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Prepare and integrate Learning Activities

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Content

General overview and aim

The goal of Work Package 2 (WP 2) is to explore learning paths based on the learning outcomes from the national curricula analyses. To achieve the learning outcomes of math and informatics curricula, the project team composes a set of tasks that can be developed to enhance AT and CT skills of students.

This document contains the most important definition and their interpretation, the processing and analysis of national curricula, and the set of math tasks.

Introduction

The aim of the CT&MathABLE project is to enhance European educational resilience and capacity by leveraging digital transformation tools and pedagogies. To realise innovative school curricula to enable recognition and validation of skills and qualifications, addressing future demands for citizens with the digital skills and computational literacy needed for digital transformation. The project delivers open, relevant, and localized educational content with novel modes of interaction with high-quality content.

The 2nd work package (WP2) of the project is Developing Learning Paths for CT integrated with AT. To perform these aims, first, we had to clarify the basic concepts, how we use them, and what we mean by computational thinking, algebraic thinking, and learning path. Second, we investigated the math and informatics curricula of participating countries. This task required the consolidation of national curricula as their details are different. The consolidated topics were analyzed by content and statistics.

Concepts

The expression Learning path has several meanings that should be clarified. The most frequent usage of this expression is the flexible learning paths of Learning Management Systems (LMS). The role of the Learning path is important, for instance, in the case of flexible lifelong learning, which requires comparability and exchangeability of courses, programs, and other types of learning actions both in a national and international context. Another frequent usage of the learning path expression occurs in special needs students, in the case of gifted or dropped out, who need individual learning paths based on their special skills or the lack of proper skills. Learning path expression can be used to evaluate the different schools within a national school system, by tracking the way of students. A third meaning of the learning path expression is the possible teaching ways and the topic order in the curriculum. Which topics are in the curriculum, what is their order, and how can teachers build the syllabus of a given class topic by topic for the best learning outcomes? In our context, we used Learning Path (LP) in this last meaning.

Computational Thinking (CT) is an educational expression by Seymour Papert (Papert, 1996), who developed the Logo educational language, and it was popularized by Jeanette Wing (Wing, 2006). Nowadays, several approaches and definitions of CT describe the concept. Based on our interpretation, CT is a cognitive skill set essential for problem-solving and navigating the complexities of the digital age. Computational Thinking transcends coding proficiency, emphasizing logical reasoning, abstraction, and algorithmic problem-solving applicable across various disciplines.

There are several interpretations and lists of the components of Computational Thinking. We used two lists, a major and a minor list; the minor list is more detailed, and the two lists can be matched by hierarchy. It means the major list is at a higher level, summarizing the details of the minor list. These lists result from the literature and curricula processing during our work package.

- Decomposition
    - Decomposition
- Abstraction
    - Abstraction
- Algorithmic Thinking
    - Algorithmic Modelling
    - Logics, and Logical Thinking
    - Logical Reasoning
    - Patterns, Pattern Recognition, and Repeating Patterns
- Data
    - Data representation and analysis
    - Data collection
    - Data modeling
    - Visualization
- Evaluation
    - Evaluation
    - Adjustment for Efficiency
    - Optimization
    - Simulation
- Generalization
    - Generalization
    - Transferability
    - System Thinking

In math education, Algebraic Thinking (AT) is as important as Computational Thinking is in computer science. AT is also an educational concept, and its origin is not so clear. The history of math and algebra is measurable in millennia; however, the education methodology was strengthened only in the 20th century. century, so the concept of Algebraic Thinking appeared in the middle of the last century in published articles. More relevant are the ones published after the 1990s, when AT can be compared with CT. Based on the works of Lins (Lins, 1992), Kieran (Kieran, 2004) Kriegler (Kriegler, 2008), Stramel (Stramel, 2021), Blanton, and Kaput (Blanton & Kaput, 2011), we understand the components of AT as the following: Relational thinking, which contains equality, and inequality; Pattern recognition, which is part of most learning processes; generalization, and its base, abstraction; numbers and operations; mathematical language, which includes symbols; and problem-solving.

Algebraic Thinking helps students with the skills to solve abstract problems and the development of mathematical intuition. Understanding symbolic representations, equations, and algebraic structures enhances the cultivation of analytical thinking and problem-solving skills. The synergy between Computational and Algebraic Thinking is particularly relevant in educational contexts.

Similar to the components of Computational Thinking there are several interpretations and lists of the components of Algebraic Thinking. We used two lists in that case, too: a major and a minor list. The minor list is more detailed, and the two lists can be matched by hierarchy: the major list is at a higher level, summarizing the details of the minor list. These lists result from the literature and curricula processing during our work package.

- Relational thinking
    - Equality
    - Inequality
    - Relational thinking
- Patterns
    - Pattern recognition
    - Recognition of symbols, numbers
    - Expression patterns
- Generalization
    - Abstraction
    - Generalization
- Numbers and operations
    - Numbers
    - Operations
    - Variables and Unknowns
- Mathematical language
    - Symbols and Numbers
    - Concepts and Definitions
    - Expressions
- Problem-solving
    - Solving mathematical problems with the tools of math

The order of components can be selected in several ways; the next listing is driven by the didactical aspect. The students start their math lessons with the observation of simple objects, list their properties, compare them, select identical objects, and explore the differences among them, like size, shape, and color. It is the founding and practice of pattern recognition and the recognition of relations. The first can be called (1) relational thinking, which involves equality as well as inequality, and it leads to (2) patterns and the recognition of patterns. When the students practice and learn pattern recognition, an important part is recognizing the general in one, which is called (3) generalization. To represent generalized patterns, we use symbols and special characters, like digits. The world of digits represents (4) numbers that form number sets, and operations can be performed on them, and they have their own (5) symbolic system.

Finally, we used 6-6 major level components of Algebraic and Computational Thinking in our project.

Table 1. The main components of Computational and Algebraic Thinking.

Id	Description	Id	Description
CT1	Decomposition	AT1	Relational thinking
CT2	Abstraction	AT2	Patterns

CT3	Algorithmic thinking	AT3	Generalization
CT4	Data	AT4	Numbers and operations
CT5	Evaluation	AT5	Mathematical language
CT6	Generalization	AT6	Problem-solving

It can be observed that there are some obvious similarities between the two kinds of components. Starting with thinking, a part of cognition, both are based on collecting, identifying, classifying, and sorting information. The decomposition helps to divide the problem into smaller parts, and the abstraction purifies the problem from the unimportant traits to simplify it. Pattern searching and recognition reduce the issue to a known and solved problem. The solutions could be defined as a finite sequence of steps, and the new solution can be generalized to use other problems. So perception, processing, and representation appear in both thinking skills. The special language is also important in both cases, as the set of concepts and definitions.

Curricula analysis

The exploration of learning paths was a part of WP2 in the CT&MATHable project, which was started by the analysis of national curricula. The six countries involved sent their detailed math and informatics curricula for processing and detailed investigation. The curriculum generally comprises a sequence of topics, and for each topic, a detailed list of learning materials and outcomes is outlined. However, the structure of national curricula is different, so for comparison, the curricula had to be consolidated during the processing.

Math – Algebraic Thinking

More math curricula contain some duplication, as some important topics must be learned and practiced at different levels in the same grades, or multiple grades, while some topic details are divided into 2-3 parts in a country, and it is in only one row in the others. These differences were reduced during the steps of consolidation. First, the unreasonable duplications were removed. Then the most detailed curriculum was selected as a reference. It was the Hungarian in the case of the math subject. Each row of the other curriculum was assigned to the corresponding topic of the Hungarian curriculum if it existed, or a new topic was created if needed. The number of topics in the relevant grades was 49, 76, 116, 156, 249, and 506 by country before the consolidation, while after the processing, these were 39, 67, 76, 104, 141, and 138 in ascending order. Finally, some details must be duplicated for the different grades, so the number of categorized topic rows of nations was more, as it is visible in the last column of Table 2. The final result is that 31 major math topics were defined based on the six countries' curricula.

Table 2. Math curriculum processing progression states

Country	Rows in source	Preprocessed state	Intermediate state	Consolidated state	Categorized rows
Finland	156	156	156	116	141
Hungary	506	207	104	103	104
Lithuania	49	49	49	49	39
Spain	249	201	201	193	138
Sweden	76	76	76	73	67
Turkey	116	76	76	54	76

The summarized math curriculum list was analyzed statistically and by content. Both analyses have to take into account the limitation that we are only analyzing the topics of the curriculum and do not know the number of hours each topic is taught.

Before discussing the statistical breakdown of each nation's curricula with regards to the 31 categories we have identified, it is important to emphasize once again that there are large differences between nations regarding: (1) how many entries they have total, going from as low as 39 for Lithuania to as high as 141 for Finland; (2) in how many of the categories are they present (Turkey was only present in 18 categories, while Hungary in 30); (3) how "spread out" the curricula is: what is the average number of rows per category for a nation (going from as low as 1.95 for Lithuania to as high as 5.11 for Spain); (4) how significant each category is for the given nation.

Figure 1 shows the breakdown of each category, based on what percentage of each nation's curricula the given category makes up. By using percentage instead of the total number of entries, we standardize among nations irrespective of the curricula size. This figure clearly shows that certain categories (like Measurements, Equations, Problem-solving with equations, and Shapes' constructions) are more dominant than the others. It is also clear to see that the relative importance of each topic is different among nations (to use the above example, Finland places much greater emphasis on equations than measurements, while Lithuania does the opposite).

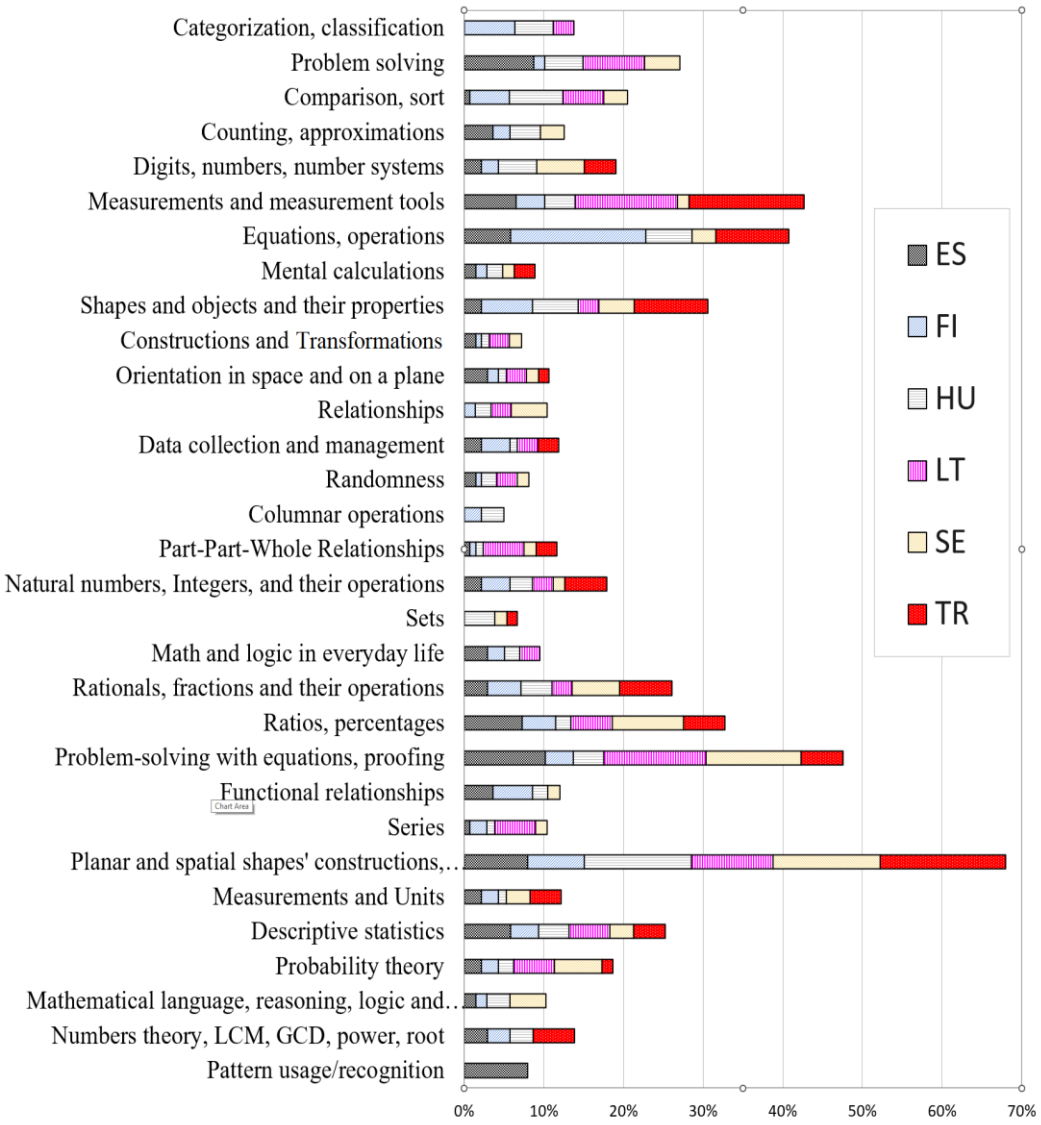

Fig. 1. Breakdown of categories by nations, relative to the importance of the math category for the nation.

While the curriculum appears to be fragmented, even statistically, we find a lot of similarities among them. Group by group, each nation shares over 47.5% of its curriculum with another 4 nations, and nearly 80% with another 3. At the same time, each nation has its own focus, part of the shared material that the national curriculum emphasizes. Aside from Geometry as it became a catch-all bucket for the spatial focus, we can see that the national foci are the following: for Spain, problem solving and pattern recognition; for Finland equations and operations; for Hungary, comparison, sorting and equations; for Lithuania Measurements and Problem solving, for Sweden Problem Solving and Ratios; and for Turkey Measurements and Equations.

We were also curious to see how concentrated each nation's curriculum is. Due to the different details of the national core curricula, a simple comparison cannot be used. Using a Hirshman-Herfindahl-like concentration measure (sum of the square of the relative weight of each category for the nation, scaled up to 0-10,000), we get the following data:

Table 3: Curriculum concentration of nations

Code	Nation	# entries	# categories present in	Concentration
ES	Spain	138	27	566
FI	Finland	141	29	621
HU	Hungary	104	30	516
LT	Lithuania	39	20	717
SE	Sweden	67	25	657
TR	Turkey	76	18	855

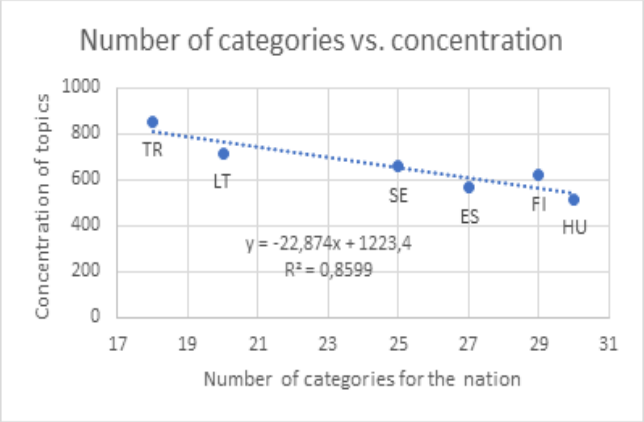

Fig. 2: Math category concentration by nation

Plotting the data in **Table 3,** we get **Fig. 2**, showcasing that the concentration of a nation's curriculum is driven greatly by the number of categories the given nation participates in. This is important, as looking at the individual data, certain topics appear to carry a great weight for a given nation. For example, over 17% of the Finnish curriculum belongs to the Equations/Operations category; no other nation has any single category that makes up such a large amount of their curricula. However, looking at **Fig. 2,** it is easy to see that while Finland is slightly above the regression line, the Finnish curriculum is in line with the other 5 nations and, indeed, is middle-of-the-ground in absolute concentration value.

The conclusion is that none of the national curricula is excessively concentrated in a handful of categories, so the math curricula are similar and cover most parts and components of Algebraic Thinking at primary school.

Informatics – Computational Thinking

The IT knowledge requirements are influenced by EU directives. The European Union has developed the Lifelong Learning program at the Community level, with the involvement of NGOs and governmental bodies of the Member States (LLL, 200X). An important component of this is the definition of key competencies based on labour market requirements, which include digital competence as a separate component. To respond to this need and describe the

components of digital competence, the EU has launched a series of publications called The European Digital Competence Framework (DigComp, XXX). The first version was published in 2013; the most recent is DigComp 2.2, published in 2022. DigComp provides a structure that allows European citizens to better understand what it means to be digitally competent and to assess and further develop their own digital competence. These are the next with some reductions.

- Information and data literacy – Browsing, searching, filtering, evaluating, and managing data, information, and digital content.
- Communication and collaboration – Interacting, searching for information and content, engaging in citizenship, and collaborating through digital technologies; Netiquette; Managing digital identity.
- Digital content creation – Developing, integrating, and elaborating digital content; Copyright and Licenses; Algorithmizing and programming.
- Safety - Protecting devices, personal data and privacy, health and well-being, and the environment.
- Problem-solving – Solving technical problems; identifying needs and technological responses; Creatively using digital technologies; Identifying digital competence gaps.

Based on this description, algorithmizing and programming belong to digital content creation, whereas application development, as a classical programming task, usually follows the steps of problem-solving. Corresponding to the EU concept, these components define the general requirements of digital literacy. Obviously, these don't cover the professional part of the digital world.

In the case of CT curricula, only 3 nations have stand-alone curricula for informatics; in their cases, the syllabus of digital culture partly belongs to the math curriculum, and partly it is part of other subjects, like craft or technology. The project team collected the stand-alone informatics curricula, and where there is not that, the IT part of the math curricula. The topics of these curricula' union were categorized as math curricula topics. The amount of material, and therefore the number of topics, is significantly lower than in mathematics, as it is taught in fewer grades and hours per week. The project focuses on the ages from 9 to 14, so the curricula of grades 3-8 were involved, where the number of topics was 401 from 6 countries. The first step of processing was eliminating math topics from math curricula, in the case of countries where there are only math curricula. The next steps were similar to math topics consolidation; however, it was simpler, as the number of topics was less, and finally, there were no such duplications that could be removed. The number of categorized topics is 288, as it is visible in Table 4.

Table 4. Informatics-related curriculum processing progression states

Country	Rows in source	Consolidated state
Finland	106	11
Hungary	132	132
Lithuania	54	54

Spain	38	20
Sweden	20	20
Turkey	51	51

The categorization of IT topics was not so clear. As the EU effects were recognizable in every curriculum, the first categorization was made by EU competencies. Three of the five EU competencies are part of the curriculum in each country. There are two competencies that are not covered by the investigated topics in the case of those countries where there is no IT-related subject. This coverage is obviously lacking, which came from its limitations, as the math curriculum was investigated. However, there are other subjects in these countries that also contain IT-related topics, so the EU components are covered, as was confirmed by colleagues from these countries.

Table 5. EU competencies in IT-related curricula

Country	Communication and collaboration	Digital content creation	Information and data literacy	Problem-solving	Safety
Finland	–	7	3	1	–
Hungary	16	71	16	23	6
Lithuania	6	23	4	9	12
Spain	–	11	2	7	–
Sweden	2	9	2	7	–
Turkey	12	15	8	10	6

Summarized, the analyses pointed out that the national curricula fulfill the expectations of EU digital competence. At the same time, algorithmizing and programming skills are not so emphasized in EU directives, as they focus only on literacy and user skills; meanwhile, these are more emphasized in national curricula. One possible reason for the over-representation of programming and algorithmization is historical. In the 80s, informatics meant programming, so the first IT-related curricula focused on programming. In the 90's the MS Office application spread in business, and it initiated the curricula changes. Most curricula preferred applications and user skills, while programming went back, but it hasn't disappeared. The next step was the penetration of the internet and mobile communication, so the informatics subject formed Information and Communication Technology (ICT) (Stevenson, 1997). Programming remained part of the curricula, then its importance and its weight gained again in the 2010s. In addition, the professionals in Computer Science emphasized the importance of Algorithmic, and more general Computational Thinking (Szlávi & Zsakó, 2012), which is essential for higher digital literacy. The investigated curricula confirmed this process. Finnish education

views digital literacy as a skill that is naturally created during education as the students use digital devices (Finnish Educational System, 2023). The latest Hungarian National Curriculum was launched in 2020 (The National Curriculum Hungary, 2020). It changed the subject name of computer science from informatics to digital culture. The components of digital culture appear in most subjects based on the new curriculum. Lithuania launched the latest curriculum in 2023, which changed the subject name of computer science from IT (information technologies) to informatics. The curriculum focuses on algorithmizing and programming skills (The National Curriculum of Lithuania 2023). The Spanish curriculum was updated in 2022. There is no separate mandatory subject for computer science; however, the math curriculum contains several topics regarding digital literacy and Computational Thinking. Additionally, some regional curricula contain optional subjects to teach computer science for pre-university grades (Spanish Government, 2022). Sweden also launched the latest national curriculum in 2022. There is no dedicated subject for informatics; digital literacy is part of math and technology subjects (The National Curriculum Sweden, 2022). The Turkish curriculum was launched in 2018, and the name of the subject is Information and Communication Technologies and Software (The National Curriculum Turkey, 2018).

A new categorization has been developed, which is better adapted to the subject areas of the curricula, the age group, and the didactic objectives expected in education. This curriculum-based extended categorization defined 12 major categories. The same analyses were made on this categorization, like the math curriculum processing with 31 major math topics. Similar to the analysis of math topics and categories, there are some comments before processing. Each nation's curricula with regards to the 12 categories we have identified, there are large differences between nations regarding: (1) how many entries they have total, going from as low as 11 for Finland to as high as 132 for Hungary; (2) in how many of the categories are they present (Finland and Sweden were only present in 4 categories, while Hungary and Turkey in 9); (3) how "spread out" the curricula is: what is the average number of rows per category for a nation (going from as low as 3.75 for Sweden to as high as 14.67 for Hungary); (4) how significant each category is for the given nation.

Figure 3 shows the breakdown of each category, based on what percentage of each nation's curricula the given category makes up. By using percentage instead of the total number of entries, we standardize among nations irrespective of the curricula size. This figure clearly shows that certain categories (like Algorithms and programming, Create and modify digital content (office and creative), and Technical solutions) are more dominant than the others. It is also clear to see that the relative importance of each topic is different among nations (to use the above example, Lithuania places much greater emphasis on Protection against the dangers of the digital world than Create and modify digital content (office and creative), while Hungary does the opposite).

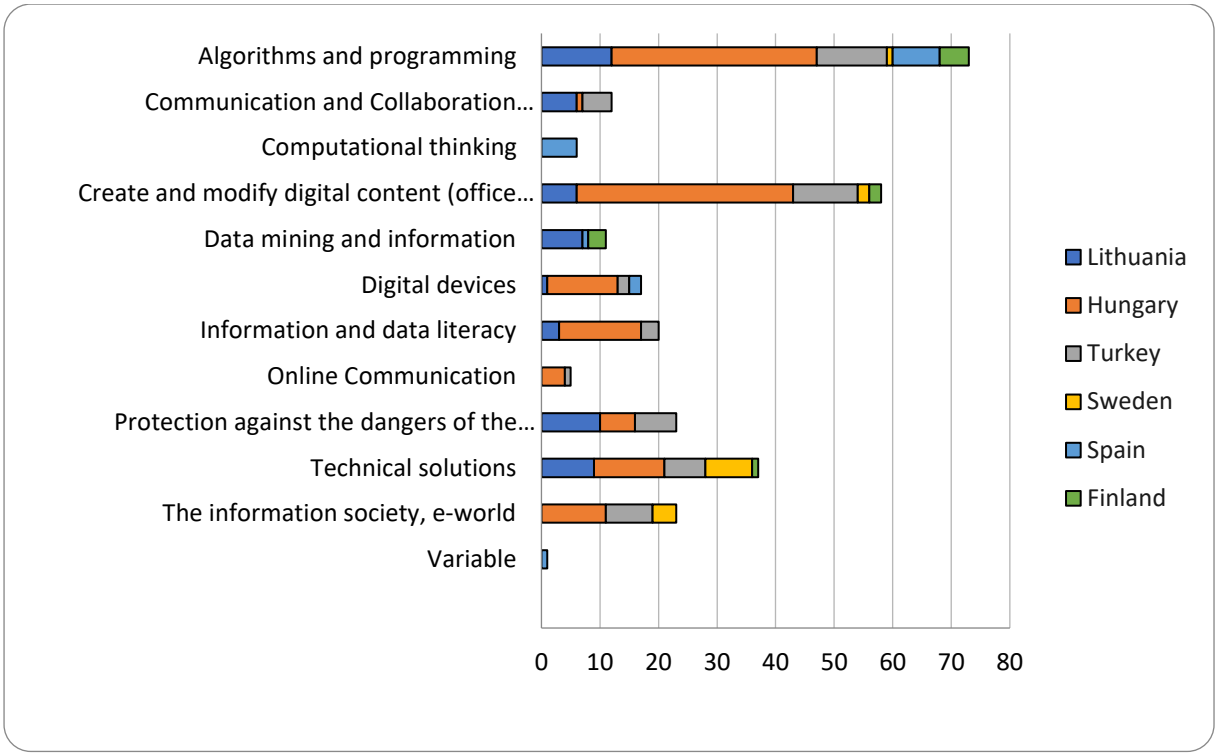

Fig. 3. Breakdown of categories by nations, relative to the importance of the IT category for the nation.

We also investigated how concentrated each nation's curriculum is. Due to the different details of the national core curricula, the Hirshman-Herfindahl-like concentration measure (sum of the square of the relative weight of each category for the nation, scaled up to 0-10,000) was used, which provided the following data:

Table 6: Curriculum concentration of nations

Code	Nation	# entries	# categories present in	Concentration
ES	Spain	18	5	3272
FI	Finland	11	4	3223
HU	Hungary	132	9	1866
LT	Lithuania	54	8	1564
SE	Sweden	15	4	3778
TR	Turkey	56	9	1486

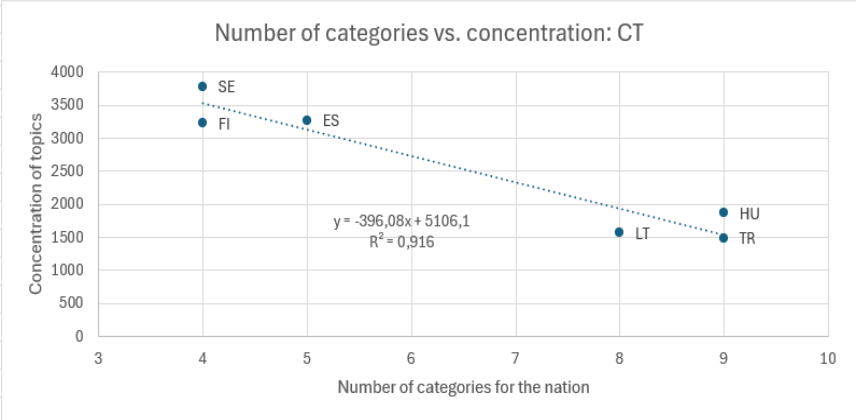

Fig. 4: IT category concentration by nation

Plotting the data in Table 6, we get Fig. 4, showcasing that the concentration of a nation's curriculum is driven greatly by the number of categories the given nation participates in, as we recognized in the math analyses. Seeable in the individual data, certain topics appear to carry a great weight for a given nation. The fact that there is no stand-alone informatics curriculum in three countries and there are in the other three, explains the differences in the case of the number of topics and categories. The fact that there is no stand-alone informatics curriculum in three countries and there are in the other three, explains the differences in the case of the number of topics and categories. Despite this, every country is close to the regression line, which means there is no significant difference regarding the concentrations of curricula.

Content Analyses

Math curricula

There are two major parts of content analysis, one is the analysis of the 31 major topics, including the purpose and the outcome of each group. This analysis was assisted by some interviews that were recorded among primary school teachers. The second is a list of detailed learning outcomes by main areas of math, like Algebra, Calculus, Geometry, etc., grouping by age range (grade 3-4, grade 5-6, and grade 7-8).

The topics and the details behind them confirmed that there is no relevant difference among the country curricula regarding the foundation of math, which contains the foundation of AT. Generally, it starts with playing, when the students stack, sort, group, and classify simple but distinguishable objects. These playful experiences allow the students to get used to the language of mathematics and to learn the basic concepts. Besides the Categorization and comparison topics, the problem-solving and Comparison and sort topics are also parts of the introductory and foundational process, so students also learn the relations and relationships that introduce them to relational thinking and problem-solving. The knowledge of basic concepts, like quantity, less, and greater, provides a foundation for moving to Counting, approximations, and Digits, numbers, and number systems topics, and the next step is the Mental calculations and Equations, operations topics, which focus on basic operations, like addition, in early grades. The Measurements and measurement tools topic is a compound topic that builds on several components of AT. Relational thinking, problem-solving, patterns, numbers and operators, symbolic representation, and mathematical language are equally important to achieve the learning outcome. Three major topics help students get basic geometry knowledge.

Shapes and objects and their properties, Orientation in space and on a plane, and Constructions and Transformations. These topics also confirm several components of AT. The further topics of early grades are not so representative, however, Data collection and management, and Math and logic in everyday life are also important foundations of Problem-solving thinking.

The identified topic groups span several grades, and the students are practicing, reinforcing, and extending the knowledge of the topic after the initial introduction. The *Columnar operations* and *Natural numbers, Integers, and their operations* topics generalize the number concept and their operations in grades 3-4. In the upper grades, the number range is extended with rational numbers, fraction operations, and the notion of functions. In the pre-secondary grades, only *Mathematical language, reasoning, logic, and combinatorics are new topics; further learning materials are extensions* of earlier topics.

Some countries have specific topics in their curricula. For instance, the Lithuanian curriculum contains finance calculations, and the Hungarian and Turkish curricula contain set operations and set theory. The Finnish and Spanish curricula emphasize the importance of mathematical language, while the Hungarian and Swedish curricula only mention it as a part of some learning materials. The essential parts of the curriculum are close to each other. Besides the initial foundations, there are other similar principles and teaching processes in the curricula. In the case of operations, the first is an approximation, then the (mental) calculation, checking, and rounding, which process is also part of the AT.

After the 31 major topics were defined, each detail of the national curricula topic was assigned to a major topic by age group. It results in some duplications on the topic level; however, the detailed descriptions explain the differences. For instance, the columnar operations in grades 3-4 are limited to natural numbers, while these are extended to negative integers in grades 5-6. Based on these details, 231 learning outcomes were defined from national curricula, and these were assigned to 31 major topics. This topic list contains every unique learning outcome from the curricula of six countries. and it is the source of the necessary tasks for practicing the components of AT, that was needed to prepare, create, and collect by the project team.

It is obvious that there are some differences in the importance and difficulties of the learning materials. To reinforce the components of AT, the students should practice those critical tasks, which can block their progress, if their skills are lacking. To select these highlighted learning materials, exploratory qualitative research helped. The first step was interviews with five teachers. Two teachers from lower-primary school, two from higher-primary school, and a teacher from secondary school.

The respondent teachers from lower-primary school stated that the arithmetical skills require more time and more practice. When the students have an established arithmetical skill, then they can explore the relations, patterns, and they can generalize. The recommended tasks must allow approximation, a lot of trial and error to find the result, and an effort should be made to find all the solutions through regular trial and error. (The regular trial and error is the basis of the backtracking algorithm.) One highlighted the subtraction as a difficult operation that requires more attention. Multiplication should be approached from the point of view of number sequences. The multiplication by 7 is hard for students, and the multiplication table must be repeated every autumn. The mathematical logics, the true and false statements, playful practice is also important, especially the negation. It helps to form and to get used to the mathematical language. The lack of experience and concept knowledge blocks the learning of units of

measurement. Life has changed; students arrive in school by car, they don't walk to the corner shop to buy half a kilogram of bread, so they don't have a concept of distance or weight. So, this topic also requires a lot of illustration tools, getting experience, and practicing.

Additionally, one respondent teacher highlighted the approximation of operations' result, even the columnar operations, and the domino-like arrangement of subjects to practice the recognition of quantities. The other one mentioned is that the students have weak memory, which should be developed. Students avoid the thinking and calculation process, and they would like to take multiple-choice tests. Last, but not least, the part-whole relations, highlighting the half, third, and quarter to prepare for fractions.

The teachers from upper-primary schools also highlighted the arithmetical skills. The basic operations should be practiced: subtraction, multiplication table, and division with two-digit numbers. During practice, approximation and rounding are also important. The classification by properties can be generalized in upper grades, for numbers, operations, triangles, rectangles, etc. The secondary school teacher, in addition, emphasized the compound operations with negative numbers.

This simple exploratory qualitative research pointed out what important details must be highlighted from the math curricula, which practice reinforces the AT. This result was confirmed by a small-scale quantitative research and a teacher workshop.

Informatics curricula

The content analyses of informatics curricula were skipped during WP2. First, there are fewer topics in curricula, and the difference among national curricula is greater. Second, the learning outcomes of informatics are well-known by the members of the project team, and there are several existing tasks available for the project team to develop computational thinking, which were created by the team. So, the list of learning outcomes was prepared by the curricula processing and statistical analyses.

Workshop in Budapest

The workshop was designed to present partial results from the ongoing project to Hungarian teachers. This event aimed to promote the existing system, allowing teachers to engage with it directly and provide valuable feedback based on their experiences during the trial. Presentations associated with the workshop highlighted the project's structure and demonstrated how the developed program could be integrated into educational settings. The goal was to explore the potential applications of the program within the context of teaching and learning, ensuring that educators could see its practical benefits and provide insights for further development.

Organizing the teacher workshop required a multifaceted approach to ensure effective engagement and participation. The Faculty of Informatics at Eötvös Loránd University spearheaded these efforts through several strategic steps:

Preparation

1. Publicity and Information Dissemination:

A detailed announcement highlighting the workshop's importance was published on the university's website, aimed at capturing the interest of educators. Additionally, a dedicated event website (https://e-hod.elte.hu/WSBp/) was created to provide comprehensive information about the workshop’s agenda and objectives.

2. Social Media Campaign:

Strategic posts were shared on multiple University-affiliated Facebook pages to generate excitement and attract a diverse audience.

3. Outreach to Schools and Partners:

Direct communication with schools and collaborative partners was conducted to broaden the workshop's reach.

4. Streamlined Registration:

A user-friendly registration form was designed to simplify the enrollment process and facilitate seamless participation.

Workshop Enhancements

To enrich the workshop experience and create a lasting impact, several measures were implemented:

1. Custom Merchandise:

Each participant received a branded canvas bag, a sleek pen featuring the event logo, and a compact notebook. These items were not only practical for carrying workshop materials but also served as memorable tokens of the event.

2. Beaver Competition Award Ceremony:

The workshop included an awards ceremony for the Beaver Competition, featuring multiple interactive stations with engaging, practical tasks and activities involving micro:bits.

Demonstrations and Activities

A demonstration was prepared using the ViLLE system, showcasing a variety of tasks to illustrate the system’s capabilities and the diversity of task types that could be created. This demo was integral to highlighting the educational potential and flexibility of the system.

By employing these diverse strategies, the Faculty of Informatics ensured a well-organized and impactful workshop that effectively engaged Hungarian teachers and demonstrated the project's ongoing developments and potential applications.

Teacher Feedback Collection

A comprehensive questionnaire was developed to gather detailed information from teachers regarding their backgrounds, experiences, ideas, and feedback on the project.

Evaluation Metrics

To assess attitudes and evaluations, a 5-point Likert scale was employed. Participants rated statements on a scale from 1 to 5, where 1 indicated strong disagreement and 5 indicated strong agreement. This method provided a nuanced understanding of teachers' perspectives and the overall effectiveness of the project.

The following sample exercises illustrate newly developed unplugged activities, each designed for specific age groups. These activities aim to enhance students' thinking skills, including both Computational Thinking and Algebraic Thinking.

Task 1 for Grades 3-4

Game Name: Trueball

Topic: Logic in Mathematics and Informatics

Required Equipment: Ball

Teacher Instructions:

- The teacher makes a statement and throws the ball to a student.
- The receiving student evaluates the truth value of the statement by responding with "true" or "false." They then make a new statement and throw the ball to another student.
- This process continues with each student making and evaluating statements.

Additional Guidelines:

- Ensure that statements are clearly defined and based on information that all students are familiar with.
- Teachers can choose statements related to specific topics such as geometry, numbers, or other subjects.
- For more advanced students, incorporate logical expressions such as "all," "exists," "not," and "none of" to increase complexity.

Task 2 for Grades 5-6

Game Name: Binary Boats (Inspired by the Bebras Task 2013-JP-04)

Topic: Number Systems, Digits, Data Representation in Informatics

Required Equipment: LEGO bricks or small paper boxes

Teacher Instructions:

- Construct small boats that can hold figures representing the numbers 8, 4, 2, and 1.
- Provide 1 to 15 figures for students to distribute into the boats following these rules: a) All figures must be placed in a boat. b) If any figure is placed in a boat, the boat must be filled to capacity. c) Provide hints as needed, such as "Start with the largest boat that can be fully filled."

Activity Continuation:

- Repeat the exercise with various numbers of figures.
- Discuss number systems and explore how different systems can be used to improve the task.

Alternative Task:

Required Equipment: Cards with dots and a pen

Teacher Instructions:

- Prepare cards with dot values of 1, 3, and 9. Provide each student with two of each type (six cards in total).
- Announce a number between 0 and 26, and students must place the cards face up to represent that number with dots.
- Discuss the strategies used: a) Which card did students start with? b) How many cards were used? c) Why was the third card not used?
- Continue the activity with new numbers, allowing students to suggest numbers as well.

Task 3 for Grades 7-8

Game Name: String Around Nails (Inspired by the Bebras Task 2013-JP-04)

Topic: Measurements and Units in Mathematics, Graph Theory, Shortest Path in Informatics

Required Equipment: Boards, nails, string

Teacher Instructions:

- Provide each group with a board, 10-15 nails, and a string. Nails should be randomly hammered into the board.
- Either mark a starting point or allow students to choose their own.
- Instruct students to find the shortest possible route that goes around each nail and returns to the starting point.
- After testing a route, students should mark the string to indicate the total length of the route, allowing them to compare and identify the shortest route.

These activities not only develop logical and computational thinking but also introduce students to fundamental concepts in mathematics and informatics in an engaging, hands-on manner.

Workshop questionnaire – Scientific Report

Participants and Demographics

A total of 71 teachers participated in the questionnaire. The majority of these educators, representing 52%, were aged between 40 and 60 years. This age distribution aligns with the demographic composition of the Hungarian national education system. Within this group, 47% primarily teach informatics and mathematics (Fig. 5).

Teaching Levels and Methods

Regarding the educational levels taught, 42% of the teachers instruct students in classes 9-10, while 48% teach students in classes 11-12. An overwhelming 90% of the respondents reported utilizing project-based methods in their teaching practices. Additionally, approximately 84% of the teachers engage their students in complex tasks that are applicable to everyday life scenarios.

Utilization of the ViLLE System

The ViLLE system, which offers tasks with varying levels of interactivity, was incorporated into the teaching methods of these educators. The teachers predominantly employed drag-and-drop and pairing tasks. Notably, around 50% of the teachers utilized all types of interactivities available within the system.

Educational Tools

The most frequently used educational tools among these teachers included Learningapps, Canva, Kahoot, Redmenta, and Mentimeter. These tools were integrated into their teaching strategies to enhance student engagement and learning outcomes.

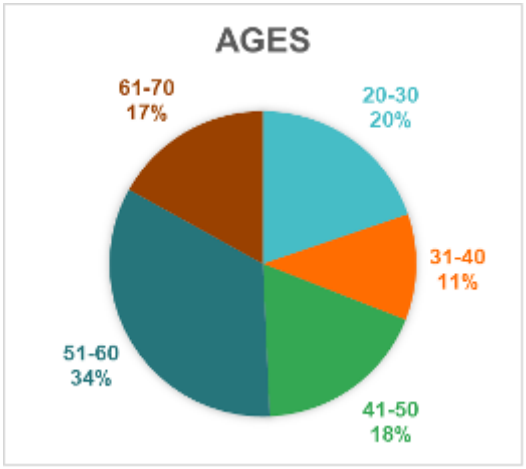

Fig. 5: Respondents' demographic distribution by age

Perceived Importance

The questionnaire also inquired about the perceived importance of the project in daily teaching practices and the broader education system. The teachers overwhelmingly affirmed the significance of the project, with strong agreement on its value not only for their own teaching but for the entire educational framework (Fig. 6).

Impact on Knowledge of Algebraic Thinking

Regarding the acquisition of new information about Algebraic Thinking, 44% of the teachers completely agreed, and another 44% agreed that they had gained new insights. This indicates a substantial positive impact on their understanding of this concept.

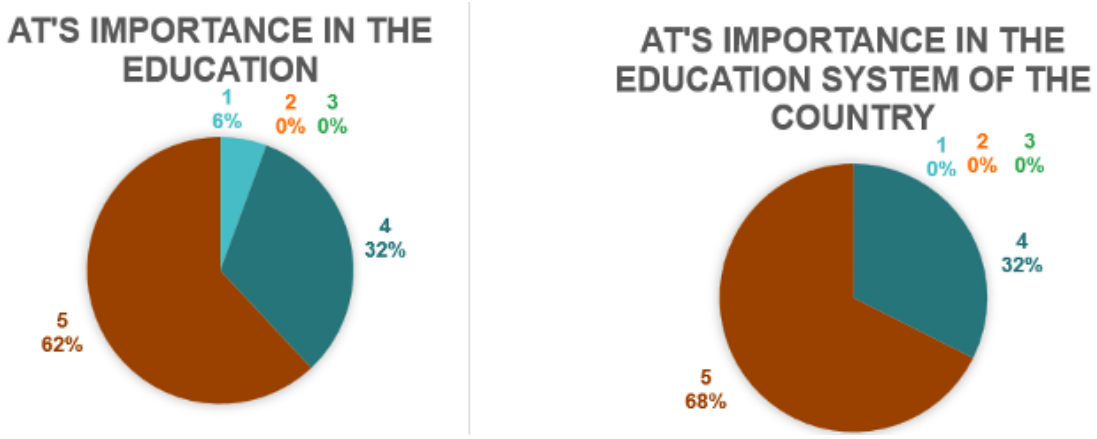

Fig. 6: Percentages of the answers to the questions: How important do you find AT?

Practical Application in Teaching

Only a minority of the respondents, specifically 6% (4 teachers), felt that the project's content was not applicable to their teaching methods. The majority, however, recognized several opportunities presented by the project. They identified potential in integrating IT unplugged activities and the interactive tasks from the ViLLE system to:

- Combine mathematics and IT,
- Stimulate student thinking,
- Address everyday problems in an educational context.

Focus and Relevance

The detailed quantitative research delved into specific mathematics topics and their relevance in education. This investigation aimed to uncover the challenges faced by students in these areas.

Findings and Confirmation

The findings primarily validated the outcomes observed in the qualitative research, reinforcing the insights gained regarding students' difficulties in mathematics. The alignment between the quantitative and qualitative results underscores the robustness of the research conclusions.

Analysis of Problematic Math Topics Based on Teacher Feedback

Curriculum Analysis and Teacher Survey

In an analysis of the mathematics curriculum, 31 distinct topics were identified. To understand which of these topics are considered most challenging by educators, a survey was conducted among teachers.

Key Findings

The survey results indicated that the following topics are perceived as the most problematic:

- Problem Solving (Topic 2): Identified as problematic by 73% of teachers.
- Probability Theory (Topic 28): Reported by 41% of teachers.
- Measurements and Measurement Tools (Topic 6): Highlighted by 38% of teachers.
- Mathematical Language, Reasoning, Logic, and Combinatorics (Topic 29): Considered problematic by 34% of teachers.

Conversely, several topics were identified as the least problematic, with no teachers reporting significant issues:

- Digits, Numbers, Number Systems (Topic 5)
- Shapes and Objects and Their Properties (Topic 9)
- Constructions and Translations (Topic 10)
- Natural Numbers, Integers, and Their Operations (Topic 17)
- Sets (Topic 18)
- Series (Topic 24)

Age Group Analysis

The survey also explored whether certain age groups find specific topics more challenging. The results revealed notable trends:

- Measurements and Measurement Tools (Topic 6): Consistently problematic across various age groups.
- Equations and Operations (Topic 7) and Mental Calculation (Topic 8): Particularly problematic for students in grades 5-6.
- Probability Theory (Topic 28) and Mathematical Language, Reasoning, Logic, and Combinatorial Maths (Topic 29): These topics tend to become more problematic in older age groups.

These insights provide valuable information for curriculum developers and educators, highlighting areas that may require additional resources or instructional support.

LP and tasks

After the curricula analyses and the workshop results analyses, the project team started to define the learning paths by age group, inserted into the built topic structure. The task creation was assigned to this learning path skeleton. The project team introduced a naming standard based on the following rules:

- The first two digits refer to grade (e.g., 34 means grades 3-4, which mainly is the age group 9-10)
- The second two digits refer to the major math topic ID
- The last two digits refer to the detail identifier within the given major category.

During the task collection project team created new tasks as well as used existing tasks from their former projects. The identifiers of tasks were created by different naming standards, but each task contains a category ID that refers to the given learning path.

There are some tasks that could be assigned to different age groups as well as different major topics, so in these cases, the header of the task contains more learning path (category) identifiers.

The current collection contains 387 tasks, which correspond to 437 assignments to learning paths.

The major topics, learning paths, and the task definition are in the Appendix.

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Appendix A – Major Math Topics

Math Area	No	Major Topic Categories
Mathematics logic/set theory	1	Categorization, Classification
Algebra	2	Problem solving
Algebra	3	Comparison, sorting
Algebra	4	Counting, approximations
Number system	5	Digits, numbers, number systems
Measuring	6	Measurements and measurement tools
Algebra	7	Equations, operations
Algebra	8	Mental calculations
Geometry	9	Shapes and objects, and their properties
Analysis	10	Constructions and Translations
Geometry	11	Orientation in space and on a plane
Algebra	12	Relationships
Probability and Statistics	13	Data collection and management
Probability and Statistics	14	Randomness
Algebra	15	Columnar operations

Algebra	16	Part-Part-Whole Relationships
Algebra	17	Natural numbers, Integers, and their operations
Mathematics logic / set theory	19	Math and logic in everyday life
Probability and Statistics	21	Ratios, percentages
Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification
Measuring	26	Measurements and Units
Algebra	31	Pattern usage/recognition
Mathematics logic/set theory	18	Sets
Algebra	20	Rationals, fractions, and their operations
Algebra	22	Problem-solving with equations, proofing
Analysis	23	Functional relationships
Algebra	24	Series (Sequences)
Probability and Statistics	27	Descriptive statistics
Probability and Statistics	28	Probability theory
Algebra	30	Number theory, LCM, GCD, power, root
Mathematics logic/set theory	29	Mathematical language, reasoning, logic, and combinatorics

Appendix B – Learning Paths by topic and age group

ID	Grade	Math Area	No	Major Topic Categories	SN	Short description of outcomes in LP based on outcomes of c. analysis (MathFull3 sheet)
1	3-4	Mathematics logic/set theory	1	Categorization, Classification	34_01_01	Regularities: Creates statements about a given set; uses the terms 'all', 'not all', 'exists...', 'none of ...', and their synonyms appropriately
2	3-4	Mathematics logic/set theory	1	Categorization, Classification	34_01_02	Students improve their skills in finding similarities, differences, and regularities. Identifies and selects elements matching multiple criteria
3	3-4	Mathematics logic/set theory	1	Categorization, Classification	34_01_03	Recognition of similar and differing attributes, organizing into groups, and creating a Venn diagram. Organizes into sets, takes two criteria into consideration at the same time, and names the organizing criteria
4	3-4	Algebra	2	Problem solving	34_02_01	Compare different strategies to solve a problem in a patterned way. Obtain possible solutions to a problem following a known strategy. Demonstrate the mathematical correctness of solutions and their coherence in the given context. A guided process for solving everyday problems. Solve multi-step problems, which may require up- or downscaling units of measurement.
5	3-4	Algebra	2	Problem solving	34_02_02	A structured process of modeling using mathematical representations (graphs, tables, etc.) to facilitate understanding and resolution of everyday problems. Produce mathematical representations through schemes or diagrams that help resolve a problematized situation.

6	3-4	Algebra	2	Problem solving	34_02_03	Search for solutions to problems; recall, re-state, solve, interpret, and check the solution; ask questions based on the problem; illustrate the problem. Interpret, verbally or graphically, problems of daily life, understanding the questions posed through different strategies or tools, including technological ones. Analyze simple mathematical conjectures by investigating patterns, properties, and relationships in a patterned way.
7	3-4	Algebra	2	Problem solving	34_02_04	Make connections between different mathematical elements, applying knowledge and experiences. Interpret situations in diverse contexts, recognizing connections between mathematics and everyday life. Give examples of problems about everyday situations that are solved mathematically.
8	3-4	Algebra	2	Problem solving	34_02_05	Recognize simple mathematical language present in everyday life in different formats, acquire basic specific vocabulary, and show understanding of the message. Explain mathematical processes and ideas, the steps followed in solving a problem, or the results obtained, using simple mathematical language in different formats.
9	3-4	Algebra	2	Problem solving	34_02_06	Get acquainted with the concept of the unknown (variable); distinguish between known and unknown data; utilize a mathematical model, check the results, and compose an answer. Learn through examples: equation, unknown of an equation, solution of an equation. Calculate the value of an expression with a letter in it, given the value of the letter. Form a letter expression from a word problem. Formulation of mathematical questions based on everyday situations. Understand unknown numbers and how they can be represented by a symbol.

10	3-4	Algebra	3	Comparison, sorting	34_03_01	Sorts based on own criteria, recognizes criteria in existing sorting, and is able to continue sorting. Sorts elements and inserts new elements into existing sorts.
11	3-4	Algebra	3	Comparison, sorting	34_03_02	Compares finite sets based on the number of elements; pairs up elements of two sets with each other (1:1). Understands and properly uses the more, less, equal amount relations, and the smaller, greater, equal relations with regards to numbers. Orders numbers and quantities by size; finds the position of numbers on number lines and tables; recognizes numbers in their different forms up to 10,000.
12	3-4	Algebra	3	Comparison, sorting	34_03_03	Mathematical similarities and how the equals sign is used to draw simple equations. Gives and understands numbers constructed through various operations.
13	3-4	Algebra	4	Counting, approximations	34_04_01	Strategies and techniques for interpreting and manipulating the order of magnitude of numbers (tens, hundreds, and thousands). Reasoned estimates and approximations of quantities in problem-solving contexts. Uses tools (abacus), understands multiplication and division by 10, 100, 1000.
14	3-4	Algebra	4	Counting, approximations	34_04_02	Counts and measures using (arbitrarily chosen or standard) units for numbers up to 10,000; can count up and down by tens, hundreds, thousands; knows the following approximation methods: approximate counting, approximate measurement, measuring with a multiple of the measurement unit; knows how to refine their approximation by re-approximation.
15	3-4	Number system	5	Digits, numbers, number systems	34_05_01	Identifies, tells apart, and describes objects, things, and people based on properties.

16	3-4	Number system	5	Digits, numbers, number systems	34_05_02	Recognition of similar and differing attributes, organizing into groups (find similarities, differences).
17	3-4	Number system	5	Digits, numbers, number systems	34_05_03	Identifies and selects elements matching multiple criteria (find similarities, regularities).
18	3-4	Number system	5	Digits, numbers, number systems	34_05_04	Understanding the symbols for numbers and their historical development across different cultures, including ancient civilizations and Roman numerals.
19	3-4	Number system	5	Digits, numbers, number systems	34_05_05	Natural numbers and their properties and how numbers can be divided, and how they can be used to specify quantities and order.
20	3-4	Number system	5	Digits, numbers, number systems	34_05_06	Reading, representation (including the number line and with manipulative materials), composition, decomposition, and re-composition of natural numbers up to 9999.
21	3-4	Number system	5	Digits, numbers, number systems	34_05_07	Understanding and applying the base ten number system up to 9999, including place-value and positional value concepts.
22	3-4	Number system	5	Digits, numbers, number systems	34_05_08	Reinforcing the perception of the decimal numeral system, understanding place and face value, and breaking up numbers into sums based on powers of 10.
23	3-4	Number system	5	Digits, numbers, number systems	34_05_09	Model and analyze three-digit numbers and thus expand and reinforce the knowledge of place value. Introduction of the number systems and numbers used by ancient civilizations.
24	3-4	Number system	5	Digits, numbers, number systems	34_05_10	Exploring various number systems used in different cultures throughout history.

25	3-4	Measuring	6	Measurements and measurement tools	34_06_01	Estimation of measures of length, mass, and capacity by comparison. Calculation and estimation of amounts and change (euros and cents) in everyday life problems: income, expenses, and savings. Up- or downscale units of time measurement and understanding concepts of path and speed.
26	3-4	Measuring	6	Measurements and measurement tools	34_06_02	Measurable attributes of objects (length, mass, capacity, surface area, volume, and angle amplitude). Conventional (km, m, cm, mm; kg, g; l, ml) and non-conventional units in everyday situations. Measurement of time (year, month, week, day, hour, and minutes) and determination of the duration of time periods. Explain the relationship between standard units of measurement and their necessity (liters, half-liters, milliliters, kilograms, grams).
27	3-4	Measuring	6	Measurements and measurement tools	34_06_03	Strategies for measuring with non-conventional methods (repeating a unit, use of grids and manipulative materials) and conventional instruments (ruler, tape measure, scales, analog and digital clock). Practice measuring, paying attention to accuracy, evaluating results, and checking measurements.
28	3-4	Measuring	6	Measurements and measurement tools	34_06_04	Strategies for calculating the perimeters of plane figures and their use in solving everyday problems. Measures the area and circumference of different polygons (possibly by coverage); approximates and measures using known units of measurement. Explain the relationship between the perimeters of squares and rectangles and their side lengths. Understand that the areas of shapes are composed of unit squares and associate the area of squares and rectangles with multiplication and addition operations.

29	3-4	Measuring	6	Measurements and measurement tools	34_06_05	Real-world decision problems using calculations (earnings, expenses, donations, savings). Measurement processes using conventional instruments (ruler, tape measure, scales, analog and digital clocks). Recognize and compare the relationship between money and coins, and solve problems related to these relationships. Understand the use of kilograms and grams, including estimation and conversion among units.
30	3-4	Measuring	6	Measurements and measurement tools	34_06_06	Read the time in minutes and hours, and explain the relationship between year-week, year-day, minute-second without conversion operations. Discuss hour-minute, minute-second, year-week, year-month-week-day relations and express one in terms of the other.
31	3-4	Algebra	7	Equations, operations	34_07_01	Equality is an expression of an equivalence relationship between two elements and obtaining simple unknowns (represented by a symbol) in either element. Equality and inequality relations, and use of = and ? signs between expressions involving operations and their properties. Representation of 'greater than' and 'less than', and use of the signs < and >.
32	3-4	Algebra	7	Equations, operations	34_07_02	Relationships between addition and subtraction, and multiplication and division: application in everyday contexts. Practice both partitive and quotative division.
33	3-4	Algebra	7	Equations, operations	34_07_03	Addition, subtraction, multiplication, and division of natural numbers are solved with flexibility and sense in contextualized situations: solving strategies, tools, and properties. Properly interprets and utilizes operations for numbers up to 10,000; understands terms: addend, sum, minuend, subtrahend, difference, multiplicand, multiplier, product, dividend, divisor, quotient, remainder; uses symbols for operations and parentheses

						for multiple operations.
34	3-4	Algebra	7	Equations, operations	34_07_04	Natural numbers and fractions in everyday life contexts: comparison and ordering. The understanding of the structure, connections, and divisibility of numbers is diversified by studying and classifying numbers. How natural numbers and simple numbers as fractions are used in student-centered situations.
35	3-4	Algebra	7	Equations, operations	34_07_05	Ensure that the students master the concept of multiplication and learn multiplication tables 6-9, and ensure mastery of multiplication tables 1-10. Practice dividing in parts (e.g., 38/4 = 36/4 + 2/4).
36	3-4	Algebra	7	Equations, operations	34_07_06	Reading and writing 4, 5, and 6-digit numbers, dividing them into parts, and specifying the place values.
37	3-4	Algebra	8	Mental calculations	34_08_01	Mental calculation strategies with natural numbers and fractions. Accurately adds and subtracts in the head for numbers up to 100; multiplies and divides. Reinforcing mental multiplication and division operations. Strategies for recognizing which simple operations (addition, subtraction, multiplication, division as division and partition) are useful to solve contextualized situations.
38	3-4	Algebra	8	Mental calculations	34_08_02	Practice the basic operations: addition, subtraction, multiplication, and division. Construction of the multiplication tables based on the number of times, repeated addition, or grid arrangement. Understands the

						relationship of multiplication and division tables.
39	3-4	Algebra	8	Mental calculations	34_08_03	Methods of calculating using natural numbers when performing mental arithmetic, approximate estimates, and written calculations. Use of digital tools in calculations.
40	3-4	Geometry	9	Shapes and objects, and their properties	34_09_01	Constructing shapes and patterns from given objects and two-dimensional shapes; recognizing and continuing line or planar patterns. Constructing bodies from edges and faces; creating edge frames and nets; identifying objects based on multiple criteria.
41	3-4	Geometry	9	Shapes and objects, and their properties	34_09_02	Recognizing symmetry in shapes such as squares and rectangles, and understanding that they have more than one line of symmetry. Completing figures according to horizontal or vertical lines of symmetry, and creating covering patterns on dotted or squared paper.
42	3-4	Geometry	9	Shapes and objects, and their properties	34_09_03	Basic two- and three-dimensional geometric objects and their properties and relationships. Construction of geometric objects, both with and without digital tools. Identification and classification of geometric figures in everyday objects based on their elements and relationships.
43	3-4	Geometry	9	Shapes and objects, and their properties	34_09_04	Finding and continuing geometric patterns through experiences. Expressing abstract concepts such as point, line, ray, line segment, and angle, with examples from their surroundings.

44	3-4	Geometry	9	Shapes and objects, and their properties	34_09_05	Identifying and classifying simple two-dimensional geometric figures in everyday objects based on their elements. Classifying shapes according to the number of corners and sides; recognizing and creating models of triangles, squares, rectangles, and circles.
45	3-4	Geometry	9	Shapes and objects, and their properties	34_09_06	Exploring the properties of two-dimensional figures using manipulative materials and digital tools. Understanding the properties of three-dimensional shapes: cubes, cuboids, cylinders, cones, and spheres.
46	3-4	Geometry	9	Shapes and objects, and their properties	34_09_07	Drawing, examining, and classifying shapes; classifying cylinders, cones, and other shapes. Developing the ability to visualize a three-dimensional environment and observe plane geometry within it. Using rulers to draw triangles, squares, and rectangles; determining diagonals in squares and rectangles.
47	3-4	Geometry	9	Shapes and objects, and their properties	34_09_08	Naming and classifying shapes based on sides and corners; creating models from single or multiple shapes. Determining similarities and differences between shapes such as cubes, square prisms, and rectangular prisms.
48	3-4	Analysis	10	Constructions and Translations	34_10_01	Strategies and techniques for the construction of two-dimensional geometric figures by composition and decomposition using manipulative materials, drawing instruments (ruler/square), and computer applications. Properties of two- and three-dimensional geometric figures: exploration through manipulative materials (grids, geoplanes, polycubes) and the use of digital tools (dynamic geometry programs, augmented reality, educational robotics).

49	3-4	Analysis	10	Constructions and Translations	34_10_02	Identification of transformed figures by means of translations and symmetries in everyday life situations. Generation of transformed figures from symmetries and translations of an initial pattern and prediction of the result.
50	3-4	Analysis	10	Constructions and Translations	34_10_03	Guiding students to observe rotational and translational symmetry in their surroundings, for example, in art. Creating mirror images with movement and masking; creating symmetrical shapes; checking the correctness of a reflection and symmetrical line patterns.
51	3-4	Geometry	11	Orientation in space and on a plane	34_11_01	Description of the relative position of objects in space or their representations using appropriate geometric vocabulary (parallel, perpendicular, oblique, right, left, etc.). Verbal description and interpretation of movements, in relation to oneself or to other points of reference, using appropriate geometric vocabulary. Interpretation of itineraries in plans, using physical and virtual supports. Geometric models in solving problems related to the other senses.
52	3-4	Geometry	11	Orientation in space and on a plane	34_11_02	Properly uses terms describing directions and distances in two- and three-dimensions. Ability to navigate their neighborhood and on a map. Recognition of geometric relationships in fields outside the mathematics class, such as art, science, and everyday life. Students practice using the concepts of direction and location.
53	3-4	Algebra	12	Relationships	34_12_01	Students deepen their skills in comparing, classifying, and ordering, searching answer options systematically, and observing cause and effect relationships in Maths.

54	3-4	Algebra	12	Relationships	34_12_02	Finds pairs in a memory game; recognizes and expresses relationships; looks for patterns among elements of a series. Creates a series based on a given rule; lists months; recognizes relationships among element doubles or triples. Extends, describes sequences of 2-4 repeating members. Differences can be in size, color, line thickness, angle of rotation, and sequences might carry over to the next line. Investigates sequences obtained by merging two sequences. Simple patterns in number sequences and simple geometric patterns: how they are constructed, described, and expressed.
55	3-4	Algebra	12	Relationships	34_12_03	Simple tables and diagrams and how they are used to categorize data and describe results from investigations, both with and without digital tools.
56	3-4	Probability and Statistics	13	Data collection and management	34_13_01	Statistical graphs of everyday life (pictograms, bar charts, histograms...): reading, interpretation. Simple strategies for the collection, classification, and organization of discrete qualitative or quantitative data in small samples using a calculator and simple computer applications. Absolute frequency: interpretation.
57	3-4	Probability and Statistics	13	Data collection and management	34_13_02	Simple statistical graphs to represent data, selecting the most convenient, using traditional resources and simple computer applications. Mode: interpretation as the most frequent data. Graphical comparison of two sets of data to establish relationships and draw conclusions.
58	3-4	Probability and Statistics	13	Data collection and management	34_13_03	Collects data in their environment; records data for later evaluation; organizes collected data in a table, and illustrates it on a diagram.

59	3-4	Probability and Statistics	13	Data collection and management	34_13_04	Read and interpret simple tables with at most three data groups, and organize the data obtained from the table. Examine and create the column chart. Use different representations to present the data, solve and set up problems related to daily life by using the information shown in tree diagrams, column graphs, tables, and other graphics.
60	3-4	Probability and Statistics	14	Randomness	34_14_01	Formulation of conjectures from data collected and analyzed, making sense of them in the context of the study.
61	3-4	Probability and Statistics	14	Randomness	34_14_02	Probability as a subjective measure of uncertainty. Recognition of uncertainty in everyday situations and by performing experiments. Identification of certain events, possible events, and impossible events. Comparing the probability of two events intuitively.
62	3-4	Probability and Statistics	14	Randomness	34_14_03	Random events in specific situations.
63	3-4	Algebra	15	Columnar operations	34_15_01	Practice addition and subtraction algorithms, ensuring that the skill is learned. (columnar addition and subtraction)
64	3-4	Algebra	15	Columnar operations	34_15_02	Practice the multiplication algorithm and ensure that the skill is mastered (columnar multiplication with one- and two-digit multipliers).
65	3-4	Algebra	15	Columnar operations	34_15_03	Interprets and checks the solution of columnar multiplication with one- and two-digit multipliers and division with one-digit divisor; approximates.

66	3-4	Algebra	16	Part-Part-Whole Relationships	34_16_01	Learn the concept of fractions and practice basic calculations of fractions in different situations. Proper fractions with denominators up to 12 in everyday contexts. Fractions as part of a whole and part of a number, and how parts are named and expressed as simple fractions. How simple fractions are related to natural numbers.
67	3-4	Algebra	16	Part-Part-Whole Relationships	34_16_02	Illustrates, draws, measures, and understands unit fractions and their multiples. The concept of unit fraction and the relationship between the numerator and the denominator is reinforced.
68	3-4	Algebra	16	Part-Part-Whole Relationships	34_16_03	Compare fractions m/n < 1 where numerators or denominators are the same. Define and use simple, compound, and integer fractions, and perform addition and subtraction with fractions. Add and subtract fractions with equal denominators and solve appropriate problems. Add and subtract decimal numbers with 1 or 2 decimal places.
69	3-4	Algebra	16	Part-Part-Whole Relationships	34_16_04	Division (grouping, segmentation) process, fractional introduction by emphasizing the part-whole relationship.
70	3-4	Algebra	17	Natural numbers, Integers, and their operations	34_17_01	Directed units (temperature); understands lesser and greater relations for negative numbers too.
71	3-4	Algebra	17	Natural numbers, Integers, and their operations	34_17_02	Students are guided to round numbers and calculate with approximations so that they learn to estimate the order of magnitude of the result.
72	3-4	Algebra	17	Natural numbers, Integers, and their operations	34_17_03	The four basic arithmetic operations (addition, subtraction, multiplication, and division) and rules for their use in calculations with natural numbers.

73	3-4	Mathematics logic/set theory	19	Math and logic in everyday life	34_19_01	Determines "true" and "false" statements; creates statements with the terms 'all', 'not all', 'exists...', 'none of ...', and their synonyms appropriately
74	3-4	Probability and Statistics	21	Ratios, percentages	34_21_01	Proportional relationships, including doubling and halving.
75	3-4	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	34_25_01	Recognize horizontal or vertical translations of an object by the number of cells. Recognize the rotation of an object around a point.
76	3-4	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	34_25_02	Scale for enlargement and reduction, and the use of scale in student-centered situations.
77	3-4	Measuring	26	Measurements and Units	34_26_01	Guide the students to understand how the system of measurement units is structured. Practice unit conversions with the most commonly used measurement units.
78	3-4	Algebra	31	Pattern usage/recognition	34_31_01	Verbal description from regularities in a collection of numbers, figures, or pictures.
79	3-4	Algebra	31	Pattern usage/recognition	34_31_02	Identification, verbal description, representation, and reasoned prediction of terms from regularities in a collection of numbers, figures, or pictures.
80	5-6	Algebra	3	Comparison, sorting	56_03_01	Students deepen their skills in comparing, classifying, and ordering, searching for answer options systematically, and observing cause and effect relationships in Maths.

81	5-6	Number system	5	Digits, numbers, number systems	56_05_01	Understands and uses the place value notation of large numbers; reads and writes natural numbers.
82	5-6	Number system	5	Digits, numbers, number systems	56_05_02	Different number systems have been used in various cultures throughout history.
83	5-6	Measuring	6	Measurements and measurement tools	56_06_01	Practice measuring and pay attention to accuracy, result evaluation, and checking the measurement.
84	5-6	Measuring	6	Measurements and measurement tools	56_06_02	Solving problems related to responsible consumption.
85	5-6	Measuring	6	Measurements and measurement tools	56_06_03	Guide the students to use the scale when using the map.
86	5-6	Geometry	9	Shapes and objects, and their properties	56_09_01	Classify 2D shapes into polygons and others, and study their properties. Find similarities, differences, and regularities.
87	5-6	Geometry	9	Shapes and objects, and their properties	56_09_02	Learn about the concepts of point, segment, line, and angle.
88	5-6	Analysis	10	Constructions and Translations	56_10_01	Statistical data sets and graphs of everyday life. Strategies for conducting a simple statistical study.
89	5-6	Analysis	10	Constructions and Translations	56_10_02	Simple statistical graphs (bar chart, pie chart, histogram, etc.). Relation and comparison of two sets of data from their graphical representation. Measures of centralization. Measures of dispersion (range). Absolute and relative frequency tables.
90	5-6	Analysis	10	Constructions and Translations	56_10_03	Calculator and other digital resources, such as a spreadsheet, to organize statistical information and perform different data visualizations.
91	5-6	Geometry	11	Orientation in space and on a	56_11_0	Guide the students to use the scale when using the map.

				plane	1	
92	5-6	Geometry	11	Orientation in space and on a plane	56_11_02	Basic two- and three-dimensional geometrical objects and their properties and relationships. Construction of geometrical objects.
93	5-6	Probability and Statistics	13	Data collection and management	56_13_01	Students' skills to systematically collect information on interesting topics are developed.
94	5-6	Probability and Statistics	13	Data collection and management	56_13_02	Create and interpret simple tables and bar graphs. Students store and present information using tables and diagrams.
95	5-6	Probability and Statistics	14	Randomness	56_14_01	Students familiarize themselves with probability based on everyday situations by concluding an event. Randomness in games: understanding "certain", "Impossible", "possible but not certain"
96	5-6	Probability and Statistics	14	Randomness	56_14_02	Approximating the probability of events, counting events, comparing the approximation with the result (for example, in a game)
97	5-6	Probability and Statistics	14	Randomness	56_14_03	Handling charts with large amounts of data. Probabilistic games were discussed and developed, where all players have the same chance of winning. Drawing charts and data tables, finding numerical characteristics, digital technologies are used.
98	5-6	Algebra	17	Natural numbers, Integers, and their operations	56_17_01	Ground the concept of a negative number and expand the number range with negative integers. Determines the given numbers' negative absolute value; knows integers. Perform four operations on natural numbers and integers.

99	5-6	Algebra	17	Natural numbers, Integers, and their operations	56_17_02	Varied counting strategies, systematic counting, and adapting counting to the size of numbers. Strategies and techniques for interpreting and manipulating the order of magnitude of numbers. Guided to round numbers and calculate with approximations, learn to estimate the order of magnitude of the result.
100	5-6	Algebra	17	Natural numbers, Integers, and their operations	56_17_03	When solving practical problems, divide by at most 2-digit numbers in writing. Approximates the quotient.
101	5-6	Algebra	17	Natural numbers, Integers, and their operations	56_17_04	Compare and round natural numbers using different methods. Define a coordinate plane, and understand how pairs of numbers represent a point on it.
102	5-6	Mathematics logic/set theory	18	Sets	56_18_01	Recognize sets in concrete cases
103	5-6	Mathematics logic/set theory	18	Sets	56_18_02	Illustrate sets in concrete cases
104	5-6	Mathematics logic/set theory	19	Math and logic in everyday life	56_19_01	Understand problems of everyday life and elaborate mathematical representations to aid problem-solving. Interpret simple mathematical language in various formats, acquire appropriate vocabulary, and effectively communicate mathematical ideas.
105	5-6	Mathematics logic/set theory	19	Math and logic in everyday life	56_19_02	Practice activities that require logical thinking, including identifying rules and dependencies and determining the number of options in math problems. Strengthen students' skills in reasoning and justification. Determine the logical value (true or false) of statements and understand various methods of justification, including mathematical proof.

106	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_01	Reading, representation, composition, decomposition, and recomposition of natural numbers, decimals to thousandths, fractions, and decimals to express quantities, and choosing the best representation for each situation or problem.
107	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_02	Base ten numbering system (natural numbers and decimals to thousandths): application of the relations it generates in operations.
108	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_03	Familiarize themselves with decimal numbers as part of the decimal system and practice basic calculations with decimal numbers. Knows and utilizes place value notation for decimal fractions, fractions, and decimals to thousandths.
109	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_04	Understand that operations with decimal numbers are similar to those with whole numbers. Additionally, addition, subtraction, multiplication, and division with rational numbers are visualized and justified. How numbers in fractions and decimals can be used in everyday situations.
110	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_05	Rational numbers, including negative numbers, and their properties, and how the numbers can be divided and used.
111	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_06	The positional number system and how it is used to describe whole numbers and decimal numbers.
112	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_07	Methods for calculations with natural numbers, simple fractions, and decimals in approximate estimates, mental arithmetic, and written calculations using digital tools.

113	5-6	Algebra	20	Rationals, fractions, and their operations	56_20_08	Mental calculation strategies with natural numbers, fractions, and decimals. Strategies for recognizing which simple or combined operations (+, -, *, /) are useful to solve contextualized situations.
114	5-6	Probability and Statistics	21	Ratios, percentages	56_21_01	Strategies for comparing, ordering, and converting measurements. Use of conventional units from the Decimal Metric System in everyday contexts. Understanding measurement tools for various quantities.
115	5-6	Probability and Statistics	21	Ratios, percentages	56_21_02	Solving problems related to responsible consumption and financial decisions. Calculations involving money and numerical information in daily life.
116	5-6	Probability and Statistics	21	Ratios, percentages	56_21_03	Identifying proportional and non-proportional situations. Solving problems involving proportionality, percentages, and scales. Understanding relationships between fractions, decimals, and percentages.
117	5-6	Probability and Statistics	21	Ratios, percentages	56_21_04	Grasping the concept of percentages and their application in real-world scenarios. Performing calculations related to changes, discounts, and comparison percentages.
118	5-6	Probability and Statistics	21	Ratios, percentages	56_21_05	Analyzing input/output tables expressing inverse proportionality. Using graphs to represent proportional relationships and understand their relation to fractions, decimals, and percentages.
119	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_01	Equality and inequality relations and use of the signs < and >. Determination of unknown data (represented by a letter or symbol) in simple expressions related by means of these signs and the signs = and ?.

120	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_02	Study equations and find solutions by reasoning and experimenting. Interprets and double-checks the result. First-degree equations are solved. Real-world problems with direct proportionality are discussed. Ratio and proportionality are defined. Properties of proportions are understood and used to solve problems.
121	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_03	Formulation of mathematical questions based on everyday situations. Strategies for solving mathematical problems in student-related situations. Formulate simple mathematical conjectures by investigating patterns, properties, and relationships in a guided manner. Pose new problems that are solved mathematically.
122	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_04	Use connections between different mathematical elements by mobilizing prior knowledge and experiences. Model everyday problems using mathematical representations. Select appropriate strategies to solve a problem and justify the choice. Verify the mathematical correctness of solutions and their coherence in context.
123	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_05	Understand the concept of a variable. Practice addition, subtraction, and multiplication of polynomials. Solve one-variable, first-degree equations using different methods. Define concepts like unary, binary, ternary, and polynomial operations. Multiply alphabetic expressions.
124	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_06	Create and re-arrange simple alphabetic expressions using natural numbers. Methods, including algebraic, for solving simple equations.

125	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_07	Express relationships using symbolic algebra. Formulate and check simple conjectures by analyzing patterns and properties. Use technological tools to investigate and verify conjectures or problems. Form and solve first-order equations and incomplete quadratic equations.
126	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_08	Recognize coherent connections between mathematics and other subjects. Solve contextualized problems by interpreting data, establishing relationships, and applying appropriate strategies and tools. Use prior knowledge and experiences to apply different mathematical processes.
127	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_09	Solve problems that require selecting solutions to inequalities that meet specific conditions. Model various real-world situations using systems of equations.
128	5-6	Algebra	22	Problem-solving with equations, proofing	56_22_10	Represent mathematical concepts, procedures, information, and results in different ways using various tools, including digital tools. Visualize ideas and structure mathematical processes to share information. Create mathematical representations to help find strategies for solving problems.
129	5-6	Analysis	23	Functional relationships	56_23_01	Description of positions and movements in the first quadrant of the Cartesian coordinate system. Learn about the first quadrant of the coordinate system and extend then to all quadrants.
130	5-6	Analysis	23	Functional relationships	56_23_02	Finds their way around a coordinate system. Coordinate system and grading of coordinate axes.
131	5-6	Algebra	24	Series (Sequences)	56_24_0	Studying the regularity of number sequences and

					1	continuing number sequences according to a rule.
132	5-6	Algebra	24	Series (Sequences)	56_24_02	Continues periodic series based on a given rule; recognizes and describes the generating rule of a series given by a few of its members.
133	5-6	Algebra	24	Series (Sequences)	56_24_03	Solve problems in a variety of contexts where different ways of describing number sequences are considered, applied, and combined. Problem situations are addressed by identifying gaps in mathematical information and learning how to find and retrieve it.
134	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_01	Geometric figures in everyday objects: identification and classification according to their elements and the relationships between them. Learn more about triangles, quadrilaterals, and circles. Group triangles based on their angles and sides. Name polygons and recognize their basic elements of rectangle, parallelogram, rhombus, and trapezoid.
135	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_02	Measure and calculate the perimeters and areas of different shapes and the volumes of rectangular cuboids. Methods for determining and estimating circumference and areas of different two-dimensional geometrical figures.
136	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_03	Geometric vocabulary: verbal description of the elements and properties of geometric figures. Explain, show, and draw basic geometric concepts such as a line, line segment, and ray.
137	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_04	Strategies for calculating areas and perimeters of plane figures in everyday life situations. Comparing, estimating, and measuring length, area, mass, volume, time, and angles using common units of measurement,

						including unit conversions related to them
138	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_05	Transformations by means of rotations, translations, and symmetries in everyday life situations: identification of transformed figures, generation from initial patterns, and prediction of the result. Symmetry in plane and how symmetry can be constructed.
139	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_06	Construction techniques of geometric figures by composition and decomposition, using manipulative materials, drawing instruments, and computer applications. Know the basic constructions: creating a perpendicular bisector, angle bisector, parallel and perpendicular lines, copying an angle.
140	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_07	Location and movements on plans and maps from reference points (including cardinal points), directions, and calculation of distances (scales): description and interpretation with the appropriate vocabulary in physical and virtual supports.
141	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_08	Learn about the concept of scale and use it in enlargements and reductions. Gain practical experience in movement along a plane. Scale for enlargement and reduction, and the use of scale in student-centered situations. Similarity in everyday life situations: identification of similar figures, generation from initial patterns, and prediction of the result.
142	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_09	Geometric models in solving problems related to the other senses. Elaboration of conjectures about geometric properties, using drawing instruments (compass and protractor) and dynamic geometry

						programs. Geometric ideas and relationships in art, science, and everyday life.
143	5-6	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	56_25_10	Students take a closer look at a rectangular cone, a circular cylinder, a circular cone, and a pyramid.
144	5-6	Measuring	26	Measurements and Units	56_26_01	Instruments (analog or digital) and appropriate units to measure lengths, objects, angles and times.
145	5-6	Measuring	26	Measurements and Units	56_26_02	Measure and calculate the perimeters and areas.
146	5-6	Probability and Statistics	27	Descriptive statistics	56_27_01	Identifying a data set as a sample and reflecting on the larger population. Formulating questions to understand population characteristics. Conducting statistical studies: collecting, recording, and organizing qualitative and quantitative data from various sources (surveys, measurements, observations).
147	5-6	Probability and Statistics	27	Descriptive statistics	56_27_02	Using calculators and digital tools like spreadsheets to organize and visualize data.
148	5-6	Probability and Statistics	27	Descriptive statistics	56_27_03	Creating and interpreting statistical graphs (pictograms, bar charts, histograms, etc.) using different technologies. Selecting the most appropriate graphical representation for data. Comparing two data sets through graphical representation to formulate conjectures and draw conclusions.
149	5-6	Probability and Statistics	27	Descriptive statistics	56_27_04	Understanding and calculating measures of centralization (mean, mode, median). Understanding and calculating measures of dispersion (range,

						variability).
150	5-6	Probability and Statistics	27	Descriptive statistics	56_27_05	Interpreting location measures and variability with technological support in real situations. Comparing two data sets according to location and dispersion measures.
151	5-6	Probability and Statistics	27	Descriptive statistics	56_27_06	Determining and interpreting absolute and relative frequencies. Practicing the calculation of frequency, relative frequency, and median.
152	5-6	Probability and Statistics	27	Descriptive statistics	56_27_07	Using statistics to solve real-world problems involving proportions, maximum and minimum values, average, mode, and median. Deepening skills in collecting, structuring, and analyzing information to draw conclusions and make decisions.
153	5-6	Probability and Statistics	28	Probability theory	56_28_01	Uncertainty in everyday life situations. Calculation of probabilities in experiments, comparisons or investigations in which Laplace's rule is applicable. Deterministic and random phenomena: identification. Simple experiments.
154	5-7	Probability and Statistics	28	Probability theory	56_28_02	Assignment of probabilities by experimentation, the concept of relative frequency and Laplace's rule. Calculate the probabilities. Construct two-outcome feasibility/probability trees and tables.
155	5-8	Probability and Statistics	28	Probability theory	56_28_03	Perform simple combinatorial analysis in concrete situations. Plays probabilistic games, performs probabilistic experiments, through these collects, organizes and displays the data according to a plan, also digitally.

156	5-9	Probability and Statistics	28	Probability theory	56_28_04	Various diagrams are interpreted and created. Explaining how cumulative frequency and cumulative relative frequency table data are represented by a cumulative frequency or cumulative relative frequency chart, and how to read and interpret the data represented by such charts.
157	5-10	Probability and Statistics	28	Probability theory	56_28_05	Understands the concepts of frequency and relative frequency. Uses this knowledge to explain 'impossible', 'certain', 'less/more likely' statements.
158	5-11	Probability and Statistics	28	Probability theory	56_28_06	Get acquainted with the concept of standard deviation. Understand measures of central tendency and measures of dispersion and how they are used for assessing results of statistical studies.
159	5-12	Probability and Statistics	28	Probability theory	56_28_07	Explaining the nature of different types of data and how variability in datasets can be interpreted in practice.
160	5-13	Probability and Statistics	28	Probability theory	56_28_08	Explore random events, chance, and risk based on observations, simulations, and statistical data. Compare the probabilities in different random trials.
161	5-6	Algebra	30	Numbers theory, LCM, GCD, power, root	56_30_01	Relationships between arithmetic operations: application in everyday contexts. Power as a product of equal factors. Squares and cubes.
162	5-6	Algebra	30	Numbers theory, LCM, GCD, power, root	56_30_02	Relationship of divisibility: multiples and divisors. Students familiarize themselves with the divisibility of numbers and divide numbers into prime factors. knows and uses the divisibility rules for 2, 3, 4, 5, 6, 9, 10, 100; groups numbers based on number of divisors or remainders

163	5-6	Algebra	31	Pattern usage/recognition	56_31_01	Generate recurring patterns from regularities using numbers, figures, or images and extend sequences based on identified regularities.
164	5-6	Algebra	31	Pattern usage/recognition	56_31_02	Use strategies to identify patterns, describe them verbally, discover hidden elements, and recognize patterns for computational interpretation.
165	7-8	Algebra	17	Natural numbers, Integers, and their operations	78_17_01	Varied systematic counting strategies in everyday life
166	7-8	Algebra	17	Natural numbers, Integers, and their operations	78_17_02	Adaptation of counting to the size of numbers
167	7-8	Algebra	17	Natural numbers, Integers, and their operations	78_17_03	Exact value, approximate value, and rounding
168	7-8	Algebra	17	Natural numbers, Integers, and their operations	78_17_04	Operations with negative numbers
169	7-8	Mathematics logic / set theory	18	Sets	78_18_01	Sorts elements into sets based on multiple criteria
170	7-8	Mathematics logic / set theory	18	Sets	78_18_02	Subset recognition and illustration
171	7-8	Mathematics logic / set theory	18	Sets	78_18_03	Numbers, sets of numbers, illustration
172	7-8	Mathematics logic / set theory	18	Sets	78_18_04	Set operations (complement, intersection, union)
173	7-8	Mathematics logic / set theory	18	Sets	78_18_05	Set of rational numbers, infinite non-periodic decimal fractions

174	7-8	Mathematics logic / set theory	18	Sets	78_18_06	Set of real numbers, properties, and usage
175	7-8	Mathematics logic / set theory	19	Math and logic in everyday life	78_19_01	Interpreting and producing mathematical text
176	7-8	Mathematics logic / set theory	19	Math and logic in everyday life	78_19_02	Reasoning and justification
177	7-8	Mathematics logic / set theory	19	Math and logic in everyday life	78_19_03	Looking for rules and dependencies and presenting them precisely
178	7-8	Mathematics logic / set theory	19	Math and logic in everyday life	78_19_04	Consider and determine the number of options (in math problems)
179	7-8	Algebra	20	Rationals, fractions, and their operations	78_20_01	Arithmetic of fractions
180	7-8	Algebra	20	Rationals, fractions, and their operations	78_20_02	opposite number, reciprocal value, absolute value
181	7-8	Algebra	20	Rationals, fractions, and their operations	78_20_03	operations with decimal numbers
182	7-8	Probability and Statistics	21	Ratios, percentages	78_21_01	Understanding and representing quantitative relationships.
183	7-8	Probability and Statistics	21	Ratios, percentages	78_21_02	Comparing decimals and percentages. Understanding the concept of percent.
184	7-8	Probability and Statistics	21	Ratios, percentages	78_21_03	Calculating the amount indicated by a percentage of the whole. Solving economic, financial, and everyday life problems related to percentages.
185	7-8	Probability and Statistics	21	Ratios, percentages	78_21_04	Exchanging units of measurement regarding time, mass, length, area, and volume based on decimal thinking.

186	7-8	Probability and Statistics	21	Ratios, percentages	78_21_05	Problem-solving by understanding linear and inverse relationships. Identifying multiplicities given the ratios.
187	7-8	Algebra	22	Problem-solving with equations, proofing	78_22_01	Form and solve first-order equations and incomplete quadratic equations. Use approximation, decomposition, or transposition methods for problem-solving with equations.
188	7-8	Algebra	22	Problem-solving with equations, proofing	78_22_02	Forming and simplifying algebraic expressions. Ensuring the equivalence of linear and quadratic algebraic expressions.
189	7-8	Algebra	22	Problem-solving with equations, proofing	78_22_03	Modelling everyday situations using mathematical representations and algebraic language. Expressing linear and quadratic relationships with symbolic algebra.
190	7-8	Algebra	22	Problem-solving with equations, proofing	78_22_04	Performing operations on polynomials.
191	7-8	Algebra	22	Problem-solving with equations, proofing	78_22_05	Selecting solutions to inequalities that satisfy certain conditions.
192	7-8	Algebra	22	Problem-solving with equations, proofing	78_22_06	Developing strategies for solving mathematical problems and evaluating chosen methods. Decomposing problems into simpler parts to facilitate computational interpretation.
193	7-8	Algebra	22	Problem-solving with equations, proofing	78_22_07	Understanding variables and their use in algebraic expressions, formulae, equations, and functions.
194	7-8	Analysis	23	Functional relationships	78_23_01	Selecting suitable representations for the same quantity in different contexts. Illustrating data from data tables graphically.

195	7-8	Analysis	23	Functional relationships	78_23_02	Identifying and comparing linear and quadratic relationships. Describing dependencies both graphically and algebraically, including direct and indirect proportionality.
196	7-8	Analysis	23	Functional relationships	78_23_03	Interpreting graphs to understand the increase and decrease of functions. Identifying the slope, constant term, and zeros of a function from its graph.
197	7-8	Analysis	23	Functional relationships	78_23_04	Mapping elements of two concrete sets to each other to show relationships. Illustrating data in tables graphically for better visualization and interpretation.
198	7-8	Algebra	24	Series (Sequences)	78_24_01	Numerical patterns and regularities
199	7-8	Algebra	24	Series (Sequences)	78_24_02	Form number sequences
200	7-8	Algebra	24	Series (Sequences)	78_24_03	Constructing, describing, and expressing patterns in number sequences and geometrical patterns
201	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_01	Understanding points, segments, straight lines, rays, and angles. Describing and classifying plane and three-dimensional geometric figures based on their properties.
202	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_02	Calculating perimeters and areas of polygons. Knowing properties of quadrilaterals, such as the sum of interior and exterior angles, convex and concave shapes, and diagonals. Understanding special quadrilaterals (trapezoid, parallelogram, rectangle, kite, rhombus, isosceles trapezoid, square) and using their properties to solve problems.

203	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_03	Using the Pythagorean theorem to solve problems. Calculating lengths and areas related to circles (circumference, segment, sector).
204	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_04	Exploring congruence, similarity, and the Pythagorean relation in plane and three-dimensional figures. Identifying and applying geometric relationships in various contexts.
205	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_05	Performing and understanding elementary transformations (rotations, translations, reflections, and symmetries). Constructing geometric figures using manipulative and digital tools (dynamic geometry programs, augmented reality). Proving the congruency of shapes through transformations in the coordinate plane. Understanding and applying scales for the reduction and enlargement of two- and three-dimensional objects.
206	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_06	Studying and calculating areas and volumes of 3D shapes such as spheres, cylinders, and cones. Creating and understanding nets of various geometric objects. Discussing and examining angles (bisector, corresponding, inverse, interior reverse, exterior reverse).
207	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_07	Practicing geometric construction and strengthening the understanding of similarity and congruence in polygons. Learning to formulate and understand the converse of conditional statements and recognizing that not all inverse statements are true. Exploring mathematical and practical problems by combining knowledge of shapes with other areas.

208	7-8	Geometry	25	Planar and spatial shapes' constructions, transformations, properties, and classification	78_25_08	Learning geometrical theorems, formulae, and arguments for their validity. Applying mathematical similarities and the equal sign in drawing equations and functions. Using geometric modeling to solve problems and understand numerical and algebraic relationships in various contexts (art, science, daily life).
209	7-8	Measuring	26	Measurements and Units	78_26_01	Estimation of measurement
210	7-8	Measuring	26	Measurements and Units	78_26_02	Measurable attributes of physical and mathematical objects
211	7-8	Measuring	26	Measurements and Units	78_26_03	Skills in units of measurement and their conversions
212	7-8	Measuring	26	Measurements and Units	78_26_04	Surface and volume calculation
213	7-8	Probability and Statistics	27	Descriptive statistics	78_27_01	Strategies for collecting and organizing data for a single variable. Identifying relevant data to answer questions posed in statistical investigations.
214	7-8	Probability and Statistics	27	Descriptive statistics	78_27_02	Analysis and interpretation of statistical tables and graphs of qualitative, discrete quantitative, and continuous quantitative variables. Interpreting data in tables, selecting the appropriate visualization method, and creating visualizations.
215	7-8	Probability and Statistics	27	Descriptive statistics	78_27_03	Understanding and calculating the average value. Determining frequency, relative frequency, and median. Calculating the average (mean) of a data series, determining the most common value (mode), and the middle data point (median), and comparing these measures.

216	7-8	Probability and Statistics	27	Descriptive statistics	78_27_04	Strategies for drawing conclusions from a sample to make judgments and appropriate decisions. Using proportions to solve problems.
217	7-8	Probability and Statistics	28	Probability theory	78_28_01	Identifying deterministic and random phenomena.
218	7-8	Probability and Statistics	28	Probability theory	78_28_02	Planning, performing, and analyzing simple experiments. Analyzing the associated uncertainty in experiments.
219	7-8	Probability and Statistics	28	Probability theory	78_28_03	Assigning probabilities to experiments. Calculating probabilities. Explaining statements about probability (impossible, certain, less/more likely).
220	7-8	Probability and Statistics	28	Probability theory	78_28_04	Calculating the standard deviation.
221	7-8	Mathematics logic / set theory	29	Mathematical language, reasoning, logic, and combinatorics	78_29_01	Using appropriate mathematical language to describe, explain, and justify reasoning, procedures, and conclusions.
222	7-8	Mathematics logic / set theory	29	Mathematical language, reasoning, logic, and combinatorics	78_29_02	Expressing true and false statements. Deducing truth values for propositions.
223	7-8	Mathematics logic / set theory	29	Mathematical language, reasoning, logic, and combinatorics	78_29_03	Developing strategies for deducing reasonable conclusions from a mathematical model.
224	7-8	Mathematics logic / set theory	29	Mathematical language, reasoning, logic, and combinatorics	78_29_04	Illustrating tasks using graph theory, such as the Seven Bridges of Königsberg problem. Using combinatorial principles in various contexts.
225	7-8	Algebra	30	Number theory, LCM, GCD, power, root	78_30_01	Divisibility of numbers

226	7-8	Algebra	30	Number theory, LCM, GCD, power, root	78_30_02	Divide numbers into prime factors
227	7-8	Algebra	30	Numbers theory, LCM, GCD, power, root	78_30_03	Calculates lowest common denominator and greatest common divisor
228	7-8	Algebra	30	Number theory, LCM, GCD, power, root	78_30_04	Power calculations with an integer exponent
229	7-8	Algebra	30	Number theory, LCM, GCD, power, root	78_30_05	Simplifying power expressions
230	7-8	Algebra	30	Number theory, LCM, GCD, power, root	78_30_06	The square root of square numbers
231	7-8	Algebra	31	Pattern usage/recognition	78_31_01	Recognition of patterns facilitates its computational interpretation

Appendix C – Task details

34_01_01

Description: Regularities: Creates statements about a given set; uses the terms 'all', 'not all', 'exists...', 'none of ...', and their synonyms appropriately.

Task ID: ES_34_01_01_01 **Title:** Even or odd

Author: CR **Team:** ES

CategoryID: 34_01_01

Text: Look at this set of numbers!

2, 4, 6, 8, 10

Write whether the following statements are true or false

a) All numbers are even
b) All numbers are odd
c) No number is even
d) No number is odd

Solution:

a) True
b) False
c) False
d) True

Task ID: ES_34_01_01_02 **Title:** Even or odd

Author: CR **Team:** ES

CategoryID: 34_01_01

Text: Look at this set of numbers!

1, 3, 5, 8, 9

Write whether the following statements are true or false

a) All numbers are even
b) All numbers are odd
c) Some number is even
d) Some number is odd

Solution:

a) False
b) False
c) True
d) True

34_01_02

Description: Students improve their skills in finding similarities, differences, and regularities. Identifies and selects elements matching multiple criteria.

Task ID: ES_34_01_02_01 **Title:** Greater than

Author: CR **Team:** ES

CategoryID: 34_01_02

Text: What do the following numbers have in common?

4, 6, 9, 10, 12

Write whether the following statements are true or false

a. They are greater than 1

b. They are greater than 4

c. They are greater than 6

d. They are greater than 3

Solution:

a. True

b. False

c. False

d. True

Task ID: ES_34_01_02_02 **Title:** Less than

Author: CR **Team:** ES

CategoryID: 34_01_02

Text: What do the following numbers have in common?

1, 3, 5, 7, 9

Write whether the following statements are true or false

a. They are less than 7

b. They are less than 9

c. They are less than 10

d. They are less than 12

Solution:

a. False

b. False

c. True

d. True

Task ID: ES_34_01_02_03 **Title:** Comparing numbers

Author: CR **Team:** ES

CategoryID: 34_01_02

Text: Look at this set of numbers!

4, 6, 9, 11, 12

Choose the even numbers greater than 4.

Solution:

6, 12

Task ID: ES_34_01_02_04 **Title:** Comparing numbers

Author: CR **Team:** ES

CategoryID: 34_01_02

Text: Look at this set of numbers!

1, 2, 3, 5, 9, 10

Choose the odd numbers less than 9

Solution:

1, 3, 5

Task ID: HU_UNPL_04 **Title:** Attribute of objects

Author: ZsP **Team:** HU

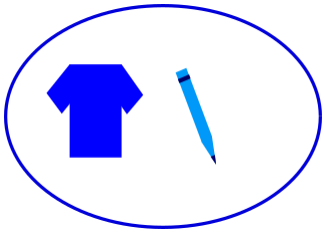
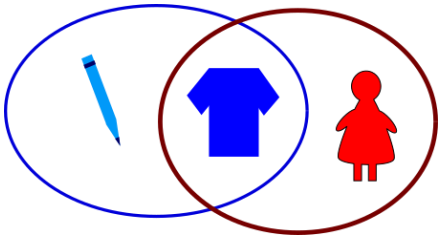
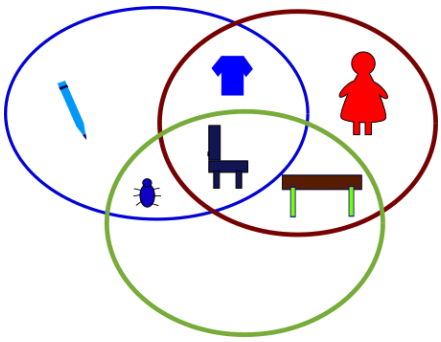
CategoryID: 34_01_02

CT topic: Data and Information > Data Processing > Classifying

Instructions for the teacher:

1. Ask students to specify some (max.5) attributes (like “the color is blue”, “it is bigger than my pen”, …). Don’t use conflicting, inconsistent attributes! Write them on the whiteboard after each other.
2. Students need to write/find objects in the room that have the same attributes. (example below)
3. You can draw sets on the table for each attribute and you can discuss the objects that are in the intersections or only in the new set.
4. *Level 2:* Students create the sets and share with each other. The classmates need to find the attributes.

Example:

attributes	**you can find in the room**	**board**
the color is blue	John’s T-shirt, Ada’s pen, …	
bigger than a pen	John’s T-shirt; teacher, …	
have more than 2 legs	… bug, chair, table, …	

34_01_03

Description: Recognition of similar and differing attributes, organizing into groups, creating a Venn-diagram. Organizes into sets, takes two criteria into consideration at the same time, names the organizing criteria

Task ID: ES_34_01_03_01 **Title:** Venn-diagram

Author: CR **Team:** ES

CategoryID: 34_01_03

Text: Look at this set of numbers!

4, 6, 9, 10, 12

Draw the set of all the even numbers using a Venn-diagram.

Solution: More solutions are possible.

Task ID: ES_34_01_03_02 **Title:** Venn-diagram

Author: CR **Team:** ES

CategoryID: 34_01_03

Text: Look at this set of numbers!

1, 4, 6, 9, 10, 12

Draw the set of all the numbers greater than 6 using a Venn-diagram.

Solution: More solutions are possible.

Task ID: ES_34_01_03_03 **Title:** Ordering numbers

Author: CR **Team:** ES

CategoryID: 34_01_03

Text: Look at this set of numbers!

4, 6, 9, 8, 10

Order the even numbers from smallest to largest.

Solution: 4, 6, 8, 9, 10

Task ID: ES_34_01_03_04 **Title:** Ordering numbers

Author: CR **Team:** ES

CategoryID: 34_01_03

Text: Look at this set of numbers! 9, 2, 10, 5, 1, 3

Order the odd numbers from largest to smallest

Solution: 10, 9, 5, 3, 2, 1

34_02_01

Description: Compare different strategies to solve a problem in a patterned way. Obtain possible solutions to a problem following a known strategy. Demonstrate the mathematical correctness of solutions and their coherence in the given context. A guided process for solving everyday problems. Solve multi-step problems, which may require up- or downscaling units of measurement.

Task ID: ALG-02-A **Title:** Put the shirts away!

Author: **Team:** Bebras

CategoryID: 34_02_01

Put your shirts away (six shirts)

There are six shirts in a pile on the chair. Puffy puts the shirts into the drawers one by one. She starts at the top drawer with one shirt and puts the next shirt in the second from the top drawer and so on. When she has put a shirt into the bottom drawer, she starts from the top again.

Into which drawer will she put the last shirt?

Click on the correct drawer.

Task ID: ALG-02-B **Title:** Put the shirts away!

Author: **Team:** Bebras

CategoryID: 34_02_01

Put your shirts away (seven shirts)

There are seven shirts in a pile on the chair. Puffy puts the shirts into the drawers one by one. She starts at the top drawer with one shirt and puts the next shirt in the second from the top drawer and so on. When she has put a shirt into the bottom drawer, she starts from the top again.

Into which drawer will she put the last shirt?

Click on the correct drawer.

Task ID: ALG-10-A **Title:** Turn on the light bulb

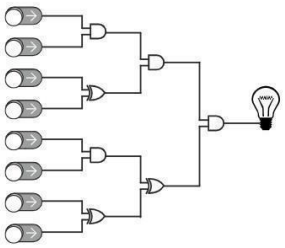
Author: **Team:** Bebras

CategoryID: 34_02_01 **CategoryID+:** 56_19_01, 78_19_03

Lights on

(symbols are black and white “arrows”)

The game "Light on" has 8 switches that can be operated. Wires lead out of these switches, which lead through some components and finally to a light bulb.



The output from the component is ON only when BOTH incoming wires are ON.

The output from the component is ON when exactly ONE of the incoming wires is ON.

Which switches have to be ON for the light bulb to be on? Click the switches to turn them on.

Task ID: ALG-10-B **Title:** Turn on the light bulb

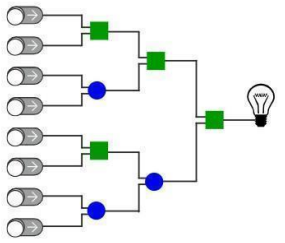
Author: **Team:** Bebras

CategoryID: 34_02_01 **CategoryID+:** 56_19_01, 78_19_03

Lights on

(symbols are colourful)

The game "Light on" has 8 switches that can be operated. Wires lead out of these switches, which lead through some components and finally to a light bulb.



The output from the component is ON only when BOTH incoming wires are ON.

The output from the component is ON when exactly ONE of the incoming wires is ON.

Which switches should be ON for the light bulb to light up? Click the switches to turn them on.

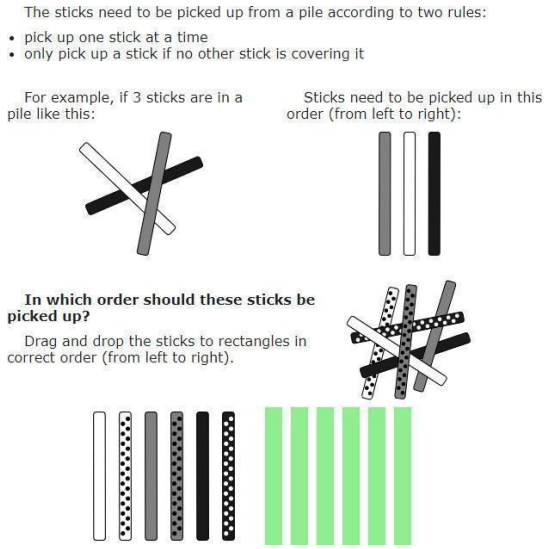
Task ID: ALG-11-A **Title:** Pick up the sticks

Author: **Team:** Bebras

CategoryID: 34_02_01 **CategoryID+:** 56_19_01, 78_22_06

Pick up sticks

(instructions are in a different order)

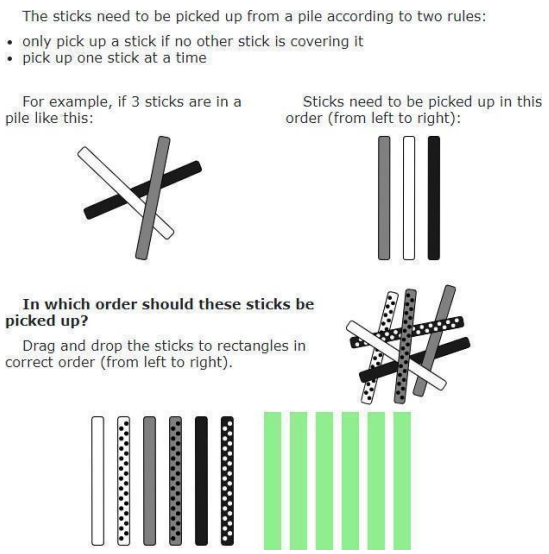


Task ID: ALG-11-B **Title:** Pick up the sticks

Author: **Team:** Bebras

CategoryID: 34_02_01 **CategoryID+:** 56_19_01, 78_22_06

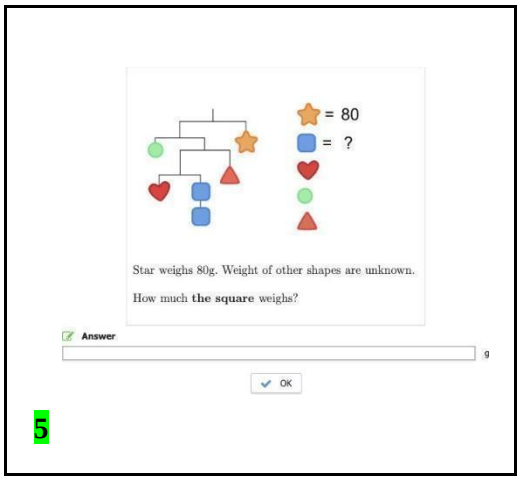
Pick up sticks



Task ID: AT12_6.5B **Title:** Weight of the shapes 1

Author: **Team:** Finnish Team

CategoryID: 34_02_01 **CategoryID+:** 56_22_06



5

34_02_06

Description: Get acquainted with the concept of the unknown (variable); distinguish between known and unknown data; utilize a mathematical model, check the results, and compose an answer. Learn through examples: equation, unknown of an equation, solution of an equation. Calculate the value of an expression with a letter in it, given the value of the letter. Form a letter expression from a word problem. Formulation of mathematical questions based on everyday situations. Understand unknown numbers and how they can be represented by a symbol.

Task ID: AT1_2.4A **Title:** Letters 1.a

Author: **Team:** Finnish Team

CategoryID: 34_02_06

An alphabet can represent a number. For example, if 2 + a = 3, then a = 1.
If 3 + b = 12, then b = ___ 9
If c - 6 = 9, then c = ___ 15
If 11 = 8 + d, then d = ___ 3
If 7 + e = 7 + 8 + 2, then e = ___ 10
If g + g + 2 = 12, then g = ___ 5

Task ID: AT1_2.4B **Title:** Letters 1.b

Author: **Team:** Finnish Team

CategoryID: 34_02_06

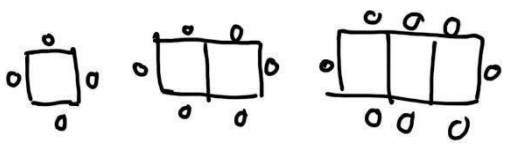
An alphabet can represent a number. For example, if a + 2 = 3, then a = 1.
If b + 3 = 12, then b = ___ 9
If 15 - c = 9, then c = ___ 6
If 11 = d + 8, then d = ___ 3
If 7 + 8 + 2 = 7 + e, then e = ___ 10
If g + g = g + 5, then g = ___ 5

Task ID: AT1_3.11A **Title:** Table and chairs 1

Author: **Team:** Finnish Team

CategoryID: 34_02_06

Linear figure: 4, 6, 8 …
(n-1) + 2 or y = 2x + 2
(table & chairs)



1) How many people can sit when 4 tables are joined ? 10
2) How many people can sit when 7 tables are joined ? 16

(difficult)

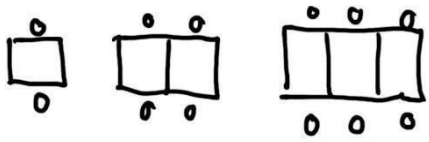
Task ID: AT1_3.11B **Title:** Table and chairs 2

Author: **Team:** Finnish Team

CategoryID: 34_02_06

Linear figure: 2, 4, 6, …
y = 2x

(table & chairs)



1) How many people can sit when 4 tables are joined ? 8
2) How many people can sit when 7 tables are joined ? 14

(medium)

Task ID: AT1_3.3A **Title:** Number Pairs 1

Author: **Team:** Finnish Team

CategoryID: 34_02_06

Fill in the table according to the rule.

y = x + 10

(3 pairs)

A number that goes into this machine will always come out in the same way.

Complete the table of the numbers that go into and come out of the machine.

x + y = 10; y = 10 –
x 1 → 9

3 → 7

5 → 5

6 → 4

10 → 0

Task ID: AT1_3.3B **Title:** Number Pairs 2

Author: **Team:** Finnish Team

CategoryID: 34_02_06

Fill in the table according to the rule.

y = x -10

(3 pairs)

A number that goes into this machine will always come out in the same way.

Complete the table of the numbers that go into and come out of the machine.

y =
2x 1
→ 2

11 → 22

32 → 64

45 → 90

205 → 410

Task ID: AT1_4.2A **Title:** Create an expression from the word problem 1

Author: **Team:** Finnish Team

CategoryID: 34_02_06

If **m** stands for the number of boys in the class and **n** stands for the numbers of girls in the class,

write a math expression for the number of boys and girls in the class altogether.

m+n#n+m

(difficult)

Task ID: AT1_4.2B **Title:** Create an expression from the word problem 2

Author: **Team:** Finnish Team

CategoryID: 34_02_06

There are more boys than girls in the class. If **m** stands for the number of boys and **n** stands for the numbers of girls, write a math expression for how many more boys than girls in the class. m-n (difficult)

Task ID: AT1_5.3A **Title:** Simplify expression 1

Author: **Team:** Finnish Team

CategoryID: 34_02_06

If **b** is a number, 1 + b + b can be simplified (written more simply) as 1 + 2b. Simplify the math expression.
a + a + a 3a#3*a#3×a#3·a#3xa
c + c + 1 2c+1#1+2c#2*c+1#1+2*c#2×c+1#1+2×c #2·c+1#1+2·c#2xc+1#1+2xc

Task ID: AT1_5.3B **Title:** Simplify expression 2

Author: **Team:** Finnish Team

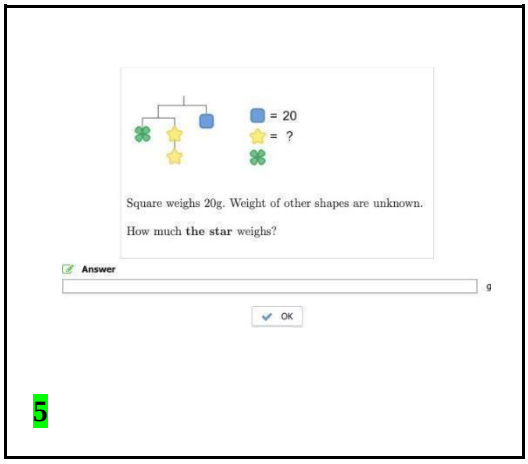
CategoryID: 34_02_06

a + a 2a#2*a#2×a#2·a#2xa
c + c + c + 1 3c+1#1+3c#3*c+1#1+3*c#3×c+1#1+ 3×c#3·c+1#1+3·c#3xc+1#1+3xc

Task ID: AT1_6.5A **Title:** Weight of the shapes 3

Author: **Team:** Finnish Team

CategoryID: 34_02_06



5

Task ID: AT12_6.1A **Title:** Operation with unknown 1

Author: **Team:** Finnish Team

CategoryID: 34_02_06 **CategoryID+:** 56_22_06

If   **= 7,**

+

then 

+  **+ 3 = ...**

10

If 3 × 4 =  **,**

then  **: 2 = …**

6

Task ID: AT12_6.1B **Title:** Operation with unknown 2

Author: **Team:** Finnish Team

CategoryID: 34_02_06 **CategoryID+:** 56_22_06

If   **= 9,**

+

then  **- 4 = ...**

 **+**

5

If 5 - 2 =  **,**

Then 4  **= …**

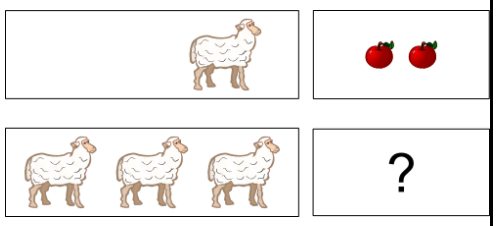
+

7

Task ID: AT12_6.3A **Title:** Open sentence 1

Author: **Team:** Finnish Team

CategoryID: 34_02_06 **CategoryID+:** 56_22_02



You need **2 apples** each day

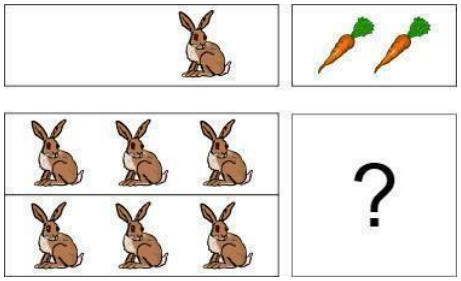
to feed **a sheep**.

How many apples would you need each day for **3 sheep**? 6

Task ID: AT12_6.3B **Title:** Open sentence 2

Author: **Team:** Finnish Team

CategoryID: 34_02_06 **CategoryID+:** 56_22_02



You need **2 carrots** each day

to feed **a rabbit**.

How many carrots would you need for **3 rabbits** for **2 days**? 12

Task ID: HU_UNPL_26 **Title:** Drawit

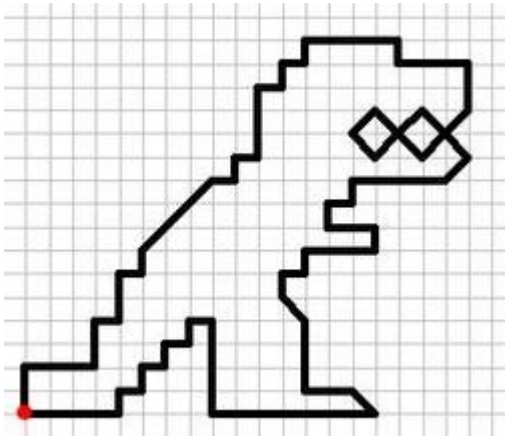
Author: ZsP **Team:** HU

CategoryID: 34_02_06

CT topic: algorithm, pattern recognition

Instructions for the teacher:

1. Print a picture and give it on a square grid paper with a given start point



2. Ask students to draw arrows (→↗↘↓↑) giving instructions for drawing the picture

↑	↑	→	→	→	↑	↑	…

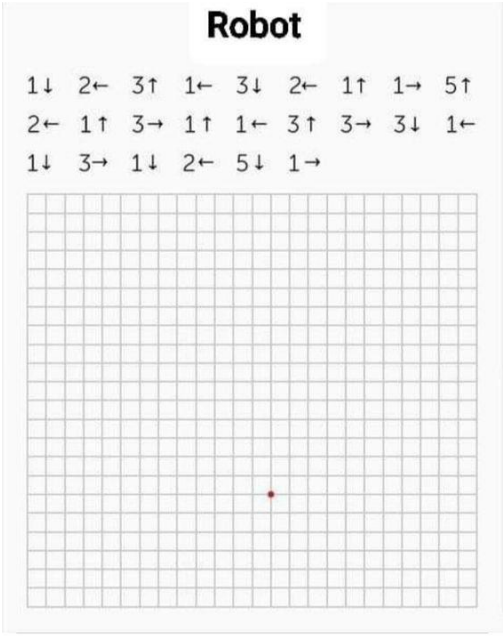
3. Discuss the "coding idea" - how could you have a shorter instruction sequence: using numbers, how many times need to use the given arrow.
4. Ask students to modify the coding instruction

2 ↑	3 →	2 ↑	1→	…

The students could draw their own pictures, write only the instructions, and give them to another student to solve it.

Variation:

- prepare pictures can be solved with repetition


Robot
1↓ 2← 3↑ 1← 3↓ 2← 1↑ 1→ 5↑
2← 1↑ 3→ 1↑ 1← 3↑ 3→ 3↓ 1←
1↓ 3→ 1↓ 2← 5↓ 1→

34_03_01

Description: Sorts based on own criteria, recognizes criteria in existing sorting, and is able to continue sorting. Sorts elements and inserts new elements into existing sorts.

Task ID: ALG-05-A **Title:** Sailor necklace

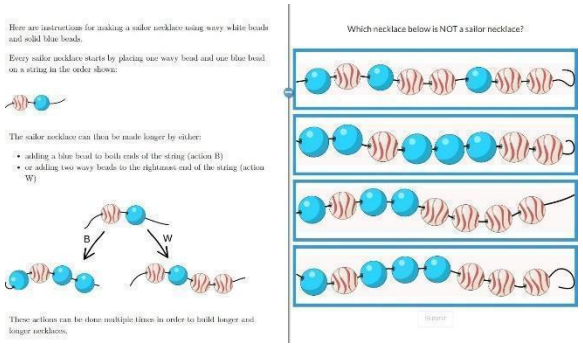
Author: **Team:** Bebras

CategoryID: 34_03_01 **CategoryID+:** 56_22_03, 78_24_03

ALG-05-A

Sailor necklace

(option B on the left, W on the right)



Task ID: ALG-05-B **Title:** Sailor necklace

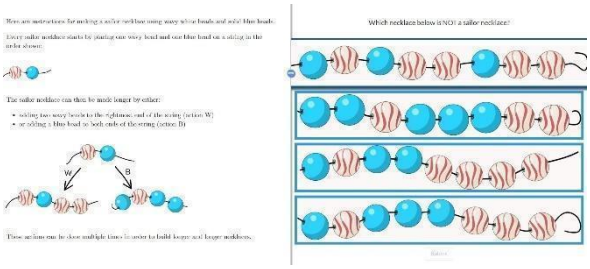
Author: **Team:** Bebras

CategoryID: 34_03_01 **CategoryID+:** 56_22_03, 78_24_03

ALG-05-B

Sailor necklace

(option W on the left, B on the right)



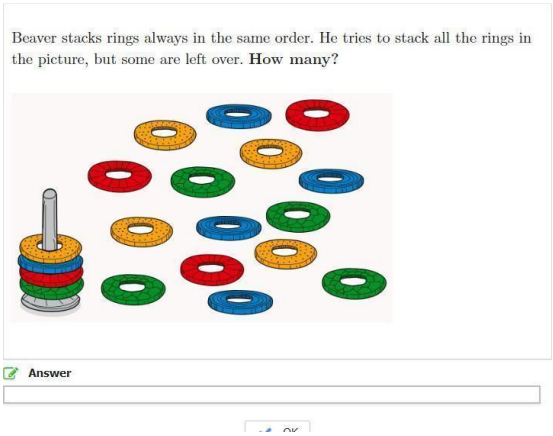
Task ID: ALG-07-A **Title:** Stacking rings

Author: **Team:** Bebras

CategoryID: 34_03_01

ALG-07-A

Stacking rings
(Open-answer)



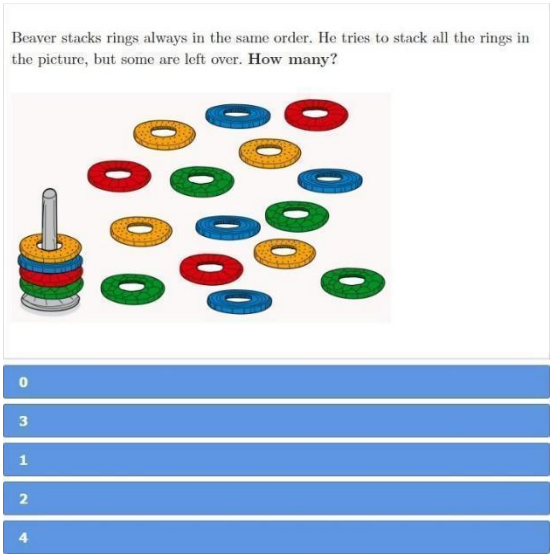
Task ID: ALG-07-B **Title:** Stacking rings

Author: **Team:** Bebras

CategoryID: 34_03_01

ALG-07-B

Stacking rings
(Multiple
choice)



Task ID: ALG-08-A **Title:** Stickers

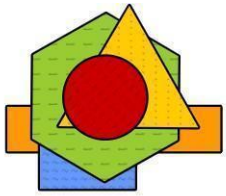
Author: **Team:** Bebras

CategoryID: 34_03_01

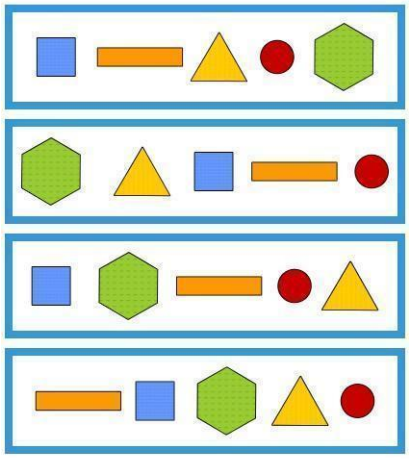
ALG-08-A

Stickers

(blue square is on top of the orange block)



In which order the stickers have been applied?



Task ID: ALG-08-B **Title:** Stickers

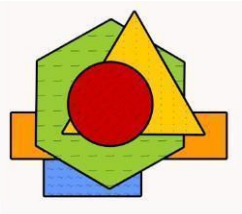
Author: **Team:** Bebras

CategoryID: 34_03_01

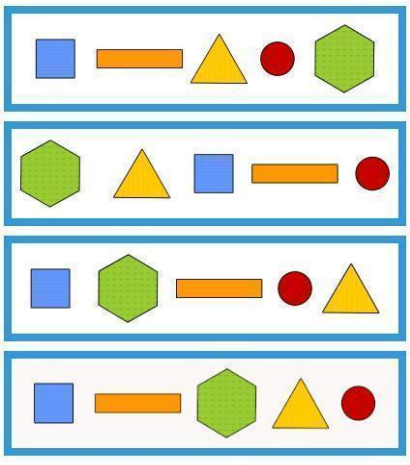
ALG-08-B

Stickers

(orange block is on top of the blue square)



In which order the stickers have been applied?



Task ID: ALG-09-A **Title:** Forest party

Author: **Team:** Bebras

CategoryID: 34_03_01

ALG-09-A

Forest party

(animals have names)

The table shows which kind of foods Betty Beaver, Fiona Fox, and Bobby Bear can eat.

	Leaves	Fish	Mushrooms	Berries
Betty Beaver	Yes	No	No	Yes
Fiona Fox	No	Yes	No	Yes
Bobby Bear	No	Yes	Yes	Yes

One day, they have nine portions of food.

Divide the foods so that each of them gets three portions of food by dragging and dropping them into the table.

Betty Beaver			
Fiona Fox			
Bobby Bear			

Task ID: ALG-09-B **Title:** Forest party

Author: **Team:** Bebras

CategoryID: 34_03_01

ALG-08-B

Forest party

(animals don't have names)

The table shows which kind of foods Beaver, Fox and Bear can eat.

Beaver	Yes	No	No	Yes
Fox	No	Yes	No	Yes
Bear	No	Yes	Yes	Yes

One day, they have nine portions of food.

Divide the foods so that each of them gets three portions of food by dragging and dropping them into the table.

Beaver			
Fox			
Bear			

Task ID: ALG-12-A **Title:** Items in bags

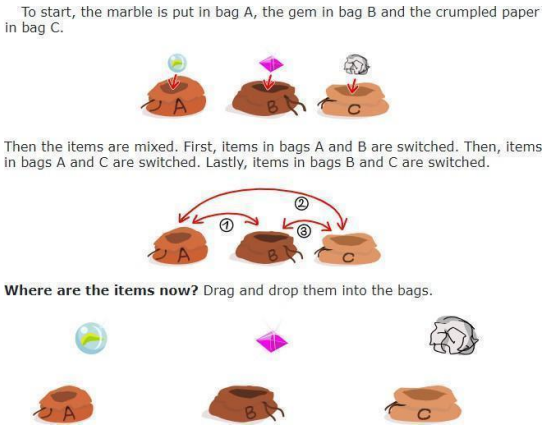
Author: **Team:** Bebras

CategoryID: 34_03_01 **CategoryID+:** 56_03_01

ALG-12-A

Items in bags

(items are in a different order)



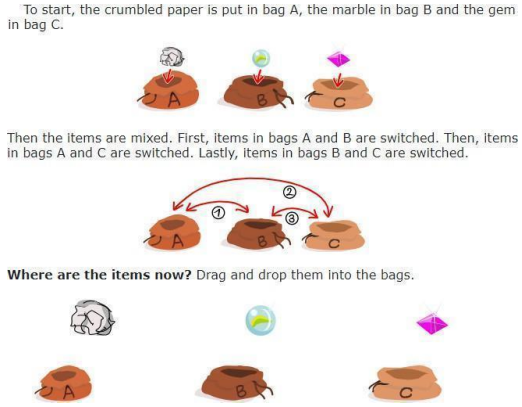
Task ID: ALG-12-B **Title:** Items in bags

Author: **Team:** Bebras

CategoryID: 34_03_01 **CategoryID+:** 56_03_01

ALG-12-B

Items in bags



Task ID: AT12_3.1B **Title:** Pattern in the series 1

Author: **Team:** Finnish Team

CategoryID: 34_03_01 **CategoryID+:** 56_03_01

Repeat: AABCAABCAAB…

1) What shape will be in the next (12th) figure?

- A
- B
- C

2) What shape will be in the 16th figure?

- A
- B
- C

(medium)

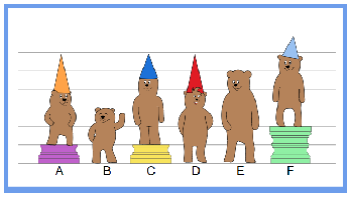
34_03_02

Description: Compares finite sets based on the number of elements; pairs up elements of two sets with each other (1:1). Understands and properly uses the more, less, equal amount relations, and the smaller, greater, equal relations with regards to numbers. Orders numbers and quantities by size; finds the position of numbers on number lines and tables; recognizes numbers in their different forms up to 10,000.

Task ID: AT1_6.2A **Title:** Compare sizes 1

Author: **Team:** Finnish Team

CategoryID: 34_03_02



Who is the tallest bear?

E

(multiple choice A..F)

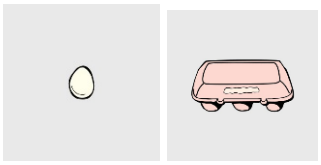
Task ID: AT1_6.4A **Title:** Count and compare 1

Author: **Team:** Finnish Team

CategoryID: 34_03_02

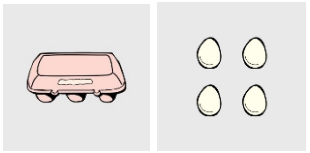
One carton has always six eggs:

Which square has more eggs in total?



2

Which square has more eggs in total?



1

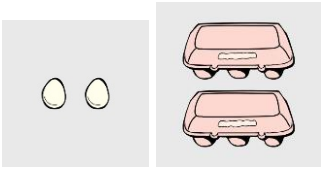
Task ID: AT1_6.4B **Title:** Count and compare 2

Author: **Team:** Finnish Team

CategoryID: 34_03_02

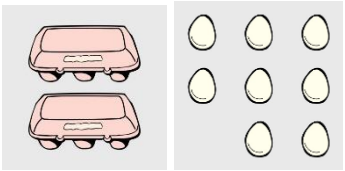
One carton has always six eggs:

Which square has more eggs in total?



2

Which square has more eggs in total?

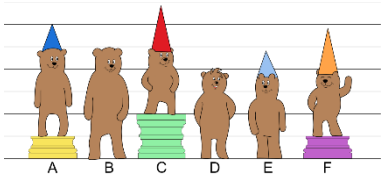


1

Task ID: AT12_6.2B **Title:** Compare sizes 2

Author: **Team:** Finnish Team

CategoryID: 34_03_02 **CategoryID+:** 56_03_01



Who is the tallest bear?

B

(multiple choice A..F)

34_04_01

Description: Strategies and techniques for interpreting and manipulating the order of magnitude of numbers (tens, hundreds, and thousands). Reasoned estimates and approximations of quantities in problem-solving contexts. Uses tools (abacus), understands multiplication and division by 10, 100, 1000.

Task ID: HU_34_04_01_01 **Title:** The magnitudes of numbers

Author: PS **Team:** HU

CategoryID: 34_04_01

Text: What is the magnitudes of numbers?

a) 734
b) 91
c) 3971
d) 101
e) 1984

Options:

1) ten
2) hundred
3) thousand

Solution:

a) 2
b) 1
c) 3
d) 2
e) 3

Task ID: HU_34_04_01_02 **Title:** Multiplication with 10, 100 and 1000

Author: PS **Team:** HU

CategoryID: 34_04_01

Text: Solve and check the next operations.

a) 347 * 10 =
b) 100 * 21 =
c) 1000 * 391 =
d) 7895 * 100 =

Solution:

e) 3470

f) 2100

g) 391 000

h) 789 500

Task ID: HU_34_04_01_03 **Title:** Approximation of the result of multiplication

Author: PS **Team:** HU

CategoryID: 34_04_01

Text: Approximate the result of the product of 34 * 27.

Options:

a) 34*27 > 1000

b) 1000 > 34*27 > 800

c) 800 > 34*27

Solution:

b)

34_04_02

Description: Counts and measures using (arbitrarily chosen or standard) units for numbers up to 10,000; can count up and down by tens, hundreds, thousands; knows the following approximation methods: approximate counting, approximate measurement, measuring with a multiple of the measurement unit; knows how to refine their approximation by re-approximation.

Task ID: HU_34_04_02_01 **Title:** Estimation of square's area 1

Author: PS **Team:** HU

CategoryID: 34_04_02

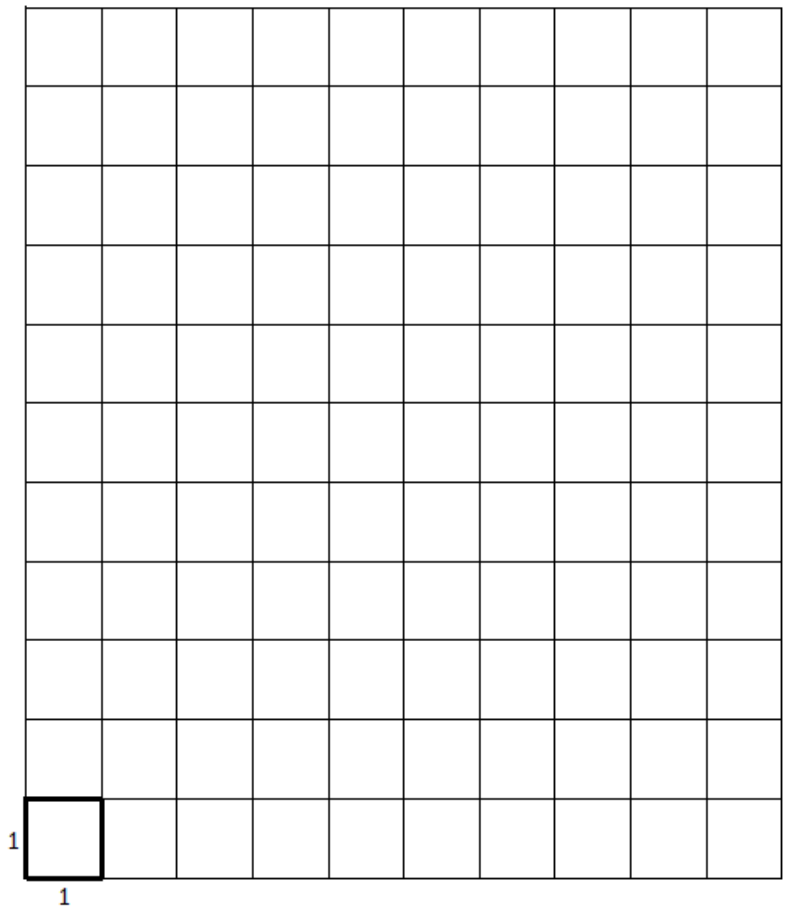
Text: The small square's length of side is 1. What is the length of side if the area is square is the hundredfold?

a) 10

b) 20

c) 100

d) 1000



Solution:

c)

Task ID: HU_34_04_02_02 **Title:** Estimation of square's area 2

Author: PS **Team:** HU

CategoryID: 34_04_02

Text: The square's length of side is 4. What is the length of side if the area is square is the hundredfold.

Options:

a) 10

b) 40

c) 100

d) 400

Solution:

b)

34_05_01

Description: Identifies, tells apart, and describes objects, things, people based on properties.

Task ID: HU_UNPL_04b **Title:** Attribute of objects2

Author: ZsP **Team:** HU

CategoryID: 34_05_01

CT topic: Data and Information > Data Processing > Classifying

Instructions for the teacher:

> Play the “Attributes of objects (HU_UNPL_04)” but use attributes that are related to the measurements (height, width, weight, value)

34_06_01

Description: Estimation of measures of length, mass, and capacity by comparison. Calculation and estimation of amounts and change (euros and cents) in everyday life problems: income, expenses, and savings. Up- or downscale units of time measurement and understanding concepts of path and speed.

Task ID: ES_34_06_01_01 **Title:** Distances

Author: OG **Team:** ES

CategoryID: 34_06_01

Text: Order the following lengths from smallest to largest:

10m, 100cm, 1km, 1100m

Solution: 100cm, 10m, 1km, 1100m

Task ID: ES_34_06_01_02 **Title:** Managing money

Author: OG **Team:** ES

CategoryID: 34_06_01

Text: My friends and I have pooled the money we have to buy some sticker packs: Jon has put 5€, Ana has put 6€, Isabel has put 4€ and I have put 7€. Each sticker pack costs 3€.

a) How many packs are we going to be able to buy?

b) Are we going to have money left over?

Solution:

a) 7 sticker packs

b) 1€

34_06_02

Description: Measurable attributes of objects (length, mass, capacity, surface area, volume, and angle amplitude). Conventional (km, m, cm, mm; kg, g; l, ml) and non-conventional units in everyday situations. Measurement of time (year, month, week, day, hour, and minutes) and determination of the duration of time periods. Explain the relationship between standard units of measurement and their necessity (liters, half-liters, milliliters, kilograms, grams).

Task ID: ES_34_06_02_01 **Title:** Units for measuring

Author: OG **Team:** ES

CategoryID: 34_06_02

Text: Choose the appropriate units of measurement (km, m, kg, l) to complete the following sentences:

a) There is a short distance from my house to yours, about 100_

b) This bag weighs almost 5_

c) I have drunk 1_ of water

Solution:

a) 100m

b) 5kg

c) 1l

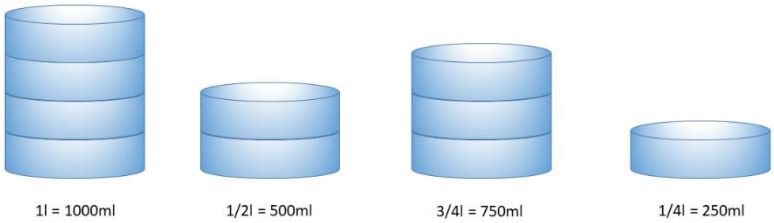
Task ID: ES_34_06_02_02 **Title:** Mililiters

Author: OG **Team:** ES

CategoryID: 34_06_02

Text: Fill in the missing quantities in the drawings.

Solution:

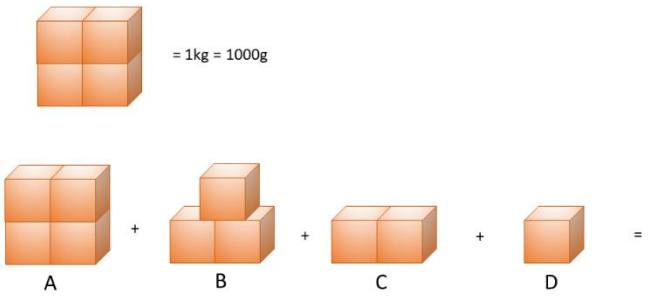


Task ID: ES_34_06_02_03 **Title:** Which is the weight of the packages?

Author: OG **Team:** ES

CategoryID: 34_06_02

Text: Indicate the weight corresponding to packages A, B, C and D (use the unit of measurement that seems most appropriate to you), and give the result of adding these quantities.



Solution:

A = 1kg = 1000g

B = 3/4kg = 750g

C = 1/2kg = 500g

A + B + C = 2250g = 2,25kg

34_06_04

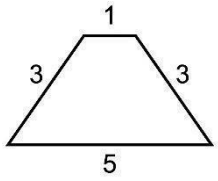
Description: Strategies for calculating perimeters of plane figures and their use in solving everyday problems. Measures the area and circumference of different polygons (possibly by coverage); approximates and measures using known units of measurements. Explain the relationship between the perimeters of squares and rectangles and their side lengths. Understand that the areas of shapes are composed of unit squares and associate the area of squares and rectangles with multiplication and addition operations.

Task ID: AT1_1.4A **Title:** Perimeter calculation 1.a

Author: **Team:** Finnish Team

CategoryID: 34_06_04

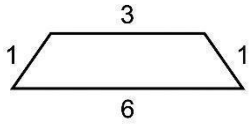
To find the parameter of a two-dimensional shape, you add the lengths of its all sides.



The parameter of this trapezoid equals-3 + 1 + 3 + 5, which is equal to 12.

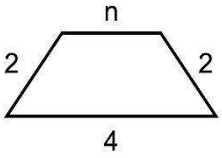
What is the parameter of each following trapezoid?

Simplify your answer, if possible. For example, 2 + c + c can be simplified as 2 + 2c.



11

(easy)



8 + n

n + 8

8 + 1n

1n + 8

8 + 1*n

1*n + 8

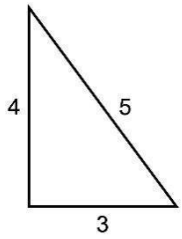
(difficult)

Task ID: AT1_1.4B **Title:** Perimeter calculation 1.b

Author: **Team:** Finnish Team

CategoryID: 34_06_04

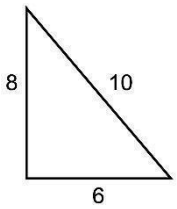
To find the parameter of a two-dimensional shape, you add the lengths of its all sides.



The parameter of this triangle equals 3 + 4 + 5, which is equal to 12.

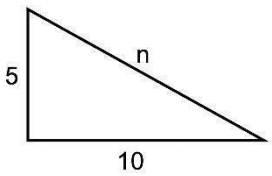
What is the parameter of each following triangle?

Simplify your answer, if possible. For example, 2 + c + c can be simplified as 2 + 2c.



24

(easy)



15 + n

n + 15

15 + 1n

1n + 15

15 + 1*n

1*n + 15

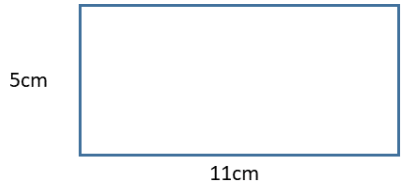
(difficult)

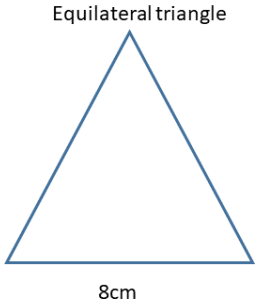
Task ID: ES_34_06_04_01 **Title:** Perimeter

Author: OG **Team:** ES

CategoryID: 34_06_04

Text: Calculate the perimeter of these figures.





Solution:

Perimeter of the rectangle: 32cm

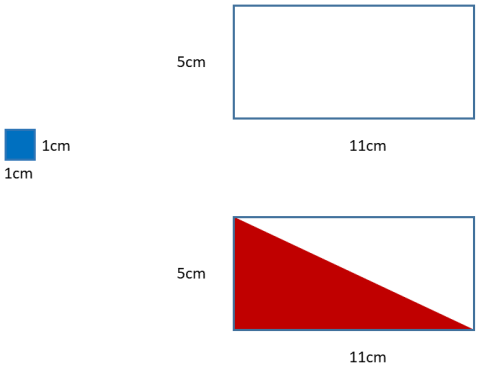
Perimeter of the triangle: 24cm

Task ID: ES_34_06_04_02 **Title:** Squares and triangles

Author: OG **Team:** ES

CategoryID: 34_06_04

Text: How many small squares do you need to fill the rectangle? And, how many small squares do you need to fill the red triangle?



Solution:

55 small squares to fill the rectangle

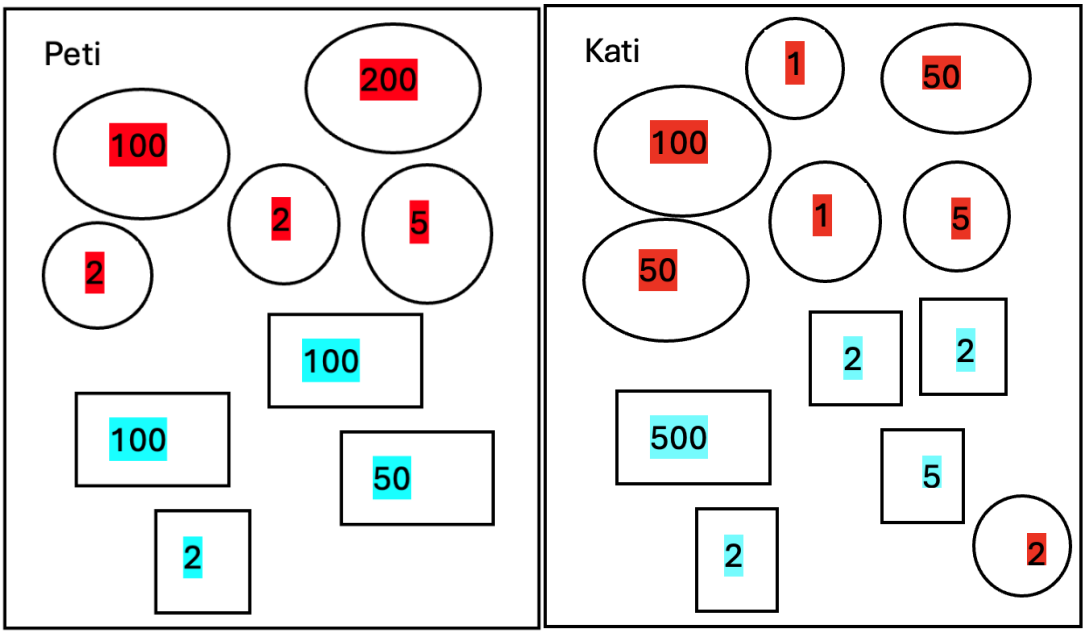
55/2 = 27,5 small squares to fill the triangle

Task ID: HU_34_06_04_01 **Title:** Debts - assets

Author: AR **Team:** HU

CategoryID: 34_06_05

Text: Who has what? (Red: his/her assets, Blue: his/her debts)



Solution: Peti: 57; -302

Task ID: HU_UNPL_01 **Title:** String_around_nails1

Author: ZsP **Team:** HU

CategoryID: 34_06_04

Instructions for the teacher:

1. Give boards with 5-6 nails and a string for each group. Nails can be hammered into the board randomly.
2. Ask students to estimate the distance between the nails. Which of the two nails has the greatest distance between them?
3. Ask students to proof the estimation: measure the distances for each nail pair.
4. Ask students to indicate the total length of the distances without summing the written-down numbers.
5. Compare the result with the sum of the separated distance-values.

Discuss the precision and the method of measurement, and how you can do it more precisely, and more effectively.

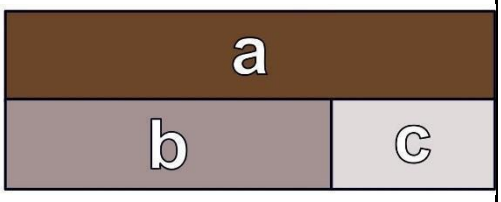
34_06_05

Description: Real-world decision problems using calculations (earnings, expenses, donations, savings). Measurement processes using conventional instruments (ruler, tape measure, scales, analog and digital clock). Recognize and compare the relationship between money and coins, and solve problems related to these relationships. Understand the use of kilograms and grams, including estimation and conversion among units.

Task ID: AT12_4.1A **Title:** Evaluate expression 1

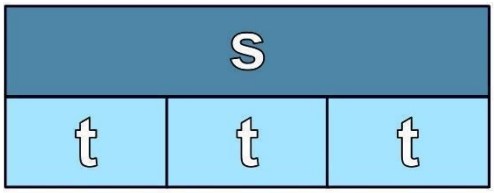
Author: **Team:** Finnish Team

CategoryID: 34_06_05 **CategoryID+:** 56_06_01



Which of the following math expressions do NOT stand for the length of **a**?

- b + c
- c + b
- b - c



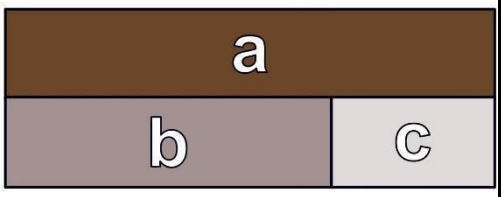
Which of the following math expressions stands for the length of **t**?

- s + 3
- s : 3
- 3 × s

Task ID: AT12_4.1B **Title:** Evaluate expression 2

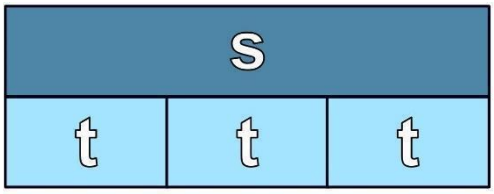
Author: **Team:** Finnish Team

CategoryID: 34_06_05 **CategoryID+:** 56_06_01



Which of the following math expressions stands for the length of **b**?

- a - b
- a + c
- a - c



Which of the following math expressions do NOT stand for the length of **s**?

- t + t + t
- t : 3
- 3 × t

Task ID: ES_34_06_05_01 **Title:** What can I do with my money?

Author: OG **Team:** ES

CategoryID: 34_06_05

Text: I have saved all this money.

a) How much is it?

b) I want to buy a racket that costs 195€. How much money will I have left over?

c) If I also wanted to give my brother another racket like mine, how much money would I have to borrow from my parents?

Solution:

a) 385€

b) 190€

c) 5€

34_07_01

Description: Equality as an expression of an equivalence relationship between two elements and obtaining simple unknowns (represented by a symbol) in either element. Equality and inequality relations, and use of = and ? signs between expressions involving operations and their properties. Representation of 'greater than' and 'less than', and use of the signs < and >.

Task ID: AT1_5.1A **Title:** Evaluate expression 4

Author: **Team:** Finnish Team

CategoryID: 34_07_01

Which of the following math expressions is NOT equal to 8 + 7? • 8 + 2 + 5 • 10 + 5 • 7 + 8 • 4 + 3 + 7
Which of the following math expressions is NOT equal to 53 - 7? • 53 - 3 - 4 • 50 - 4 • 3 + (50 - 7) • 47 + 5 - 7
Which of the following math expressions is NOT equal to 4 × (2 + 3)? • 4 × 5 • 4 × 2 + 4 × 3 • 4 × 2 + 5 • 4 × (3 + 2)

Task ID: AT1_5.1B **Title:** Evaluate expression 5

Author: **Team:** Finnish Team

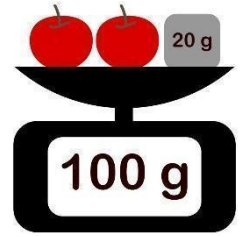
CategoryID: 34_07_01

Which of the following math expressions is NOT equal to 28 + 7? • 28 + 2 + 5 • 30 + 5 • 7 + 28 • 24 + 3 + 7
Which of the following math expressions is NOT equal to 13 - 7? • 13 - 3 - 4 • 10 - 4 • 3 + (10 - 7) • 7 + 5 - 7
Which of the following math expressions is NOT equal to 4 × (10 + 5)? • 4 × 15 • 4 × 10 + 4 × 5 • 4 × 10 + 5 • 4 × (5 + 10)

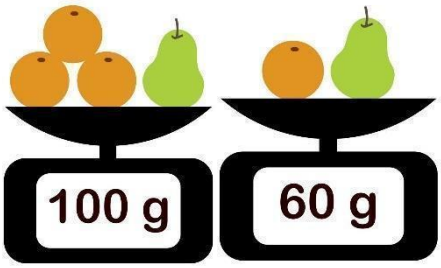
Task ID: AT12_2.3A **Title:** Work with variables 1.a

Author: **Team:** Finnish Team

CategoryID: 34_07_01 **CategoryID+:** 56_22_02



= _____ g 40



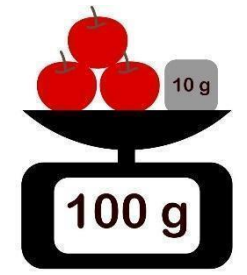
= _____ g 20

= _____ g 40

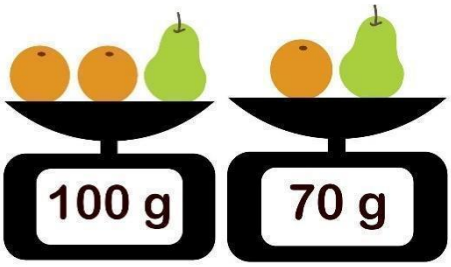
Task ID: AT12_2.3B **Title:** Work with variables 1.b

Author: **Team:** Finnish Team

CategoryID: 34_07_01 **CategoryID+:** 56_22_02



= _____ g 30



= _____ g 30

= _____ g 40

Task ID: AT123_2.1A **Title:** Equal sign 1

Author: **Team:** Finnish Team

CategoryID: 34_07_01 **CategoryID+:** 56_22_01, 78_22_03

In this math sentence:

4 + 6 = 10,

what is the name of the symbol "="?

Equal sign

An equal sign

The equal sign

In this math sentence:

7 + 3 = 10,

what does the symbol "=" mean?

- Solve the problem.
- The answer
- The total
- Both sides of the symbol "=" have the same value.

In this math sentence:

7 + 3 = 6 + 4,

what does the symbol "=" mean?

- Solve the problem.
- The answer
- The total
- Both sides of the symbol "=" have the same value.

Task ID: AT123_2.1B **Title:** Equal sign 2

Author: **Team:** Finnish Team

CategoryID: 34_07_01 **CategoryID+:** 56_22_01, 78_22_03

In this math sentence:

4 + 6 = 3 + 7,

what is the name of the symbol “=”?

Equal sign

An equal sign

The equal sign

In this math sentence:

7 - 3 = 4,

what does the symbol “=” mean?

- Solve the problem.
- The answer
- The total
- Both sides of the symbol “=” have the same value.

In this math sentence:

7 - 3 = 6 - 2,

what does the symbol “=” mean?

- Solve the problem.
- The answer
- The total
- Both sides of the symbol “=” have the same value.

Task ID: HU_34_07_01_01 **Title:** Relation between temperatures

Author: AR **Team:** HU

CategoryID: 34_07_01

Text: Compare the temperatures! The relational signal should point to the warmer side!

Options:

a. +7 °C -17 °C

b. -9 °C -7 °C

c. -6 °C +2 °C

d. -15 °C -5 °C

Solution: >; <; <; <

Task ID: HU_UNPL_04c **Title:** Attribute of objects3

Author: ZsP **Team:** HU

CategoryID: 34_07_01

CT topic: Data and Information > Data Processing > Classifying

Instructions for the teacher:

Play the "Attributes of objects (HU_UNPL_04)" but use attributes that are related to the relations (greather, less than, …)

Task ID: HU_UNPL_06 **Title:** Array_counting2

Author: ZsP **Team:** HU

CategoryID: 34_07_01 **CategoryID+:** 34_08_02

CT topic: Data and Information > Data Structures > Array

Instructions for the teachers:

Use a whiteboard. Draw an array (10-12 boxes next to each other) and write a zero in each box.

a. Give students cards with values and indexes:

   Use the terms "natural numbers", "integers", "greater/less (by n)", …

   For example: "Let's have a natural number greater than 3 in the 5th box." or "Let's have an even integer number in the 4th box." or "Let's have an even natural number greater than the number in box 10 into the 9th box."

   Don't define conflicting, inconsistent goals!

b. Then give instructions to students like

Increase the values by 3 in every 2nd box.

Decrease the values by 1 in every 3rd box.

Use operations fit to the age of your students and fit to the usable operations for integers and natural numbers.

c. The students go to the whiteboard and change the values.

d. You can ask students to give instructions to reach a goal they have on the cards.

34_07_03

Description: Addition, subtraction, multiplication, and division of natural numbers solved with flexibility and sense in contextualized situations: solving strategies, tools, and properties. Properly interprets and utilizes operations for numbers up to 10,000; understands terms: addend, sum, minuend, subtrahend, difference, multiplicand, multiplier, product, dividend, divisor, quotient, remainder; uses symbols for operations and parentheses for multiple operations.

Task ID: HU_34_07_03_01 **Title:** Relation between integers

Author: AR **Team:** HU

CategoryID: 34_07_03

Text: Perform the operations!

Options:

a. The number less than 2 is 5:

b. A number greater than -4 by 5:

c. A number less than 9 by 16:

d. A number less than -3 by 8:

e. A number greater than 7 by 15:

f. A number greater than -7 by 15:

Solution: -3; 1; -7; -11; 22; 8

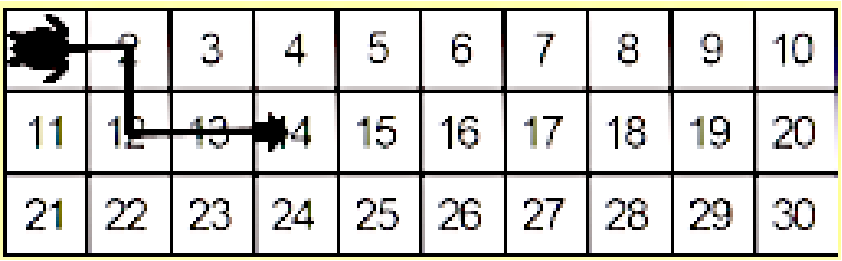
34_08_01

Description: Mental calculation strategies with natural numbers and fractions. Accurately adds and subtracts in the head for numbers up to 100; multiplies and divides. Reinforcing mental multiplication and division operations. Strategies for recognizing which simple operations (addition, subtraction, multiplication, division as division and partition) are useful to solve contextualized situations.

Task ID: AT1_1.3A **Title:** Turtle operation 1.a

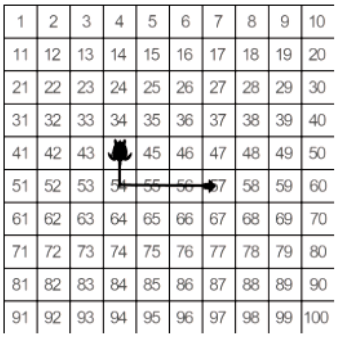
Author: **Team:** Finnish Team

CategoryID: 34_08_01



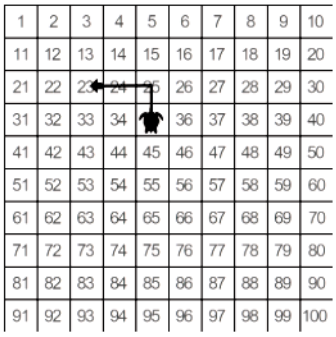
The turtle starts moving from 1 and lands on 14. The math expression,

1 + 1 + 10 + 2, represents its movement step by step.



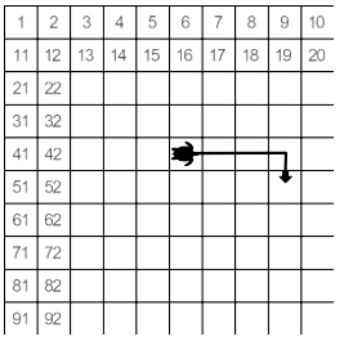
Which math expression represents the turtle's movement?

- 44 + 10 + 3
- 44 - 10 - 3
- 44 + 1 + 30
- 44 - 1 - 30
- 44 + 9 + 3



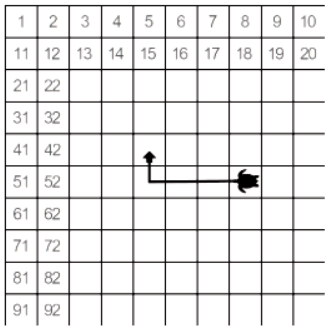
Which math expression represents the turtle's movement?

- 35 - 10 - 2
- 35 + 10 + 2
- 35 + 1 + 20
- 35 - 1 - 20
- 35 - 9 - 2



Which math expression represents the turtle's movement?

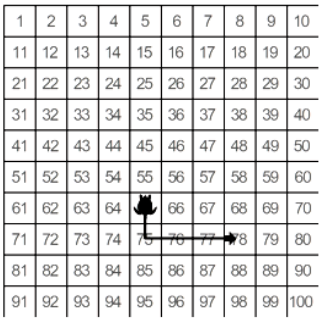
- 46 + 3 + 10
- 46 - 3 - 10
- 46 + 30 + 1
- 46 - 30 - 1
- 45 + 3 + 9



Which math expression represents the turtle's

movement?

- 58 - 3 - 10
- 58 + 3 + 10
- 58 - 30 - 1
- 58 + 30 + 1
- 58 - 3 - 9



Write a math expression that represents the turtle's movement.

65 + 10 + 3

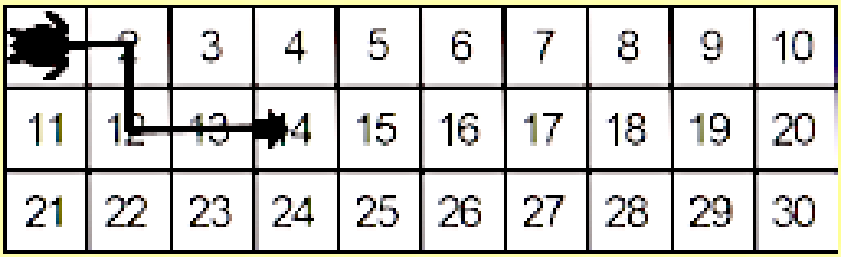
(open-answer)

* The picture will be edited so that some numbers are not visible as in the Version B.

Task ID: AT1_1.3B **Title:** Turtle operation 1.b

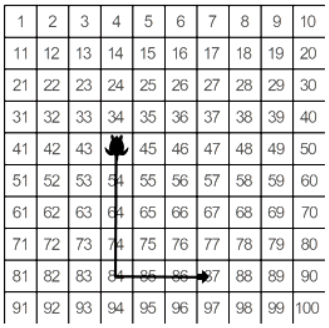
Author: **Team:** Finnish Team

CategoryID: 34_08_01



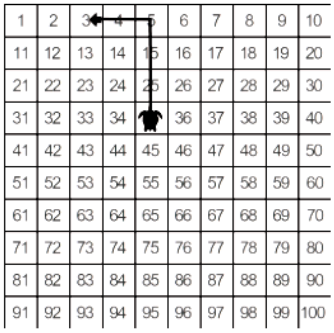
The turtle starts moving from 1 and lands on 14. The math expression,

1 + 1 + 10 + 2, represents its movement step by step.



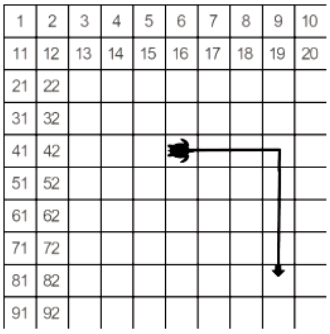
Which math expression represents the turtle's movement?

- 44 + 40 + 3
- 44 - 40 - 3
- 44 + 4 + 30
- 44 - 4 - 30
- 44 + 39 + 3



Which math expression represents the turtle's movement?

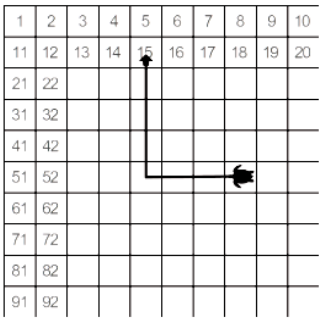
- 35 - 30 - 2
- 35 + 30 + 2
- 35 + 3 + 20
- 35 - 3 - 20
- 35 - 29 - 2



Which math expression represents the turtle's

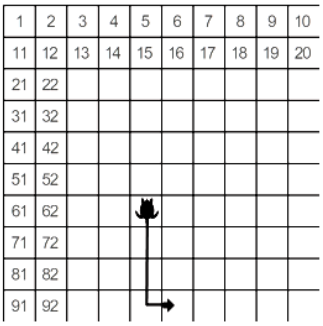
movement?

- 46 + 3 + 40
- 46 - 3 - 40
- 46 + 30 + 4
- 46 - 30 - 4
- 46 + 3 + 39



Which math expression represents the turtle's movement?

- 58 - 3 - 40
- 58 + 3 + 40
- 58 - 30 - 4
- 58 + 3 + 40
- 58 - 3 - 39



Write a math expression that represents the turtle's movement.

65 + 30 + 1

(open-answer)

34_08_02

Description: Practice the basic operations: addition, subtraction, multiplication, and division. Construction of the multiplication tables based on number of times, repeated addition, or grid arrangement. Understands the relationship of multiplication and division tables.

Task ID: AT1_2.2A **Title:** Open number sentences 1.a

Author: **Team:** Finnish Team

CategoryID: 34_08_02

Enter the number that belongs in the blank.
6 + ___ = 25 19
___ - 15 = 9 24
18 = ___ + 15 3
___ = 15 - 9 6
___ + 15 = 8 + 14 7
13 - 4 = ___ - 3 12
___ × 4 = 24 6

Task ID: AT1_2.2B **Title:** Open number sentences 1.a

Author: **Team:** Finnish Team

CategoryID: 34_08_02

Enter the number that belongs in the blank.
___ + 6 = 25 19
24 - ___ = 9 15
15 = ___ - 3 18
___ = 7 + 2 + 8 17
7 + 15 = ___ + 14 8
13 - 4 = 12 - ___ 3
24 = ___ × 4 6

34_09_01

Description: Constructing shapes and patterns from given objects and two-dimensional shapes; recognizing and continuing line or planar patterns. Constructing bodies from edges and faces; creating edge frames and nets; identifying objects based on multiple criteria.

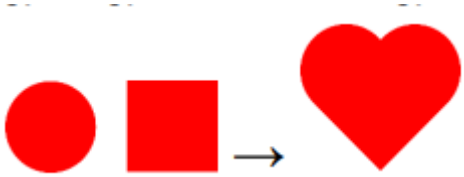
Task ID: 2022-DE-02 **Title:** Heart graphic

Author: **Team:** Bebras

CategoryID: 34_09_01

Text: Tina starts from a circle and a square, which she turns into a heart. All you need are the following three three transformations:

- Rotate a shape at will
- Rotate a shape at will
- Doubling a shape so that both remain in the same place.



Options:

A. Doubling a circle, rotating a square, shifting a circle, shifting a circle

B. Doubling a square, rotating a square, offsetting a square, offsetting a circle

C. Doubling a circle, rotating a circle, shifting a circle, shifting a square

D. Shift circle, shift circle, double circle, shift square

Solutions:

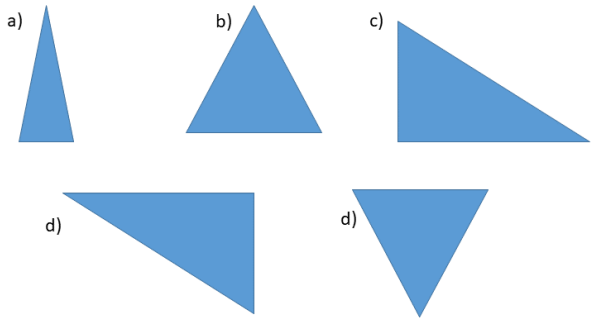
A)

Task ID: ES_34_09_01_01 **Title:** Creating rectangles

Author: OG **Team:** ES

CategoryID: 34_09_01

Text: What two shapes should you join to form a rectangle? Click on them.



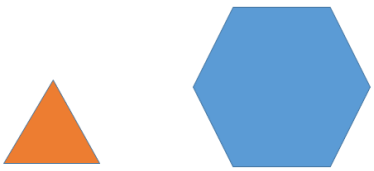
Solution: c and d

Task ID: ES_34_09_01_02 **Title:** Creating hexagons

Author: OG **Team:** ES

CategoryID: 34_09_01

Text: How many orange triangles do you need to form a hexagon like the blue one?



Solution: 6

Task ID: ES_34_09_01_03 **Title:** Quadrangular base pyramid

Author: OG **Team:** ES

CategoryID: 34_09_01

Text: What plane shapes do you need to form a quadrangular base pyramid?

Options:

a) 4 triangles

b) 3 triangles and 1 square

c) 4 triangles and 1 square

Solution: c

Task ID: ES_34_09_01_04 **Title:** Hexagonal base pyramid

Author: OG **Team:** ES

CategoryID: 34_09_01

Text: What plane shapes do you need to form a hexagonal base pyramid?

Options:

a) 6 triangles

b) 3 triangles and 1 hexagon

c) 6 triangles and 1 hexagon

Solution: c

34_09_02

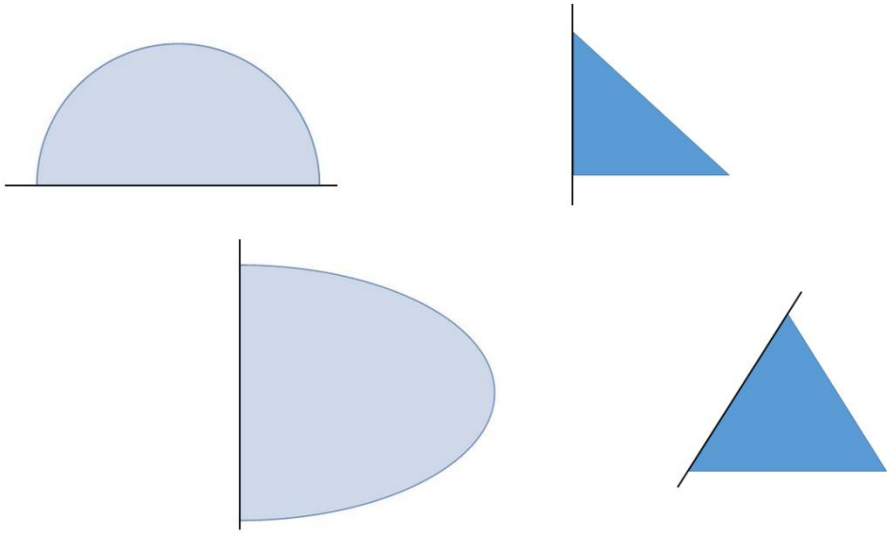
Description: Recognizing symmetry in shapes such as squares and rectangles, and understanding that they have more than one line of symmetry. Completing figures according to horizontal or vertical lines of symmetry, and creating covering patterns on dotted or squared paper.

Task ID: ES_34_09_02_01 **Title:** Complete the symmetry

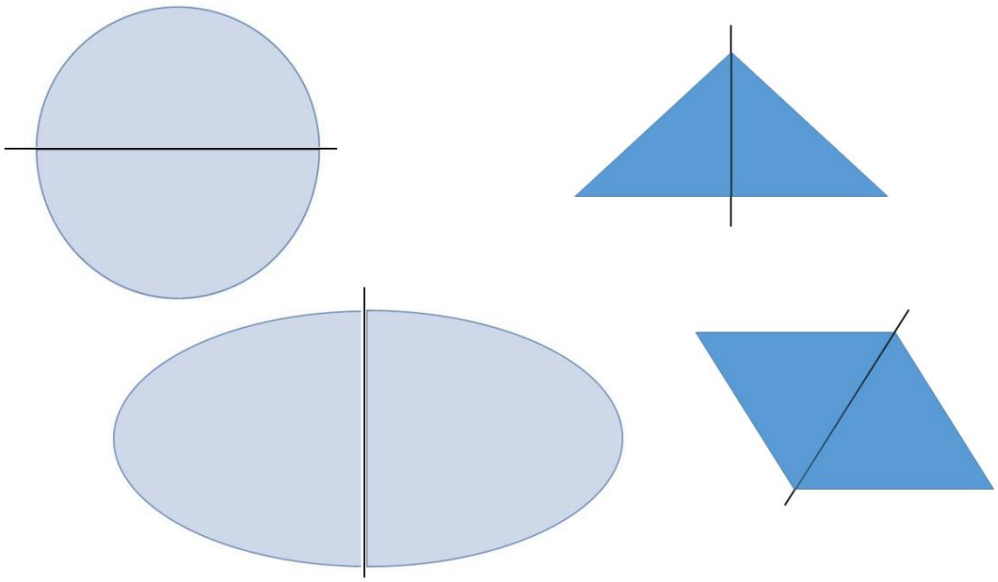
Author: OG **Team:** ES

CategoryID: 34_09_02

Text: Complete the given figures according to the given line of symmetry



Solution:

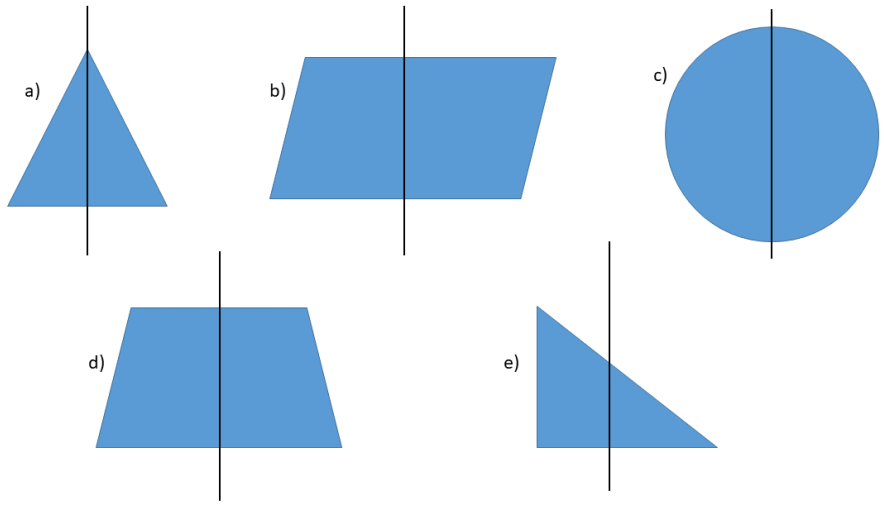


Task ID: ES_34_09_02_02 **Title:** Which is symmetrical?

Author: OG **Team:** ES

CategoryID: 34_09_02

Text: Which of these figures are symmetrical with respect to the black line?



Solution: a, c, d

34_09_03

Description: Basic two- and three-dimensional geometric objects and their properties and relationships. Construction of geometric objects, both with and without digital tools. Identification and classification of geometric figures in everyday objects based on their elements and relationships.

Task ID: ES_34_09_03_01 **Title:** Which is the form?

Author: OG **Team:** ES

CategoryID: 34_09_03

Text: What plane shape have 4 sides of equal length, parallel two by two, forming two acute angles and two obtuse angles?

Options:

a) Square

b) Rhombus

c) Trapezoid

Solution: b

Task ID: ES_34_09_03_02 **Title:** Which is the form?

Author: OG **Team:** ES

CategoryID: 34_09_03

Text: Which four-sided plane shape has only two parallel sides?

Options:

a) Square

b) Rhombus

c) Trapezoid

Solution: c

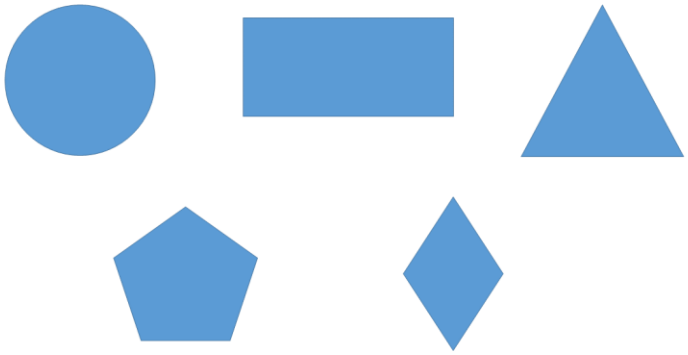
Task ID: ES_34_09_03_03 **Title:** Identify elements in the figures

Author: OG **Team:** ES

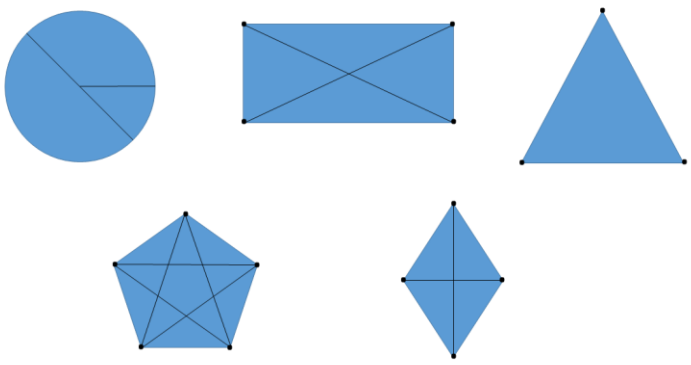
CategoryID: 34_09_03

Text: Identify the following elements in the given figures:

Edge, vertex, radius, diameter, diagonal



Solution:



Task ID: HU_UNPL_13 **Title:** ShapeGame

Author: ZsP **Team:** HU

CategoryID: 34_09_03

In this activity your students will need to pay attention to the shapes, the color and position of the shapes to be able to recreate the design that is on the card with the big shapes.

Instructions for the teacher:

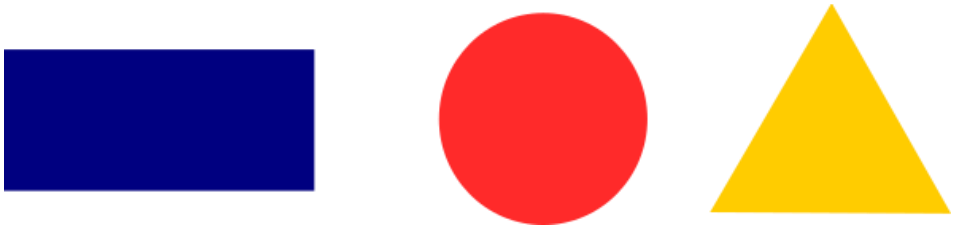
1. Give the printed and cut out shapes and the cards with the combined shapes to students.
2. Ask students to work in pairs:
    a. The first student pulls out a card.
    b. The other student places the shapes he sees on the card.
    c. The first student (the one who drew the card) checks that the solution is correct.
    d. They then change the roles.

Variations:

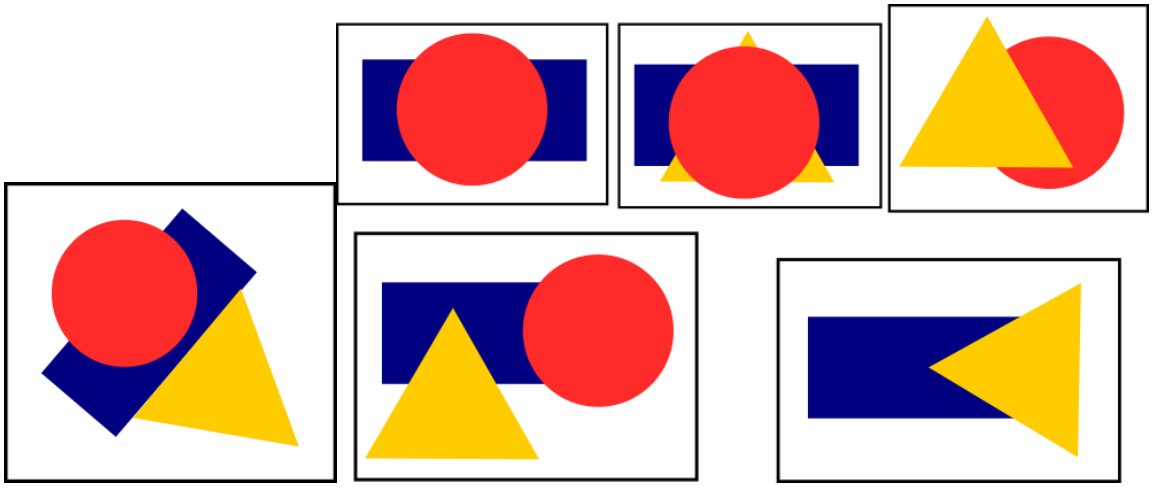
- You can play this game separately in groups or individually (all students try to solve all tasks).
- with larger cards - the teacher can show a combined picture, and students need to reproduce it. The first right reproduction earns a score…

Preparing:

the shapes - print (laminate), cut



Cards (examples):



34_09_05

Description: Identifying and classifying simple two-dimensional geometric figures in everyday objects based on their elements. Classifying shapes according to the number of corners and sides; recognizing and creating models of triangles, squares, rectangles, and circles.

Task ID: ES_34_09_05_01 **Title:** I know the shape

Author: OG **Team:** ES

CategoryID: 34_09_05

Text: Classify these objects according to whether their shape is cylindrical, pyramidal, cubic or spherical:

- Glass
- Can of Coke
- Tent
- Shoe box
- Ball
- Orange
- Die
- The tip of a pencil

Solution:

cylindrical	pyramidal	cubic	spherical
Glass Can of Coke	Tent The tip of a pencil	Shoe box Die	Ball Orange

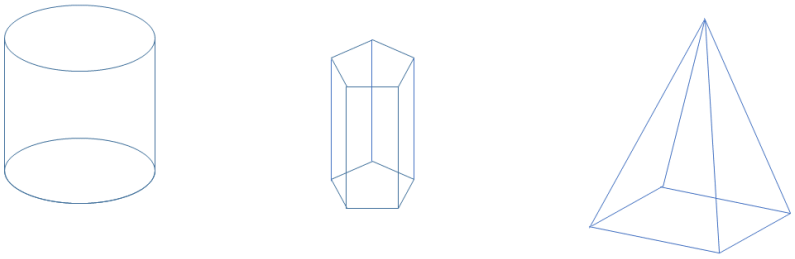
Task ID: ES_34_09_05_02 **Title:** I know the elements

Author: OG **Team:** ES

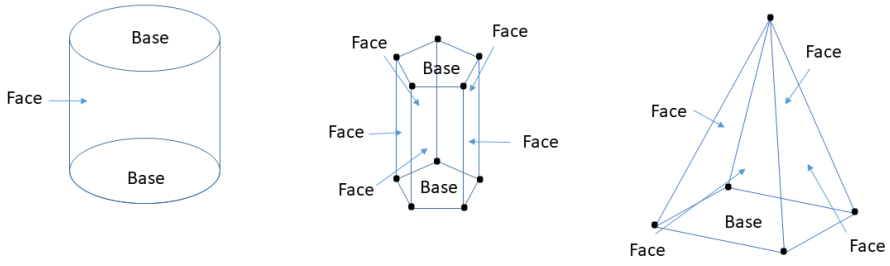
CategoryID: 34_09_05

Text: Identify the following elements in the given figures:

Base, face, edge, vertex



Solution:



Edges: the segments formed by the intersection of two faces.
Vertices: the points where 3 or more edges intersect.
(The bases are also faces)

34_09_06

Description: Exploring the properties of two-dimensional figures using manipulative materials and digital tools. Understanding the properties of three-dimensional shapes: cubes, cuboids, cylinders, cones, and spheres.

Task ID: ES_34_09_06_01 **Title:** Which are the elements of these shapes?

Author: OG **Team:** ES

CategoryID: 34_09_06

Text: Complete the following table by putting an X where appropriate:

	just one base	two bases	one vertex
A cylinder has			
A cone has			
A sphere has			

Solution:

	just one base	two bases	one vertex
A cylinder has		X	
A cone has	X		X
A sphere has			

34_09_08

Description: Naming and classifying shapes based on sides and corners; creating models from single or multiple shapes. Determining similarities and differences between shapes such as cubes, square prisms, and rectangular prisms.

Task ID: ES_34_09_08_01 **Title:** Numbering elements of shapes

Author: OG **Team:** ES

CategoryID: 34_09_08

Text: Answer the following questions and let's see if you know what the difference is between a rectangular prism and a cube:

	Write the correct number
How many faces does a rectangular prism have?	
How many faces does a cube have?	
How many vertices does a rectangular prism have?	
How many vertices does a cube have?	
How many edges does a rectangular prism have?	
How many edges does a cube have?	
How many equal faces does a rectangular prism have?	
How many equal faces does a cube have?	

Solution:

	Write the correct number
How many faces does a rectangular prism have?	6
How many faces does a cube have?	6
How many vertices does a rectangular prism have?	8
How many vertices does a cube have?	8
How many edges does a rectangular prism have?	12
How many edges does a cube have?	12
How many equal faces does a rectangular prism have?	3 pairs of parallel and equal faces
How many equal faces does a cube have?	6

34_10_01

Description: Strategies and techniques for the construction of two-dimensional geometric figures by composition and decomposition using manipulative materials, drawing instruments (ruler/square), and computer applications. Properties of two- and three-dimensional geometric figures: exploration through manipulative materials (grids, geoplanes, polycubes) and the use of digital tools (dynamic geometry programs, augmented reality, educational robotics).

Task ID: HU_UNPL_29 **Title:** Play tangram2

Author: ZsP **Team:** HU

CategoryID: 34_10_01

CT Topic: Data and Information > Data Analysis > Pattern Recognition

Link: Tangram

Ideas: https://www.tangram-channel.com/tangrams-pages/tangram-arrow-2-solution-12/

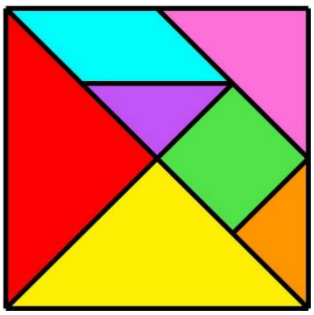
Instructions for the teacher:

1. Print the basic set of the pieces and shapes and cut them out.
2. Students need to find the solutions: how to arrange the pieces to have the shape.
3. Instead of printing you can use 3Dprinter or use salt dough to create your own Tangram set.

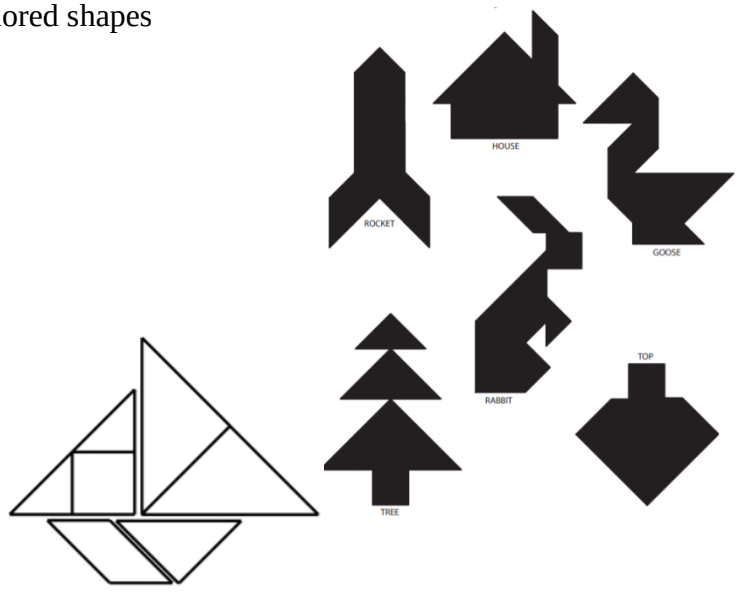
Use only symmetric shapes and ask students to find the symmetry and create only the half of the shape - then they can change, and continue (finalize) their classmate's shape based only on the symmetry (not seeing the original shape). In the end, they can check whether the solution was correct.

Difficulty:

1. Easier: Colored shapes
2. Harder: Outlined shapes, including the black “shadow” shape
3. Hardest: Single colored shapes



example outline:



34_11_01

Description: Description of the relative position of objects in space or their representations using appropriate geometric vocabulary (parallel, perpendicular, oblique, right, left, etc.). Verbal description and interpretation of movements, in relation to oneself or to other points of reference, using appropriate geometric vocabulary. Interpretation of itineraries in plans, using physical and virtual supports. Geometric models in solving problems related to the other senses.

Task ID: ALG-13-A **Title:** Tortoise and Hare

Author: **Team:** Bebras

CategoryID: 34_11_01 **CategoryID+:** 56_22_02

Tortoise and hare
("in one minute")

A tortoise and a hare are racing against each other on a track.

They start at the same time at the circle marked with a heart symbol. They follow the directions of the arrows on the track.

In one minute, the tortoise is able to move onto the very next circle and the hare is able to move onto the second circle skipping one circle.

In which circle the tortoise and the hare meet for the first time after the start? Click that circle.

Task ID: ALG-13-B **Title:** Tortoise and Hare

Author: **Team:** Bebras

CategoryID: 34_11_01 **CategoryID+:** 56_22_02

Tortoise and hare
("in one turn")

A tortoise and a hare are racing against each other on a track.

They start at the same time at the circle marked with a heart symbol. They follow the directions of the arrows on the track.

In one turn, the tortoise is able to move onto the very next circle and the hare is able to move onto the second circle skipping one circle.

In which circle the tortoise and the hare meet for the first time after the start? Click that circle

Task ID: ES_34_11_01_01 **Title:** Playing with lines

Author: OG **Team:** ES

CategoryID: 34_11_01

Text: From the lines shown:

Option:

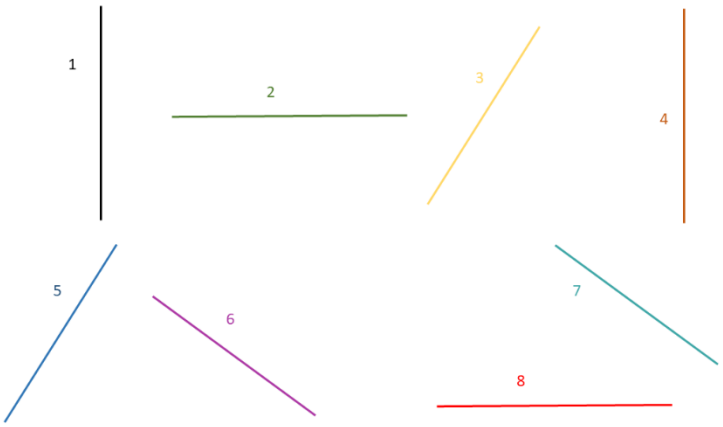
a) Which are vertical?

b) Which are horizontal?

c) Which are oblique?

d) Which pairs of lines are parallel?

e) Which pairs of lines are perpendicular?



Solution:

a) 1 and 4

b) 2 and 8

c) 3, 5, 6 and 7

d) 1 and 4; 2 and 8; 3 and 5; 6 and 7

e) 1 and 2; 1 and 8; 4 and 2; 4 and 8; 3 and 6; 3 and 7; 5 and 6; 5 and 7

34_11_02

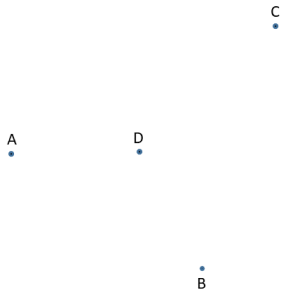
Description: Properly uses terms describing directions and distances in two- and three-dimensions. Ability to navigate their neighborhood and on a map. Recognition of geometric relationships in fields outside the mathematics class, such as art, science, and everyday life. Students practice using the concepts of direction and location.

Task ID: ES_34_11_02_01 **Title:** Which will the figure be?

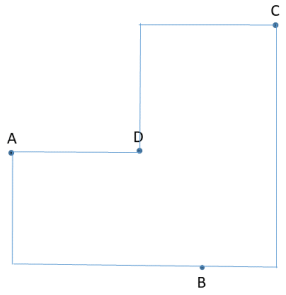
Author: OG **Team:** ES

CategoryID: 34_11_02

Text: Draw a path that starts from point A, passes through points B, C and D, and ends again at A, using only vertical and horizontal lines.



Solution:



Task ID: HU_UNPL_22 **Title:** Orientation

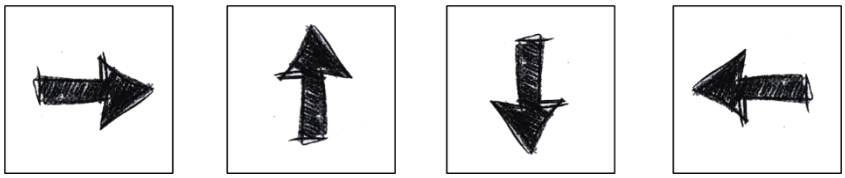
Author: ZsP **Team:** HU

CategoryID: 34_11_02

CT topic: Algorithms and Programming > Commands > Sequence of Commands

Instructions for the teacher:

1. Print the maze and instruction cards.
    a. Instruction cards: up, down, left, and right.
2. Give the instruction cards to the students and place a "robot" (any object) on the start position of the maze.
3. Students need to use cards to give instructions to the robot and guide it through the maze.
4. Check the students' solutions step by step.
5. Continue with another maze! Students can also draw mazes for each other and exchange the mazes to give instructions to "robots".



Variation:

- play the game with modification of the meaning of "left" and "right" instruction cards: they will do turning (you can use a modified picture on the card )

34_12_02

Description: Finds pairs in a memory game; recognizes and expresses relationships; looks for patterns among elements of a series. Creates a series based on a given rule; lists months; recognizes relationships among element doubles or triples. Extends, describes sequences of 2-4 repeating members. Differences can be in size, color, line thickness, angle of rotation, and sequences might carry over to the next line. Investigates sequences obtained by merging two sequences. Simple patterns in number sequences and simple geometric patterns: how they are constructed, described, and expressed.

Task ID: AT1_3.1A **Title:** Pattern in the series 2

Author: **Team:** Finnish Team

CategoryID: 34_12_02

Repeat: ABCABCAB…

1) What shape will be in the next (9th) figure?

- A
- B
- C

2) What shape will be in the 12th figure?

- A
- B
- C

(easy)

Task ID: AT1_3.2A **Title:** Number sequence 1

Author: **Team:** Finnish Team

CategoryID: 34_12_02

Complete the number sequence.
99 96 93 90 87 (-3)
29 33 37 41 45 (+4)
36 35 33 30 26 (-1, -2, -3, -4, …)

Task ID: AT1_3.2B **Title:** Number sequence 2

Author: **Team:** Finnish Team

CategoryID: 34_12_02

Complete the number sequence.
87 90 93 96 99 (+3)
45 41 37 33 29 (-4)
26 27 29 32 36 (+1, +2, +3, +4, …)

Task ID: HU_UNPL_XX **Title:** Set Game

Author: ZsP **Team:** HU

CategoryID: 34_12_02

Coming soon…

34_13_01

Description: Statistical graphs of everyday life (pictograms, bar charts, histograms...): reading, interpretation. Simple strategies for the collection, classification, and organization of discrete qualitative or quantitative data in small samples using a calculator and simple computer applications. Absolute frequency: interpretation.

Task ID: ES_34_13_01_01 **Title:** Multilingual

Author: CR **Team:** ES

CategoryID: 34_13_01

Text: Maria speaks French, English and Spanish. Andrés speaks French, Chinese and English. Paula speaks Spanish and French.

In which language can everyone can understand each other?

Solution: French

Task ID: ES_34_13_01_02 **Title:** Multilingual

Author: CR **Team:** ES

CategoryID: 34_13_01

Text: Maria speaks French, English and Spanish. Andrés speaks French, Chinese and English. Paula speaks Spanish and English.

Which language is the least spoken?

Solution: Chinese

34_13_02

Description: Simple statistical graphs to represent data, selecting the most convenient, using traditional resources and simple computer applications. Mode: interpretation as the most frequent data. Graphical comparison of two sets of data to establish relationships and draw conclusions.

Task ID: ES_34_13_02_01 **Title:** Venn-diagram for food

Author: CR **Team:** ES

CategoryID: 34_13_02

Text: Ana eats meat, salad and cake. Peter eats fish, pasta and apple. John eats fish, salad and pear. Maria eats meat, salad and apple

Use the Venn-diagram to answer the following questions.

a. How many people eat meat?

b. How many people eat fish?

c. How many people eat salad?

Solution:

a. 2

b. 2

c. 3

Task ID: ES_34_13_02_02 **Title:** Venn-diagram for food

Author: CR **Team:** ES

CategoryID: 34_13_02

Text: Ana eats meat, salad and cake. Peter eats fish, pasta and apple. John eats fish, salad and pear. Maria eats meat, salad and apple

Use the Venn-diagram to answer the following questions.

a. Who doesn't eat meat?

b. Who doesn't eat fish?

c. Who doesn't eat apple?

Solution:

a. 2

b. 2

c. 2

34_13_03

Description: Collects data in their environment; records data for later evaluation; organizes collected data in a table, illustrates it on a diagram.

Task ID: ES_34_13_03_01 **Title:** Ages and sports

Author: CR **Team:** ES

CategoryID: 34_13_03

Text: Ana is 15 years old, plays tennis and likes the colour red. Andrés is 14 years old, plays football and likes the colour yellow. Maria is 15 years old, plays tennis and likes the colour blue. Juan is 16 years old, plays football and likes the colour yellow.

a. Are there any children older than 14 who like the colour yellow?

b. Are there any children under the age of 15 who play football?

Solution:

a. Juan

b. Andrés

Task ID: ES_34_13_03_02 **Title:** Ages and sports

Author: CR **Team:** ES

CategoryID: 34_13_03

Text: Ana is 15 years old, plays tennis and likes the colour red. Andrés is 14 years old, plays tennis and likes the colour yellow. Maria is 15 years old, plays tennis and likes the colour blue. Juan is 16 years old, plays football and likes the colour yellow.

a. Are there any children under 16 who like the colour blue?

b. Are there any children older than 13 who play tennis?

Solution:

a. María

b. Ana and María

34_13_04

Description: Read and interpret simple tables with at most three data groups and to organize the data obtained from the table. Examine and create the column chart. Use different representations to present the data, solve and set up problems related to daily life by using the information shown in tree diagrams, column graphs, tables, and other graphics.

Task ID: ES_34_13_04_01 **Title:** Young olympiads

Author: CR **Team:** ES

CategoryID: 34_13_04

Text: The table lists the age, favourite colour, sport and country of six boys and girls.

NAMES	AGE	COLOUR	SPORTS	COUNTRY
ANDRÉS	13	Red	Tennis	Spain
MARÍA	14	Green	Tennis	Germany
PEDRO	13	Blue	Football	Spain
JAVIER	14	Red	Football	Italy
LUCÍA	13	Red	Tennis	French
PALOMA	13	Blue	Tennis	French

Answer the following questions:

a. Who plays tennis and speaks French?

b. Who is over 13 years old and plays tennis?

c. Who is 13 years old, speaks French and likes the colour red?

Solution:

a. Lucía and Paloma

b. María

c. Lucía

Task ID: ES_34_13_04_02 **Title:** Young olympiads

Author: CR **Team:** ES

CategoryID: 34_13_04

Text: The table lists the age, favourite colour, sport and country of 6 boys and girls.

NAMES	AGE	COLOUR	SPORTS	COUNTRY
ANDRÉS	13	Red	Tennis	Spain
MARÍA	14	Green	Tennis	Germany
PEDRO	13	Blue	Football	Spain
JAVIER	14	Red	Football	Italy
LUCÍA	13	Red	Tennis	France
PALOMA	13	Blue	Tennis	France

Answer the following questions:

a. In which country does the 14-year-old tennis player live?

b. How old is the girl who lives in France, plays tennis and likes the colour red?

Solution:

a. Germany

b. 13

34_14_01

Description: Formulation of conjectures from data collected and analyzed, making sense of them in the context of study.

Task ID: ES_34_14_01_01 **Title:** Cross these data

Author: CR **Team:** ES

CategoryID: 34_14_01

Text: Table with the data of the students in a class.

	CHICOS	CHICAS	Total
Students in the class	10	15	25
Students who speak more than 1 language	8	12	20
Students who have more than 1 sibling	6	6	12
Students who practice more than 1 sport	10	12	22

Write whether the following statements are true or false

a. There are more girls than boys speak less than two languages.

b. No boys play less than two sports

Solution:

a. True

b. True

Task ID: ES_34_14_01_02 **Title:** Cross these data

Author: CR **Team:** ES

CategoryID: 34_14_01

Text: Table with the data of the students in a class.

	CHICOS	CHICAS	Total
Students in the class	10	15	25
Students who speak more than 1 language	5	12	17
Students who have more than 1 sibling	6	6	12
Students who practice more than 1 sport	10	12	22

Answer the following questions:

a. How many girls have less than two sibling?

b. How many students play less than 2 sports?

Solution:

a. 9

b. 3

34_14_02

Description: Probability as a subjective measure of uncertainty. Recognition of uncertainty in everyday situations and by performing experiments. Identification of certain events, possible events, and impossible events. Comparing the probability of two events intuitively.

Task ID: ES_34_14_02_01 **Title:** Winners: girls or boys?

Author: CR **Team:** ES

CategoryID: 34_14_02

Text: Table with the data of the students in a class.

	Boys	Girls	Total
Students in the class	10	30	40

A football ticket is raffled among the students in the class. Write whether the following statements are true or false:

a. It is more likely that a girl will win the prize because there are more girls in the class.

b. It is more likely that a boy will win the prize because boys like football more than girls.

Solution:

a. True

b. False

34_14_03

Description: Random events in specific situations.

Task ID: ES_34_14_03_01 **Title:** Winners: girls or boys?

Author: CR **Team:** ES

CategoryID: 34_14_03

Text: Table with the data of the students in a class.

	CHICOS	CHICAS	Total
Students in the class	10	30	40

A trip is raffled among the students in the class. Write whether the following statements are true or false:

a. It is less likely that a boy will win the prize because there are less boys in the class.

b. It is less likely that a girl will win the prize because there are less boys in the class.

Solution:

a. True

b. False

34_15_01

Description: Practice addition and subtraction algorithms, ensure that the skill is learned. (columnar addition and subtraction)

Task ID: HU_34_15_01_01 **Title:** Columnar operation - addition and subtraction 1

Author: PS **Team:** HU

CategoryID: 34_15_01

Text: Solve and check the next operations.

a)

772

+ 89

———---

b)

827

-318

———-

Solution:

a) 861

b) 509

Task ID: HU_34_15_01_02 **Title:** Columnar operation - addition and subtraction 2

Author: PS **Team:** HU

CategoryID: 34_15_01

Text: Solve and check the next operations.

a)

772

- 89

—–––––--

b)

913

+ 79

—–––––--

Solution:

a) 683
b) 992

Task ID: HU_34_15_01_03 **Title:** Columnar operation - addition and subtraction 3

Author: PS **Team:** HU

CategoryID: 34_15_01

Text: Solve and check the next operations.

a)

127

+ 371

—–––––--

b)

913

- 79

—–––––--

Solution:

a) 498
b) 834

34_15_02

Description: Practice the multiplication algorithm and ensure that the skill is mastered (columnar multiplication with one- and two-digit multipliers).

Task ID: HU_34_15_02_01 **Title:** Columnar operation - multiplication 1

Author: PS **Team:** HU

CategoryID: 34_15_02

Text: Solve and check the next operations.

a)

343 * 7

—--

b)

827 * 31

—-—

Solution:

a) 2401

b) 25 637

Task ID: HU_34_15_02_02 **Title:** Columnar operation - multiplication 2

Author: PS **Team:** HU

CategoryID: 34_15_02

Text: Solve and check the next operations.

a)

1234567 * 8

—-—-—--

b)

243 * 37

—--

Solution:

a) 9 876 536

b) 8 991

Task ID: HU_34_15_02_03 **Title:** Columnar operation - multiplication 3

Author: PS **Team:** HU

CategoryID: 34_15_02

Text: Solve and check the next operations.

a)

827 * 318

—-—

b)

12345679 * 8

—-—-—---

Solution:

a) 262 986

b) 98 765 432

34_15_03

Description: Interprets and checks the solution of columnar multiplication with one- and two-digit multipliers and division with one-digit divisor; approximates.

Task ID: HU_34_15_03_01 **Title:** Columnar operation - division 1

Author: PS **Team:** HU

CategoryID: 34_15_03

Text: Solve and check the next operations.

a)

343:7 =

b)

792:6 =

Solution:

a) 49

b) 132

Task ID: HU_34_15_03_02 **Title:** Columnar operation - division 2

Author: PS **Team:** HU

CategoryID: 34_15_03

Text: Solve and check the next operations.

a)

8128:4 =

b)

231:11 =

Solution:

a) 2032

b) 21

Task ID: HU_34_15_03_03 **Title:** Columnar operation - division 3

Author: PS **Team:** HU

CategoryID: 34_15_03

Text: Solve and check the next operations.

a)

792:36 =

b)

8128:64 =

Solution:

a) 22

b) 127

Task ID: HU_34_15_03_04 **Title:** Columnar operation - division 4

Author: PS **Team:** HU

CategoryID: 34_15_03

Text: Solve and check the next divisings, please don't forget the remainder.

a)

1023:6 =

b)

987:7 =

c)

7891:4 =

Solution:

a) 170, 3

b) 141, 0

c) 1975, 3

Task ID: HU_34_15_03_05 **Title:** Columnar operation - division 5

Author: PS **Team:** HU

CategoryID: 34_15_03

Text: Solve and check the next divisings, please don't forget the remainder.

a)

1023:16 =

b)

987:27 =

c)

7891:34 =

Solution:

a) 63, 15

b) 36, 15

c) 232, 3

34_16_01

Description: Learn the concept of fractions and practice basic calculations of fractions in different situations. Proper fractions with denominators up to 12 in everyday contexts. Fractions as part of a whole and part of a number and how parts are named and expressed as simple fractions. How simple fractions are related to natural numbers.

Task ID: HU_34_16_01_01 **Title:** Fractions of numbers 1.

Author: AR **Team:** HU

CategoryID: 34_16_01

Text: Calculate the fractions of the numbers:

Options:

a. 1/5 of 45;

b. 1/2 of 20;

c. 1/6 of 36;

d. 1/2 of 24;

e. 1/5 of 25.

Solution: 9; 10; 6; 12; 5

Task ID: HU_34_16_01_02 **Title:** Fractions of numbers 2.

Author: AR **Team:** HU

CategoryID: 34_16_01

Text: What is the number of:

Options:

a. 20 is 1/2 of;

b. 45 is1/5 of;

c. 36 is 1/6 of;

d. 24 is 1/4 of;

e. 72 is 1/9 of.

Solution: 40; 225; 216; 96; 648

34_16_02

Description: Illustrates, draws, measures, and understands unit fractions and their multiples. The concept of unit fraction and the relationship between numerator and denominator is reinforced.

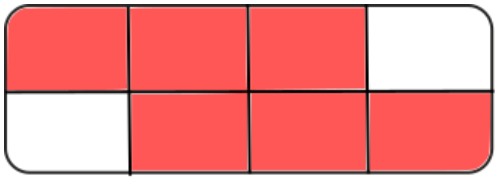
Task ID: HU_UNPL_33 **Title:** Fractions2

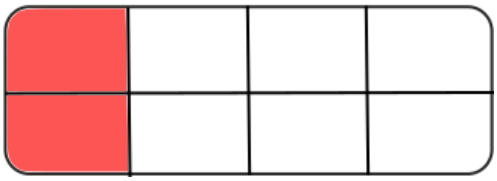
Author: ZsP **Team:** HU

CategoryID: 34_16_02

Instructions for the teacher:

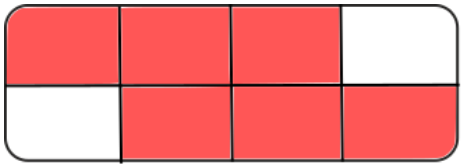
1. Prepare cards with partially colored objects (see example picture)
2. Give the cards to students randomly.
3. The students need to decide whose card shows a higher number (or the equalation)

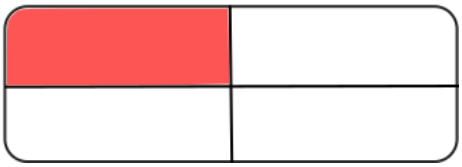




Variations:

- the easiest if the colored areas are fitting, but you can color the parts differently (see picture)
- use several forms and different fraction-parts (¼ instead of 2/8)





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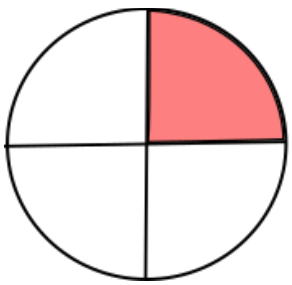
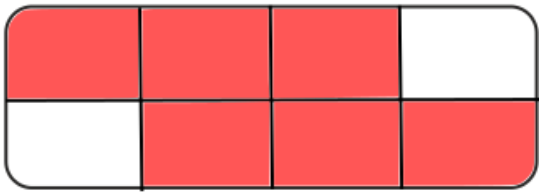




34_17_03

Description: The four basic arithmetic operations (addition, subtraction, multiplication, and division) and rules for their use in calculations with natural numbers.

Task ID: AT1_2.5A **Title:** Word problems 1.a

Author: **Team:** Finnish Team

CategoryID: 34_17_03

When you multiply a number by 3, you get 15.

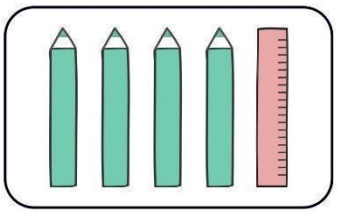
What is the number?

5

(open answer; 3x = 15)

A ruler costs one euro more than a pencil.

Total 16 €



One pencil costs ____ € 3

(y = x + 1; 4x + y = 16)

Task ID: AT1_2.5B **Title:** Word problems 1.b

Author: **Team:** Finnish Team

CategoryID: 34_17_03

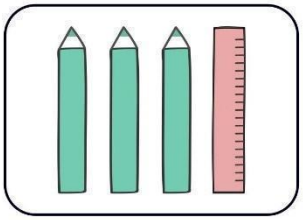
When you multiply a number by 3 and then add 2 to it, you get 17.

What is the number?

5 (open answer; 3x + 2 = 17)

A ruler costs one euro more than a pencil.

Total 9 €



One pencil costs ____ € 2

(y = x + 1; 3x + y = 9)

Task ID: HU_UNPL_02 **Title:** Array_counting

Author: ZsP **Team:** HU

CategoryID: 34_17_03

CT topic: Data and Information > Data Structures > Array

Instructions for the teachers:

Use a whiteboard. Draw an array (10-12 boxes next to each other) and write a zero in each box.

a. Give students cards with values and indexes:

   For example: “Let’s have 3 in the 5th box.” or “Let’s have an even number in the 4th box.” or “Let’s have an even number greater than 10 in the 9th box.”

   Don’t define conflicting, inconsistent goals!

b. Then give 2 instructions to students like

   Increase the values by 3 in every 2nd box.

   Decrease the values by 1 in every 3rd box.

   Use operations fit to the age of your students.

c. The students go to the whiteboard and change the values.

d. You can ask students to give instructions to reach a goal they have on the cards.

34_19_01

Description: Determines "true" and "false" statements; creates statements with the terms 'all', 'not all', 'exists...', 'none of ...', and their synonyms appropriately

Task ID: AT1_1.1A **Title:** Numerical manipulation 1.a

Author: **Team:** Finnish Team

CategoryID: 34_19_01

7 + 5 = 12 true / false
12 = 4 + 8 true / false
12 = 12 true / false
5 = 5 + 0 true / false
9 + 0 = 0 true / false
17 - 17 = 17 true / false
31 - 0 = 31 true / false
7 + 5 = 5 + 7 true / false
4 × 7 = 7 × 4 true / false
12 + 9 - 8 = 12 + 1 true / false
5 + 7 = 5 + 5 + 2 true / false
77 + 36 - 26 = 77 + 10 true / false

9 + 9 = 10 + 10 - 2 true / false
27 + 15 = 28 + 14 true / false
(9 × 4) + 4 = 10 × 4 true / false
4 + 6 × 2 = 16 true / false

Task ID: AT1_1.1B **Title:** Numerical manipulation 1.b

Author: **Team:** Finnish Team

CategoryID: 34_19_01

9 + 5 = 14 true / false
8 = 4 + 12 t rue / false
512 = 512 true / false
67 = 67 + 0 true / false
0 + 9 = 0 true / false
9 + 6 + 17 - 17 = 9 + 6 true / false
31 - 0 = 0 true / false
37 + 65 = 65 + 37 true / false
14 × 7 = 7 × 14 true / false

12 + 119 - 118 = 12 + 1 true / false
50 + 73 = 50 + 50 + 23 true / false
77 + 136 - 126 = 77 + 10 true / false
19 + 19 = 20 + 20 - 2 true / false
327 + 115 = 328 + 114 true / false
4 + (9 × 4) = 10 × 4 true / false
4 + 6 × 2 = 20 true / false

Task ID: AT1_1.2A **Title:** Generalization 1.a

Author: **Team:** Finnish Team

CategoryID: 34_19_01

Tom solves 14 + 65 and correctly gets 79. Then the teacher asks him to solve 65 + 14. He knows the answer without adding the numbers. When adding 14 and 65 in any order, you always get the same answer, 79. Will Tom's idea always work for all numbers? • Always • Sometimes • Never
Liz solves 23 + 46 and correctly gets 69. Then the teacher asks her whether 23 + 46 + 15 = 69 + 15 is true or false. Can Liz know that it is true without actually adding 15 to both sides? Yes, she knows the answer without any calculation. When adding the same amount to both sides, they are still equal. No, she has to do the calculation to be able to answer the question.

Task ID: AT1_1.2B **Title:** Generalization 1.b

Author: **Team:** Finnish Team

CategoryID: 34_19_01

Tom realizes that when adding any two numbers in any order, he always gets the same answer, for example 15 + 20 = 35 and 20 + 15 = 35. Will Tom's idea always work for subtraction?

- Always
- Sometimes
- Never

Liz solves 23 + 46 and correctly gets 69. Then the teacher asks her whether 23 + 46 - 15 = 69 - 15 is true or false. Can Liz know that it is true without actually subtracting 15 from both sides?

- Yes, she knows the answer without any calculation. When subtracting the same amount from both sides, they are still equal.
- No, she has to do the calculation to be able to answer the question.

Task ID: ES_34_19_01_01 **Title:** Uuuuhm!

Author: CR **Team:** ES

CategoryID: 34_19_01

Text: Look at this set of meals!

Orange, apple, cake, ice cream

Write whether the following statements are true or false

a. All are desserts

b. All are fruits

c. None is fruits

d. None is desserts

Solution:

a. True

b. False

c. False

d. False

Task ID: ES_34_19_01_02 **Title:** Uuuuhm!

Author: CR **Team:** ES

CategoryID: 34_19_01

Text: Look at this set of meals!

meat, fish, ensalada, hamburguesa

Write whether the following statements are true or false

a. All are desserts

b. All are fruits

c. None is fruits

d. None is desserts

Solution:

a. False

b. False

c. True

d. True

Task ID: HU_UNPL_20 **Title:** Trueball

Author: ZsP **Team:** HU

CategoryID: 34_19_01

CT topic: logic

Material: ball

Teacher instructions:

1. Tell a statement and throw the ball to one of the students.
2. The student needs to define the truth value of the statement (telling “true” or “false”)
3. Then the student tells a statement and throws the ball to another student
4. …

The statements need to be clearly defined and include information that all students know. You can use a special topic (like geometry, numbers, or from another subject…).

Variation:

- the statements need to include “all”, “exists”, “not”, and “non of” (based on the age group’s need)

34_21_01

Description: Proportional relationships, including doubling and halving.

Task ID: ES_34_21_01_01 **Title:** One data is missing

Author: CR **Team:** ES

CategoryID: 34_21_01

Text: Table with the data of the students in a class.

	CHICOS	CHICAS	Total
Students in the class	10		

If there were twice as many girls in the class as boys, how many students would there be in the class?

Solution: 30

Task ID: ES_34_21_01_02 **Title:** One data is missing

Author: CR **Team:** ES

CategoryID: 34_21_01

Text: Table with the data of the students in a class.

	CHICOS	CHICAS	Total
Students in the class	10		

If there were twice as many girls in the class as boys, how many students would there be in the class?

Solution: 30

Task ID: HU_UNPL_31 **Title:** DrawIt2

Author: ZsP **Team:** HU

CategoryID: 34_21_01 **CategoryID+:** 34_25_01

Instructions for the teacher:

- Show the students how to solve the “DrawIt game” (explain or let’s remember the instructions and how to follow them).
- Give a sequence of instruction and the students follow it and draw the image.
- Ask the students to enlarge the image to twice its size or to reduce the image by half
    - the students can modify the instructions first, then follow the modified instructions and check the solution.
- Ask students to create/draw an image that can be easily reduced to a third of its size

34_26_01

Description: Guide the students to understand how the system of measurement units is structured. Practice unit conversions with the most commonly used measurement units.

Task ID: HU_UNPL_01 **Title:** String_around_nails1

Author: ZsP **Team:** HU

CategoryID: 34_26_01

Instructions for the teacher:

1. Give boards with 5-6 nails and a string for each group. Nails can be hammered into the board randomly.
2. Ask students to estimate the distance between the nails. Which of the two nails has the greatest distance between them?
3. Ask students to proof the estimation: measure the distances for each nail pair.
4. Ask students to indicate the total length of the distances without summing the written-down numbers.
5. Compare the result with the sum of the separated distance-values.

Discuss the precision and the method of measurement, and how you can do it more precisely, and more effectively.

34_31_02

Description: Identification, verbal description, representation and reasoned prediction of terms from regularities in a collection of numbers, figures or pictures.

Task ID: HU_UNPL_03 **Title:** Play tangram

Author: ZsP **Team:** HU

CategoryID: 34_31_02

CT Topic: Data and Information > Data Analysis > Pattern Recognition

Link: Tangram

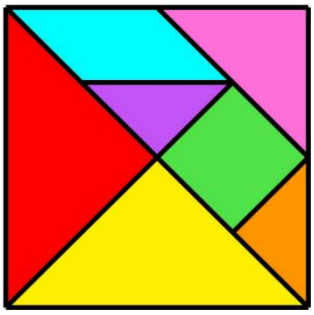
Ideas: https://www.tangram-channel.com/tangrams-pages/tangram-arrow-2-solution-12/

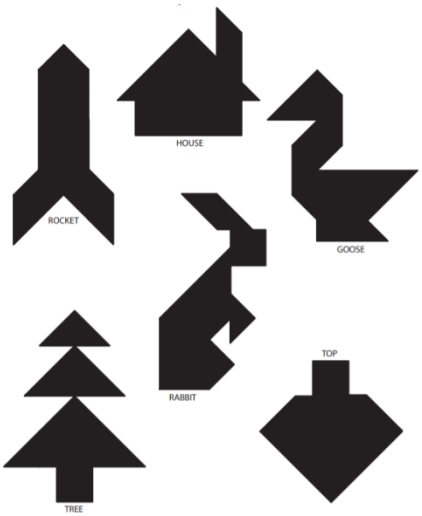
Instructions for the teacher:

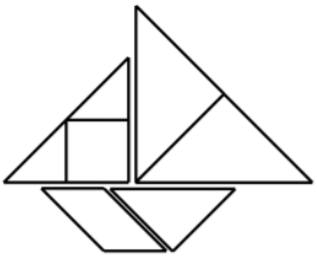
4. Print the basic set of the pieces and shapes and cut them out.
5. Students need to find the solutions: how to arrange the pieces to have the shape.
6. Instead of printing you can use 3Dprinter or use salt dough to create your own Tangram set.

Difficulty:

4. Easier: Colored shapes
5. Harder: Outlined shapes, including the black “shadow” shape
6. Hardest: Single colored shapes







example outline:

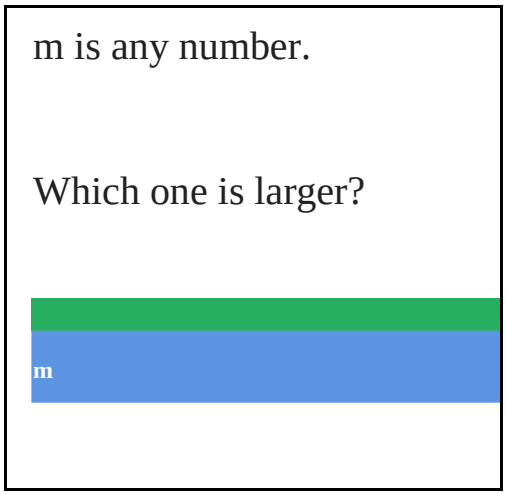
56_03_01

Description: Students deepen their skills in comparing, classifying and ordering, searching answer options systematically and observing cause and effect relationship in Maths.

Task ID: AT2_6.4A **Title:** Compare expressions 1

Author: **Team:** Finnish Team

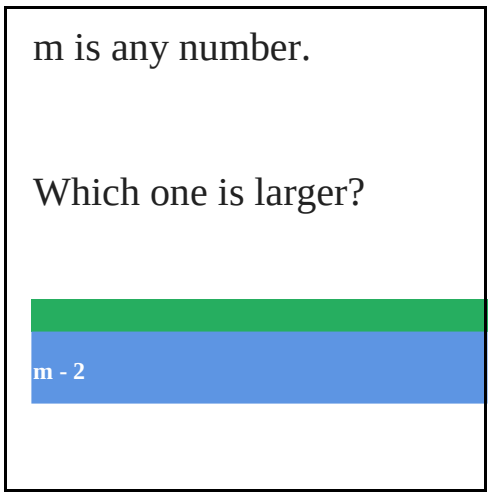
CategoryID: 56_03_01



Task ID: AT2_6.4B **Title:** Compare expressions 2

Author: **Team:** Finnish Team

CategoryID: 56_03_01



Task ID: AT23_6.3A **Title:** Count and sort 1

Author: **Team:** Finnish Team

CategoryID: 56_03_01 **CategoryID+:** 78_22_01

Drag the following offers in order, starting from the one that offers the

largest discount.

Two in the price of one 2

Buy two and get one for free 3

Three in the price of one 1

Task ID: AT23_6.3B **Title:** Count and sort 2

Author: **Team:** Finnish Team

CategoryID: 56_03_01 **CategoryID+:** 78_22_01

Drag the following offers in order, starting from the one that offers the

largest discount.

Buy three and get one for free 3

Buy one and get another for free 2

Three in the price of one 1

56_05_01

Description: Understands and uses the place value notation of large numbers; Read and write natural numbershats it!

Task ID: HU_UNPL_08 **Title:** Boats (2013-JP-04)

Author: **Team:** Bebras

CategoryID: 56_05_01

CT topic: Data and Information > Data Representation > Binary/Number systems

Idea from 2013-JP-04

Instructions for the teachers:

1. Build small boats for 8, 4, 2 and 1 person(s) from, for example, legos, and paper boxes.
2. Take 1-15 figures at a time. The students need to arrange the figures into the boats by following two rules:
    a. All figures need to be in a boat.
    b. If at least one figure is in one boat, all places in that boat need to be filled with figures i.e. the boat needs to be full.
    c. You can give some hints: “Start with the biggest boat that can be full.”
3. Continue the activity with several numbers of figures.

Discuss the idea of the number systems and how can you improve the boats using another number system.

VARIATION

56_06_01

Description: Practice measuring and pay attention accuracy, result evaluation and checking the measurement.

Task ID: ES_56_06_01_01 **Title:** Distance between two villages

Author: CR **Team:** ES

CategoryID: 56_06_01

Text: The distance on a map between two villages is 2 cm and the map is at a scale of 1:200000 (one centimetre in the plane is equivalent to 200000 centimetres in reality). How many kilometres are there between the two villages?

a. 40 Kilometres

b. 4 Kilometres

c. 20 Kilometres

d. 2 Kilometres

Solution: d

Task ID: ES_56_06_01_02 **Title:** Distance between two villages

Author: CR **Team:** ES

CategoryID: 56_06_01

Text: The distance on a map between two villages is 5 cm and the map is at a scale of 1:500000 (one centimetre in the plane is equivalent to 500000 centimetres in reality). How many kilometres are there between the two villages?

a. 25 Kilometres

b. 2,5 Kilometres

c. 5 Kilometres

d. 50 Kilometres

Solution: c

56_06_02

Description: Solving problems related to responsible consumption.

Task ID: ES_56_06_02_01 **Title:** Water for the shower!

Author: CR **Team:** ES

CategoryID: 56_06_02

Text: A family consists of a father, a mother and two children. In each shower they consume 10 litres of water, the father and mother shower twice a day and each child once. They have decided that they will not waste so much water and will only use 8 litres per shower. How much water will they save in a week?

a. 80 litres

b. 84 litres

c. 40 litres

d. 44 litres

Solution: b

56_06_03

Description: Guide the students to use the scale when using the map.

Task ID: ES_56_06_03_01 **Title:** Distance in a map

Author: CR **Team:** ES

CategoryID: 56_06_03

Text: we have to draw on a 1:500000 scale map two villages that are 10 kilometres apart (one centimetre in the plane is equivalent to 500000 centimetres in reality). What is the length of the segment joining the two villages on the map?

a. 2 cm

b. 10 cm

c. 20 cm

d. 5 cm

Solution: a

56_09_01

Description: Classify 2D shapes into polygons and others and study their properties. Find similarities, differences and regularities.

Task ID: ES_56_09_01_01 **Title:** Geometric shape recognition

Author: CR **Team:** ES

CategoryID: 56_09_01

Text: write the number of the corresponding figure:

a. equilateral triangle

b. rectangle

c. pentagon

d. heptagon

e. hexagon

Figura 1

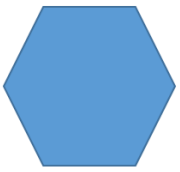
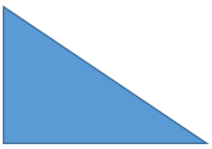


Figura 2

Figura 3



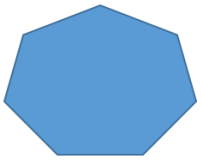


Figura 4

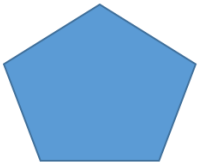


Figura 5

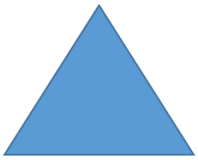


Figura 6

Solution:

1. Figure 6
2. Figure 2
3. Figure 5
4. Figure 4
5. Figure 1

Task ID: ES_56_09_01_02 **Title:** Concave or convex?

Author: CR **Team:** ES

CategoryID: 56_09_01

Text: write whether the following figures are concave or convex

Figura 1

Figura 2

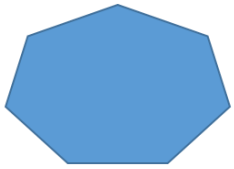


Figura 3

Figura 4

Solution:

Figure 1: concave

Figure 2: convex

Figure 3: convex

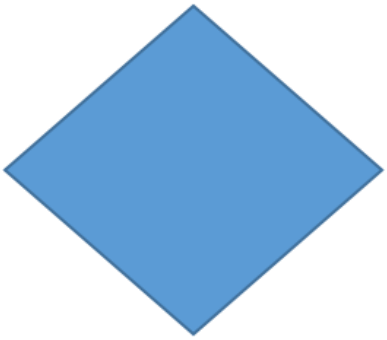
Figure 4: concave

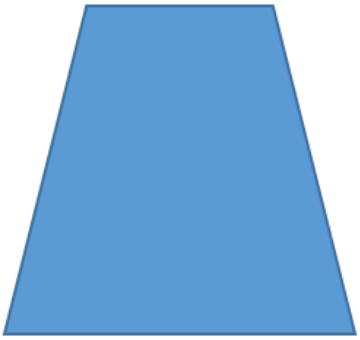
Task ID: ES_56_09_01_03 **Title:** Concave or convex?

Author: CR **Team:** ES

CategoryID: 56_09_01

Text: Write whether the following statements are true or false





a. All the figures are concave quadrilaterals

b. All figures are convex quadrilaterals

c. All figures are concave polygon

d. All figures are convex polygons

Solution:

1. False
2. True
3. False
4. True

Task ID: ES_56_09_01_04 **Title:** Concave, convex, quadrilaterals or polygon?

Author: CR **Team:** ES

CategoryID: 56_09_01

Text: Write whether the following statements are true or false

a. All the figures are concave quadrilaterals

b. All figures are convex quadrilaterals

c. All figures are concave polygon

d. All figures are convex polygons

Solution:

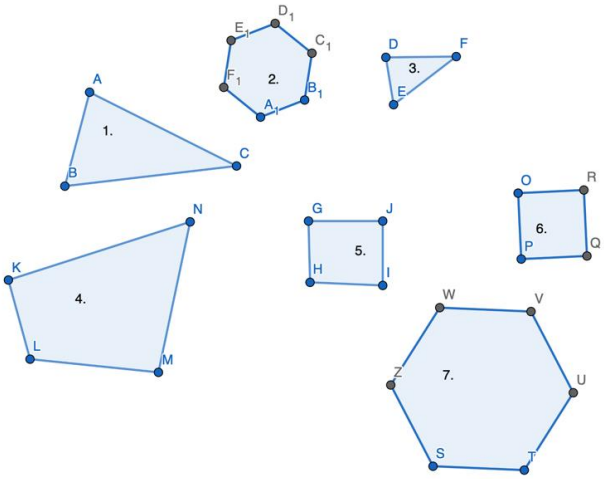
1. False
2. False
3. True
4. False

Task ID: HU_56_09_01_01 **Title:** Pairing shapes

Author: AR **Team:** HU

CategoryID: 56_09_01

Text: Pair the following shapes according to an aspect you think of!



Solution:

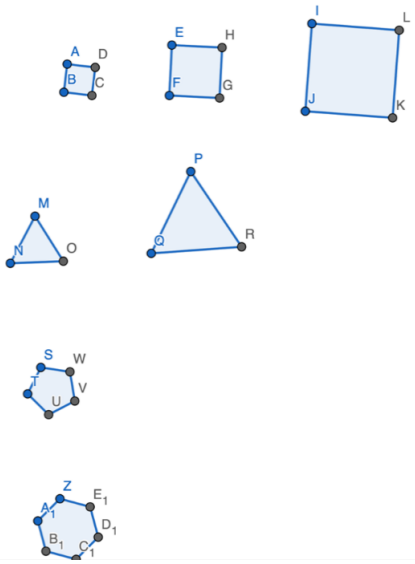
More solutions

Task ID: HU_56_09_01_02 **Title:** Series with shapes

Author: AR **Team:** HU

CategoryID: 56_09_01

Text: Continue the lines of the figure you started!



Solution: Draw a larger rectangle, triangle, pentagon, hexagon.

Task ID: HU_UNPL_14 **Title:** ShapeGame2

Author: ZsP **Team:** HU

CategoryID: 56_09_01

CT topic: pattern recognition

In this activity your students will need to pay attention to the shapes, the color and position of the shapes to be able to recreate the design that is on the card with the big shapes.

Instructions for the teacher:

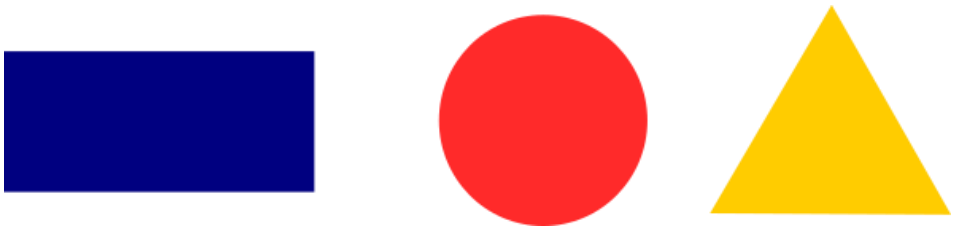
1. Give the printed and cut-out shapes and the cards with the combined shapes to students.
2. Ask students to work in pairs:
    a. The first student pulls out a card and tries to describe it to the other one without showing the card
    b. The other student places the shapes.
    c. The first student (the one who drew the card) checks that the solution is correct.
    d. They then change the roles.

Variations:

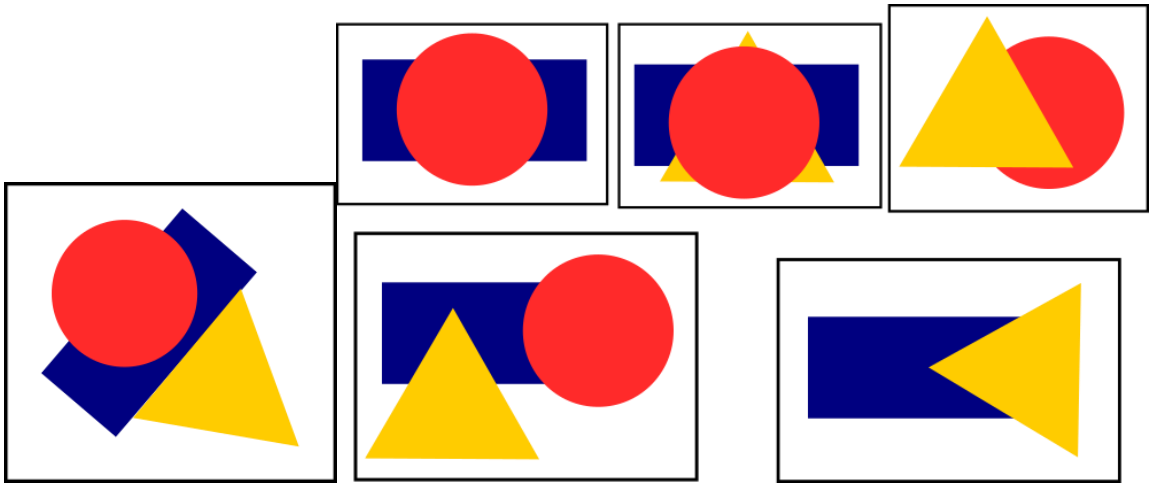
- with larger cards - the teacher can describe a combined picture, and students need to reproduce it. The first right reproduction earns a score…
- you can use more specific shapes based on the topics (for example if you learn about rectangles, you can prepare trapezoid, square, deltoid, rectangle - and use the terms for them.

Preparing:

the shapes - print (laminate), cut



Cards (examples):



56_09_02

Description: Learn about the concept of point, segment, line and angle.

Task ID: ES_56_09_02_01 **Title:** Triangle's angles

Author: CR **Team:** ES

CategoryID: 56_09_02

Text: Write whether the following statements are true or false

a. each of the three angles is 90 degrees

b. each of the three angles is 60 degrees

c. each of the three angles is 45 degrees

Solution:

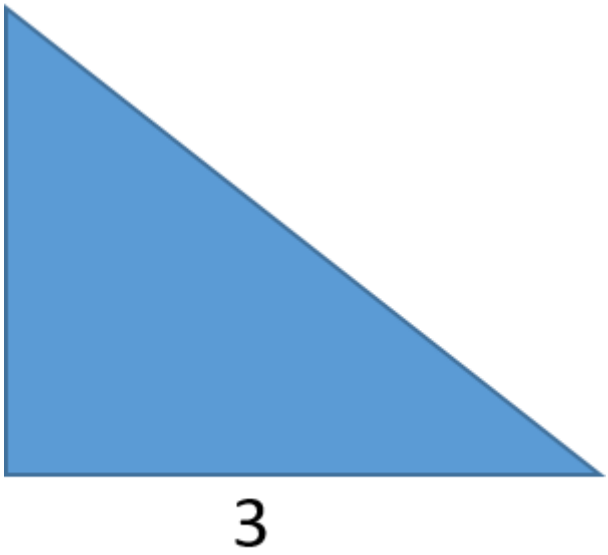
1. False
2. True
3. False

Task ID: ES_56_09_02_02 **Title:** Triangle's angles

Author: CR **Team:** ES

CategoryID: 56_09_02

Text: Write whether the following statements are true or false



a. each of the three angles is 90 degrees

b. each of the three angles is 60 degrees

c. each of the three angles is 45 degrees

Solution:

1. False
2. False
3. False

56_10_02

Description: Simple statistical graphs (bar chart, pie chart, histogram, etc.). Relation and comparison of two sets of data from their graphical representation. Measures of centralization. Measures of dispersion (range). Absolute and relative frequency tables.

Task ID: ES_56_10_02_01 **Title:** What is the mode?

Author: CR **Team:** ES

CategoryID: 56_10_02

Text: Frequency table of the number of sibling in a group of friends

Number of Sibling	Frequency
1	5
2	15
3	11
4	4
5	0
6	1

what is the mode?

a. 1

b. 2

c. 3

d. 4

e. 5

f. 6

Solution: b

Task ID: ES_56_10_02_02 **Title:** What is the mean?

Author: CR **Team:** ES

CategoryID: 56_10_02

Text: Frequency table of the number of children in a group of families

Number of Children	Frequency
1	26
2	21
3	12
4	1

what is the mean?

Solution: 1,8

Task ID: ES_56_10_02_03 **Title:** What is the median?

Author: CR **Team:** ES

CategoryID: 56_10_02

Text: Frequency table of the number of children in a group of families

Number of Children	Frequency
0	3
1	9
2	8
3	8
4	6

what is the median?

Solution: 2,1

Task ID: ES_56_10_02_04 **Title:** What is the relative frequency?

Author: CR **Team:** ES

CategoryID: 56_10_02

Text: Frequency table of sports played by children in a class with 25 students

SPORTS	Absolute frequency
Tennis	10
Football	15
Ski	5
Basketball	13
Swimming	7

What is the relative frequency for Ski?

a. 0,1

b. 5

c. 250

d. 0,2

Solution: a

Task ID: HU_UNPL_30 **Title:** HeatMap (2020-DE-02)

Author: **Team:** HU

CategoryID: 56_10_02

Instructions for the teachers:

1. Show, explain the bebras-task's problem the students:

In the heat map of an image the color of a square indicates the uniqueness of the pixel color at this position. The lighter the color the more unique is the pixel.

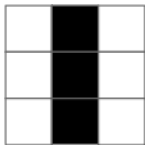
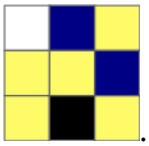
 Unique. None of the other images has the same pixel color at this position.

 Rather unique. Only one of the other images has the same pixel color at this position.

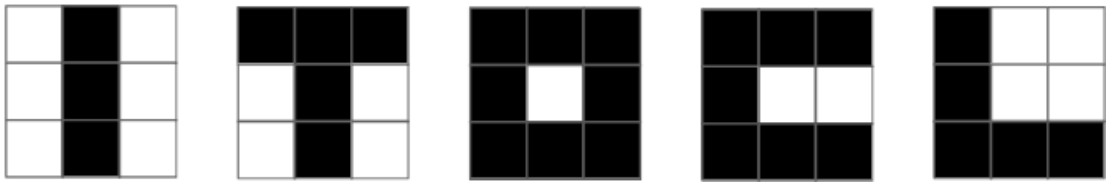
 Not unique: Two of the other images have the same pixel color at this position.

 Rather common: Three of the other images have the same pixel color at this position.

 Common: All other images have the same pixel color at this position.

For example, the image  has the heat map  .

2. Give pictures the students and ask them to "code it", create the heat map of the image (e.g.:



)

3. Ask students to create pictures, prepare the heat map of their picture. Then give the heat map an another student, who need to "decode" it (draw the original picture)

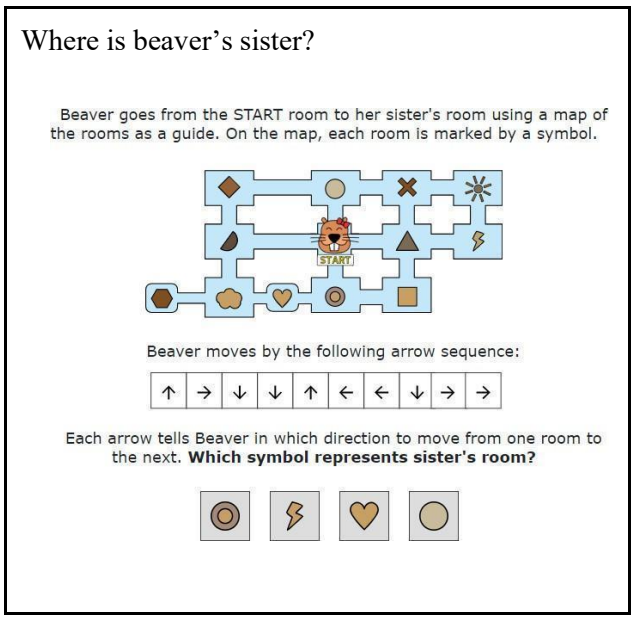
56_11_01

Description: Guide the students to use the scale when using the map.

Task ID: ALG-01 **Title:** Where is beaver's sister?

Author: **Team:** Bebras

CategoryID: 56_11_01



Task ID: ES_56_11_01_01 **Title:** What scale has been used?

Author: CR **Team:** ES

CategoryID: 56_11_01

Text: What scale has been used to construct figure 2?

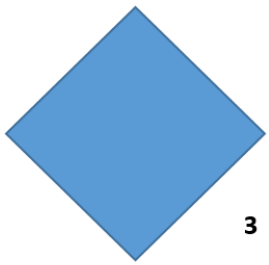


Figura 1

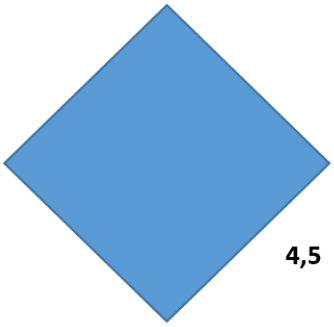


Figura 2

a. 1:1

b. 2:1

c. 0,75:1

d. 1,5:1

Solution: d

Task ID: ES_56_11_01_02 **Title:** What scale has been used?

Author: CR **Team:** ES

CategoryID: 56_11_01

Text: What scale has been used to construct figure 2?

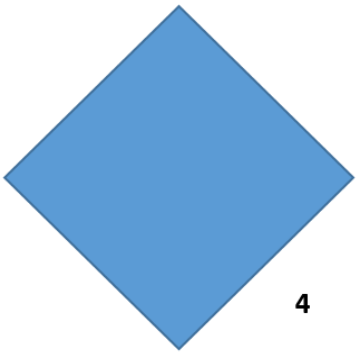


Figure 1

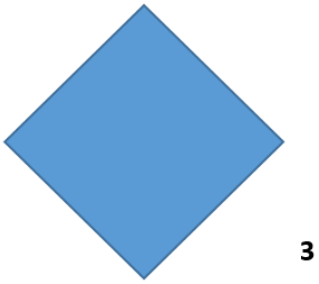


Figure 2

Solution: 0,75:1

56_11_02

Description: Basic two- and three-dimensional geometrical objects and their properties and relationships. Construction of geometrical objects.

Task ID: ES_56_11_02_01 **Title:** Two or three-dimensional objects

Author: CR **Team:** ES

CategoryID: 56_11_02

Text: write whether the following objects are two-dimensional or three-dimensional

a. circumference

b. sphere

c. cube

d. square

Solution:

1. two-dimensional
2. three-dimensional
3. three-dimensional
4. two-dimensional

Task ID: ES_56_11_02_02 **Title:** Two or three-dimensional objects

Author: CR **Team:** ES

CategoryID: 56_11_02

Text: write whether the following objects are two-dimensional or three-dimensional

a. rhombus

b. pyramid

c. hexagon

d. prism

Solution:

1. two-dimensional
2. three-dimensional
3. two-dimensional
4. three-dimensional

Task ID: HU_UNPL_23 **Title:** Orientation2

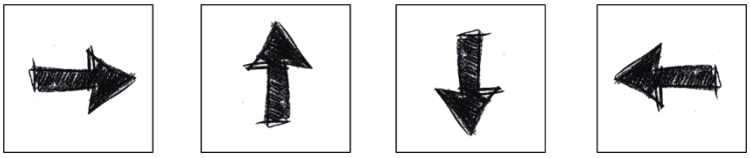
Author: ZsP **Team:** HU

CategoryID: 56_11_02

CT topic: Algorithms and Programming > Commands > Sequence of Commands

Instructions for the teacher:

1. Build a 3D maze* and print the instruction cards.
    a. Instruction cards: left, right, forward, and back.
2. Give the instruction cards to the students and place a ball (robot) on the start position of the maze.
3. Students need to use cards to instruct their classmates on how to turn the maze, and so they try to guide them through the maze.
4. In the 3D maze the ball will roll to the next wall - the instructions focus on moving the maze, not the ball.
5. Continue with another maze! Students can also build mazes for each other and exchange the mazes.



Variation:

- play the game with using variables: “how many degrees need to turn”

3D maze building instructions:

- https://www.instructables.com/3D-Cardboard-Labyrinth-Maze/
- from lego: https://rebrickable.com/mocs/MOC-60469/nathansonic/2-level-maze-16x16/#details
- buy: https://www.amazon.com/Adults-Puzzle-Educational-Stickerless-Puzzles/dp/B07YBVVDB7?th=1

56_17_01

Description: Ground the concept of a negative number and expand the number range with negative integers. Determines given numbers negative, absolute value; knows integers. Perform four operations on natural numbers and integers.

Task ID: AT2_2.2A **Title:** Open number sentences 2.a

Author: **Team:** Finnish Team

CategoryID: 56_17_01

Enter the number that belongs in the blank.
___ - 15 = 9 24
18 = ___ + 15 3
___ = 15 - 9 6
24 + ___ = 24 + 30 + 70 100
17 + 615 = ___ + 614 18
13 - 4 = ___ - 3 12
___ × 4 = 24 6
9 = ___ : 3 27

Task ID: AT2_2.2B **Title:** Open number sentences 2.b

Author: **Team:** Finnish Team

CategoryID: 56_17_01

Enter the number that belongs in the blank.
___ + 6 = 25 19
15 = ___ - 3 18
___ = 7 + 2 + 8 17
24 + ___ = 24 + 3 + 7 10
7 + 15 = ___ + 14 8
513 - 14 = ___ - 13 512
24 = ___ × 4 6
___ : 3 = 9 27

Task ID: HU_56_17_01_01 **Title:** Brackets using and operations on integers

Author: PS **Team:** HU

CategoryID: 56_17_01

Text: Calculate the value of the following expressions where A=7, B= -2, C=5 and D= -3.

Options:

a) A + B + C

b) A – B – C

c) D + B – C

d) D – C – B

e) A*(B – C) + D

f) (A + B) – (C + D)

Solution:

a) 10

b) 4

c) -10

d) -6

e) -52

f) 3

Task ID: HU_56_17_01_02 **Title:** Denomination of banknotes 1

Author: PS **Team:** HU

CategoryID: 56_17_01

Text: Peter's monthly salary is 4,575 EUR. Paper banknotes denominations: 5, 10, 20, 50, 100, 200, 500.

Options:

a) How should we denominate them so that Peter has as few banknotes as possible?

b) How many banknotes would Peter get if there were only 5 euro notes in the till?

Solution:

a) 9 * 500 + 1*50 + 1* 20 + 1*5

b) 945

Task ID: HU_56_17_01_03 **Title:** Denomination of banknotes 2

Author: PS **Team:** HU

CategoryID: 56_17_01

Text: Look at the diagram!

Options:

a) What is the amount of money in the picture?

b) How many €5 banknotes is it equivalent to?

Solution:

a) 385 EUR

b) 77

Task ID: HU_UNPL_11 **Title:** Array_counting2b

Author: ZsP **Team:** HU

CategoryID: 56_17_01 **CategoryID+:** 56_20_08, 78_17_01

CT topic: Data and Information > Data Structures > Array

Instructions for the teachers:

Use a whiteboard. Draw an array (10-12 boxes next to each other) and write a zero in each box.

e. Give students cards with values and indexes:

   Use the terms “natural numbers”, “integers”, “greater/less (by n)”, …

   For example: “Let’s have a natural number greater than 3 in the 5th box.” or “Let’s have an even integer number in the 4th box.” or “Let’s have an even natural number greater than the number in box 10 into the 9th box.”

   Don’t define conflicting, inconsistent goals!

f. Then give instructions to students like

   Increase the values by 3 in every 2nd box.

   Decrease the values by 1 in every 3rd box.

   Use operations fit to the age of your students and fit to the usable operations for integers and natural numbers.

g. The students go to the whiteboard and change the values.

h. You can ask students to give instructions to reach a goal they have on the cards.

56_18_01

Description: Recognize sets in concrate cases

Task ID: HU_56_18_01_01 **Title:** Elements of a set - prim numbers

Author: PS **Team:** HU

CategoryID: 56_18_01

Text: Which numbers can be assigned to the set of prim numbers?

Options:

a) 1, 2, 3, 4, 5, 6, 7, 8, 9

b) 2, 5, 9, 13, 17

Solution:

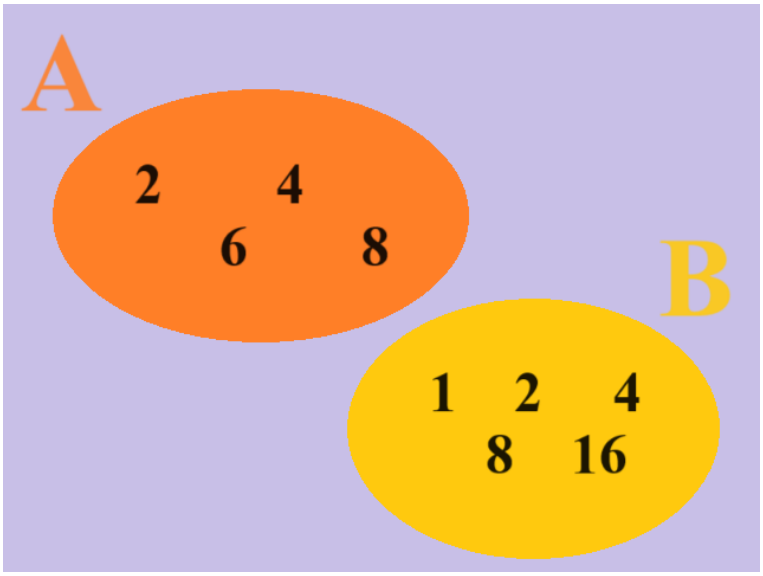
a) 2, 3, 5, 7

b) 2, 5, 13, 17

Task ID: HU_56_18_01_02 **Title:** Set operation 1

Author: PS **Team:** HU

CategoryID: 56_18_01



Text: Which numbers belong to the

Options:

a) set of A U B

b) `set of A ∩ B`

Solution:

a) 1, 2, 4, 6, 8, 16

b) 2, 4, 8

Task ID: HU_56_18_01_03 **Title:** Elements of a set - integers

Author: PS **Team:** HU

CategoryID: 56_18_01

Text: Select the even numbers which are divisible by 3.

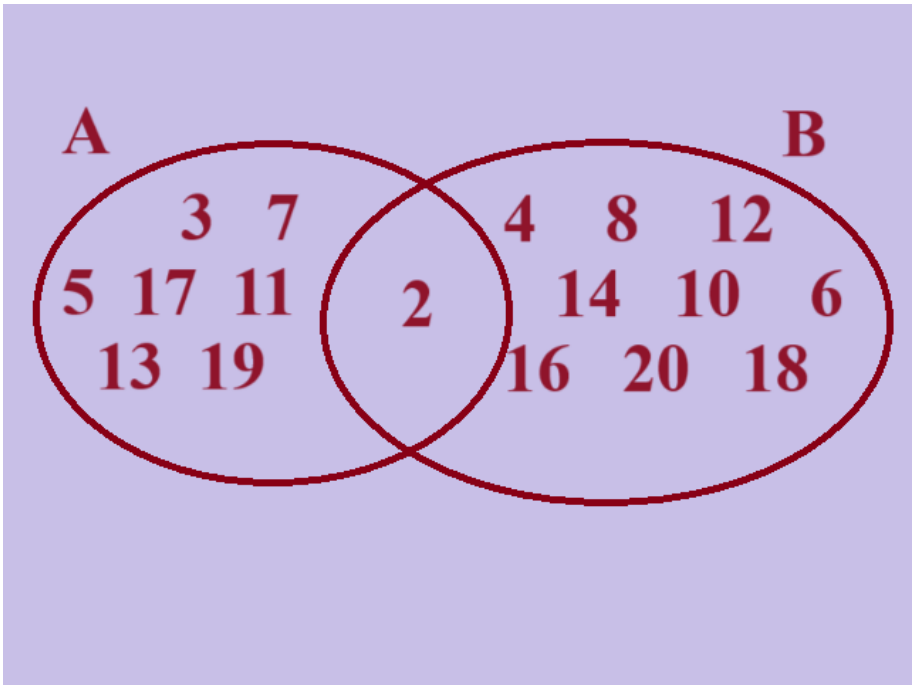
(3, 5, 9, 12, 20, 24, 28, 30)

Solution: 12, 24, 30

Task ID: HU_56_18_01_04 **Title:** Set operation 2

Author: PS **Team:** HU

CategoryID: 56_18_01



Text: The A ∩ B = 2.

Options:

a) What kind of numbers are in the set A?

b) What kind of numbers are in the set B?

Solution:

a) Prim numbers

b) Even numbers

56_18_02

Description: Illustrate sets in concrate cases

Task ID: HU_UNPL_09 **Title:** Classifiing

Author: ZsP **Team:** HU

CategoryID: 56_18_02

CT topic: Data and Information > Data Processing > Classifying

Instructions for the teachers:

1. Draw sets on the whiteboard and name them.
    a. Use a maximum of three sets.
    b. For example: animals, humans, and flowers; students, teachers, and parents.
2. Ask the students to give common attributes for each intersection in between the sets.
3. Variations: Write the attributes for the intersections and students name the sets. Students create the sets and classmates write attributes for the intersections. Students write the attributes for the intersections and classmates name the sets.

56_19_01

Description: Understand problems of everyday life and elaborate mathematical representations to aid problem-solving. Interpret simple mathematical language in various formats, acquire appropriate vocabulary, and effectively communicate mathematical ideas.

Task ID: ES_56_19_01_01 **Title:** How old?

Author: CR **Team:** ES

CategoryID: 56_19_01

Text: Mary is 15 years younger than Peter and Peter is four times Mary's age.

a) How old is Peter?

b) How old is Mary?

Solution:

a) 20

b) 5

Task ID: ES_56_19_01_02 **Title:** How much money?

Author: CR **Team:** ES

CategoryID: 56_19_01

Text: I have money in my wallet and three times as much at home. If I have a total of 20 euros, how much money do I have in my wallet?

Solution: 5

56_19_02

Description: Practice activities that require logical thinking, including identifying rules and dependencies and determining the number of options in math problems. Strengthen students' skills in reasoning and justification. Determine the logical value (true or false) of statements and understand various methods of justification, including mathematical proof.

Task ID: ES_56_19_02_01 **Title:** Mental calculation

Author: CR **Team:** ES

CategoryID: 56_19_02

Text: If you add 20 to a number, you get three times as much as if you subtract 8. What number is it?

Solution: 22

Task ID: ES_56_19_02_02 **Title:** Mental calculation

Author: CR **Team:** ES

CategoryID: 56_19_02

Text: A building consists of 3 basements, the ground floor and 9 additional floors. The height of each basement is 1 metre less than the height of each floor. Basement -3 is at a height of -9 m. What is the height of the building above ground?

Solution: 40 metres

Task ID: ES_56_19_02_03 **Title:** Mental calculation

Author: CR **Team:** ES

CategoryID: 56_19_02

Text: On your mobile phone you record 2 documentaries of 15 minutes and three music videos of 5 minutes each. Is it true that if you delete one of the documentaries you will have 15 minutes of recording on your mobile?.

Solution: No

Task ID: HU_UNPL_21 **Title:** Trueball2

Author: ZsP **Team:** HU

CategoryID: 56_19_02

CT topic: logic

Material: ball

Teacher instructions:

1. Tell a statement and throw the ball to one of the students.
2. The student needs to define the truth value of the statement (telling “true” or “false”) and give (explain) the justification (why)
3. Then the student tells a statement and throws the ball to another student
4. …

The statements must be clearly defined and include information that all students know or see in the room. You can use a special topic (like geometry, numbers, or from another subject…).

Variation:

- the statements need to include “all”, “exists”, “not”, and “non of” (based on the age group’s need)
- you can create more complex statements with combinations using “and”, “or” and “not”.

56_20_01

Description: Reading, representation, composition, decomposition, and recomposition of natural numbers, decimals to thousandths, fractions, and decimals to express quantities, and choosing the best representation for each situation or problem.

Task ID: HU_UNPL_25b **Title:** Fractions

Author: ZsP **Team:** HU

CategoryID: 56_20_01

CT topic: pattern recognition,

Play the HU_UNPL_25 (Percentangles) activity, but use only the 2 “right” cards.

56_20_07

Description: Methods for calculations with natural numbers, simple fractions, and decimals in approximate estimates, mental arithmetic, and written calculations using digital tools.

Task ID:AT2_5.1A **Title:** Evaluate expression 6

Author: **Team:** Finnish Team

CategoryID: 56_20_07

Which of the following math expressions is NOT equal to 53 -7? • 53 - 3 - 4 • 50 - 4 • 3 + (50 - 7) • 47 + 5 - 7
Which of the following math expressions is NOT equal to 4 × (60 + 5)? • 4 × 65 • 4 × 60 + 4 × 5 • 4 × 60 + 5 • 4 × 70 - 4 × 5
Which of the following math expressions is NOT equal to 3 × (19 - 1)? • 3 × 18 • 3 × 19 - 3 × 1 • 3 × 19 - 1 • 3 × 20 - 3 × 2
Which of the following math expressions is NOT equal to 170 × 20? • 100 × 20 + 70 × 20 • (100 + 70) × 20 • 100 + 70 × 20 • 2000 + 1400

Task ID:AT2_5.1B **Title:** Evaluate expression 7

Author: **Team:** Finnish Team

CategoryID: 56_20_07

Which of the following math expressions is NOT equal to 28 + 7? • 28 + 2 + 5 • 30 + 5 • 7 + 28 • 24 + 3 + 7
Which of the following math expressions is NOT equal to 4 × (10 + 5)? • 4 × 15 • 4 × 10 + 4 × 5 • 4 × 10 + 5 • 4 × (5 + 10)
Which of the following math expressions is NOT equal to 3 × (59 - 1)? • 3 × 58 • 3 × 59 - 3 × 1 • 3 × 59 - 1 • 3 × 60 - 3 × 2
Which of the following math expressions is NOT equal to 17 × 20? • 10 × 20 + 7 × 20 • (10 + 7) × 20 • 10 + 7 × 20 • 200 + 140

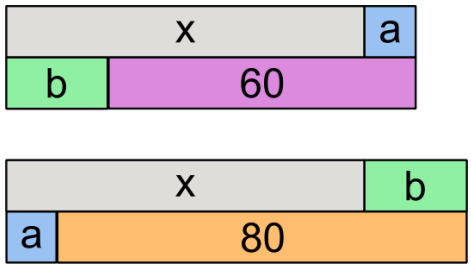
56_21_01

Description: Strategies for comparing, ordering, and converting measurements. Use of conventional units from the Decimal Metric System in everyday contexts. Understanding measurement tools for various quantities.

Task ID: AT23_6.2A **Title:** Evaluate expression 3

Author: **Team:** Finnish Team

CategoryID: 56_21_01 **CategoryID+:** 78_22_01



Block x and block a are as long as

block b and 60 cm.

Block x and block b are as long as

block a and 80 cm.

How long is block x?

70#70,0#70.0 [cm]

Task ID: ES_56_21_01_01 **Title:** Approximation

Author: CR **Team:** ES

CategoryID: 56_21_01

Text: Which of the following values is closest to 950 grams?

a. 0,5 kilogram
b. 0,450 kilogram
c. 0,700 kilogram
d. 1 kilogram

Solution:

d

Task ID: ES_56_21_01_02 **Title:** Approximation

Author: CR **Team:** ES

CategoryID: 56_21_01

Text: Which of the following values is closest to 1 kilogran?

a. 999 grams
b. 1,1 kilogram
c. 0,700 kilogram
d. 1100 grams

Solution:

a

Task ID: ES_56_21_01_03 **Title:** Correct unit

Author: CR **Team:** ES

CategoryID: 56_21_01

Text: In what units do you measure the distance between two cities?

Solution:

Kilometres

Task ID: ES_56_21_01_04 **Title:** Correct unit

Author: CR **Team:** ES

CategoryID: 56_21_01

Text: In what units is the capacity of a petrol tank measured?

Solution:

litres

56_21_02

Description: Solving problems related to responsible consumption and financial decisions. Calculations involving money and numerical information in daily life.

Task ID: ES_56_21_02_01 **Title:** What is more?

Author: CR **Team:** ES

CategoryID: 56_21_02

Text: Who does more damage to the environment?

a. use 5 litres of water in the shower
b. use 30 decilitres of water in the shower

Solution:

a

Task ID: ES_56_21_02_02 **Title:** What is more?

Author: CR **Team:** ES

CategoryID: 56_21_02

Text: Who is more environmentally friendly?

a. you reuse 1,5 kilogram of plastic
b. you reuse 1300 grams of plastic

Solution:

a

56_21_03

Description: Identifying proportional and non-proportional situations. Solving problems involving proportionality, percentages, and scales. Understanding relationships between fractions, decimals, and percentages.

Task ID: ES_56_21_03_01 **Title:** Playing with %

Author: CR **Team:** ES

CategoryID: 56_21_03

Text: Anna has 10 oranges and Maria has 110% of the oranges that Anna has. How many oranges does Maria have?

a. 110
b. 11
c. 9
d. 20

Solution: b

Task ID: ES_56_21_03_02 **Title:** Playing with %

Author: CR **Team:** ES

CategoryID: 56_21_03

Text: Anna has 10 oranges and Maria has 90% of the oranges that Anna has. How many oranges does Maria have?

a. 110
b. 11
c. 9
d. 20

Solution: c

Task ID: HU_UNPL_25 **Title:** Percentages

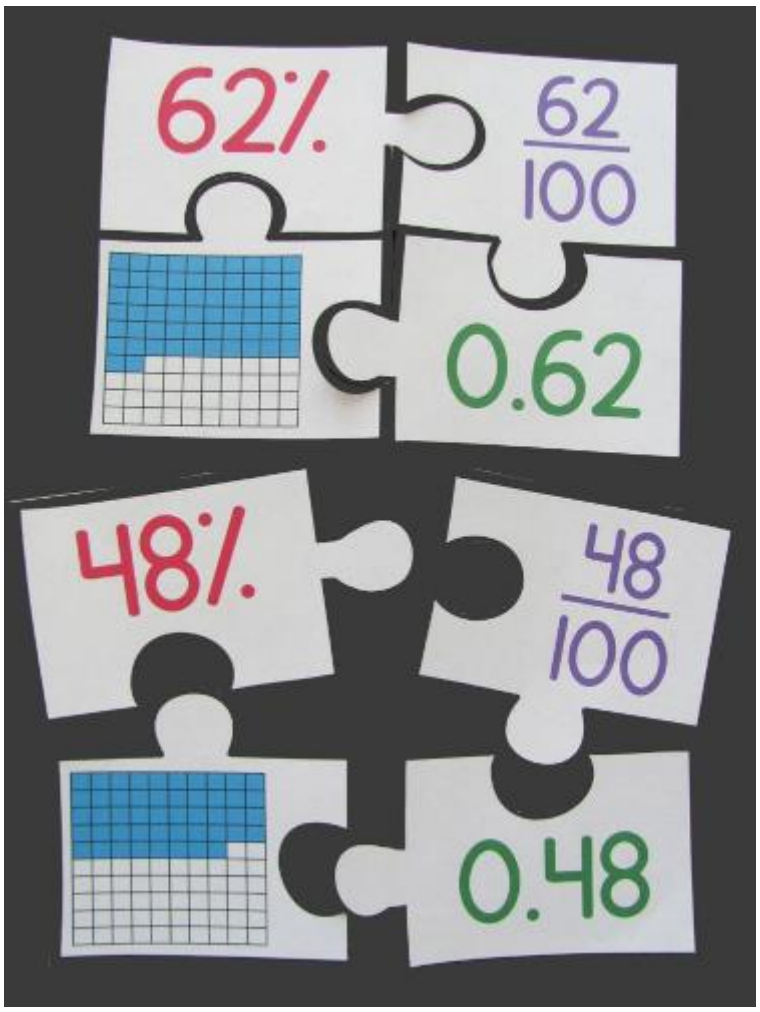
Author: ZsP **Team:** HU

CategoryID: 56_21_03

CT topic: pattern recognition,

Instructions for the teachers:

1. Create (based on the knowledge of your students and your goals), then print and cut the puzzle cards
2. Give the card set to the students and ask them to pass the puzzle tiles based on the values



Variations:

- the students can work in pairs
- Prepare the block-cards (bottom left) without coloring and ask students to color them.

56_21_04

Description: Grasping the concept of percentages and their application in real-world scenarios. Performing calculations related to changes, discounts, and comparison percentages.

Task ID: ES_56_21_04_01 **Title:** Order the numbers

Author: CR **Team:** ES

CategoryID: 56_21_04

Text: Order the following numbers from smallest to largest

a. 1/4
b. 0,3
c. 5/2
d. 1,5

Solution: a, b, d, c

Task ID: ES_56_21_04_02 **Title:** Order the numbers

Author: CR **Team:** ES

CategoryID: 56_21_04

Text: Order the following numbers from largest to smallest

a. 1 metre
b. 150 centimetre
c. 1,2 metre
d. 10 metres

Solution: d, b, c, a

Task ID: ES_56_21_04_03 **Title:** Increasing the reserve

Author: CR **Team:** ES

CategoryID: 56_21_04

Text: The water reserves of a reservoir have increased by 20% compared to the previous year's 60 million litres. What is the current reserve?

a. 40 million litres
b. 72 million litres
c. 80 million litres
d. 48 million litres

Solution: b

Task ID: ES_56_21_04_04 **Title:** Decreasing the reserve

Author: CR

CategoryID: 56_21_04

Text: The water reserves of a reservoir have decreased by 20% compared to the previous year's 60 million litres. What is the current reserve?

a. 40 million litres
b. 72 million litres
c. 80 million litres
d. 48 million litres

Solution: d

56_21_05

Description: Analyzing input/output tables expressing inverse proportionality. Using graphs to represent proportional relationships and understand their relation to fractions, decimals, and percentages.

Task ID: ES_56_21_05_01 **Title:** Renting a car

Author: CR **Team:** ES

CategoryID: 56_21_05

Text: The cost of renting a car is 100 euros fixed plus 150 euros for each day it is rented. How much does it cost to rent a car for 5 days?

a. 850 euros
b. 250 euros
c. 1250 euros
d. 400 euros

Solution: a

Task ID: ES_56_21_05_02 **Title:** Renting a bike

Author: CR **Team:** ES

CategoryID: 56_21_05

Text: The cost of renting a bicycle is 20 euros fixed plus 20 euros for each day it is rented. How much does it cost to rent a car for 4 days?

a. 160 euros
b. 100 euros
c. 60 euros
d. 40 euros

Solution: b

Task ID: ES_56_21_05_03 **Title:** Sheep

Author: CR **Team:** ES

CategoryID: 56_21_05

Text: 120 sheep have been shorn out of a flock of 480 sheep. What % of the sheep are shorn?

a. 30 %
b. 25 %
c. 10%
d. 50%

Solution: b

Task ID: ES_56_21_05_04 **Title:** I will pay later

Author: CR **Team:** ES

CategoryID: 56_21_05

Text: The municipality imposes a 15% surcharge on fines paid late. What is the cost with surcharge for a fine of 75 euros?

a. 90 euros
b. 100 euros
c. 89,30 euros
d. 86,26 euros

Solution: d

56_22_02

Description: Study equations and find solutions by reasoning and experimenting. Interprets and double-checks the result. First-degree equations are solved. Real-world problems with direct proportionality are discussed. Ratio and proportionality are defined. Properties of proportions are understood and used to solve problems.

Task ID: AT2_1.1A **Title:** Numerical manipulation 2.a

Author: **Team:** Finnish Team

CategoryID: 56_22_02

12 = 4 + 8 true / false
12 = 12 true / false
967 = 967 + 0 true / false
19 + 6 + 170 - 170 = 19 + 6 true / false
31 - 0 = 31 true / false
137 + 265 = 265 + 137 true / false
7 - 5 = 5 - 7 true / false
145 × 70 = 70 × 145 true / false
10 : 5 = 5 : 10 true / false
12 + 190 - 180 = 12 + 10 true / false
500 + 730 = 500 + 500 + 230 true / false
77 + 136 - 116 = 77 + 21

true / false
9 + 9 = 10 + 10 - 2 true / false
327 + 115 = 329 + 113 true / false
(9 × 4) + 4 = 10 × 4 true / false
12 + 9 : 3 = 7 true / false

Task ID: AT2_1.1B **Title:** Numerical manipulation 2.b

Author: **Team:** Finnish Team

CategoryID: 56_22_02

8 = 4 + 12 true / false
512 = 512 true / false
67 = 67 + 0 true / false
9 + 6 + 17 - 17 = 9 + 6 true / false
987 - 0 = 987 true / false
37 + 65 = 65 + 37 true / false
12 - 10 = 10 - 12 true / false
14 × 7 = 7 × 14 true / false
4 : 2 = 2 : 4

true / false
12 + 119 - 118 = 12 + 1 true / false
50 + 73 = 50 + 50 + 23 true / false
77 + 136 - 126 = 77 + 10 true / false
19 + 19 = 20 + 20 - 2 true / false
327 + 115 = 328 + 114 true / false
4 + (9 × 4) = 10 × 4 true / false
4 + 7 × 5 = 55 true / false

Task ID: AT2_1.2A **Title:** Generalization 2.a

Author: **Team:** Finnish Team

CategoryID: 56_22_02

Tom solves 14 + 65 and correctly gets 79. Then the teacher asks him to solve 65 + 14. He knows the answer without adding the numbers. When adding 14 and 65 in any order, you always get the same answer, 79.

Will Tom's idea always work for all numbers?

- (a) Always
- (b) Sometimes
- (c) Never

Liz solves 23 + 46 and correctly gets 69. Then the teacher asks her whether 23 + 46 + 15 = 69 + 15 is true or false. Can Liz know that it is true without actually adding 15 to both sides?

- Yes, she knows the answer without any calculation. When adding the same amount to both sides, they are still equal.
- No, she has to do the calculation to be able to answer the question.

Dan solves 3 × 15 and correctly gets 45. Then the teacher asks him to solve 15 × 3. He knows the answer without multiplying the numbers. When multiplying 3 and 15 in any order, you always get the same answer, 45. Will Dan's idea always work for all numbers?

- Always
- Sometimes
- Never

The sum of 5397 + 6951 is

- an odd number
- an even number

Task ID: AT2_1.2B **Title:** Generalization 2.b

Author: **Team:** Finnish Team

CategoryID: 56_22_02

Tom realizes that when adding any two numbers in any order, he always gets the same answer, for example 15 + 20 = 35 and 20 + 15 = 35. Will Tom's idea always work for subtraction?

- Always
- Sometimes
- Never

Liz solves 23 + 46 and correctly gets 69. Then the teacher asks her whether 23 + 46 - 15 = 69 - 15 is true or false. Can Liz know that it is true without actually subtracting 15 from both sides?

- Yes, she knows the answer without any calculation. When subtracting the same amount from both sides, they are still equal.
- No, she has to do the calculation to be able to answer the question.

Dan realizes that when multiplying any two numbers in any order, he always gets the same answer, for example 3 × 15 = 45 and 15 × 3 = 45. Will Dan's idea always work for division?

- Always
- Sometimes
- Never

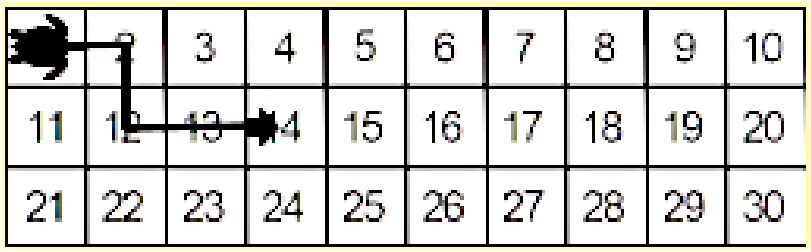
The sum of 5396 + 6952 is

- an odd number
- an even number

Task ID:AT2_1.3A **Title:** Turtle operation 2.a

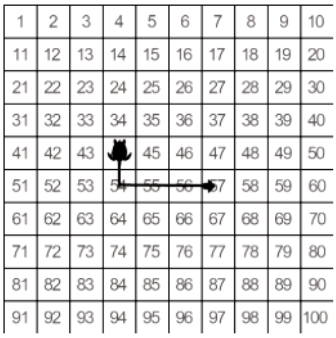
Author: **Team:** Finnish Team

CategoryID: 56_22_02



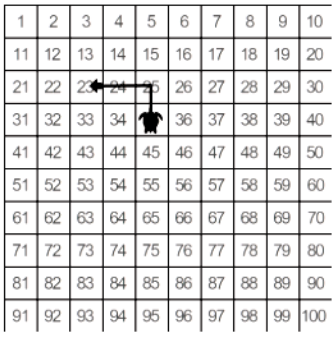
The turtle starts moving from 1 and lands on 14. The math expression,

1 + 1 + 10 + 2, represents its movement step by step.



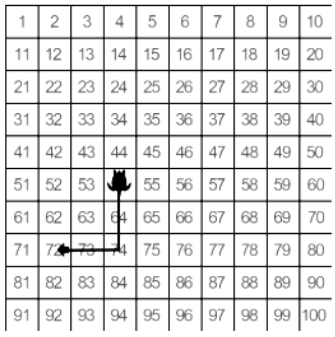
Which math expression represents the turtle's movement?

- 44 + 10 + 3
- 44 - 10 - 3
- 44 + 1 + 30
- 44 - 1 - 30
- 44 + 9 + 3



Which math expression represents the turtle's movement?

- 35 - 10 - 2
- 35 + 10 + 2
- 35 + 1 + 20
- 35 - 1 - 20
- 35 - 9 - 2

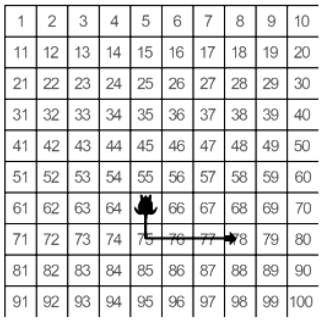


Write a math expression that represents the turtle's

movement.

54 + 20 - 2

(open-answer)

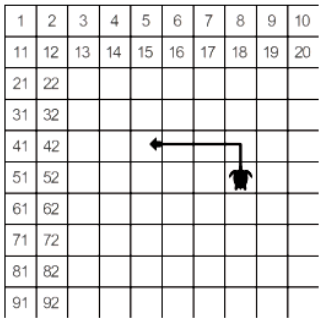


Write a math expression that represents the turtle's movement.

65 + 10 + 3

(open-answer)

* The picture will be edited so that some numbers are not visible as in the Version B.



Write a math expression that represents the turtle's movement.

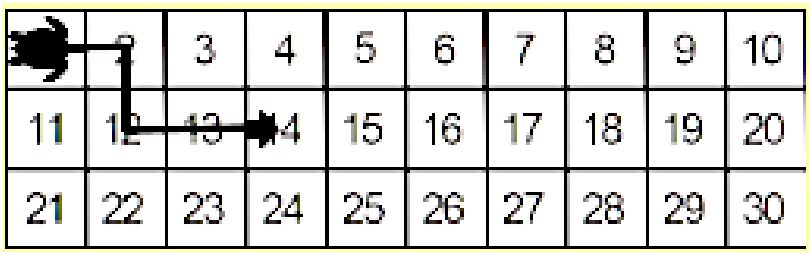
58 - 10 - 3

(open-answer)

Task ID: AT2_1.3B **Title:** Turtle operation 2.b

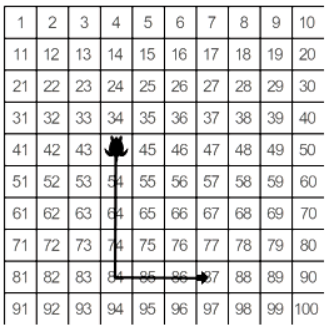
Author: **Team:** Finnish Team

CategoryID: 56_22_02



The turtle starts moving from 1 and lands on 14. The math expression,

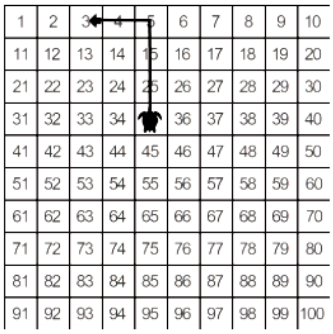
1 + 1 + 10 + 2, represents its movement step by step.



Which math expression represents the turtle's movement?

(5 choices)

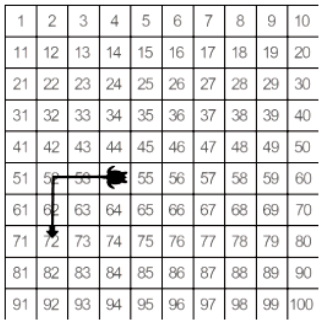
- 44 + 40 + 3
- 44 - 40 - 3
- 44 + 4 + 30
- 44 - 4 - 30
- 44 + 39 + 3



Which math expression represents the turtle's movement?

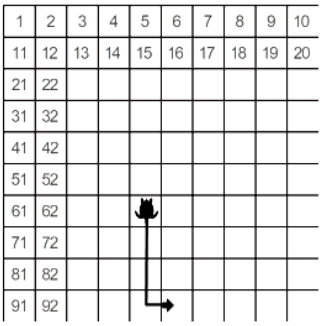
- 35 - 30 - 2

- 35 + 30 + 2
- 35 + 3 + 20
- 35 - 3 - 20
- 35 - 29 - 2



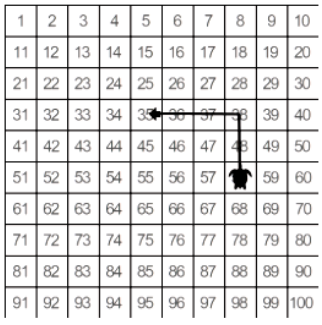
Write a math expression that represents the turtle's movement.

54 - 2 + 20 (open-answer)



Write a math expression that represents the turtle's movement.

65 + 30 + 1 (open-answer)



Write a math expression that represents the turtle's movement.

58 - 20 – 3 (open-answer)

* The picture will be edited so that some numbers are not visible as in the Version A.

Task ID:AT2_2.5A **Title:** Word problems 2.a

Author: **Team:** Finnish Team

CategoryID: 56_22_02

When you multiply a number by 3, you get 15.

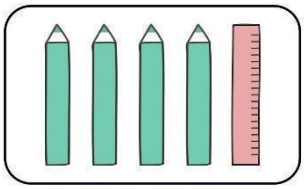
What is the number?

5

(open answer; 3x = 15)

A ruler costs one euro more than a pencil.

Total 16 €



One pencil costs ____ € 3

(y = x + 1; 4x + y = 16)

Task ID:AT2_2.5B **Title:** Word problems 2.b

Author: **Team:** Finnish Team

CategoryID: 56_22_02

When you multiply a number by 3 and then add 2 to it, you get 17.

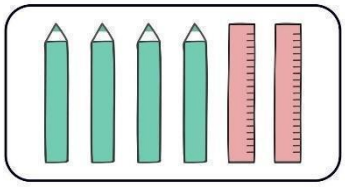
What is the number?

5

(open answer; 3x + 2 = 17)

A ruler costs one euro more than a pencil.

Total 20 €



One pencil costs ____ € 3

(y = x + 1; 4x + 2y = 20)

Task ID: AT23_6.4A **Title:** Compare expressions 5

Author: **Team:** Finnish Team

CategoryID: 56_22_02 **CategoryID+:** 78_22_01

You wish to take piano lessons twice a week for 3 weeks. Which is the cheapest offer?

- ☆ Piano School ☆: 5 € for each lesson
- ✨ Super Music ✨: 15 € for the first 4 lessons and then 10 € for every additional lesson

(PS = 30€, SM = 35€)

Task ID: AT23_6.4B **Title:** Compare expressions 6

Author: **Team:** Finnish Team

CategoryID: 56_22_02 **CategoryID+:** 78_22_01

You wish to take piano lessons twice a week for some time. Which is the cheapest offer?

- ☆ Piano School ☆: 5 € for each lesson
- ✨ Super Music ✨: 15 € for the first 4 lessons and then 10 € for every additional lesson

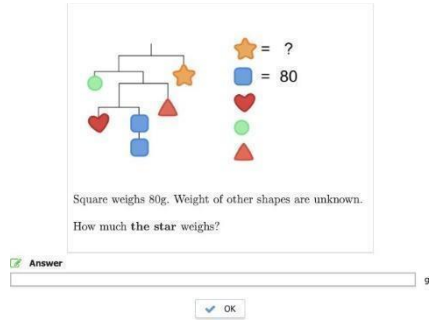
Music Masters

Not enough information provided

Task ID: AT23_6.5A **Title:** Weight of the shapes 4

Author: **Team:** Finnish Team

CategoryID: 56_22_02 **CategoryID+:** 78_22_01



Rectangle = 5, then star = 80

56_22_03

Description: Formulation of mathematical questions based on everyday situations. Strategies for solving mathematical problems in student-related situations. Formulate simple mathematical conjectures by investigating patterns, properties, and relationships in a guided manner. Pose new problems that are solved mathematically.

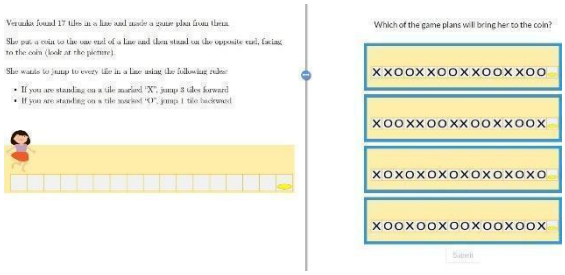
Task ID: ALG-03-A **Title:** Jumping game

Author: **Team:** Bebras

CategoryID: 56_22_03

ALG-03-A

Jumping game (yellow background)



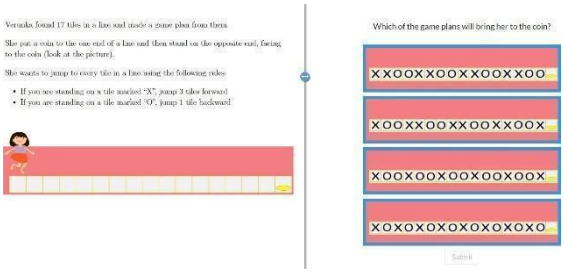
Task ID: ALG-03-B **Title:** Jumping game

Author: **Team:** Bebras

CategoryID: 56_22_03

ALG-03-B

Jumping game (pink background)



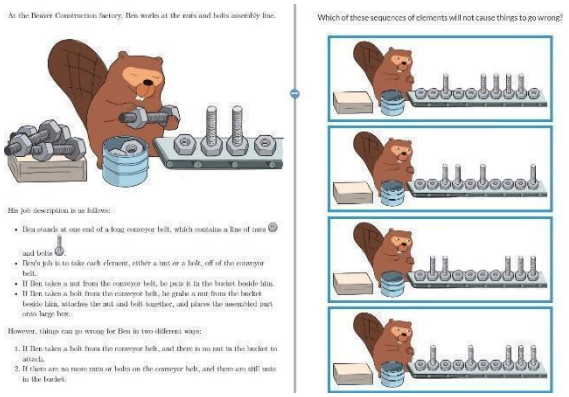
Task ID: ALG-04-A **Title:** Nuts and bolts

Author: **Team:** Bebras

CategoryID: 56_22_03 **CategoryID+:** 78_24_03

ALG-04-A

Nuts and bolts
(nuts and bolts)



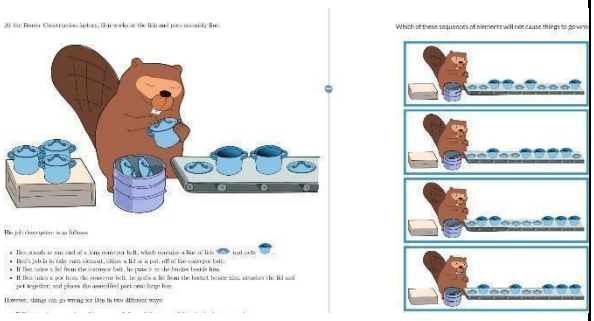
Task ID: ALG-04-B **Title:** Nuts and bolts

Author: **Team:** Bebras

CategoryID: 56_22_03 **CategoryID+:** 78_24_03

ALG-04-B

Nuts and bolts
(lids and pots)



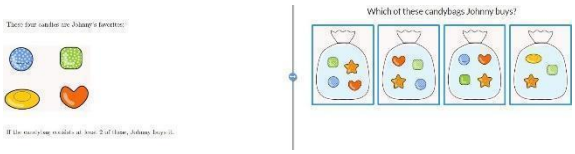
Task ID: ALG-14 C **Title:** Candy bag

Author: **Team:** Bebras

CategoryID: 56_22_03

ALG-14

Candy bag



Task ID: AT2_5.3A **Title:** Simplify expression 3

Author: **Team:** Finnish Team

CategoryID: 56_22_03

If **b** is a number, 1 + b + b can be simplified (written more simply) as 1 + 2b.

Simplify the math expressions.

a + a + a 3a#3*a#3×a#3·a#3xa

c + c + 1 2c+1#1+2c#2*c+1#1+2*c#2×c+1#1+2×c#2·c+1#1+2·c#2xc+1#1+2xc

d + 3 + d - 3

2d#2*d#2×d#2·d#d2#d*2#d×2#d·2#dx2#2xd

e -
e 0

Task ID: AT2_5.3B **Title:** Simplify expression 4

Author: **Team:** Finnish Team

CategoryID: 56_22_03

a + a 2a#2*a#2×a#2·a#2xa
c + c + c + 1 3c+1#1+3c#3*c+1#1+3*c#3×c+1#1+ 3×c#3·c+1#1+3·c#3xc+1#1+3xc
d + 3 + d + 3 2d+6#2*d+6#2×d+6#2·d+6#6+2d#6 +2*d#6+2×d#6+2·d#6+2xd#2xd+6
1 + e - e 1

Task ID: HU_56_22_03_01 **Title:** Practice symbols

Author: AR **Team:** HU

CategoryID: 56_22_03

Text: Write the following sentences using mathematical symbols.

Options:

a) One-third of a number greater than twice the number 'a' by four;

b) Subtract eight from a third of a number 'b', add two to the quotient, and subtract six from the sum;

c) Multiply the difference between the numbers 'x' and 'y' by four, add eight to the product and divide the sum by two;

d) I add twice the number 'a' and three times the number 'b', subtract five times the number 'c' from the sum, multiply the result by six and divide the product by seven.

Solution: a)

56_22_05

Description: Understand the concept of a variable. Practice addition, subtraction, and multiplication of polynomials. Solve one-variable, first-degree equations using different methods. Define concepts like unary, binary, ternary, and polynomial operations. Multiply alphabetic expressions.

Task ID:AT2_2.4A **Title:** Letters 2.a

Author: **Team:** Finnish Team

CategoryID: 56_22_05

An alphabet can represent a number. For example, if 2 + a = 3, then a = 1.
If 3 + b = 12, then b = ___ 9
If c - 6 = 9, then c = ___ 15
If 11 = 8 + d, then d = ___ 3
If 7 + e = 7 + 8 + 2, then e = ___ 10
If g + g + 2 = 12, then g = ___ 5 (open answer)
If m + n + n = 12 and m + n = 10, then n = ___ 2

Task ID:AT2_2.4B **Title:** Letters 2.b

Author: **Team:** Finnish Team

CategoryID: 56_22_05

An alphabet can represent a number. For example, if a + 2 = 3, then a = 1.
If b + 3 = 12, then b = ___ 9
If 15 - c = 9, then c = ___ 6
If 11 = d + 8, then d = ___ 3
If 7 + 8 + 2 = 7 + e, then e = ___ 10
If g + g = g + 5, then g = ___ 5 (open answer)
If m = n + 3 and n = 5, then m = ___ 8

Task ID: AT2_3.3A **Title:** Number Pairs 3

Author: **Team:** Finnish Team

CategoryID: 56_22_05

Fill numbers in the table according to the rule. y = x + 10 (3 pairs)
A number that goes into this machine will always come out in the same way. Complete the table of the numbers that go into and come out of the machine. x + y = 10; y = 10 – x 1 → 9 3 → 7 5 → 5 6 → 4 10 → 0
A number that goes into this machine will always come out in the same way. Complete the table of the numbers that go into and come out of the machine. y = x : 2
2 → 1 22 → 11 64 → 32 90 → 45 410 → 205

Task ID: AT2_3.3B **Title:** Number Pairs 4

Author: **Team:** Finnish Team

CategoryID: 56_22_05

Fill numbers in the table according to the rule. y = x -10 (3 pairs)
A number that goes into this machine will always come out in the same way. Complete the table of the numbers that go into and come out of the machine. x + y = 100; y = 100 – x 10 → 90 30 → 70 50 → 50 60 → 40 100 → 0
A number that goes into this machine will always come out in the same way. Complete the table of the numbers that go into and come out of the machine.
y = 2x 1 → 2 11 → 22 32 → 64 45 → 90 205 → 410

56_22_06

Description: Create and re-arrange simple alphabetic expressions using natural numbers. Methods, including algebraic, for solving simple equations.

Task ID: AT2_4.2A **Title:** Create an expression from the word problem 3

Author: **Team:** Finnish Team

CategoryID: 56_22_06

If **m** stands for the number of boys in the class and **n** stands for the numbers of girls in the class, write a math expression for the number of boys and girls in the class altogether. m+n#n+m (medium)
If **c** stands for the number of pens in each box, write a math expression for the number of pens in 3 boxes. 3c#3*c#3×c#3·c#c+c+c#3xc (difficult)

Task ID: AT2_4.2B **Title:** Create an expression from the word problem 4

Author: **Team:** Finnish Team

CategoryID: 56_22_06

There are more boys than girls in the class. If **m** stands for the number of boys and **n** stands for the numbers of girls, write a math expression for how many more boys than girls in the class. m-n (medium)
There are 3 pupils. If **c** stands for the number of pens that are divided equally among them, write a math expression for how many pens each pupil gets. c:3#c/3#c÷3 (difficult)

56_22_09

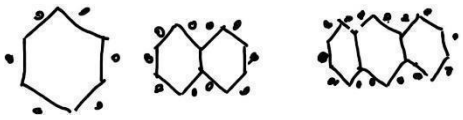
Description: Solve problems that require selecting solutions to inequalities that meet specific conditions. Model various real-world situations using systems of equations.

Task ID: AT2_3.11B **Title:** Table and chairs 5

Author: **Team:** Finnish Team

CategoryID: 56_22_09

Linear figure: 6, 10, 14, …
(n-1) + 4 or y = 4x+2 (table & chairs)



1) How many people can sit when 4 tables are joined ?
   18
2) How many people can sit when 7 tables are joined ?
   30

(difficult)

56_23_01

Description: Description of positions and movements in the first quadrant of the Cartesian coordinate system. Learn about the first quadrant of the coordinate system and extend then to all quadrants.

Task ID: ES_56_23_01_01 **Title:** Translation of a vector

Author: CR **Team:** ES

CategoryID: 56_23_01

Text: Write the coordinates of the vector resulting from the translation of the vector $\vec{v}(1,3)$ according to the vector $\vec{v}$ (2,1).

a. (3,4)

b. (2,3)

c. (4,3)

d. (3,2)

Solution: a

Task ID: ES_56_23_01_02 **Title:** Translation of a vector

Author: CR **Team:** ES

CategoryID: 56_23_01

Text: Write the coordinates of the vector resulting from the translation of the vector

$\vec{v}(-1,3)$ according to the vector - $\vec{v}$ (2,1).

a. (-3,-4)

b. (-2,-3)

c. (-1,2)

d. (-3,2)

Solution: d

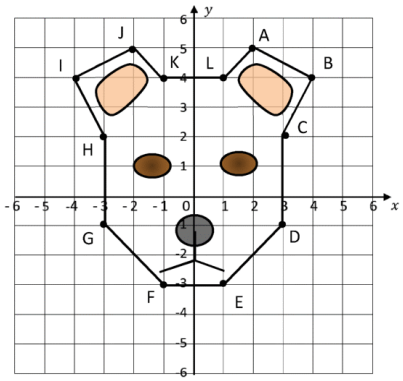
Task ID: HU_UNPL_27 **Title:** Coordinates

Author: ZSP **Team:** HU

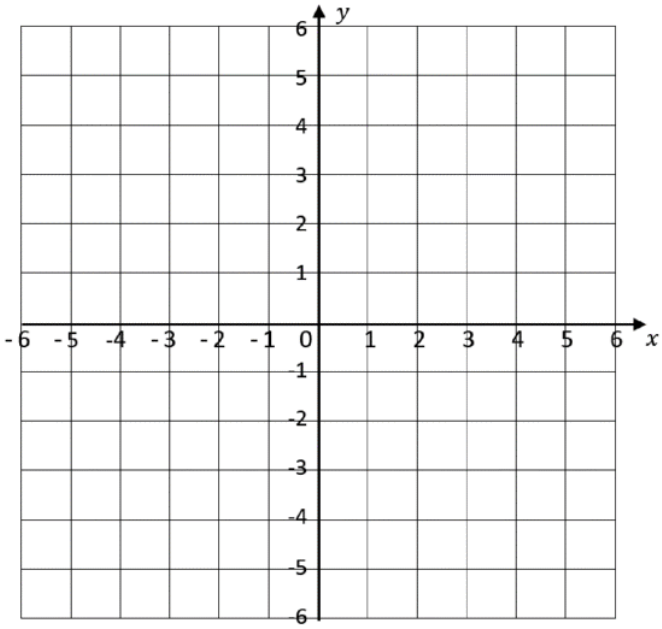
CategoryID: 56_23_01

CT topics: instructions, algorithm, decomposition

Instructions for the teachers:



1. Create (based on the knowledge of your students and your goals), then print a draw in a coordinate system
2. Ask students to write the coordinates of each point of the face (A, B, C, …L)
3. Ask students to draw their own face, picture and write the coordinates.
4. The students give the coordinates to their classmates who need to draw the picture.



2) Draw your own face using the grid below and write down the coordinates of the outline.

A (,)	H (,)
B (,)	I (,)
C (,)	J (,)
D (,)	K (,)
E (,)	L (,)
F (,)	M (,)
G (,)	N (,)

Variations:

- Tell the coordinates to the students and they need to sign the points and draw the face.

56_23_02

Description: Finds their way around a coordinate system. Coordinate system and grading of coordinate axes.

Task ID: ES_56_23_02_01 **Title:** Using vector for translation

Author: CR **Team:** ES

CategoryID: 56_23_02

Text: Let the points A(2,1), B(-1,-1) and C(1,3) be in the Cartesian coordinate system. Which translation vectors do we have to apply to follow the path: A→B→C?

a. (-3,-2) and (2,4)

b. (2,3) and (-2,4)

c. (-2,-3) and (-2,-4)

Solution: a

Task ID: ES_56_23_02_02 **Title:** Using vector for translation

Author: CR **Team:** ES

CategoryID: 56_23_02

Text: Let the points A(1,5), B(1,0) and C(0,-1) be in the Cartesian coordinate system. Which translation vectors do we have to apply to follow the path: A→B→C?

a. (0,5) and (-1,-1)

b. (-5,0) and (1,1)

c. (0,-5) and (-1,-1)

Solution: c

Task ID: ES_56_23_02_03 **Title:** Symmetric point: OY

Author: CR **Team:** ES

CategoryID: 56_23_02

Text: Write the coordinates of the point symmetric to the point (-1,5) with respect to the OY-axis

a. (1,-5)

b. (1,5)

c. (-1,-5)

Solution: b

Task ID: ES_56_23_02_04 **Title:** Symmetric point: OX

Author: CR **Team:** ES

CategoryID: 56_23_02

Text: Write the coordinates of the point symmetric to the point (-1,5) with respect to the OX-axis

a. (1,-5)

b. (1,5)

c. (-1,-5)

Solution: c

Task ID: ES_56_23_02_05 **Title:** Symmetric point: origin

Author: CR **Team:** ES

CategoryID: 56_23_02

Text: Write the coordinates of the point symmetric to the point (-1,5) with respect to the origin

a. (1,-5)

b. (1,5)

c. (-1,-5)

Solution: a

56_24_02

Description: Continues periodic series based on a given rule; recognizes and describes the generating rule of a series given by a few of its members.

Task ID: AT2_3.2A **Title:** Number sequence 3

Author: **Team:** Finnish Team

CategoryID: 56_24_02

Complete the number sequence.
29 33 37 41 45 (+4)
36 35 33 30 26 (-1, -2, -3, -4, …)
4 8 16 32 64 2×(n-1)

Task ID: AT2_3.2B **Title:** Number sequence 4

Author: **Team:** Finnish Team

CategoryID: 56_24_02

Complete the number sequence.
45 41 37 33 29 (-4)
26 27 29 32 36 (+1, +2, +3, +4, …)
64 32 16 8 4 (n-1) / 2

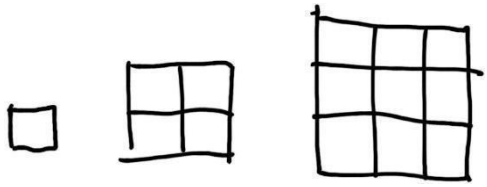
Task ID: AT23_3.1A **Title:** Table and chairs 3

Author: **Team:** Finnish Team

CategoryID: 56_24_02 **CategoryID+:** 78_22_01

Non-linear figure: 1, 4, 9, …

(n-1) +3, +5, +7, … or y = x^2

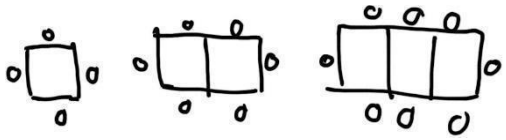


1. 2. 3.

1) How many squares are in the next figure? 16
2) How many squares are in the 7th figure? 49

(easy)

Linear figure: 4, 6, 8 …
(n-1) + 2 or y = 2x + 2
(table & chairs)



3) How many people can sit when 4 tables are joined ? 10
4) How many people can sit when 7 tables are joined ? 16

(easy)

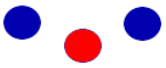
Task ID: HU_UNPL_17 **Title:** Series

Author: ZSP **Team:** HU

CategoryID: 56_24_02

CT topic: Data and Information > Data Structures > Sequence

Instructions for the teacher:

1. Take 10-20 colored/patterned buttons on the table.
2. Start to create a sequence with different colored/patterned buttons.
    a. You can place the buttons in different ways:
        i. one line ()
        ii. a little bit askew ()
        iii. with different-sized gaps between them ()
        iv. …
3. Give instructions to the students: Continue the sequence!
    a. The sequence can be continued in several ways:
        i. *blue, red, blue,* red, blue, red, …
        ii. *blue, red, blue,* blue, red, blue, blue, red, blue, ….
        iii. …
    b. You can also give some additional hints/instructions to the students:
        i. Use all the colors.
        ii. Check the position of the buttons.
        iii. …
4. Have a discussion: the color/pattern is not the only thing that can define the sequence.

Variation/extension:

- ask students to work in pairs: the 1st student starts a sequence and the 2nd student needs to continue - discuss how clear was the starting, whether the students can continue the sequence in several ways…

56_25_01

Description: Geometric figures in everyday objects: identification and classification according to their elements and the relationships between them. Learn more about triangles, quadrilaterals, and circles. Group triangles based on their angles and sides. Name polygons and recognize their basic elements of rectangle, parallelogram, rhombus, and trapezoid.

Task ID: ES_56_25_01_01 **Title:** Understanding spatial shapes

Author: CR **Team:** ES

CategoryID: 56_25_01

Text: write which figure corresponds to the following definition: Consisting of a base and several triangular faces.

a. pyramid

b. sphere

c. cube

d. square

Solution: a

Task ID: ES_56_25_01_02 **Title:** Understanding spatial shapes

Author: CR **Team:** ES

CategoryID: 56_25_01

Text: write which figure corresponds to the following definition: Formed by the union of six regular rectangles

a. cube

b. pyramid

c. hexagon

d. prism

Solution: a

Task ID: ES_56_25_01_03 **Title:** Understanding spatial shapes

Author: CR **Team:** ES

CategoryID: 56_25_01

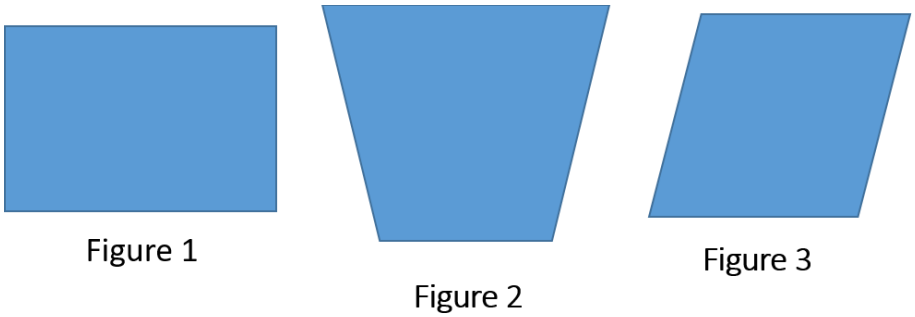
Graph: ES_56_25_03_01.png

Text: Which figure is an isosceles trapezoid?

a. figure 1

b. figure 2

c. figure 3



Solution: b

Task ID: ES_56_25_01_04 **Title:** Understanding spatial shapes

Author: CR **Team:** ES

CategoryID: 56_25_01

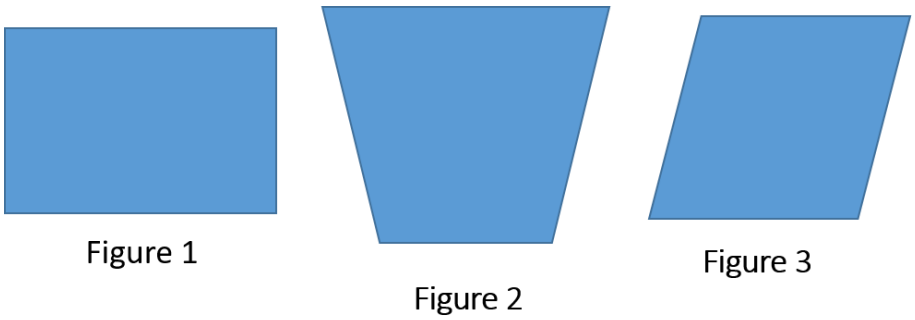
Graph: ES_56_25_03_01.png

Text: Which figure is a rhomboid?

a. figure 1

b. figure 2

c. figure 3



Solution: 1 and 3

Task ID: ES_56_25_01_05 **Title:** Understanding slopes

Author: CR **Team:** ES

CategoryID: 56_25_01

Graph: ES_56_25_05_01.png

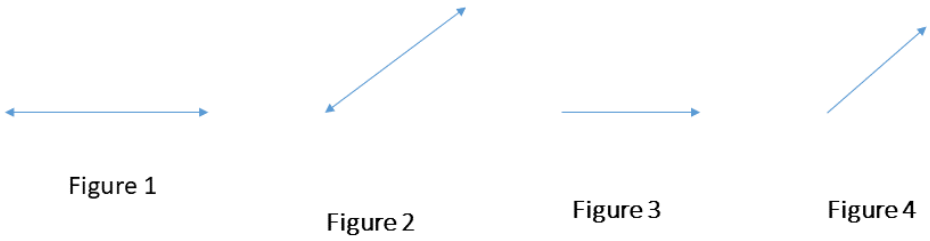
Text: Which figure represents the semi-straight line with a slope of 45 degrees?

a. figure 1

b. figure 2

c. figure 3

d. figure 4



Solution: Figure 4

Task ID: ES_56_25_01_06 **Title:** Understanding slopes

Author: CR **Team:** ES

CategoryID: 56_25_01

Graph: ES_56_25_05_01.png

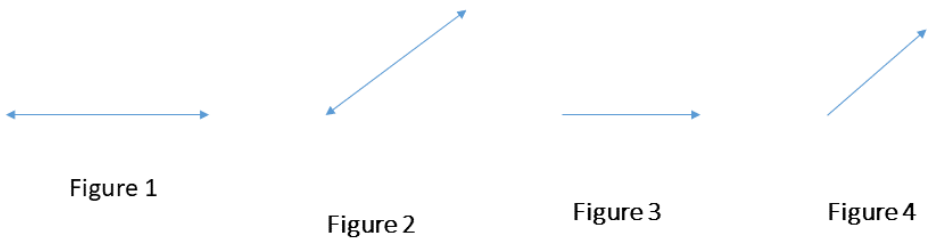
Text: which figure represents the line with a slope of 0 degrees?

a. figure 1

b. figure 2

c. figure 3

d. figure 4



Solution: a and c Figure 1 and Figure 3

Task ID: HU_UNPL_32 **Title:** Toothpick_geometry2

Author: ZSP **Team:** HU

CategoryID: 56_25_01

Plasticine, toothpick

Instructions for the teacher:

1. Prepare cards with 2D geometric objects, shapes.
2. Give the cards to students with plasticine balls (you can use marshmallow or styrofoam balls) and toothpicks.
3. Ask students to work in pairs:
    a. The first student pulls out a card and tries to describe the object shown on the card to the other one without showing the card
    b. The other student builds the object (they can modify the length of the toothpicks).
    c. The first student (the one who drew the card) checks that the solution is correct.
    d. They then change their roles.

Variations:

- instruct without cards: e.g: “prepare/build a right triangle”; or “build a rectangle”

56_25_02

Description: Measure and calculate the perimeters and areas of different shapes and the volumes of rectangular cuboids. Methods for determining and estimating circumference and areas of different two-dimensional geometrical figures.

Task ID: ES_56_25_02_01 **Title:** Area of the figure

Author: CR **Team:** ES

CategoryID: 56_25_02

Text: what is the area of the figure?

a. 9

b. 20

c. 10

d. 12

Solution: d

Task ID: ES_56_25_02_02 **Title:** Area of the figure

Author: CR **Team:** ES

CategoryID: 56_25_02

Text: what is the area of the figure?

a. 10

b. 20

c. 9

d. 12

Solution: a

Task ID: ES_56_25_02_04 **Title:** Area of the circle

Author: CR **Team:** ES

CategoryID: 56_25_02

Graph: ES_56_25_04_01.png

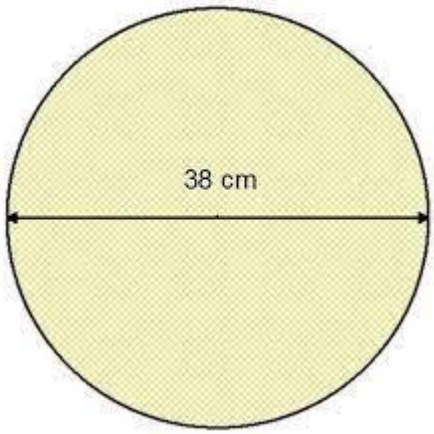
Text: what is the area of the figure?

a. $1444\ \pi$

b. $361\ \pi$

c. 1444

d. 361



Solution: b

Task ID: ES_56_25_02_05 **Title:** Area of the circle

Author: CR **Team:** ES

CategoryID: 56_25_02

Graph: ES_56_25_04_02.png

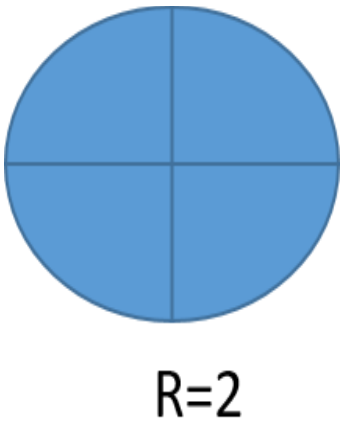
Text: what is the area of the figure?

a. 4π

b. 2π

c. 2

d. 4



Solution: a

56_25_04

Description: Strategies for calculating areas and perimeters of plane figures in everyday life situations. Comparing, estimating, and measuring length, area, mass, volume, time, and angles using common units of measurement, including unit conversions related to them

Task ID: ES_56_25_04_01 **Title:** Which is the largest area?

Author: CR **Team:** ES

CategoryID: 56_25_04

Text: Which figure has the largest area?

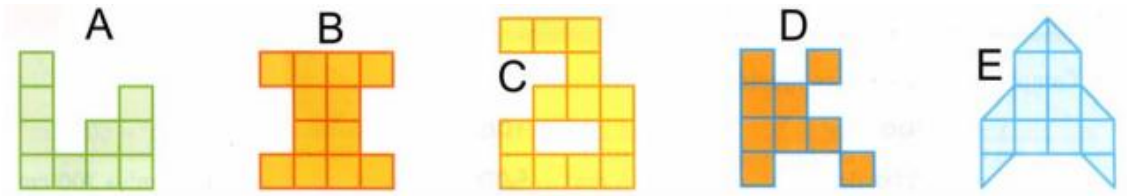
a. A

b. B

c. C

d. D

e. E



Solution: c

56_25_05

Description: Transformations by means of rotations, translations, and symmetries in everyday life situations: identification of transformed figures, generation from initial patterns, and prediction of the result. Symmetry in plane and how symmetry can be constructed.

Task ID: ES_56_25_05_01 **Title:** Creating 3D shapes

Author: CR **Team:** ES

CategoryID: 56_25_05

Graph: ES_56_25_08_01.png

Text: We move a circle along a straight segment.

what geometric figure is the result?

a. sphere

b. cylinder

c. pyramid

d. cube

Solution: b

Task ID: ES_56_25_05_02 **Title:** Creating 3D shapes

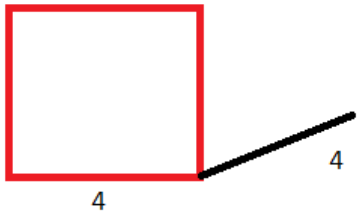
Author: CR **Team:** ES

CategoryID: 56_25_05

Graph: ES_56_25_08_02.png

Text: We move a square of side 4 across a segment of length 4. What geometric figure is the result?

a. sphere
b. cylinder
c. pyramid
d. cube



Solution: d

Task ID: ES_56_25_05_03 **Title:** Axes of symmetry

Author: CR

CategoryID: 56_25_05

Text: How many axes of symmetry does a square have?

a. 1
b. 2
c. 4
d. 6

Solution: c

Task ID: ES_56_25_05_04 **Title:** Axes of symmetry

Author: CR

CategoryID: 56_25_05

Text: How many axes of symmetry does an exagon have?

a. 1
b. 3
c. 6
d. 12

Solution: c

56_25_06

Description: Construction techniques of geometric figures by composition and decomposition, using manipulative materials, drawing instruments, and computer applications. Know the basic constructions: creating a perpendicular bisector, angle bisector, parallel and perpendicular lines, copying an angle.

Task ID: ES_56_25_06_01 **Title:** Pixels and areas

Author: CR **Team:** ES

CategoryID: 56_25_06

Graph: ES_56_25_06_01.png

Text: what is the area of the blue figure?

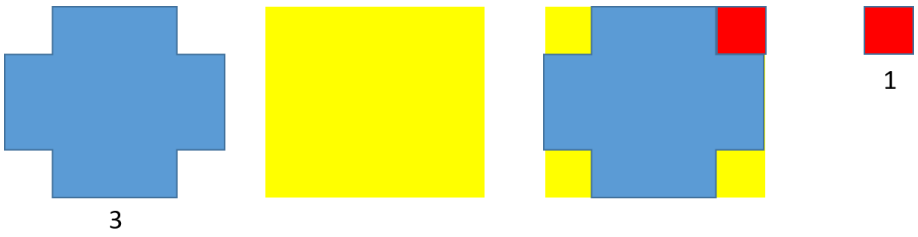
a. 20

b. 21

c. 22

d. 25

Solution: b



Task ID: ES_56_25_06_02 **Title:** It is a circle!

Author: CR **Team:** ES

CategoryID: 56_25_06

Graph: ES_56_25_05_01.png

Text: what is the area of the blue figure?

a. $\pi/4$

b. $3\pi/4$

c. $2\pi/4$

d. π

Solution: b

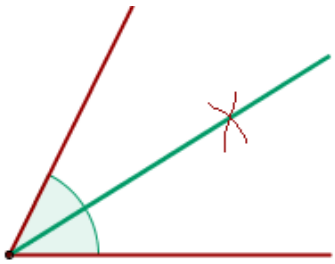
Task ID: ES_56_25_06_03 **Title:** Particular lines

Author: CR **Team:** ES

CategoryID: 56_25_06

Graph: ES_56_25_10_01.png

Text: what is the green line called?



a. the green line is the bisector of the angle

b. the green line is the mediatrix of the angle

c. the green line is the bisector of the line

d. the green line is the mediatrix of the line

Solution: a

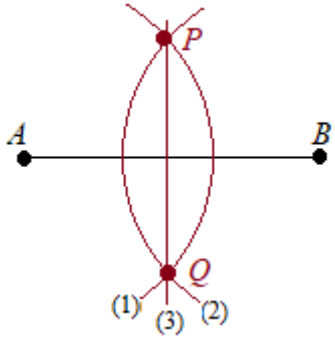
Task ID: ES_56_25_06_04 **Title:** Particular lines

Author: CR **Team:** ES

CategoryID: 56_25_06

Graph: ES_56_25_10_02.png

Text: what is the PQ line called?



a. the PQ line is the bisector of the angle

b. the PQ line is the mediatrix of the angle

c. the PQ line is the bisector of the line

d. the PQ line is the mediatrix of the line

Solution: d

56_25_07

Description: Location and movements on plans and maps from reference points (including cardinal points), directions, and calculation of distances (scales): description and interpretation with the appropriate vocabulary in physical and virtual supports.

Task ID: ES_56_25_07_01 **Title:** The tortoise is moving

Author: CR **Team:** ES

CategoryID: 56_25_07

Text: a tortoise moves in the cartesian plane as follows:

- from the point (1,1) to (7,1)

- from the point (7,1) to (1,4)

- from the point (1,4) to (1,1)

Which figure represents the path followed by the tortoise?

a. Equilateral triangle

b. Isosceles triangle

c. Scalene triangle

Solution: c

Task ID: ES_56_25_07_02 **Title:** The tortoise is moving

Author: CR **Team:** ES

CategoryID: 56_25_07

Text: a tortoise moves in the cartesian plane as follows:

- from the point (1,1) to (7,1)

- from the point (7,1) to (4,3)

- from the point (4,3) to (4,1)

Which figure represents the path followed by the tortoise?

a. Equilateral triangle

b. Isosceles triangle

c. Scalene triangle

Solution: b

56_25_08

Description: Learn about the concept of scale and use it in enlargements and reductions. Gain practical experience in movement along a plane. Scale for enlargement and reduction, and the use of scale in student-centered situations. Similarity in everyday life situations: identification of similar figures, generation from initial patterns, and prediction of the result.

Task ID: ES_56_25_08_01 **Title:** Scales

Author: CR **Team:** ES

CategoryID: 56_25_08

Text: an object is drawn to scale 1:1

a. the dimensions of the drawing match the actual dimensions of the object

b. the dimensions on the drawing are half of the actual dimensions of the object

c. the dimensions on the drawing are twice the actual dimensions of the object

Solution: a

Task ID: ES_56_25_08_02 **Title:** Scales

Author: CR **Team:** ES

CategoryID: 56_25_08

Text: an object is drawn to scale 2:1

a. the dimensions of the drawing match the actual dimensions of the object

b. the dimensions on the drawing are half of the actual dimensions of the object

c. the dimensions on the drawing are twice the actual dimensions of the object

Solution: c

Task ID: ES_56_25_08_03 **Title:** Scales

Author: CR **Team:** ES

CategoryID: 56_25_08

Text: an object is drawn to scale 1:3

a. the dimensions of the drawing match the dimensions of the object

b. the dimensions on the drawing are one third of the dimensions of the object

c. the dimensions on the drawing are three time the dimensions of the object

Solution: b

56_25_09

Description: Geometric models in solving problems related to the other senses. Elaboration of conjectures about geometric properties, using drawing instruments (compass and protractor) and dynamic geometry programs. Geometric ideas and relationships in art, science, and everyday life.

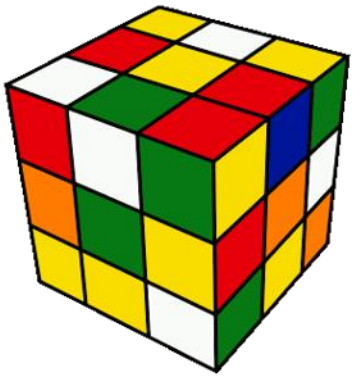
Task ID: ES_56_25_09_01 **Title:** 3D figures

Author: CR **Team:** ES

CategoryID: 56_25_09

Graph: ES_56_25_09_01.png

Text: Which geometric figure corresponds to this object?



a. sphere

b. cylinder

c. pyramid

d. cube

Solution: d

Task ID: ES_56_25_09_02 **Title:** 3D figures

Author: CR **Team:** ES

CategoryID: 56_25_09

Graph: ES_56_25_09_02.png

Text: which geometric figure corresponds to this object?

a. sphere

b. cylinder

c. pyramid

d. cube

Solution: c

56_25_10

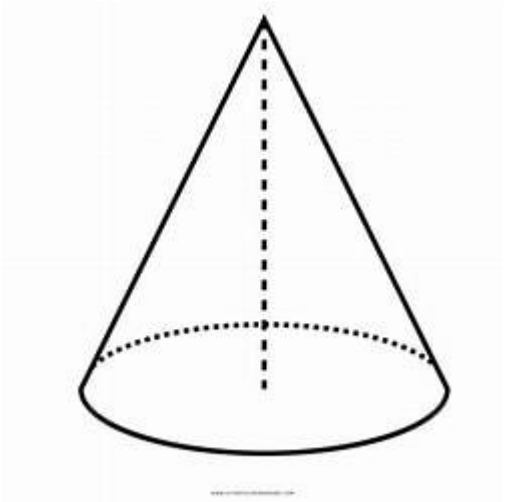
Description: Students take a closer look at a rectangular cone, a circular cylinder, a circular cone, and a pyramid.

Task ID: ES_56_25_10_01 **Title:** 3D figures

Author: CR **Team:** ES

CategoryID: 56_25_10

Text: Which geometric figure corresponds to the drawing?



a. circular cylinder

b. circular cone

c. pyramid

d. rectangular cone

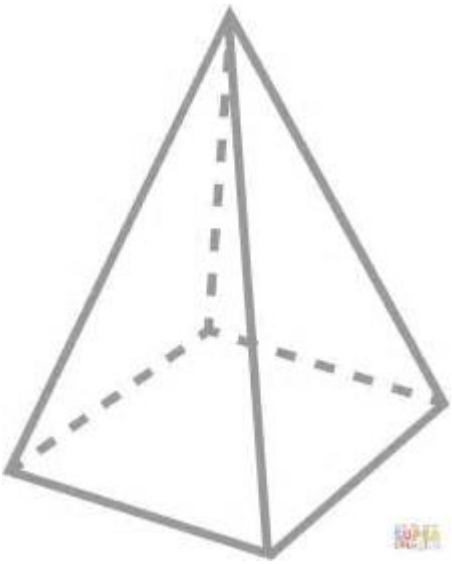
Solution: b

Task ID: ES_56_25_10_02 **Title:** 3D figures

Author: CR **Team:** ES

CategoryID: 56_25_10

Text: Which geometric figure corresponds to the drawing?



a. circular cylinder

b. circular cone

c. pyramid

d. rectangular cone

Solution: c

56_26_01

Description: Instruments (analog or digital) and appropriate units to measure lengths, objects, angles and times.

Task ID: ES_56_26_01_01 **Title:** What is this?

Author: CR **Team:** ES

CategoryID: 56_26_01

Text: Write whether the following statements are true or false

a. The measuring cylinder is a volume measuring instrument.

b. The flask is a volume measuring instrument.

c. The measuring cylinder is a length measuring instrument

d. The flask is a length measuring instrument.

Solution:

a. True

b. True

c. False

d. False

Task ID: HU_UNPL_05 **Title:** String_around_nails2

Author: CR **Team:** ES

CategoryID: 56_26_01

CT topic: Algorithms and Programming > Graph > The Shortest Path

Instructions for the teacher:

1. Give boards with 5-10 nails and a string for each group. Nails can be hammered into the board randomly.
2. Mark the starting point or students can decide the starting point themselves.
3. Hand out the boards and ask the students to find the shortest route possible. The route has to go around each nail and return to the starting point.
4. After the students have tested a route, they place a mark on the string to indicate the total length of the route — this way they can recognize which route is the shortest.

56_26_02

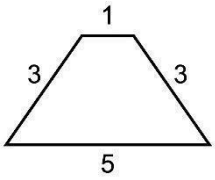
Description: Measure and calculate the perimeters and areas.

Task ID: AT2_1.4A **Title:** Perimeter calculation 2.a

Author: **Team:** Finnish Team

CategoryID: 56_26_02

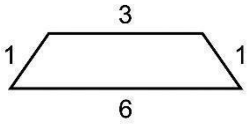
To find the parameter of a two-dimensional shape, you add the lengths of its all sides.



The parameter of this trapezoid equals ~~to~~ 3 + 1+ 3 + 5, which is equal to 12.

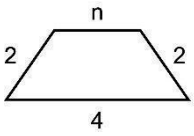
What is the parameter of each following trapezoid?

Simplify your answer, if possible. For example, 2 + c + c can be simplified as 2 + 2c.



11

(easy)



8 + n

n + 8

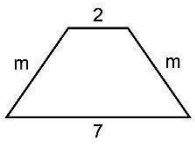
8 + 1n

1n + 8

8 + 1*n

1*n + 8

(medium)



2m + 9

9 + 2m

2*m + 9

9 + 2*m

m + m + 9

9 + m + m

m + 9 + m

* Should these answered highlighted in red be accepted for 11-12 y students?

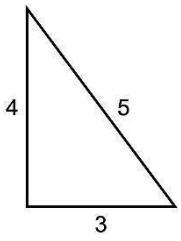
(difficult)

Task ID: AT2_1.4B **Title:** Perimeter calculation 2.b

Author: **Team:** Finnish Team

CategoryID: 56_26_02

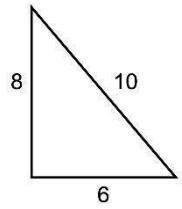
To find the parameter of a two-dimensional shape, you add the lengths of its all sides



The parameter of this triangle equals ~~to~~ 3 + 4 + 5, which is equal to 12.

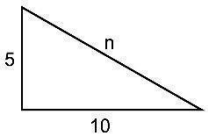
What is the parameter of each following triangle?

Simplify your answer, if possible. For example, 2 + c + c can be simplified as 2 + 2c.



24

(easy)



15 + n

n + 15

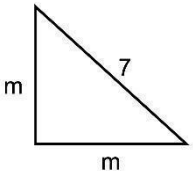
15 + 1n

1n + 15

15 + 1*n

1*n + 15

(medium)



2m + 7

7 + 2m

2*m + 7

7 + 2*m

m + m + 7

7 + m + m

m + 7 + m

* Should these answered highlighted in red be accepted for 11-12 y students?

(difficult)

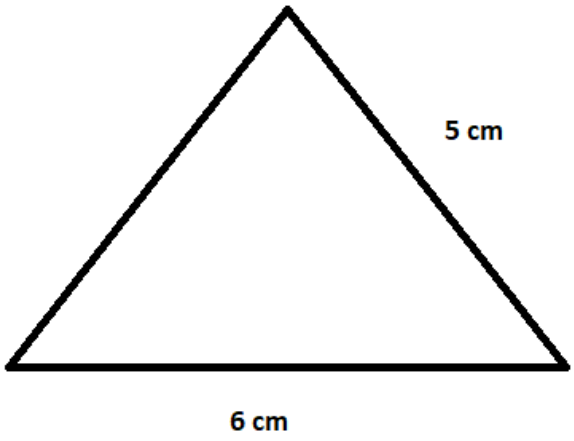
Task ID: ES_56_26_02_01 **Title:** It is a triangle!

Author: CR **Team:** ES

CategoryID: 56_26_02

Graph: ES_56_26_02_01.png

Text: calculate the area of the figure.



a. 12

b. 6

c. 30

d. 15

Solution: a

56_27_01

Description: Identifying a data set as a sample and reflecting on the larger population. Formulating questions to understand population characteristics. Conducting statistical studies: collecting, recording, and organizing qualitative and quantitative data from various sources (surveys, measurements, observations).

Task ID: ES_56_27_01_01 **Title:** Use your vote!

Author: CR **Team:** ES

CategoryID: 56_27_01

Text: In a village, elections are to be held the following week, and 50 people are asked which political parties they are going to vote for, and the following result is obtained:

Parties	People
A	26
B	10
C	11
D	3

According to the poll, which party will win? By what percentage will win?

a. A, 26%
b. D, 26%
c. A, 52%
d. D, 52%

Solution: d

Task ID: ES_56_27_01_02 **Title:** Too many TV!

Author: CR **Team:** ES

CategoryID: 56_27_01

Text: The table shows the number of televisions owned by pupils in a class.

Nª TV	Frequency
1	26
2	10
3	11
4	3

Write whether the following statements are true or false

a. the mean is greater than 3
b. the mean is greater than 2
c. the mean is less than 3
d. the mean is less than 2

Solution:

a. False
b. True
c. True
d. False

Task ID: ES_56_27_01_03 **Title:** More TVs

Author: CR **Team:** ES

CategoryID: 56_27_01

Text: The table shows the number of televisions owned by pupils in a class.

Nª TV	Frequency
1	26
2	10
3	11
4	3

Write whether the following statements are true or false

a. the absolute frequency of 1 TV is 26
b. the relative frequency of 1 TV is 26
c. the absolute frequency of 1 TV is 0,52
d. the relative frequency of 1 TV is 0,52

Solution:

a. True
b. False
c. False
d. True

56_27_02

Description: Using calculators and digital tools like spreadsheets to organize and visualize data.

Task ID: ES_56_27_02_01 **Title:** Multisport

Author: CR **Team:** ES

CategoryID: 56_27_02

Text: The table shows the number of sports played by 8 friends

Nª TV	Frequency
1	1
2	3
3	1
4	1
5	2

what is the average?

Solution: 3

Task ID: ES_56_27_02_02 **Title:** Multisport

Author: CR **Team:** ES

CategoryID: 56_27_02

Text: The table shows the number of sports played by 8 friends

Nª TV	Frequency
1	1
2	3
3	1
4	1
5	2

what is the average deviation?

Solution: 1,25

56_27_03

Description: Creating and interpreting statistical graphs (pictograms, bar charts, histograms, etc.) using different technologies. Selecting the most appropriate graphical representation for data. Comparing two data sets through graphical representation to formulate conjectures and draw conclusions.

Task ID: ES_56_27_03_01 **Title:** I have to buy another TV

Author: CR **Team:** ES

CategoryID: 56_27_03

Text: The table shows the number of televisions owned by pupils in a class.

Nª TV	Frequency
1	26
2	10
3	11
4	3

What is the mode?

Solution: 1 TV

Task ID: ES_56_27_03_02 **Title:** Discrete or continuous variable?

Author: CR **Team:** ES

CategoryID: 56_27_03

Text: Write whether the following statements are true or false

a. number of children is a discrete variable
b. number of children is a continuous variable,
c. weight is a discrete variable
d. weight is a continuous variable

Solution:

a. True
b. False
c. False
d. True

Task ID: ES_56_27_03_03 **Title:** Average calculation

Author: CR **Team:** ES

CategoryID: 56_27_03

Text: In Class A, all pupils are 5 years old. In Class B, all pupils are 5 years old except 1 pupil who is 4 and 1 pupil who is 6. There are 10 students in the two classes

a. Calculate the average number of years of class A.

b. Calculate the average number of years of class B.

Solution:

a. 5

b. 5

56_27_04

Description: Understanding and calculating measures of centralization (mean, mode, median). Understanding and calculating measures of dispersion (range, variability).

Task ID: ES_56_27_04_01 **Title:** Deviation and dispersion

Author: CR **Team:** ES

CategoryID: 56_27_04

Text: In Class A, all pupils are 5 years old. In Class B, all pupils are 5 years old except 1 pupil who is 4 and 1 pupil who is 6. There are 10 students in the two classes

a. Calculate the average deviation of the number of years of class A.

b. Calculate the average deviation of the number of years of class B.

c. Who has the widest dispersion?

Solution:

a. 0

b. 0,2

c. Class B

56_31_01

Description: Generate recurring patterns from regularities using numbers, figures, or images and extend sequences based on identified regularities.

Task ID: HU_UNPL_07 **Title:** Egg of Columbus

Author:

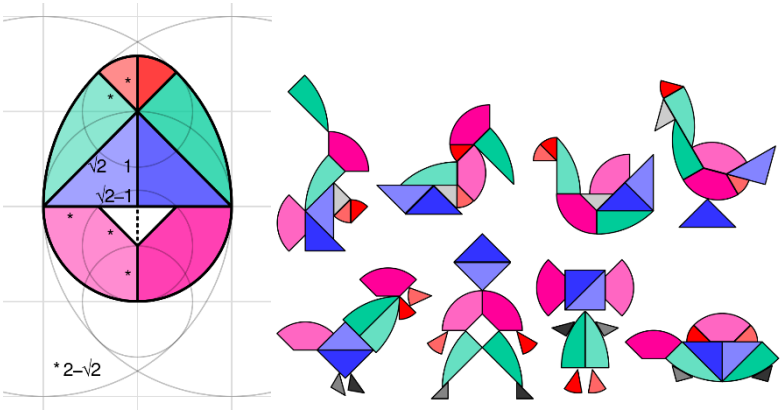
CategoryID: 56_31_01

CT topic: Data and Information > Data Analysis > Pattern Recognition

Link: https://en.wikipedia.org/wiki/Egg_of_Columbus_(tangram_puzzle)

Instructions for the teacher:

1. Print the basic set of shapes and cut them out.
    a. Difficulty level: colored shapes, outlined shapes, including the black border in shapes, and single colored shapes.
    b. You can also 3D print the shapes or make them out of salt dough!
2. The students need to arrange the pieces into shapes.



Variation:

Continue with the shapes! Let the students create their own shapes with the shape pieces. Then they draw it out and give it to their classmates to do.

Easier: outlines of the shape pieces, harder: outline of the whole shape.

56_31_02

Description: Use strategies to identify patterns, describe them verbally, discover hidden elements, and recognize patterns for computational interpretation.

Task ID: ALG-06-A **Title:** Patch rug

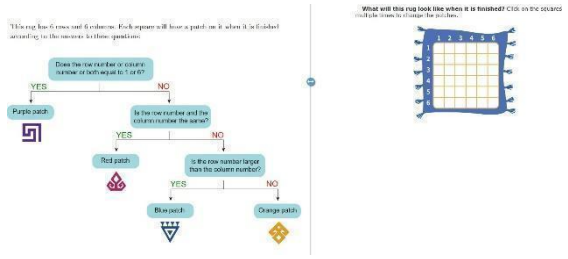
Author: **Team:** Bebras

CategoryID: 56_31_02 **CategoryID+:** 78_31_02

ALG-06-A

Patch rug

(last one “Is the row number larger than the column number”)



Task ID: ALG-06-B **Title:** Patch rug

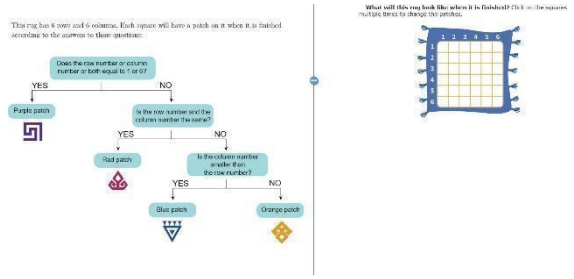
Author: **Team:** Bebras

CategoryID: 56_31_02 **CategoryID+:** 78_31_02

ALG-06-B

Patch rug

(last one “Is the column number smaller than the row number”)



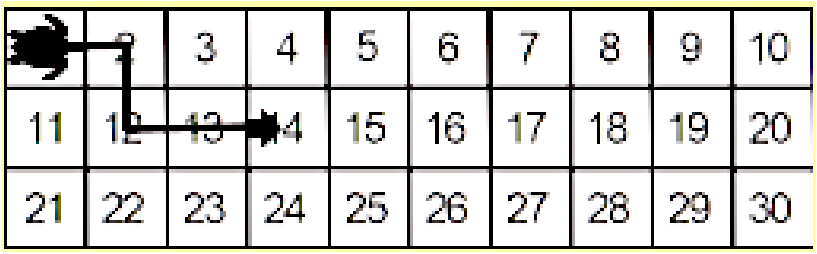
78_17_01

Description: Varied systematic counting strategies in everydays

Task ID: AT3_1.3A **Title:** Turtle operation 3.a

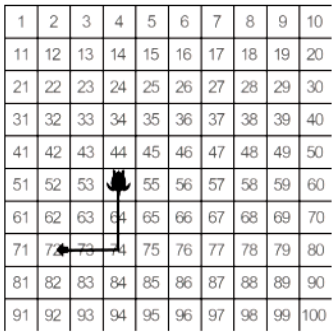
Author: **Team:** Finnish Team

CategoryID: 78_17_01



The turtle starts moving from 1 and lands on 14. The math expression,

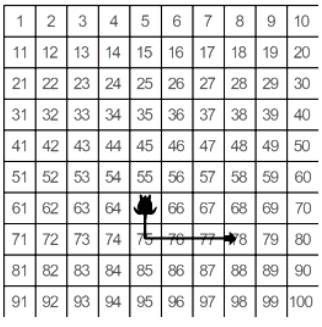
1 + 1 + 10 + 2, represents its movement step by step.



Write a math expression that represents the turtle's movement.

54 + 20 - 2

(open-answer)

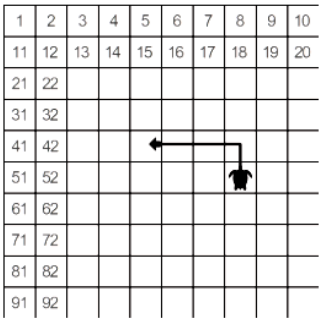


Write a math expression that represents the turtle's movement.

65 + 10 + 1

(open-answer)

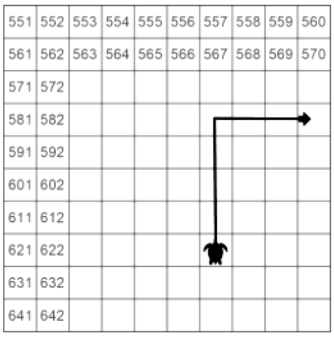
* The picture will be edited so that some numbers are not visible as in the Version B.



Write a math expression that represents the turtle's movement.

58 - 10 - 3

(open-answer)



Write a math expression that represents the turtle's movement.

627 - 40 + 3

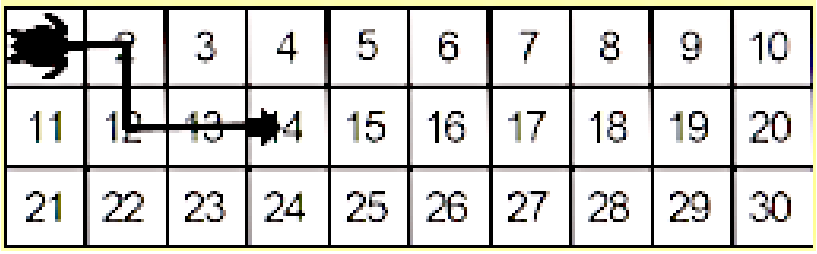
(open-answer)

(some numbers are not visible)

Task ID: AT3_1.3B **Title:** Turtle operation 3.b

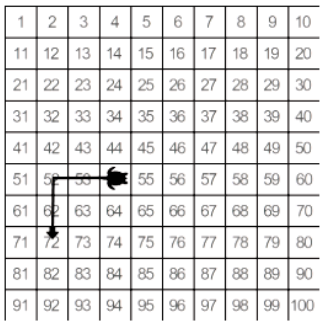
Author: **Team:** Finnish Team

CategoryID: 78_17_01



The turtle starts moving from 1 and lands on 14. The math expression,

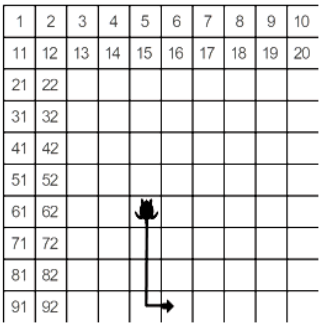
1 + 1 + 10 + 2, represents its movement step by step.



Write a math expression that represents the turtle's movement.

54 - 2 + 20

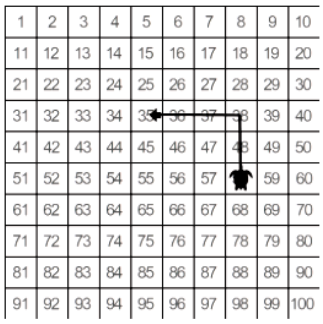
(open-answer)



Write a math expression that represents the turtle's movement.

65 + 30 + 1

(open-answer)

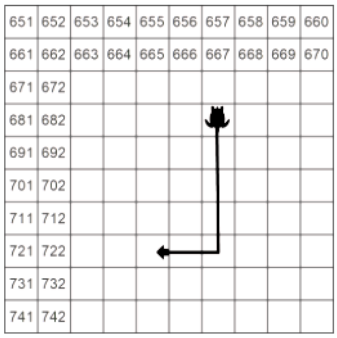


Write a math expression that represents the turtle's movement.

58 - 20 - 3

(open-answer)

* The picture will be edited so that some numbers are not visible as in the Version A.



Write a math expression that represents the turtle's movement.

687 + 40 - 2

(open-answer)

(some numbers are not visible)

Task ID: AT3_2.2A **Title:** Open number sentences 3.a

Author: **Team:** Finnish Team

CategoryID: 78_17_01

Enter the number that belongs in the blank.
___ - 15 = 9 24
___ = 15 - 9 6
24 + ___ = 24 + 30 + 70 100
17 + 615 = ___ + 614 18
9 = ___ : 3 27

Task ID: AT3_2.2B **Title:** Open number sentences 3.b

Author: **Team:** Finnish Team

CategoryID: 78_17_01

Enter the number that belongs in the blank.
___ + 6 = 25 19
15 = ___ - 3 18
513 - 14 = ___ - 13 512
24 = ___ × 4 6
___ : 3 = 9 27

78_17_03

Description: Exact value, approximate value, and rounding

Task ID: AT3_5.1A **Title:** Evaluate expression 8

Author: **Team:** Finnish Team

CategoryID: 78_17_03

Which of the following math expressions is NOT equal to $4 \times (60 + 5)$? • 4×65 • $4 \times 60 + 4 \times 5$ • $4 \times 60 + 5$ • $4 \times 70 - 4 \times 5$
Which of the following math expressions is NOT equal to 170×20? • $100 \times 20 + 70 \times 20$ • $(100 + 70) \times 20$ • $100 + 70 \times 20$ • $2000 + 1400$
Which of the following math expressions is NOT equal to $10 \times 3 - 3$? • $10 \times 3 - 1 \times 3$ • $3 \times (10 - 1)$ • $10 \times (3 - 3)$ • $30 - 3$

Task ID: AT3_5.1B **Title:** Evaluate expression 9

Author: **Team:** Finnish Team

CategoryID: 78_17_03

Which of the following math expressions is NOT equal to 4 × (10 + 5)? • 4 × 15 • 4 × 10 + 4 × 5 • 4 × 10 + 5 • 4 × (5 + 10)
Which of the following math expressions is NOT equal to 3 × (59 - 1)? • 3 × 58 • 3 × 59 - 3 × 1 • 3 × 59 - 1 • 3 × 60 - 3 × 2
Which of the following math expressions is NOT equal to 10 × 30 - 30? • 10 × 30 - 1 × 30 • 30 × (10 - 1) • 10 × (30 - 30) • 300 - 30

Task ID: AT3_6.4A **Title:** Compare expressions 3

Author: **Team:** Finnish Team

CategoryID: 78_17_03

m is any number.

Which one is larger?

m + 2

could be either

m is any number.

Which one is larger?

m + 2

could be either

Task ID: AT3_6.4B **Title:** Compare expressions 4

Author: **Team:** Finnish Team

CategoryID: 78_17_03

m is any number.

Which one is larger?

m is any number.

Which one is larger?

78_17_04

Description: Operations with negative numbers

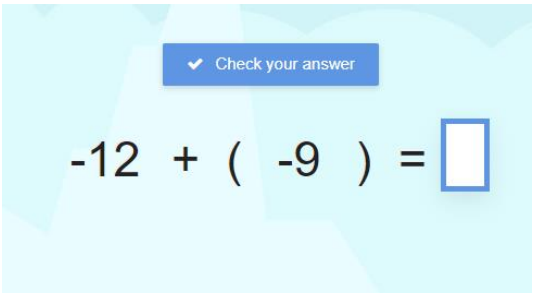
Task ID: 7_10.8 **Title:** Addition and subtraction with negative numbers

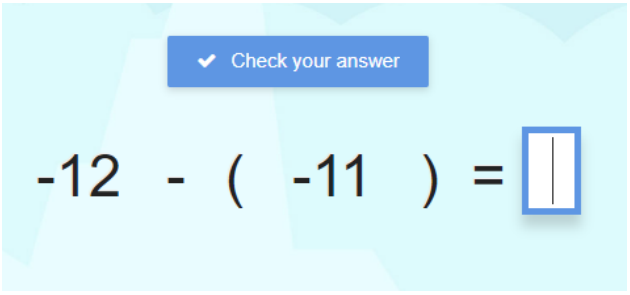
Author: **Team:** Finnish Team

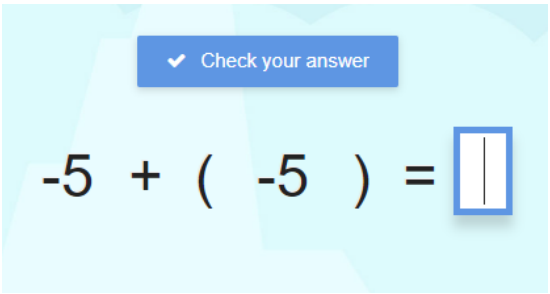
CategoryID: 78_17_04

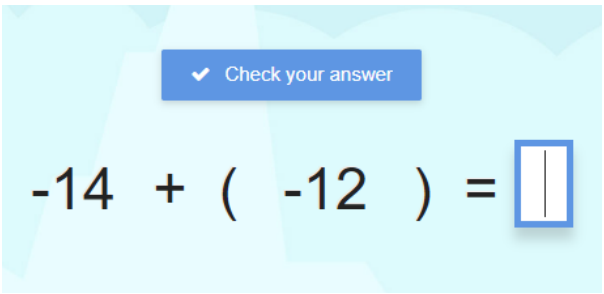
Text: After choosing challenge level, you are asked 10 different equations. Students will submit their answer to the equation.

Pictures below show examples (medium challenge level):









78_18_04

Description: Set operations (complement, intersection, union)

Task ID: HU_UNPL_19 **Title:** SetBingo

Author: ZSP **Team:** HU

CategoryID: 78_18_04

CT topic: Data and Information > Data Processing > Classifying

Instructions for the teachers:

1. Draw sets on the whiteboard.
    a. Use a maximum of three sets.
    b. Give the categories (names, definitions) for the sets: for example: integers, even numbers, greater than 10.
2. Each student writes 2 numbers between 1 and 10 into their own sets (in the right place).
3. Then each student can tell a number and other students need to write them into the correct place.
4. A student has a bingo when in each part/section can be found a number.

Variations:

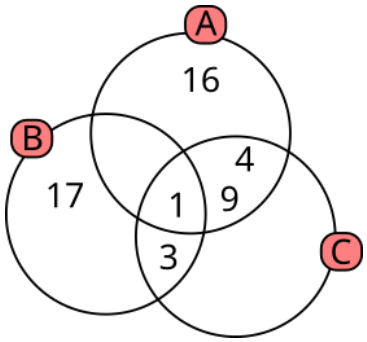
- Students create the sets with elements and classmates write the definitions of the sets.
- Students write the numbers and define the place. The classmates need to create the sets and find the correct place and give the definition of the set. e.g: In the union can be found 1,3,4,9,16,17; In the intersection of the three sets is 1. In the intersection of 2 sets are 4 and 9. The other intersection contains 3. The 3rd intersection is empty.

  the solution:

  A={square numbers}

  B={odd numbers}

  C={numbers less than 10}



78_19_03

Description: Looking for rules and dependencies and presenting them precisely

Task ID: HU_UNPL_21 **Title:** Trueball2

Author: ZSP **Team:** HU

CategoryID: 78_19_03

CT topic: logic

Instructions for the teachers:

1. Tell a statement and throw the ball to one of the students.
2. The student needs to define the truth value of the statement (telling “true” or “false”) and give (explain) the justification (why)
3. Then the student tells a statement and throws the ball to another student
4. …

The statements must be clearly defined and include information that all students know or see in the room. You can use a special topic (like geometry, numbers, or from another subject…).

Variation:

- the statements need to include “all”, “exists”, “not”, and “non of” (based on the age group’s need)
- you can create more complex statements with combinations using “and”, “or” and “not”.

78_20_01

Description: arithmetics of fractions

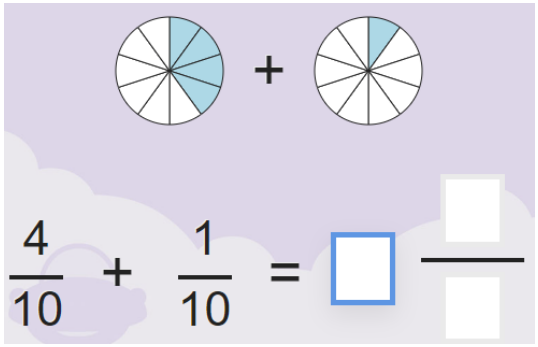
Task ID: 7_39.8 **Title:** Addition and subtraction with fractions (like denominators)

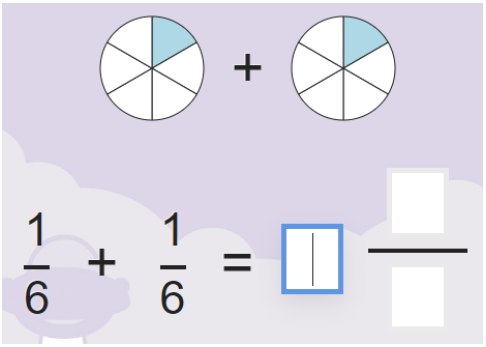
Author: **Team:** Finnish Team

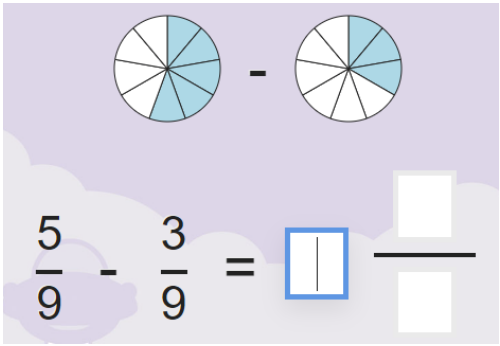
CategoryID: 78_20_01

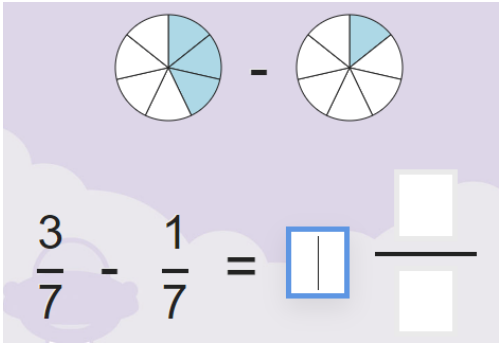
Text: After choosing challenge level, you are asked 10 different equations. Students will submit their answer to the equation.

Picture below show examples (medium challenge level):









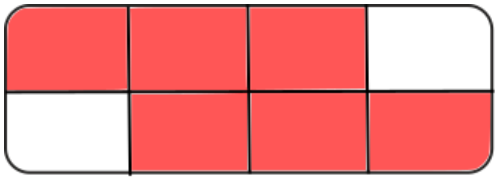
Task ID: HU_UNPL_16 **Title:** Fractions

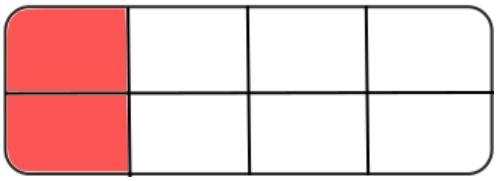
Author: ZSP **Team:** HU

CategoryID: 78_20_01

Instructions for the teacher:

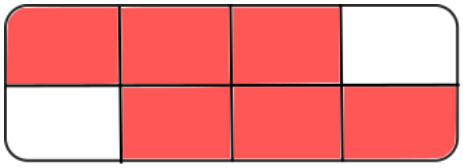
1. Prepare cards with partially colored objects (see example picture)
2. Give the cards to students randomly.
3. The students need to find the pair of their card(s) - they can ask each other like
    - I have the 6/8, who has the 2/8?

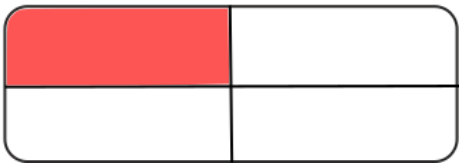




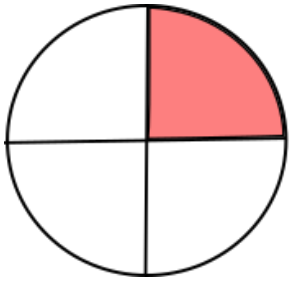
Variations:

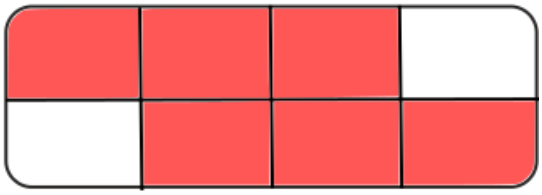
- the easiest if the colored areas are fitting, but you can color the parts differently (see picture)
- use several forms and different fraction-parts (¼ instead of 2/8)



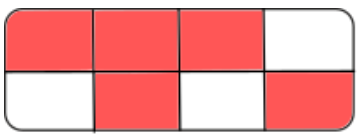


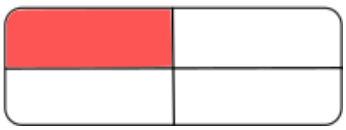
or





- create cards where three or four cards are needed to make a whole





78_20_03

Description: operations with decimal numbers

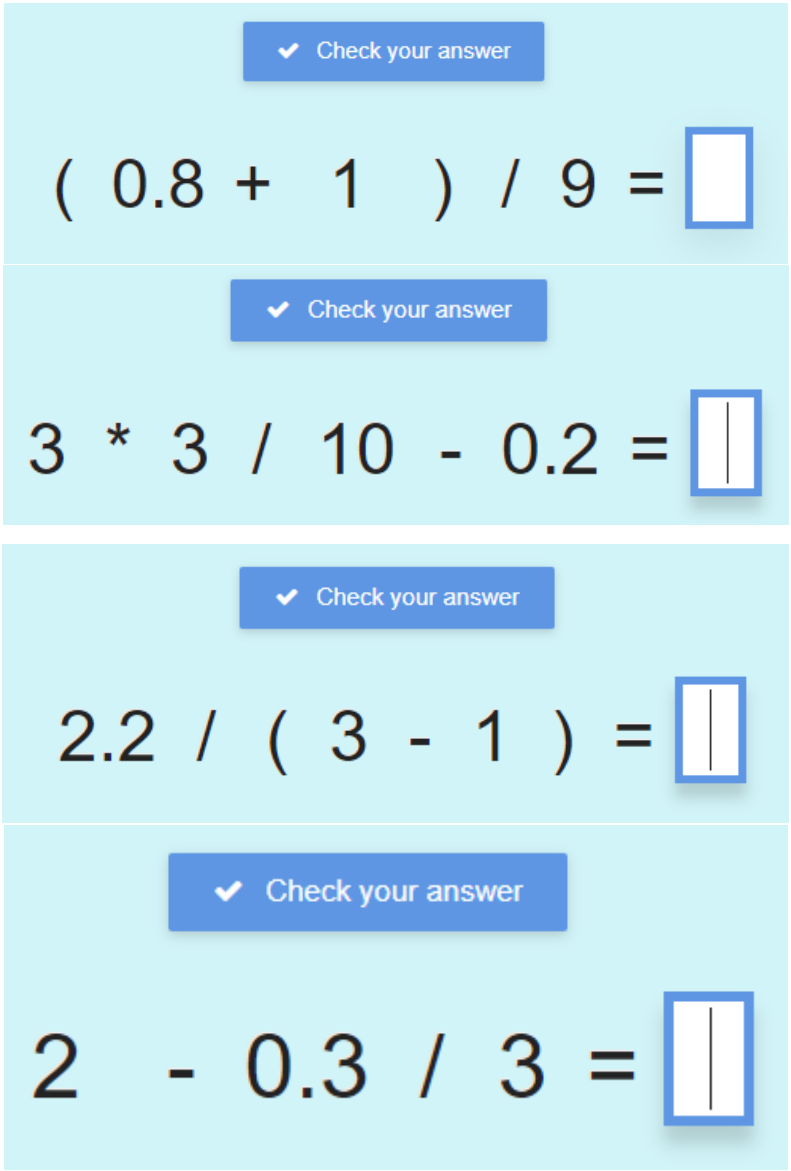
Task ID: 6_10.9 **Title:** Basic arithmetic operations with decimal numbers (order of operations)

Author: **Team:** Finnish Team

CategoryID: 78_20_03

Text: After choosing challenge level, you are asked 10 different equations. Students will submit their answer to the equation.

Picture below show examples (medium challenge level):



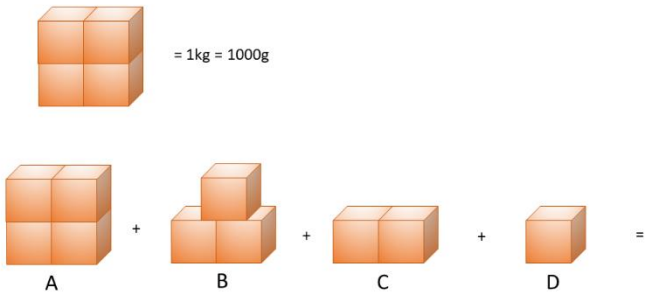
78_21_01

Description: Understanding and representing quantitative relationships.

Task ID: ES_78_21_01_01 **Title:** Sugar consumption

Author: JB **Team:** ES

CategoryID: 78_21_01



Text: City A has a population of 40,000 and a consumption of 40,000 kg of sugar per year. City B has a population of 15,000 and a consumption of 30,000 kg of sugar per year. We can say that each person of city A consumes, comparing with each person of city B:

Options:

a) more sugar

b) less sugar

c) the same quantity of sugar

Solution:

Each person of city A = 1 kg/year, each person of city B = 2 kg/year, so more consumption per person in city B.

Task ID: HU_UNPL_24 **Title:** Percentages2

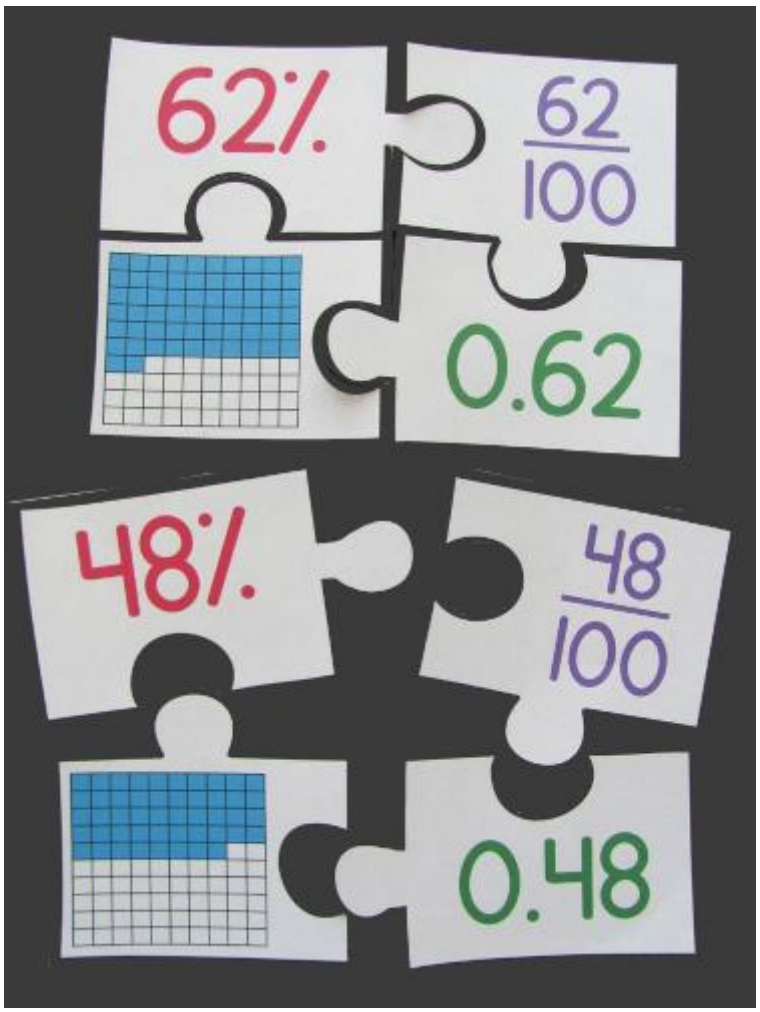
Author: ZSP **Team:** HU

CategoryID: 78_21_01

CT topic: pattern recognition,

Instructions for the teachers:

1. Create (based on the knowledge of your students and your goals), then print and cut the puzzle cards
2. Give the card set to the students and ask them to pass the puzzle tiles based on the values



Variations:

- the students can work in pairs
- Prepare the block-cards (bottom left) without coloring and ask students to color them.
- use fewer blocks (small squares) than 100 on the block cards and simplify the fractions. (e.g: 1/4; 25%, 0.25, and 8 squares (colored 2))

78_21_02

Description: Comparing decimals and percentages. Understanding the concept of percent.

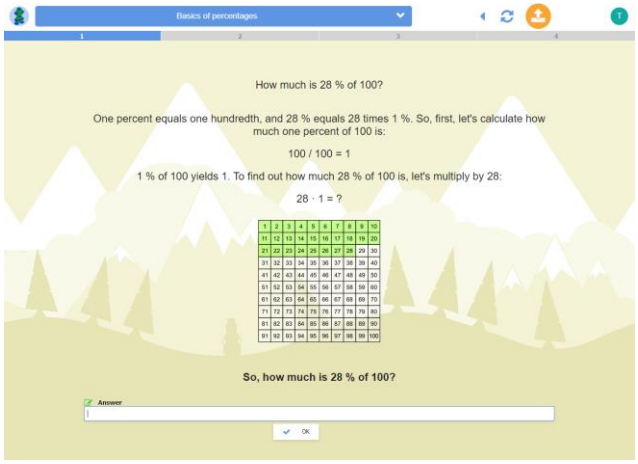
Task ID: 6_20.1 **Title:** Basics of percentages

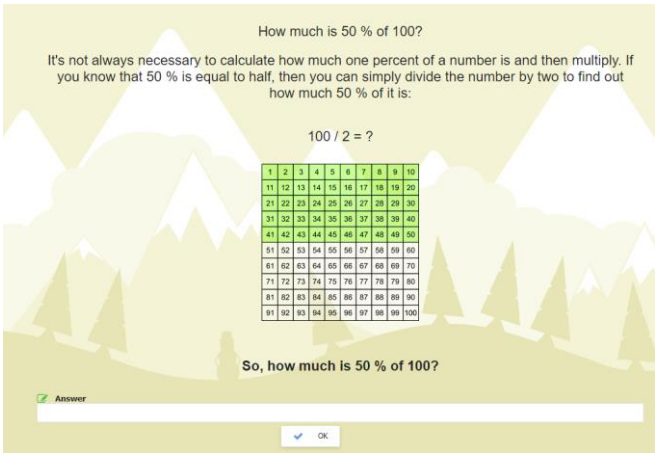
Author: **Team:** Finnish Team

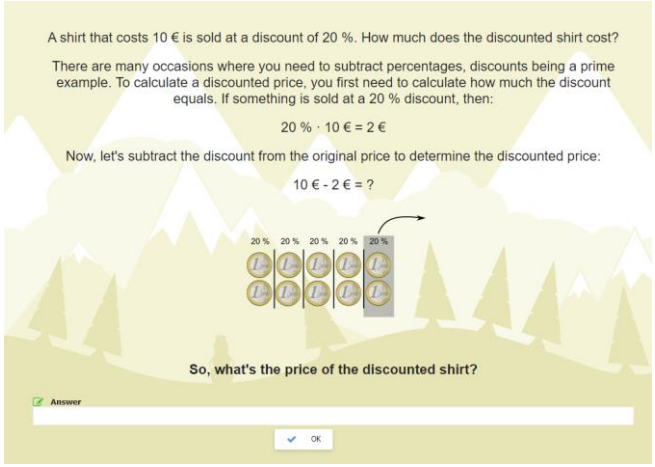
CategoryID: 78_21_02

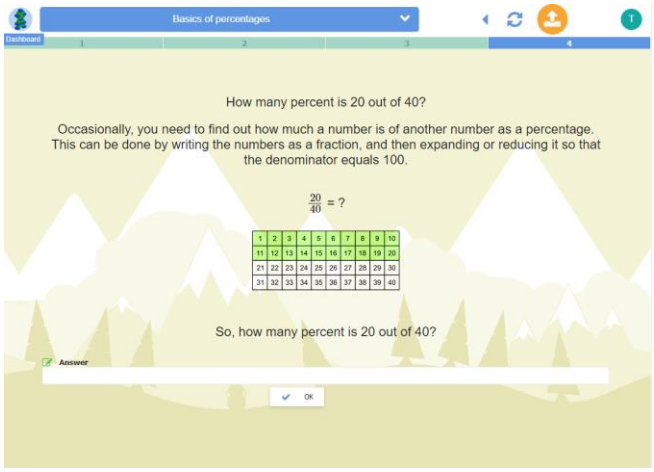
Text: You have to solve 4 percentage questions. There is text and pictures that can help the student to solve the question.

Pictures below show examples:









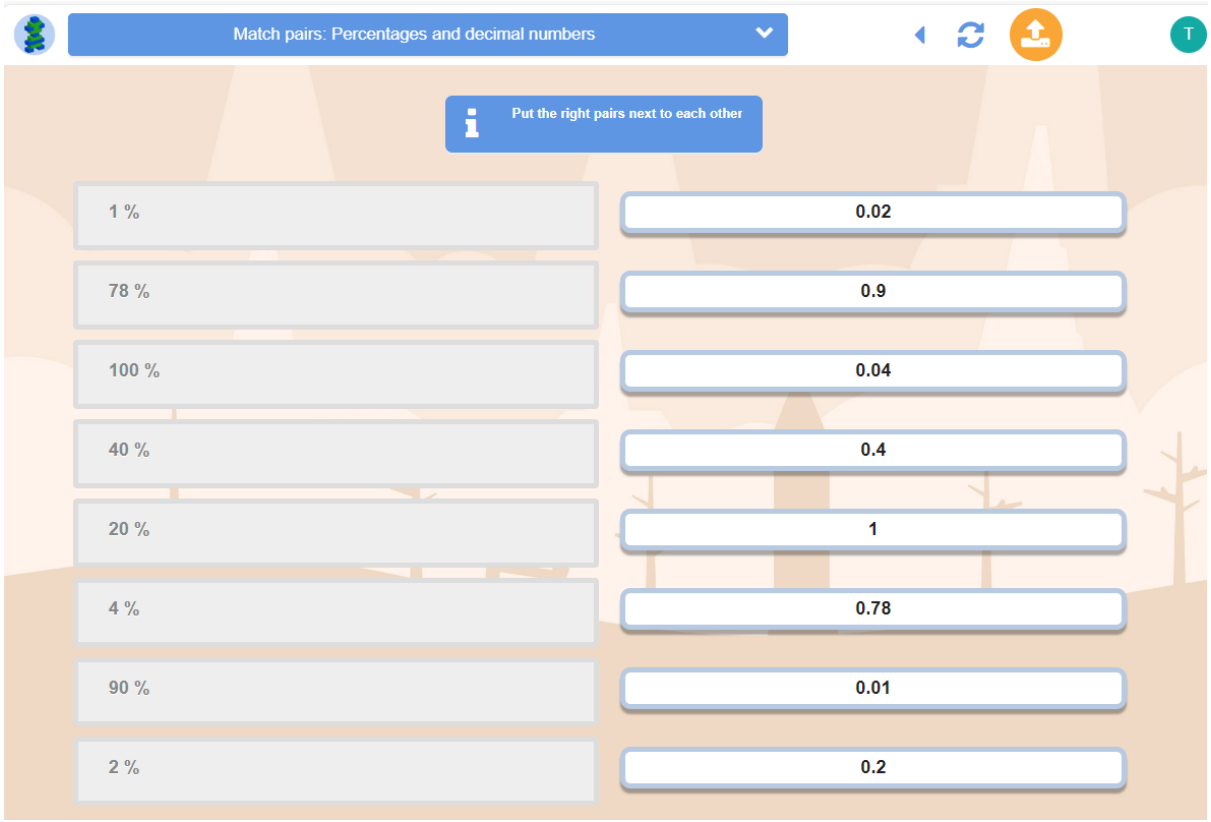
Task ID: 6_41.3 **Title:** Match pairs: Percentages and desimal numbers

Author: **Team:** Finnish Team

CategoryID: 78_21_02

Text: You have to match the right percentage and the decimals together

Picture below shows an example:



Task ID: ES_78_21_02_01 **Title:** How many percent?

Author: JB **Team:** ES

CategoryID: 78_21_02

Text: If 1 is equivalent to 100%, and 0.5 is equivalent to 50%, which percentage equals to 0.08?

Solution:

8%

78_21_03

Description: Calculating the amount indicated by a percentage from the whole. Solving economic, financial, and everyday life problems related to percentages.

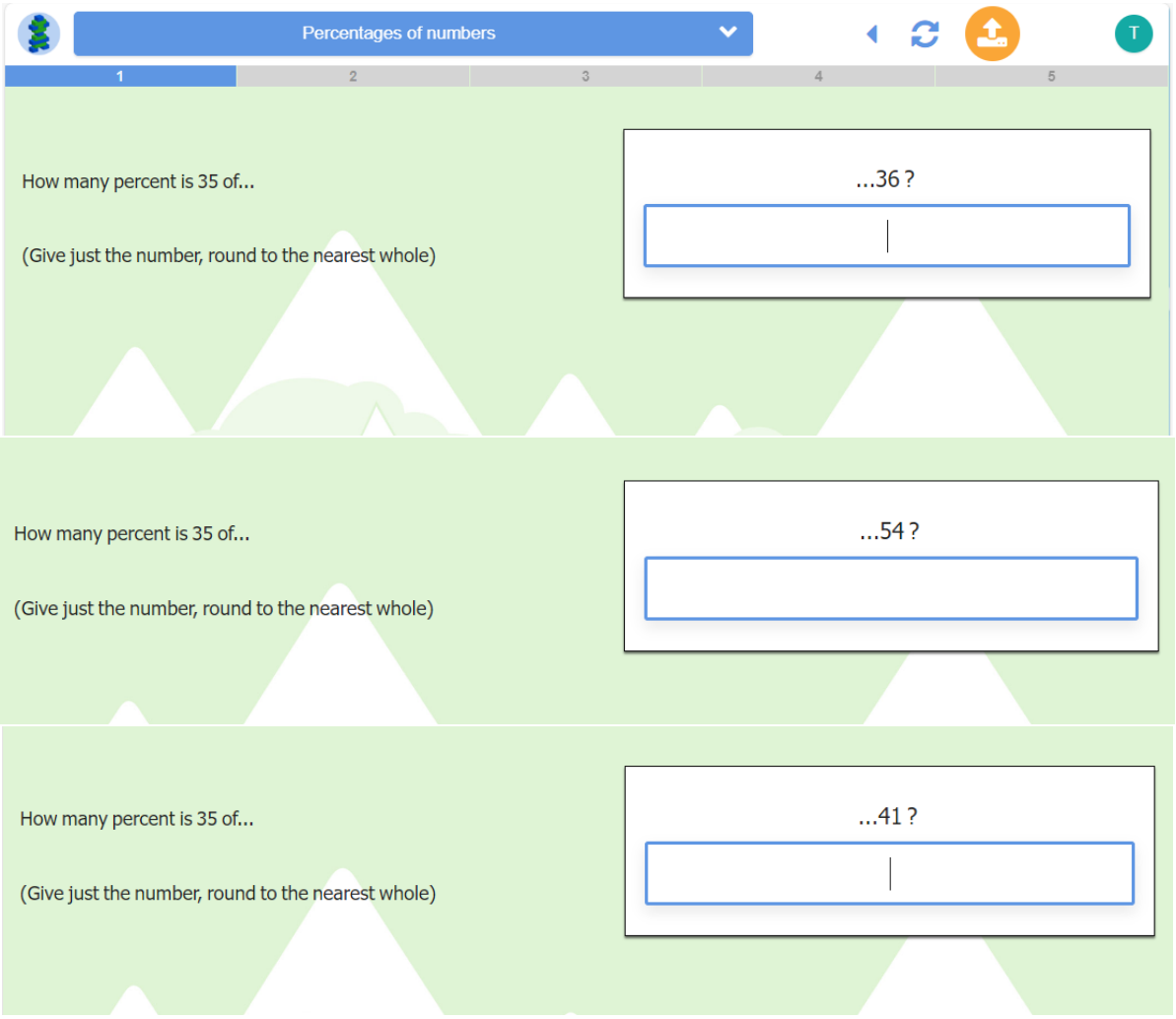
Task ID: 7_32.7 **Title:** Percentages of numbers

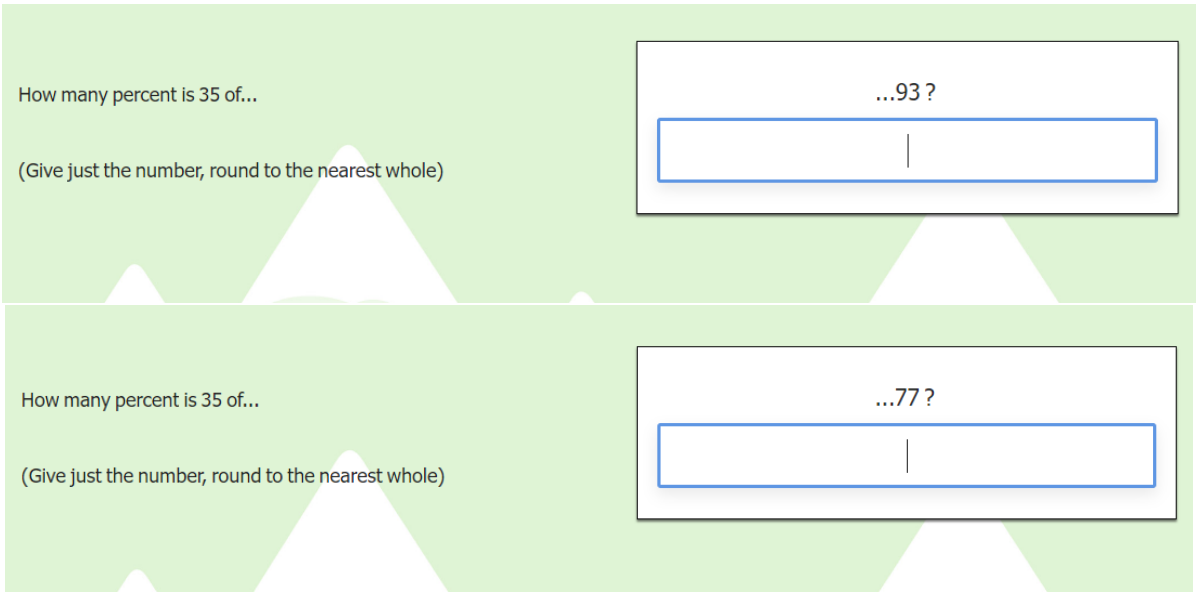
Author: **Team:** Finnish Team

CategoryID: 78_21_03

Text: You have to solve 5 percentage questions.

Pictures below show examples:





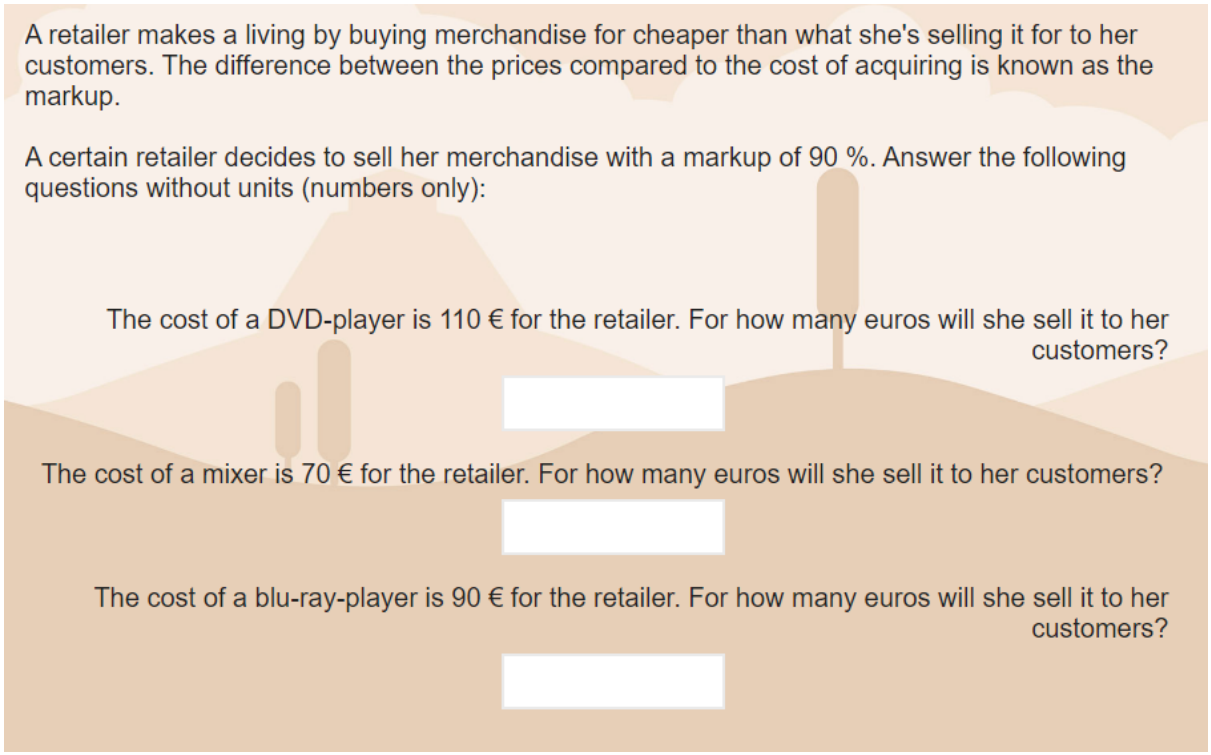
Task ID: 8_1.16 **Title:** Percentage increase: Retailing

Author: **Team:** Finnish Team

CategoryID: 78_21_03

Text: You have to solve percentage markup questions.

Pictures below show examples:



A retailer makes a living by buying merchandise for cheaper than what she's selling it for to her customers. The difference between the prices compared to the cost of acquiring is known as the markup.

A certain retailer decides to sell her merchandise with a markup of 40 %. Answer the following questions without units (numbers only):

The cost of a DVD-player is 130 € for the retailer. For how many euros will she sell it to her customers?

The cost of a mixer is 110 € for the retailer. For how many euros will she sell it to her customers?

The cost of a blender is 60 € for the retailer. For how many euros will she sell it to her customers?

78_21_04

Description: Exchanging units of measurement regarding time, mass, length, area, and volume based on decimal thinking.

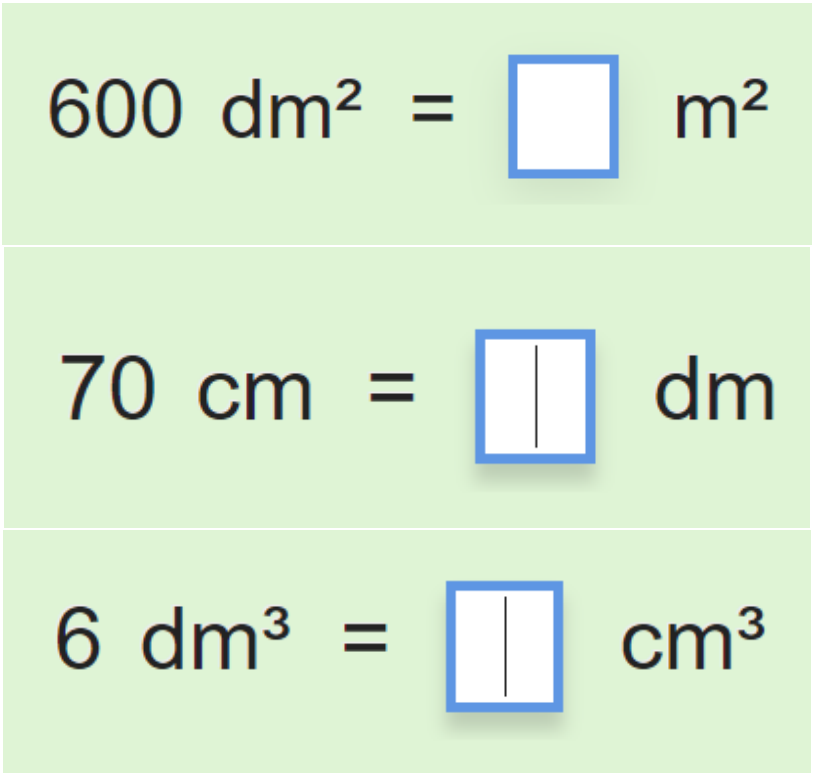
Task ID: 8_1.15 **Title:** Unit conversion: Length, area and volume 2

Author: **Team:** Finnish Team

CategoryID: 78_21_04

Text: After choosing challenge level, you are asked 8 different conversion equations. Students will submit their answer to the equation.

Pictures below show examples (medium challenge level):



Solution: 6, 7, 6000

78_21_05

Description: Problem-solving by understanding linear and inverse relationships. Identifying multiplicities given the ratios.

Task ID: ES_78_21_05_01 **Title:** What is rate?

Author: JB **Team:** ES

CategoryID: 78_21_01

Text: Suppose in an election, candidate A receives 3 votes, and candidate C receives nearly 3 times as many votes. The ratio of votes received by candidate A to candidate C is:

Options:

a) 1:3

b) 3:1

c) 3:3

d) 9

Solution:

1:3

78_22_01

Description: Form and solve first-order equations and incomplete quadratic equations. Use approximation, decomposition, or transposition methods for problem-solving with equations.

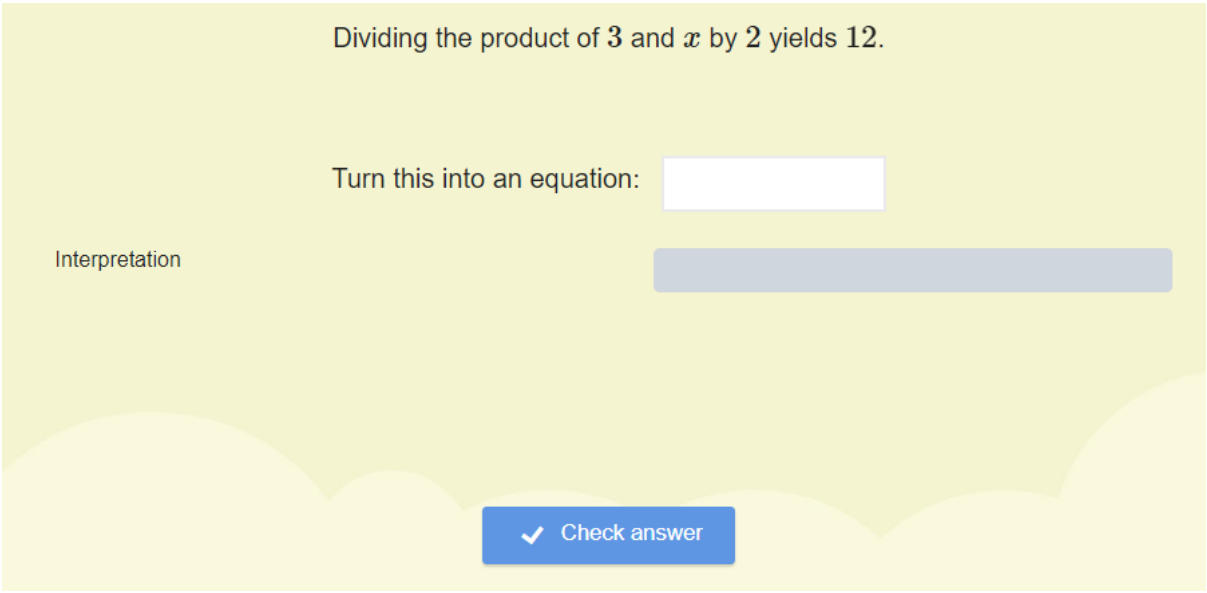
Task ID: 8_15.20 **Title:** Form and solve equations

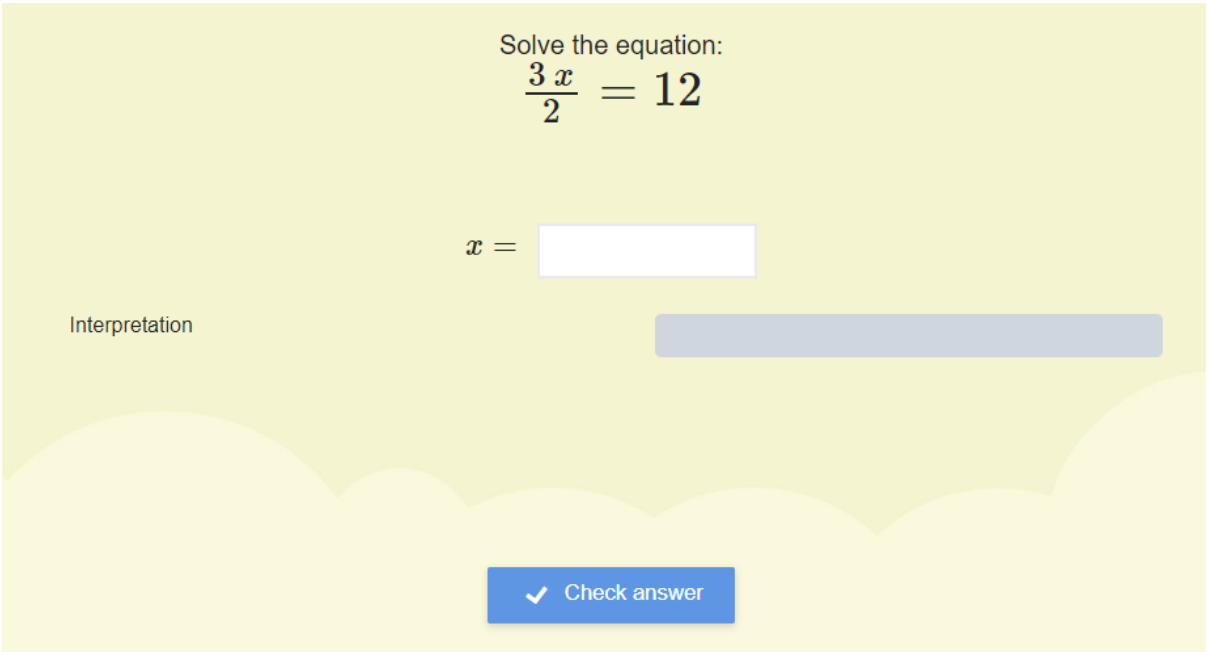
Author: **Team:** Finnish Team

CategoryID: 78_22_01

Text: You are asked to form an equation. Students will submit their answer and then they are asked to solve the equation.

Picture below shows examples:





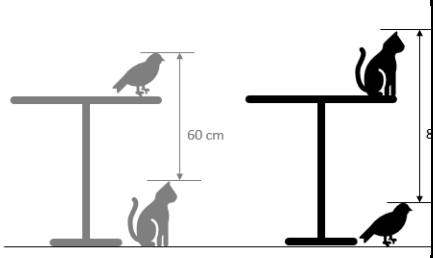
78_22_04

Description: Performing operations on polynomials.

Task ID: AT3_6.2B **Title:** Cat and bird

Author: **Team:** Finnish Team

CategoryID: 78_22_04



When the cat is sitting on the floor and the bird is standing on the table, the distance from the top of the cat's ear to the top of the bird's head is 60 cm.

When the bird is standing on the floor and the cat is sitting on the table, the distance from the top of the bird's head to the top of the cat's ear is 80 cm.

How tall is the table?

70#70,0#70.0 [cm]

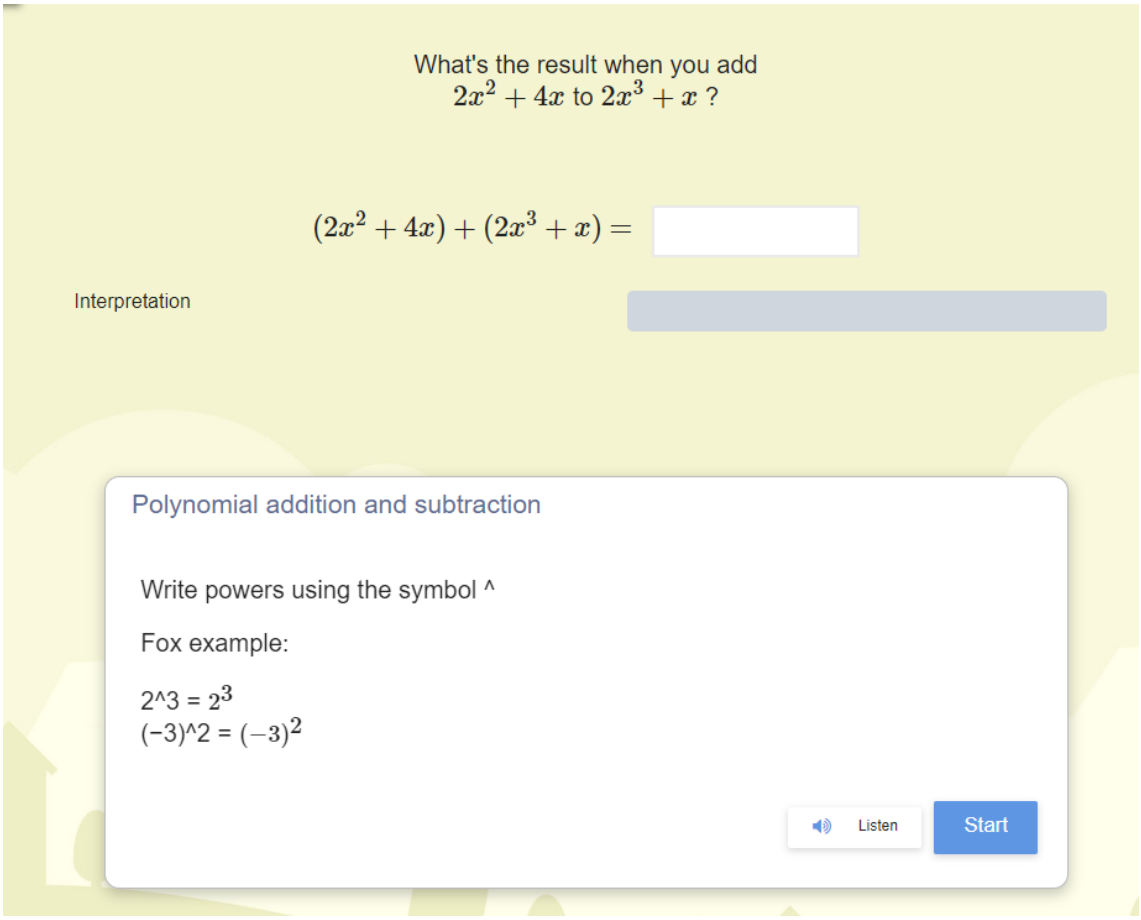
Task ID: 8_11.13 **Title:** Polynomial addition and subtraction

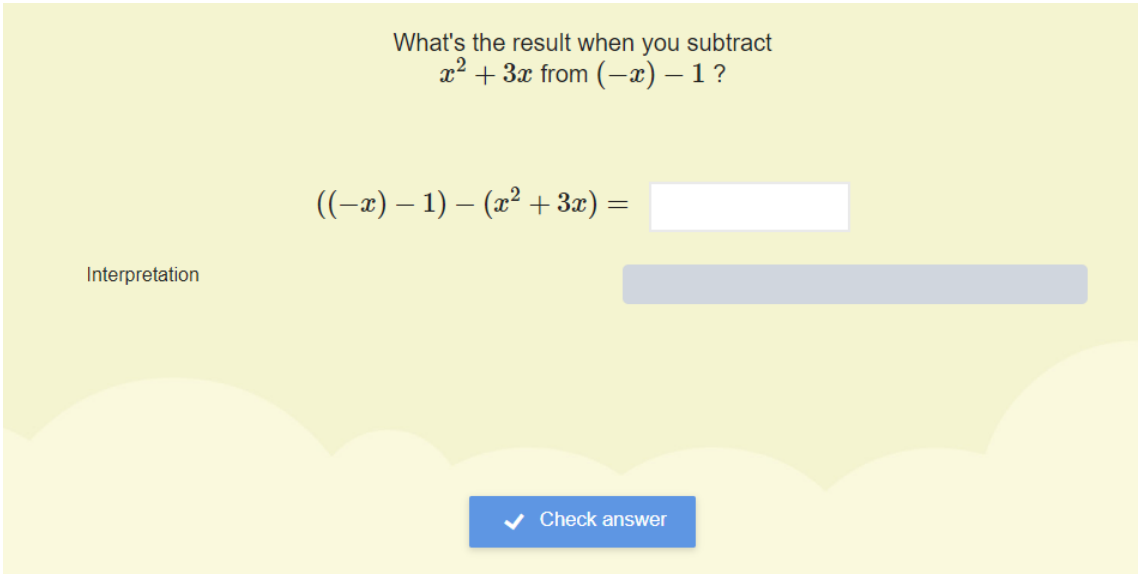
Author: **Team:** Finnish Team

CategoryID: 78_22_04

Text: You are asked to do additions and subtractions to a polynomial equation.

Pictures below show an examples:





78_22_07

Description: Understanding variables and their use in algebraic expressions, formulae, equations, and functions.

Task ID: AT3_2.4A **Title:** Work with variables 3.a

Author: **Team:** Finnish Team

CategoryID: 78_22_07

An alphabet can represent a number. For example, if 2 + a = 3, then a = 1.
If 30 + b = 120, then b = ___ 90
If c - 6 = 9, then c = ___ 15
If 110 = 80 + d, then d = ___ 30
If 7 + e = 7 + 8 + 2, then e = ___ 10
If g + g + 2 = 12, then g = ___ 5
If h + h + h = h + 6, then h = ___ 3 (open answer)
If m + n + n = 12 and m + n = 10, then n = ___ 2
If 2 + k = 2k, then k = ___ 2
If s + 5 > 8, then s > ____ 3
If 3t < 12, then t < ____ 4 (open answer)
If a + b = 10, then a + b ? c =_____ c+10 10+c

Task ID: AT3_2.4B **Title:** Work with variables 3.b

Author: **Team:** Finnish Team

CategoryID: 78_22_07

An alphabet can represent a number. For example, if a + 2 = 3, then a = 1.
If b + 3 = 12, then b = ___ 9
If 150 - c = 90, then c = ___ 60
If 11 = d + 8, then d = ___ 3
If 700 + 80 + 20 = 700 + e, then e = ___ 100
If h + h + h + 2 = 14, then h = ___ 4
If g + g = g + 5, what is g? 5 (open answer)
If m = n + 3 and n = 5, then m = ___ 8
If $\frac{k}{2} + 4 = 10$, then k = ___ 12
If s - 3 > 5, then s > ____ 8
If $\frac{t}{3} < 4$, then t < ____ 12 (open answer)
If a + b = 10, then a + b - c = __ 10-c -c+10

Task ID: AT3_2.5A **Title:** Word problems 3.a

Author: **Team:** Finnish Team

CategoryID: 78_22_07

When you add 4 to a number and then multiply the result by 2, you get 14.

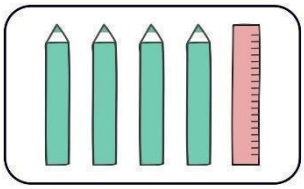
What is the number?

3

(open answer; 2[x + 4] = 14)

A ruler costs **one** euro more than a pencil.

Total 16 €

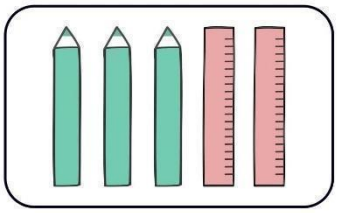


One pencil costs ____ € 3

(y = x + 1; 4x + y = 16)

A ruler costs **two** euros more than a pencil.

Total 24 €



One pencil costs ____ € 4

(y = x + 2; 3x + 2y = 24)

Task ID: AT3_2.5B **Title**: Word problems 3.b

Author: **Team:** Finnish Team

CategoryID: 78_22_07

When you multiply a number by 3 and then add 2 to it, you get 17.

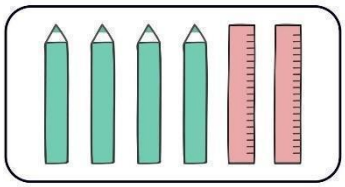
What is the number?

5

(open answer; 3x + 2 = 17)

A ruler costs **one** euro more than a pencil.

Total 20 €

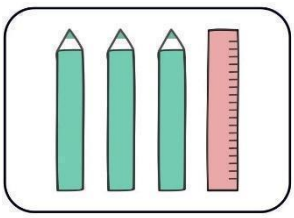


One pencil costs ____ € 3

(y = x + 1; 4x + 2y = 20)

A ruler costs **two** euros more than a pencil.

Total 18 €



One pencil costs ____ € 4

(y = x + 2; 3x + y = 18)

Task ID: AT3_3.3A **Title:** Number Pairs 5

Author: **Team:** Finnish Team

CategoryID: 78_22_07

Fill numbers in the table according to the rule. y = 2x + 1 (3 pairs)
A number that goes into this machine will always come out in the same way.   Complete the table of the numbers that go into and come out of the machine. y = x : 2 2 → 1 22 → 11 64 → 32 90 → 45 410 → 205

Task ID: AT3_3.3B **Title:** Number Pairs 6

Author: **Team:** Finnish Team

CategoryID: 78_22_07

Fill numbers in the table according

to the rule.

y = 2x - 1

(3 pairs)

A number that goes into this machine will always come out in the same way.

Complete the table of the numbers that go into and come out of the machine.

x + y = 100; y = 100 – x

10 → 90

30 → 70

50 → 50

60 → 40

100 → 0

Task ID: AT3_4.2A **Title:** Create an expression from the word problem 5

Author: **Team:** Finnish Team

CategoryID: 78_22_07

If **c** stands for the number of pens in each box,

write a math expression for the number of pens in 3 boxes.

3c#3*c#3×c#3·c#c+c+c#3xc

(easy)

Sam has 5 more cookies than Tim has. If **b** stands for the number of cookies that Tim has,

Write a math expression for the number of cookies that Sam and Tim have altogether.

b+b+5#b+5+b#5+b+b#
2b+5#2*b+5#2×b+5#2·b+5#

5+2b#5+2*b#5+2×b#5+2·b#5+2xb#2xb+5

(medium)

One pen costs **p** euros and one ruler costs **r** euros. If Ben buys 4 pens and 2 rulers, what does 4p + 2r stand for?

- 6pr
- 8pr
- The number of pens and rulers Ben buys
- The amount of money Ben has to pay for the pens and rulers

(4 choices in this order)
(difficult)

Task ID: AT3_4.2B **Title:** Create an expression from the word problem 6

Author: **Team:** Finnish Team

CategoryID: 78_22_07

There are 3 pupils. If **c** stands for the number of pens that are divided equally among them,

write a math expression for how many pens each pupil gets. c:3#c/3#c÷3

(easy)

Sam has 5 more cookies than Tim has. If **b** stands for the number of cookies that Sam has,

Write a math expression for the number of cookies that Sam and Tim have altogether.

b+b-5#b-5+b#-5+b+b#

2b-5#2*b-5#2×b-5#2·b-5#2xb-5#

-5+2b#-5+2*b#-5+2×b#-5+2·b#-5+2×b

(medium)

One pen costs **m** euros and one ruler costs **n** euros. If Ben buys 4 pens and 2 rulers, what does 4m + 2n stand for?

- 6mn
- 8mn
- The number of pens and rulers Ben buys
- The amount of money Ben has to pay for the pens and rulers

(4 choices in this order)

(difficult)

Task ID: AT3_5.3A **Title:** Simplify expression 5

Author: **Team:** Finnish Team

CategoryID: 78_22_07

If **b** is a number, 1 + b + b can be simplified (written more simply) as 1 + 2b. Simplify the math expression.
a + a + a 3a#3*a#3×a#3·a#3xa
c + c + 1 + c 3c+1#1+3c#3*c+1#1+3*c#3×c+1#1+3×c #3·c+1#1+3·c#3xc+1#1+3xc
d + 3 + d - 3 2d#2*d#2×d#2·d#d2#d*2#d×2#d·2#dx2 #2xd
e - e 0
5f - 2f 3f#3*f#3×f#3·f#3xf
g + g + h + g 3g+h#3*g+h#3×g+h#3·g+h#h+3g#h+3*g #h+3×g#h+3·g#h+3xg#3xg+h
4s - 2s + 5t - 2t 2s+3t#2*s+3*t#2×s+3×t#2·s+3·t#3t+2s#3*t +2*s#3×t+2×s#3·t+2·s#2xs+3xt#3xt+2xs

Task ID: AT3_5.3B **Title:** Simplify expression 6

Author: **Team:** Finnish Team

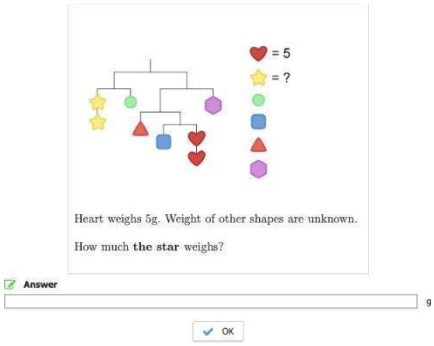
CategoryID: 78_22_07

Which of the following math expressions is NOT equal to 4 × (10 + 5)? • 4 × 15 • 4 × 10 + 4 × 5 • 4 × 10 + 5 • 4 × (5 + 10)
Which of the following math expressions is NOT equal to 3 × (59 - 1)? • 3 × 58 • 3 × 59 - 3 × 1 • 3 × 59 - 1 • 3 × 60 - 3 × 2
Which of the following math expressions is NOT equal to 10 × 30 - 30? • 10 × 30 - 1 × 30 • 30 × (10 - 1) • 10 × (30 - 30) • 300 - 30

Task ID: AT3_6.5B **Title:** Weight of the shapes 2

Author: **Team:** Finnish Team

CategoryID: 78_22_07



20?

Task ID: HU_UNPL_31 **Title:** DrawIt2

Author: ZsP **Team:** HU

CategoryID: 78_22_07

Instructions for the teacher:

- Show the students how to solve the “DrawIt game” (explain or let’s remember the instructions and how to follow them).
- Give a sequence of instruction and the students follow it and draw the image.
- Ask the students to enlarge the image to twice its size or to reduce the image by half
    - the students can modify the instructions first, then follow the modified instructions and check the solution.

Ask students to create/draw an image that can be easily reduced to a third of its size

78_23_02

Description: Identifying and comparing linear and quadratic relationships. Describing dependencies both graphically and algebraically, including direct and indirect proportionality.

Task ID: AT3_4.1A **Title:** Evaluate expression 10

Author: **Team:** Finnish Team

CategoryID: 78_23_02

e	7	10	16	19
f	4	7	13	16

Which of the following math sentences represent the relationship between **e** and **f**?

- e = 2f - 1
- f = e - 3
- f = 11 - e

j	1	3	8	11
k	3	7	17	23

Which of the following math sentences represent the relationship between **j** and **k**?

- j = k : 3
- k = j + 2
- k = 2j + 1

Task ID: AT3_4.1B **Title:** Evaluate expression 11

Author: **Team:** Finnish Team

CategoryID: 78_23_02

g	1	3	6	9
h	1	9	36	81

Which of the following math sentences represent the relationship between **g** and **h**?

- $g = h^2$
- $h = g^2$
- $g = h : 3$

u	1	4	7	10
v	4	10	16	22

Which of the following math sentences represent the relationship between **u** and **v**?

- $v = u + 3$
- $u = v - 3$
- $v = 2 \times (u + 1)$

78_23_03

Description: Interpreting graphs to understand the increase and decrease of functions. Identifying the slope, constant term, and zeros of a function from its graph.

Task ID: HU_UNPL_28 **Title:** Coordinates2

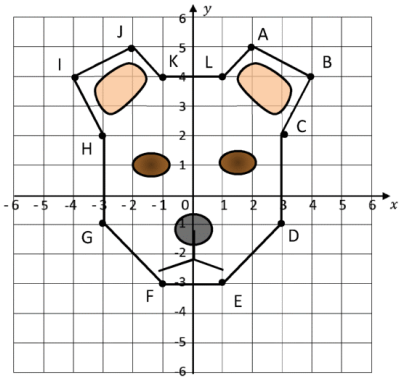
Author: ZSP **Team:** HU

CategoryID: 78_23_03

CT topic: instructions, algorithm, decomposition

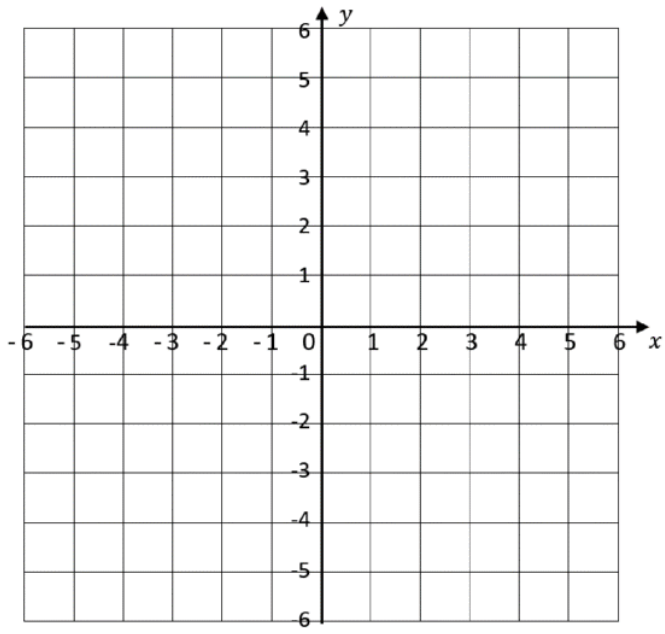
Instructions for the teachers:

1. Tell students coordinates that can be found in a coordinate system. Prepare a picture - so that if the students connect the points, an image will show.
2. Ask students to do modifications:
    a. shift the image left by 2 coordinates
    b. stretch the image, make it twice as high
    c. rotate the image
    d. …



Let' be the instructions for the modification based on the knowledge of your students and your goals

3. Ask students to draw their own picture and write the coordinates.
4. The students give the coordinates to their classmates who need to draw the image and do modifications again.



2) Draw your own face using the grid below and write down the coordinates of the outline.

A (,)	H (,)
B (,)	I (,)
C (,)	J (,)
D (,)	K (,)
E (,)	L (,)
F (,)	M (,)
G (,)	N (,)

78_24_01

Description: Numerical patterns and regularities

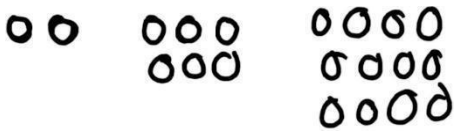
Task ID: AT3_3.1B **Title:** Table and chairs 4

Author: **Team:** Finnish Team

CategoryID: 78_24_01

Non-linear figure: 2, 6, 12, …

(n-1) +4, +6, + 8, … or y = x^2 + x

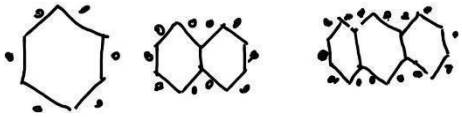


1. 2. 3.

1) How many circles are in the next figure? 20
2) How many circles are in the 7th figure? 56

(difficult)

Linear figure: 6, 10, 14, …
(n-1) + 4 or y = 4x+2 (table & chairs)



3) How many people can sit when 4 tables are joined ? 18
4) How many people can sit when 7 tables are joined ? 30

(medium)

Task ID: AT3_3.2A **Title:** Number sequence 5

Author: **Team:** Finnish Team

CategoryID: 78_24_01

Complete the number sequence.
36 35 33 30 26 (-1, -2, -3, -4, …)
4 8 16 32 64 2 × (n-1)
3 4 7 11 18 29 (n-1) + (n-2)

Task ID: AT3_3.2B **Title:** Number sequence 6

Author: **Team:** Finnish Team

CategoryID: 78_24_01

Complete the number sequence.
26 27 29 32 36 (+1, +2, +3, +4, …)
64 32 16 8 4 (n-1) / 2
1 2 3 5 8 13 (n-1) + (n-2)

78_24_03

Description: Constructing, describing, and expressing patterns in number sequences and geometrical patterns

Task ID: HU_UNPL_17 **Title:** Series

Author: ZSP **Team:** HU

CategoryID: 78_24_03

CT topic: Data and Information > Data Structures > Sequence

Instructions for the teacher:

5. Take 10-20 colored/patterned buttons on the table.
6. Start to create a sequence with different colored/patterned buttons.
    a. You can place the buttons in different ways:
        i. one line ()
        ii. a little bit askew ()
        iii. with different-sized gaps between them ()
        iv. …
7. Give instructions to the students: Continue the sequence!
    a. The sequence can be continued in several ways:
        i. *blue, red, blue,* red, blue, red, …
        ii. *blue, red, blue,* blue, red, blue, blue, red, blue, ….
        iii. …
    b. You can also give some additional hints/instructions to the students:
        i. Use all the colors.
        ii. Check the position of the buttons.
        iii. …
8. Have a discussion: the color/pattern is not the only thing that can define the sequence.

Variation/extension:

- ask students to work in pairs: the 1st student starts a sequence and the 2nd student needs to continue - discuss how clear was the starting, whether the students can continue the sequence in several ways…

78_25_01

Description: Understanding points, segments, straight lines, rays, and angles. Describing and classifying plane and three-dimensional geometric figures based on their properties.

Task ID: HU_78_25_01_01 **Title:** Classify planar shapes

Author: PS **Team:**HU

CategoryID: 78_25_01

Text: Look at the diagram!

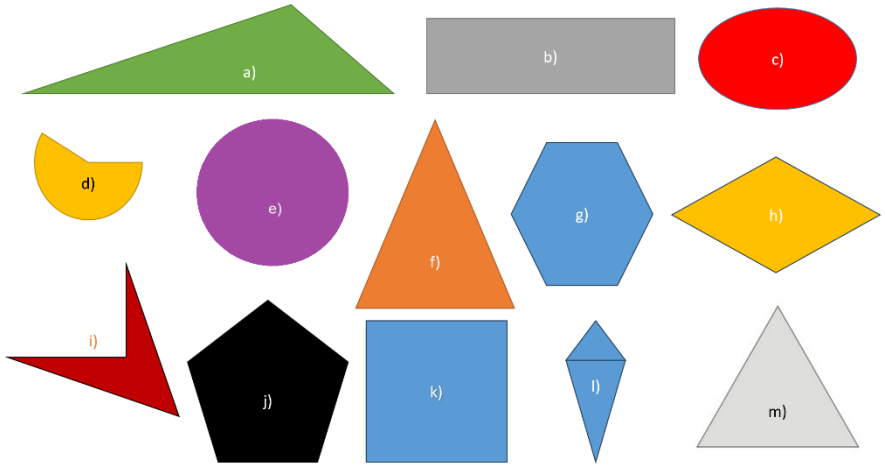
Options:

a) Select the polygons

b) Select the regular polygons

c) Select the convex polygons

d) Select the regular planar shapes



Solution:

a) a, b, f, g, h, i, j, k, l, m

b) g, j, k, m

c) a, b, f, g, h, j, k, l, m

d) e, g, j, k, m

Task ID: HU_78_25_01_02 **Title:** Classify spatial shapes

Author: PS **Team:**HU

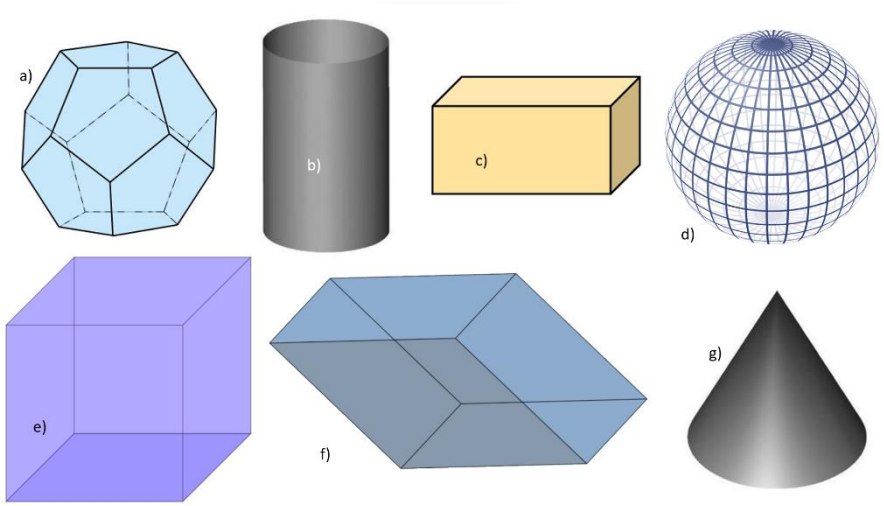
CategoryID: 78_25_01

Text: Look at the diagram!

Options:

a) select the solid of revolutions

b) select the platonic solids (regular solids, all sides are regular polygons)



Solution:

a) b, d, g

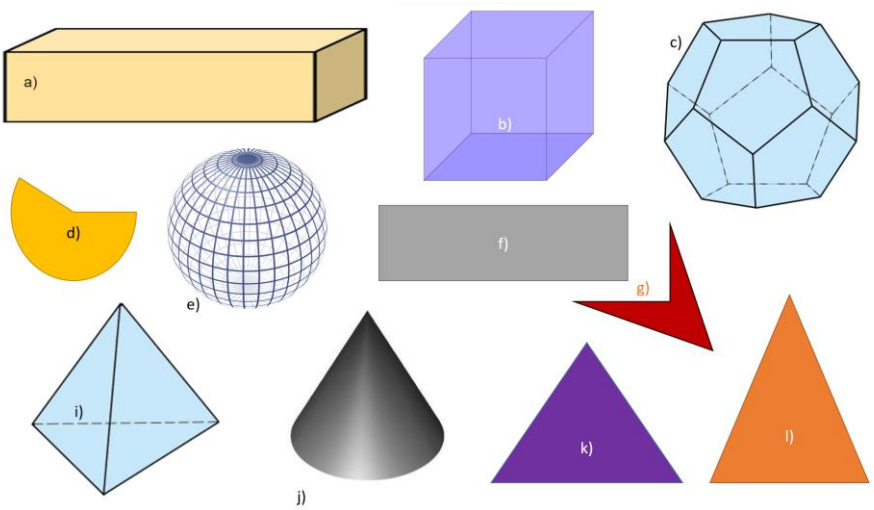
b) a, e

Task ID: HU_78_25_01_03 **Title:** Classify planar and spatial shapes

Author: PS **Team:** HU

CategoryID: 78_25_01

Text: Look at the diagram!



Options:

a) select the planar shapes

b) select the spatial shapes

Solution:

a) a, d, f, g, k, l

b) b, c, e, i, j

Task ID: HU_78_25_01_04 **Title:** Classify spatial and planar shapes and assign to set 1

Author: PS **Team:** HU

CategoryID: 78_25_01

Text: Classify the shapes in the figure into the appropriate set.

Options:

A) planar shapes

B) convex planar shapes

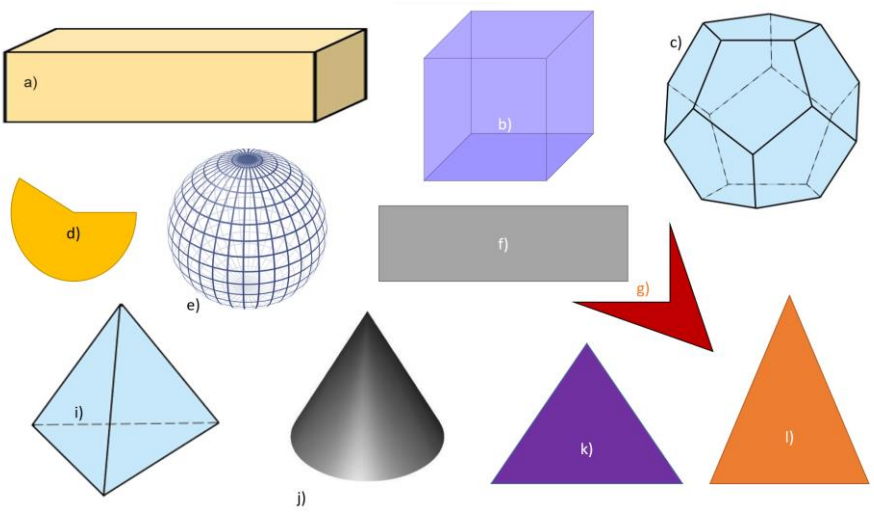
C) regular planar shapes

D) spatial shapes

E) solid of revolutions

F) polyhedrons

G) platonic solids (regular solids, all sides are regular polygons)



Solution:

A) a, d, f, g, k, l

B) a, f, k, l

C) k

D) b, c, e, i, j

E) e, j

F) b, c, i

G) b, c, i

Task ID: HU_78_25_01_05 **Title:** Classify spatial and planar shapes and assign to set 2

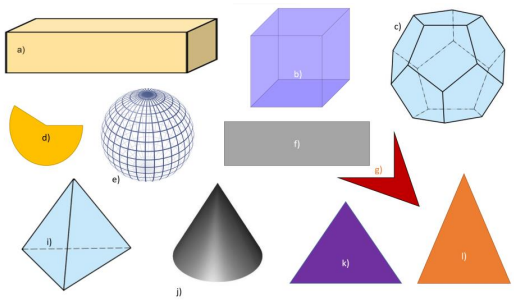
Author: PS **Team:** HU

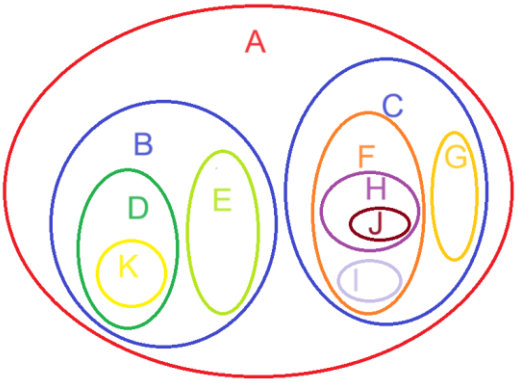
CategoryID: 78_25_01

Text:

a) Identify and name the sets based on the relations of the Ven diagram

b) Classify the shapes in the figure into the appropriate set





Options:

Sets Concave polygons
Convex planar shapes
Planar shapes
Platonic solids
Polygons
Polyhedrons
Regular planar shapes
Solid of revolutions
Spatial solids
Spatial solids and planar shapes

Solution:

a)

Concave polygons	I
Convex planar shapes	H
Planar shapes	C
Platonic solids	G
Polygons	F
Polyhedrons	D
Regular planar shapes	J
Solid of revolutions	E
Spatial solids	B
Spatial solids and planar shapes	A

b)

Concave polygons	g
Convex planar shapes	f, k, l
Planar shapes	d, f, g, k, l
Platonic solids	b, c, i
Polygons	f, g, k, l
Polyhedrons	a, b, c, i
Regular planar shapes	k
Solid of revolutions	j
Spatial solids	a, b, c, e, i, j
Spatial solids and planar shapes	a, b, c, d, e, f g, i, j, k, l

78_25_02

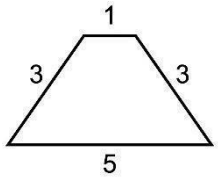
Description: Calculating perimeters and areas of polygons. Knowing properties of quadrilaterals, such as the sum of interior and exterior angles, convex and concave shapes, and diagonals. Understanding special quadrilaterals (trapezoid, parallelogram, rectangle, kite, rhombus, isosceles trapezoid, square) and using their properties to solve problems.

Task ID: AT3_1.4A **Title:** Perimeter calculation 3.a

Author: **Team:** Finnish Team

CategoryID: 78_25_02

To find the parameter of a two-dimensional shape, you add the lengths of all its sides.

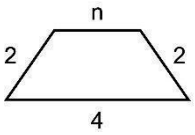


The parameter of this shape equals 3 + 1 + 3 + 5, which is equal to 12.

What is the parameter of each following shape?

Simplify your answer, if possible.

For example, 2 + c + c can be simplified as 2 + 2c.

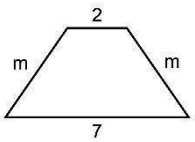


8 + n

n + 8

8 + 1n

1n + 8 (easy)



2m + 9

9 + 2m

2*m + 9

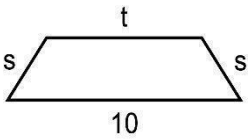
9 + 2*m

m + m + 9

9 + m + m …

* Should these answered highlighted in red be accepted for 11-12 y students?

(medium)



2s + t + 10

2s +1t + 10

t + 2s + 10

1t + 2s + 10

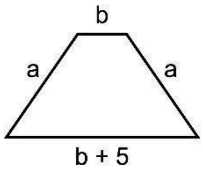
10 + 2s + t

s + s + t + 10

t + s + s + 10 …

* Should these answered highlighted in red be accepted for 11-12 y students?

(medium)



2a + 2b + 5

2a + 5 + 2b

2b + 2a + 5

2b + 5 + 2a

5+ 2a + 2b

5 + 2b + 2a

5 + 2(a+b)

5 + 2(b+a)

2(a+b) + 5

2(b+a) + 5

…

a + a + b + b + 5

5 + a + a + b + b …

* Should these answered highlighted in red be accepted for 11-12 y students?

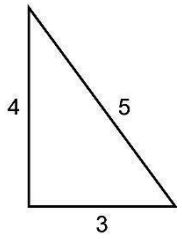
(difficult)

Task ID: AT3_1.4B **Title:** Perimeter calculation 3.b

Author: **Team:** Finnish Team

CategoryID: 78_25_02

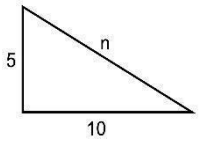
To find the parameter of a two-dimensional shape, you add the lengths of its all sides.



The parameter of this triangle equals 3 + 4 + 5, which is equal to 12.

What is the parameter of each following shape?

Simplify your answer, if possible. For example, 2 + c + c can be simplified as 2 + 2c.



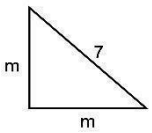
15 + n

n + 15

15 + 1n

1n + 15

(easy)



2m + 7

7 + 2m

2*m + 7

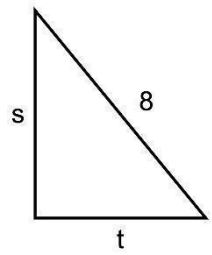
7 + 2*m

m + m + 7

7 + m + m …

* Should these answered highlighted in red be accepted for 11-12 y students?

(medium)



s + t + 8

1s +1t + 8

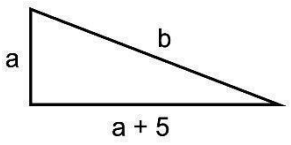
t + s + 8

1t + 1s + 8

8 + s + t

8 +1s + 1t

(medium)



2a + b + 5

2a + 5 + b

b + 2a + 5

b + 5 + 2a

5+ 2a + b

5 + b + 2a

…

a + a + b + 5

5 + a + a + b …

* Should these answered highlighted in red be accepted for 11-12 y students?

(difficult)

78_25_03

Description: Using the Pythagorean theorem to solve problems. Calculating lengths and areas related to circles (circumference, segment, sector).

Task ID: HU_UNPL_15 **Title:** Toothpick_geometry

Author: ZSP **Team:** HU

CategoryID: 78_25_03

CT topic: Algorithms and Programming > Graph > The Shortest Path

Instructions for the teacher:

1. Prepare cards with 2D and 3D geometric objects.
2. Give the cards to students with plasticine balls (you can use marshmallow or styrofoam balls) and toothpicks.
3. Ask students to work in pairs:
    a. The first student pulls out a card and tries to describe the object shown on the card to the other one without showing the card
    b. The other student builds the object.
    c. The first student (the one who drew the card) checks that the solution is correct.
    d. They then change their roles.

Variations:

- instruct without cards: e.g: “prepare/build a cube”; or “build an octahedron”
- Let’s discuss, how many toothpicks and plasticine balls were used.

78_26_01

Description: Estimation of measurement

Task ID: HU_UNPL_10 **Title:** String_around_nails3

Author: ZSP **Team:** HU

CategoryID: 78_26_01

CT topic: Algorithms and Programming > Graph > The Shortest Path

Instructions for the teacher:

1. Give boards with 10-15 nails and a string for each group. Nails can be hammered into the board randomly.
2. Mark the starting point or students can decide the starting point themselves.
3. Hand out the boards and ask the students to find the shortest route possible. The route has to go around each nail and return to the starting point.
4. After the students have tested a route, they place a mark on the string to indicate the total length of the route — this way they can recognize which route is the shortest.

78_26_03

Description: Skills in units of measurement and their conversions

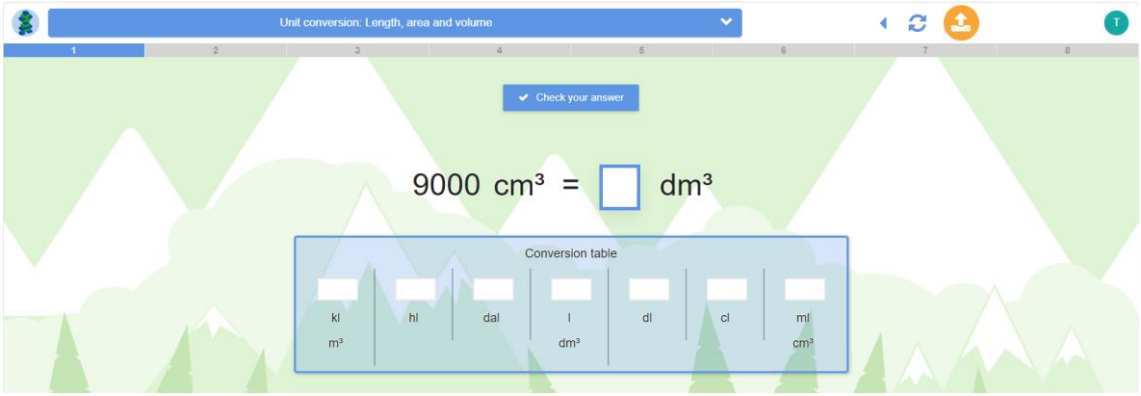
Task ID: 9_1.13 **Title:** Unit conversion: Length, area and volume

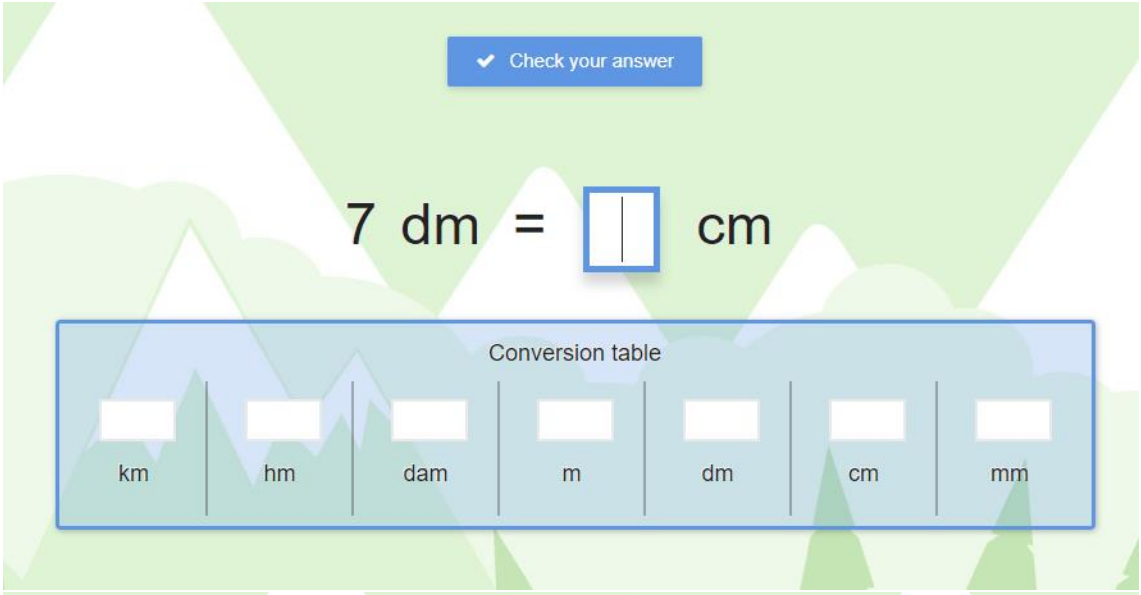
Author: **Team:** Finnish Team

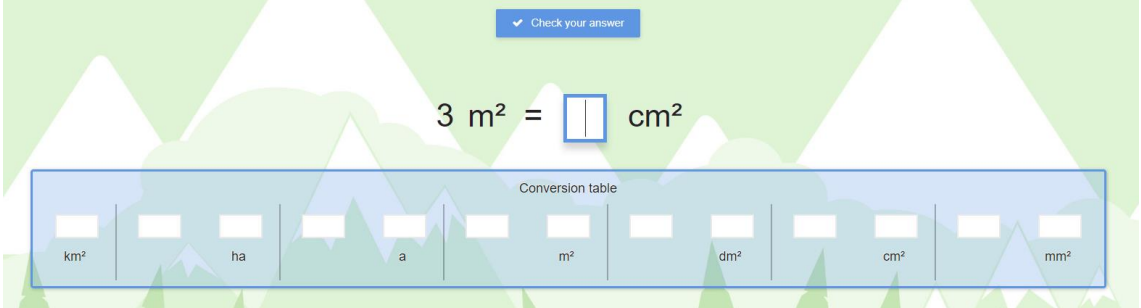
CategoryID: 78_26_03

Text: After choosing the challenge level, you are asked 8 different unit conversion equations. Students will submit their answer to the equation. Below the equation, there is a conversion table that students can use for help.

Pictures below show examples (medium challenge level):







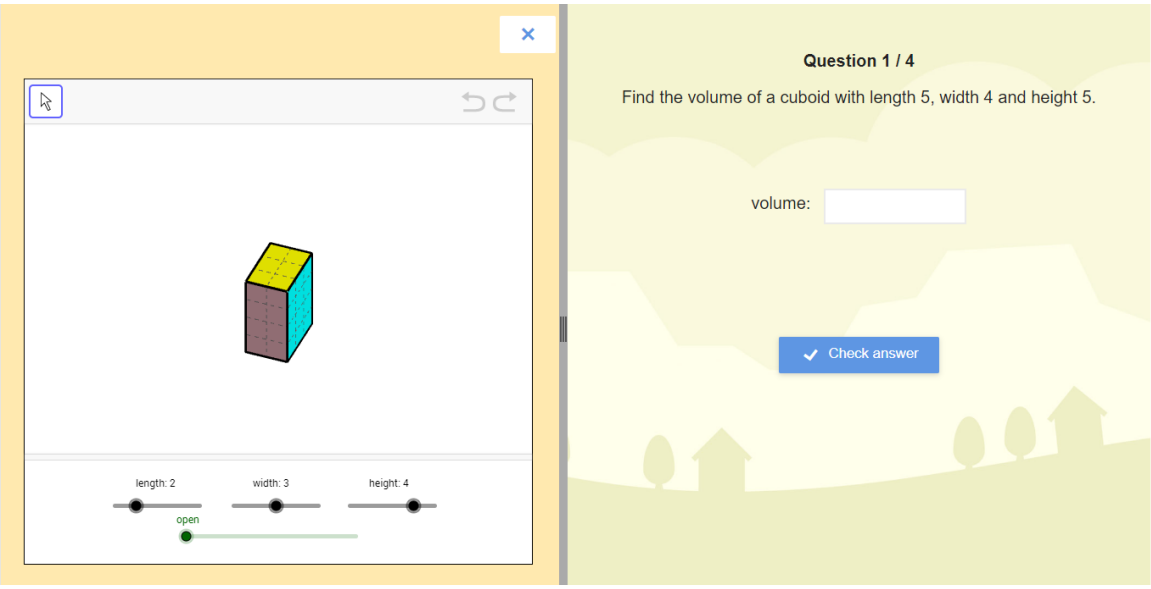
78_26_04

Description: Surface and volume calculation

Task ID: 8_51.9 **Title:** Area and volume of a cuboid

Author: **Team:** Finnish Team

CategoryID: 78_26_04



Text:

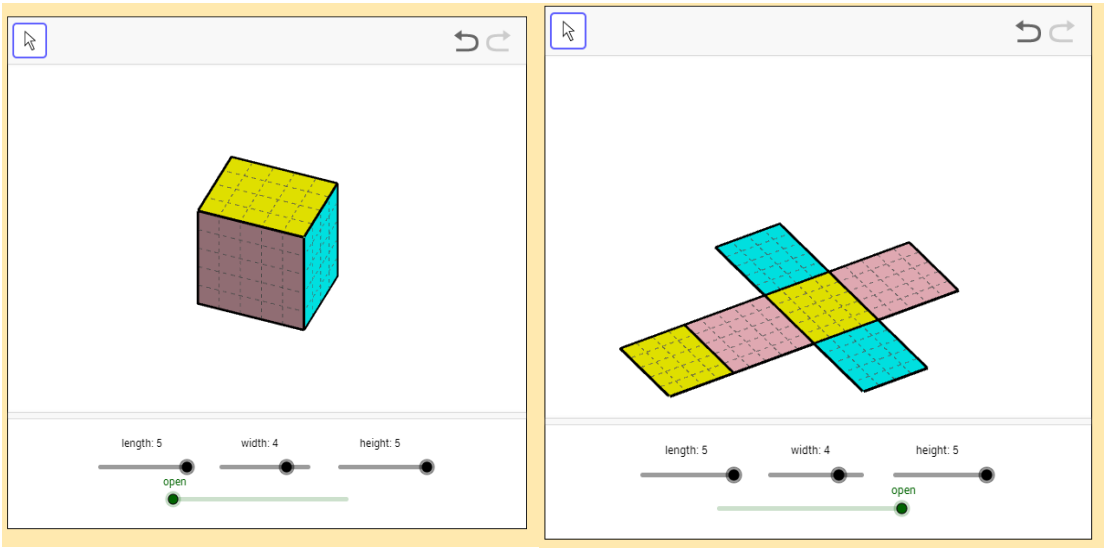
Find the volume of a cuboid with length x, width y, and height z.

Find the area of a cuboid with length x, width y, and height z.

Interaction:

You can change the length, width, and height of the cuboid to better visualize the volume and area of the cuboid.

Pictures below show the examples:



78_27_01

Description: Strategies for collecting and organizing data for a single variable. Identifying relevant data to answer questions posed in statistical investigations.

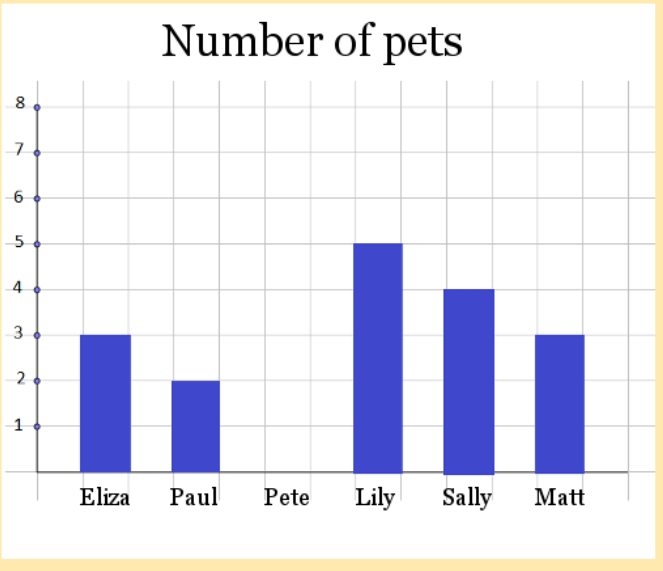
Task ID: 4_31.13 **Title:** Fill in the table: Pets

Author: **Team:** Finnish Team

CategoryID: 78_27_01

Text: You are asked to fill the table according to the chart.

Pictures below show example of the chart and the table:



	Number of pets
Eliza	
Paul	
Pete	
Lily	
Sally	
Matt	

Task ID: ES_78_27_01_01 **Title:** Statistical formulation

Author: JB **Team:** ES

CategoryID: 78_27_01

Text: If we want to answer the next question: “How does the average electrical consumption of urban residents compare to that of rural residents?”

Which is the relevant data that we need?

Options:

A. electrical consumption data for urban populations

B. electrical consumption data for both urban and rural populations

C. energy consumption data for both urban and rural populations

D. gas consumption data for both urban and rural populations

Solution:

B, electrical consumption data for both urban and rural populations

Task ID: ES_78_27_01_02 **Title:** Statistical strategy

Author: JB **Team:** ES

CategoryID: 78_27_01

Text: Which are strategies for collecting and organizing data for a single variable?

Options:

a) Surveys

b) Observations

c) Interviews

d) All the other options

Solution:

d) All the other options

78_27_02

Description: Analysis and interpretation of statistical tables and graphs of qualitative, discrete quantitative, and continuous quantitative variables. Interpreting data in tables, selecting the appropriate visualization method, and creating visualizations.

Task ID: 4_31.11 **Title:** Collecting creatures

Author: **Team:** Finnish Team

CategoryID: 78_27_02

Text: You are asked to choose the right statement according to the table.

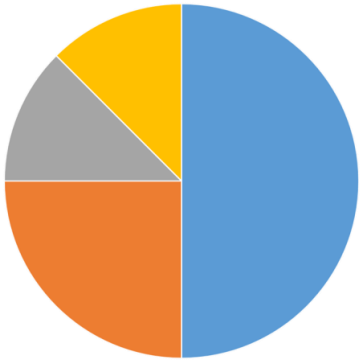
Pictures below show example of the statements and the table:

Task ID: ES_78_27_02_01 **Title:** Statistical statements

Author: JB **Team:** ES

CategoryID: 78_27_02

Text: In the cheese chart, we can see the sales of the 4 trimesters. In blue, the 1st trim.; in red, the 2nd trim.; in grey, the 3rd trim.; and in yellow, the 4th trim. Which of the following statements is true?



Options:

a) 1st trim. sales are the smallest.

b) Sales in the 4th trim. are greater than those in the 2nd.

c) 1st trim. sales are double those of 2nd trim.

d) None of the other statements is true.

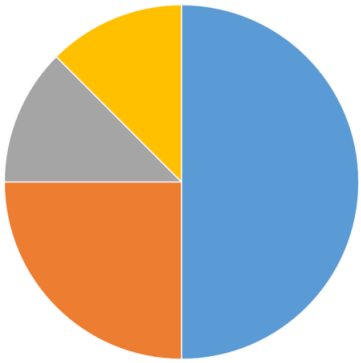
Solution: 1st trim. sales are double those of 2nd trim.

Task ID: ES_78_27_02_02 **Title:** Statistical statements

Author: JB **Team:** ES

CategoryID: 78_27_02

Text: In the cheese chart, we can see the sales of the 4 trimesters. In blue, the 1st trim.; in red, the 2nd trim.; in grey, the 3rd trim.; and in yellow, the 4th trim. Which of the following statements is true?



Options:

a) 1st trim. sales are the smallest.

b) Sales in the 4th trim. are greater than those in the 2nd.

c) Sales in the 2nd trim. are double those of the 4th.

d) None of the other statements is true.

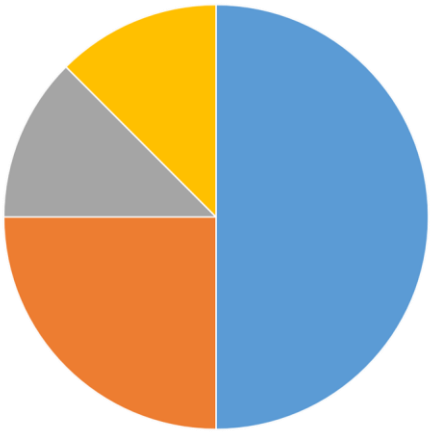
Solution: Sales in the 2nd trim. are double those of the 4th

Task ID: ES_78_27_02_03 **Title:** Statistical statements

Author: JB **Team:** ES

CategoryID: 78_27_02

Text: In the cheese chart, we can see the sales of the 4 trimesters. In blue, the 1st trim.; in red, the 2nd trim.; in grey, the 3rd trim.; and in yellow, the 4th trim. Which of the following statements is true?



Options:

a) 2nd trim. sales are the biggest.

b) 1st trim. sales are triple those of the 4th.

c) 1st trim. sales are quadruple those of the 4th.

d) None of the other statements is true.

Solution: 1st trim. sales are quadruple those of the 4th

78_27_03

Description: Understanding and calculating the average value. Determining frequency, relative frequency, and median. Calculating the average (mean) of a data series, determining the most common value (mode), and the middle data point (median), and comparing these measures.

Task ID: 7_3.13 **Title:** Mean, median and mode 5

Author: **Team:** Finnish Team

CategoryID: 78_27_03

Text: You are asked find arithmetic mean, median, and mode from a set of numbers. This exercise has explanations for arithmetic mean, median, and mode. After you give an answer, it will give you an explanation or a hint.

Pictures below show examples:

The average of a set of numbers is a number that is representative of all of them, and tries to answer the question: "What is the center of the set?". There are many different averages, including the following, most common ones:

Arithmetic mean

The arithmetic mean, or often simply the mean or average, is calculated by adding up the numbers of the set in question and dividing the sum by the number of addends:

For example, the mean of numbers $1, 1, 1, 2, 2, 3, 4$ is $\frac{1+1+1+2+2+3+4}{7} = \frac{14}{7} = 2$

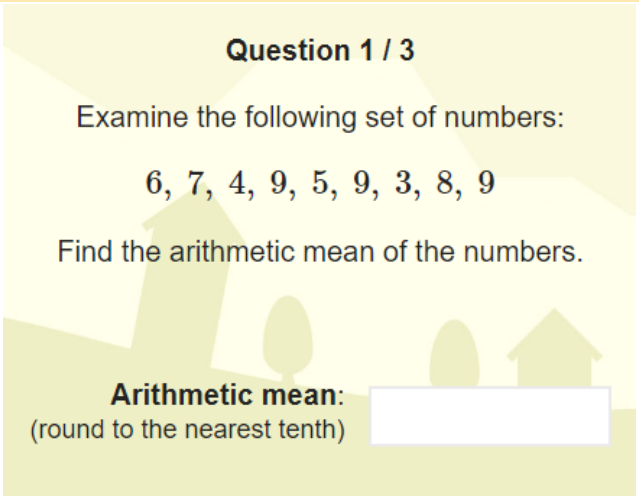
Median

The median of a set of numbers is the number in the middle when the set is ordered. In other words, the median divides the set into a lower half and a greater half.

For example, the median of numbers $1, 1, 1, 2, 2, 3, 4$ is 2, since it's the number in the middle, being the fourth out of seven.

Mode

The mode of a set of numbers is the number that occurs most frequently in it. For example, the mode of the set of numbers $1, 1, 1, 2, 2, 3, 4$ is 1, since there are three of them.



Question 2 / 3

Examine the following set of numbers:

$$6,\ 7,\ 4,\ 9,\ 5,\ 9,\ 3,\ 8,\ 9$$

Find the median.

Median:

Good job!

$$\frac{6+7+4+9+5+9+3+8+9}{9} = \frac{60}{9}$$
$$\approx 6{,}667$$
$$\approx 6{,}7$$

This is the arithmetic mean of the numbers.

Oops, try again!

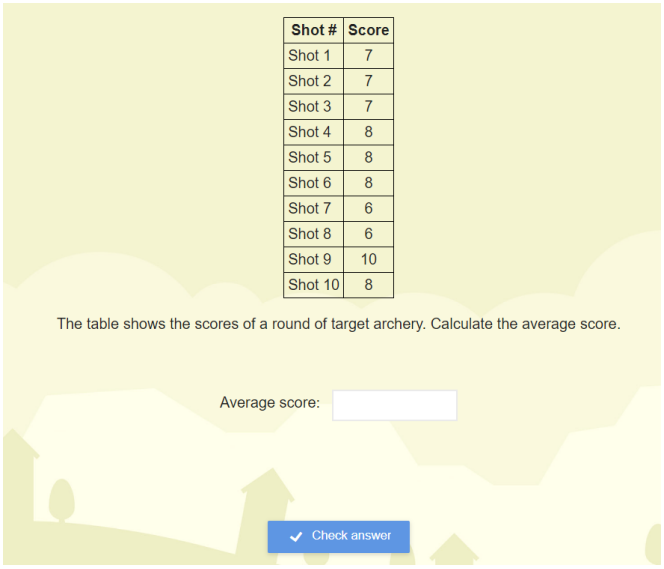
When the numbers are ordered, the median is the number in the middle.

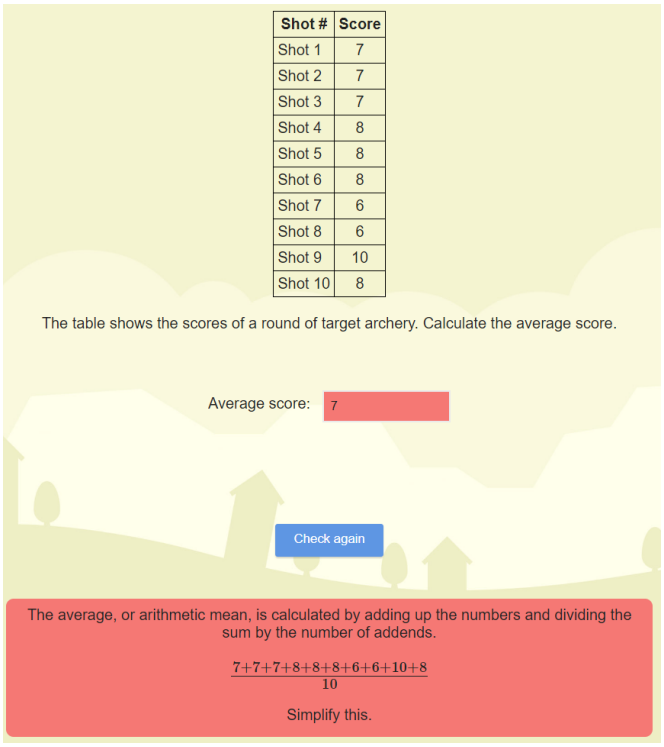
Task ID: 8_78.6 **Title:** Target archery (mean)

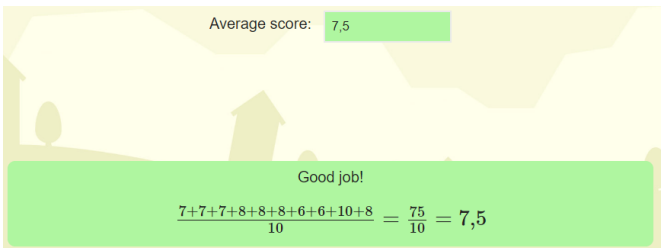
Author: **Team:** Finnish Team

CategoryID: 78_27_03

Text: You are asked to calculate the average score. After you answer, it will give you explanation. Pictures below show examples:





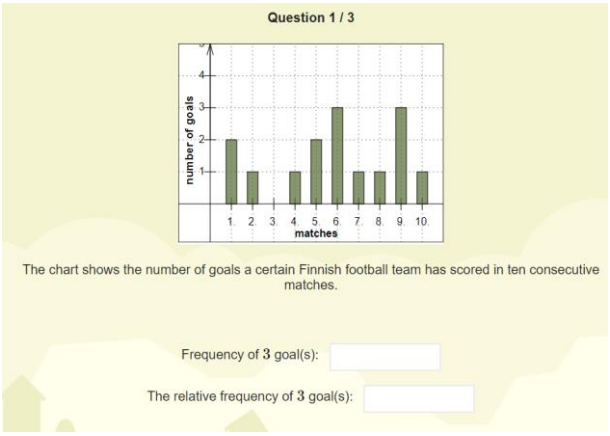


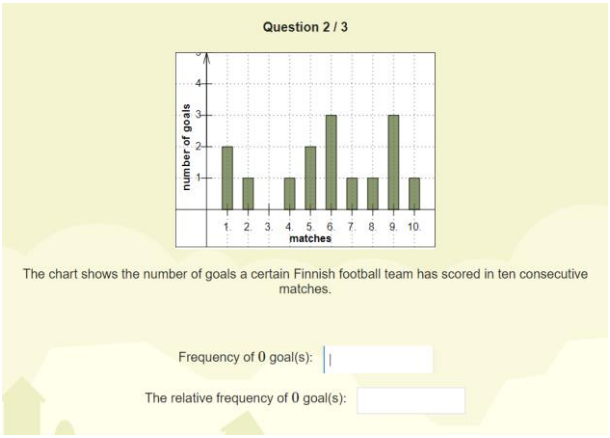
Task ID: 8_69.9 **Title:** Football: Frequency and relative frequency 1

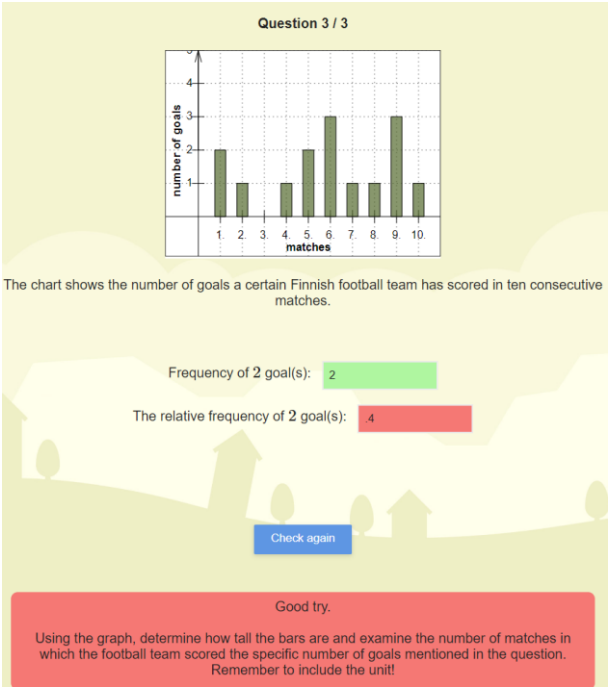
Author: **Team:** Finnish Team

CategoryID: 78_27_03

Text: You are asked to fill 3 questions about frequency and the relative frequency according to the chart. If you give a wrong answer, it will give you a hint. Pictures below show examples:







78_27_04

Description: Strategies for drawing conclusions from a sample to make judgments and appropriate decisions. Using proportions to solve problems.

Task ID: ES_78_27_04_01 **Title:** Statistical strategy

Author: JB **Team:** ES

CategoryID: 78_27_04

Text: If we want to answer the next question: “How does the average electrical consumption of urban residents compare to that of rural residents?”

Which is the relevant data that we need?

Options:

A. electrical consumption data for urban populations

B. electrical consumption data for both urban and rural populations

C. energy consumption data for both urban and rural populations

D. gas consumption data for both urban and rural populations

Solution:

B, electrical consumption data for both urban and rural populations

Task ID: ES_78_27_04_02 **Title:** Statistical strategy

Author: JB **Team:** ES

CategoryID: 78_27_04

Text: If we want to answer the next question: “What factors influence student performance in mathematics?”

Which is the relevant data that we need?

Options:

a) Student test scores

b) Attendance records

c) Study habits

d) All the other options

Solution:

d) All the other options

Task ID: ES_78_27_04_03 **Title:** Statistical strategy

Author: JB **Team:** ES

CategoryID: 78_27_04

Text: If we are researching the impact of a new teaching method on student learning outcomes, which is the relevant data that we need?

Options:

a) The weather in May

b) Pre- and post-test scores

c) Colour of the classroom

d) How many litres there are in the sea

Solution:

Pre- and post-test scores

78_28_01

Description: Identifying deterministic and random phenomena.

Task ID: ES_78_28_01_01 **Title:** Probability concepts

Author: JB **Team:** ES

CategoryID: 78_28_01

Text: The data type is deterministic if it is predetermined by something, or can be calculated by a formula. In other case, it is random. Then, which of the following data are deterministic?

Options:

a) Temperature conversion between Celsius and Kelvin.

b) The relationship between circumference and radius.

c) The position of a falling body at the instant *t* if we know the initial height (h).

d) All the other options.

Solution:

For the c) option: $s(t) = h - \frac{1}{2}gt^2$

78_28_03

Description: Assigning probabilities to experiments. Calculating probabilities. Explaining statements about probability (impossible, certain, less/more likely).

Task ID: 7_3.25 **Title:** Certain, possible, or impossible?

Author: **Team:** Finnish Team

CategoryID: 78_28_03

Text: You are presented 8 scenarios and you have to answer if they are possible, certain or impossible.

Pictures below show examples:

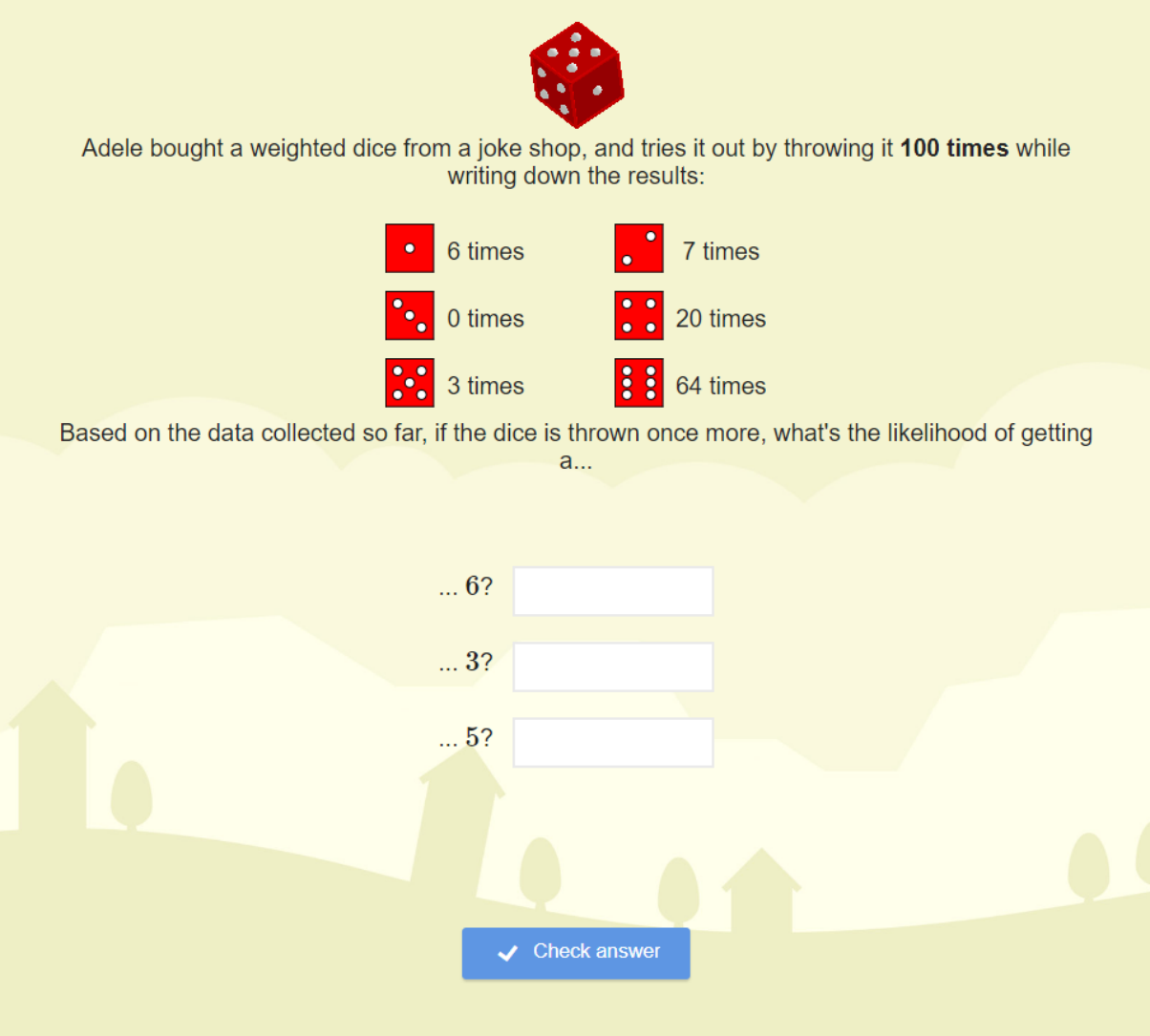
Task ID: 8_27.4 **Title:** Weighted dice

Author: **Team:** Finnish Team

CategoryID: 78_28_03

Text: You are asked to count likelihoods.

Picture below show an example:



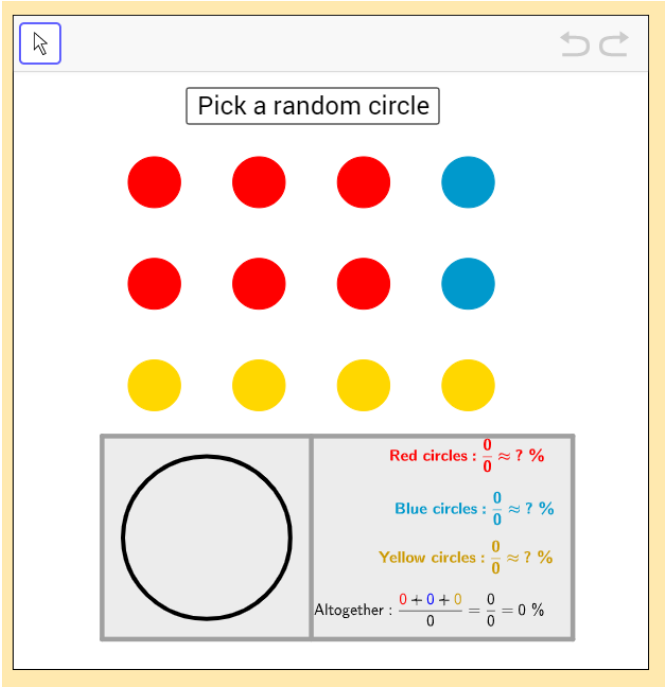
Task ID: 8_27.8 **Title:** Probability and randomness

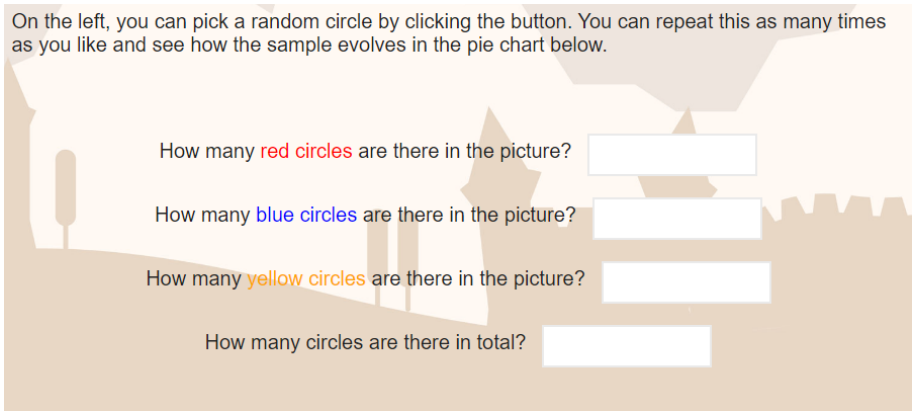
Author: **Team:** Finnish Team

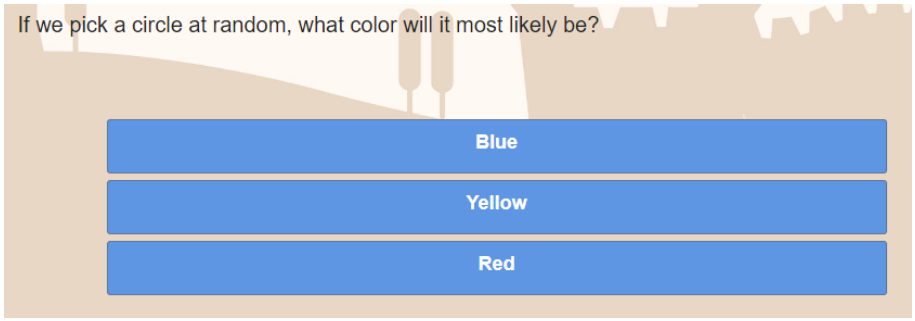
CategoryID: 78_28_03

Text: You are first asked to count the number of different colored circles in a picture. After that it will ask you which colored circle is most likely to be picked at random.

Pictures below show an example:







78_28_04

Description: Calculating the standard deviation.

Task ID: ES_78_28_04_01 **Title:** Probability concepts

Author: JB **Team:** ES

CategoryID: 78_28_04

Text: In an ice cream shop, there are four types of ice cream. One is worth 1 euro, another is worth 5 euros, the third type is also worth 5 euros, and the fourth is 9 euros. How much is the standard deviation?

Options:

a) 5.

b) More than 9.

c) Less than 3.

d) None of the other values.

Solution: Less than 3 (Sqrt(8) = 2.82)

78_29_01

Description: Using appropriate mathematical language to describe, explain, and justify reasoning, procedures, and conclusions.

Task ID: HU_UNPL_21 **Title:** Trueball2

Author: ZSP **Team:** HU

CategoryID: 78_29_01

CT topic: logic

Instructions for the teachers:

5. Tell a statement and throw the ball to one of the students.
6. The student needs to define the truth value of the statement (telling “true” or “false”) and give (explain) the justification (why)
7. Then the student tells a statement and throws the ball to another student
8. …

The statements must be clearly defined and include information that all students know or see in the room. You can use a special topic (like geometry, numbers, or from another subject…).

Variation:

- the statements need to include “all”, “exists”, “not”, and “non of” (based on the age group’s need)
- you can create more complex statements with combinations using “and”, “or” and “not”.

78_29_02

Description: Expressing true and false statements. Deducing truth values for propositions.

Task ID: AT3_1.1A **Title:** Numerical manipulation 3.a

Author: **Team:** Finnish Team

CategoryID: 78_29_02

12 = 4 + 8 true / false
512 = 512 true / false
967 = 967 + 0 true / false
19 + 6 + 170 - 170 = 19 + 6 true / false
1987 - 0 = 1987 true / false
137 + 265 = 265 + 137 true / false
520 - 100 = 100 - 520 true / false
145 × 70 = 70 × 145 true / false
10 : 5 = 5 : 10 true / false
12 + 190 - 180 = 12 + 10 true / false
500 + 730 = 500 + 500 + 230 true / false
77 + 136 - 116 = 77 + 21 true / false
90 + 90 = 100 + 100 - 20

true / false
327 + 115 = 329 + 113 true / false
(9 × 4) + 4 = 10 × 4 true / false
12 + 9 : 3 = 7 true / false
1250 × (45 - 45) = 5300 × (79 - 79) true / false

Task ID: AT3_1.1B **Title:** Numerical manipulation 3.b

Author: **Team:** Finnish Team

CategoryID: 78_29_02

8 = 4 + 12 true / false
512 + 5 = 512 + 7 true / false
1967 = 1967 + 0 true / false
119 + 16 + 1700 - 1700 = 119 + 16 true / false
987 - 0 = 987 true / false
1137 +2265 = 2265 + 1137 true / false
12 - 10 = 10 - 12 true / false
14 × 7 = 7 × 14 true / false

4 : 2 = 2 : 4 true / false
120 + 900 - 800 = 120 + 100 true / false
5000 + 7300 = 5000 + 5000 + 2300 true / false
770 + 1360 - 1160 = 770 + 200 true / false
19 + 19 = 20 + 20 - 2 true / false
3270 + 1150 = 3290 + 1170 true / false
(99 × 4) + 4 = 100 × 4 true / false
4 + 7 × 5 = 55 true / false
1250 × (45 - 44) = 2500 true / false

Task ID: AT3_1.2A **Title:** Evaluate expression 10

Author: **Team:** Finnish Team

CategoryID: 78_29_02

Liz solves 23 + 46 and correctly gets 69. Then the teacher asks Liz whether 23 + 46 + 15 = 69 + 15 is true or false. Can Liz know that it is true without actually adding 15 to both sides? • Yes, she knows the answer without any calculation. When adding the same amount to both sides, they are still equal. • No, she has to do the calculation to be able to answer the question.
Dan solves 3 * 15 and correctly gets 45. Then the teacher asks him to solve 15 * 3. He knows the answer without multiplying the numbers. When multiplying 3 and 15 in any order, you always get the same answer, 45. Will Dan's idea always work for all numbers? • Always

- Sometimes
- Never

Anytime you add two odd numbers, will you get an odd number?

- Always
- Sometimes
- Never

Task ID: AT3_1.2B **Title:** Evaluate expression 10

Author: **Team:** Finnish Team

CategoryID: 78_29_02

Liz solves 23 + 46 and correctly gets 69. Then the teacher asks Liz whether 23 + 46 - 15 = 69 - 15 is true or false. Can Liz know that it is true without actually subtracting 15 from both sides?

- Yes, she knows the answer without any calculation. When subtracting the same amount from both sides, they are still equal.
- No, she has to do the calculation to be able to answer the question.

Dan realizes that when multiplying any two numbers in any order, he always gets the same answer, for example 3 * 15 = 45 and 15 * 3 = 45.

Will Dan’s idea always work for division?

- Always
- Sometimes
- Never

Anytime you add two even numbers, will you get an even number?

- Always
- Sometimes
- Never

78_30_01

Description: Divisibility of numbers

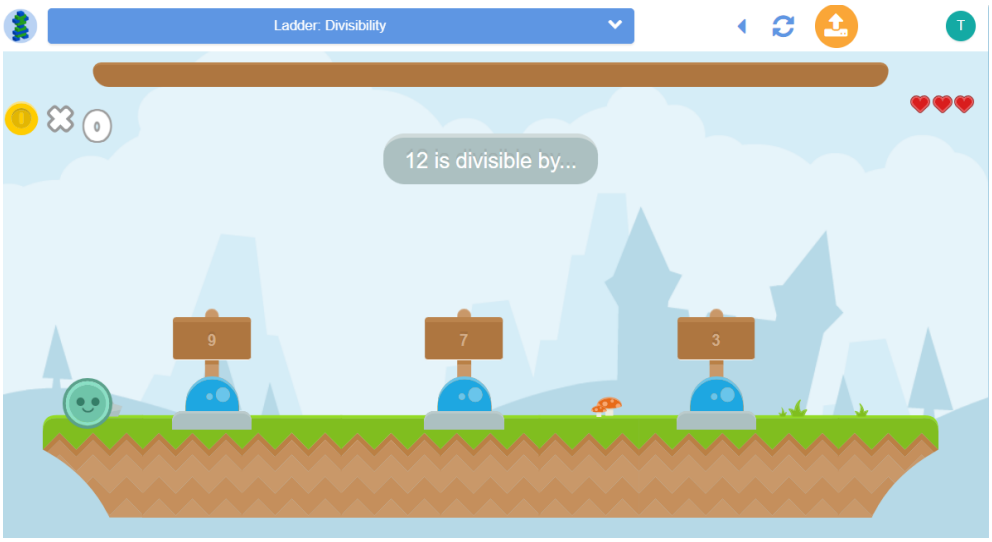
Task ID: 7_4.16 **Title:** Ladder: Divisibility

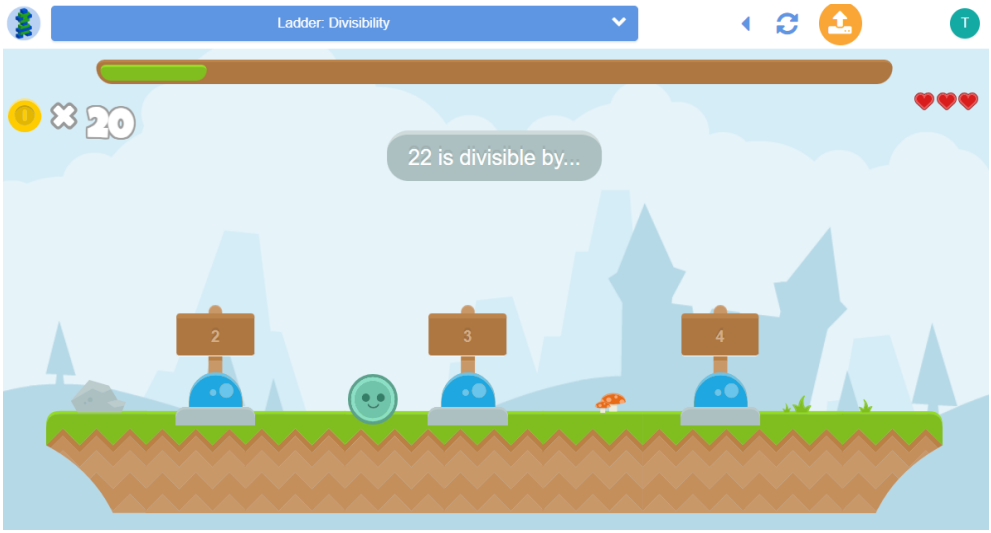
Author: **Team:** Finnish Team

CategoryID: 78_30_01

Text: You are given a number and you have to choose from three options the one that it is divisible with. You have 3 hearts and wrong answers will subtract one of them.

Pictures below show examples:




Ladder: Divisibility
T
20
22 is divisible by...
2
3
4

78_30_02

Description: Divide numbers into prime factors

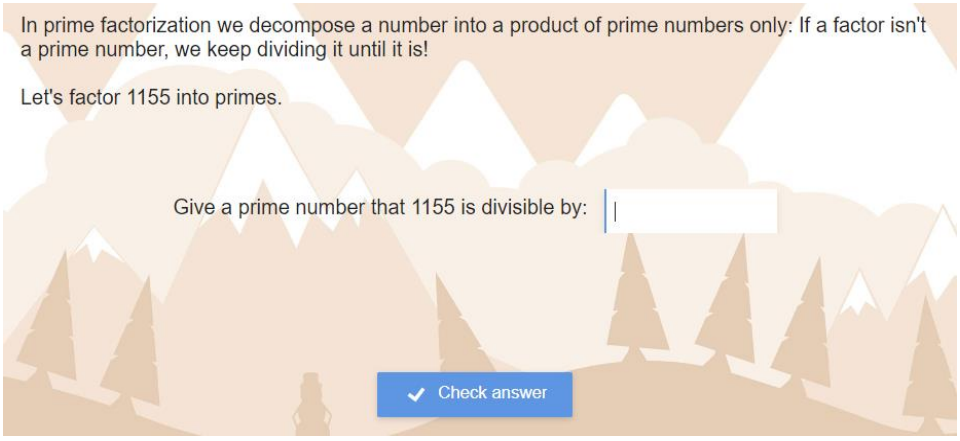
Task ID: 7_22.2 **Title:** Prime factorization

Author: **Team:** Finnish Team

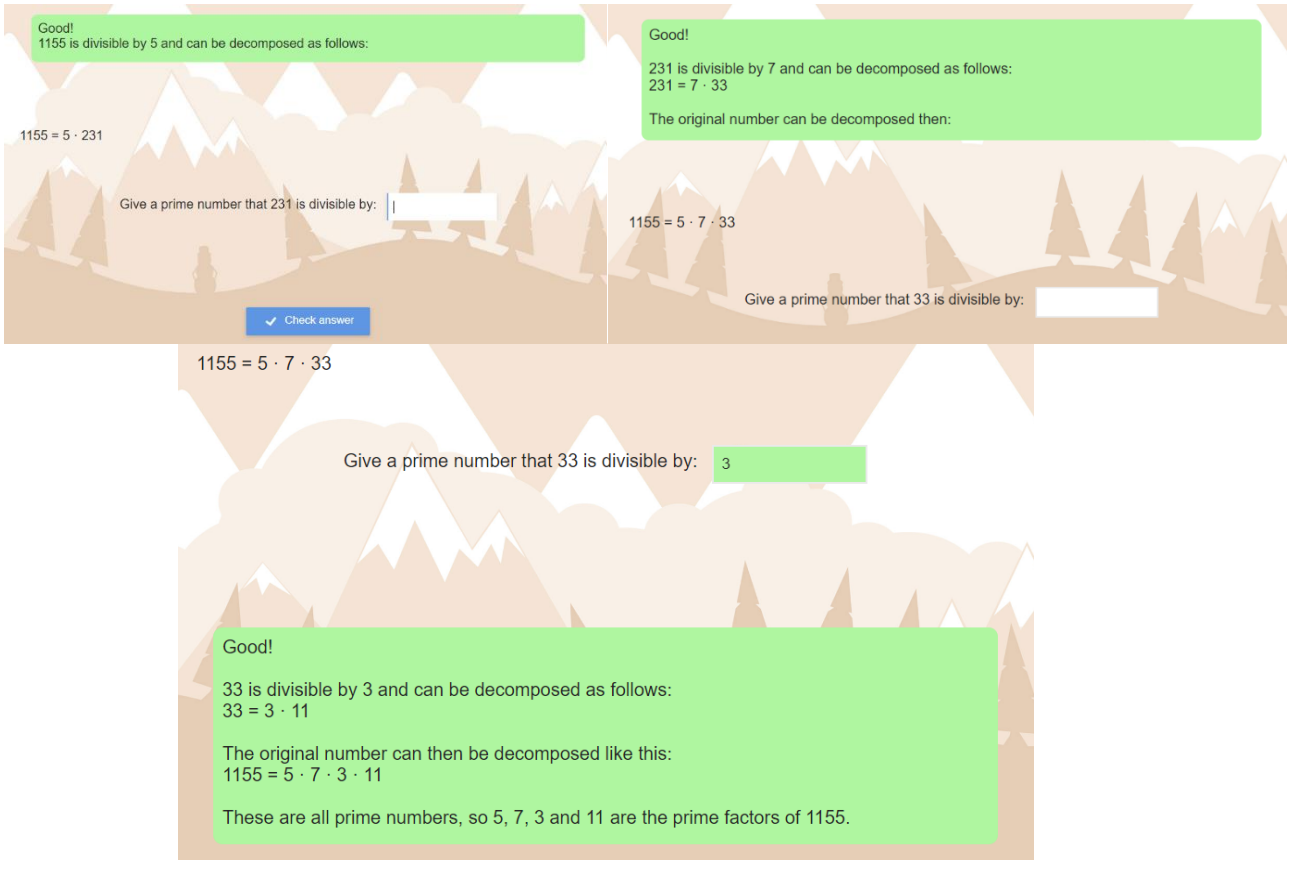
CategoryID: 78_30_02

Text: You are given a number and you have to submit a prime number that is divisible whit it.

Picture below shows an example:



After that the original number is decompose whit the prime number and whit this new decomposed number you have to give a new prime number to divide it whit and so on until it forms a prime number. Pictures below shows examples:



Task ID: HU_UNPL_18 **Title:** Array_counting3

Author: ZSP **Team:** HU

CategoryID: 78_30_02

CT topic: Data and Information > Data Structures > Array

Instructions for the teachers:

Start the Array-counting2 game, but now use instructions from this topic, like

- write a prime number in the 4th box
- write the square of the number from the 4th box in the box that is the square root of the original box's number
- Write a non-prime number on the whiteboard and ask students to
    - create the prime factorization and
    - write the number how many times a prime can be found in the number to the place signed by the prime

e.g: $18=2*3^2 \Rightarrow 0 \mid 1 \mid 2 \mid 0 \mid 0 \mid \ldots$

78_30_03

Description: Calculates lowest common denominator and greatest common divisor

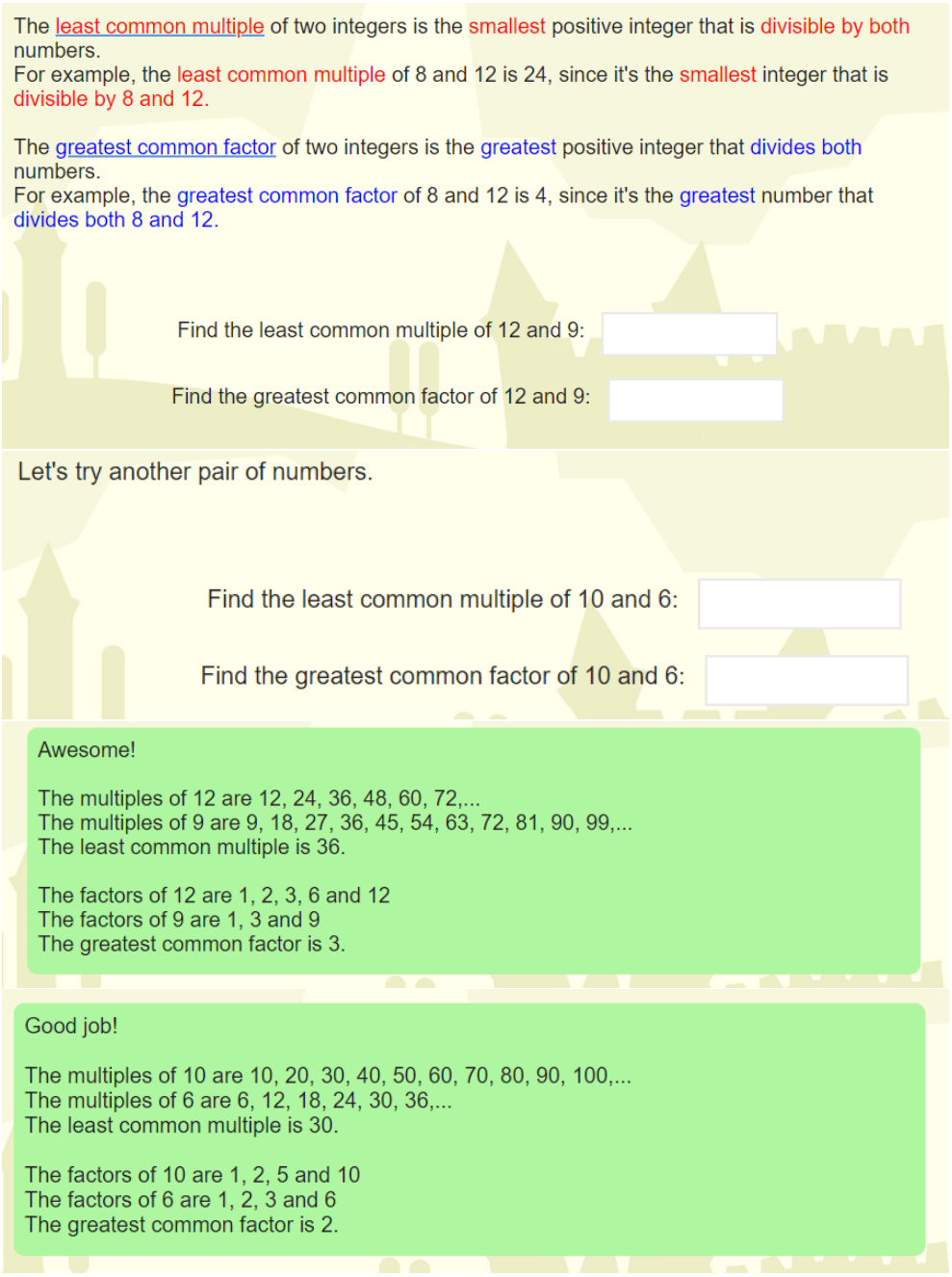
Task ID: 7_4.21 **Title:** Least common multiple and greatest common factor

Author: **Team:** Finnish Team

CategoryID: 78_30_03

Text: You have to find the least common multiple of two integers and the greatest common factor of two integers. The underlined text will take you to Wikipedia article about least common multiples and greatest common factors. When given a right answer it will give you an explanation.

Pictures below show examples:



78_30_04

Description: Power calculations with an integer exponent

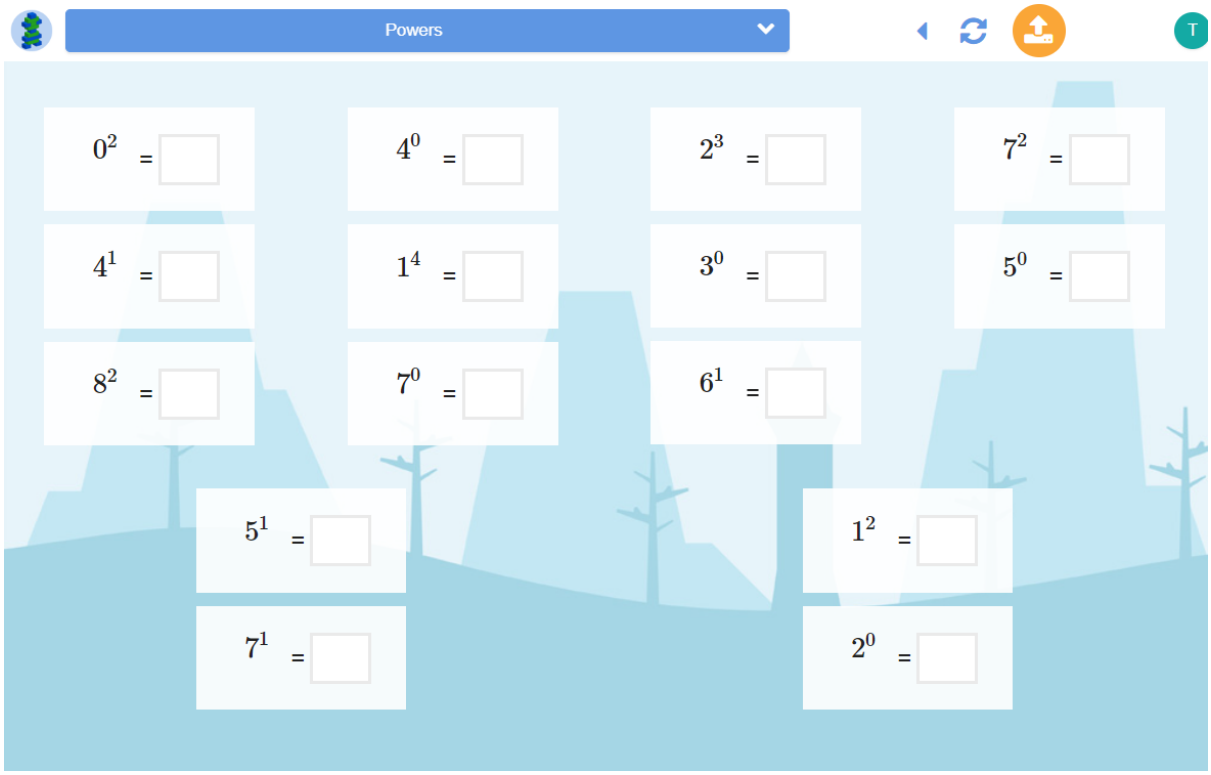
Task ID: 7_2.11 **Title:** Powers

Author: **Team:** Finnish Team

CategoryID: 78_30_04

Text: You have to solve equation.

Picture below shows an example:



78_30_05

Description: Simplifying power expressions

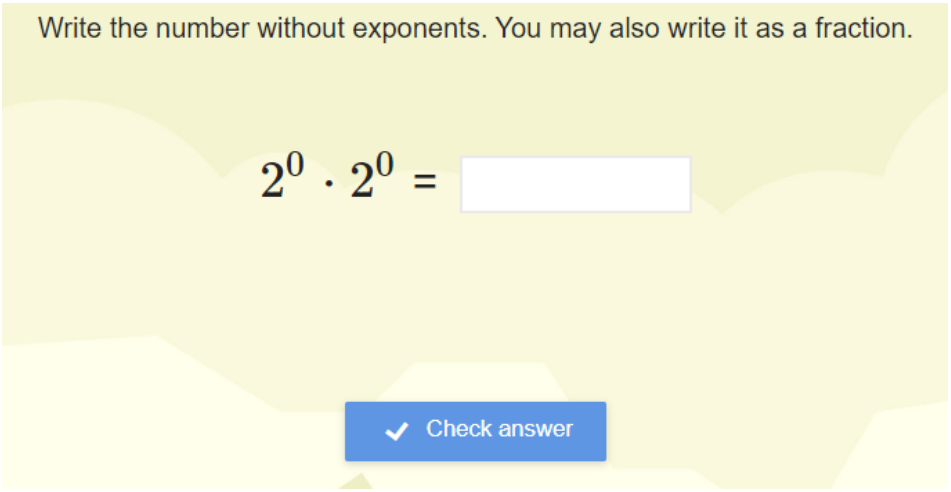
Task ID: 8_7.15 **Title:** Exponential expressions

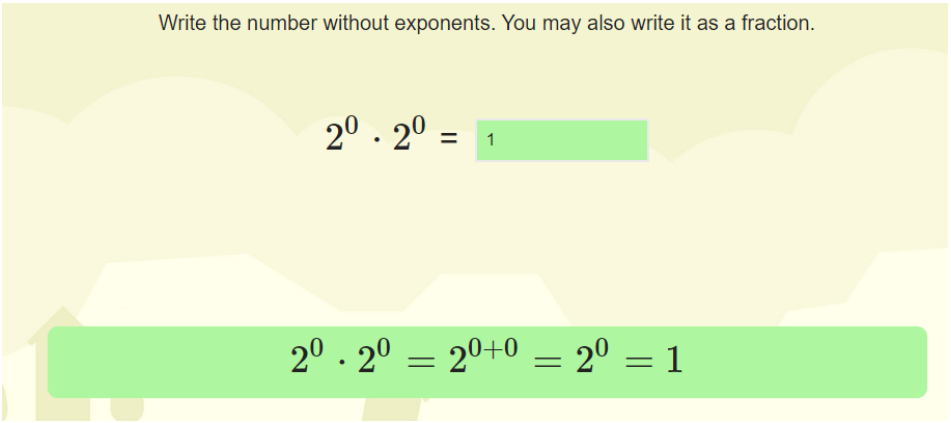
Author: **Team:** Finnish Team

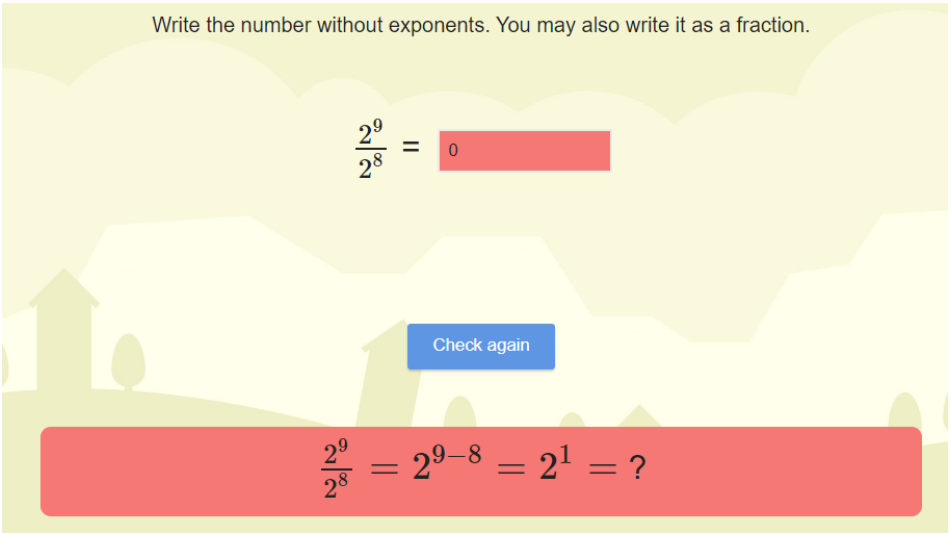
CategoryID: 78_30_05

Text: You have to solve equations. After you answer it will give you explanation or a hint.

Pictures below show examples:







78_30_06

Description: The square root of square numbers

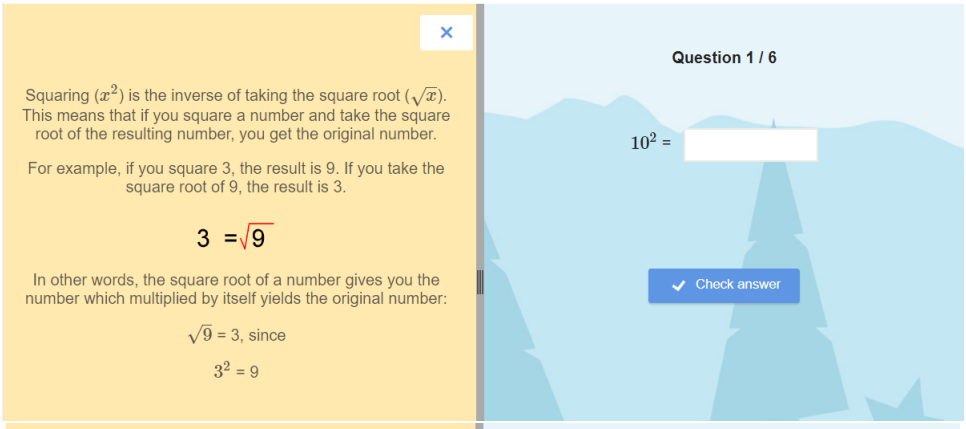
Task ID: 8_45.4 **Title:** Square and square root

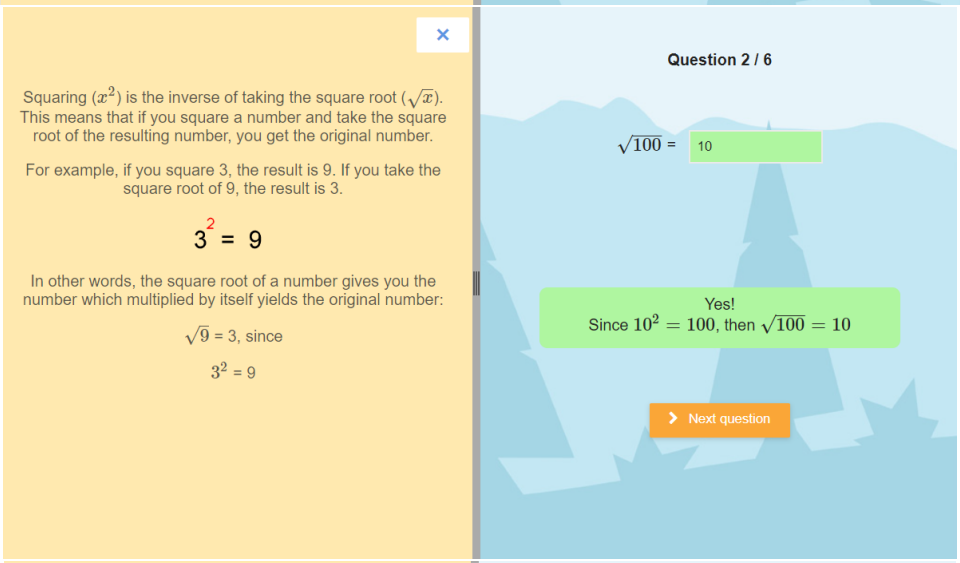
Author: **Team:** Finnish Team

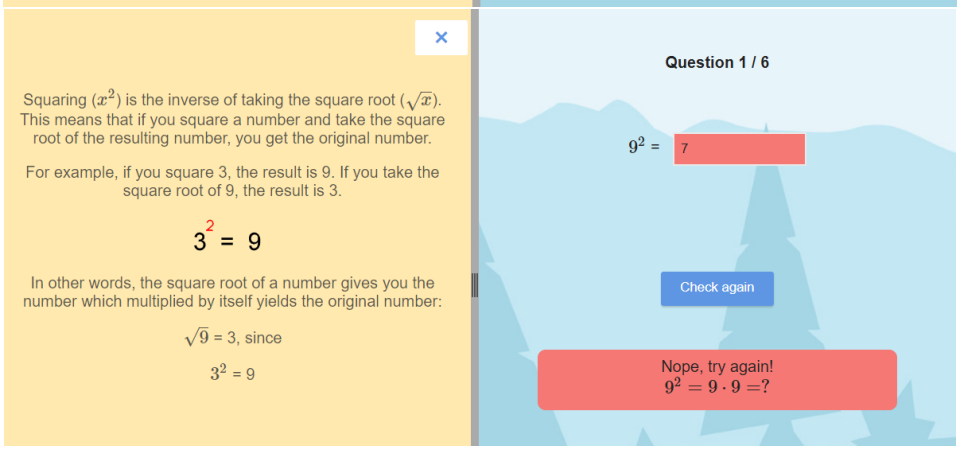
CategoryID: 78_30_06

Text: You have to solve equations. After you answer it will give you explanation or a hint.

Pictures below show examples:







78_31_01

Description: Recognition of patterns facilitating its computational interpretation

Task ID: HU_UNPL_12 **Title:** Ostomachoin puzzle

Author: ZSP **Team:** HU

CategoryID: 78_31_01

CT topic: Data and Information > Data Analysis > Pattern Recognition

Instructions for the teacher:

1. Print the basic set of the shapes and cut them out.
    a. You can also 3D print the shapes or make them out of salt dough!
2. Students needs to arrange the pieces into shapes
    a. Difficulty level: colored shapes, outlined shapes, including the black “shadow” shapes, single colored shapes.