Co-funded by the European Union

Translate and integrate learning activities

The results are based on the work within the project “Computational Thinking and Mathematical Problem Solving, an Analytics Based Learning Environment” (CT&MathABLE). Coordination: Prof. Valentina Dagienė, Vilnius University (Lithuania). Partners: Ankara University (Türkiye), Eötvös Loránd University (Hungary), Gedminų Progymnasium (Lithuania), KTH Royal Institute of Technology (Sweden), Özkent Akbilek Middle School (Türkiye), University of Basque Country (Spain), University of Turku (Finland),. The project has received co-funding by the Erasmus+.

These results are developed by Pál Sarmasági, Zsuzsa Pluhár, Javier Bilbao under WP2.

Aims and goals of the WP section

As it is mentioned in previous reports of this WP2 of the CT&MathABLE project, algebraic thinking and computational thinking share common ground in problem-solving skills and manipulating abstract concepts and symbols. For both types of thinking, different learning activities have been designed, developed, and run during the project in order to be integrated into the classes.

Integrating algebraic and computational thinking helps students gain a more holistic understanding of mathematics and its applications in various fields. This integration enables learners to apply algebraic concepts to programming and data analysis, and vice versa, enhancing their critical thinking and problem-solving abilities. Additionally, it helps students develop a more intuitive comprehension of abstract concepts and strengthens their capacity to reason logically and systematically.

Due to the different countries members of the consortium of the project, and to the different languages used in these countries, and for a better integration and usability of the learning activities, the consortium has developed an intensive work of translation of the learning activities from English to the following languages: Finnish (Finland), Hungarian (Hungary), Lithuanian (Lithuania), Spanish, Basque, Catalan (Spain), Swedish (Sweden), Turkish (Türkiye).

The process

The selection of tasks for the pilot had been carried out jointly by all partners. This collaborative decision-making ensured that the chosen activities reflected the project's goals, were suitable for the target age groups, and addressed the skills and competencies identified as priorities. By translating the jointly selected tasks and their accompanying teacher guidelines, the partners guaranteed that the pedagogical intentions behind each activity were preserved across all languages.

As part of the project, the Finnish partner played a key role in ensuring the readiness of the task environment for all participating countries. Their primary responsibility was to record the selected tasks in English within the project's designated digital platform. This included not only entering the problem statements but also formatting and organizing the accompanying descriptions, instructions, and guidance for the teachers who would be leading the activities.

The environment supports a wide range of task types, such as drag-and-drop activities, multiple-choice questions, and interactive problem-solving exercises, making it a flexible solution for digital education. Once tasks are created, they can be exported in file formats that are compatible with ViLLE, the chosen learning management system (LMS).

ViLLE, developed at the University of Turku, offers powerful and customizable learning analytics tailored to different projects. It is designed to support educational activities from primary school

to higher education and is already in use across many academic contexts. Its analytics tools give teachers detailed insights into student performance, helping them recognize learning trends, difficulties, and overall progress.

The Finnish partner carefully structured the environment to ensure that each task was accessible, easy to navigate, and consistently presented. This preparation allowed for a unified approach across all countries, ensuring that all participants worked from the same set of materials and guidelines. The environment included the student-facing tasks and on the common drive were collected the teacher support materials, such as pedagogical tips, activity introductions, and additional context necessary for successful classroom implementation.

Once the English versions of the tasks and instructions were finalized and uploaded, each participating country used the system's documentation to translate the materials into their respective national languages. This translation process was essential to ensure that teachers and students could work with materials in their native language, thus maintaining clarity and supporting the quality of the pilot implementation.

For task translation, the complete set of tasks was duplicated into language-specific folders managed by the project's lead user (Fig. 1).

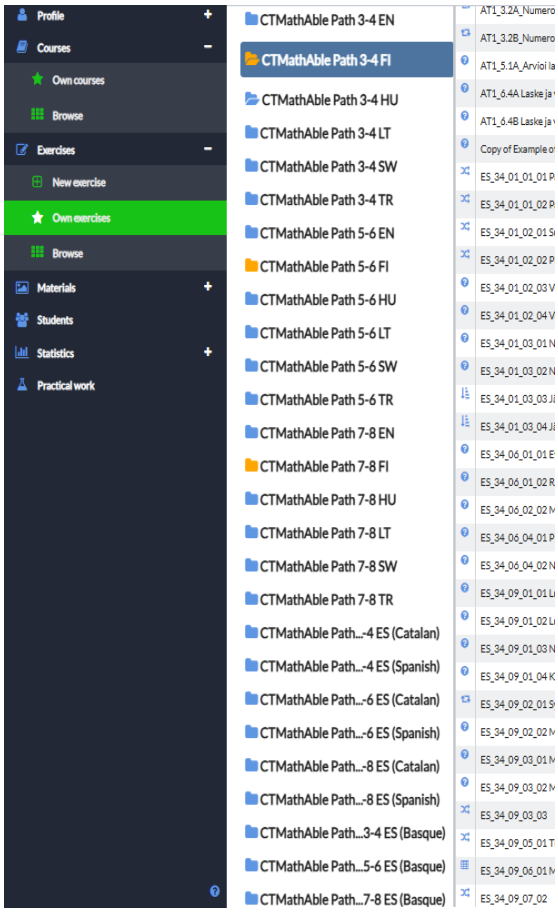


Figure1: The prepared folders for the translation

Each folder was then shared exclusively with a designated translator for that specific language (Fig. 2). This approach ensured that translators had access only to the versions they were responsible for, thereby reducing the risk of mix-ups or human errors.

Figure 2: Example perspective from Hungary regarding the assigned tasks and the areas where translation is needed.

ViLLE's task editing interface displays the original text strings and allows translators to replace them with their respective translations (Figs. 3, 4, 5, and 6). Before saving their modifications, translators are required to re-test the task to ensure that it functions correctly in the new language. This structured process helps maintain consistency, accuracy, and overall task quality across different language versions.

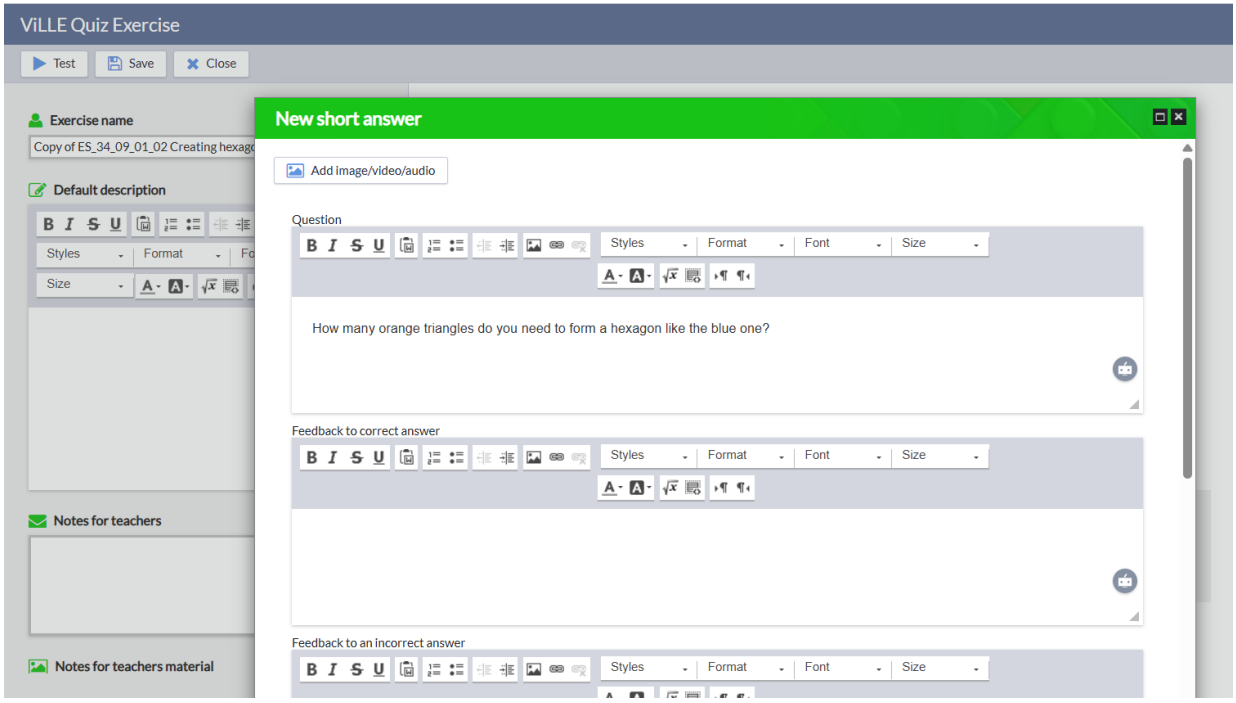


Figure 3: Example views of the ViLLE's system

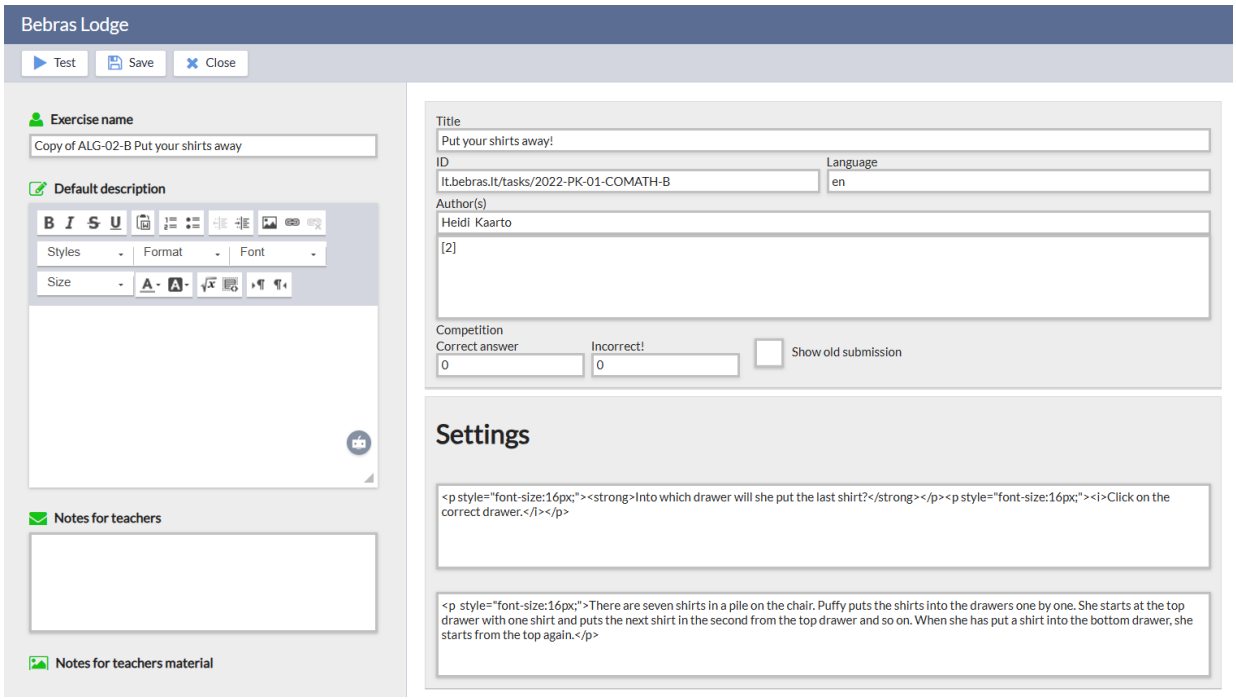


Figure 4: Example views of the task's translation environment

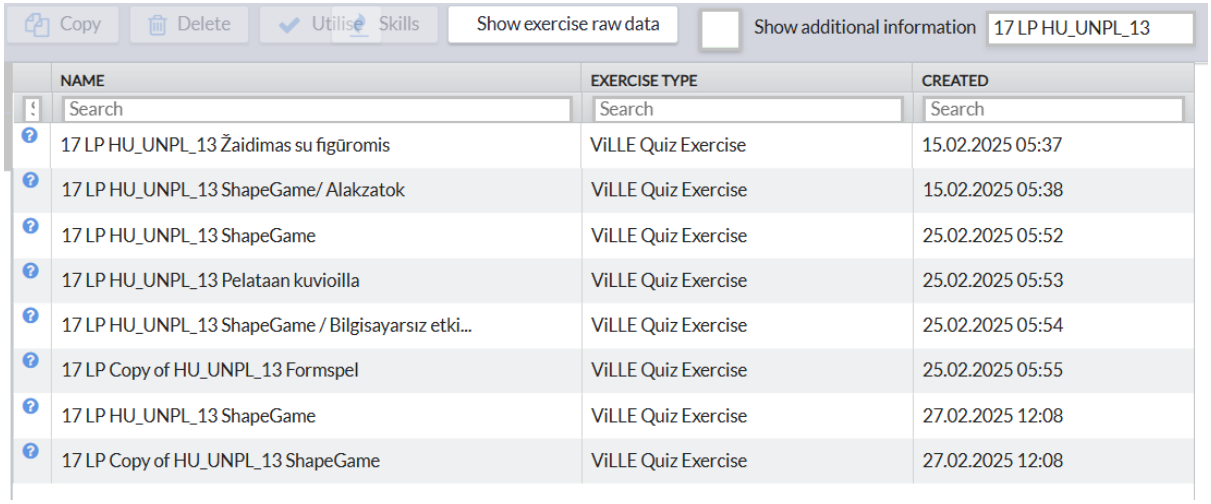


Figure 5: Example showing ViLLE search resulting in all the translations of one of the tasks

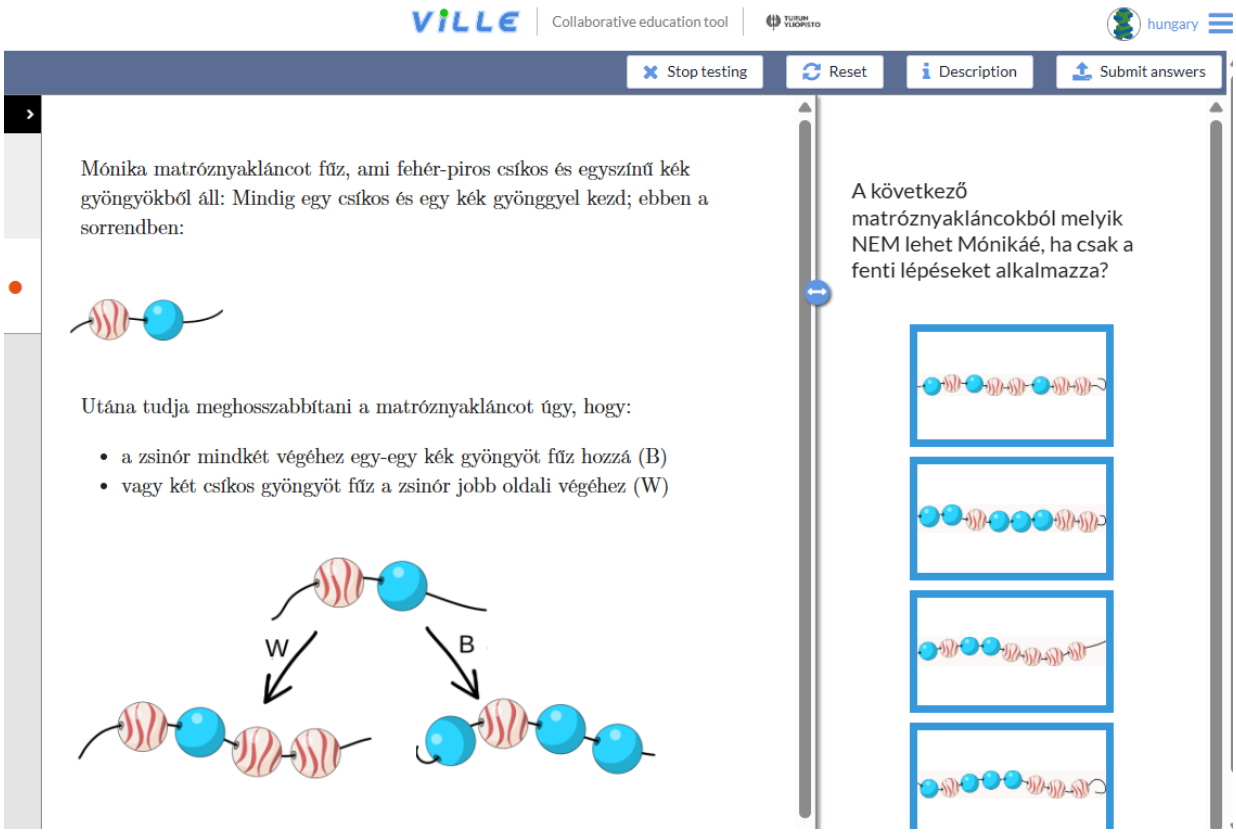


Figure 6: Before saving their modifications, translators are required to re-test the task

Unplugged activities

We provided the unplugged activities to the teachers in PDF format so they could be easily accessed and used in the classroom. These materials were uploaded into ViLLE to ensure they could be integrated with the platform's learning environment. Still, they were also shared separately to give teachers the flexibility to use them offline or outside the system if needed.

Hungary coordinated the preparation of the original documents, which included both the pictures and texts needed for the activities. These complete packages were then distributed to all project partners. Each partner was responsible for creating translations in their own language, and to keep the work organized, every translation was stored in a separate subfolder within the shared project structure (Fig. 7). This way, the multilingual versions remained clearly structured and easy to find, ensuring that the unplugged activities could be adapted and used in different educational contexts across countries.

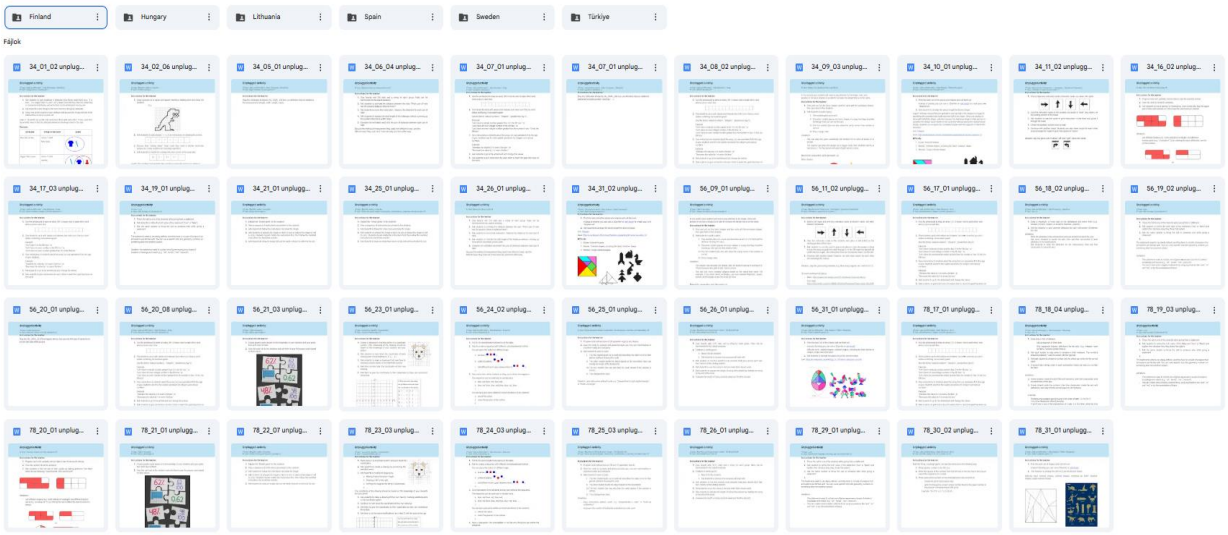


Figure 7: The common folder with the unplugged activities and the subfolders supporting the translation

Instructions

During the pilot, the translated teacher descriptions played a crucial role. They provided guidance on how to introduce the activities, how to facilitate them effectively, and how to support students in solving the problems. These materials also included hints on how to adapt tasks for different classroom situations and how to connect them to various curriculum areas. The unified yet locally adapted documentation supported teachers in delivering a coherent pilot experience across all participating countries.

Welcome to our learning activities pilot.

During the pilot phase, feel free to integrate as many activities as possible into your educational process. You don't need to complete all tasks within a single week or on one topic. Don't forget, our goal is to keep students motivated. To enhance motivation, we encourage you to provide feedback and track their progress.

Please read the system ***instructions*** carefully (FI team - link).

The pilot is available between ***March 20th and May 2nd***.

We have also developed unplugged activities with teacher instructions—please incorporate these into your lessons as needed. The other tasks can be assigned to students either during class or as individual homework.

After completing the pilot (by May 12th), please share your feedback by filling out the following questionnaire: <link>.

Thank you for being part of the **Erasmus CTMathAble** project and for piloting our learning activities!

Figure 8: Example instruction text for teachers

Conclusion

In conclusion, the Finnish partner's work in preparing and uploading the English task set and environment, combined with the coordinated translation efforts by all partners, laid the foundation for a smooth and consistent pilot phase. This process ensured both fidelity to the project's shared objectives and the flexibility for each country to adapt the materials to their local educational context.

The demo link, prepared based on the translated learning paths, can be accessed:

Finland	Try CT&MathAble, Suomi	https://ville.utu.fi/?demo=start&dk=teCdwDbGLBsW
Hungary	Try CT&MathAble, Hungary	https://ville.utu.fi/?demo=start&dk=TEb8M7NfAyFV
Lithuania	Išbandyk CT&MathAble	https://ville.utu.fi/?demo=start&dk=janhhT5XXVRi
Sweden	Try CT&MathAble, Sverige	https://ville.utu.fi/?demo=start&dk=ousVY3vs9CBt
Türkiye	Try CT&MathAble, Türkiye	https://ville.utu.fi/?demo=start&dk=HbpK4srF2Ktz
Spain - Spanish	Try CT&MathAble, Spain - Spanish	https://ville.utu.fi/?demo=start&dk=ufqeYHCb2SvS
Spain - Catalan	Try CT&MathAble, Spain - Catalan	https://ville.utu.fi/?demo=start&dk=ohpg37kUE46z
Spain - Basque	Try CT&MathAble, Spain - Basque	https://ville.utu.fi/?demo=start&dk=BJEvguXxtSAH

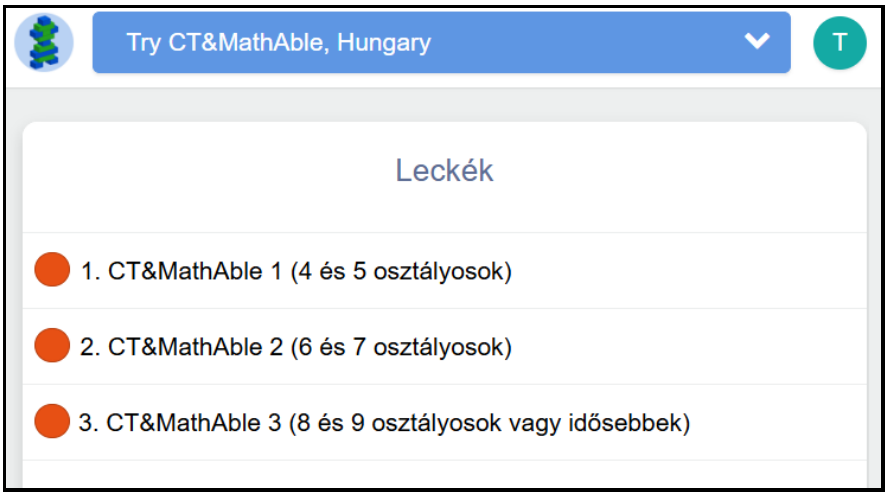


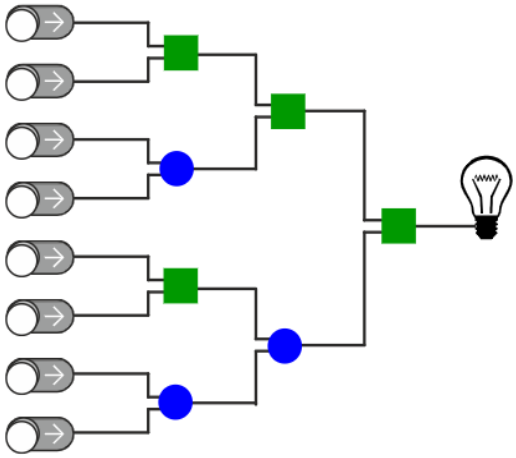
Figure 9: Student view of the system - Homepage example in Hungarian

Appendix A: An example of a translated task in English and its corresponding translations in partner languages.

Hungarian

Kapcsold fel az izzót

A „Kapcsold fel az izzót” játékban 8 kapcsoló kapcsolható be- illetve ki. Ezekből a kapcsolókból vezetékek vezetnek néhány alkotóelemen keresztül egy villanykörtéhez.



A ■ alkotóelem kimeneti vezetéke csak akkor van FELKAPCSOLVA, ha MINDKÉT becsatlakozó vezeték fel van kapcsolva.

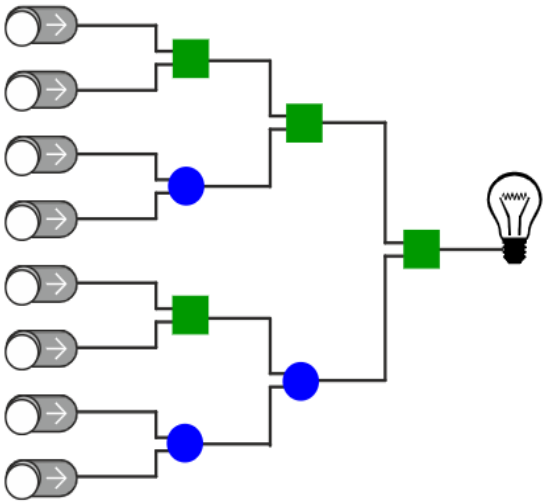
A ● alkotóelem kimeneti vezetéke csak akkor van FELKAPCSOLVA, ha a becsatlakozó vezetékek közül PONTOSAN EGY van felkapcsolva.

Melyik kapcsolóknak kell FELKAPCSOLVA lenniük, hogy a végén a villanykörte világítson? Kattints a kapcsolókra a fel-, illetve lekapcsolásukhoz!

Finnish

04 LP ALG-10-B Valot päälle

Pelissä "Valot päälle" on 8 kytkintä, joita voi käyttää. Näistä kytkimistä lähtee johtoja, jotka kulkevat joidenkin komponenttien läpi ja lopulta hehkulamppuun.



Komponentti ■ *on PÄÄLLÄ vain silloin, kun MOLEMMAT siihen tulevista johdoista ovat PÄÄLLÄ.*

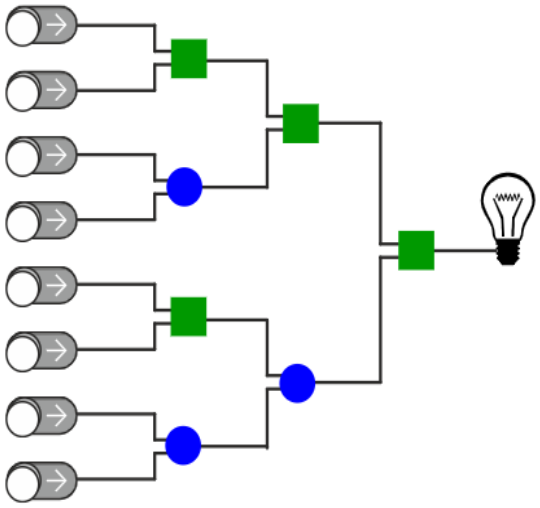
Komponentti ● *on PÄÄLLÄ, kun täsmälleen YKSI siihen tulevista johdoista on PÄÄLLÄ*

Mitkä kytkimet on oltava päällä, jotta hehkulamppu palaisi? Kytke kytkimet päälle napsauttamalla niitä.

Lithuanian

Įjunk šviesą

Žaidime „Įjunk šviesą" yra 8 valdomi jungikliai. Iš šių jungiklių išvesti laidai eina per tam tikrus elementus ir galiausiai pasiekia lemputę.



Elementas ■ įsijungia tik tada, kai įjungti ABU įeinantys laidai.

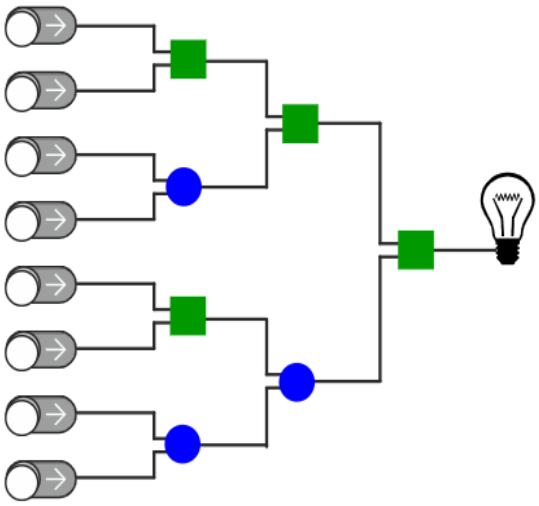
Elementas ● įsijungia, kai įjungtas tik VIENAS iš įeinančių laidų.

Kurie jungikliai turi būti įjungti, kad lemputė šviestų? Spustelėkite jungiklius, kad juos įjungtumėte.

Sweden

Slå på ljuset

Spelet "Slå på ljuset" har 8 strömbrytare som kan användas. Från strömbrytarna leds ledningar genom vissa komponenter och tillslut till en glödlampa.



Strömmen från komponenten ■ är PÅ enbart när BÅDA inkommande ledningar är PÅ.

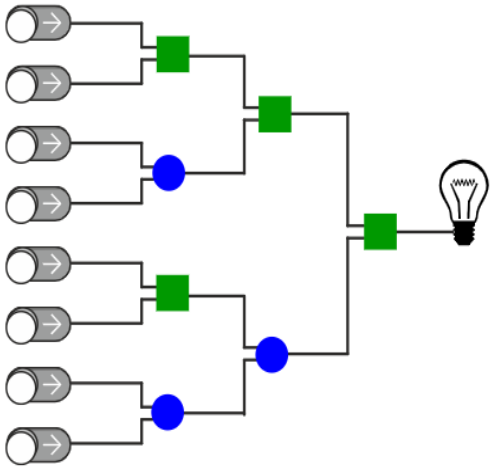
Strömmen från komponenten ● är PÅ när exakt EN av de inkommande ledningarna är PÅ.

Vilka strömbrytare behöver vara PÅ för att glödlampan ska lysa?Klicka på strömbrytarna för att slå på dem.

Spanish

04 LP Copy of ALG-10-B Encender la bombilla

El juego "Encender la bombilla" tiene 8 interruptores. De los interruptores salen cables, que pasan por algunos componentes y finalmente llegan a una bombilla



El cable de salida del componente ■ es ON solo cuando LOS DOS cables entrantes están en ON.

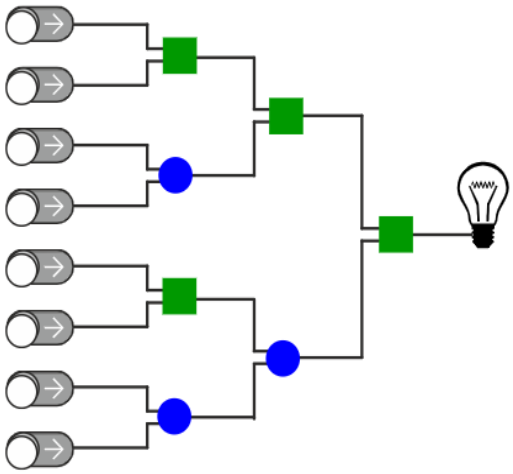
El cable de salida del componente ● es ON solo cuando UNO DE LOS DOS cables entrantes está en ON.

¿Qué interruptores deben estar en ON para que la bombilla esté encendida? Haz click en los interruptores para ponerlos en ON.

Catalan

04 LP Copy of ALG-10-B Llums enceses

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.*

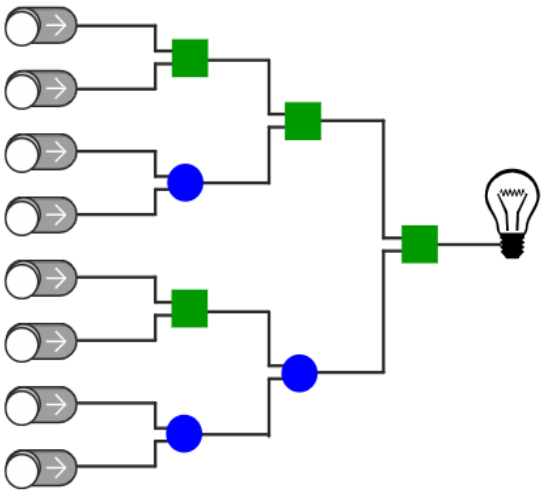
The output from the component ● *is ON when exactly ONE of the incoming wires is ON.*

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

Basque

04 LP ALG-10-B Argia piztu

"Argia piztu" jokoak 8 etengailu ditu. Etengailu horietatik kableak ateratzen dira, osagai batzuetatik pasatzen dira eta azkenik bonbilla batera iristen dira.



■ *osagaiaren irteera-kablea ON da, soilik sartzen diren BI kableak ON egoeran daudenean.*

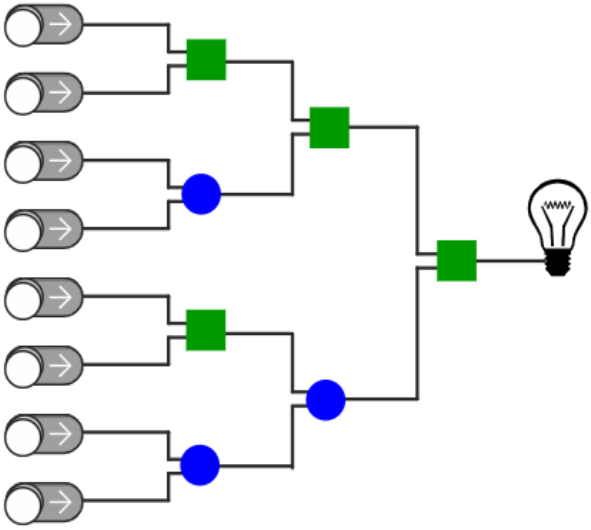
● *osagaiaren irteera ON da, sartzen diren kableetako BAT bakarrik ON dagoenean.*

Zein etengailuk egon behar dute ON bonbillako argia piztuta egoteko?
Klik etengailuak pizteko.

Türkiye

Lambayı Yakma

"Lambayı yakma" adlı oyunda çalıştırılabilen 8 anahtar vardır. Bu anahtarlardan bazı bileşenlere ve son olarak lambaya giden kablolar çıkar.



■ *Bileşenin çıkışı SADECE her iki gelen kablo AÇIK olduğunda AÇIK durumdadır.*

● *Bileşenin çıkşı SADECE gelen kablolardan BİRİNİN AÇIK olduğu durumda AÇIK olur.*

Lambanın açık olması için hangi anahtar açık olmalıdır? Anahtarları açmak için tıklayınız.

Appendix B: An example unplugged activity in English and in translated partner languages

Unplugged activity

CT topic: Data and Information > Data Analysis > Pattern Recognition
AT topic: Pattern usage/recognition-31

Instructions for the teacher:

1. Print the basic set of the pieces and shapes and cut them out.

   Instead of printing you can use a 3Dprinter or salt dough to create your own Tangram set.

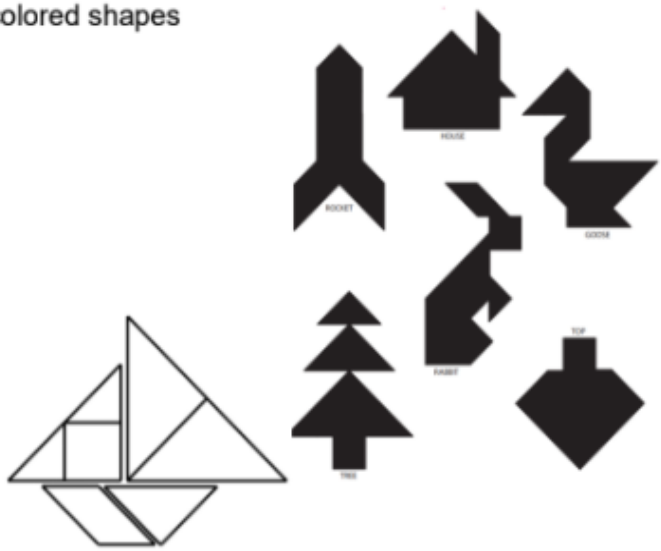
2. Ask students to arrange the pieces to get the desired shape.

Link: Tangram

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

Difficulty:

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



Hungarian

Számítógép nélküli tevékenység

CT topic: Data and Information > Data Analysis > Pattern Recognition
AT topic: Pattern usage/recognition-31

Utasítások a tanárnak:

1. Nyomtassa ki a formákat és alakzatokat, majd vágja ki őket.

   Nyomtatás helyett használhat 3D-nyomtatót vagy sógyurmát is, hogy elkészítse saját Tangram-készletét.

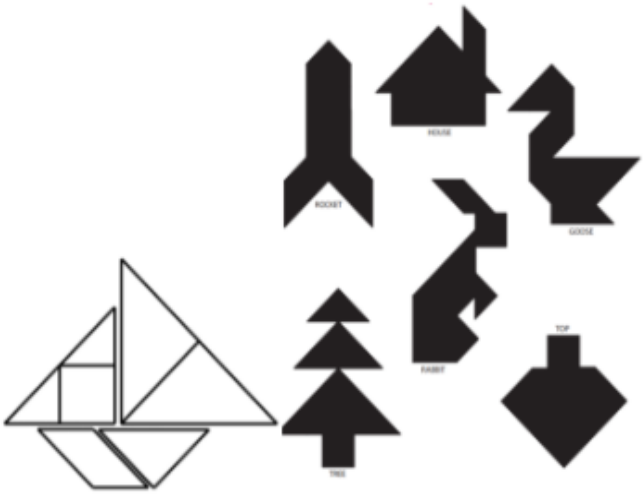
2. Kérje meg a tanulókat, hogy rendezzék el a darabokat úgy, hogy a kívánt formákat kapják.

Link: Tangram

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

Nehézség:

1. Könnyebb: *Színes formák*
2. Nehezebb: *Körvonalazott formák, beleértve a fekete „árnyék" alakzatot is*
3. Legnehezebb: *Egyszínű formák*



Finnish

Toiminnallinen tehtävä

CT-aiheet: Tieto ja informaatio > Data-analyysi > Hahmontunnistus
AT-aiheet: Hahmontunnistus

Ohjeet opettajalle:

1. Tulosta Tangram-peli ja leikkaa palat irti toisistaan.

   Tulostamisen sijaan Tangram-pelin voi 3D-tulostaa tai muovailla taikataikinasta (salt dough).

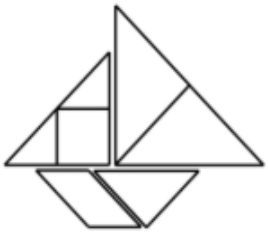
2. Oppilaiden tehtävänä on järjestää palat annetun kuvion muotoon.

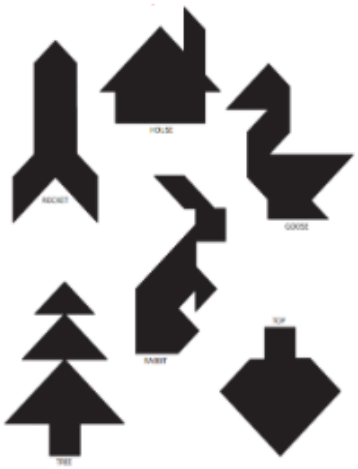
Linkki: Tangram

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

Vaikeusasteen vaihtelu mallikuvan avulla:

1. Helppo malli: Malli koostuu eri värisistä palasista.
2. Haastavampi malli: Malli esitetään sekä ääriviivoin esitettyinä palasina että yhtenäisenä mustana varjokuvana.
3. Haastavin malli: Malli on yhtenäinen ja yksivärinen varjokuva.





Lithuanian

Informatika be kompiuterio

Informatinio mąstymo tema: duomenys ir informacija, duomenų analizė, šablonų atpažinimas
Algebrinio mąstymo tema: konstrukcijos ir transformacijos

Instrukcija mokytojui:

1. Atspausdinkite pagrindinį detalių ir formų rinkinį, iškirpkite. Vietoj spausdinimo galite naudoti 3D spausdintuvą arba druskos tešlą ir sukurti savitą tangramos rinkinį.
2. Paprašykite mokinių sudėlioti figūras, kad gautų norimą formą.

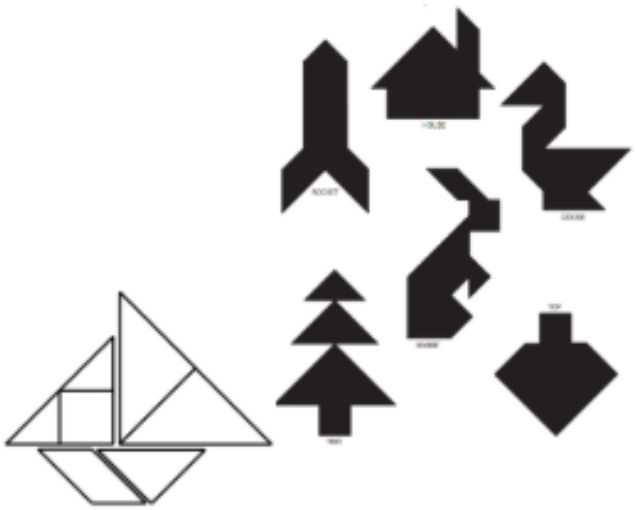
2 lygis: pasirinkite simetriškas figūras ir paprašykite pusės mokinių iš pradžių nustatyti simetriją ir sukurti tik vieną figūros pusę. Kai vienas mokinys baigs pusę figūros, paprašykite jo perduoti šią pusę figūros savo partneriui, kad šis užbaigtų konstrukciją remdamasis vien simetrija ir nematydamas pradinės figūros. Galiausiai mokiniai gali palyginti baigtas figūras su originalais ir patikrinti jų tikslumą.

Nuoroda: Tangram

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

Sudėtingumo lygis:

1. Lengvas: Tik spalvotos figūros
2. Vidutinis: Juodos figūros, įskaitant juodą „šešėlio“ formą.
3. Sunkus: Vienos spalvos figūros



Spanish

Unplugged activity

Tema de CT: Datos e información > Análisis de datos > Reconocimiento de patrones
Tema de AT: Uso de patrones/reconocimiento-31

Instrucciones para el docente:

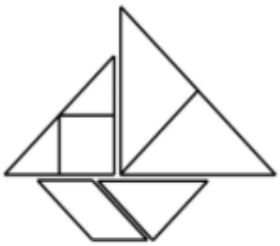
1. Imprime el conjunto básico de piezas y formas y recórtalas.
   En lugar de imprimir, puedes usar una impresora 3D o masa de sal para crear tu propio conjunto de Tangram.
2. Pide a los estudiantes que ordenen las piezas para obtener la forma deseada.

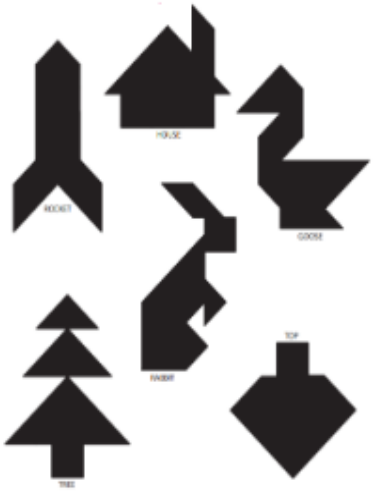
Link: Tangram

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

Dificultad:

1. Más fácil: formas de colores
2. Más difícil: formas delineadas, incluida la forma de "sombra" negra
3. Lo más difícil: formas de un solo color





Basque

Unplugged activity

CT topic: Data and Information > Data Analysis > Pattern Recognition
AT topic: Pattern usage/recognition-31

Irakaslearentzako jarraibideak:

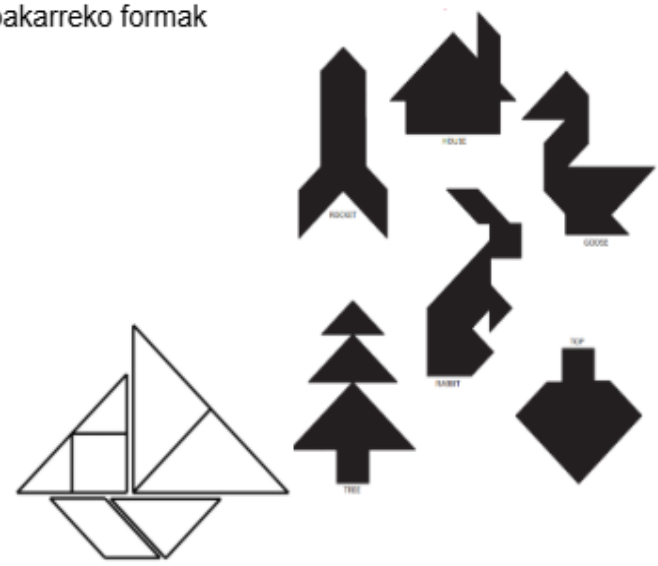
1. Inprima ezazu piezen eta oinarrizko formen multzoa, eta, moztu.
2. Eskatu ikasleei piezak ordenatzeko, nahi duten forma lortzeko.

Link: *Tangram*

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

Zailtasuna:

1. Errazagoa: kolore-formak
2. Zailagoa: forma delineatuak, "itzal" beltzaren forma barne
3. Zailena: kolore bakarreko formak



Sweden

Unplugged activity

CT topic: Data and Information > Data Analysis > Pattern Recognition
AT topic: Pattern usage/recognition-31

Instruktioner för läraren:

1. Skriv ut grunduppsättningen av bitarna och formerna och klipp ut dem.

   Istället för att skriva ut kan du använda en 3D-skrivare eller trolldeg för att skapa ditt eget Tangram-set.

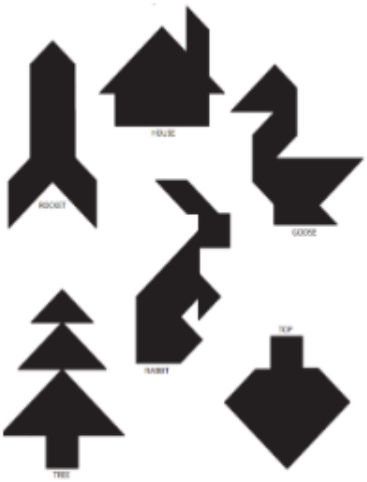
2. Be eleverna att arrangera bitarna för att få fram den önskade formen

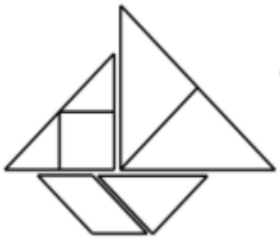
Länk: Tangram

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

Svårighetsgrad:

1. Lättare: Färgade former
2. Svårare: Former med konturer, inklusive den svarta "skuggformen"
3. Svårast: Enfärgade former





Türkiye

Bilgisayarsız etkinlik

CT Konusu: Veri ve Bilgi > Veri Analizi > Desen Tanıma
AT Konu: Desen Kullanımı/Tanıma-31

Öğretmen için yönergeler:

1. Temel parça ve şekil setini yazdırın ve kesin.
   Yazdırmak yerine, 3D yazıcı veya tuz hamuru kullanarak kendi Tangram setinizi oluşturabilirsiniz.
2. Öğrencilerden, istenilen şekli elde etmek için parçaları sıralamalarını isteyin.

Link: Tangram

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

Zorluk seviyesi:

1. Daha kolay: renkli şekiller
2. Daha zor: siyah 'gölge' şekli dahil, çizilmiş şekiller
3. En zor: tek renkli şekiller