

GOOD PRACTICE EXAMPLE · GRADE 8 · MATHEMATICS

Development of the Concept of Number

A square garden's missing side opens the door to five number sets

Maria Docheva · Plovdiv Language High School, Bulgaria

AI Navigators Project, Syndicate Education Podkrepa



About the Lesson

Teacher, school, subject, grade and duration



Learning Objectives

What students should be able to do afterward



Lesson Flow

Five phases - from a square garden to the real numbers



AI in Action

Four AI tools and the real products used in class



Results & Reflection

What the lesson showed and why it was selected

About the Lesson



TEACHER

Maria Docheva



SCHOOL

Plovdiv Language High School, Bulgaria



SUBJECT & TOPIC

Mathematics - Development of the
Concept of Number



GRADE

8th grade (14–15 years old)



DURATION

45 minutes



CURRICULUM LINK

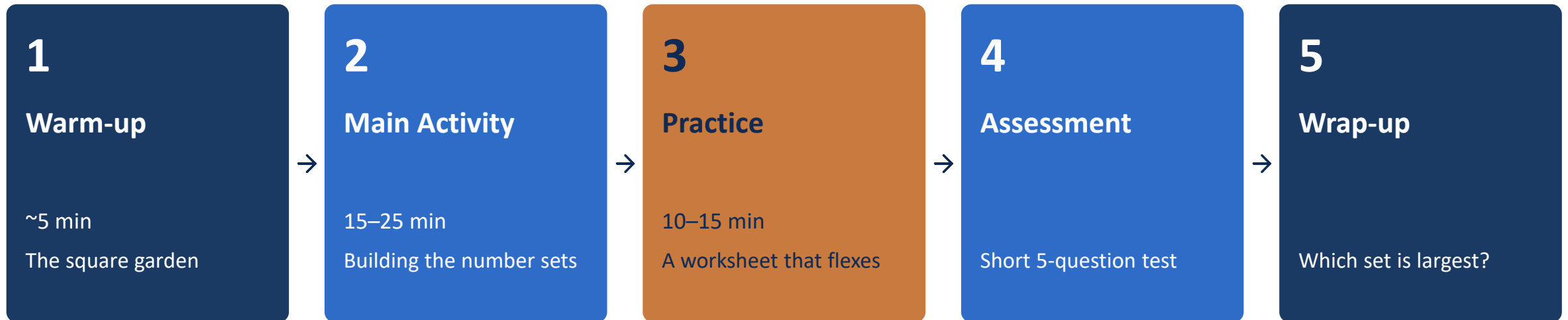
Number sets: natural, integer, rational,
irrational, real



What Students Achieve

- 1 Recognize and classify numbers as natural, integer, rational, irrational or real by the end of the lesson.
- 2 Explain, through examples like $\sqrt{2}$ and negative numbers, why the concept of number had to keep expanding.
- 3 Order numbers on the number line and identify which sets each one belongs to.
- 4 Solve short number-classification tasks with at least 80% success.

v2



Four different AI tools support this single 45-minute lesson - each with a distinct, well-defined role.



FOUR AI TOOLS · ONE 45-MINUTE LESSON

From a Square Garden to the Real Numbers

What follows: how each of the five phases actually unfolded in Maria Docheva's classroom.

The Square Garden

Tool: ChatGPT



A practical problem, posed before any definition of $\sqrt{}$: *a square garden has an area of 50 m^2 . Let the side be a . Then $a^2 = 50$, so $a = \sqrt{50}$ - a number that isn't whole, and can't be written as a simple fraction.*

The bridge to a new kind of number

Students try to pin down $\sqrt{50}$ as a fraction and can't. The teacher names what just happened: mathematics has run out of room before - first with debts and cold temperatures (integers), then with sharing and measuring (fractions) - and it's just run out again. That gap is where irrational numbers, and the rest of the lesson, begin.

A Real-World Task, Written with AI

Tool: ChatGPT

Purpose of using AI: generating a concrete, real-world scenario that leads students to a square root - and to numbers beyond the rationals - without starting from a dry, formal definition.

”

Give a practical task that leads to a square root.

The real prompt used by the teacher



Building the Number Sets



Mapping the Number Sets (5 min)

A step-by-step diagram of the expansion $N \subset Z \subset Q \subset R$, each new set built to solve a problem the last one couldn't.



Negative Numbers, Fractions, Irrationals (10 min)

Concrete examples anchor each set: debt and freezing temperatures for negative numbers, sharing food for fractions, $\sqrt{2}$ for the irrationals.



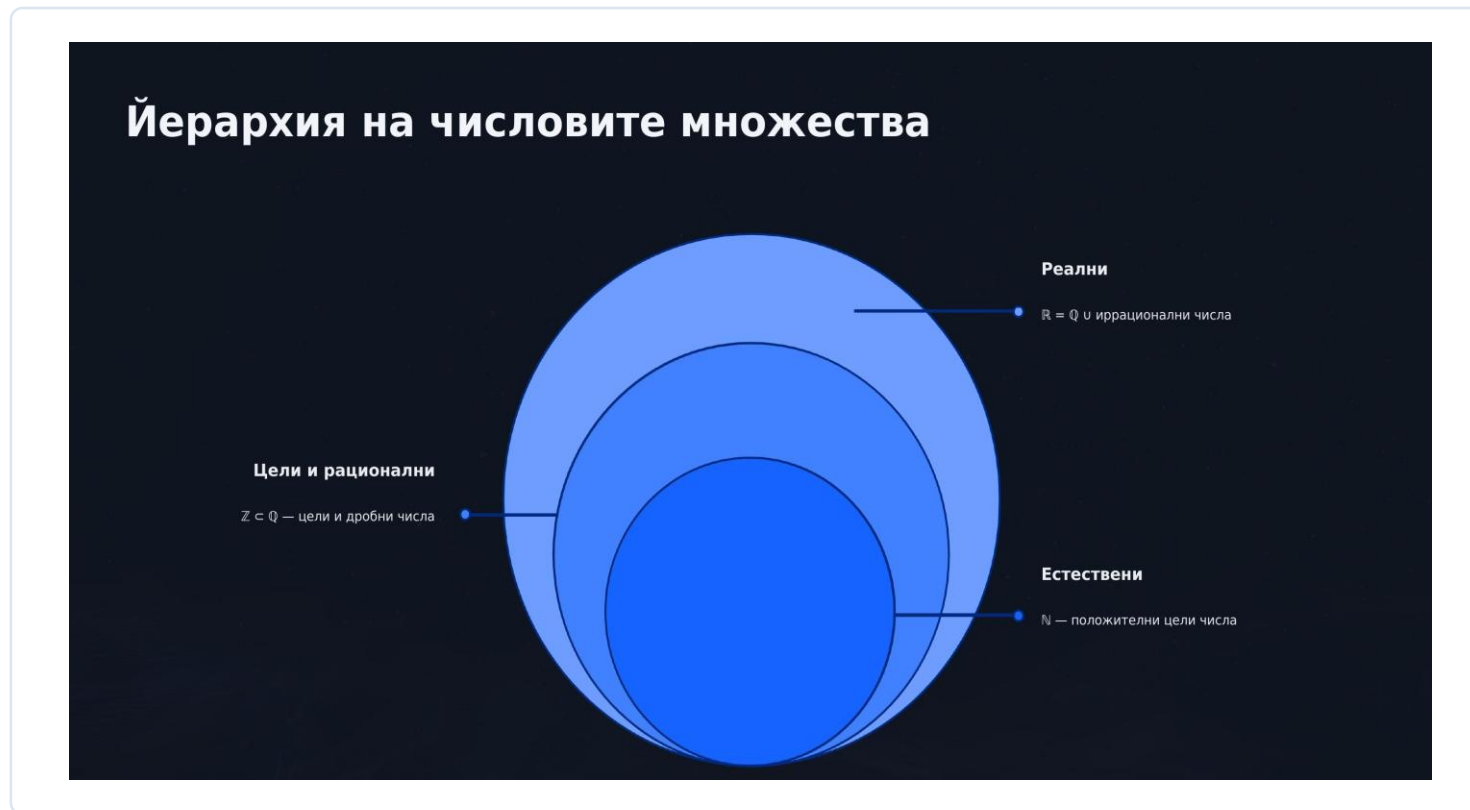
Working the Number Line (5–10 min)

Students place different numbers on a shared number line, then answer quick oral questions to check their understanding.

A Presentation Built by AI

Tool: Gamma

The teacher used Gamma to turn the lesson's structure into a full classroom presentation - including this hierarchy diagram, showing exactly how each number set nests inside the next.



Development of the Concept of Number, Visualized with AI



An AI-Illustrated Story of Number

Beyond the presentation and the infographic, the teacher also had AI generate a short illustrated story - “Beyond Reason: The Story of Impossible Numbers” - tracing the idea of number from counting sheep to $\sqrt{2}$, π and e .



Pages from the AI-illustrated story, “Beyond Reason: The Story of Impossible Numbers”



A Worksheet That Flexes

Tool: ChatGPT

Core Task

Classify given numbers, fill in the missing sets on the diagram, and order numbers by size — the same worksheet every student starts from.

Extra Support

Guiding questions break the classification task into smaller steps for students who find it difficult.

Extra Challenge

Proof-style problems and trickier irrational-number examples stretch the students who are ready to go further.

AI (ChatGPT) generated both the guiding questions and the challenge problems, so every student works the same worksheet at their own level.



A Short Test, Five Questions

Method: a short test (5 questions), plus oral questions throughout the lesson.

AI support: ChatGPT generated the test questions.

Evidence of learning: correct classification of numbers, a clear explanation of the difference between rational and irrational numbers, and at least 3 of 5 tasks solved correctly.



What Remains After the Lesson



Generated with AI

- Practical warm-up task - ChatGPT
- Classroom presentation - Gamma
- “Development of Number” infographic - AI image generation
- Illustrated story of number - AI image generation
- Worksheet & test questions - ChatGPT



Traditional materials

- Textbook
- Notebook
- Board

Which Set Is Largest?

The teacher's summary: a quick round of questions ties the lesson together - “Which number set is the largest?” “Where does $\sqrt{2}$ belong?” - pulling every set from natural to real back into one picture.

Homework: the assigned textbook problems, plus one extra task: give an example of your own for each number set.

$\sqrt{2}$

TEACHER REFLECTION

” *Students participated actively.*

Irrational numbers were the sticking point - a sign, the teacher noted, that this first concrete encounter with $\sqrt{2}$ needs a second, more hands-on pass before it fully lands. ChatGPT, Gemini, Canva and Gamma turned one square garden into a guided tour through five different kinds of number.

— **Maria Docheva**

Why We Chose This Lesson



One Problem, the Whole Curriculum

A single square garden opens onto the entire number-sets curriculum - natural through real - instead of five abstract definitions introduced cold.



AI Across the Full Toolkit

Four different AI tools - ChatGPT, Gemini, Canva and Gamma - each play a distinct role in one 45-minute lesson: task design, visual explanation, and differentiated practice.



Practice That Flexes Both Ways

The same worksheet stretches in both directions, with AI-generated guiding questions for students who struggle and proof-style challenges for those ready to go further.

$\sqrt{2}$

Thank you for your attention!

Lesson: Development of the Concept of Number · Maria Docheva, Plovdiv Language High School, Bulgaria