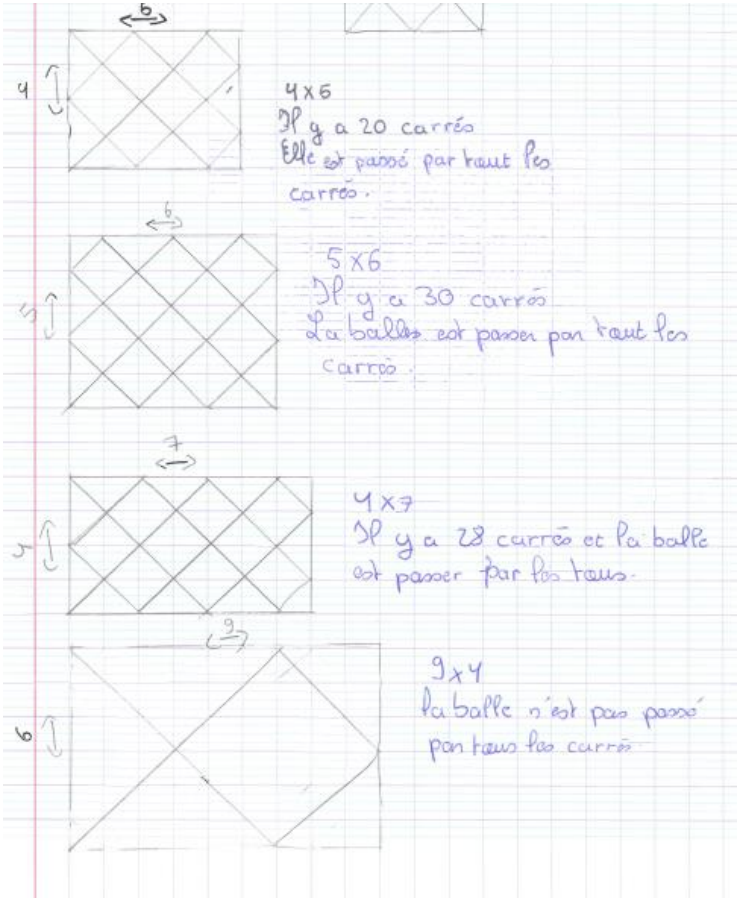
Architect-Mathematician



Rayane

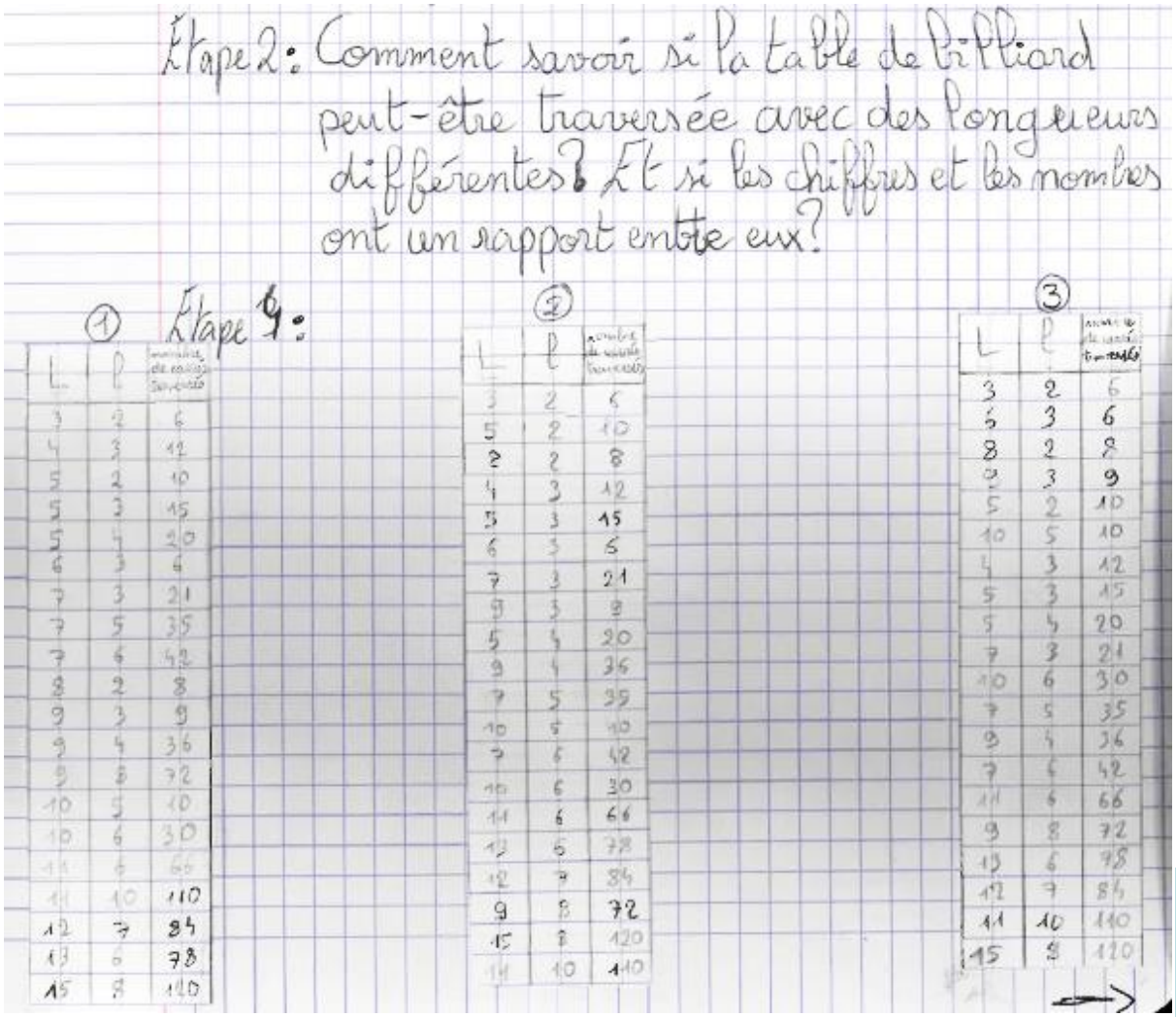


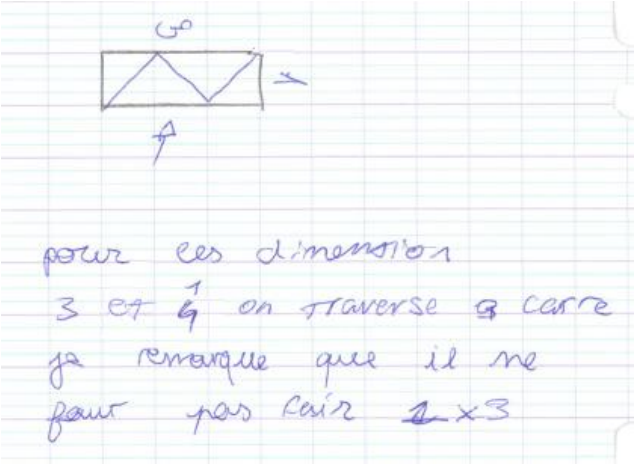
Manel



Aminat

STEP 4: Experimentation	You can use the calculator, build a graph, use a spreadsheet, use a geometry software or another. You can draw figures, use your geometry material, make cuts ... You can propose a method, a suitable calculation. You can recognize a theorem, a property, apply a formula.	 Carpentor-Controller- Semiotic translator





Violetta

Clémence (ancienne élève 4e)

STEP 4:

Experimentation

You can use the calculator, build a graph, use a spreadsheet, use a geometry software or another. You can draw figures, use your geometry material, make cuts ... You can propose a method, a suitable calculation. You can recognize a theorem, a property, apply a formula.

Carpentor- Controller- Semiotic translator

J'ai remarqué que si il y avait deux nombres paires la balle ne ~~passait~~ traversait pas la totalité des carrés. Alors que si on met deux nombres impaire en général la balle traverse tout les carrés sauf éxeption comme le rectangle 3 et 9 qui lui, la balle ne passe que 9 cases au lieu de 27.
Et si l'on met un chiffre paire et un chiffre impaire, la balle traversera obligatoirement toutes les carrés dans chaque cas.
Sauf peut-être le 10 et 5 mais dans les cas que j'ai trouvé la balle passé à chaque fois.

Clémence (ancienne élève de 4e)

Le nombre traversé de carrés est le nombre total de carré dans le rectangle:

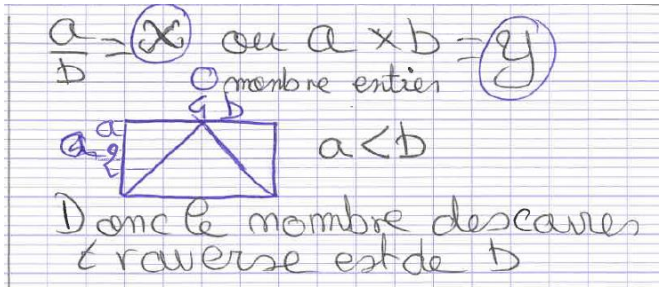
$10 \times 38 = \boxed{380}$ nombre total

nombre de carrés traversés: 380

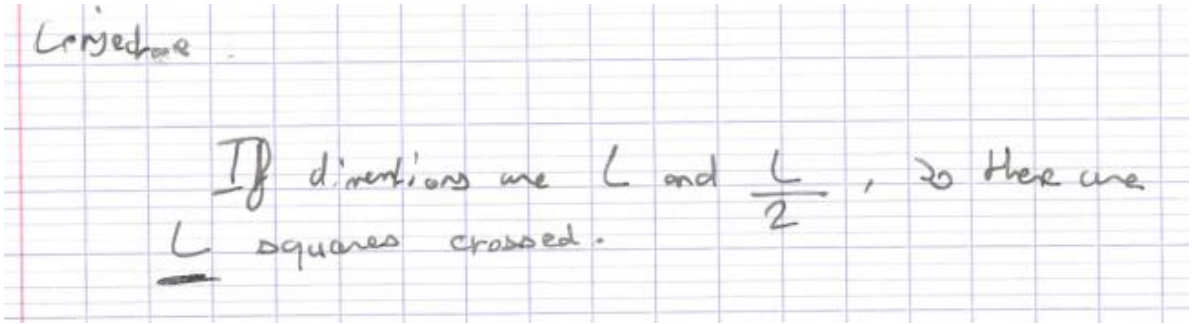
Alors le résultat est 380/380 carrés traversés.

Nous avons le résultat de la trajectoire de la balle; sur un terrain de 10 par 38: toutes les carrés ont été traversés.

Chris



Yousra (ancienne élève de 4e)



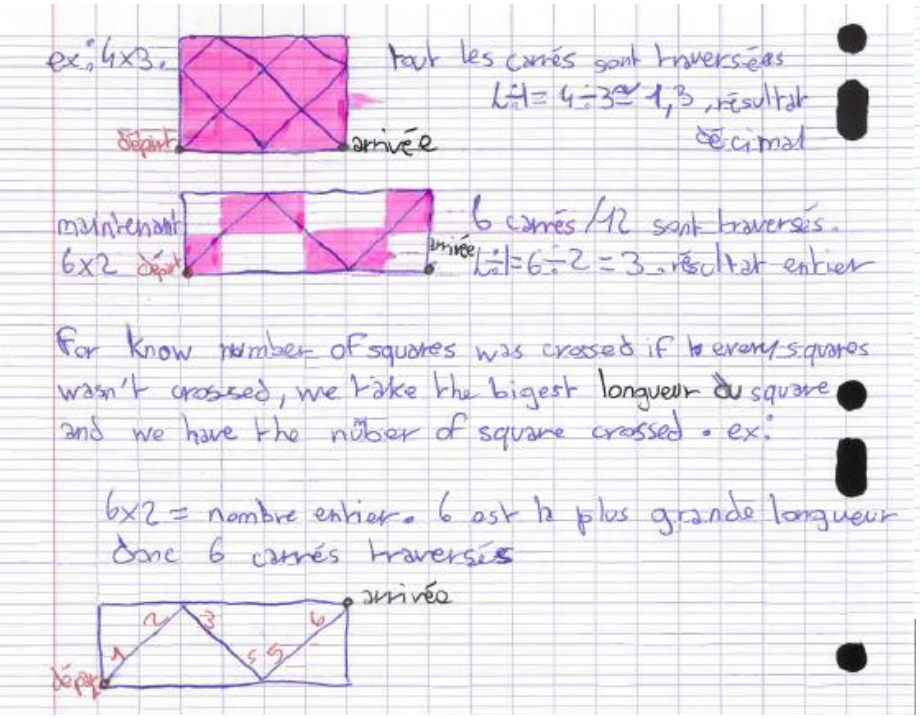
Rayane

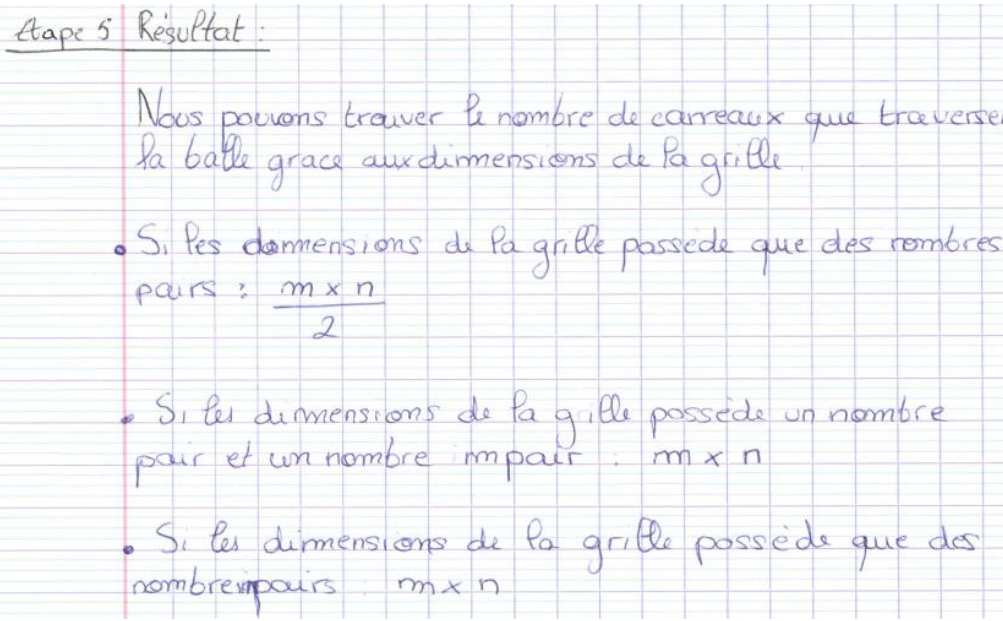
STEP 3:

Conjectures

A conjecture is a possible solution, a reasonable guess. To solve a problem, you need to develop one or more conjectures. A conjecture may be the result of an experiment, so the step may precede step 3

Explorer-Mathematician-Librarian





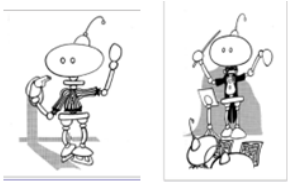
Rogette

Yanis (ancien élève de 4e)

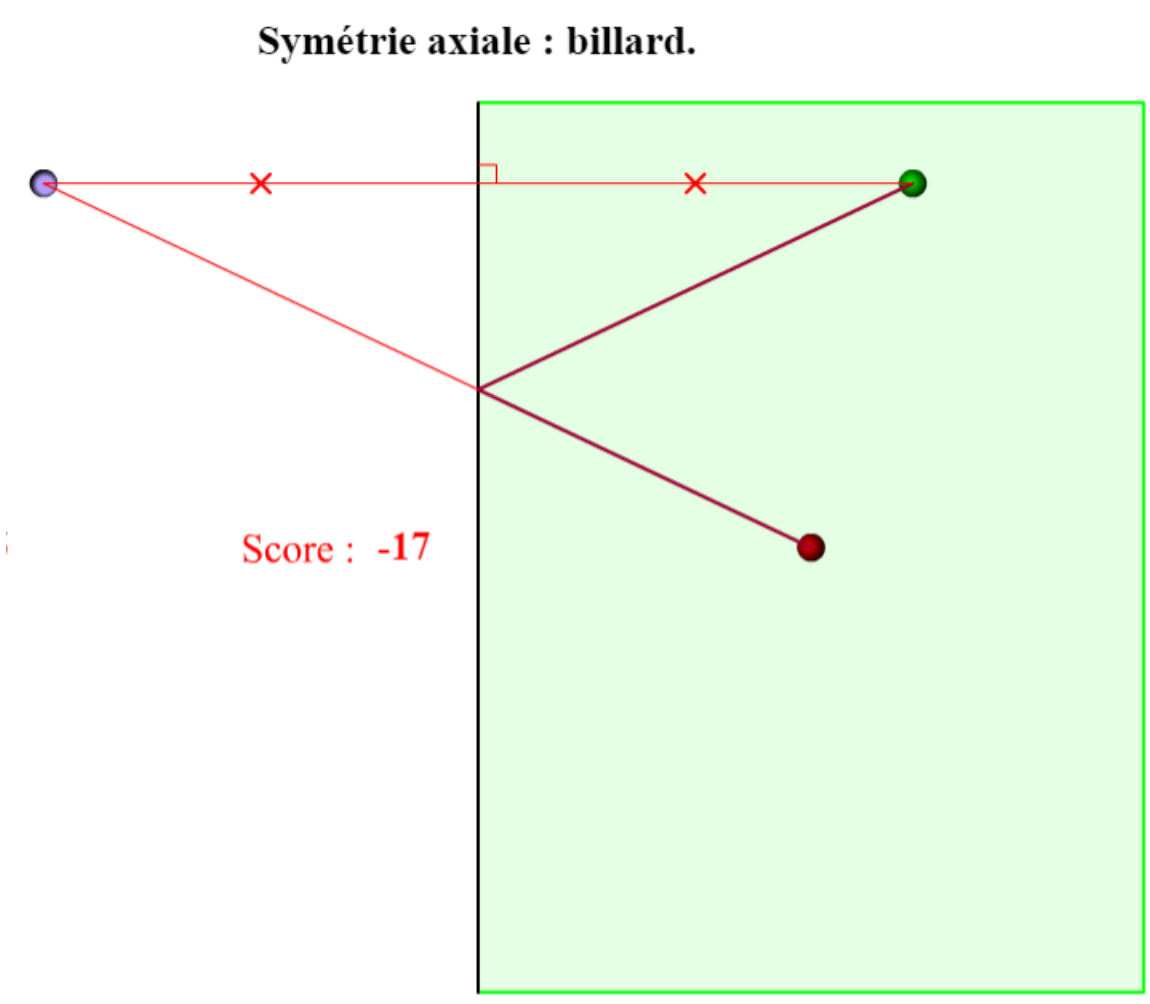
STEP 5:

Results

Write a sentence in which you present your results and explain the sequence of your ideas. Does the result obtained during the experiment confirm the conjecture? Does the result of experimentation seem to you to be coherent?



Arbitrator-Conductor



We could observate trajectories by symetrical effect

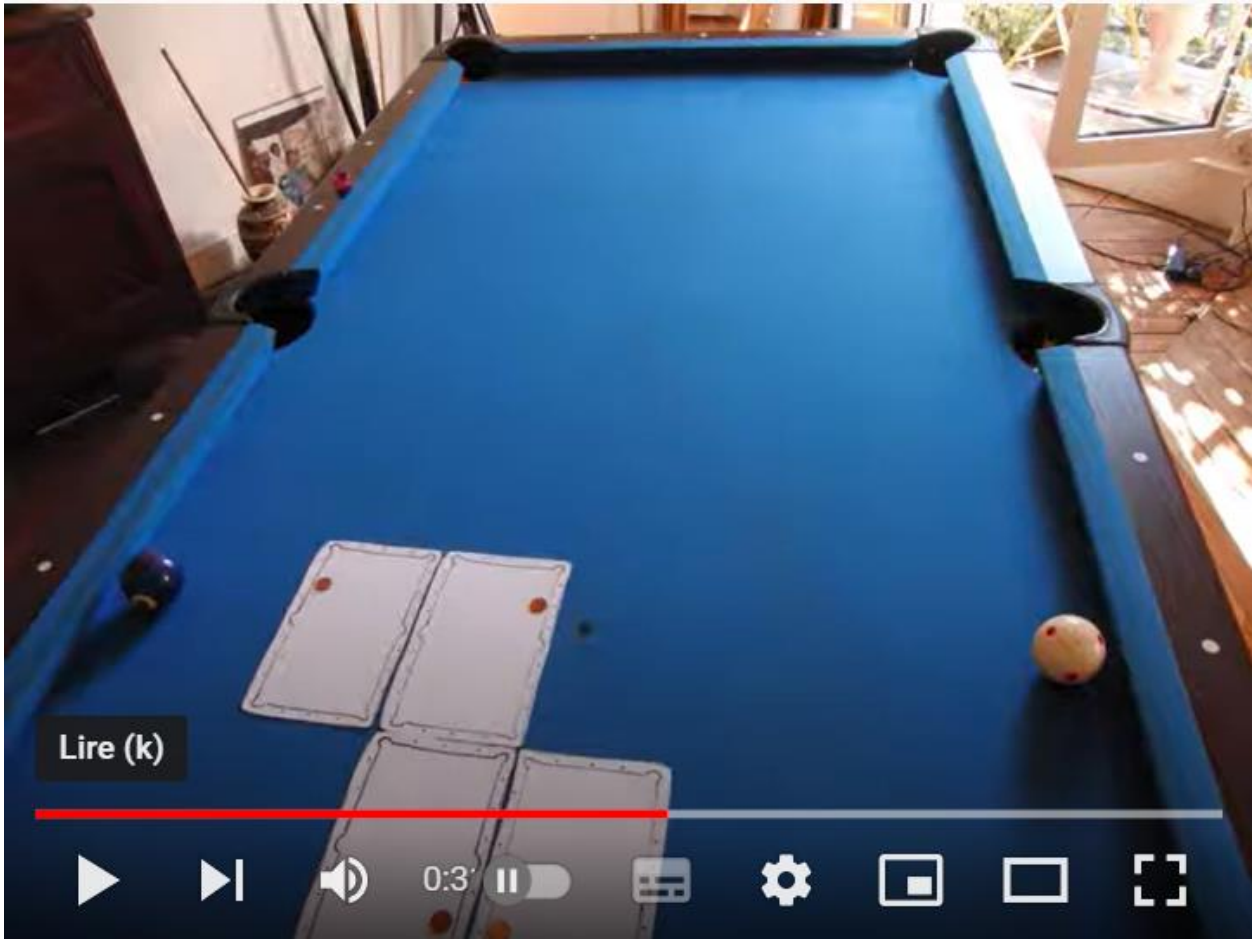
http://matoumatheux.ac-rennes.fr/geom/symetrie/6/billard.htm

STEP 6:

Demonstration Conclusion

You will implement reasoning. With your teacher, or alone, you will make a reasoning that will validate or invalidate your results. Then, it may follow a written or oral restitution of this demonstration

Mathematician



We could observate trajectories by symetrical effect

https://www.youtube.com/watch?v=eX5u2VOn9A4

STEP 6:

Demonstration Conclusion

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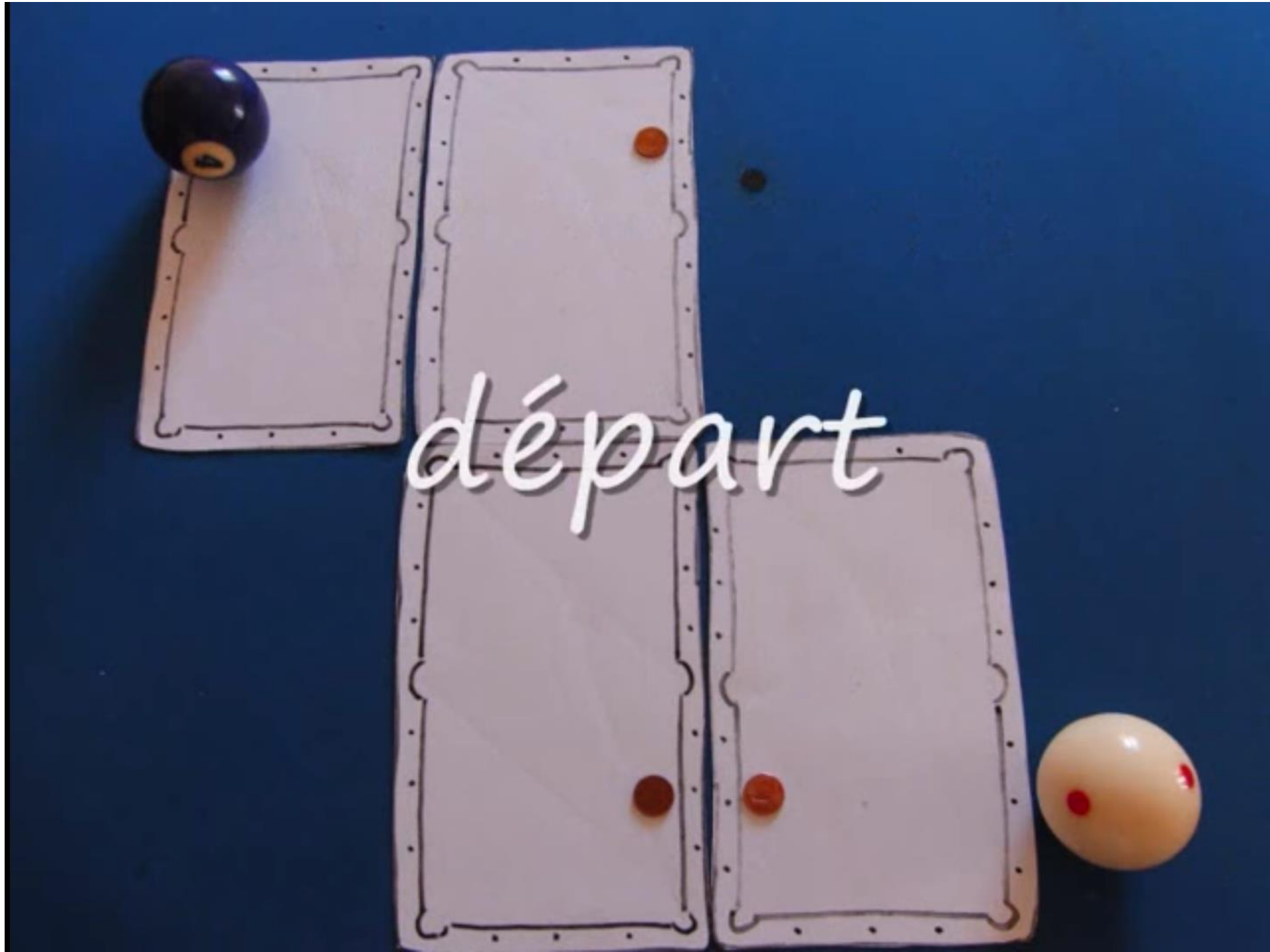
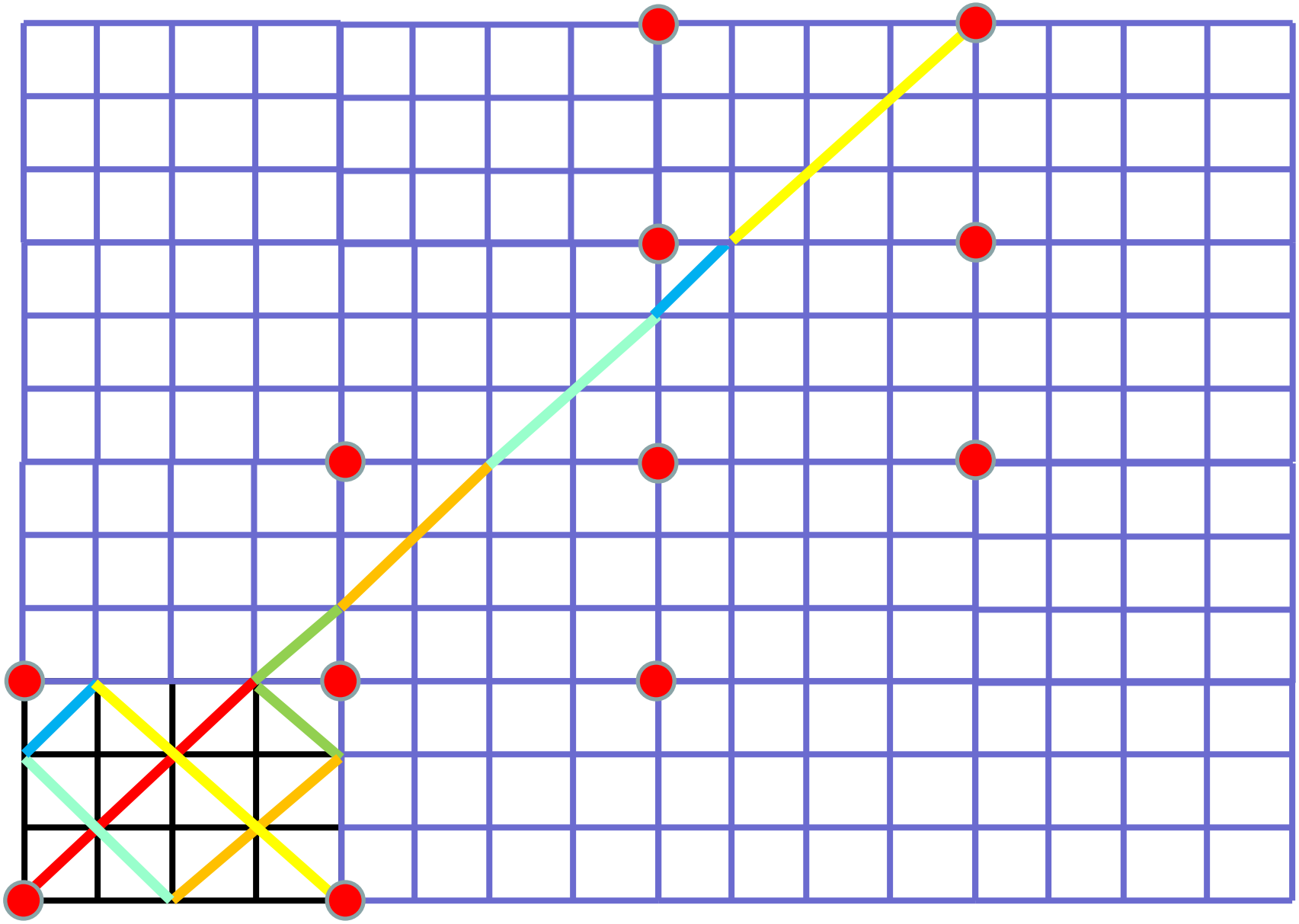
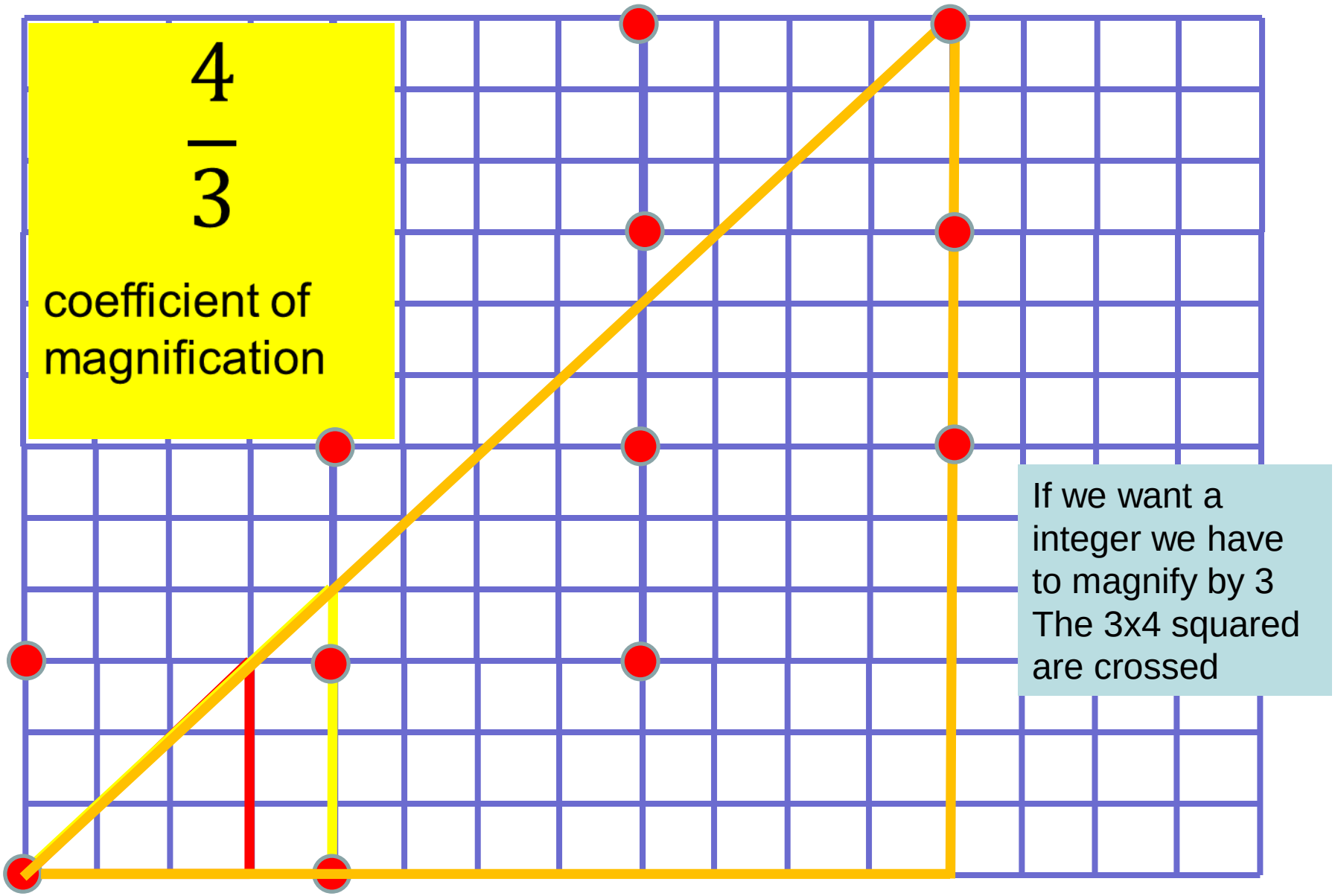
Mathematician


départ

In our problem ?



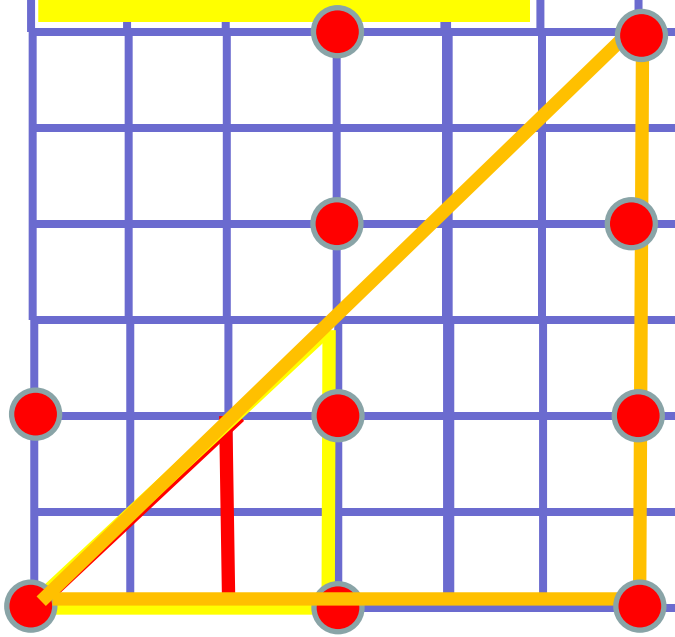
Could you recognize Thales theorema ?



If we change the dimensions of the rectangle ?

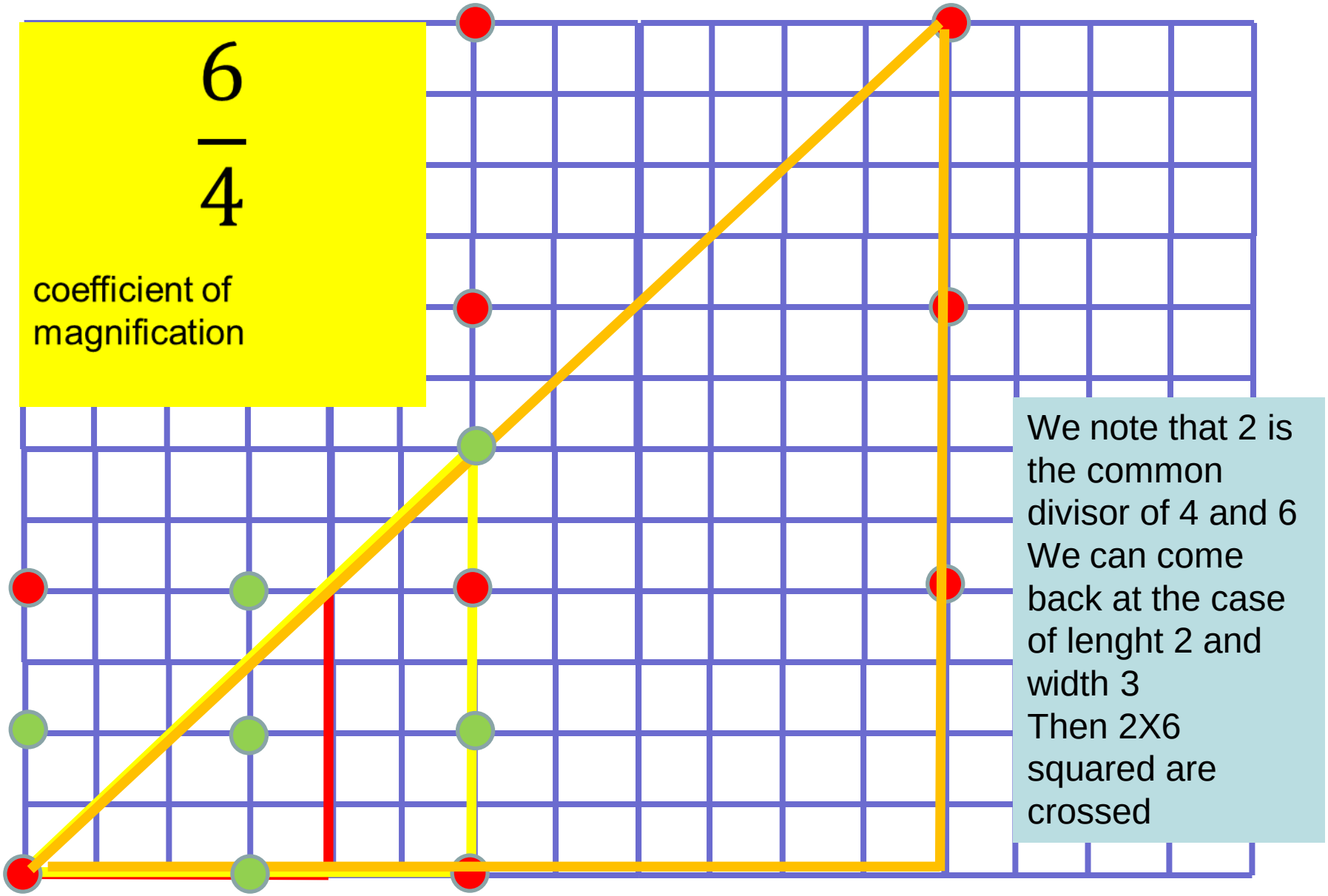
$\frac{3}{2}$

coefficient of magnification



If we want a integer we have to magnify by 2
The 3x2 squared are crossed
Note that 3 and 2 are no common divisor

If Lenght and width have common divisor ?



Try your own lenght and width !