REALISTIC MATHEMATICS EDUCATION FROM THEORY TO PRACTICE

Jasmina Milinković

The main principles of RME

P1. Real context;

P2. Models;

P3. Schematization

P4. Integrative approach

P1 Genuine realistic contexts in RME

- Source for the learning process
- Complex
- Multifaceted problems

“realistic” - “imaginable”

Dream of traveling around world

Kad od Češke podjem peške,
Mogu bez ijedne greške,
Preko Finske, preko Švedske,
Ja da stignem do Norveške.

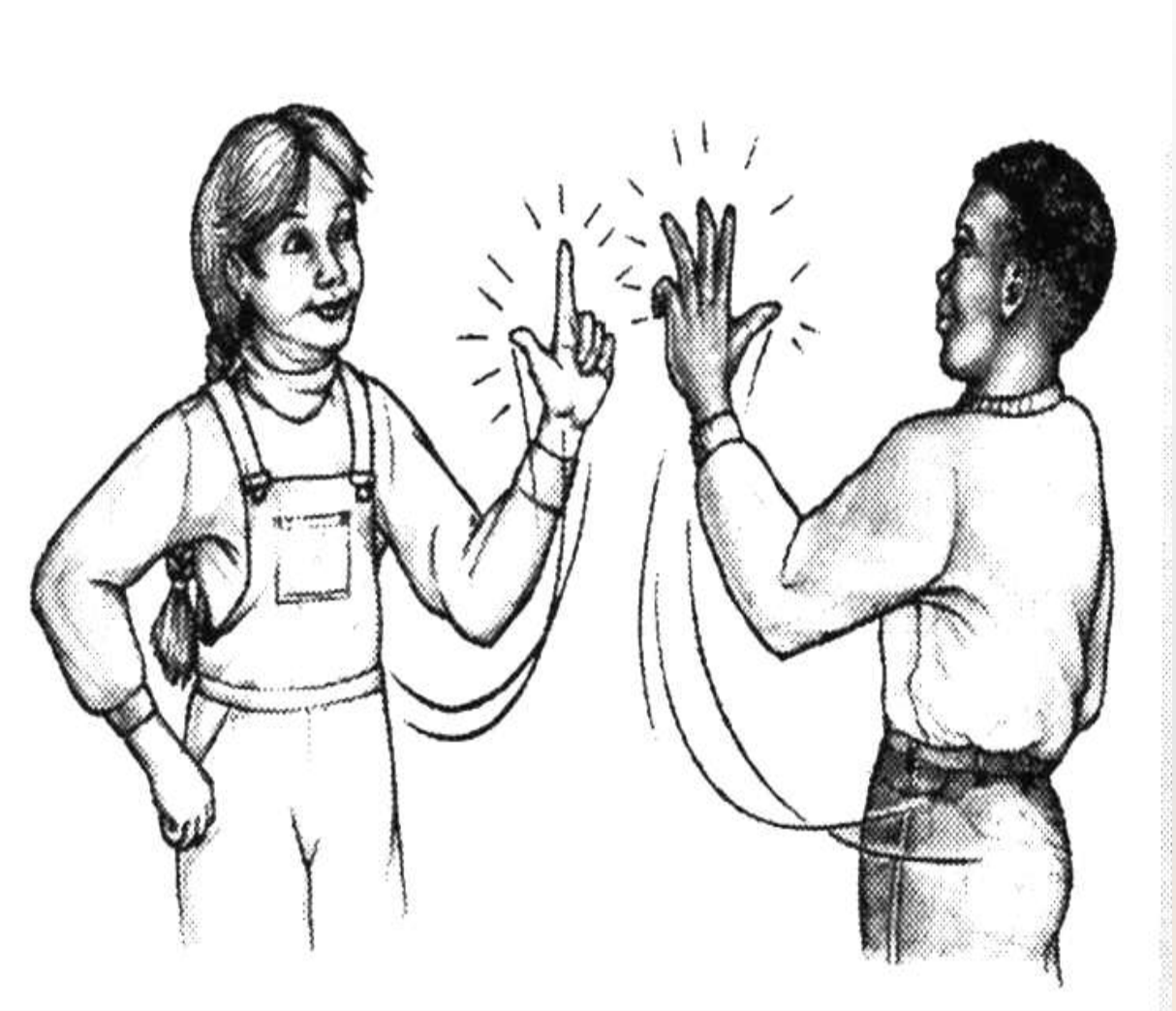
V. Binić

When you come along on foot from the Czech Republic,
I can without any error,
Through Finland, over Sweden
Get to Norway.

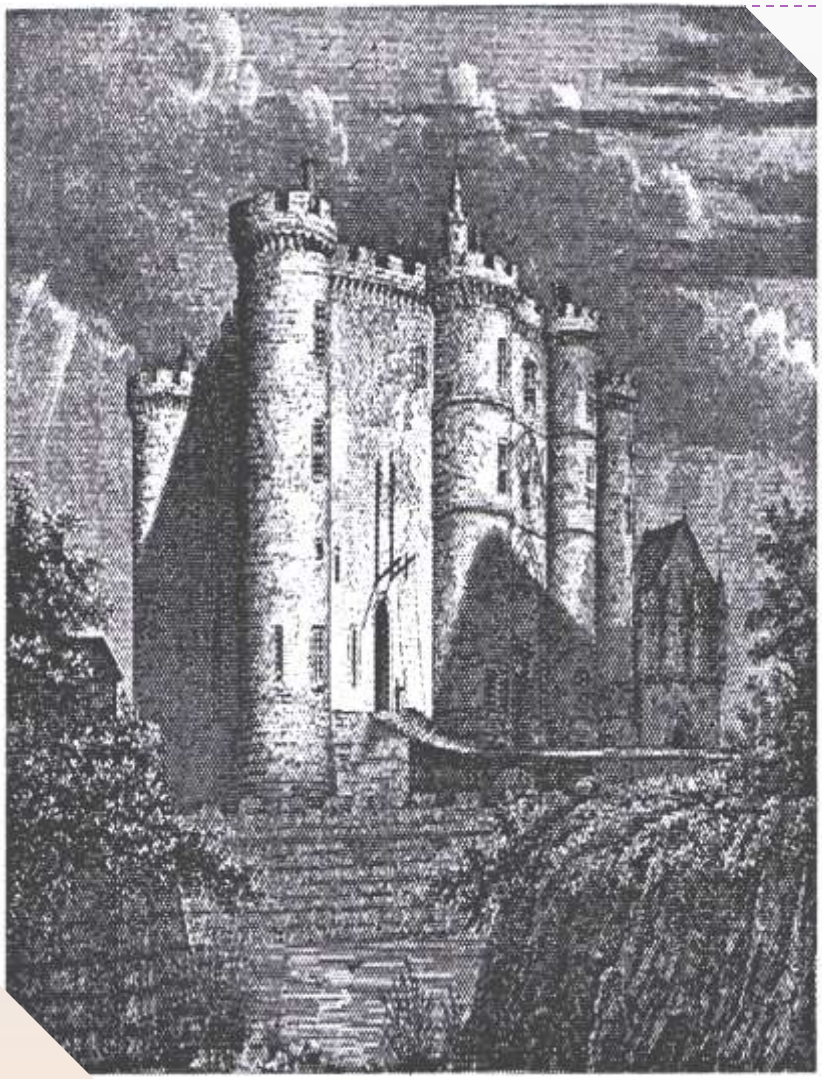
Real context for children

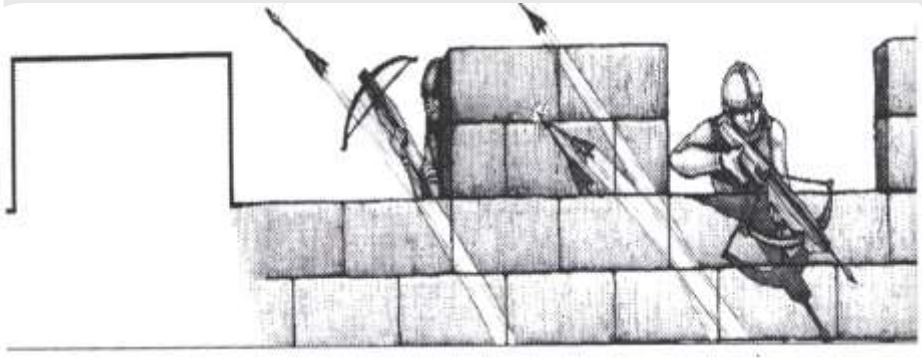
- Nontrivial
- Relevant
- Exemplary contexts:
  - everyday child's surrounding (school, home)
  - fairy tale alike,
  - science fiction movie scenarios like,
  - mathematical

Game



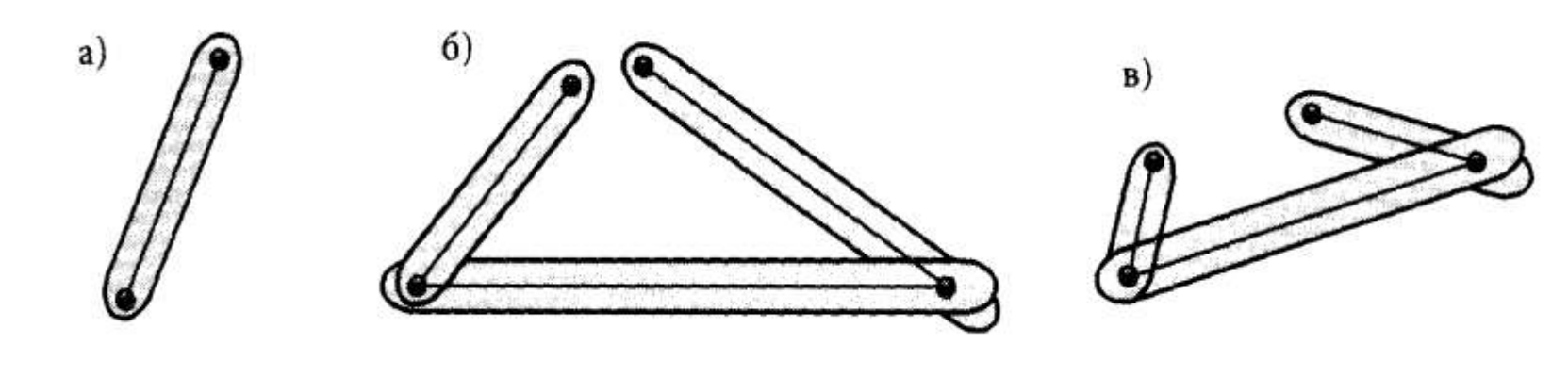
Fairy tale



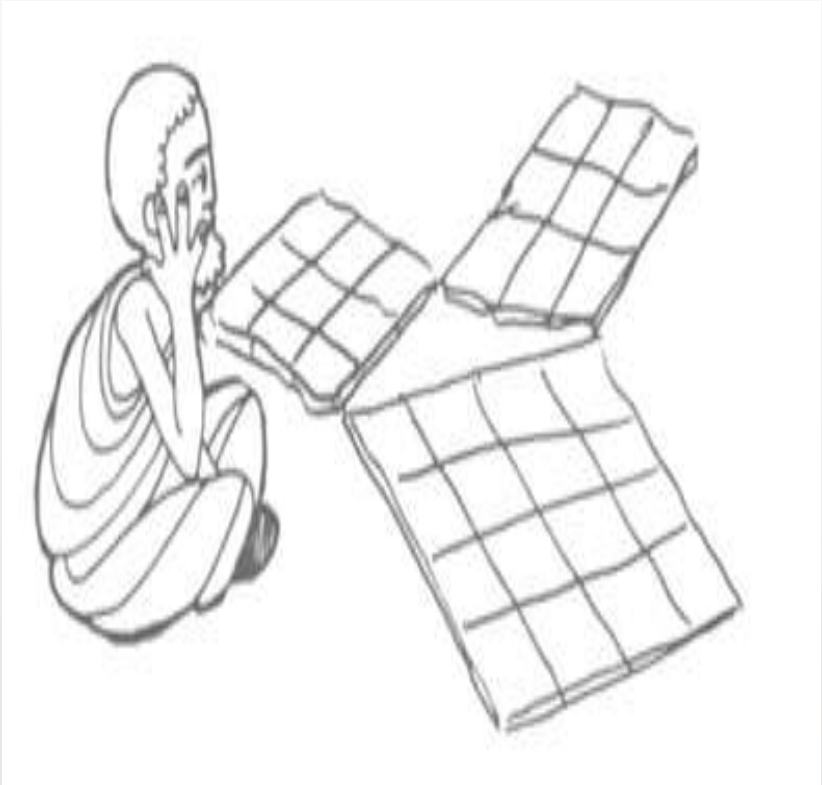


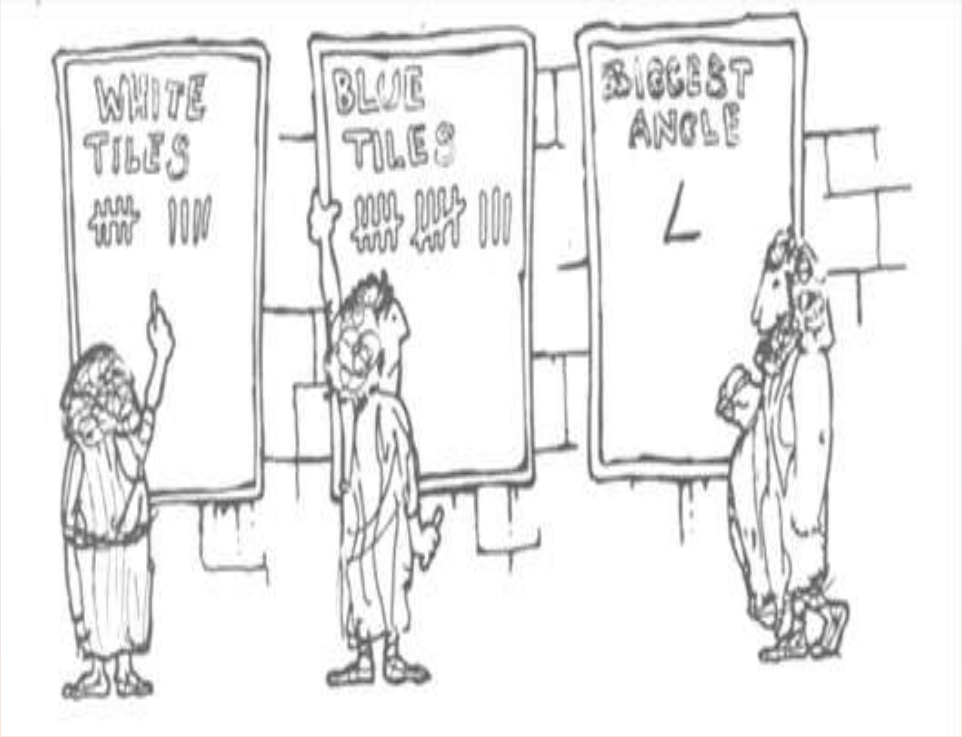
Dangler

- Can you make a triangle from any 3 segments?

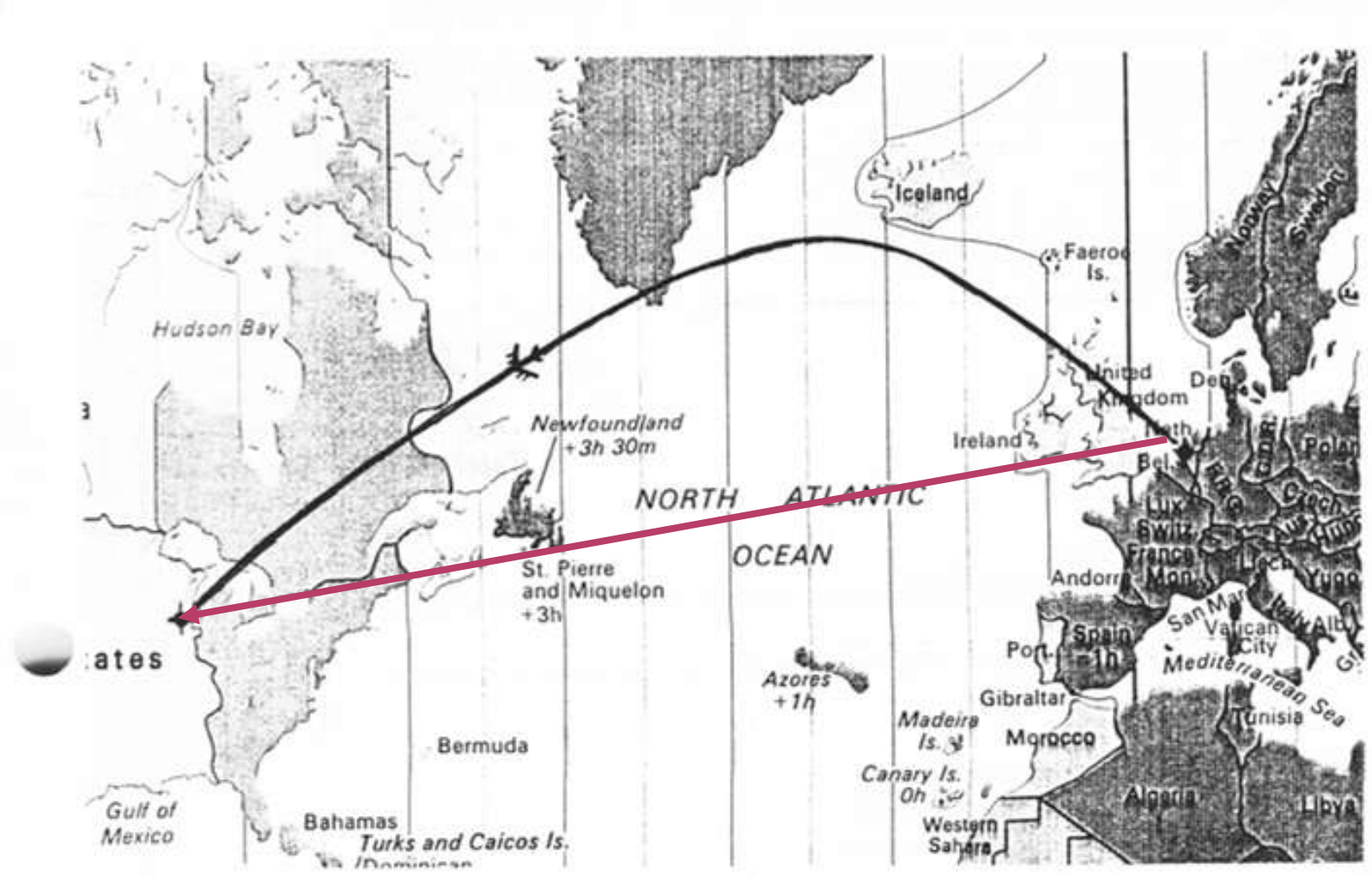


White and Blue tiles of Pythagoras

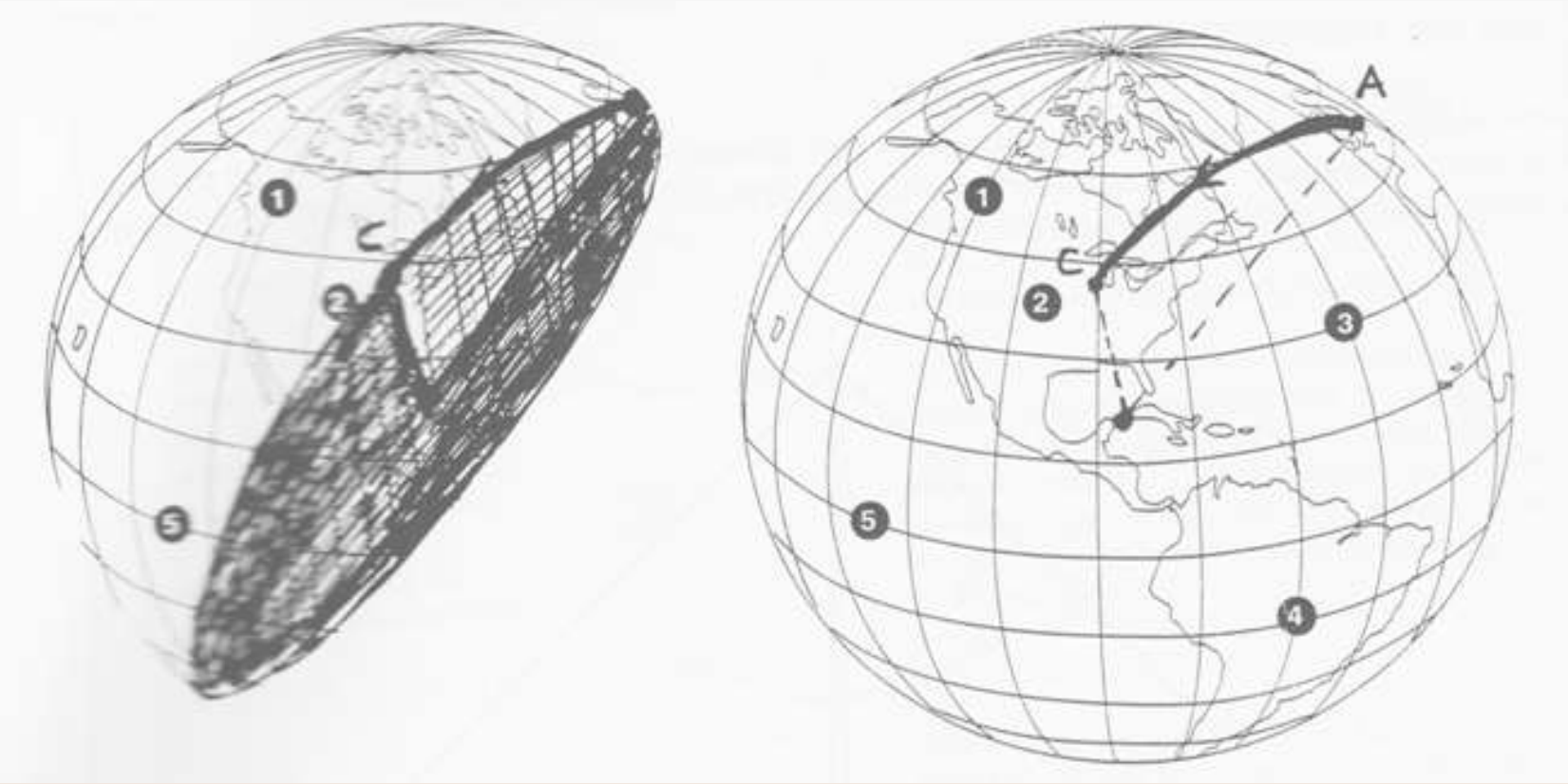




What is the shortest distance between Amsterdam and Chicago?



Arc on a Great Circle



Role of problems in real context

- First, they are used to elicit, to constitute or re-invent mathematical concepts.

- Second, problems are used to show how mathematical knowledge can be applied, used to solve real context problem situations.

P2 Schematization

- Schematization is process of gradual building up of mental schemes toward formal schemes of mathematics science.

- Schematization in mathematics is a result of mathematization.

Mathematization

- Horizontal mathematization

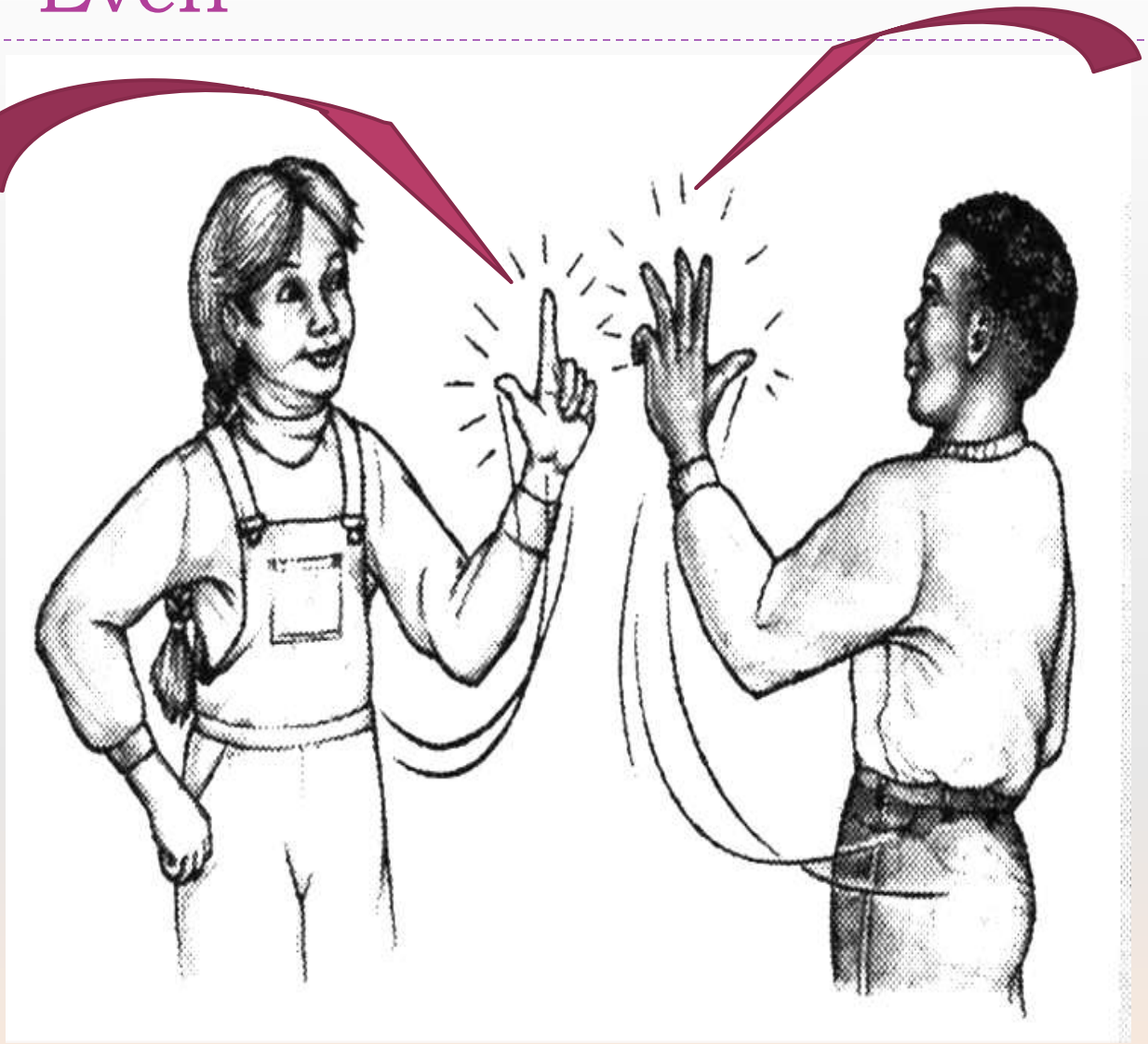
  - going from real world into world of mathematical symbols;

- Vertical mathematization

  - building up and reorganization within the mathematical structure.

Odd – Even

2



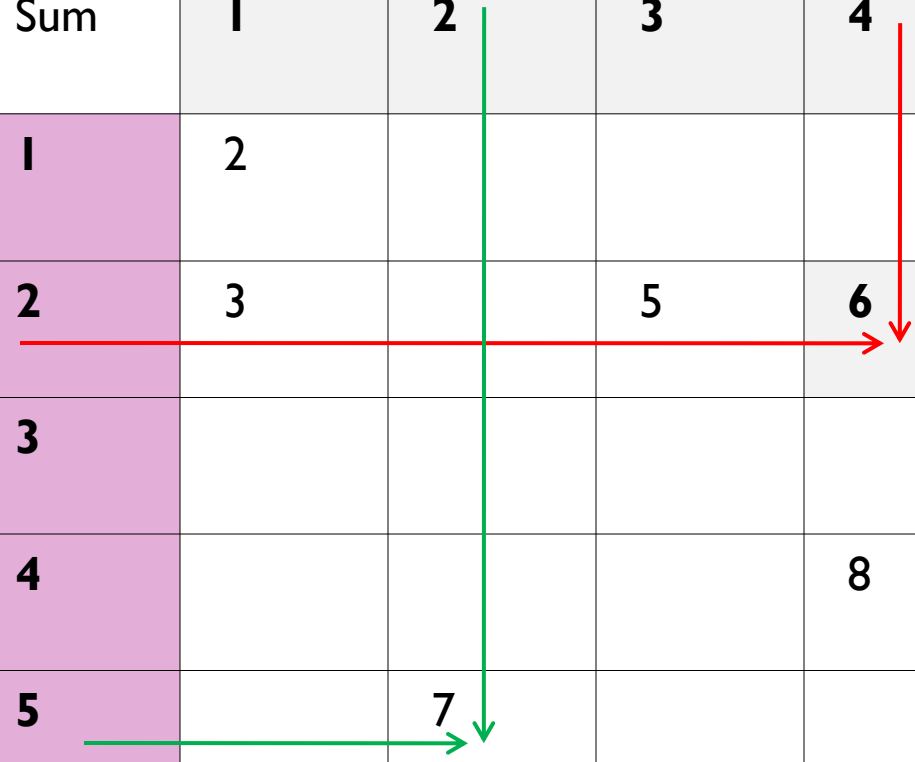
4

Oli (Odd) – Milan (Even)

- 2 plus 4 equals 6.
- 6 is even.
- Result: Milan wins.

Oli (odd) : Milan (even)

Sum	1	2	3	4	5
1	2				
2	3		5	6	
3					
4				8	
5		7			10



Oli (odd) : Milan (even)

Sum	1	2	3	4	5
1	2				
2	3		5	6	
3					
4				8	
5		7			10

Sum	1	2	3	4	5
1	M				
2	O		O	M	
3					
4				M	
5		O			M

Oli (odd) : Milan (even)

Sum	1	2	3	4	5
1	2				
2	3		5	6	
3					
4				8	
5		7			10

Sum	1	2	3	4	5
1	E				
2	O		O	E	
3					
4				E	
5		O			E

Oli (odd) : Milan (even)

Sum	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10

Sum	1	2	3	4	5
1	E	O	E	O	E
2	O	E	O	E	O
3	E	O	E	O	E
4	O	E	O	E	O
5	E	O	E	O	E

Oli (odd) : Milan (even)

- Odd 12 combinations
- Even 13 combinations

- 12 :13

- Conclusion

Sum	1	2	3	4	5
1	E	O	E	O	E
2	O	E	O	E	O
3	E	O	E	O	E
4	O	E	O	E	O
5	E	O	E	O	E

P3 Multiple models

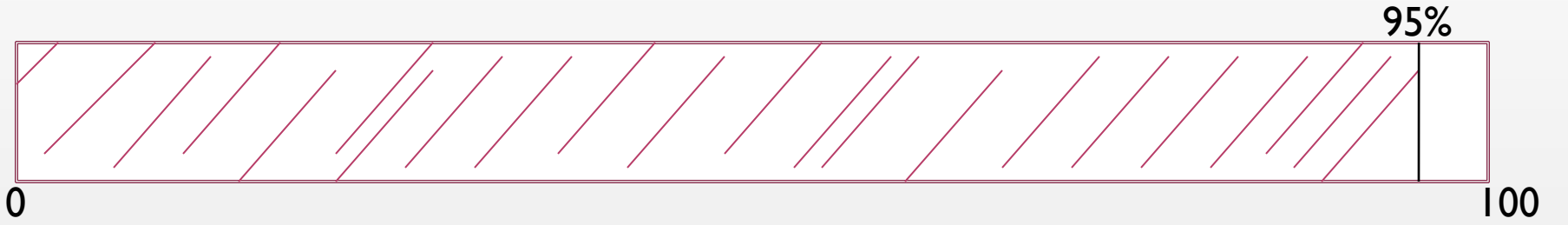
- Models are mediating tools
- Models help students to solve problems
- Models serve as didactical tools
- The result of PS process is a mathematical model.

Modeling tasks

	Task	**Feature**
Realistic modeling	Create a price structure for a taxi driver.	Open task Have to create a model Whole modeling cycle
Contextual modeling	A taxi driver has a fixed price of 2$ and the price/km is $0.15. How much costs a drive of 6km.	Word problem
Educational modeling		
Socio critical modeling		
Epistemological modeling		

Parking lot

Model for percents



0%									**100%**
0									N

Maribor Branik - Lancia

- Stadium "Ljudski vrt"
- Capacity 12 994 people

P4 Integration of mathematics

On a level of studying

- problem
- lesson
- unit
- strand
- subject
- curriculum

Connections unit

- Geometry - Number – Probability - Algebra

Activities:

- Exploring maps of various kinds
- Making decisions
- Using simple graphs
- Representing
- Concept of maximal graph

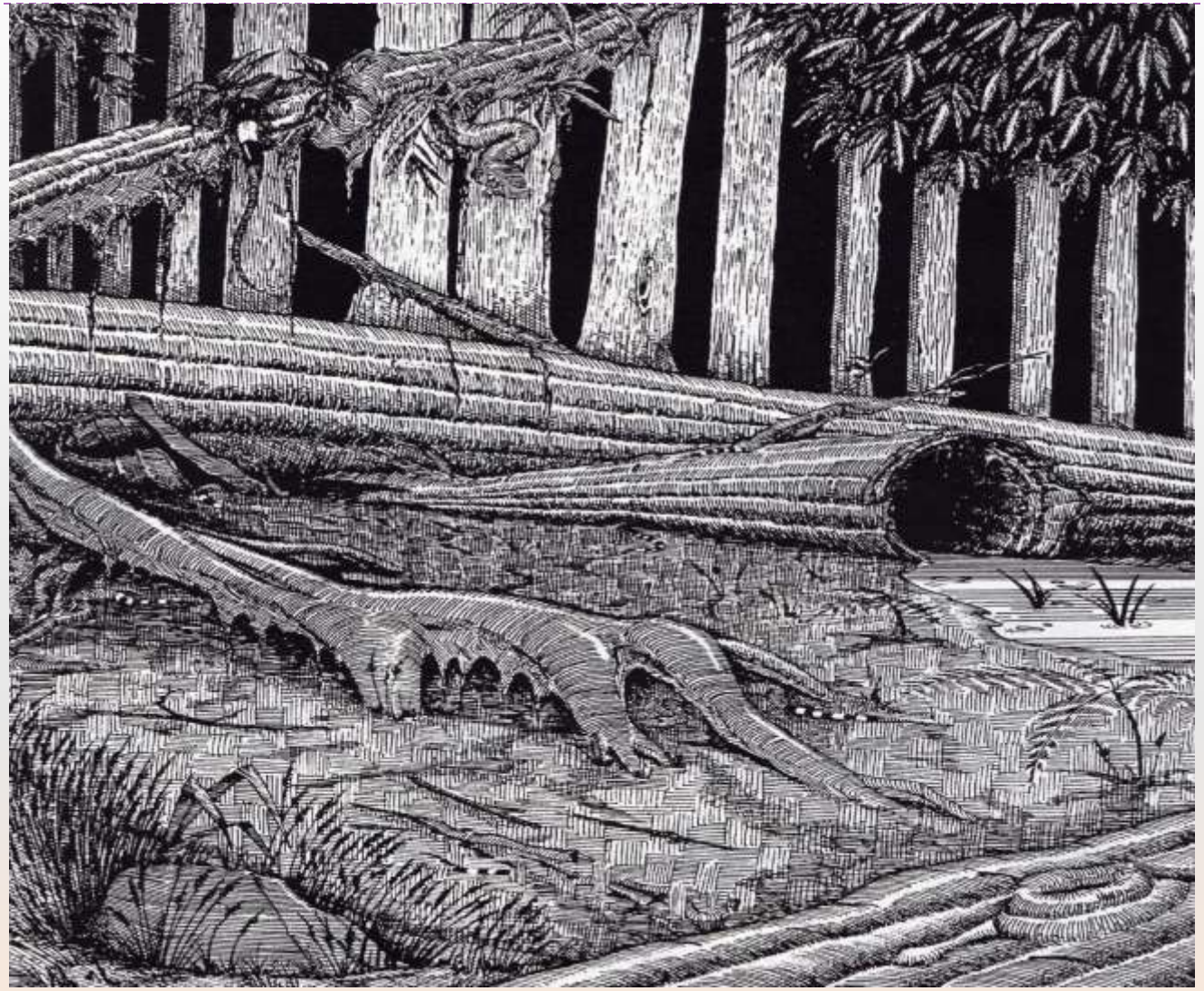
Connections

1) Connecting student's experience with math learning;
2) Connecting conceptual and procedural knowledge;
3) Connecting mathematics and other subjects;
4) Connecting mathematics concepts.

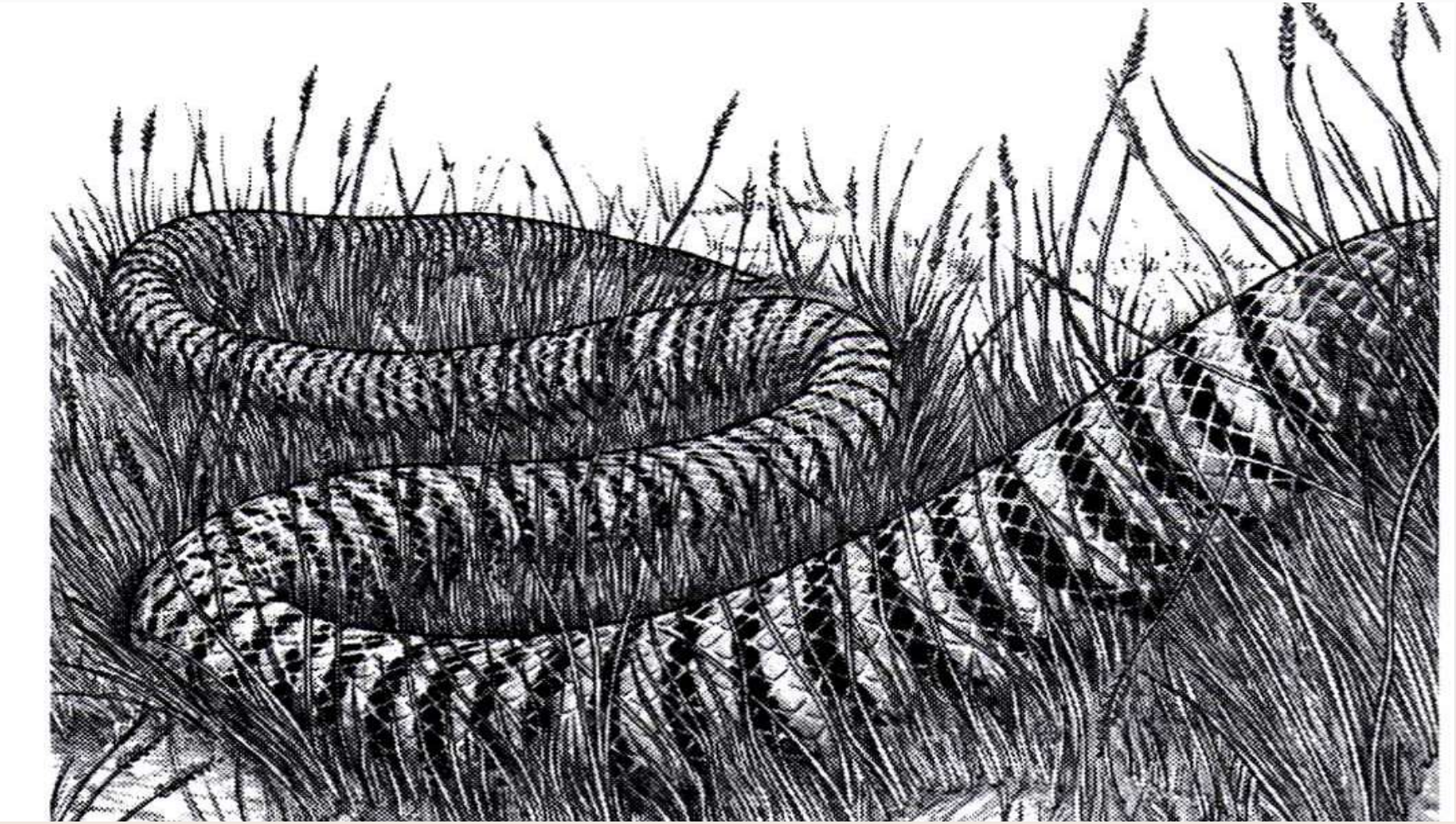
Mathematics in Context

- ✓ Math in the real world
- ✓ Math in the background
- ✓ Mathematics underlying phenomena
- ✓ Math in the environment

Snake forest



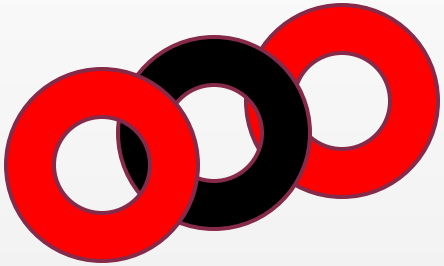
Black red rings snake

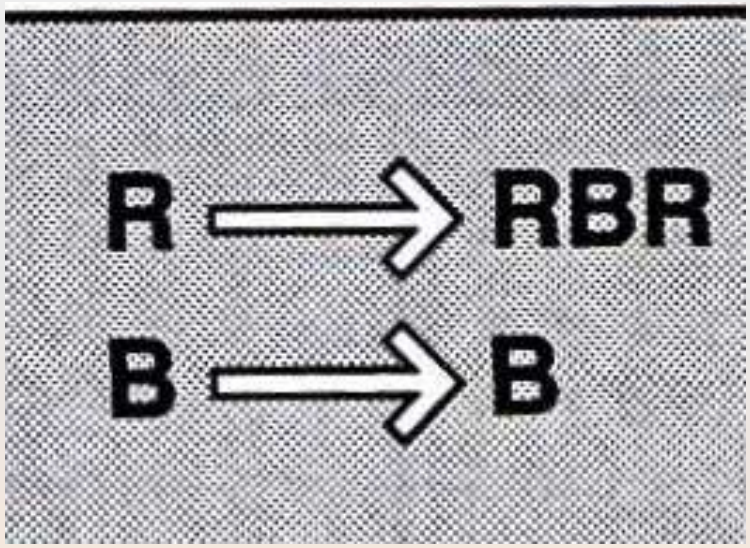


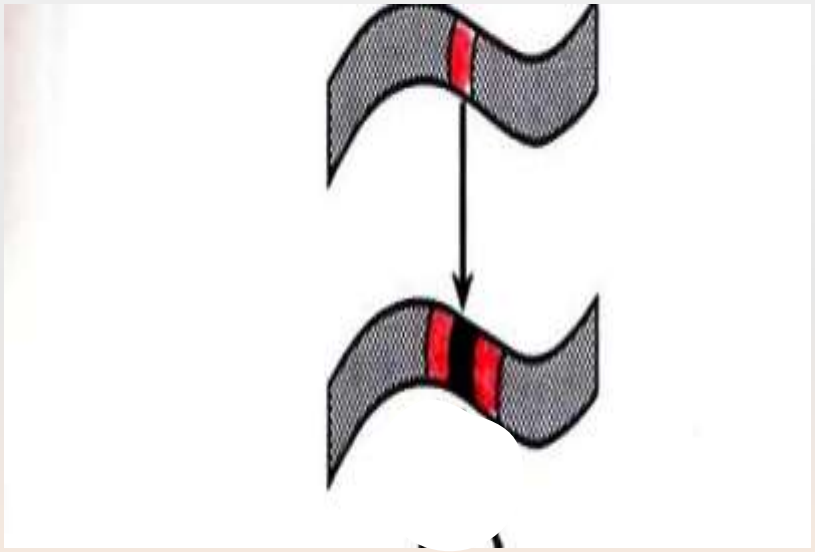
Snake growth

R - red ring

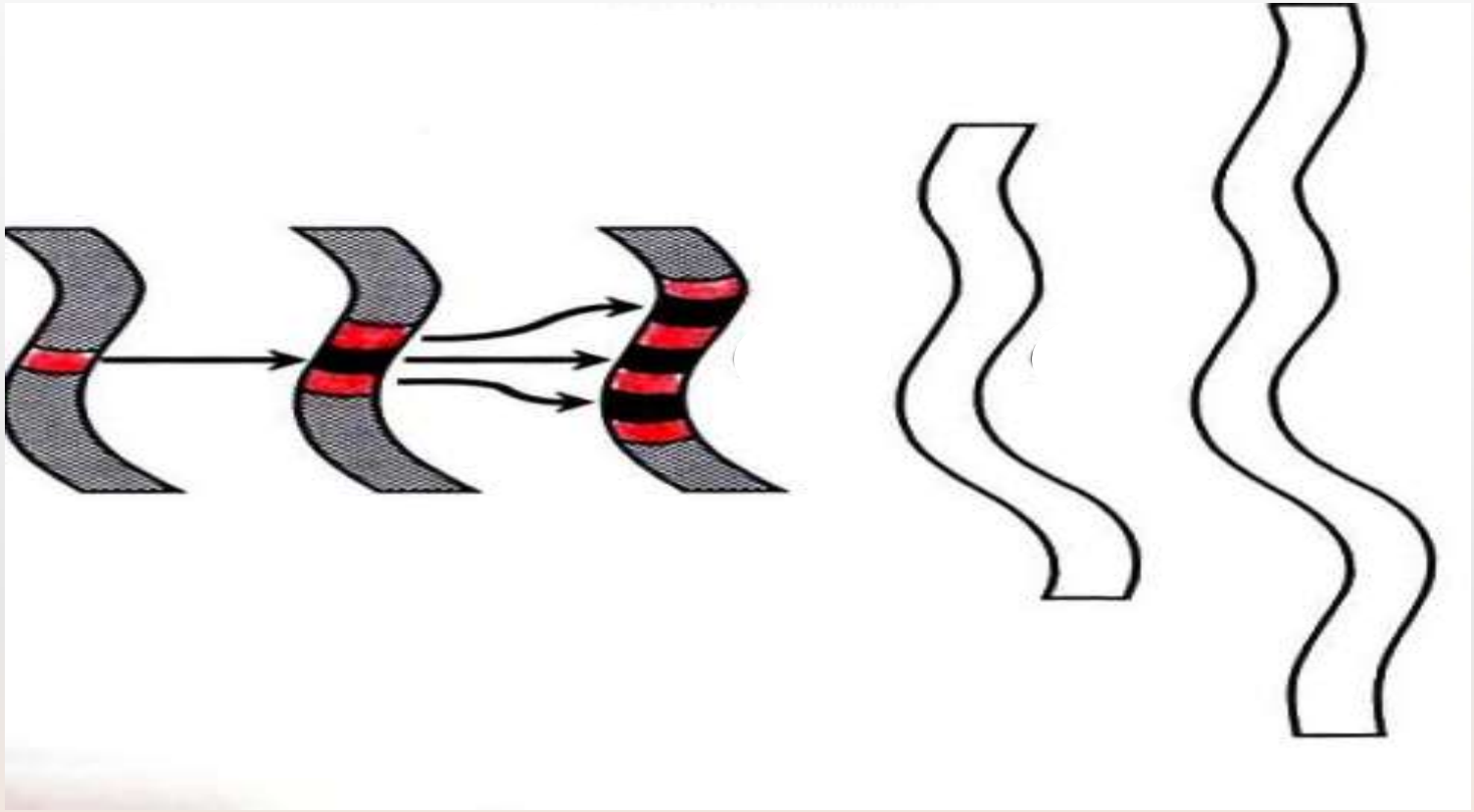
B – black ring





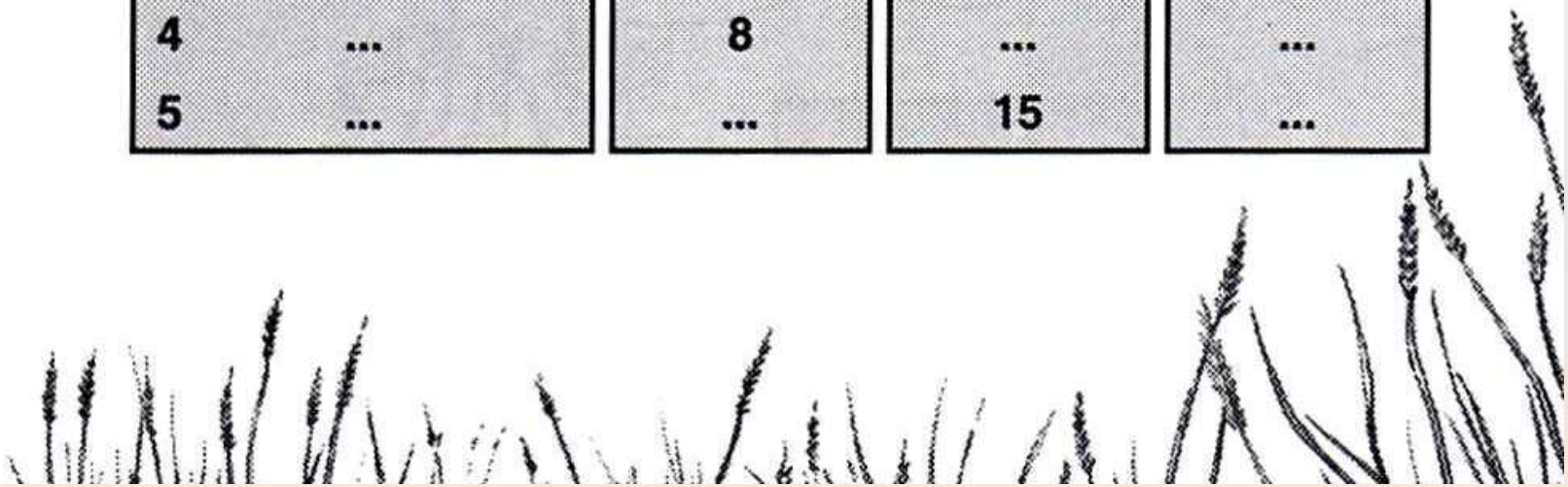


Successive strings



Number of rings in n- cycle?

	PATTERN	number of red rings	number of black rings	number of rings
1	R	1	0	1
2	RBR	2	1	3
3	RBRBRBR	4	3	7
4	...	8	...	...
5	...	...	15	...



Answer

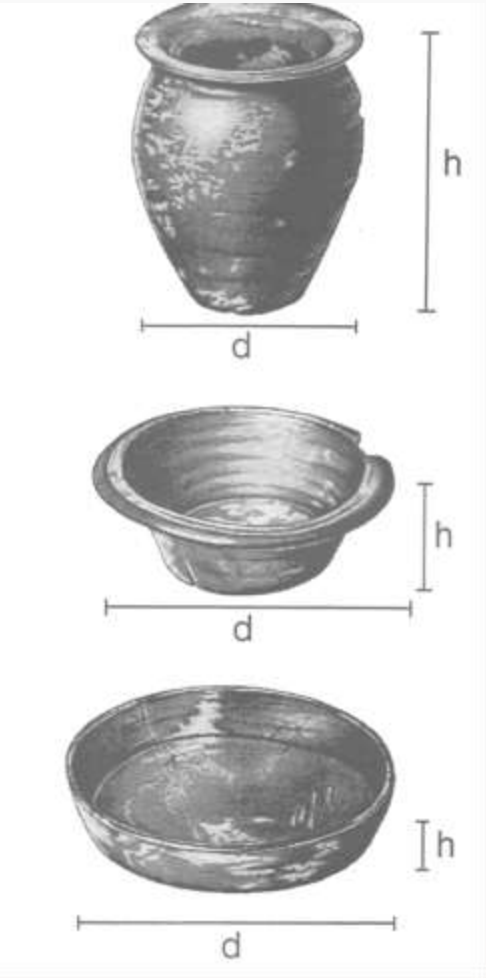
R rings	$1, 2, 4, 8, \ldots, 2^{n-1}$
B rings	$0, 1, 3, \ldots, 2^{n-1} - 1$
Total	$1, 3, 7, \ldots, 2^{n} - 1$

2^{n-1}

Pottery: Form and Shape

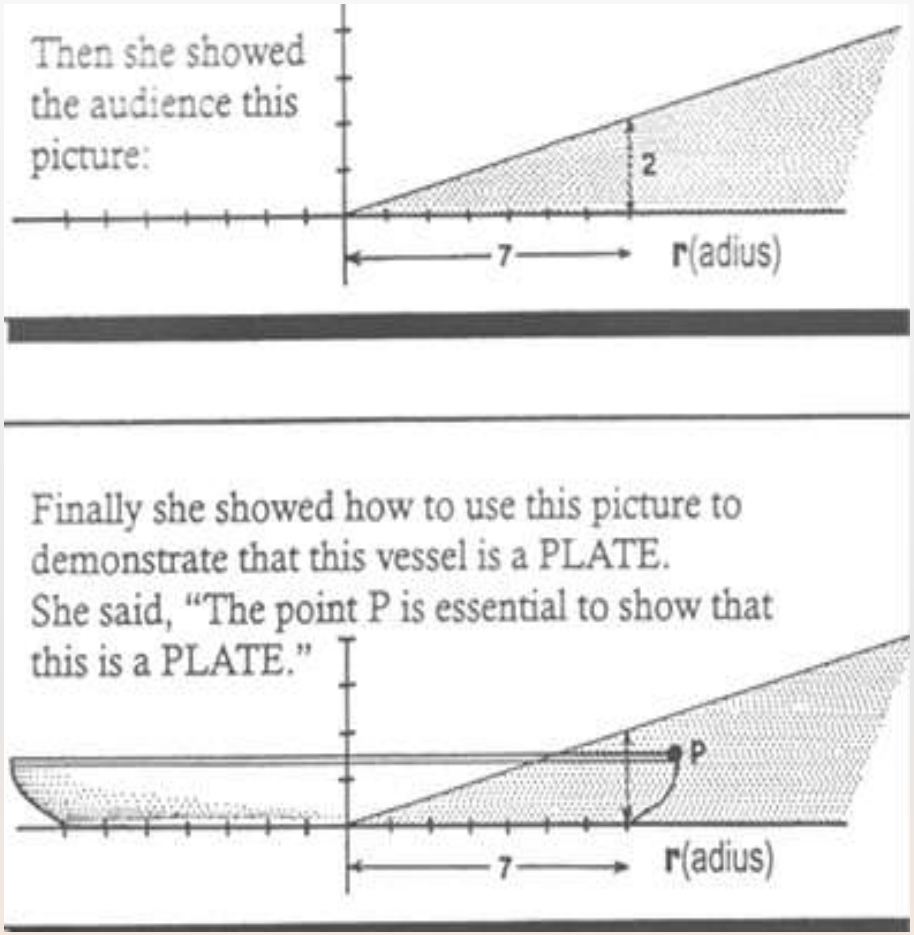
- Archeological situations
- Statistics
- Classification and pattern matching
- Combining knowledge of ratio and geometry

Webster's classification system

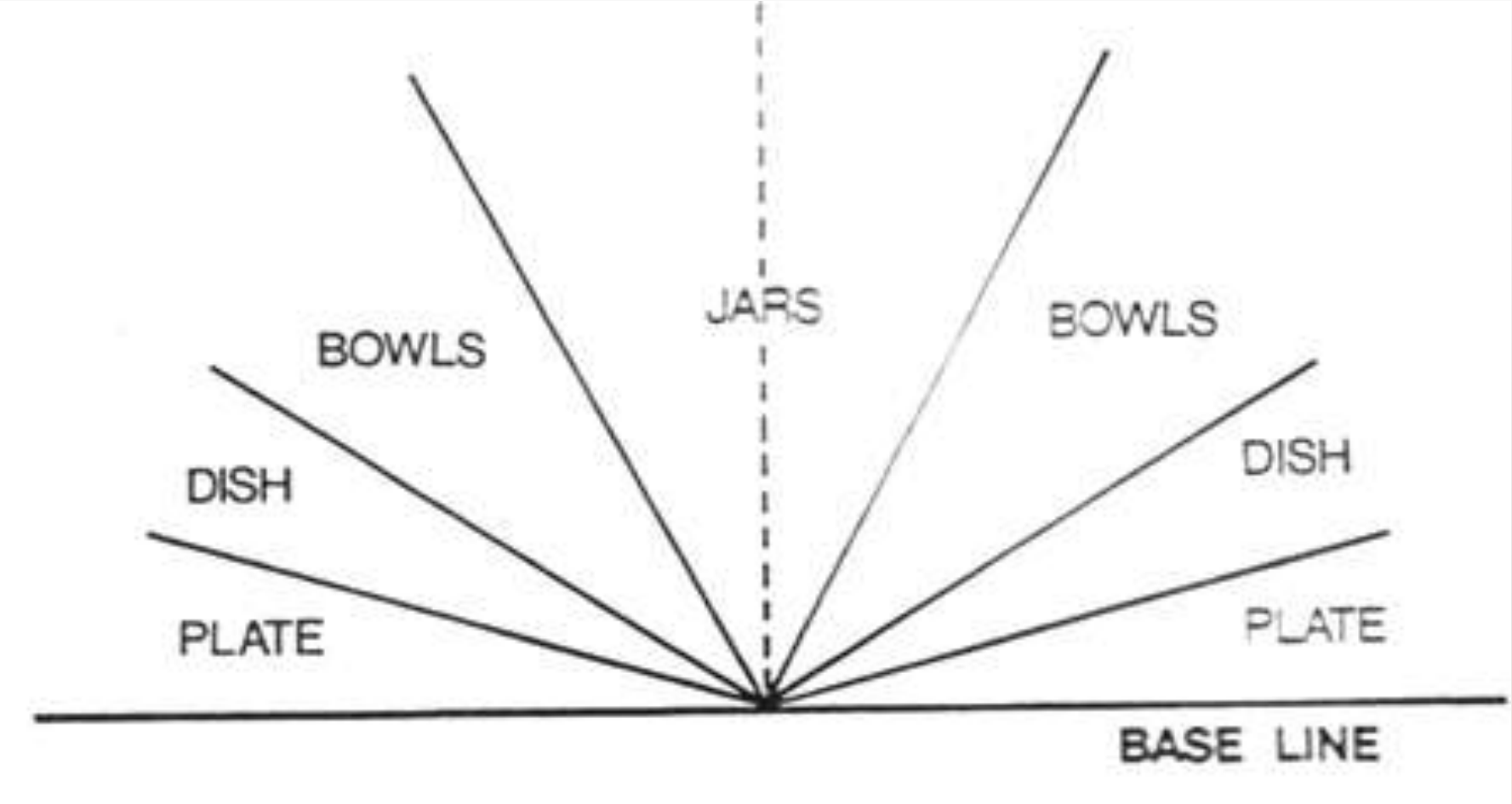


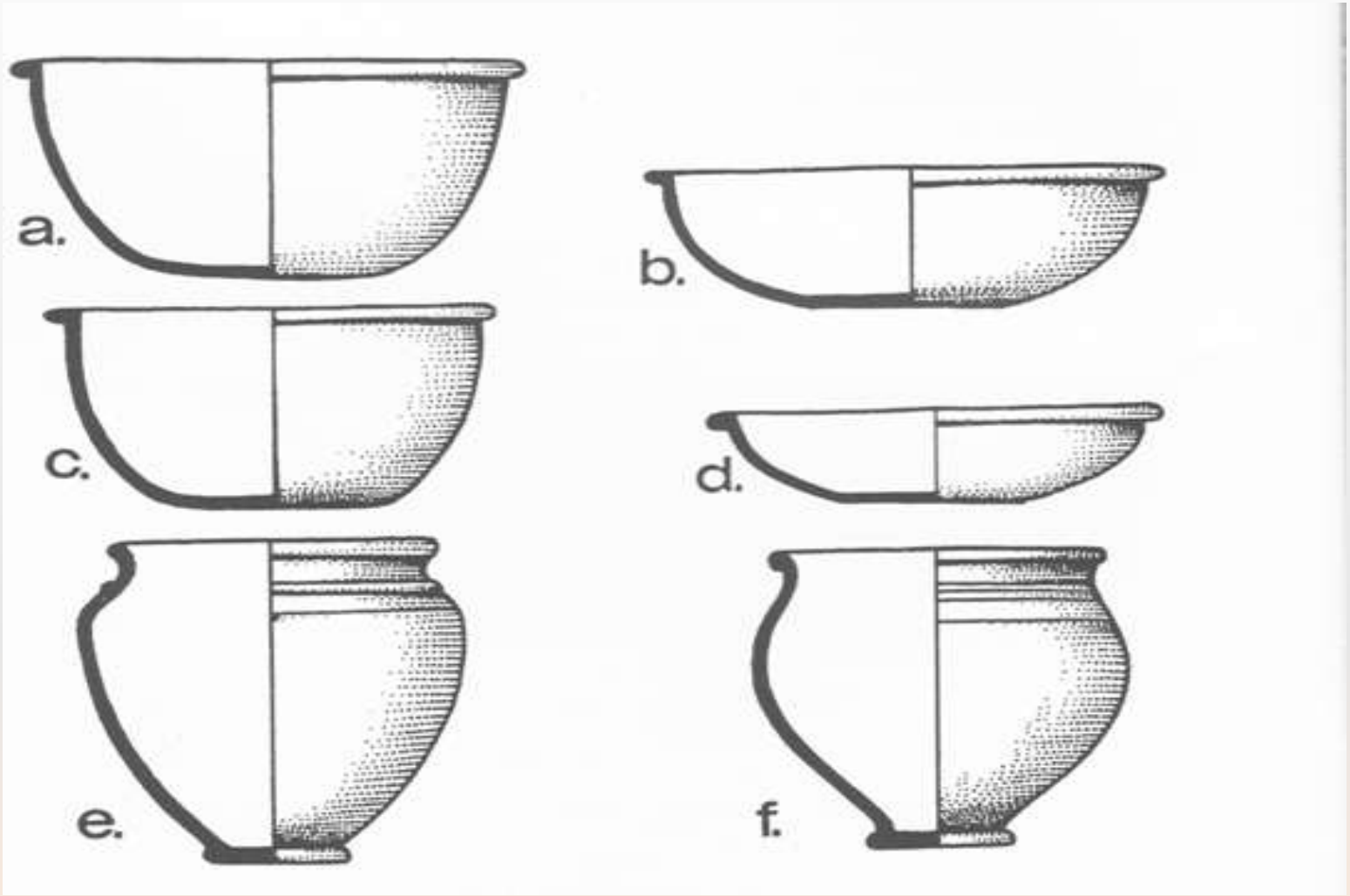
How do you think the information in the pictures could be used to classify these vessels?

Jar or Plate or Bowl or Dish or Plate?



h(eight) ≤ 2/7 r(adius)


JARS
BOWLS
BOWLS
DISH
DISH
PLATE
PLATE
BASE LINE


a.
b.
c.
d.
e.
f.

Implementation of RME in classroom

1)What is teacher role in RME classroom?

2) What teaching methods should they use?

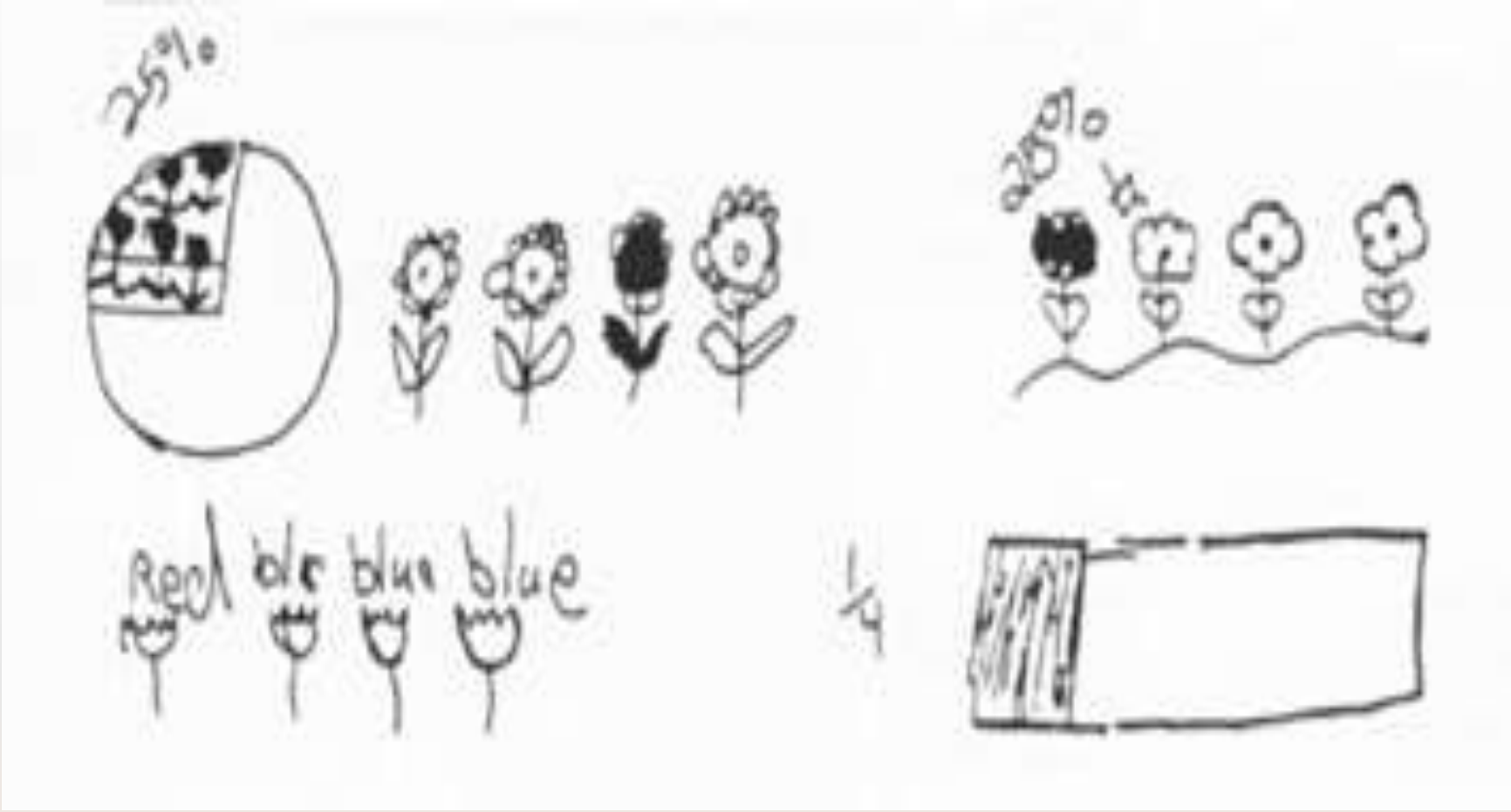
3)What educational materials should be used?;

4) How to assess students progress?

What is teacher role in RME classroom?

- Planner
- Facilitator
- Organizer
- Coordinator
- Evaluator
- Assessor

Make a drawing to express that 25 percent of the flowers are red.

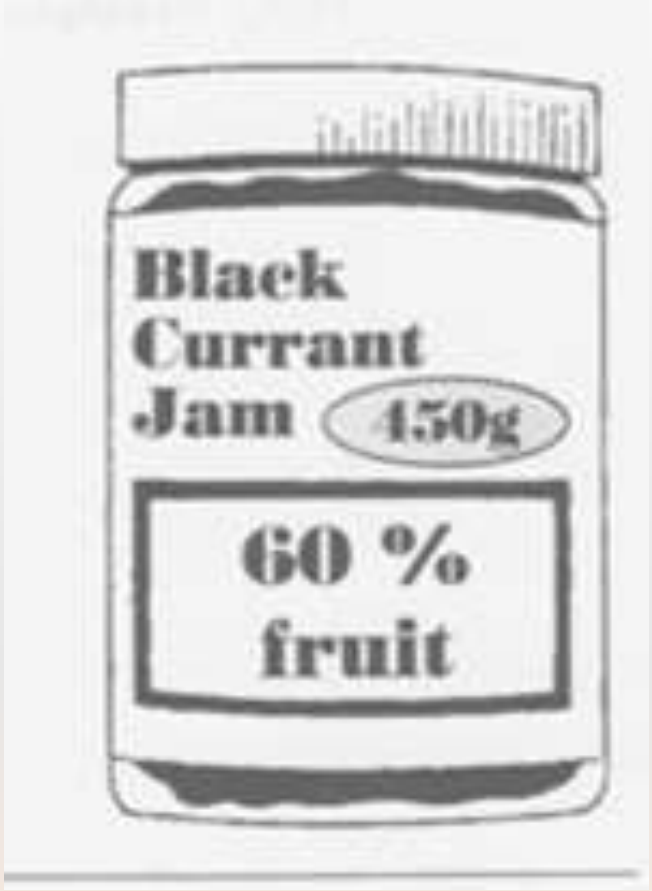


How to assess students progress?

- Multiple sources of information on students' understanding and performance.
- The purpose : to gain information about development of structure of mathematical knowledge.

Assessments on percents

- How many grams of fruit does this jar contain? Show how you got your answer.



Parking lot

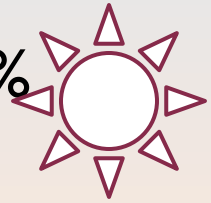
1. Which parking lot is more full?
2. Figure out for each parking lot whether the red light is on or not? Explain…

PARKING LOT A

Total space 200

Occupied 183

90%

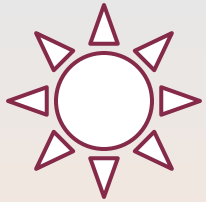


PARKING LOT B

Total space 300

Occupied 255

90%



Which ad do you think The Yamm company would use?

- The Yamm Company
- Yamm bar $1
  Yammy bar $1.25

Ideas for an advertising campaign:

The students' profile:

1) How does he solve (meaningful) mathematical problems;
2) How does she communicate ideas (use mathematical language);
3) How does he reason mathematically;
4) Does she make connections between mathematics and other domains, and everyday life;
5) What does he understand about mathematical concepts and procedures;
6) What is her disposition toward mathematics (creativity, interest, confidence).

Shortcomings of RME

- attachment to the contexts and models
- difficult transfer
- lack of time for practicing and memorizing mathematical procedures
- simultaneous multiple concepts
- delayed transition to abstract concepts
- importance of the structure of the staff in school
- importance of professional qualifications of teachers
- RME is technically and time demanding

Materials revised for this presentation come from:

- Field test version of *Mathematics in Context*, published by Encyclopedia Britannica Corporation
- Materials for workshops organized for teachers involved in the field testing of MiC.
- Mathematics for IV grade, textbook published by Kreativni Centar, Beograd

Time for your questions

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