

WHEN COMPUTATIONAL THINKING MEETS MATHEMATICS

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DigiMaths 4 ALL

A TECHNOLOGY-ENHANCED APPROACH TO STRENGTHENING MATHEMATICAL PROBLEM SOLVING IN PRIMARY EDUCATION

Computational Thinking (CT) and mathematical problem solving

Mathematical problem solving requires more than performing calculations. When solving word problems and other complex tasks, students must:

Interpret information
Identify relevant relationships
Organize solution strategies
Evaluate results

Decomposition
Abstraction
Algorithmic thinking
Debugging

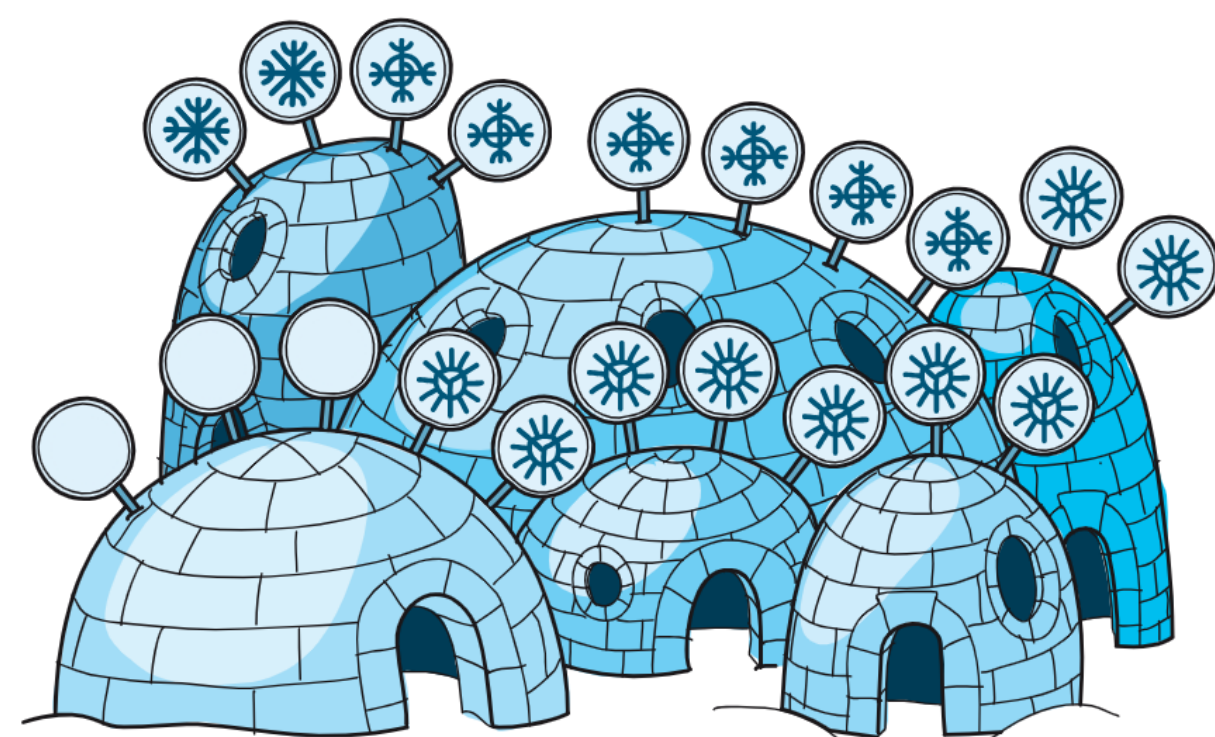
These cognitive demands closely resemble core CT processes, suggesting that **CT** may support **mathematical problem solving**.

CT AS COGNITIVE SCAFFOLD FOR MATHEMATICAL PROBLEM SOLVING...

Designing tasks for mathematical problem solving

A key contribution of DigiMaths4All is its task-design framework, which systematically integrates mathematical problem solving with Computational Thinking (CT). The framework combines mathematics tasks with CT tasks targeting decomposition, pattern recognition, algorithmic thinking, and debugging. Carefully sequenced activities create explicit connections between these domains, allowing pupils to practise CT processes that support mathematical reasoning.

Three types of decorative snowflakes have different prices:
❄ - 50 c, ❄ - 1 € and ❄ - 3 €. You have 18 € to spend in total.
Decorate the castle so that you spend the same amount of money on each type of snowflake.



For the 150th anniversary of Mikalojus Konstantinas Čiurlionis, the factory "Rūta" produced bulk candies. 0,5 kg of candies with Čiurlionis' artworks costs 12,50 €.

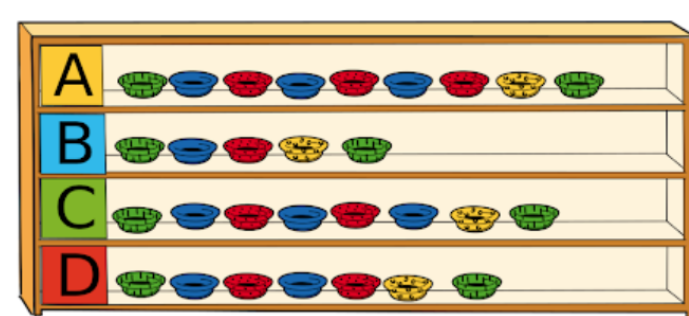
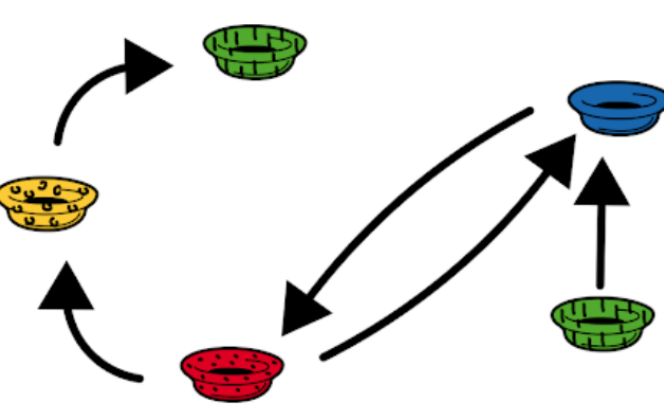
How much do 250 g of these candies cost (€)?

Check your answer.
You said candies cost 12,50 €.

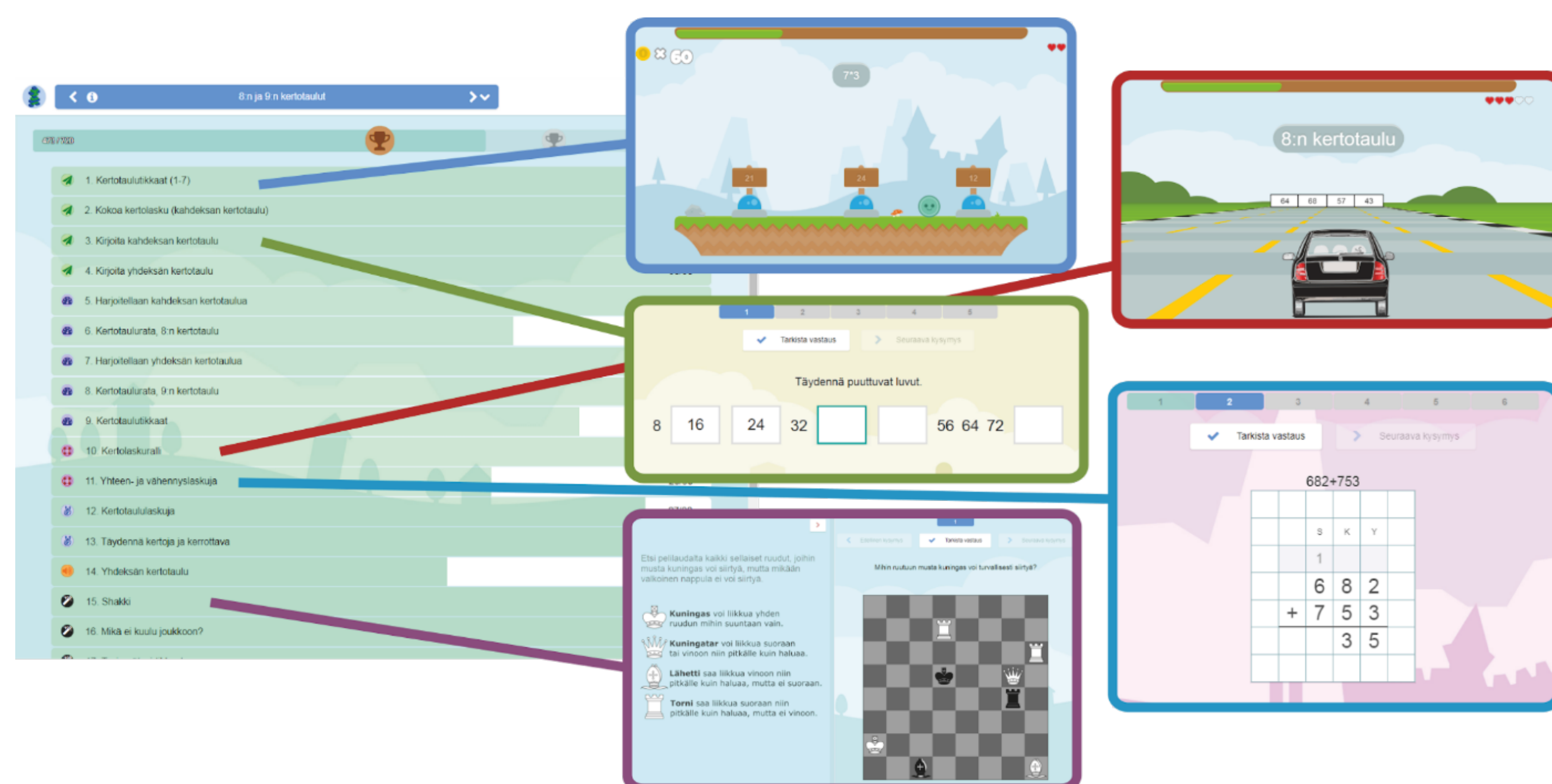
0,5 kg = 500 g – 12,50 €
250 g is half of 500 g, so you pay half of 12,50 €.
12,5 € : 2 = ... €

Well done!

The robot has to put dishes on the shelf according to the rules represented by the schema:



Which one of the shelves has the dishes **incorrectly** ordered?



...STRENGTHENS THE REASONING SKILLS FOR SOLVING MATH PROBLEMS.

Intervention model



Class-based randomised controlled trials (RCT) were conducted on a total of >3000 Lithuanian 4th grade students, with 16 weekly curriculum based lessons.

Group A – traditional maths (control group)

Group B – gamification-enriched maths

Group C – CT-enriched maths

Enrichment: 50% common and 50% enriched.

Assessment: Pre- and post-intervention tests and delayed post-assessment tests conducted one year after the intervention

Background

DigiMaths4All is an educational research project lead by Vilnius University project with University of Turku as partner. The aim is to strengthen student Math problem solving skills with targeted gamified and CT-enriched interventions. **VILLE** is a learning environment developed by Turku Research Institute for Learning Analytics. As well as serving as a platform for educational research, it offers a popular curriculum in several subjects with weekly VILLE lessons leveraging gamification.

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References:

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Try the tasks in VILLE:

<https://tinyurl.com/trydigimaths>
DigiMaths4All project website:
<https://tinyurl.com/digimaths4all>
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