asymptote

ASYMPTOTE Manual

ASYMPTOTE
Adaptive Synchronous Mathematics learning PaThs
for Online Teaching in Europe

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Chapter 1:
Introduction

1.1. The ASYMPTOTE Idea

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of the European Union

Motivation & Background

- ## COVID-19 pandemic

  - „Emergency Remote Teaching (ERT)"
    (Hodges et al., 2020)

  - Teachers facing lack of technical training
    (Barlovits et al., 2021)

  - Increased use of basic reproduction tasks &
    lack of feedback (Barlovits, 2021; Drijvers et
    al. 2021)

ERT and its challenges:
- Technique & application
- Diagnosis & support
- No personal contact
- Reproduction tasks

(Aldon et al., 2021; Barlovits et al., 2021;
Drijvers et al. 2021)

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- ## MCM@Home concepts

  - First concept for using MathCityMap for
    online teaching & learning

ERT and its challenges:
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MCM

(Ludwig & Jablonski, 2021)

MCM@Home

(Barlovits et al., 2021)

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Motivation & Background

- ## COVID-19 pandemic

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    al. 2021)

- ## MCM@Home concepts

  - First concept for using MathCityMap for
    online teaching & learning

- ## ASYMPTOTE-Projekt

  - Consideration of criteria for the
    development of online learning platforms
    (Salmon, 2012)

ERT and its challenges:
- Technique & application
- Diagnosis & support
- No personal contact
- Reproduction tasks

(Aldon et al., 2021; Barlovits et al., 2021;
Drijvers et al. 2021)

MCM

(Ludwig & Jablonski, 2021)

MCM@Home

(Barlovits et al., 2021)

ASYMPTOTE
- Complete distance learning
- "Blended Learning"
- Homework
- Exam preparation

(Barlovits et al, 2022)

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The ASYMPTOTE concept

- ## ASYMPTOTE
  - Adaptive Synchronous Mathematics Learning Paths for Online Teaching in Europe
  - Erasmus+ project (DE, GR, IT, PT, ES)

- ## 2-component system
  - Goal: creation and editing of learning graphs (LG)
  - Web portal: creation of adaptive LG by teacher
  - App: differentiated & gamified use of LG by learners

- ## Synchronous handling of LG
  - Use & further development of the MathCityMap Digital Classroom

ASYMPTOTE
- Complete distance learning
- "Blended Learning"
- Homework
- Exam preparation

(Barlovits et al, 2022)

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The ASYMPTOTE partners

The Learning Graph concept

- ## Computer-based learning environments (Lichti & Roth, 2018; Greene et al., 2011):

  - Internet-based and pre-structured learning environment
  - Sequence of coordinated work assignments
  - Self-acting and self-responsible handling by learners
    → Enables choice of personal learning path

- ## ASYMPTOTE Learning Graph

  - Provision of a pre-structured learning environment
  - Learners can find their own way within the learning environment
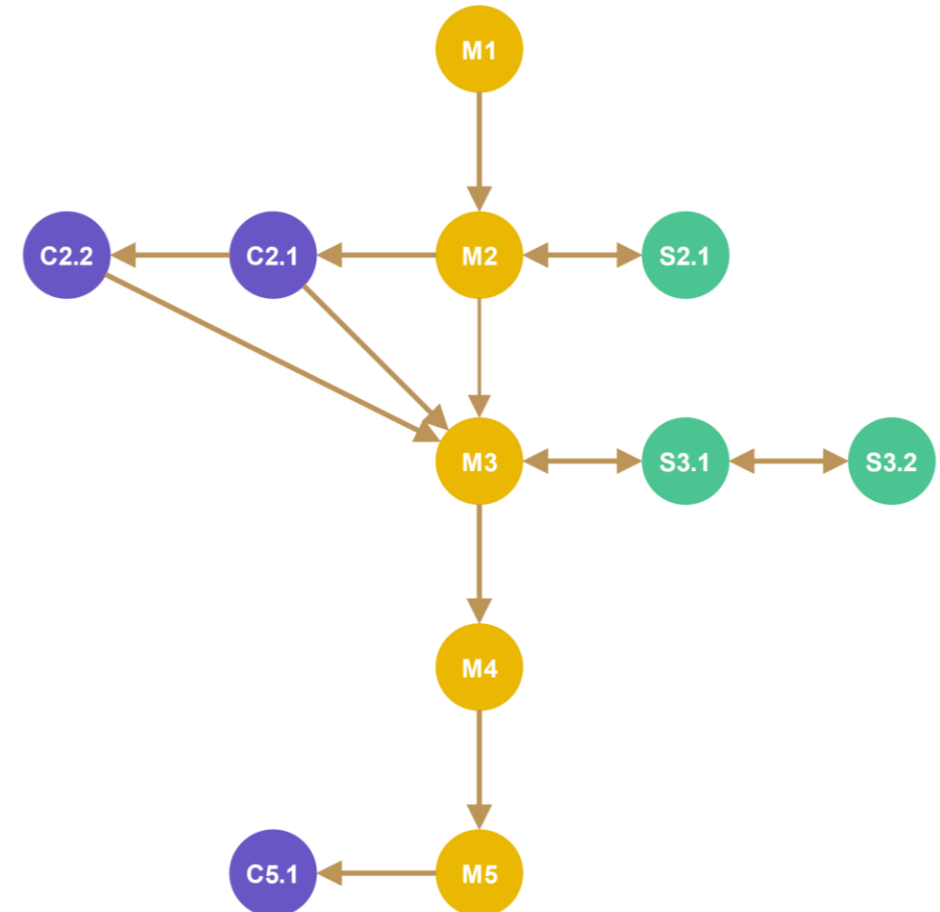
The Learning Graph concept

- ## Main tasks
  - Compulsory part
  - Goal: "Solve as many main tasks as possible!"

- ## Challenge tasks
  - Unlock by solving the previous task
  - Voluntarily accessible

- ## Support tasks
  - Voluntarily accessible

- ## Adaptivity & Autonomy
  - LG unfolds according to work progress & performance level
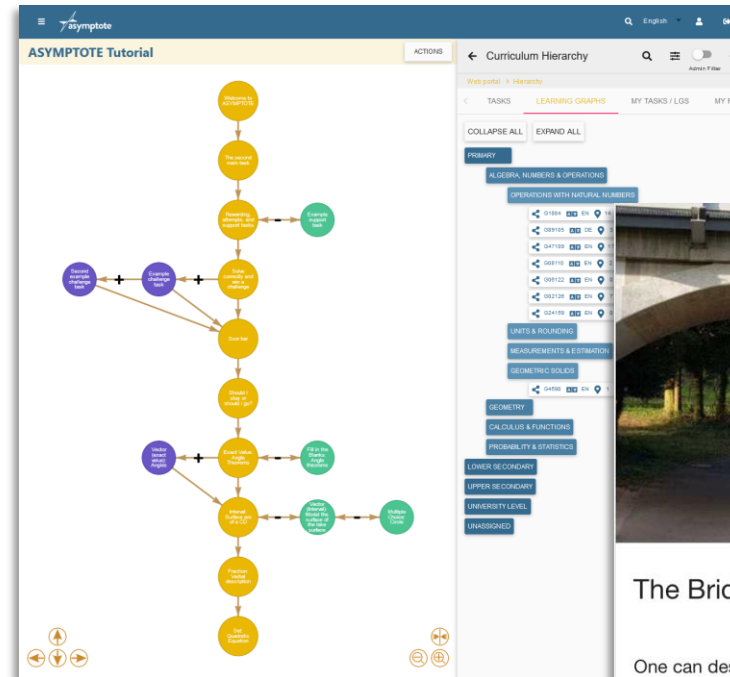 - At the same time, the idea of freedom of choice is preserved

The Learning Graph concept

Example of an individual learning path

- ## Main tasks
  - Compulsory part
  - Goal: "Solve as many main tasks as possible!"

- ## Challenge tasks
  - Unlock by solving the previous task
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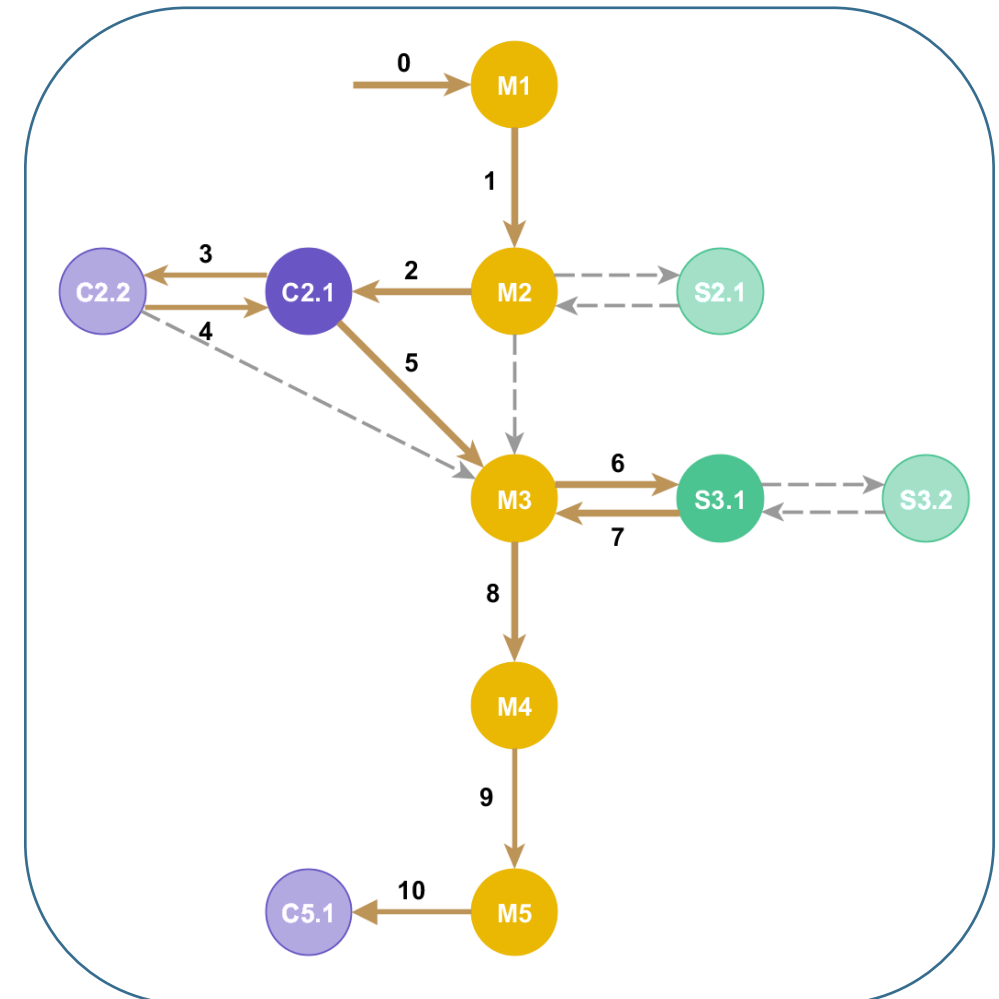
Chapter 1:
Introduction

1.2. Key functionalities of ASYMPTOTE

The web portal

- Workspace of the teacher
- Selection & creation of tasks
  - 9 task formats, including exact value, multiple choice, fill-in-the-blank, …
- Learning Graph selection & creation
- Community platform
  - Share & publish content you create
- Digital classroom

The Bridge

One can describe the railway bridge as quadratic function $f(x) = ax^2 + bx + c$. Calculate the value of the factor a in the term of the quadratic function.

Note: One meter is equal to one unit of length. Round to two decimal numbers.

quadratic function   modelling   measure

Sprache

English (Default)

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The Digital Classroom

- Features
  - Class overview
  - Evaluation function
  - Communication function

- Update 2023
  - Digital classroom as a representation of the class unit
    → Handling of <u>multiple</u> LG possible
  - Advanced analyses for each LG
  - Long-term analyses by comparing multiple LGs within a Digital Classroom

The app

- Workspace of the learner

- No registration necessary
  - Accessing an LG or Digital Classroom by code

- Working on a Learning Graph
  - Gamification: points
  - Can be interrupted and continued later
  - Several times possible
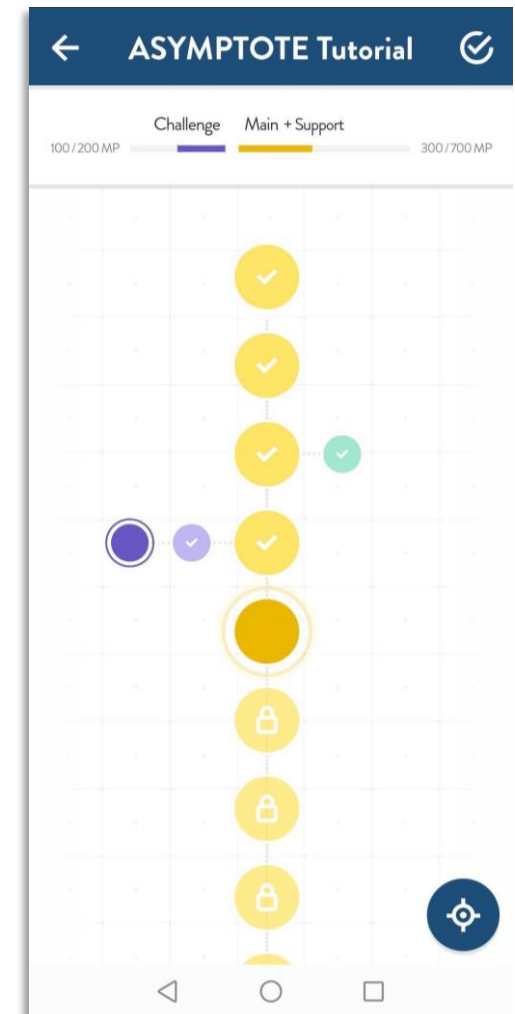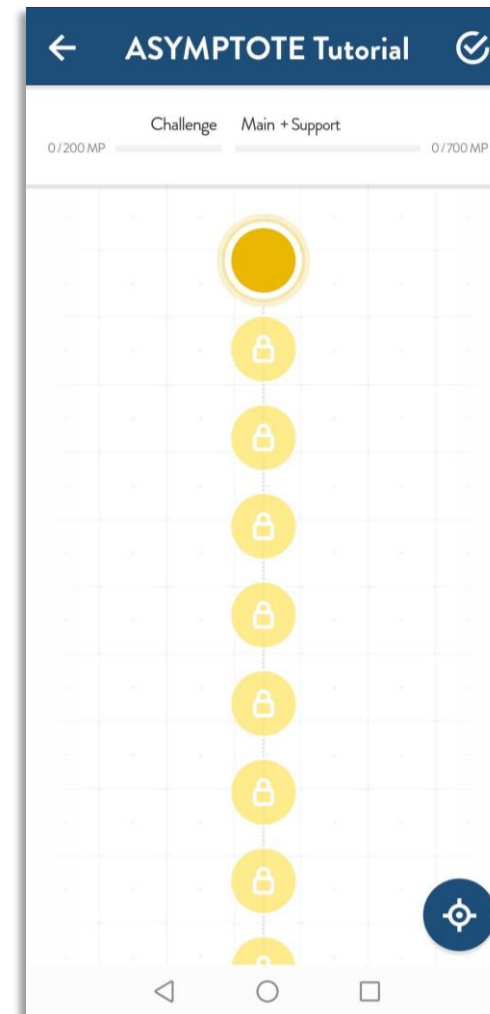
The app
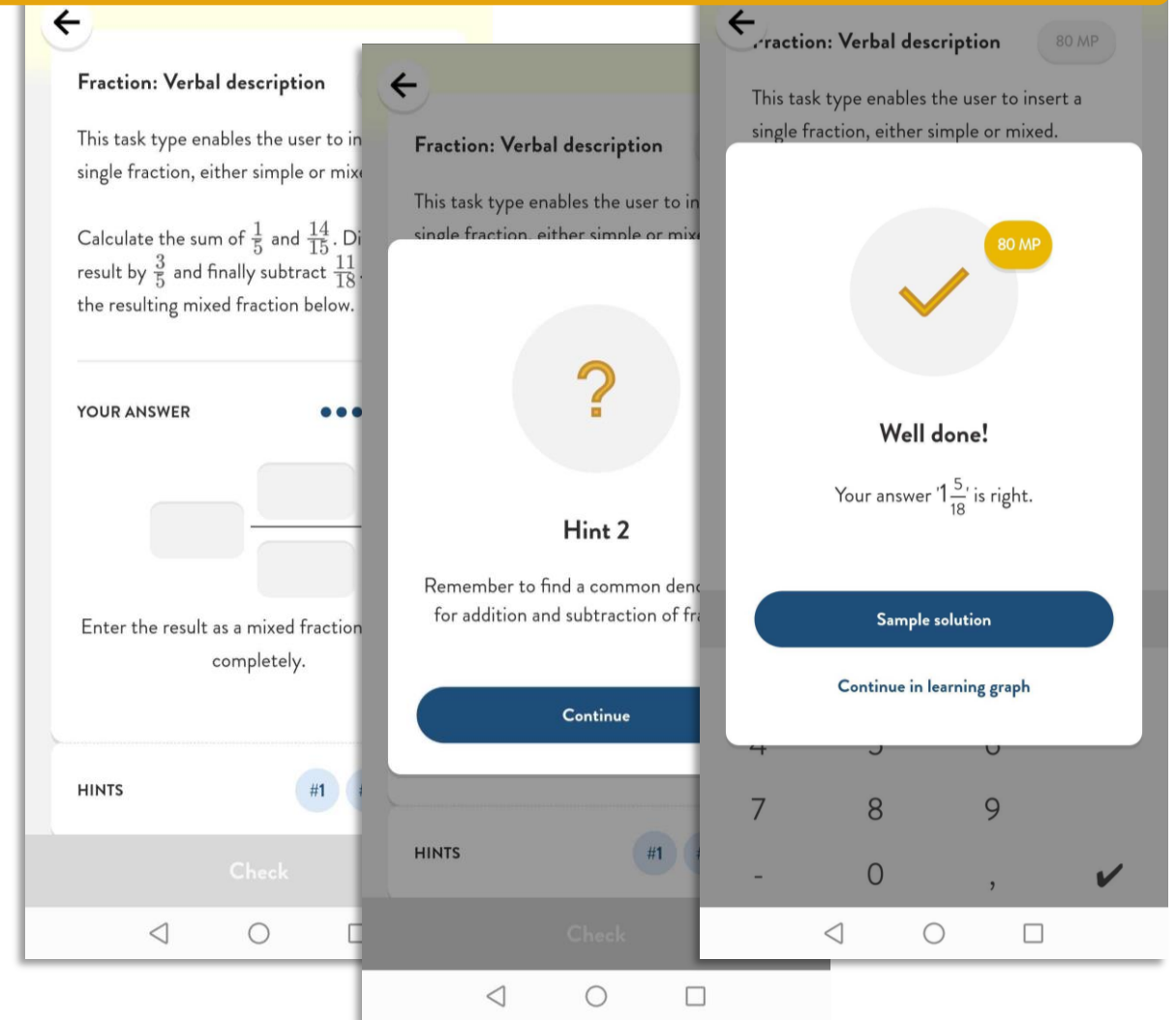
- 4 answer attempts per task
  - of which 1 free attempt

- Stepped hints

- Answer validation

- Sample solutions

- ASYMPTOTE Tutorial LG:
  Try out the app from the student perspective by entering the code **g47109**

Chapter 2:
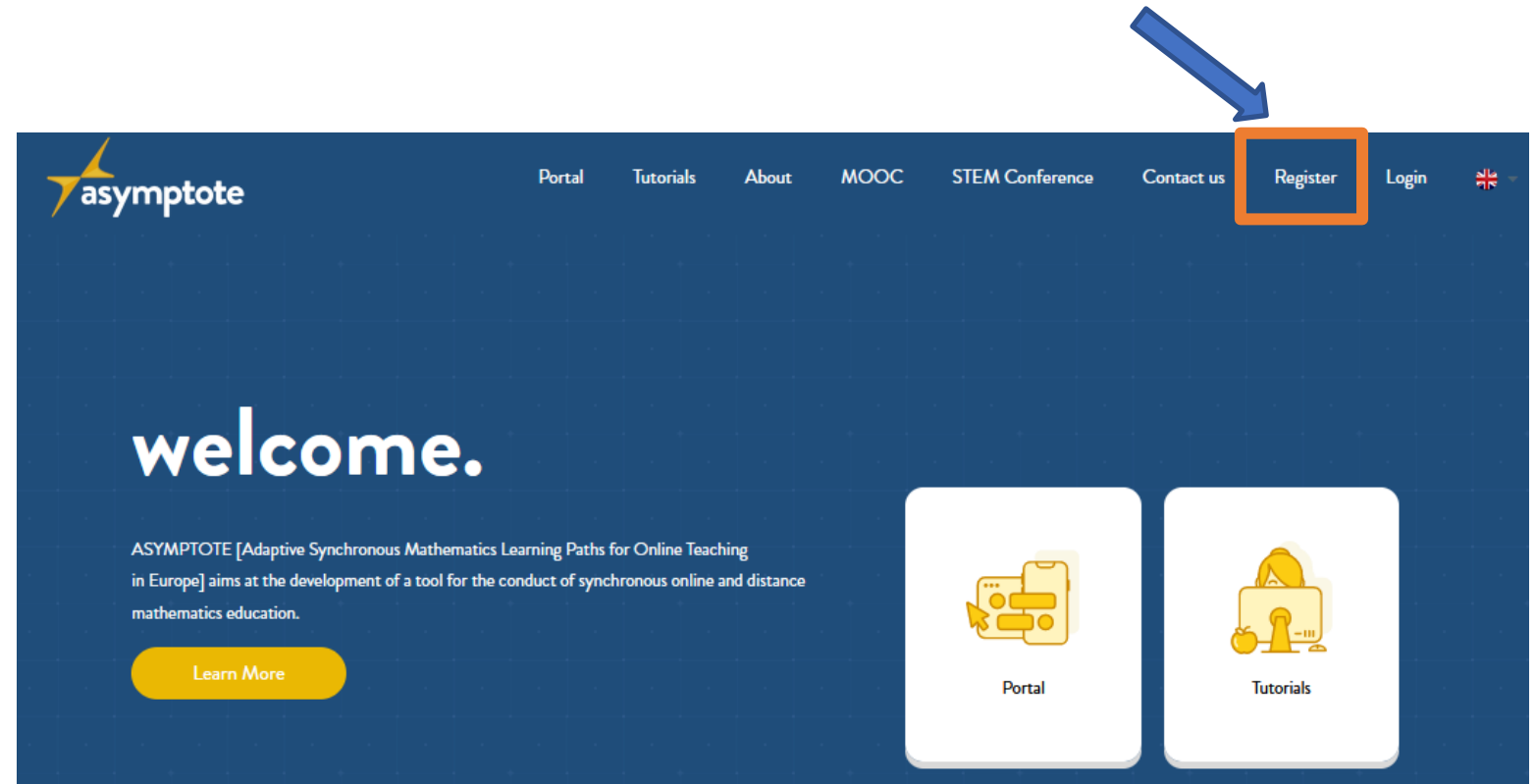# The ASYMPTOTE web portal

2.1. How to create an account

Web Portal Registration

Visit the ASYMPTOTE Web

Portal:

https://www.asymptote-

project.eu/en/welcome/

1. Click on the "Register"

   button

2. Fill out the registration form

Web Portal Login

Visit the ASYMPTOTE Web

Portal:

https://www.asymptote-

project.eu/en/welcome/

1. Click on the "Login" button

   and enter your username

   and password

2. Click on the "Portal" button

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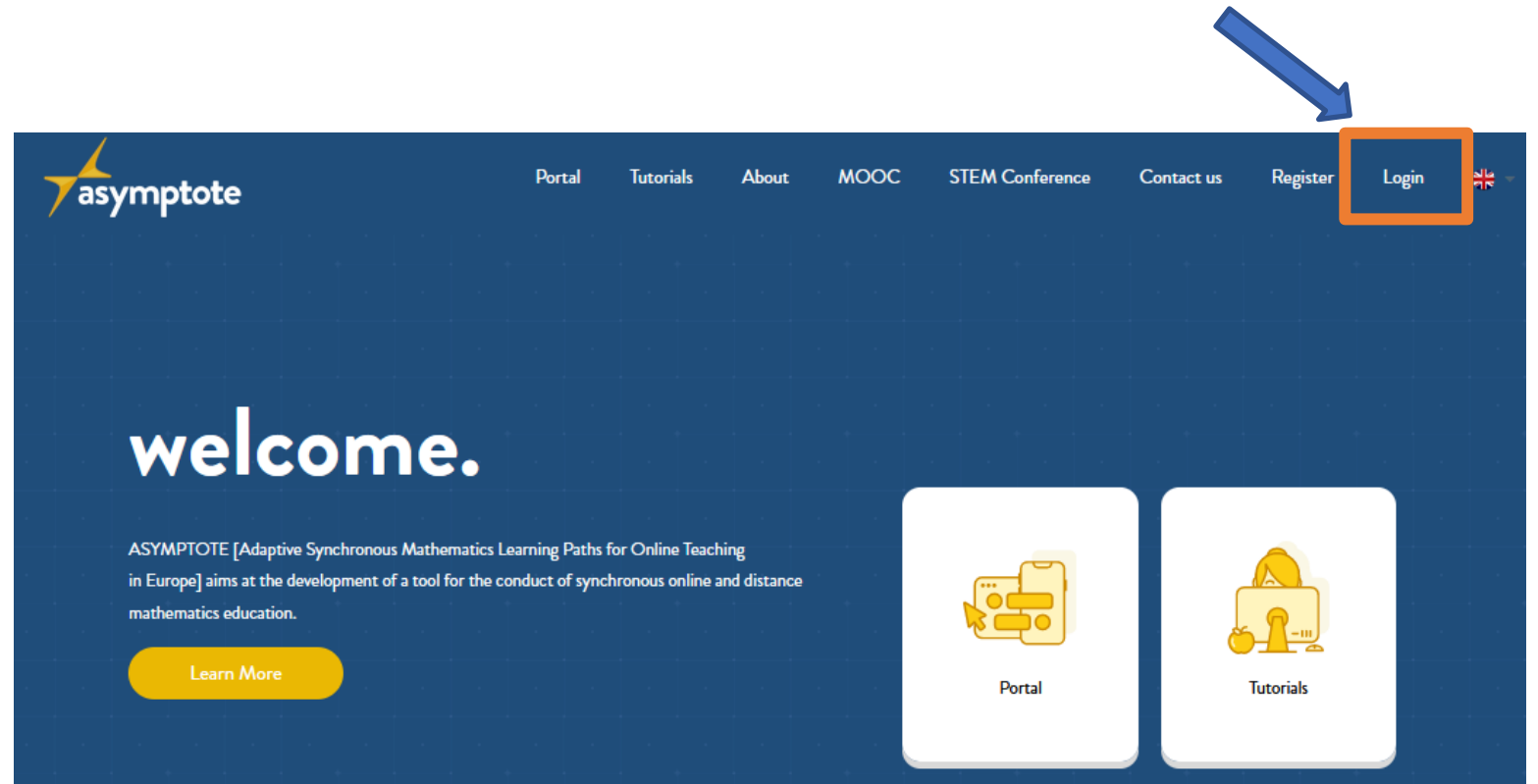
Chapter 2:
The ASYMPTOTE web portal

## 2.2. How to create tasks

Overview

Let´s create a task!

1. Criteria to create tasks and task categories

2. Categories details

3. How to create a task in asymptote web portal

Criteria to create tasks and task categories

- ## Education Level

Education level are an ordered set of categories, intended to group educational programs.

| Education Level | → | **Primary**
Lower secondary
Higher secondary
University |
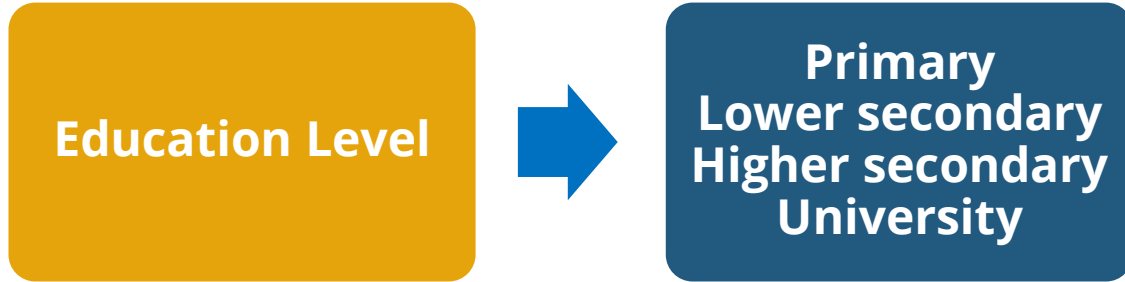
- ## Task Categories

Learning	Training	Reasoning	Modeling
learning tasks, the aids must teach how to solve the task.	task for resolution of exercises of direct application of concepts.	task for solving exercises that are not direct application of concepts.	tasks that involve modeling the problem before solving it.

Task details

- **Title image:** a representative image for the task.
- **Basic data:**
  - ➤ **Title**
  - ➤ **Definition of task**
- **Task format:** task type and solution which is interval, exact value, multiple choice, fill in the blanks, vector(exact value), vector (interval), set and information station.
- **Sample solution:** Type of solution is text or picture. A solution plan should be added for every task. This plan will be visible for student/learner after solving the task.
- **Hints:** Type of hint is text, picture or video. Minimum: 2 hints.
- **Curriculum Hierarchy & Task Category:**
  - ➤ **Task category:** learning, training, reasoning and modeling.
  - ➤ **Curriculum association: Selection of the mathematical topic, e.g. linear functions**
- **Grade & Tags:**
  - ➤ **From grade: 1 to 13**
  - ➤ **Tags**
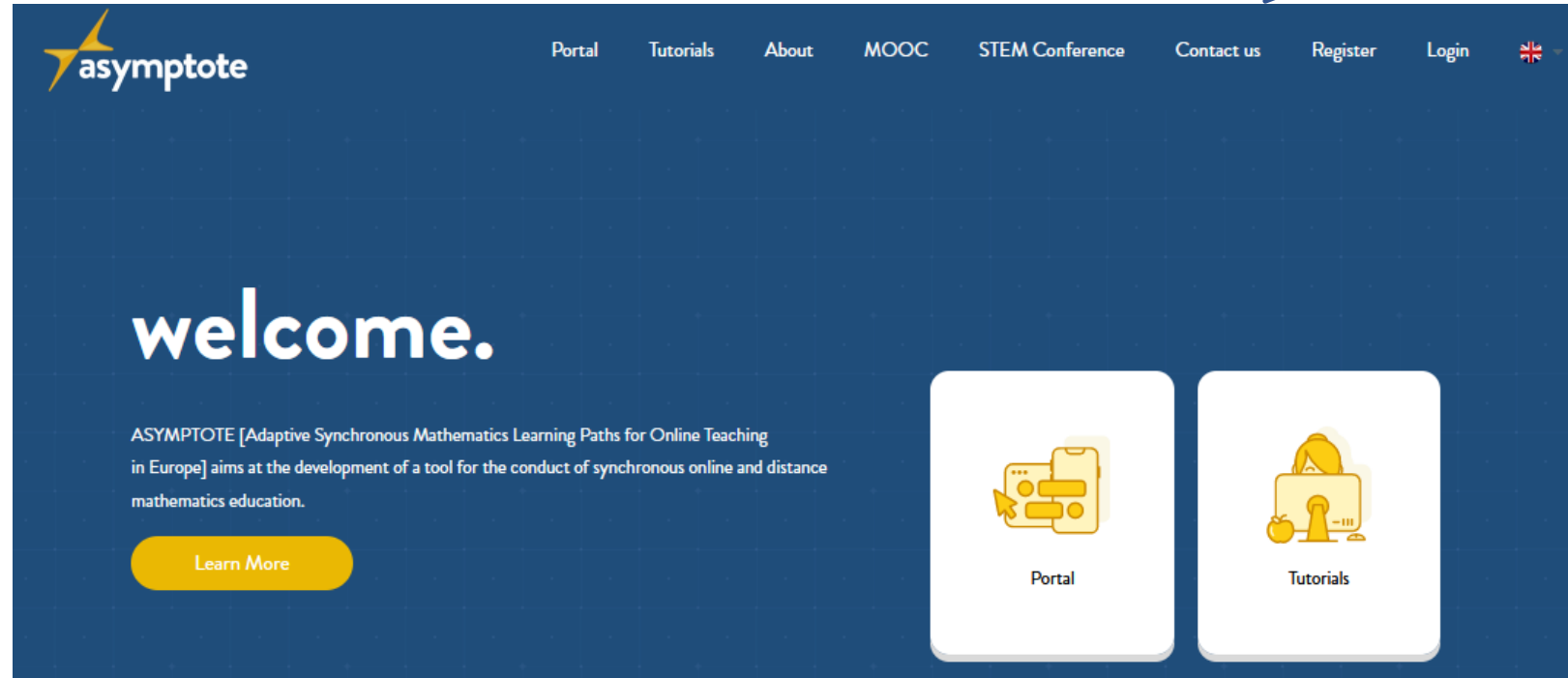
How to create a learning graph in ASYMPTOTE web portal

Login to the portal page

https://www.asymptote-project.eu/en/welcome/

(1) Register

(2) Login

(3) Enter at the portal

(1)

(2)

(3)

How to create a task in asymptote web portal

Select "Browse"

How to create a task in asymptote web portal

Click on the button "+"

How to create a task in asymptote web portal

Choose "New task"

How to create a task in asymptote web portal

Fill the form:

- The image is only mandatory if the task is of the modeling type, otherwise it is optional.

- In the "Definition of task" describe what must be done in this task (task formulation).

Title image

Please upload a represantative image for your task.

SELECT IMAGE

Basic data

Definition of task

Title *

Definition of task *

How to create a task in asymptote web portal

- **Task format –** choose an appropriate answer type of the task.

- **Sample solution -** enter a task resolution.

How to create a task in asymptote web portal

- **Stepped Hints -** put at least 2 hints.

- **Curriculum Hierarchy & Task Category -** select

  the task category and the Education Level

How to create a task in asymptote web portal

- In "Currently selected category" press "select" (1) and verify that the selected category is correct (2).

- Grade & Tags – select a grade from 1 to 13 and assign at least one topic-related tag.

How to create a task in asymptote web portal

After filling out the form select "create"

How to create a task in asymptote web portal
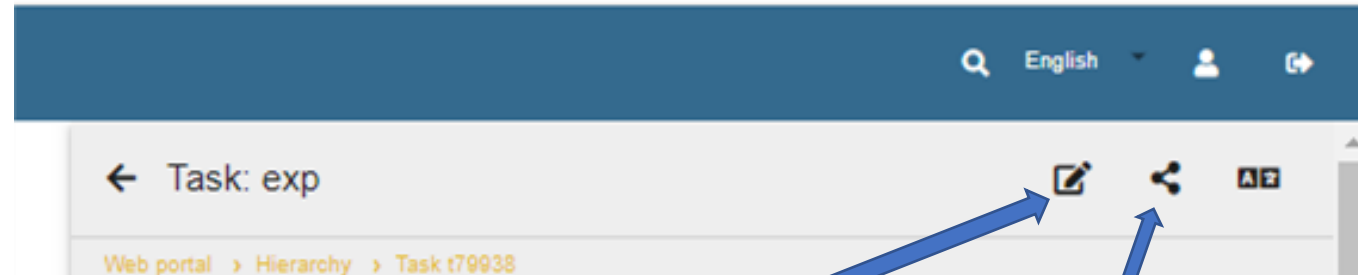
After creating a task, you can edit it

Share the task with a group

where to see tasks in asymptote web portal

Select "Tasks" and then choose a topic

Chapter 2:
The ASYMPTOTE web portal

2.3. Answer formats

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The task view

A task consists of:

1. Title & Task

2. Image

3. Answer format & sample solution

4. Stepped hints

5. Task type *(learning/exercising/modeling/reasoning)*

6. Curricular hierachy

7. Grade & Tags

Task Category & Curriculum Hierarchy

Task category:

Modeling

Current hierarchy association:

1: Quadratic functions

The Bridge

One can describe the railway bridge as quadratic function $f(x) = ax^2 + bx + c$.
Calculate the value of the factor a in the term of the quadratic function.

Note: One meter is equal to one unit of length. Round to two decimal numbers.

quadratic function   modelling   measure

Language

CODE: t57688   *English (Default)*

9

Interval

- Tasks that require some latitude, such as modeling, estimating, or rounding.

Exact value

- Tasks with exact result, e.g. arithmetic problems & combinatorial problems.

Multiple Choice

- Quiz tasks & true/false statement query

Fill in the Blanks

- Tasks for learning technical terms and language

Escalator

The ride on an escalator can be described by the function f with f: y = -0.4 x + 6.6. Thereby x is in this equation the time for the ride in seconds, y the height in meter. A person takes the escalator to the next floor. The next floor is 3.5 m heigt. Estimate the time for the ride.

linear function

Answer:

Task type and solution*   Task type: Interval

7.0   7.5   8.0   8.5

Interval

- Tasks that require some latitude, such as modeling, estimating, or rounding.

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linear function

Answer:

Task type and solution*

Task type

Interval

7.0   7.5   8.0   8.5

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Interval

- Tasks that require some latitude, e.g., modeling & estimating.

Exact value

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Multiple Choice

- Quiz tasks & query true/false statements

Fill in the Blanks

- Tasks for learning technical terms and language

Find coefficient

Find a if the graph of quadratic function $f(x) = (2a + 3)x^2$ is passing through the point $A(3, 45)$

Quadratic function   coefficient $A(x, y) \in C_f \Leftrightarrow f(x) = y$

Answer:

Task type and solution*

Task type
Exact value

Answer:
1

Interval

- Tasks that require some latitude, e.g., modeling & estimating.
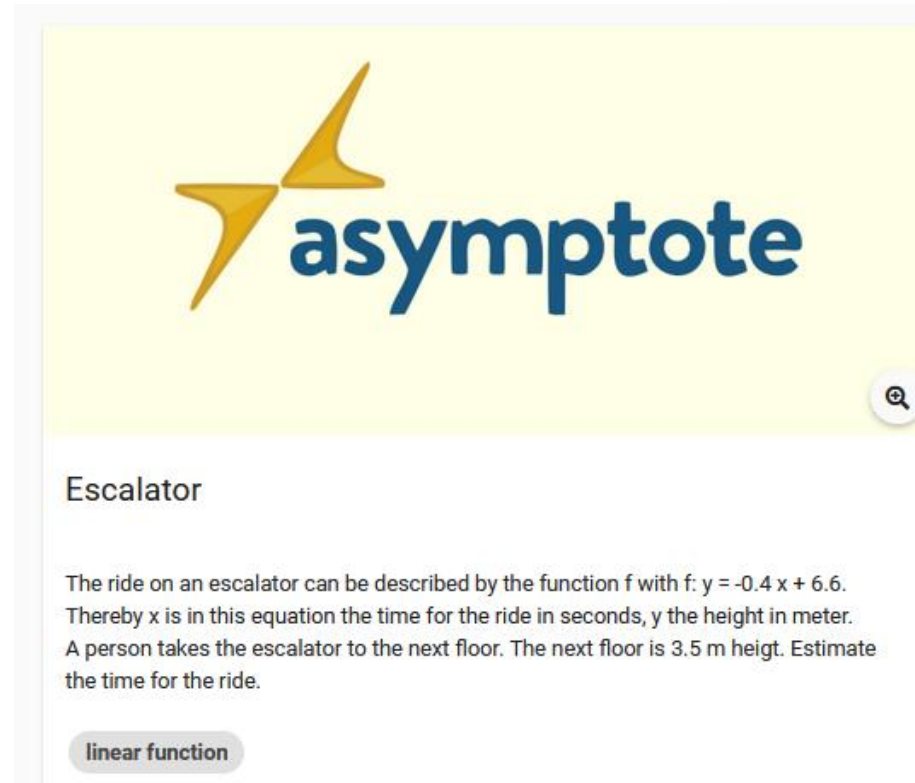
Exact value

- Tasks with exact result, e.g. arithmetic problems & combinatorial problems.

Multiple Choice

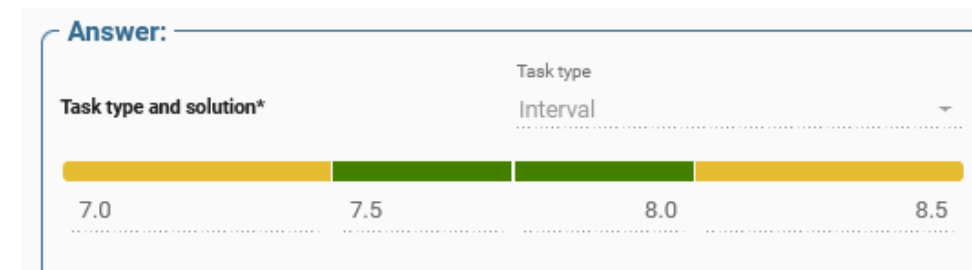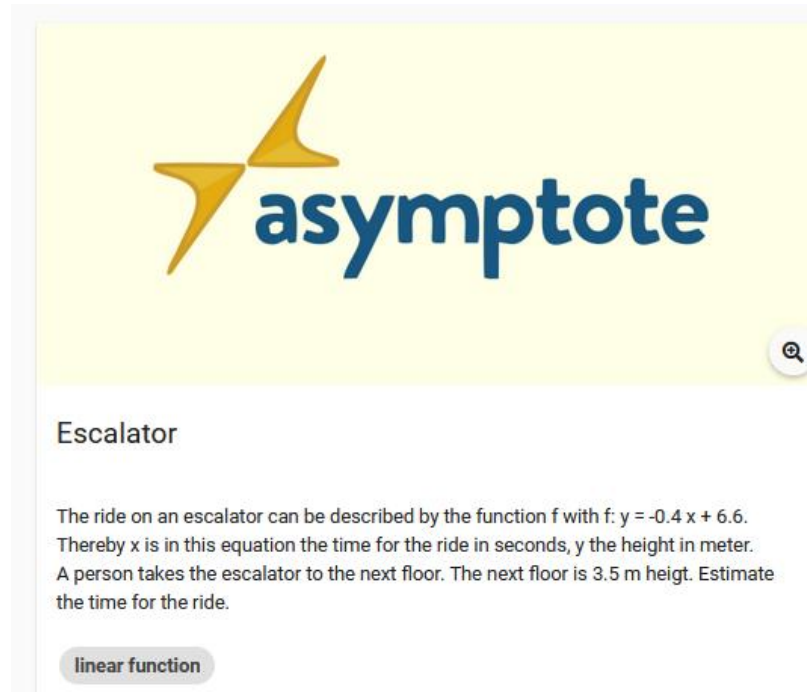- Quiz tasks & query true/false statements

Fill in the Blanks

- Tasks for learning technical terms and language

Interval

- Tasks that require some latitude, e.g., modeling & estimating.

Exact value

- Tasks with exact result, e.g. arithmetic problems & combinatorial problems.

Multiple Choice

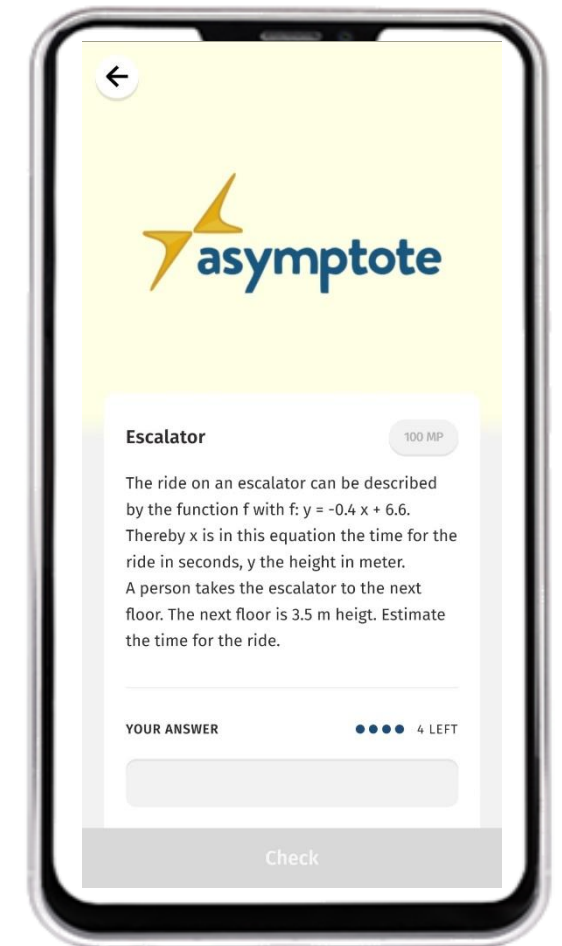- Quiz tasks & query true/false or irrational results.

Fill in the Blanks

- Tasks for learning technical terms and language

Tabletennis

The Chinese tabletennis player Ma Long is famous for his balloon defense. In one case, he make a ballon defense with 3.8 m height and a range of 10.6 m.
The flight path can be described by $f(x) = -0.14x^2 + 3.8$
Cross all correct answers for this description.

term   quadratic function

Answer:

Task type and solution*	Task type
	Multiple Choice

- [ ] The vertex of the graph is S(0/0)
- [x] The vertex of the graph is S(0/3.8)
- [ ] The vertex of the graph is S(3.8/0)
- [x] The graph intersect the x-axis at 5.2 and - 5.2
- [ ] The graph intersect the x-axis at 0 and 10.6
- [ ] The graph intersect the x-axis at 0 and 5.3

Interval

- Tasks that require some latitude, e.g., modeling & estimating.

Exact value

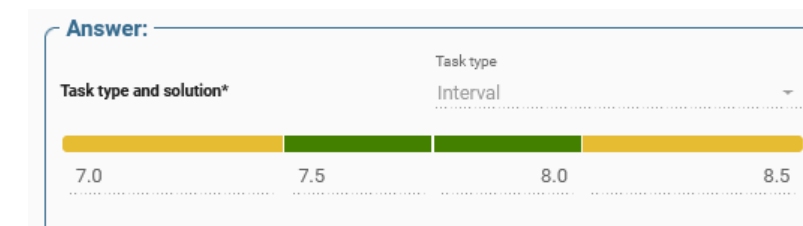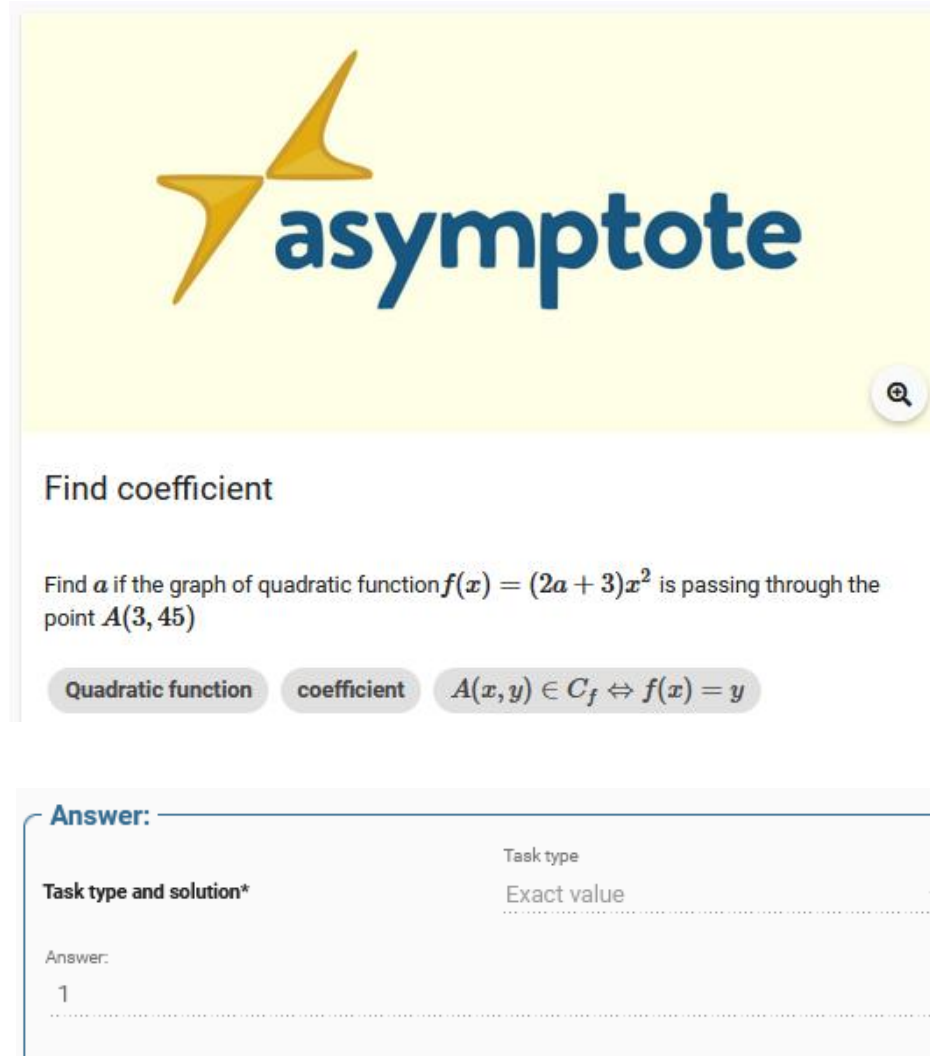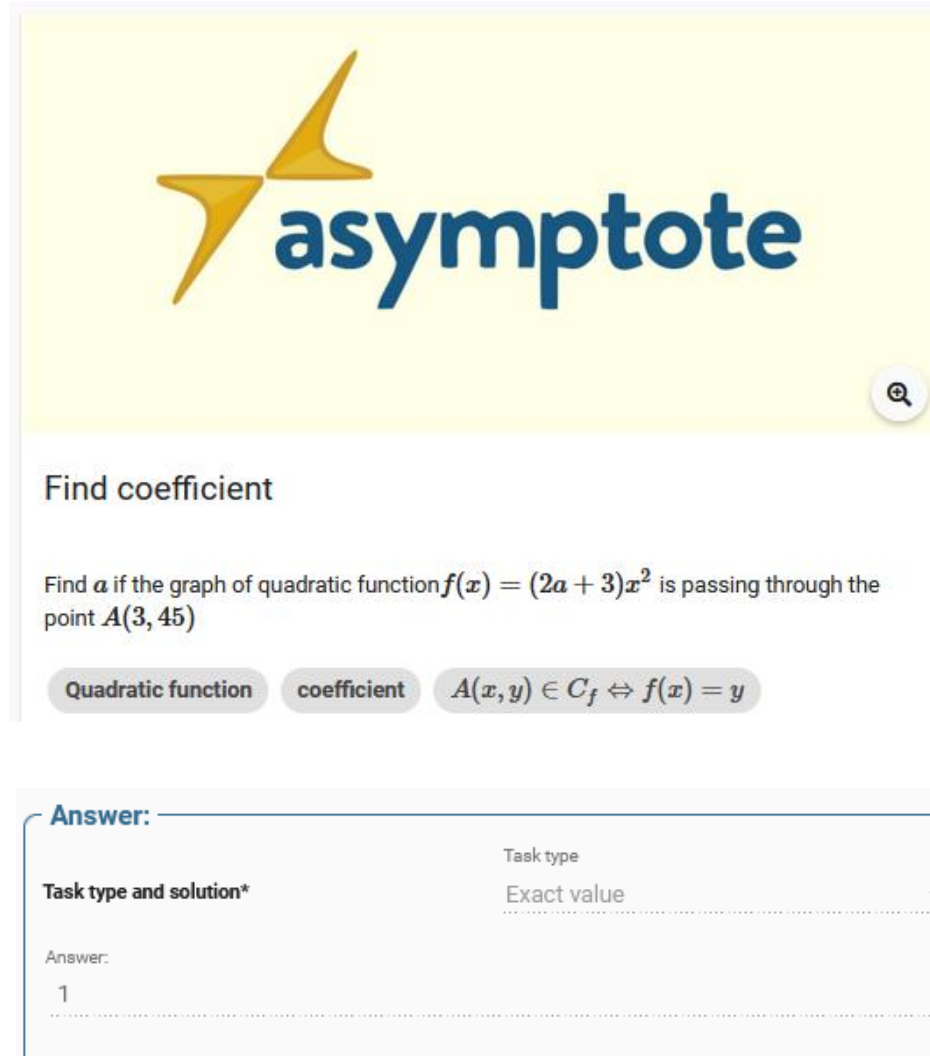- Tasks with exact result, e.g. arithmetic problems & combinatorial problems.

Multiple Choice

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Fill in the Blanks

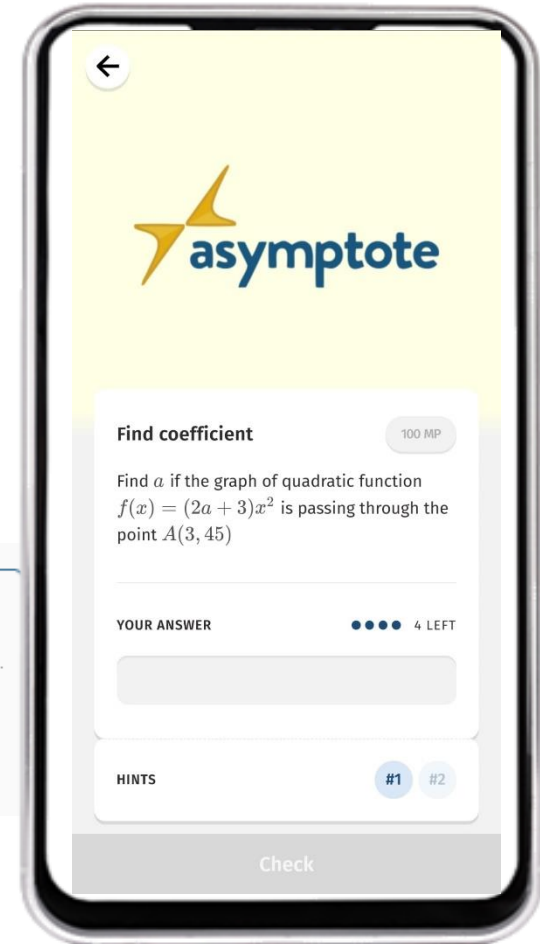- Tasks for learning technical terms and language

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Tabletennis   100 MP

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Cross all correct answers for this description.

YOUR ANSWER   ●●●● 4 LEFT

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- [ ] The graph intersect the x-axis at 5.2 and - 5.2
- [ ] The graph intersect the x-axis at 0 and 10.6
- [ ] The graph intersect the x-axis at 0 and 5.3

Check

Interval

- Tasks that require some latitude, e.g., modeling & estimating.

Exact value

- Tasks with exact result, e.g. arithmetic problems & combinatorial problems.

Multiple Choice

- Quiz tasks & true/false statement query

Fill in the Blanks

- Tasks for learning technical terms and language

Law of gravity

The Italian Galileo Galilei discovered the law of gravity. The distance s in meters that a body falls in t seconds is approximately $s = 5 t^2$.
He verified his law on the Pisa Sharp Tower, which is 54 m high (see picture).
a.) How long does the stone fall from the top to the bottom?
b.) From what height do you have to drop a stone so that it reaches the ground in 2s?

Round to 2 decimal places.

Pisa   law of gravity

Answer:

Task type and solution*	Task type
	Fill in the Blanks

Fill in the Blanks

a.) The stone falls **3,29/3.29/3,28/3.28** seconds from the top to the bottom.

b.) You have to drop the stone from a height of **20** m that it reaches the ground in 2 s.

Interval

- Tasks that require some latitude, e.g., modeling & estimating.

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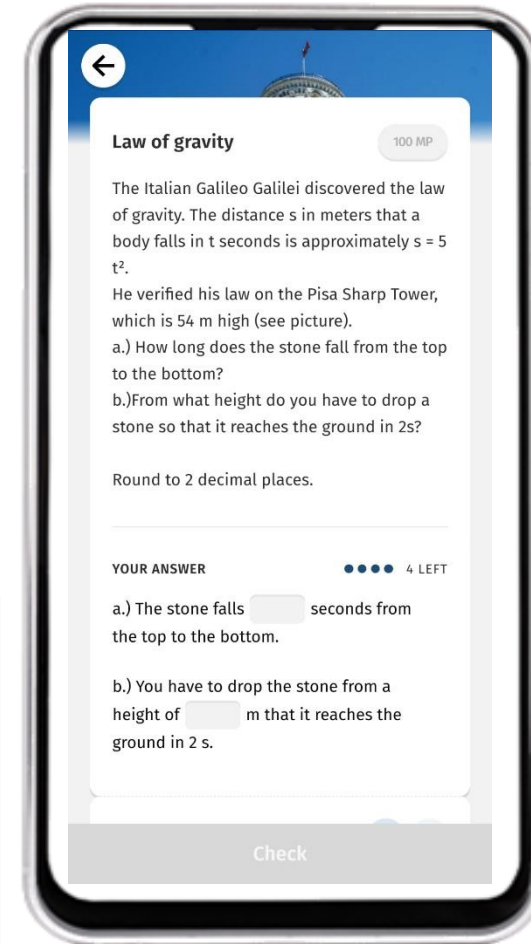
Round to 2 decimal places.

Pisa   law of gravity

Answer:

Task type and solution*   Task type: Fill in the Blanks

Fill in the Blanks

a.) The stone falls **3,29/3.29/3,28/3.28** seconds from the top to the bottom.

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Vector (Interval and Exact Value)

- Tasks with solutions from several ordered components (multidimensional extension of the formats interval and exact value)

Set

- Tasks with solution from several unordered components
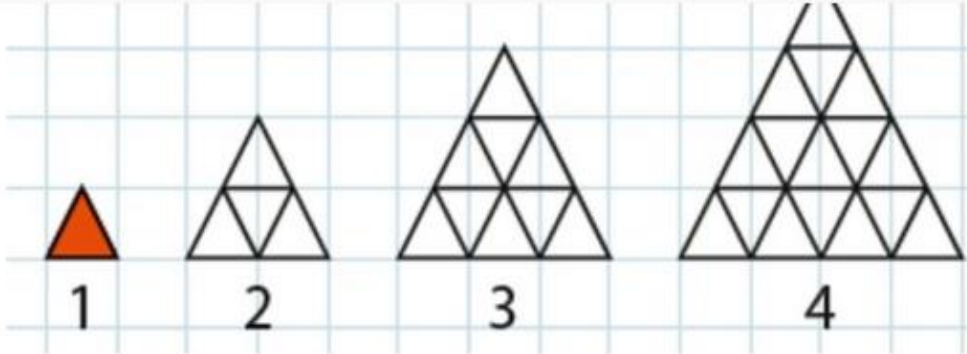
Fraction

- Tasks with real or mixed fractions

Information station

- Possibility to introduce facts (without task and solution input) or to set research tasks

Sequence of triangles 1

Determine the numbers of small trinagles for the given step.

term   linear function

Answer:

Task type and solution*	Task type
	Vector (exact value)
variable name*	Value of Step 5*
Step 5	25
variable name*	Value of Step 8*
Step 8	64

Vector (Interval and Exact Value)

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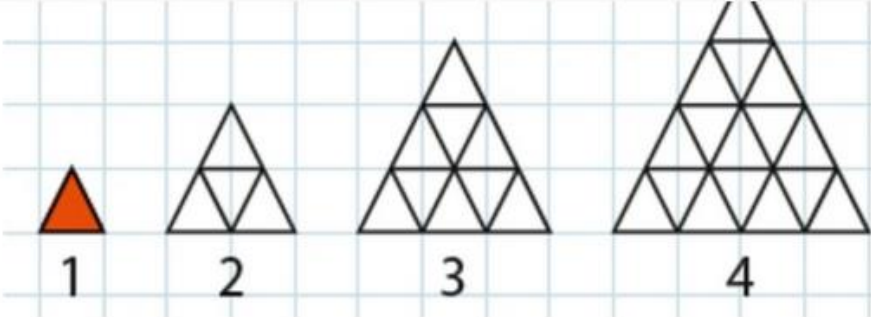
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Find the coefficients of terms in algebraic expression_3

Find the number a and b if the following algebraic expression is independent of x and y.

$$A = x(a + 3b) + y(2a - 6) + 2a + 5$$

Answer 1 is for a and Answer 2 is for b

linear equations   algebraic expression

Answer:

Task type and solution*	Task type
	Set
Answer: 1	Value of Answer: 1 — 3
Answer: 2	Value of Answer: 2 — -1

Vector (Interval and Exact Value)

- Tasks with solutions from several ordered components (multidimensional extension of the formats interval and exact value)

Set

- Tasks with solution from several unordered components

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asymptote

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Answer 1 is for a and Answer 2 is for b

linear equations   algebraic expression

Answer:

Task type and solution*	Task type
	Set
Answer: 1	Value of Answer: 1
	3
Answer: 2	Value of Answer: 2
	-1

Find the coefficients of terms in algebraic expression_3 100 MP

Find the number a and b if the following algebraic expression is independent of x and y.
$A = x(a + 3b) + y(2a - 6) + 2a + 5$
Answer 1 is for a and Answer 2 is for b

YOUR ANSWER   ●●●● 4 LEFT

SOLUTION 1

SOLUTION 2

Check

Vector (Interval and Exact Value)

- Tasks with solutions from several ordered components (multidimensional extension of the formats interval and exact value)

Set

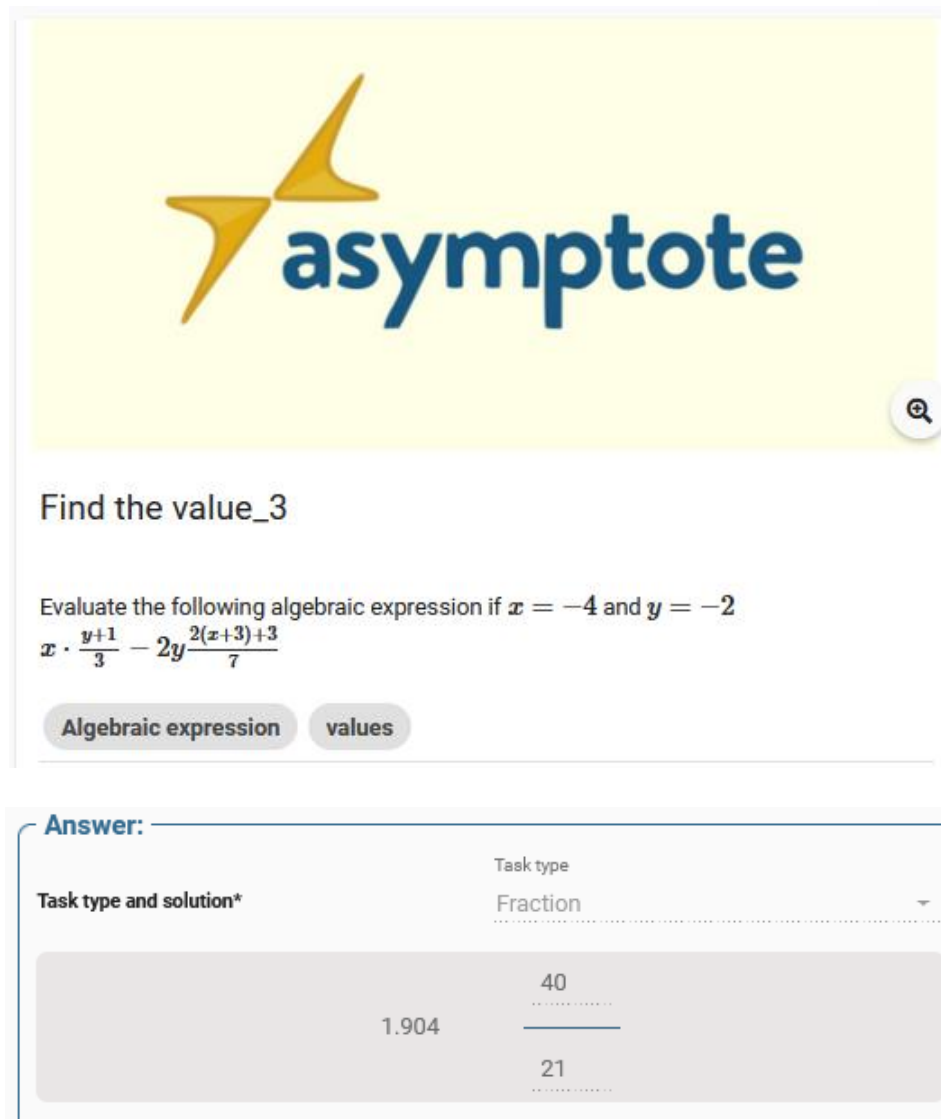- Tasks with solution from several unordered components

Fraction

- Tasks with real or mixed fractions

Information station

- Possibility to introduce facts (without task and solution input) or to set research tasks

Find the value_3

Evaluate the following algebraic expression if $x = -4$ and $y = -2$

$$x \cdot \frac{y+1}{3} - 2y \frac{2(x+3)+3}{7}$$

Algebraic expression   values

Answer:

Task type and solution*

Task type

Fraction

$1.904 \quad \frac{40}{21}$

Vector (Interval and Exact Value)

- Tasks with solutions from several ordered components (multidimensional extension of the formats interval and exact value)

Set

- Tasks with solution from several unordered components

Fraction

- Tasks with real or mixed fractions

Information station

- Possibility to introduce facts (without task and solution input) or to set research tasks
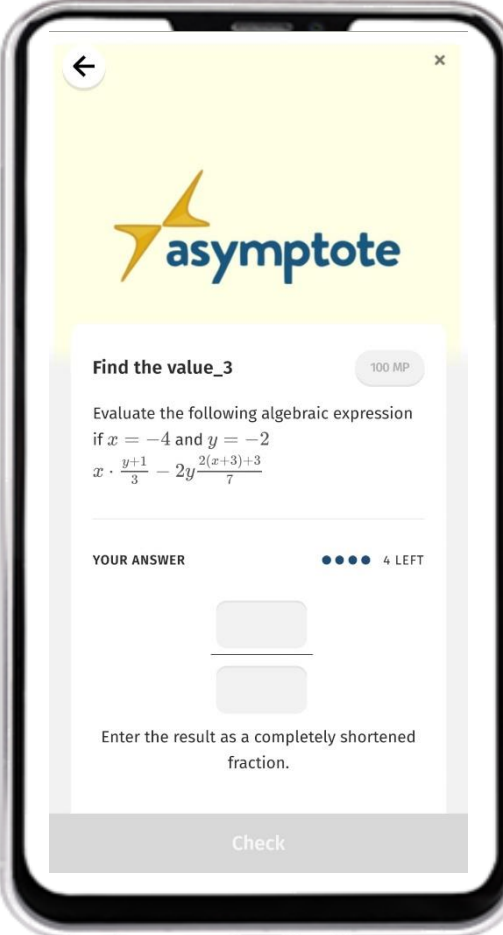

Find the value_3

Evaluate the following algebraic expression if $x = -4$ and $y = -2$

$$x \cdot \frac{y+1}{3} - 2y\frac{2(x+3)+3}{7}$$

Algebraic expression   values

Answer:

Task type and solution*   Task type   Fraction

1.904 $\frac{40}{21}$

Vector (Interval and Exact Value)

- Tasks with solutions from several ordered components (multidimensional extension of the formats interval and exact value)

Set

- Tasks with solution from several unordered components

Fraction

- Tasks with real or mixed fractions

Information station

- Possibility to introduce facts (without task and solution input) or to set research tasks

Chapter 2:
The ASYMPTOTE web portal

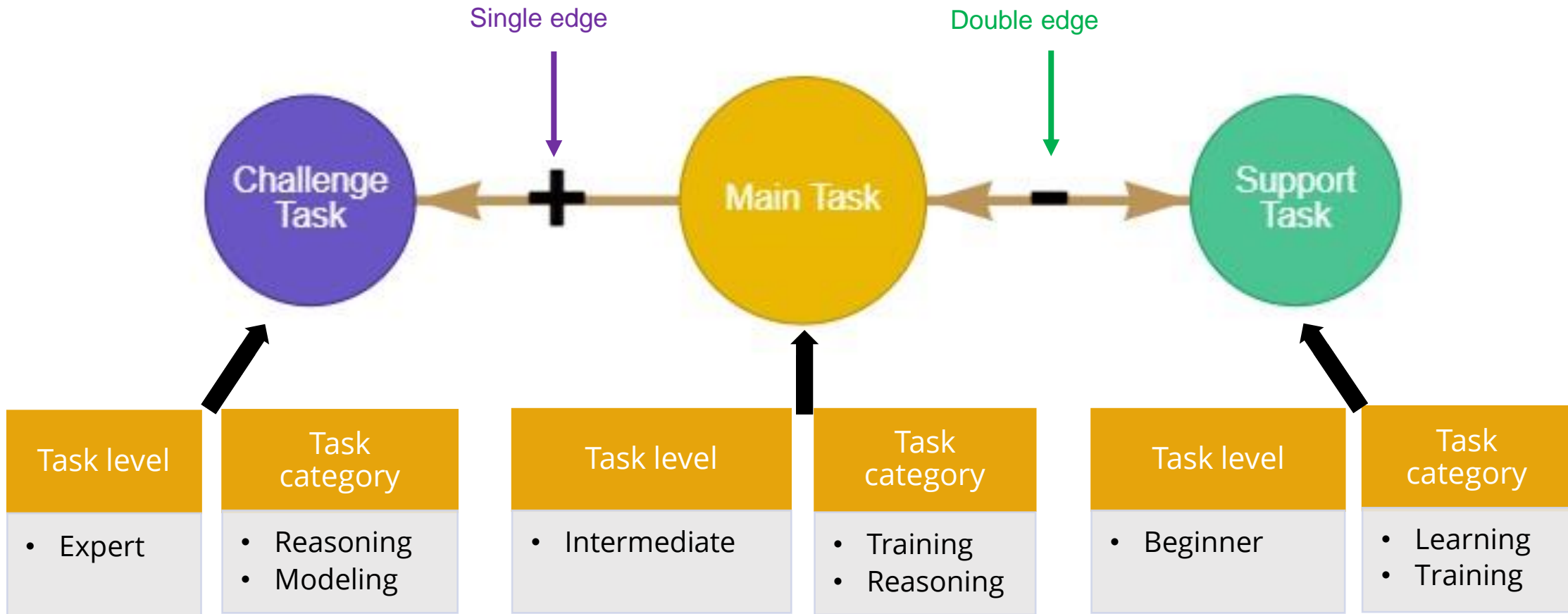## 2.4. How to create a Learning Graph

Overview

Let´s create a learning graph!

Guiding in the learning process, organizing tasks in order to achieve success in learning.

1. One learning graph level for each subject to learn

2. Example of a learning graph

3. How to create a learning graph in ASYMPTOTE web portal

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One learning graph level for each subject to learn

Single edge

Double edge

Task level	Task category
• Expert	• Reasoning • Modeling

Task level	Task category
• Intermediate	• Training • Reasoning

Task level	Task category
• Beginner	• Learning • Training

This level can be replicated for each learning subject.

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Example of a learning graph

- Optional after solving the main task;
- Number of challenger tasks as wanted;
- Must go to the next main task.

Mandatory

- Mandatory after 2nd incorrect entry on the main task;
- Number of support tasks as needed;
- Must return to the main task (double edge).
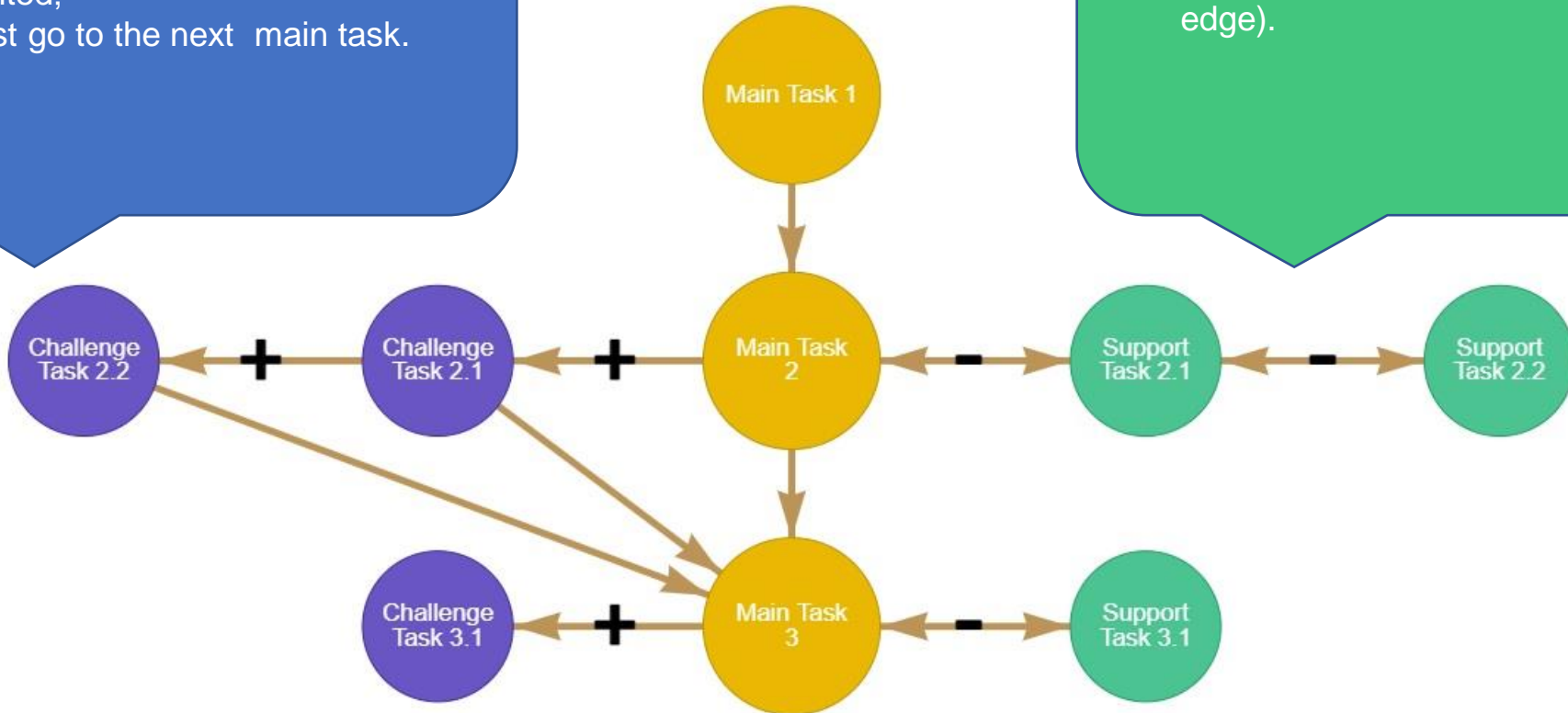
How to create a learning graph in ASYMPTOTE web portal

Select "LG & Tasks"

LG & Tasks
Learning Graph & Tasks

Profile
Personal data, statistics
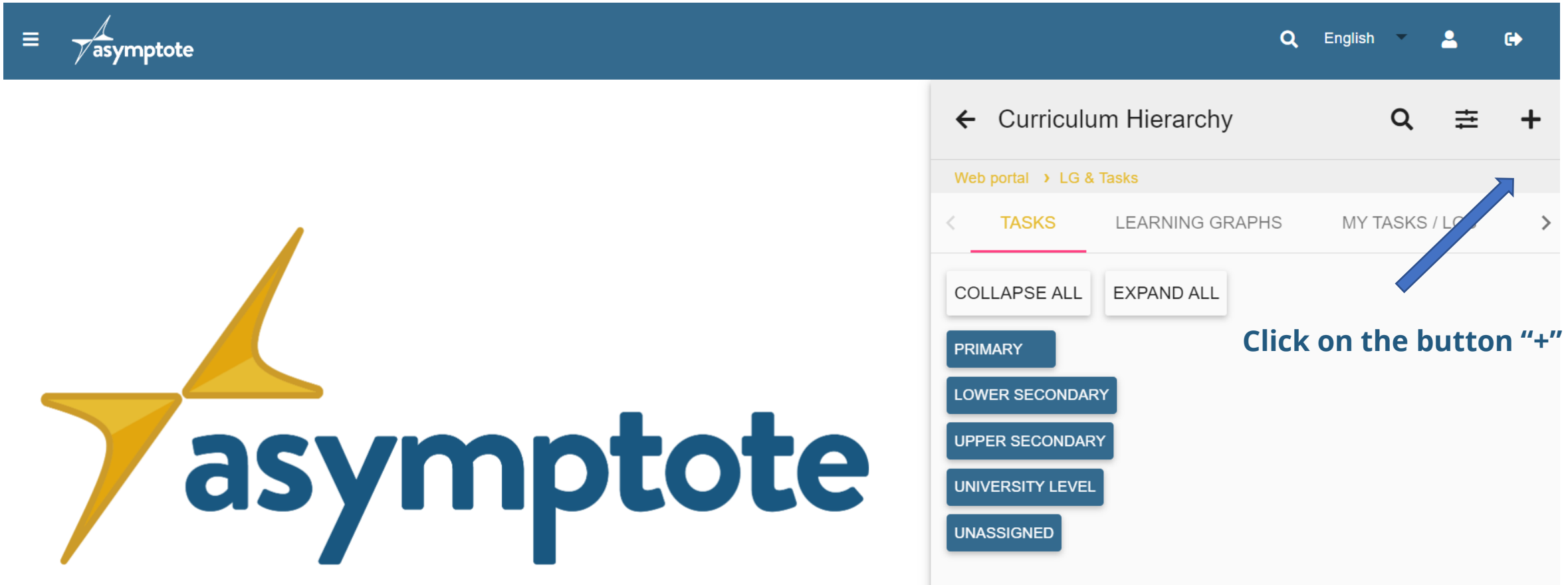
Groups
Create and manage
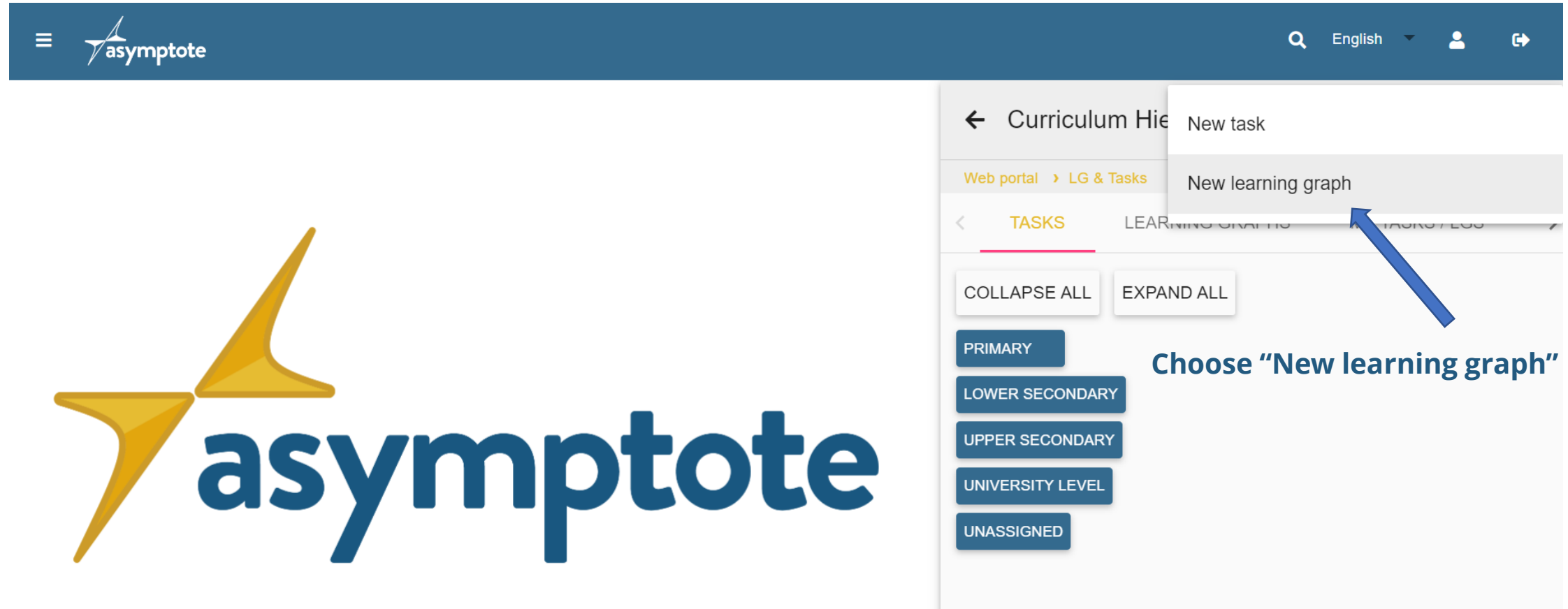
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How to create a learning graph in ASYMPTOTE web portal

Click on the button "+"

How to create a learning graph in ASYMPTOTE web portal

Choose "New learning graph"

How to create a learning graph in ASYMPTOTE web portal

Fill the form:

- The image is optional

- The learning graph must have a title and a description

← Create a learning graph

Web portal › LG & Tasks › Create

Title image

Please upload a represantative image for your Learning Graph.

SELECT IMAGE

Basic data

Title *

Title is required

About this Learning Graph

How to create a learning graph in ASYMPTOTE web portal

- Learning graphs must be assigned to a curricular topic, e.g. linear functions

Curriculum Hierarchy

Currently selected category:

1: Unassigned

PRIMARY

LOWER SECONDARY

UPPER SECONDARY

UNIVERSITY LEVEL

UNASSIGNED

How to create a learning graph in ASYMPTOTE web portal

The tasks, previously created, will be added to

the learning graph after it was created.

After filling out the form select "create"

Settings

ℹ Gamification

ℹ Display sample solutions

ℹ Display hints

ℹ Check Answers

ℹ Enter Answers

Notice: Tasks can be added to the trail after it was created.

CREATE

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How to create a learning graph in ASYMPTOTE web portal

← Graph : Learning graph

Web portal › LG & Tasks › Graph g79569

After creating a task, you can edit it

Share the task with a group

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How to create a learning graph in ASYMPTOTE web portal

Learning graph

ACTIONS

← Graph : Learning graph

Web portal › LG & Tasks › Graph g79569

Choose "ACTIONS"

Add tasks to your Learning Graph

Currently, your Learning Graph does not contain any tasks.
Add your own or other public tasks.

Learning graph display area

asymptote

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How to create a learning graph in ASYMPTOTE web portal

Learning graph

Activate Edit Mode

Save changes

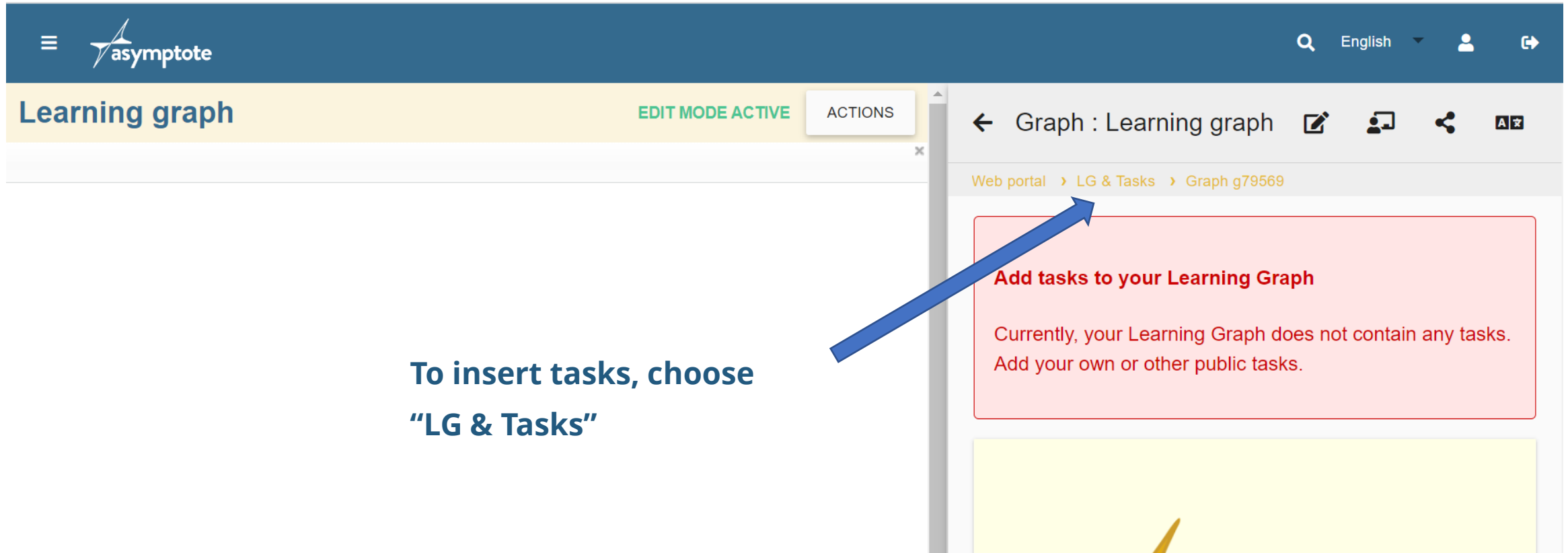Undo Changes

Graph : Learning graph

portal › LG & Tasks › Graph g79569

Add tasks to your Learning Graph

Currently, your Learning Graph does not contain any tasks.
Add your own or other public tasks.

Choose "Activate Edit Mode"

Learning graph

EDIT MODE ACTIVE   ACTIONS

Graph : Learning graph

Web portal › LG & Tasks › Graph g79569

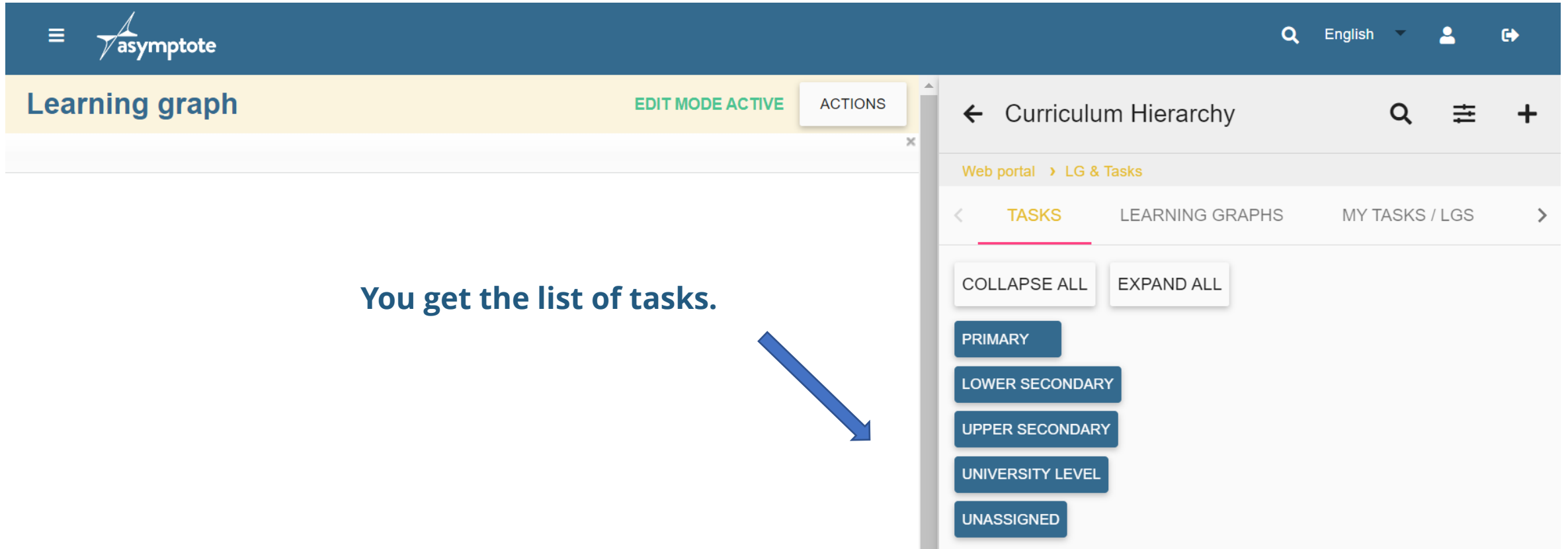**Add tasks to your Learning Graph**

Currently, your Learning Graph does not contain any tasks.
Add your own or other public tasks.

Now we are ready to select tasks to the learning graph.

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How to create a learning graph in ASYMPTOTE web portal

To insert tasks, choose "LG & Tasks"

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How to create a learning graph in ASYMPTOTE web portal

You get the list of tasks.

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How to create a learning graph in ASYMPTOTE web portal

Learning Graphs

EDIT MODE ACTIVE
UNSAVED CHANGES
ACTIONS

Main Task 1

Select a task

7872 PT BEBEDOURO
14101 PT TANQUE DE ÁGUA
34102 PT CAIXOTE PARA LIXO
78100 PT QUAL É A ESCALA?
0674 PT PAVILHÃO INCLINADO
0594 PT PINTAR ESFERAS
0499 PT CÍRCULO DE RELVA
03377 DE DER WEISSE PFEILER
T17558 EN MATRIX EQUATION (TRAINING)
T78559 EN MATRIX EQUATION (LEARNING)
T59566 EN MATRIX OPERATIONS (LEARNING)
T01567 EN MATRIX OPERATIONS (TRAINING)
T56969 EN MAIN TASK 1
T18970 EN MAIN TASK 2

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How to create a learning graph in ASYMPTOTE web portal

For each new task, select:

- **Its position related to the neighbor task already added to the learning graph;**
- **Assign the neighbor task for this new task.**

Learning Graphs

EDIT MODE ACTIVE   ACTIONS   0499 PT CÍRCULO

Main Task 1

Add Node: t39978

Where do you want to place the selected node: "Support Task 1.1"?
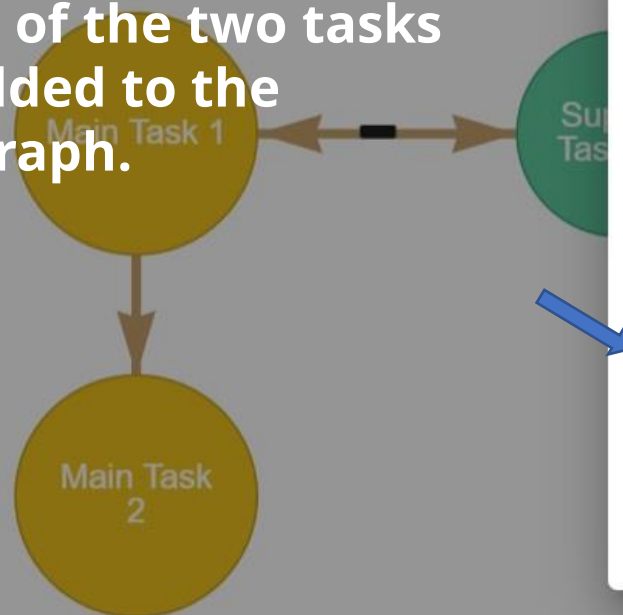
Positioning

New Neighbor Node

NO   YES

How to create a learning graph in ASYMPTOTE web portal

In this situation, we want to insert the new task on:

- **Left of...;**

- **Select one of the two tasks already added to the learning graph.**
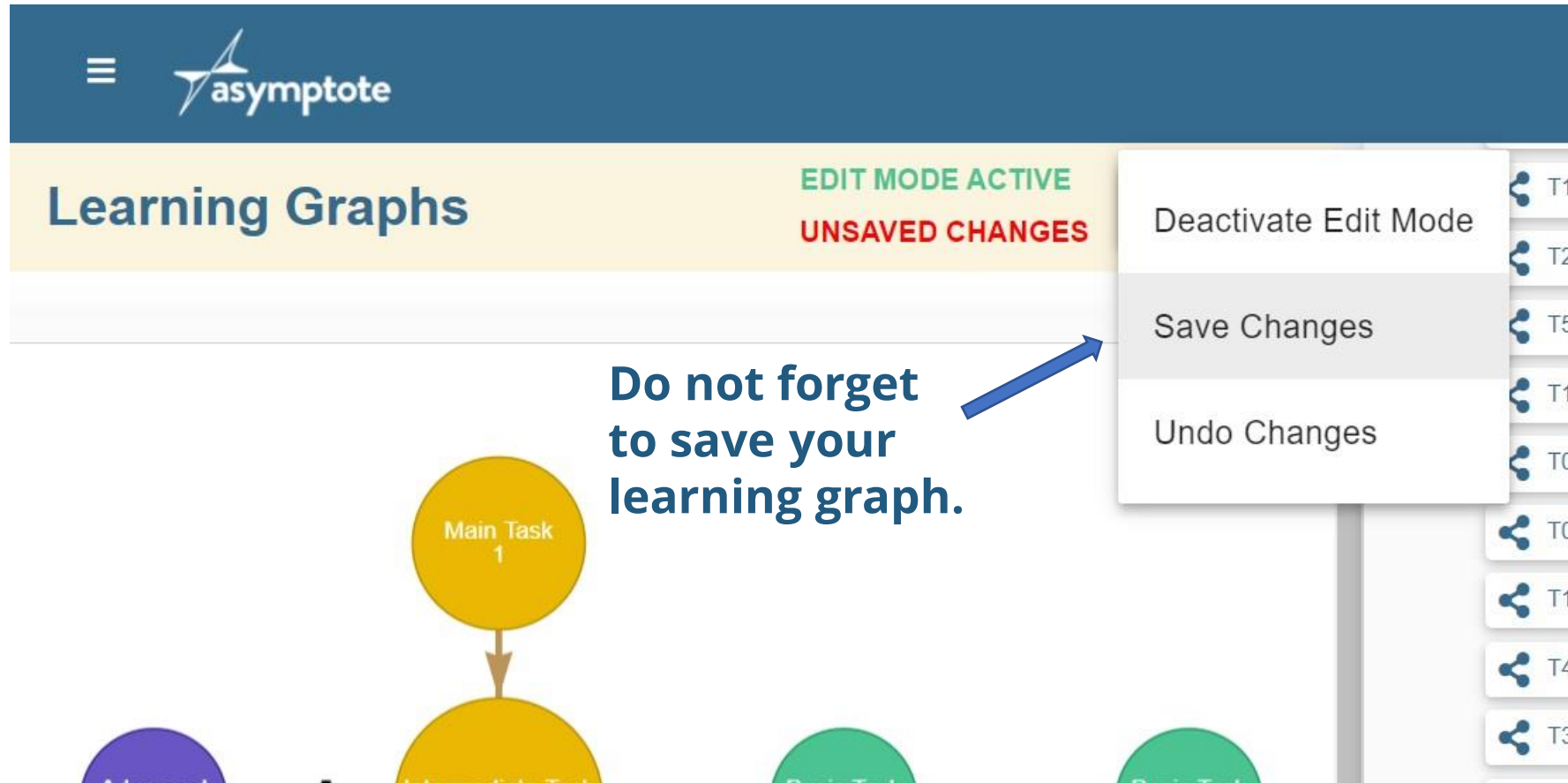
How to create a learning graph in ASYMPTOTE web portal

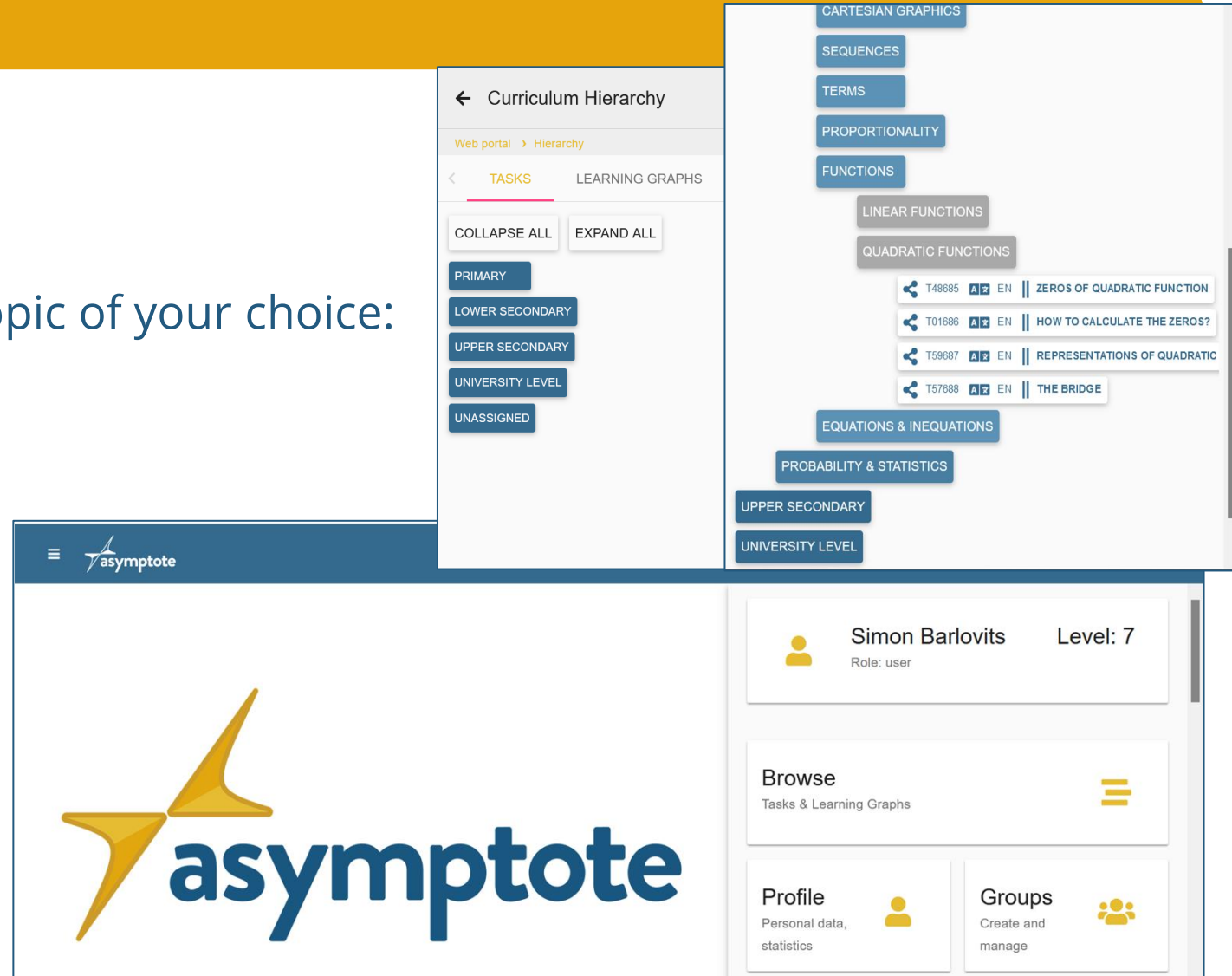**Do not forget to save your learning graph.**

Chapter 2:
The ASYMPTOTE web portal

2.5. How to search for tasks/Learning Graphs and how to share them

2.4.1 Selection of Tasks

1. Click on the "Browse" button

2. Search in the "Hierarchy" for the topic of your choice:

    – All tasks are marked in the hierarchy

    – The hierarchy is structured by
       level & curricular topics

    – You can filter for task languages

    – The task preview shows the code of
       the task, its language & title

3. Select and open a task

The Task Formular

As an example, please invoke the task "The bridge" (Link)

A task consists of:

1. Title & task instruction

2. Picture (optional)

3. Curriculum hierarchy

4. Task category: training/modeling/reasoning

5. Answer format

6. Stepped hints

7. Grade & Tags

The Bridge

One can describe the railway bridge as quadratic function $f(x) = ax^2 + bx + c$. Calculate the value of the factor a in the term of the quadratic function.

Note: One meter is equal to one unit of length. Round to two decimal numbers.

quadratic function   modelling   measure

Curriculum Hierarchy & Task Category

Task Category:

Modeling

Current hierarchy association:

1: Quadratic functions

Answer:

Task type and solution*

Task type: Interval

| -0.17 | -0.14 | -0.10 | -0.07 |

Sample solution

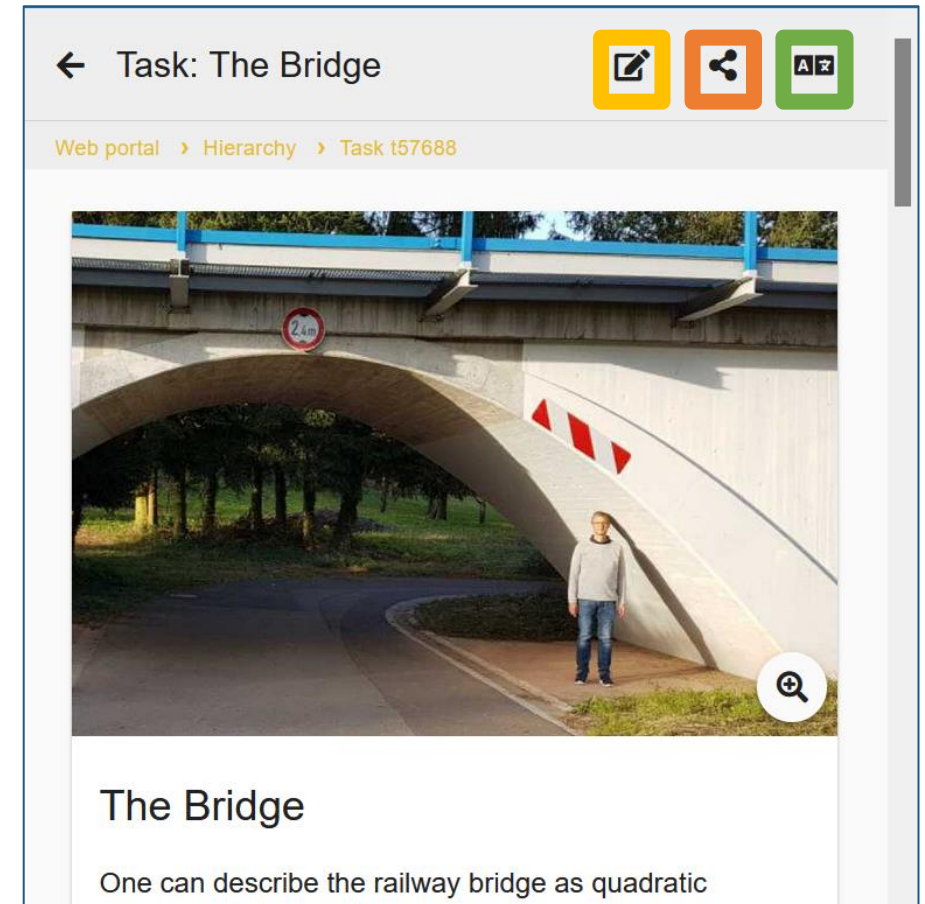TEXT   PICTURE

The Task Formular

As an example, please invoke the task "The bridge" (Link)

Furthermore, the task formular allows:

1. to edit own or shared tasks

2. to share own tasks *(more on that later)*

3. to translate a task

The Task Formular

4. to display the translated tasks

5. to copy & adapt the task

6. to add it to the personal favorites

7. to add it to a learning graph *(more on that later)*

The Bridge

One can describe the railway bridge as quadratic function $f(x) = ax^2 + bx + c$. Calculate the value of the factor a in the term of the quadratic function.

Note: One meter is equal to one unit of length. Round to two decimal numbers.

quadratic function   modelling   measure

Language

English (Default)
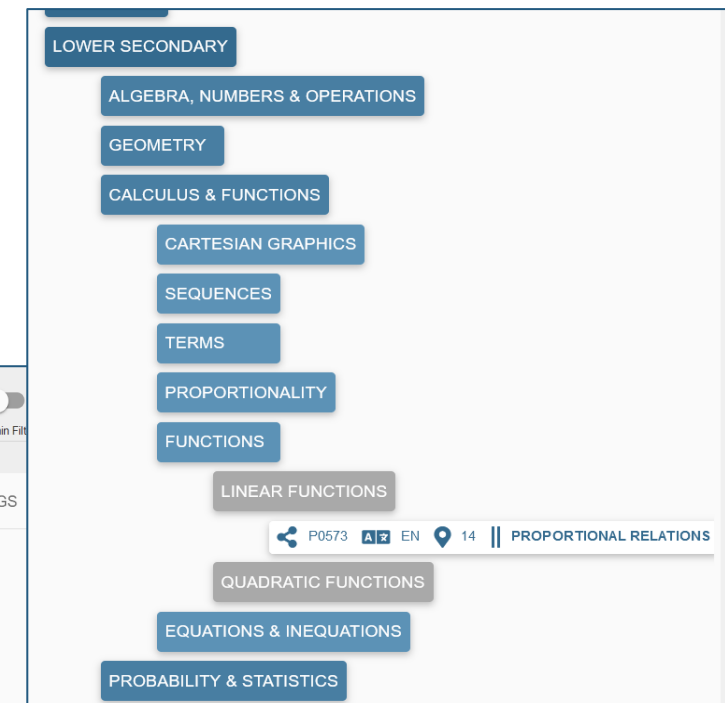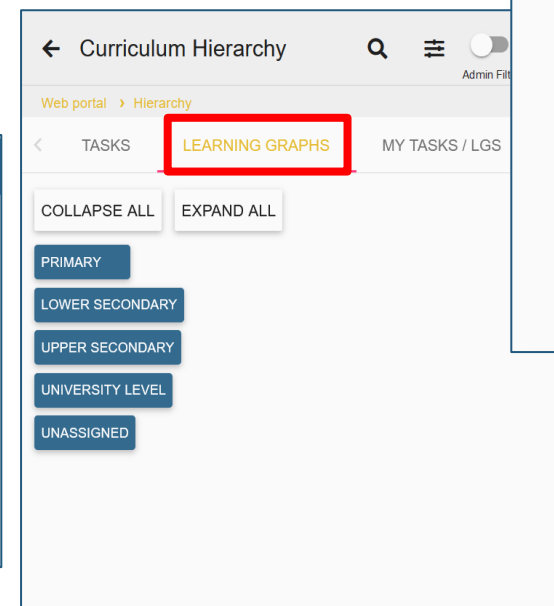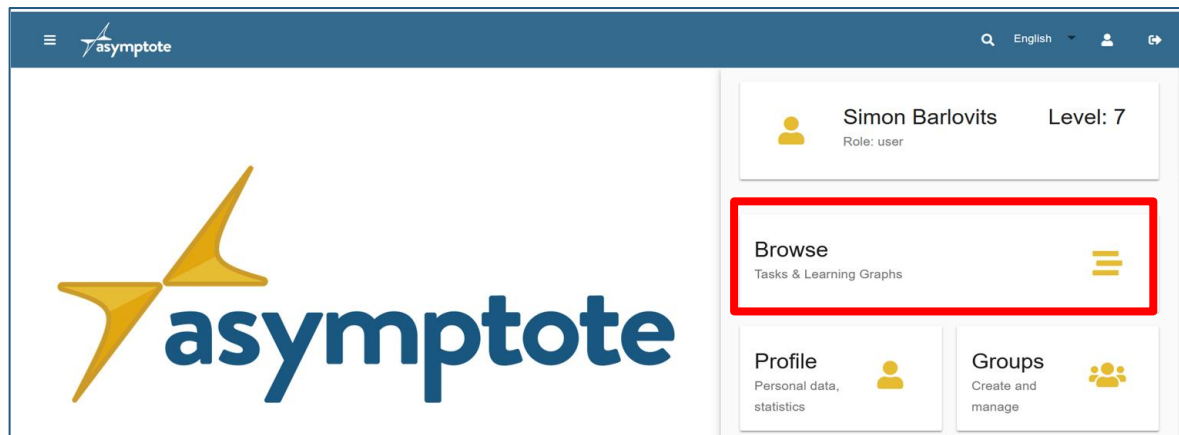
ADD TASK TO LEARNING GRAPH

2.4.2 Selection of Learning Graphs

1. Click on the "Browse" button

2. Select "Learning Graphs"

3. Search in the "Hierarchy" for the topic of your choice

4. Select and open a learning graph

The Learning Graph View

As an example, please invoke the LG "Proportional Relations" (Link)
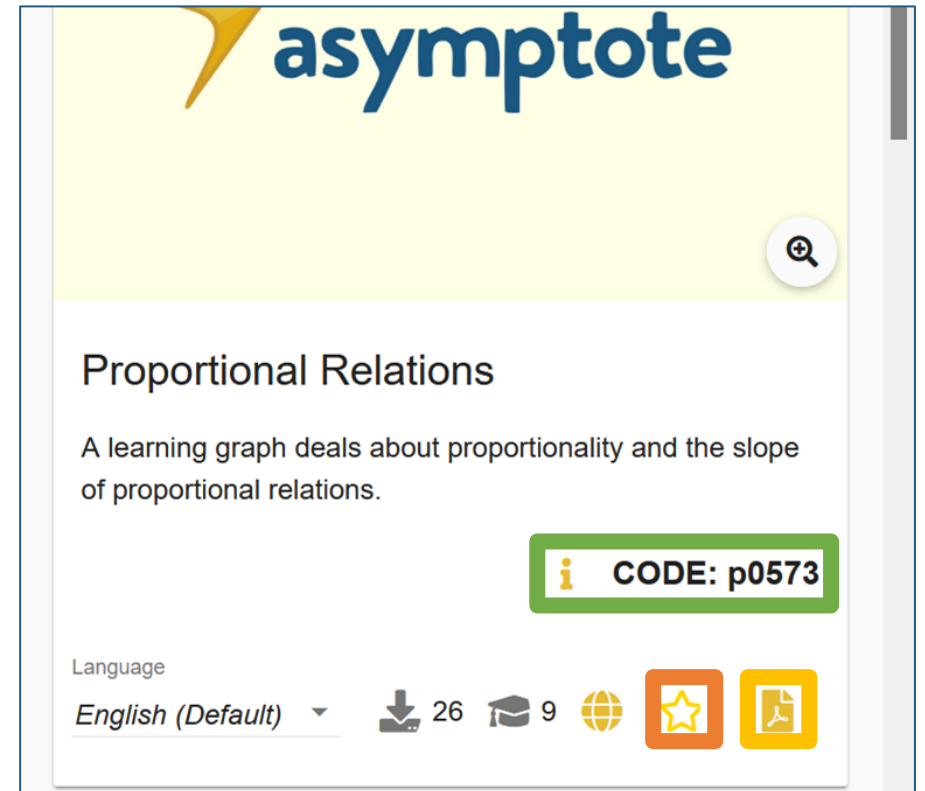
Furthermore, the LG formular allows:

1. to edit the LG

2. to create a Digital Classroom *(more on that later)*

3. to share the LG *(more on that later)*

4. to translate the LG

The Learning Graph View

5. to invoke the LG in the ASYMPTOTE app *(via Code)*

6. to add it to the personal favorites

7. to download the LG as PDF *(in development)*

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Web Portal Functionalities

The ASYMPTOTE Web Portal offers the possibility ...
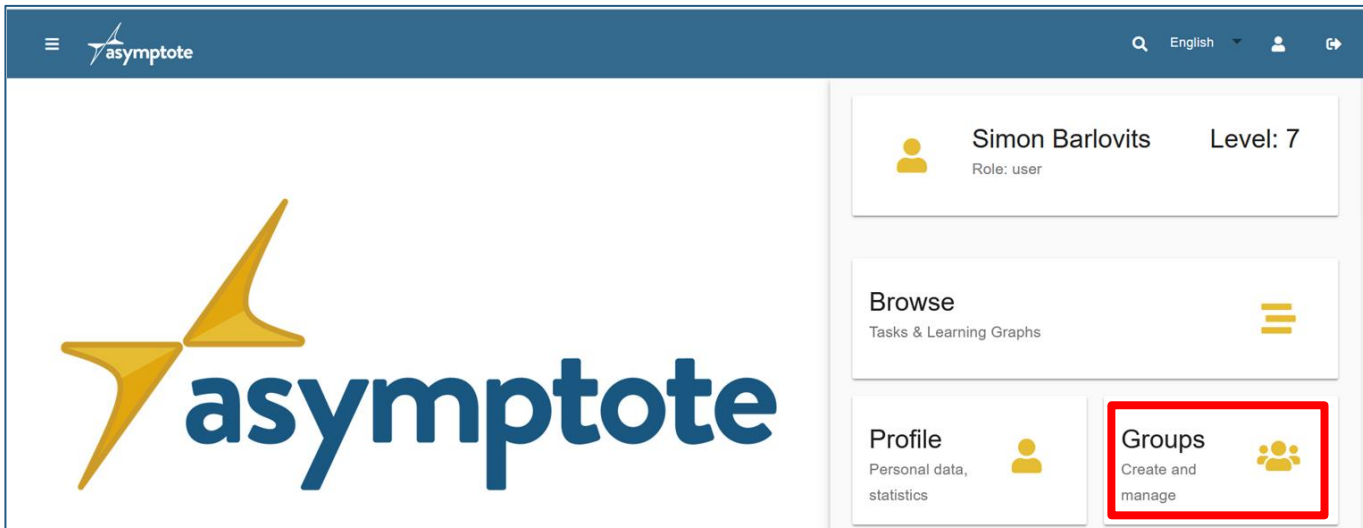
... to make own tasks and learning graphs available to other users

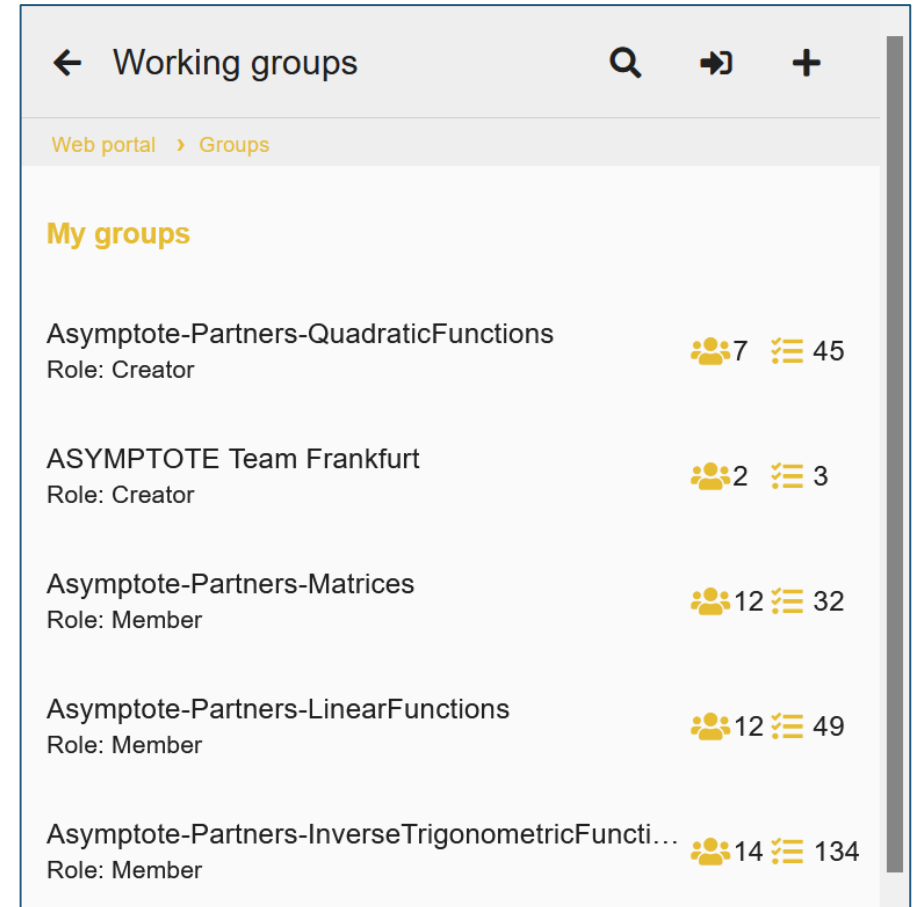... by sharing own tasks and learning graphs with groups

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Manage my Groups

1. Click on the "Groups" button

2. Overview on your groups

3. Invoke shared tasks & LG

   by clicking on a group

Manage my Groups

1. Possibility to leave or share group

   (sharing via code = group no.)

2. Possibility to delete group

   (only for group owners)

Create or Join a Groups

1. Click on the "Group" button

2. Click on the "Entrance" symbol to join a group

   via code *(code = group no.)*

3. Click on the "+" symbol to

   create a new group
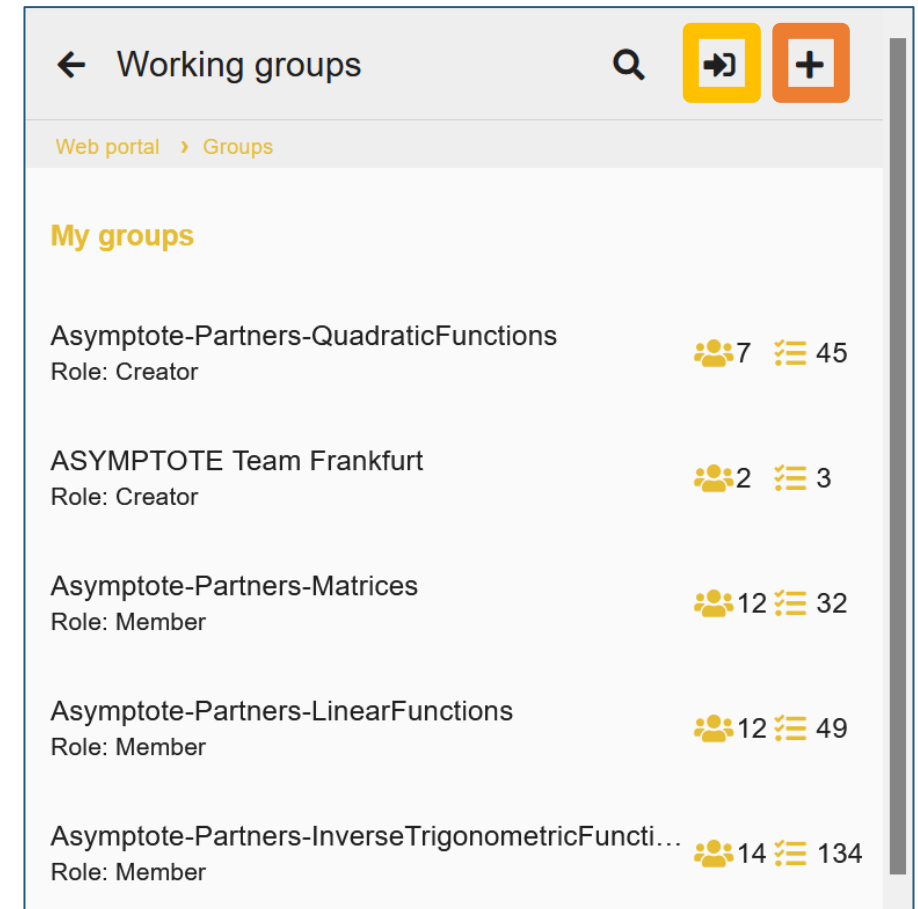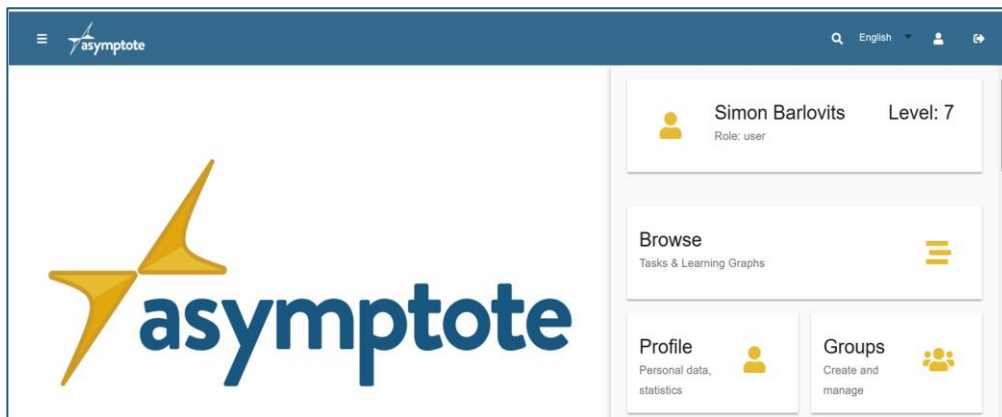
Share a Task or a Learning Graph with a Group

To share a task or a LG ...

1. invoke the task/LG

2. click on the "Share" button

3. select one of your groups
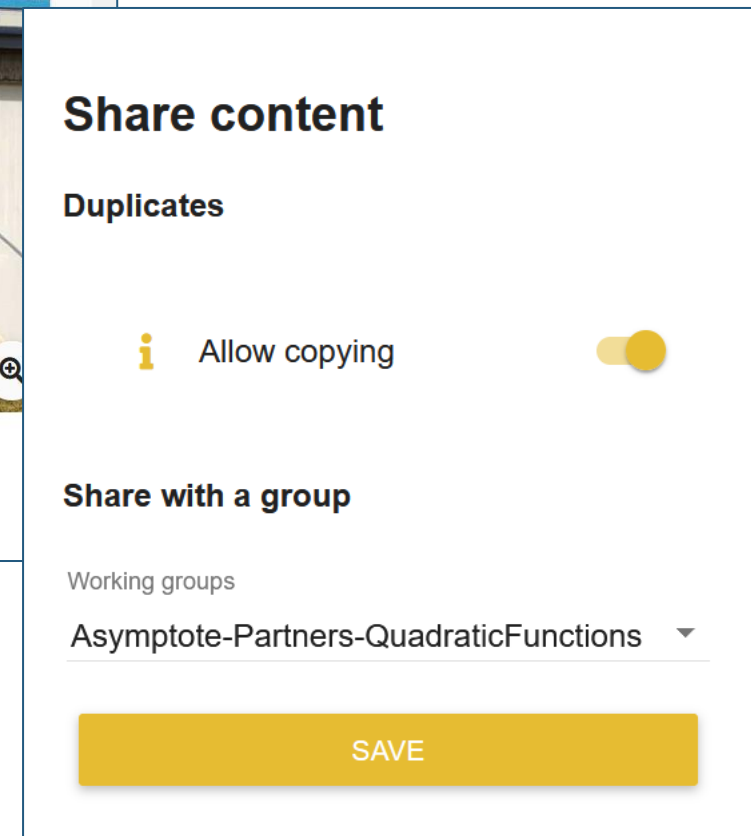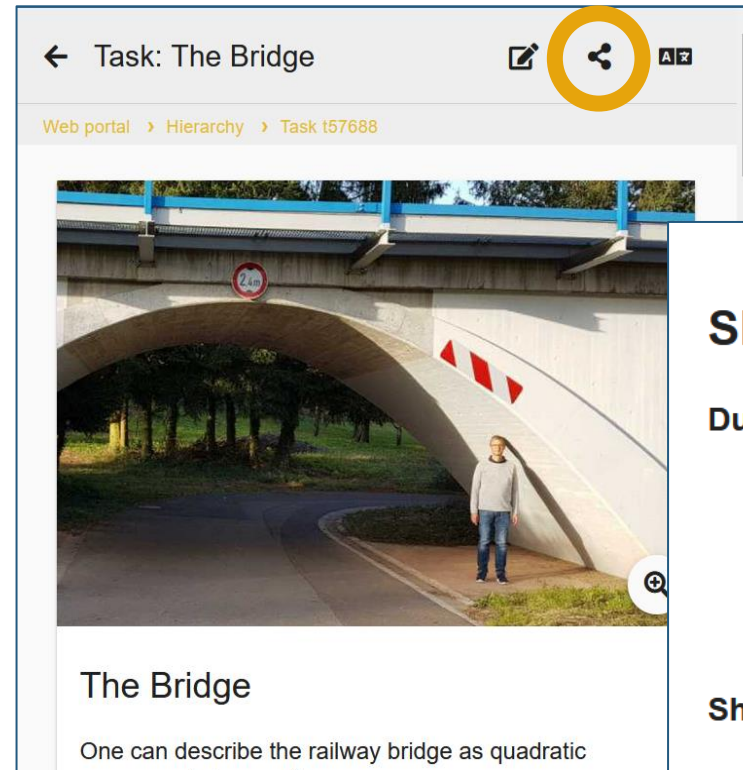
Information:

a) each task/LG can only be shared with one group
b) sharing a task/LG allows all group members its editing

Chapter 3:
The Digital Classroom

Monitoring & Evalution Tool

The Digital Classroom

Features of the Digital Classroom:

- Virtual representation of the class

- Allocation of learning graphs to students

- Real-time monitoring of student's work process

- Student-teacher interaction via chat

- Evaluation on individual & class level

Note: To use the Digital Classroom feature, an active internet connection is required

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The Digital Classroom

Virtual representation of the class:

- Click on the „Classes" button
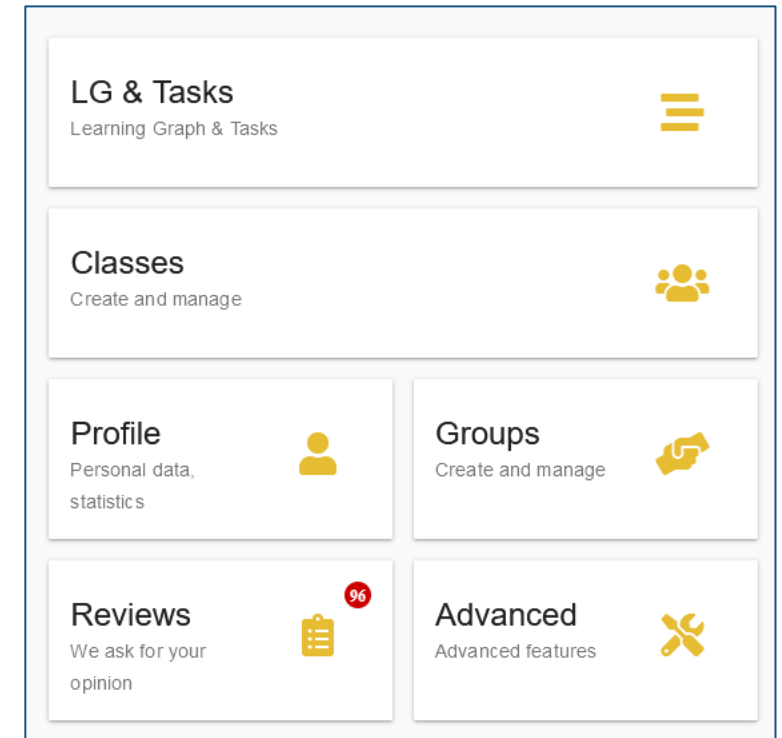
The Digital Classroom

Virtual representation of the class:

- Click on the „Classes" button
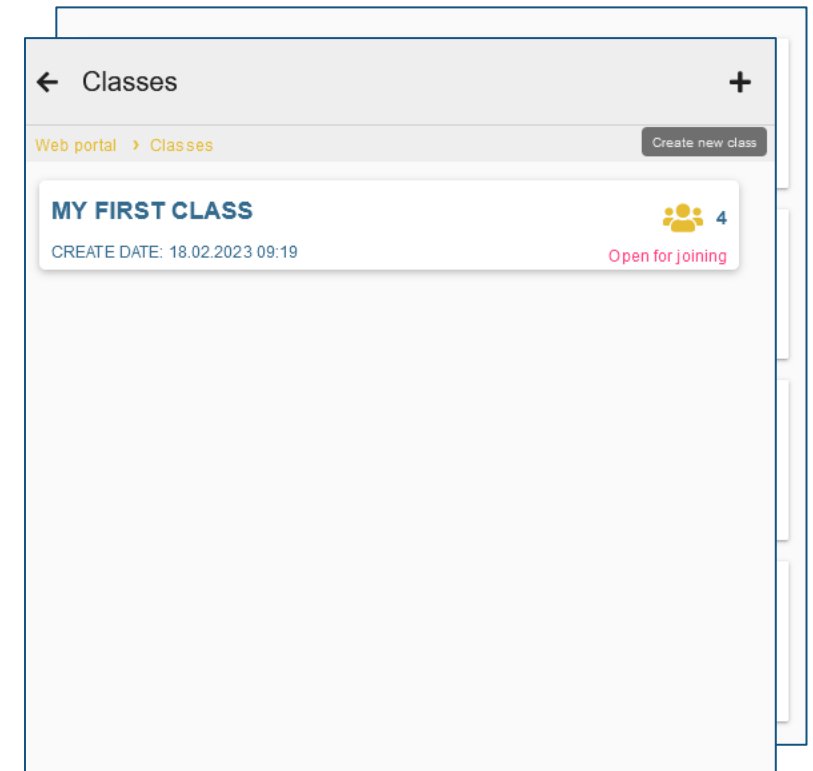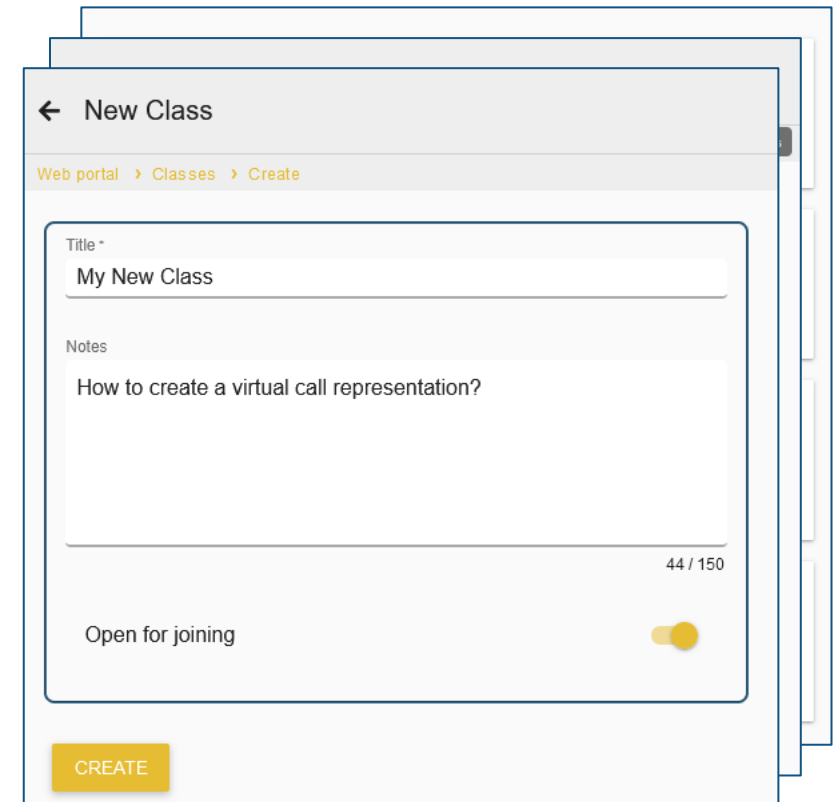
- Click on „+"

The Digital Classroom

Virtual representation of the class:

- Click on the „Classes" button

- Click on „+"

- Enter a title for your class & a short description

- Click on „Create"

Perfect, your virtual class is set up. Now let your students join the class!

The Digital Classroom

Virtual representation of the class:

- Students can join the class via scanning the QR code once
  → No registration is needed on their side!
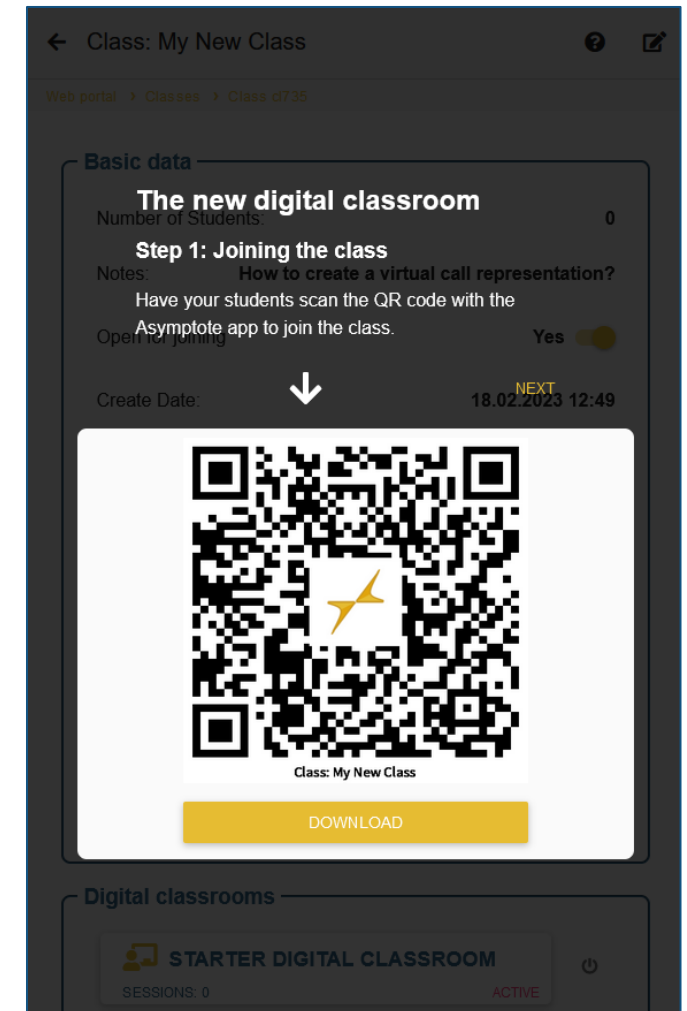
The Digital Classroom

Virtual representation of the class:

- Students can join the class via scanning the QR code once
  → No registration is needed on their side!

- Students are immediately listed in the class
  after joining
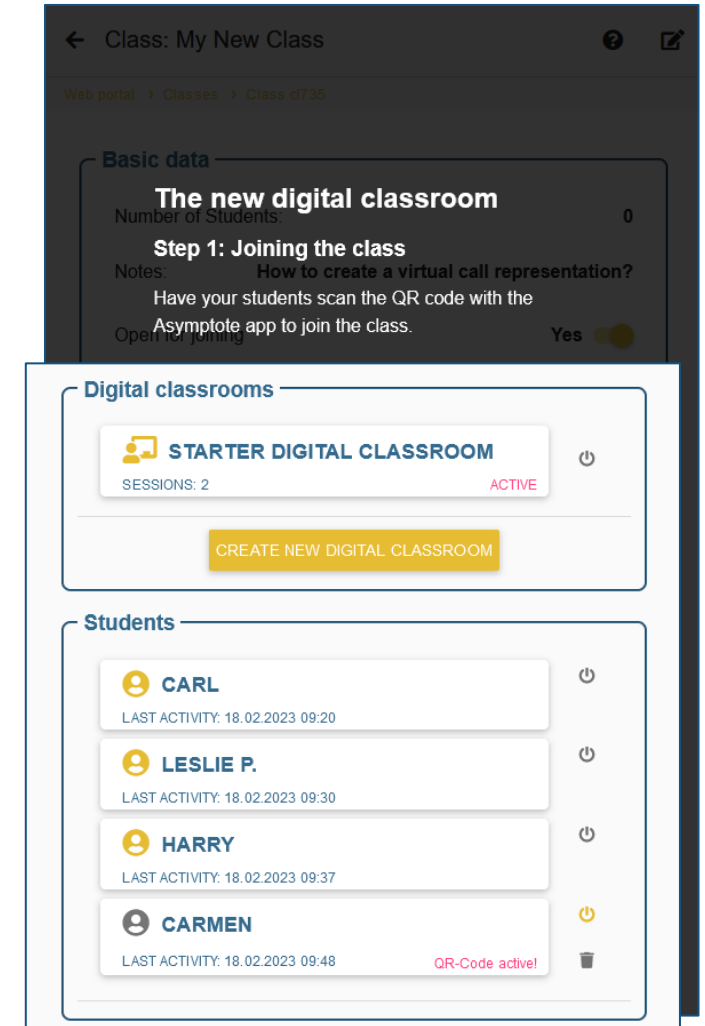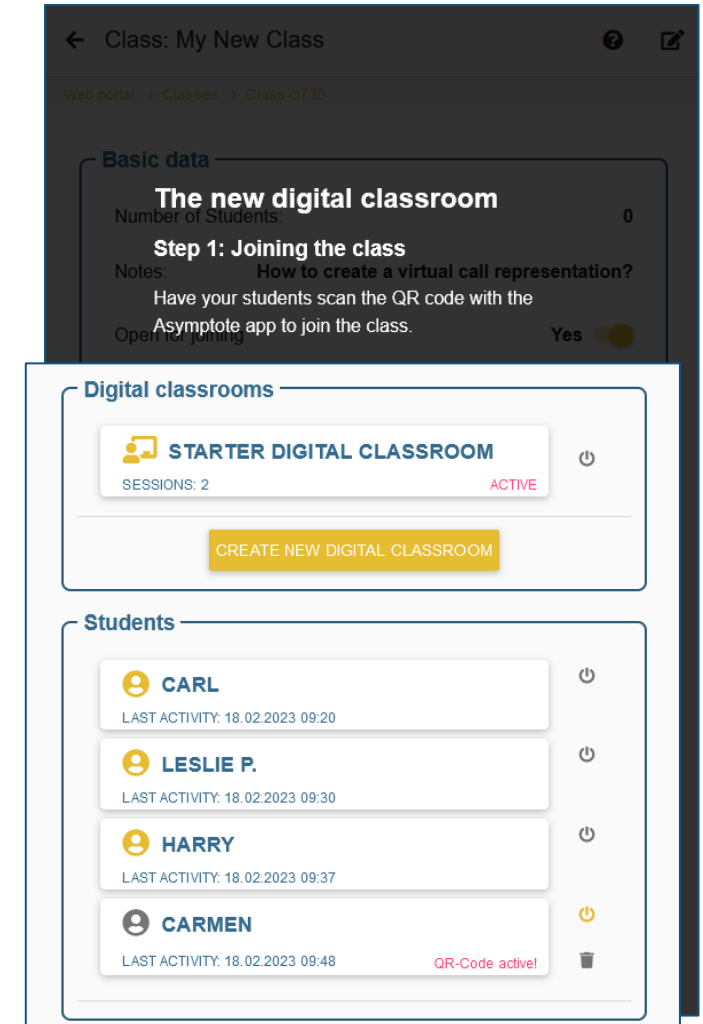
The Digital Classroom

Virtual representation of the class:

- Students can join the class via scanning the QR code once
  → No registration is needed on their side!

- Students are immediately listed in the class
  after joining

- You can change the status of a student

  - Active: student can access all allocated LG
    (see next slide; standard setting)

  - Inactive: student can view but not work on allocated LG
    (pause mode)

  - Delete: students are not longer part of the class

The Digital Classroom

Virtual representation of the class:

Reconnecting to existing work progress

- Student's can reconnect to their work progress in the app after the loss/change of the mobile device or deinstallation of the app

- An individualized student QR code is activated by the teacher and scanned by the student

- As if by magic, the previous work status appears in the app!

The Digital Classroom

Virtual representation of the class:

Reconnecting to existing work progress

- Carl has a new phone. How could he reconnect to his previous work progress?

- Click on the student account of Carl

The Digital Classroom

Virtual representation of the class:

Reconnecting to existing work progress

- Carl has a new phone. How could he reconnect to his previous work progress?

- Click on the student account of Carl

- Activate „Reconnection possible"

- Let Carl scan his individualized QR code

- His previous work process is automatically restored!

By clicking the „edit" button (upright), teachers can change student's pseudonyms.

← Student: Carl ✎

Web portal › Classes › Class cl194 › Students st53

Student Details and Settings

Pseudonym	**Carl**
code:	**st53**
Create Date:	18.02.2023 09:20
Last online:	18.02.2023 09:20
Reconnection possible	Yes
Deactivated	No

Student: Carl

DOWNLOAD

DELETE STUDENT

The Digital Classroom

Allocation of learning graphs to students:

- Click on „Starter Digital Classroom"

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The Digital Classroom

Allocation of learning graphs to students:

- Click on „Starter Digital Classroom"

- One could also create further Digital Classrooms
  to conduct lessons based on …

  - topics (e.g., "All about functions"),

  - terms (e.g., "2nd term of 2023"), or

  - methods (e.g., "Exam preparation")

The Digital Classroom

Allocation of learning graphs to students:

- Click on „Starter Digital Classroom"

- Click on „New Session"

The Digital Classroom

Allocation of learning graphs to students:

- Click on „Starter Digital Classroom"

- Click on „New Session"

  - Enter a title for the new session

  - Select a learning graph of your choice

  - Add a short welcome message for students

  - Determine the time in which the LG is accessible

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The Digital Classroom

Allocation of learning graphs to students:

- Click on „Starter Digital Classroom"

- Click on „New Session"

  - Enter a title for the new session

  - Select a learning graph of your choice

  - Add a short welcome message for students

  - Determine the time in which the LG is accessible

What is a session?
A session is the time period in which a specific LG can be completed by the students.
All task processes & chat interactions are stored in the session for evaluation purposes.
Within one Digital Classroom, multiple sessions can be created.

The Digital Classroom

Allocation of learning graphs to students:
The student's perspective (app)

- After entering the class via the QR code,
  the class is displayed under "My Class".

  - No registration is needed on student's side!

- All Digital Classrooms of this class are displayed here

The Digital Classroom

Allocation of learning graphs to students:
The student's perspective (app)

- After entering the class via the QR code,
  the class is displayed under "My Class".

  - No registration is needed on student's side!

- All Digital Classrooms of this class are displayed here

- In a Digital Classroom, all sessions are shown

  - Currently available LG are marked by a red dot

  - „Upcoming" shows already planned sessions

  - „Finished" shows passed sessions

The Digital Classroom

Allocation of learning graphs to students:
The student's perspective (app)

- After entering the class via the QR code,
  the class is displayed under "My Class".

  - No registration is needed on student's side!

- All Digital Classrooms of this class are displayed here

- In a Digital Classroom, all sessions are shown

  - Currently available LG are marked by a red dot

  - „Upcoming" shows already planned sessions

  - „Finished" shows passed sessions

- By clicking on a current session, the related LG can be accessed

The Digital Classroom

Real-time monitoring of student's work process:

- Synchronously view of the work process:

  - How are the students doing progress?

  - Do they need support?

The Digital Classroom

Real-time monitoring of student's work process:

- Synchronously view of the work process:
  - How are the students doing progress?
  - Do they need support?

- Monitoring on class level
  - Received points are displayed
  - LG & work process is represented

- 🟢 Task successful
- 🟡 Task ok
- 🔴 Task failed
- ⚪ Task skipped
- 🔵 Task opened

The Digital Classroom

Real-time monitoring of student's work process:

- Synchronously view of the work process:

  - How are the students doing progress?

  - Do they need support?

- Monitoring on individual level

  - Student's interaction with app is stored under „events"

  - Get a detailed insight in student's work process

The Digital Classroom

Student-teacher interaction via chat:

- Synchronous communication via chat

  - Text messages

  - Images

  - Audio messages

**Support your students & give individual feedback
despite of the online setting!**

The Digital Classroom

Evaluation on individual & class level:

- Use the monitoring function for an evaluation of the work session:

  - Which students performed very well?

  - Which students need further support?

  - Which task was perceived as difficult?

Note: By comparing student's performance on various LG within one Digital Classroom, you can perform a basic long-term analysis!

Data Protection within the Digital Classroom

Information on data privacy:

- The data is processed and stored in Germany (1&1 - Frankfurt site).

- The collected data is not personal

  - No registration for students necessary

  - No email addresses required

  - No clear name required: users choose a pseudonym

  - Identification is done temporarily via random key

  - Encrypted transmission of data (SSL)

ASYMPTOTE complies with the provisions of the GDPR

Chapter 4:
The ASYMPTOTE App

How to use the ASYMPTOTE App

Application download

For **Android**:

1. Visit Google play

2. Search for "ASYMPTOTE"

3. Click on the download button

For **iOS**:

1. Visit AppStore

2. Search for "ASYMPTOTE"
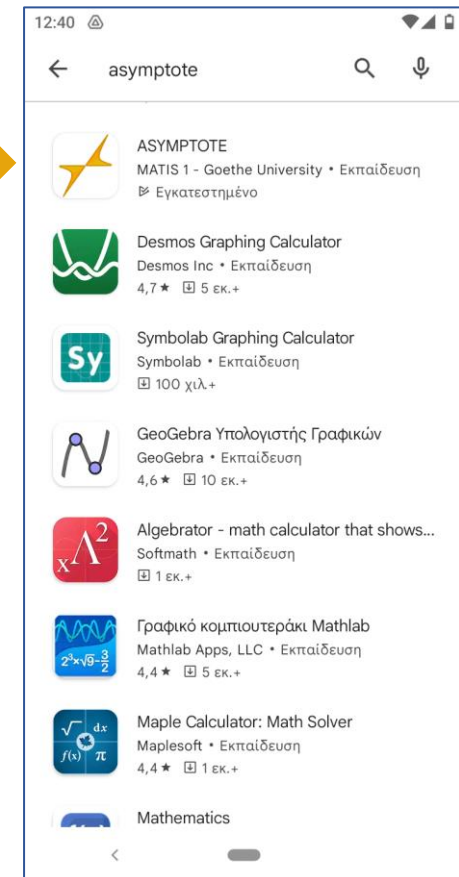
3. Click on the download button

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Application Functionalities

The ASYMPTOTE App offers the possibility ...

1. to select a **public Learning Graph** from a list available
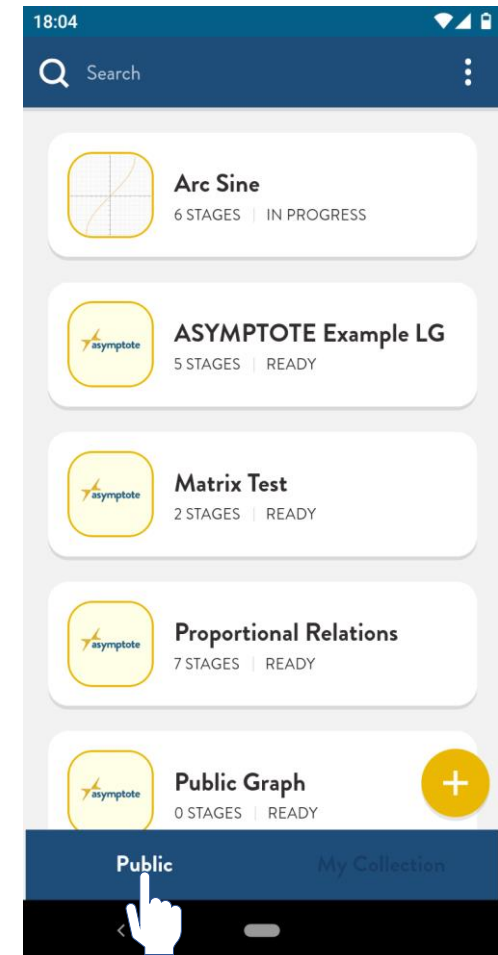
Application Functionalities

The ASYMPTOTE App offers the possibility ...

1. to select a **public Learning Graph** from a list available

2. to form a personal gallery of **Learning Graphs** in **"My collection"**
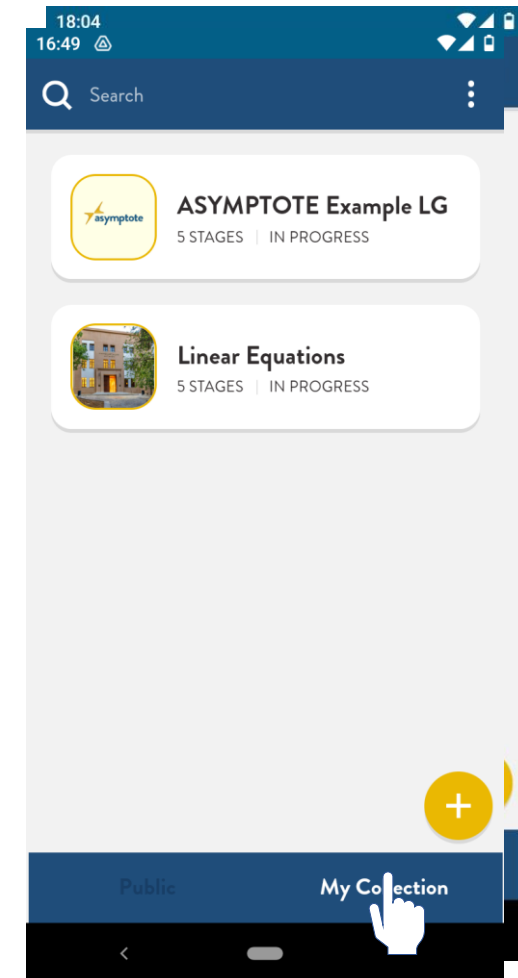
Before you start
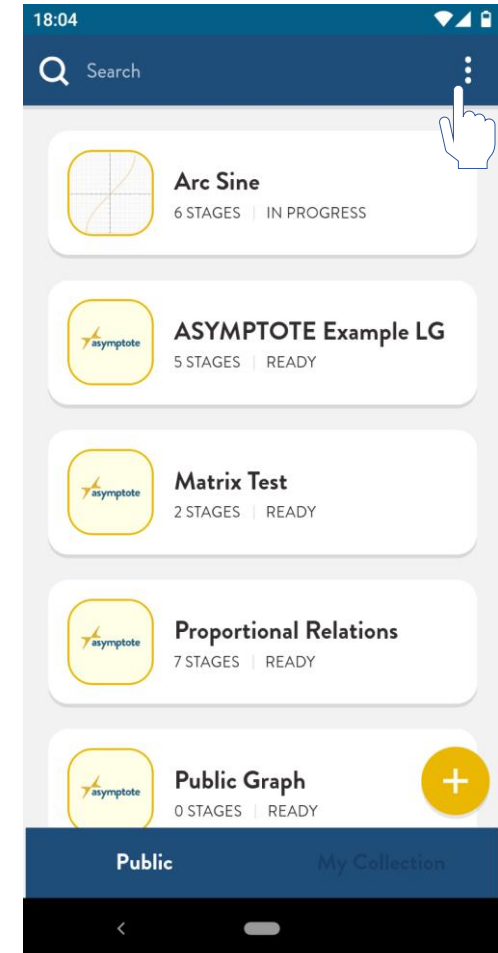
1. **Select the language you prefer**

    ➤ Click on the **three dots** button

Before you start

1. **Select the language you prefer**

   ➢ Click on the **three dots** button
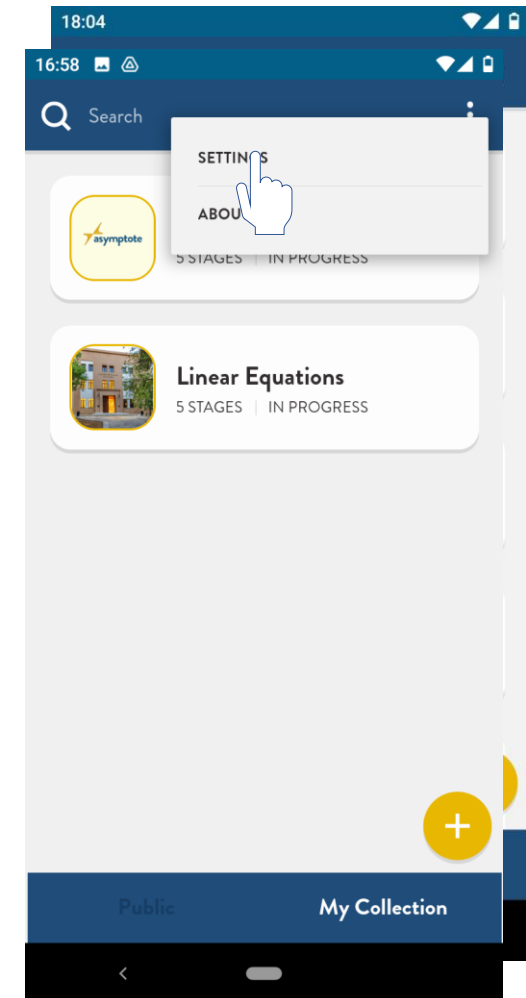
   ➢ Click on **"SETTINGS"**

Before you start

1. **Select the language you prefer**

   ➢ Click on the **three dots** button

   ➢ Click on "**SETTINGS**"

   ➢ Select your language
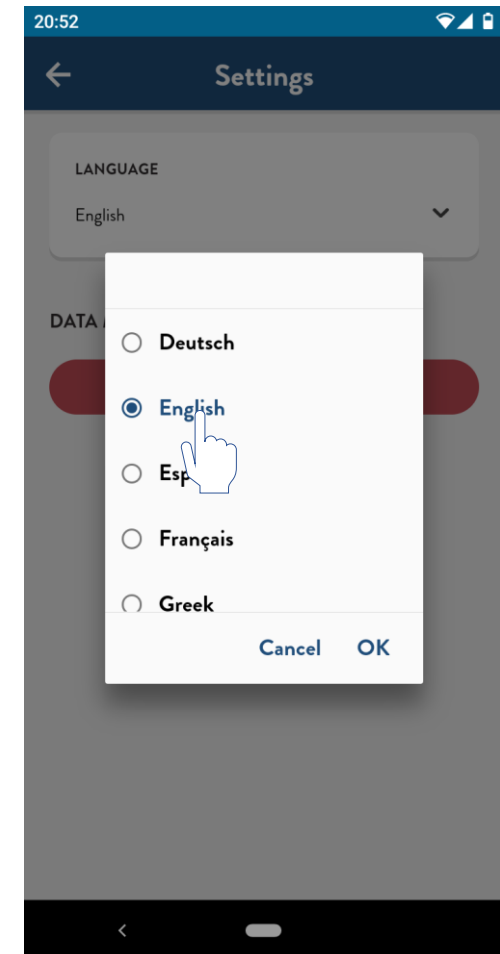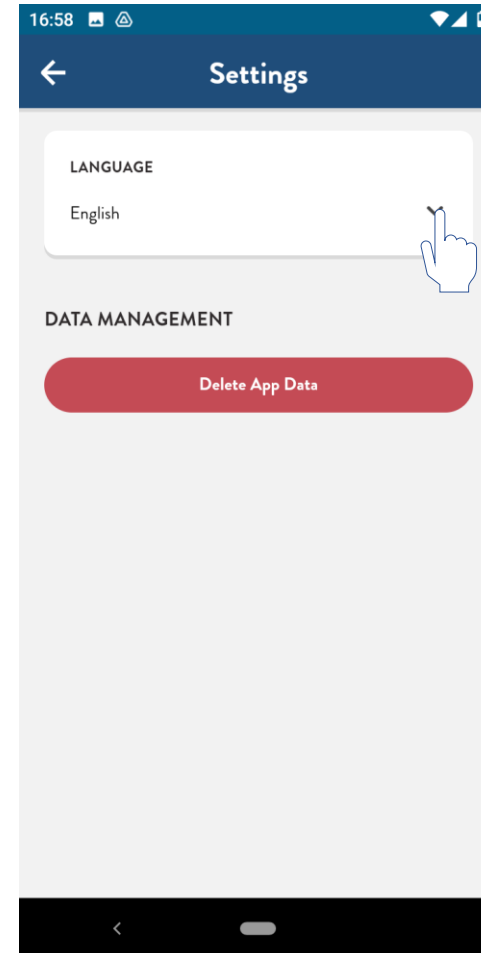
Select a public Learning Graph

1. Click on the "**Public**" button down on the left

2. Choose a Learning Graph from the available list

✓ To search the list by name or code for a desired Learning Graph you can use the 🔍 **search** button
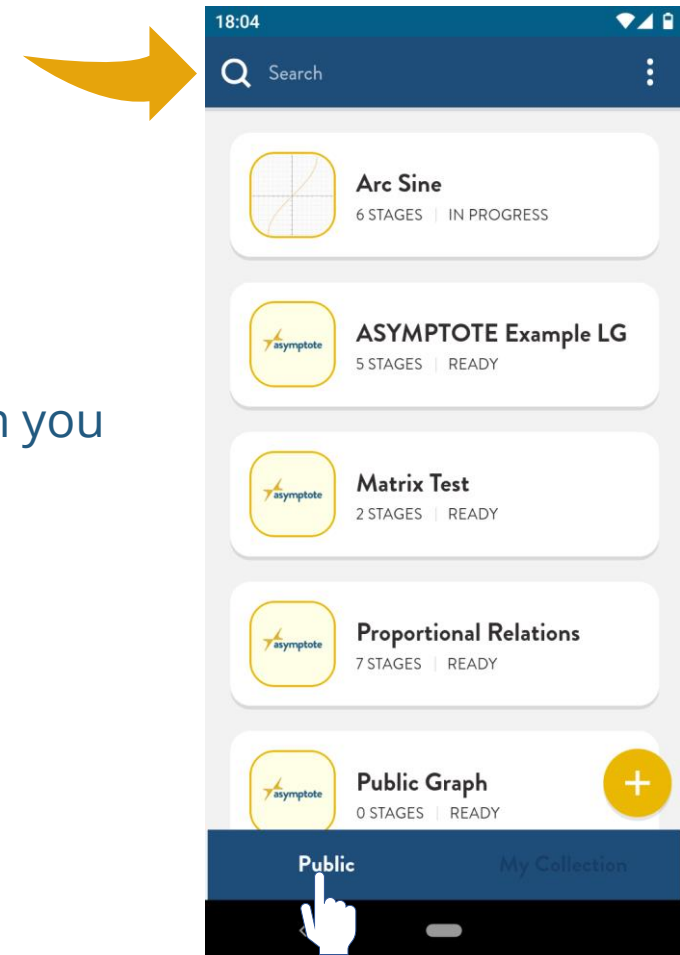
Select a public Learning Graph

1. Click on the "**Public**" button down on the left

2. Choose a Learning Graph from the available list

✓ To search the list by name or code for a desired Learning Graph you can use the 🔍 **search** button

3. Download the desired Learning Graph
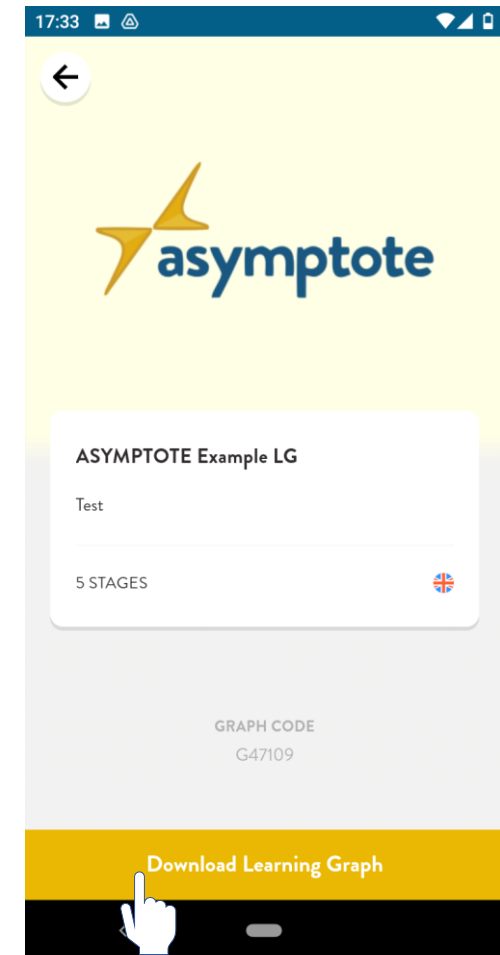
Getting to know ASYMPTOTE app

1. **Before you start** exploring the app by yourself it is recommended to choose the **Getting to know ASYMPTOTE** Learning Graph

2. This Learning Graph **presents the features** of the ASYMPTOTE app and **the multiple answer formats**.

3. You can also search this Learning Graph by code: **G47109**
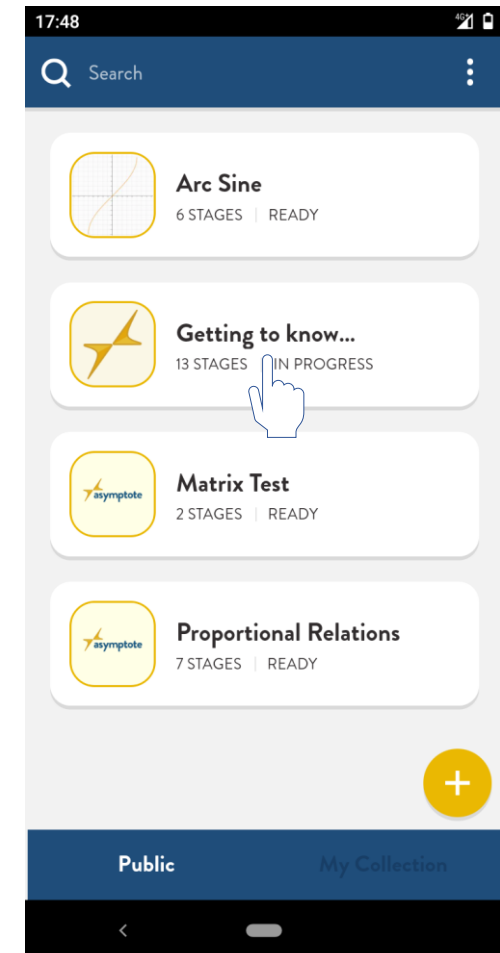
"My Collection" of Learning Graphs

1. Every downloaded Learning Graph is automatically added to your personal gallery "**My Collection**"

2. To **add** any desired Learning Graph to "My Collection" click on the ➕ button (search by code)

3. You can also **remove** any Learning Graph that you don't need anymore from your collection
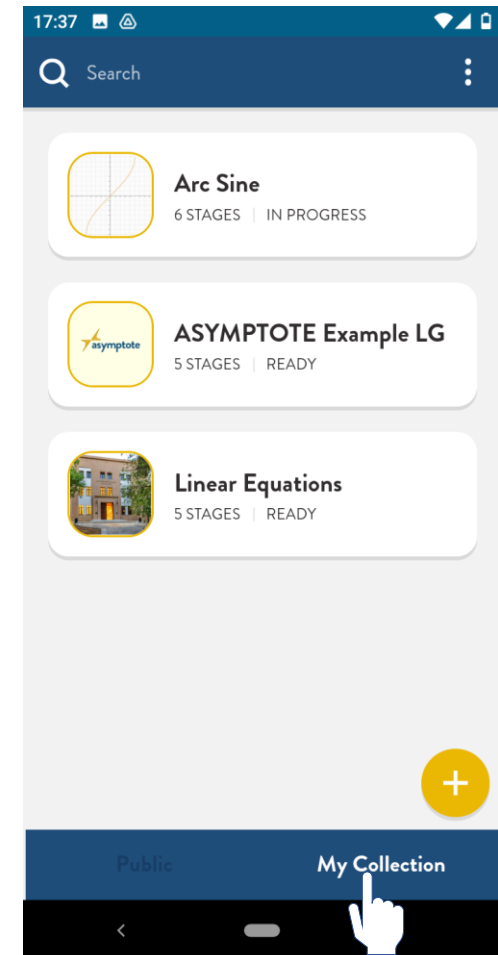
"My Collection" of Learning Graphs

1. Every downloaded Learning Graph is automatically added to your personal gallery "**My Collection**"

2. To **add** any desired Learning Graph to "My Collection" click on the ➕ button (search by code)
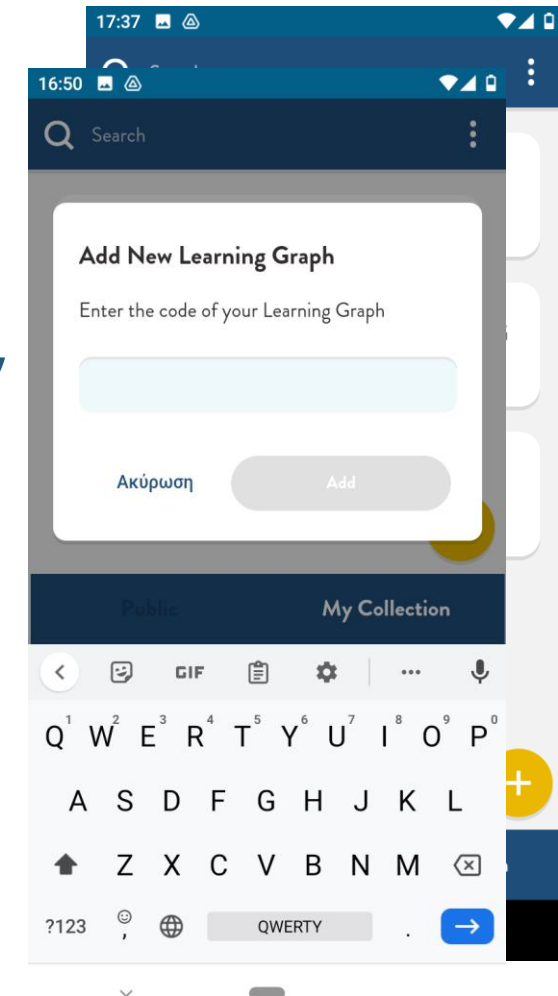
"My Collection" of Learning Graphs

1. Every downloaded Learning Graph is automatically added to your personal gallery "**My Collection**"

2. To **add** any desired Learning Graph to "My Collection" click on the ➕ button (search by code)

3. You can also **remove** any Learning Graph that you don't need anymore from your collection
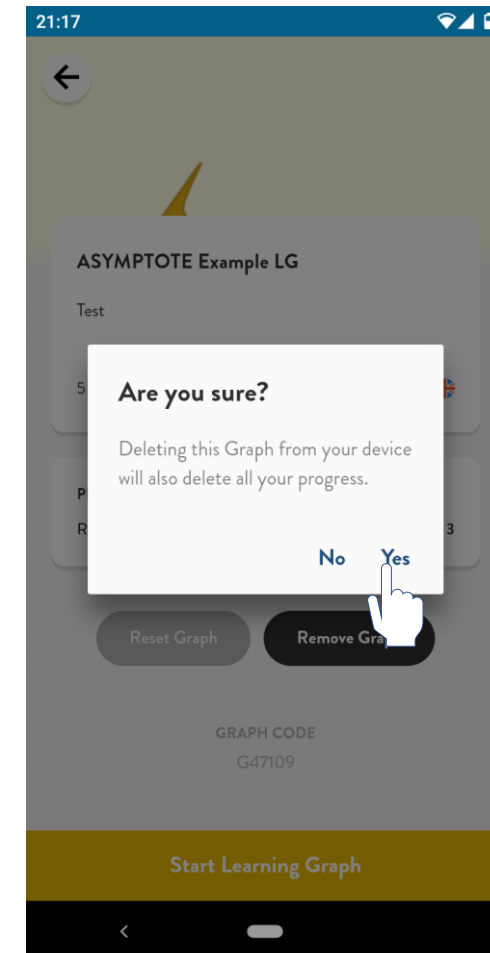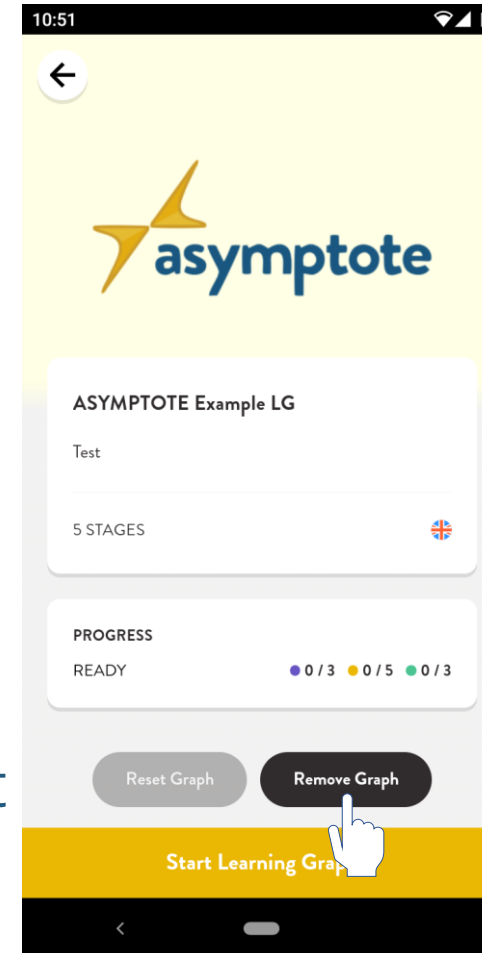
Start Learning Graph
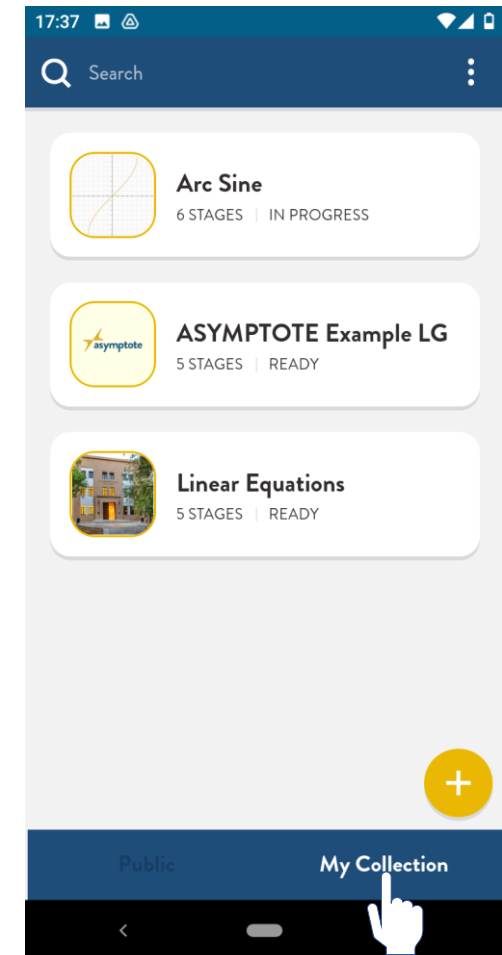
1. Choose a Learning Graph from "**My Collection**"

Start Learning Graph

1. Choose a Learning Graph from "**My Collection**"

2. Click on the "**Start Learning Graph**" button down bellow
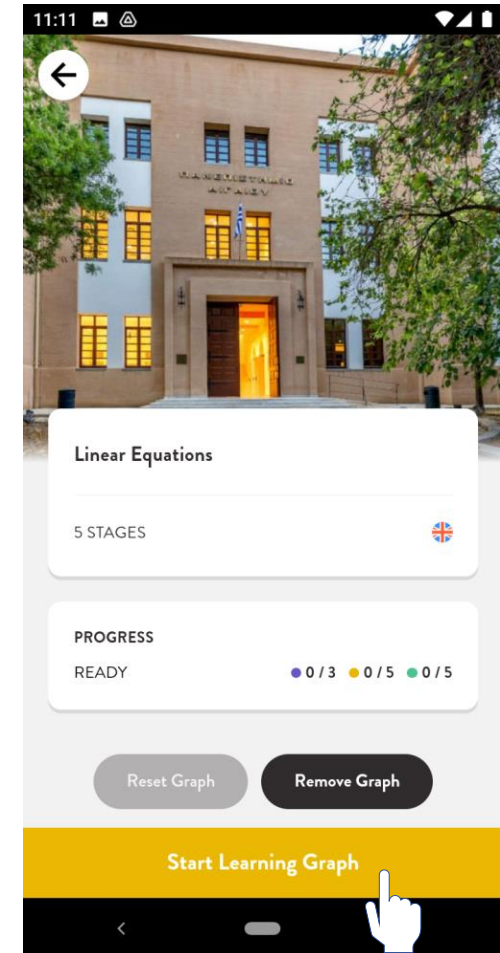
Start Learning Graph

1. Choose a Learning Graph from "**My Collection**"

2. Click on the "**Start Learning Graph**" button down bellow

3. Click on the **main task** (orange) or the **support task** (green) to start solving
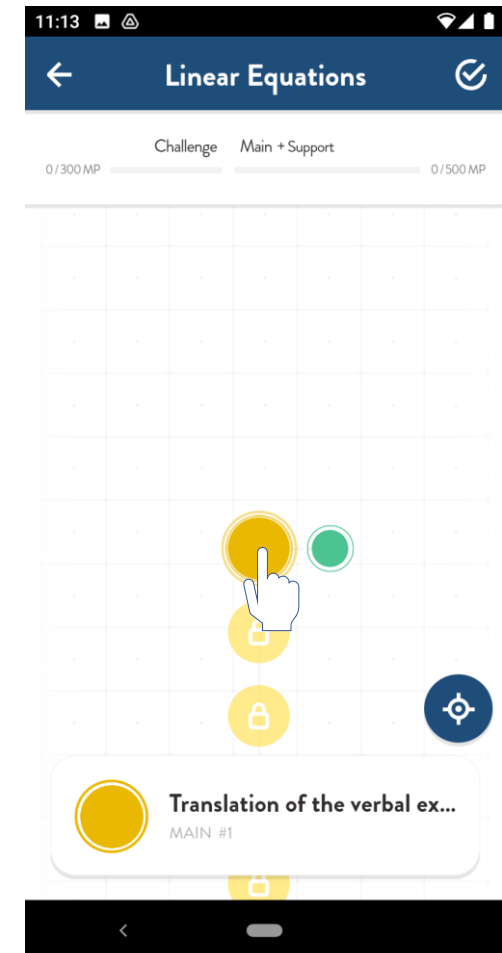
The task formular

On this interface you can see:

- The task **title**

- The task **definition**

- The **answer area**

- The task **points**

- How many **tries** you have left
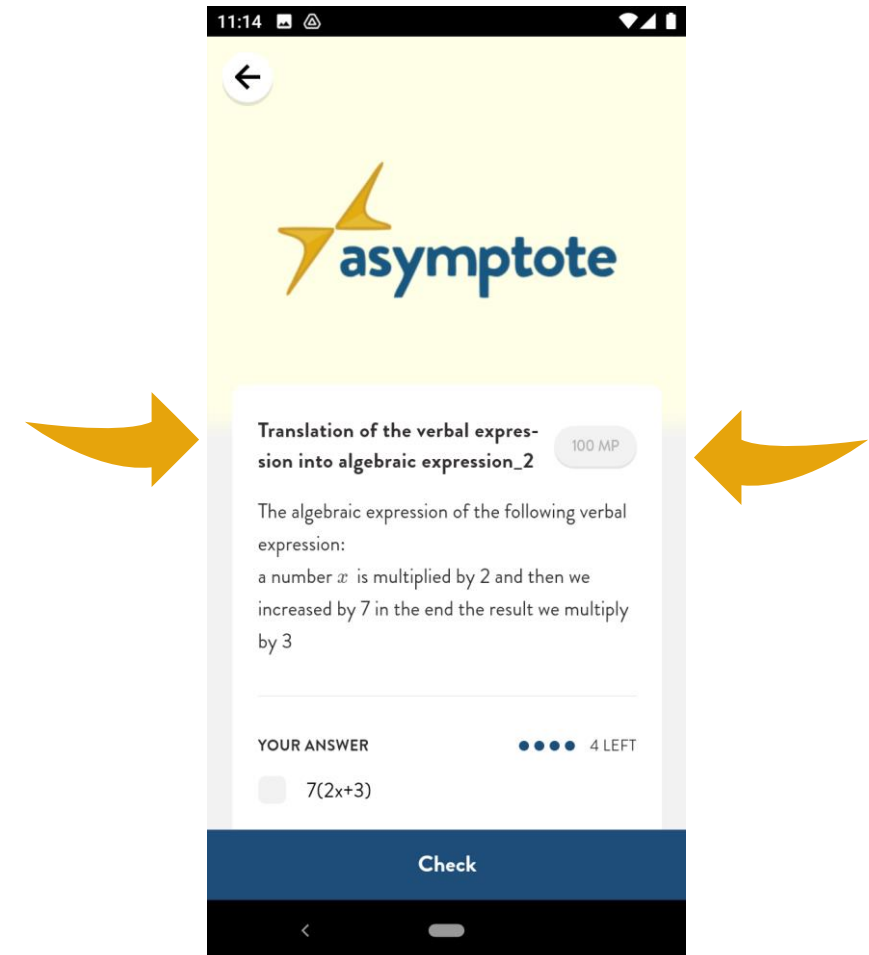
The task formular

Scrolling down on this interface you can see:

- The available **Hints**

- The "**Give up**" button
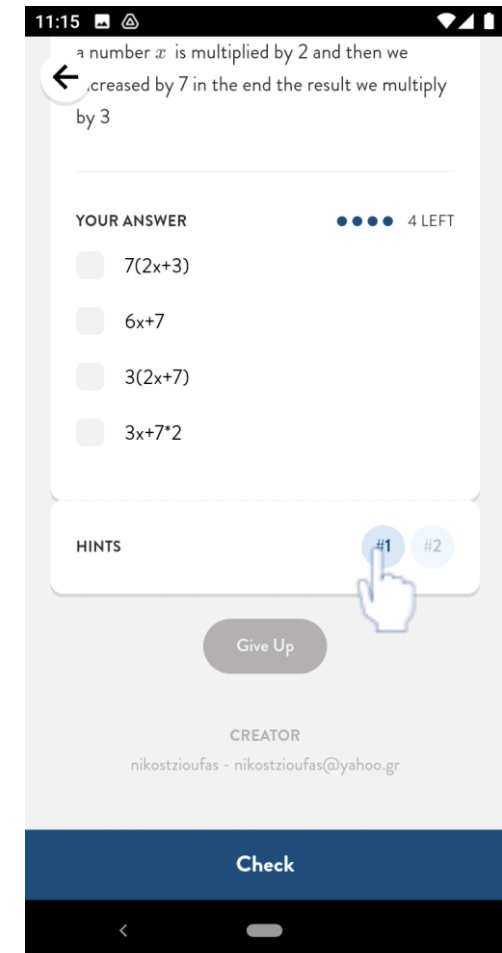
Answering the task

Choose an answer

1. If it is **correct**:

- You can see the **Sample solution** and you can **Continue**
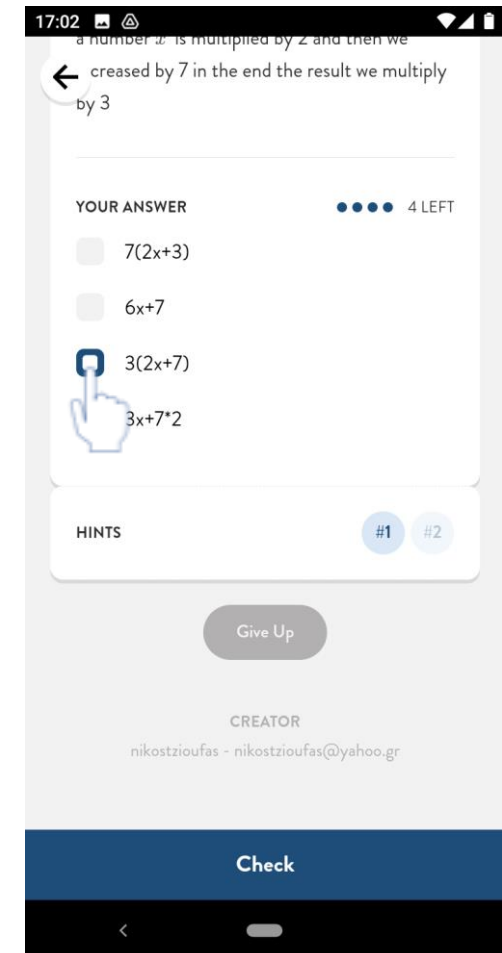
Answering the task

Choose an answer

1. If it is **correct**:

- You can see the **Sample solution** and you can **Continue**

2. If it is **wrong**:

- The first time **you don't get any help**

- The second and third time **a Hint is suggested** by the system

- The fourth time the **sample solution is available**

  - Then you should **return to the Learning Graph** to continue

The System suggest to use support / challenge tasks after twice

failing / solving a task
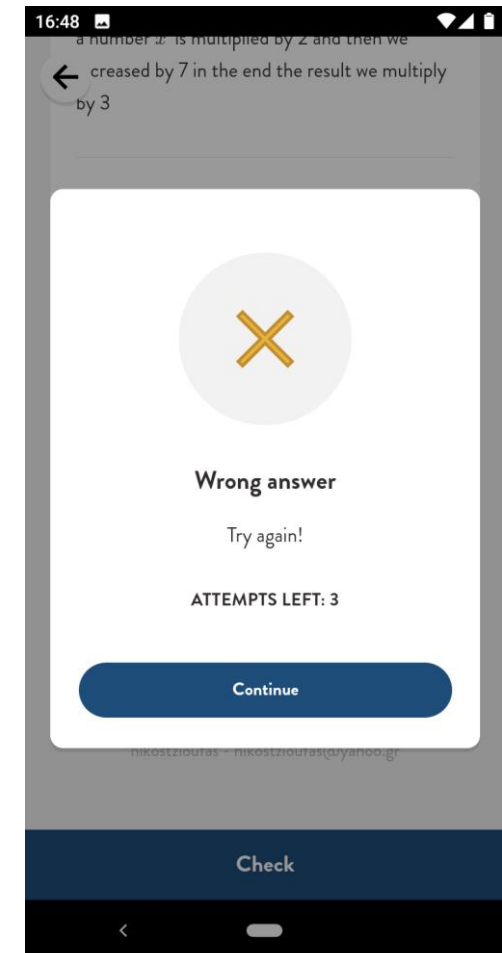
Other options

1. You can <u>check the progress</u> of a Learning Graph on the
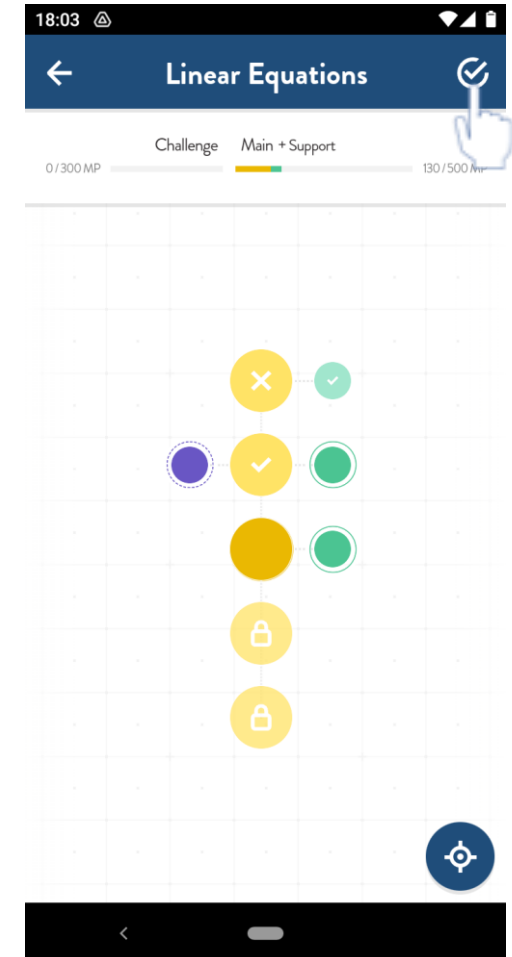
   top side of the screen

Other options

1. You can <u>check the progress</u> of a Learning Graph on the

   top side of the screen

2. You can also <u>check the progress and/or finish</u> a

   Learning Graph using the **check** button
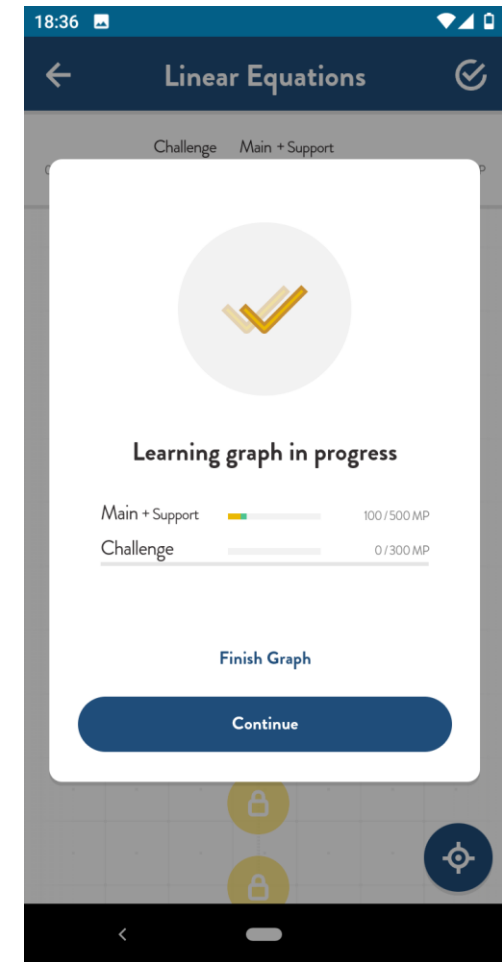
Other options

1. You can <u>check the progress</u> of a Learning Graph on the **top side of the screen**

2. You can also <u>check the progress and/or finish</u> a Learning Graph using the **check** button

3. With the **target** button you can <u>bring back the Learning Graph in the center of the screen</u>
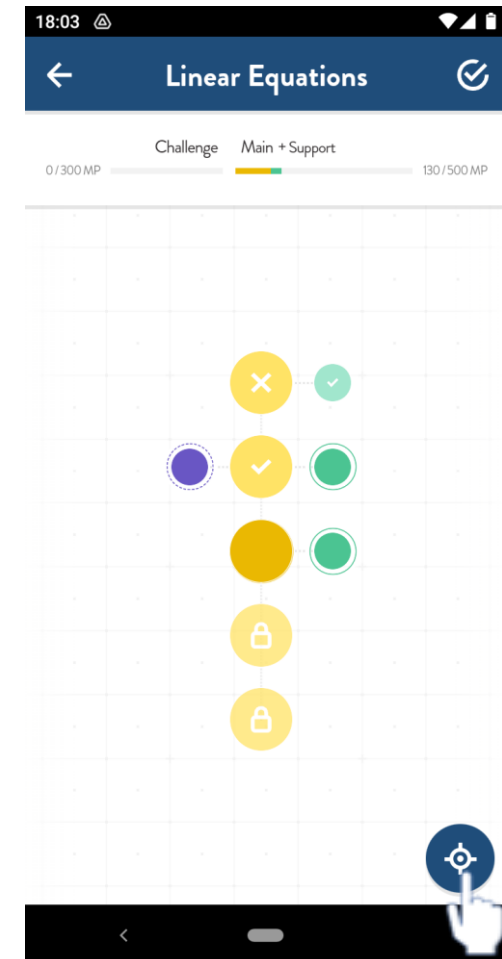
Other options

1. You can <u>check the progress</u> of a Learning Graph on the **top side of the screen**

2. You can also <u>check the progress and/or finish</u> a Learning Graph using the **check** button

3. With the **target** button you can <u>bring back the Learning Graph in the center of the screen</u>

4. You can <u>exit the Learning Graph for a while</u> using the **arrow** button
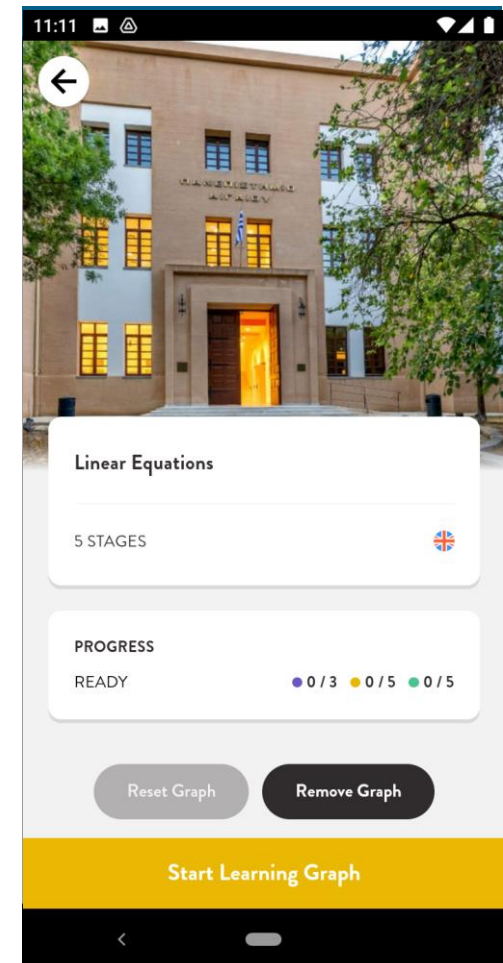
Other options

1. The Learning Graphs that <u>you haven't started yet</u> are marked with the indication "**READY**"
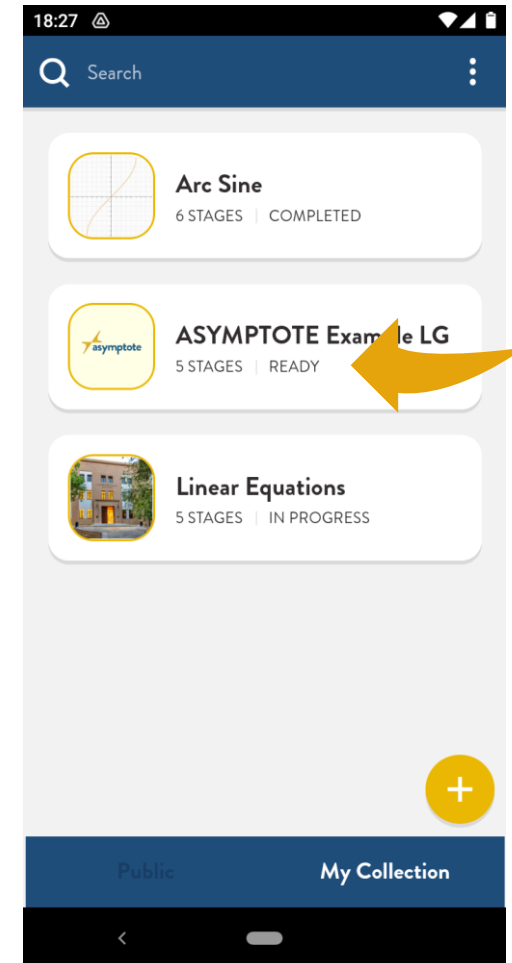
Other options

1. The Learning Graphs that <u>you haven't started yet</u> are marked with the indication "**READY**"

2. The <u>unfinished</u> Learning Graphs are marked with the indication "**IN PROGRESS**"

   - You can **reset** every unfinished Learning Graph to start again from the beginning
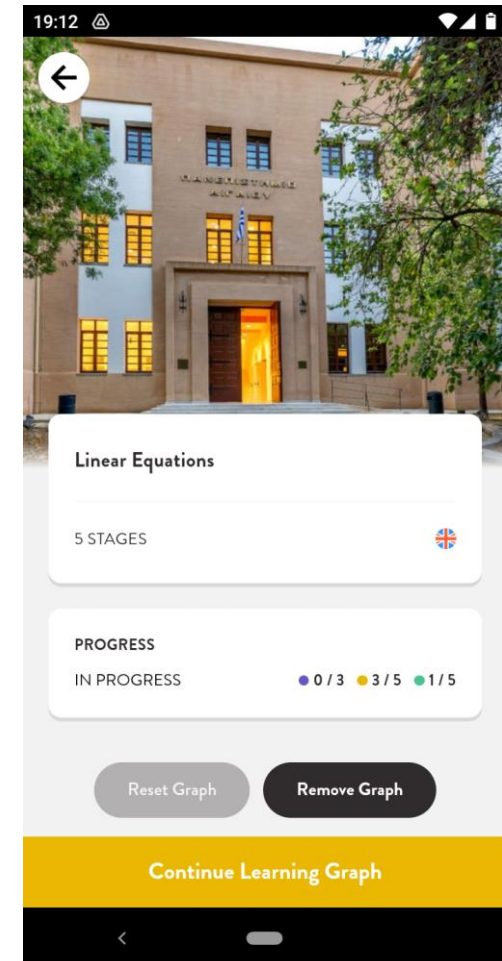
Other options

1. The Learning Graphs that <u>you haven't started yet</u> are marked with the indication "**READY**"

2. The <u>unfinished</u> Learning Graphs are marked with the indication "**IN PROGRESS**"
   - You can **reset** every unfinished Learning Graph to start again from the beginning

3. The <u>finished</u> Learning Graphs are marked with the indication "**COMPLETED**"
   - you can also **start a new sequence** of the finished Learning Graphs
   - or you can **Remove Graph** download it again and make a fresh start
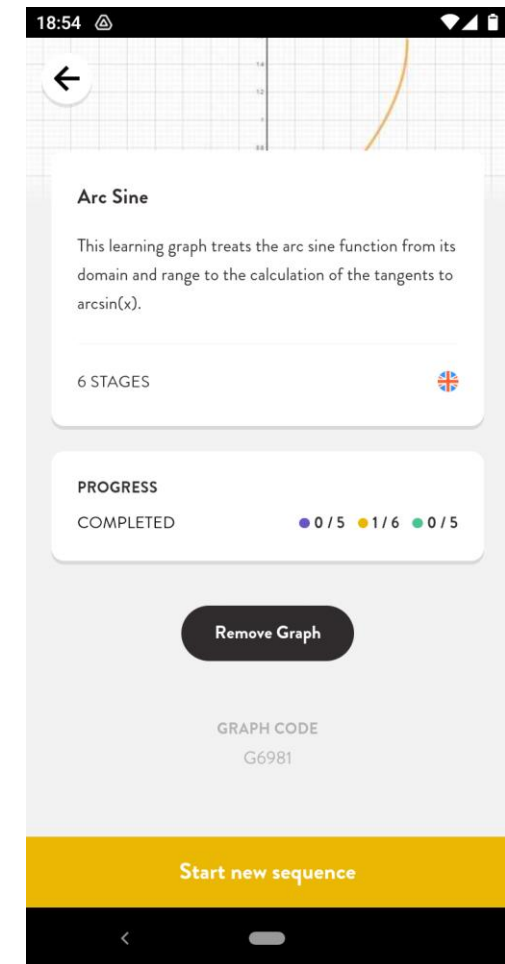
Chapter 5:
Best practice examples

Learning Graphs in different fields of mathematics

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of the European Union

Linear functions 1

Linear functions (modelling)

In this learning graph, you can practice using and modeling linear functions.

Level: lower secondary level

Download LG via this code in the app: g89220

#Main Tasks	#Challenge Tasks	#Support Tasks
5	0	6

https://www.asymptote-project.eu/de/portal-de/#!/graph/g89220
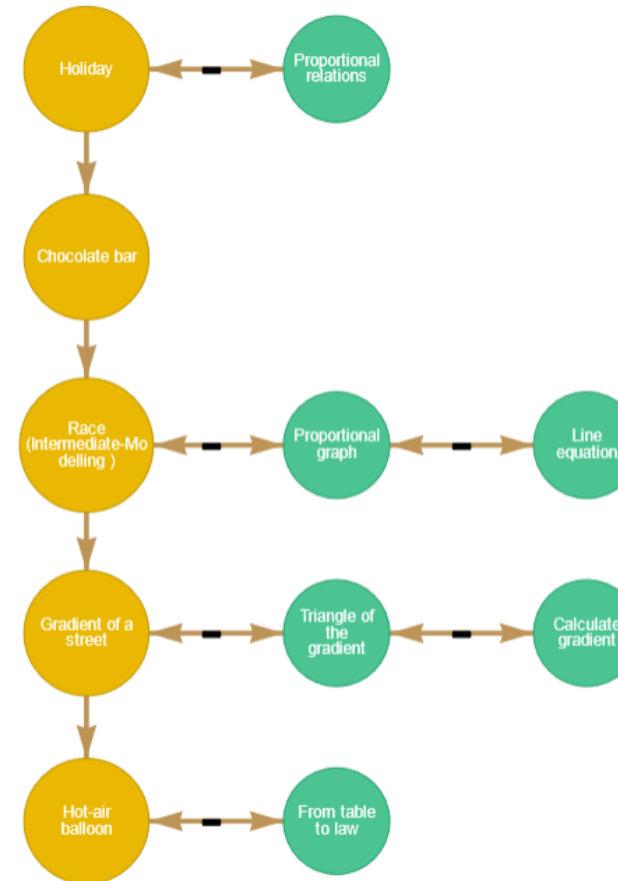
Linear functions 2

Practise linear functions

In this learning graph you can practise working with linear functions.

Level: lower secondary level

Download LG via this code in the app: g28219

#Main Tasks	#Challenge Tasks	#Support Tasks
4	2	5

https://www.asymptote-project.eu/de/portal-de/#!/graph/g28219
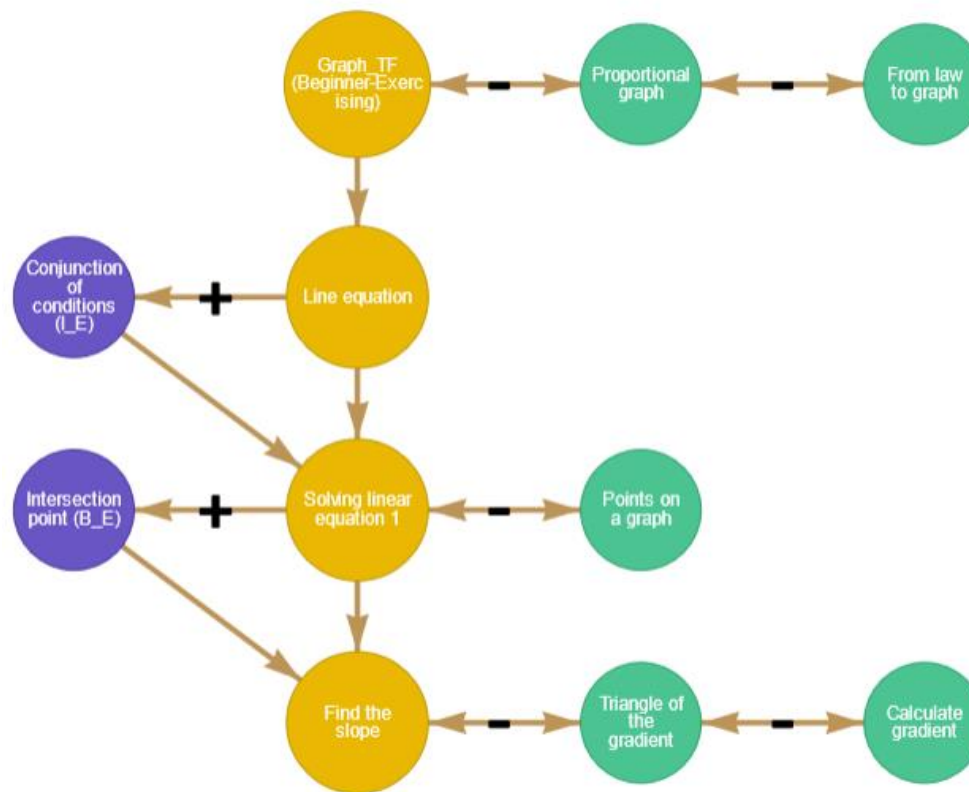
Linear functions 3

Proportional function

In this graph, you can practice and improve your knowledge about proportionality and proportional functions.

Level: lower secondary level

Download LG via this code in the app: g23218

#Main Tasks	#Challenge Tasks	#Support Tasks
4	2	3

https://www.asymptote-project.eu/de/portal-de/#!/graph/g23218
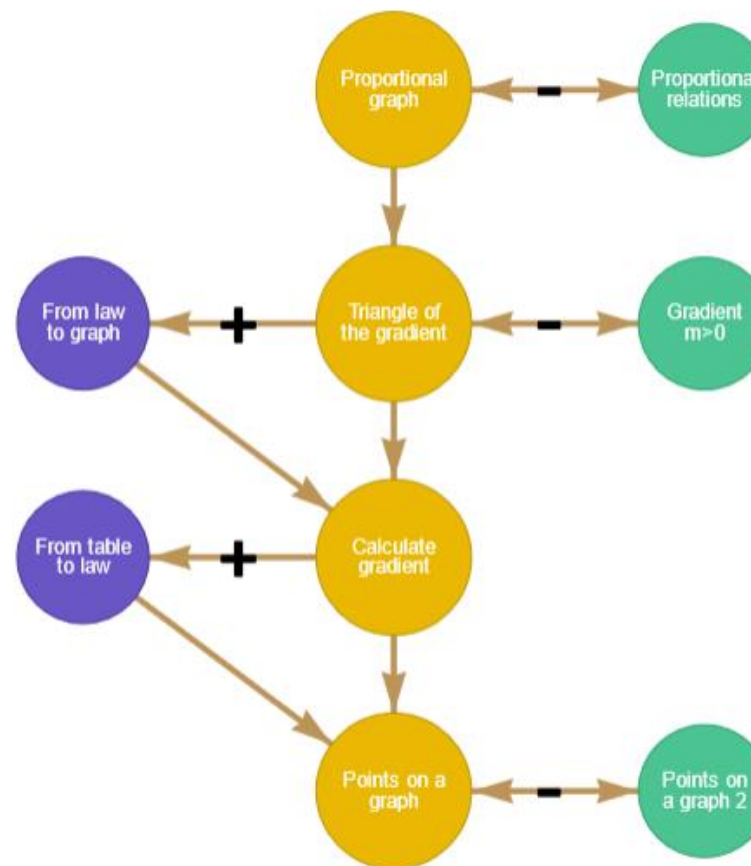
Quadratic functions 1

Modeling with quadratic functions

This learning graph is about mathematical modeling. From basic to advanced tasks, mathematical backgrounds are embedded in factual contexts and complemented by appropriate challenges and supports. Have fun with this learning graph. It is suitable for grades 9 and up.

Level: lower secondary level

Download LG via this code in the app: g04348

#Main Tasks	#Challenge Tasks	#Support Tasks
6	2	4

https://www.asymptote-project.eu/en/portal-en/#!/graph/g04348

Quadratic functions 2

Translations and the vertex of graphs of quadratic functions

This learning graph is suitable for grades 9 and up. It looks at translations of graphs of quadratic functions. There is a focus too on the vertex of quadratic functions.

Level: lower secondary level

Download LG via this code in the app: g14346

#Main Tasks	#Challenge Tasks	#Support Tasks
5	4	3

https://www.asymptote-project.eu/en/portal-en/#!/graph/g14346

Quadratic functions 3

Properties of quadratic functions

In this learning graph, different tasks around the topic of quadratic functions are offered from easy to advanced difficulty level. In addition, challenges and supports are offered at different points. The Graph is for the 8th grade.

Level: lower secondary level

Download LG via this code in the app: g28345

#Main Tasks	#Challenge Tasks	#Support Tasks
5	3	3

https://www.asymptote-project.eu/en/portal-en/#!/graph/g28345

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of the European Union
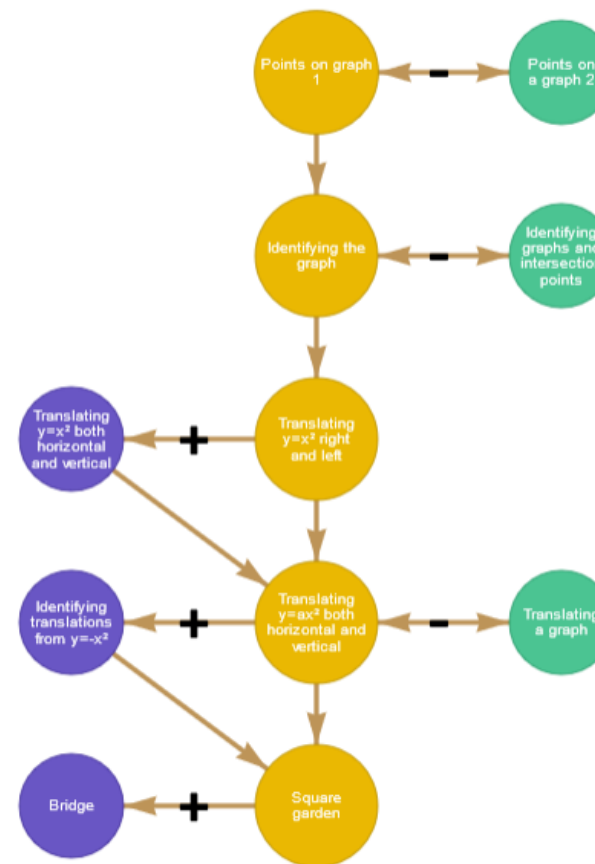
Linear equations 1

Modeling with linear equations:

This learning graph is about mathematical modeling. The main tasks consist of different modeling tasks. The respective challenges or supports are varying training tasks, which provide suitable learning opportunities due to structural similarities. Enjoy this learning graph. It is suitable for 8-9th grade.

Level: lower secondary level

Download LG via this code in the app: g19358

#Main Tasks	#Challenge Tasks	#Support Tasks
6	4	4

https://www.asymptote-project.eu/en/portal-en/#!/graph/g19358
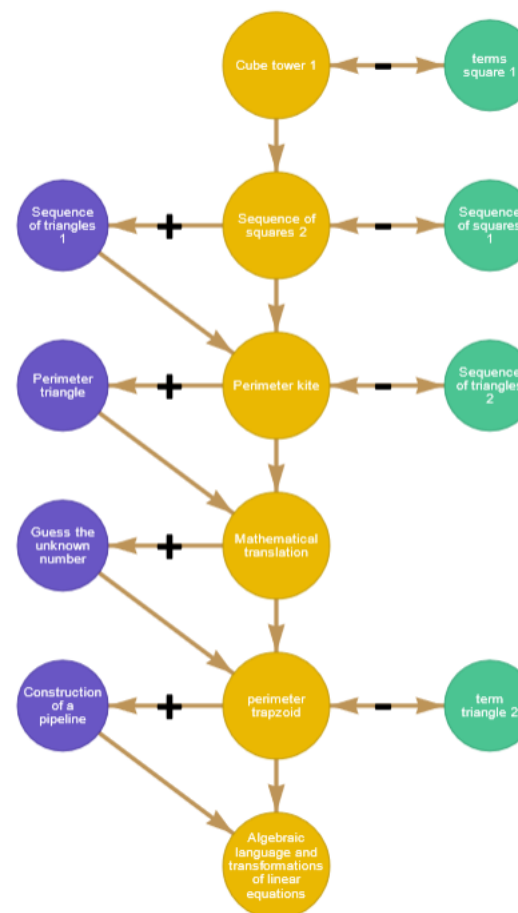
Linear equations 2

Reasoning and modeling with linear equations

This learning graph is about getting a deeper understanding of linear equations. The main tasks are not classical training tasks, but mainly consist of reasoning or modeling tasks. Training tasks find their application in the challenging or supporting tasks. Have fun and good luck! (LG for the 8th-9th grade)

Level: lower secondary level

Download LG via this code in the app: g17357

#Main Tasks	#Challenge Tasks	#Support Tasks
5	5	4

https://www.asymptote-project.eu/en/portal-en/#!/graph/g17357

Linear equations 3

Solving linear equations

This learning graph is about practicing solving linear equations. It goes from simple exercises to real-life tasks. There is the possibility to accept challenges or to get support of supporting tasks. The graph is suitable for 7-8 grade.

Level: lower secondary level

Download LG via this code in the app: g25350

#Main Tasks	#Challenge Tasks	#Support Tasks
5	5	3

https://www.asymptote-project.eu/en/portal-en/#!/graph/g25350

Co-funded by the
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of the European Union
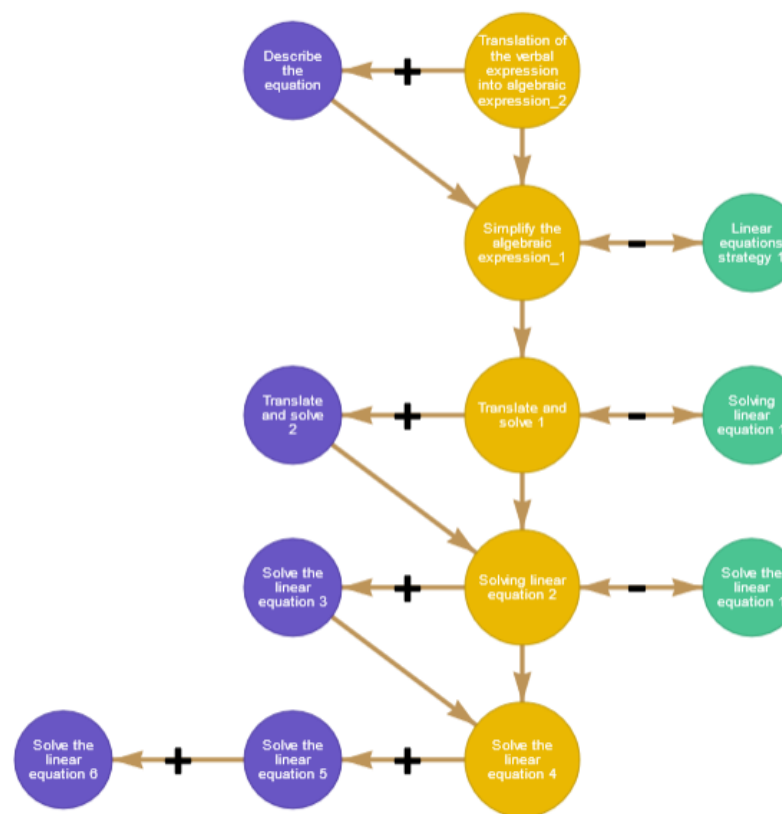
Integrals 1

Indefinite integrals

In this learning graph, you can exercise primitive calculus, immediate integrals, quasi-immediate integrals, and integration by decomposition, parts, and substitution.

Level: higher secondary level & university level

Download LG via this code in the app: g47328

#Main Tasks	#Challenge Tasks	#Support Tasks
6	5	5

https://www.asymptote-project.eu/en/portal-en/#!/graph/g47328

Co-funded by the
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of the European Union
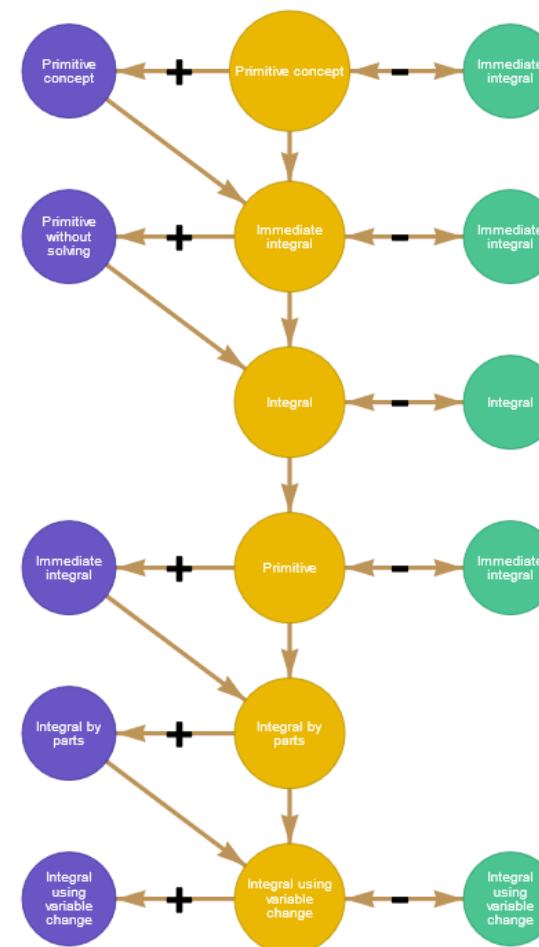
Integrals 2

LG - Definite integrals and application

The learning graph is about definite integral, integration techniques and application to the calculation of areas.

Level: higher secondary level & university level

Download LG via this code in the app: g28401

#Main Tasks	#Challenge Tasks	#Support Tasks
5	4	1

https://www.asymptote-project.eu/en/portal-en/#!/graph/g28401

Inverse Trigonometric Functions 1

Inverse Trigonometric Function: arctan

Learning graph with several exercises about the arctan function that includes: domain; range of values; derivatives; inverse function; tangent and normal line; equations and inequations; differentials; approximate values.

Level: higher secondary level & university level

Download LG via this code in the app: g18222

#Main Tasks	#Challenge Tasks	#Support Tasks
7	5	8

https://www.asymptote-project.eu/en/portal-en/#!/graph/g18222

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Inverse Trigonometric Functions 2

Inverse Trigonometric Function: arcsin

LearningGraph - inverse trigonometric function arcsin. Domain and range of values. Equations and inequalities. Tangent and normal line. Differential. Composite function derivative and inverse function derivative theorem.

Level: higher secondary level & university level

Download LG via this code in the app: g28248

#Main Tasks	#Challenge Tasks	#Support Tasks
7	10	8

https://www.asymptote-project.eu/en/portal-en/#!/graph/g28248
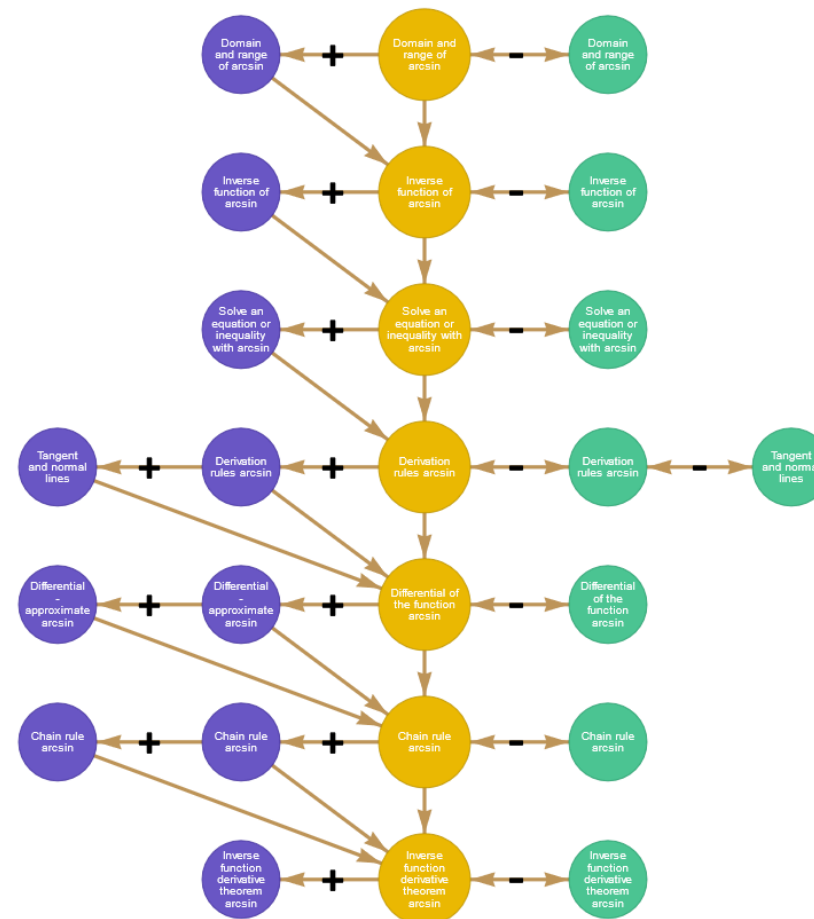
Inverse Trigonometric Functions 3

Inverse Trigonometric Functions

In this LG you can learn, train and reason about inverse trigonometric functions.

Level: higher secondary level & university level

Download LG via this code in the app: g67251

#Main Tasks	#Challenge Tasks	#Support Tasks
6	2	4

https://www.asymptote-project.eu/en/portal-en/#!/graph/g67251
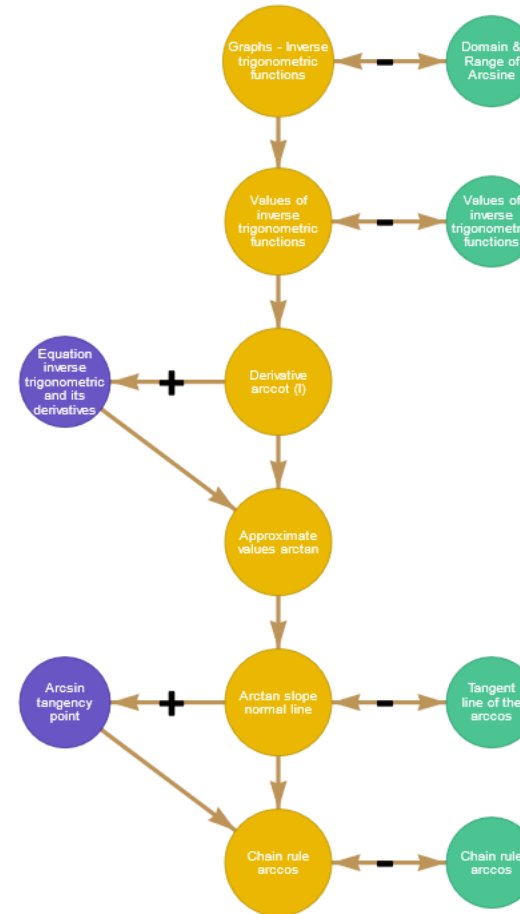
Inverse Trigonometric Functions 4

Inverse Trigonometric Function: arccos

Learning graph with several exercises about the arccos function that include: domain; range of values; derivatives; inverse function; tangent and normal line; equations and inequations; differentials; approximate values.

Level: higher secondary level & university level

Download LG via this code in the app: g03221

#Main Tasks	#Challenge Tasks	#Support Tasks
6	7	6

https://www.asymptote-project.eu/en/portal-en/#!/graph/g03221
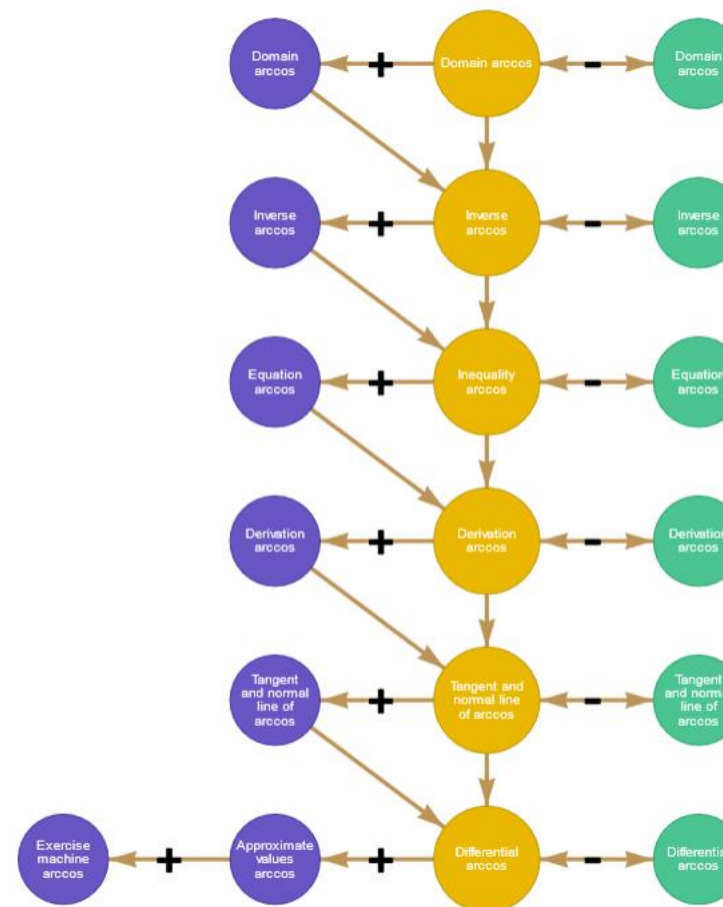
Inverse Trigonometric Functions 5

Inverse Trigonometric Function: arccot

This LG covers the topic of inverse trigonometric, arc-cotangent function. It is an LG with a high number of tasks for two main reasons: (1) The cotangent function is not part of the secondary school mathematics program, so students in higher education learn the cotangent function and then its inverse function, so students have a greater difficulty, compared to other inverse trigonometric functions. (2) This is the last inverse trigonometric function studied, so this LG is intended to function a bit as a review of the topics covered, in the context of inverse trigonometric functions.

Level: higher secondary level & university level

Download LG via this code in the app: g78228

#Main Tasks	#Challenge Tasks	#Support Tasks
8	13	13

https://www.asymptote-project.eu/en/portal-en/#!/graph/g78228
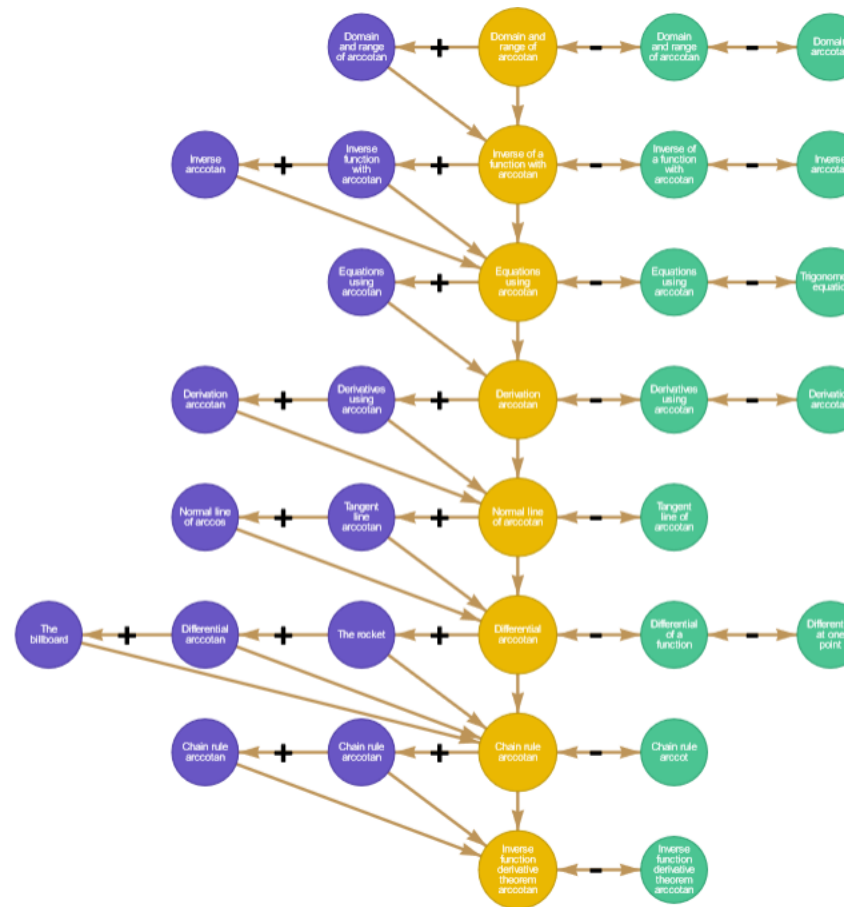
Matrices 1

Matrix operations

The purpose of this learning graph is, to work with matrix operations. Matrix operation mainly involves three algebraic operations which are addition of matrices, subtraction of matrices, and multiplication of matrices. We can also multiply a matrix by any constants, it is called scalar multiplication.

Level: higher secondary level & university level

Download LG via this code in the app: g26196

#Main Tasks	#Challenge Tasks	#Support Tasks
5	3	4

https://www.asymptote-project.eu/de/portal-de/#!/graph/g26196

Matrices 2

Matrix equations & systems of linear equations

The purpose of this learning graph is, on the one hand, to solve matrix equations and, on the other hand, to solve systems of linear equations, Matrices are the perfect tool for solving systems of equations. A very concise way of writing a system of linear equations is using the matrix equation: $AX = B$, where A is a $n \times m$ matrix, X is a $m \times 1$ matrix and B is a $n \times 1$ matrix.

Level: higher secondary level & university level

Download LG via this code in the app: g05197

#Main Tasks	#Challenge Tasks	#Support Tasks
4	2	5

https://www.asymptote-project.eu/de/portal-de/#!/graph/g05197
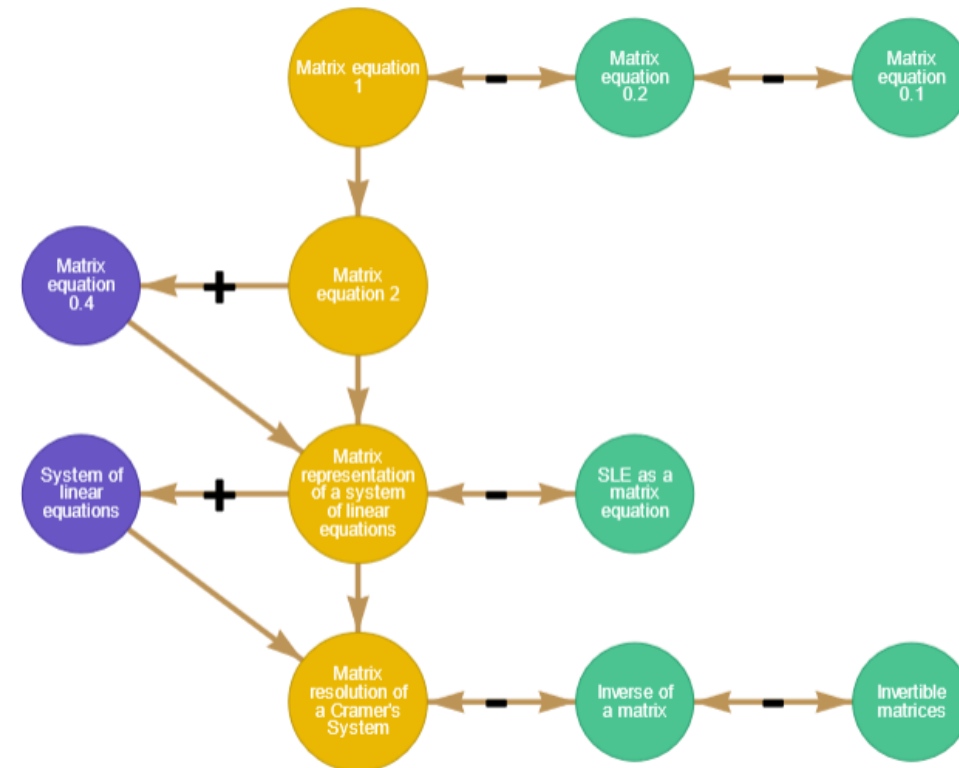
Matrices 3

Elementary matrix operations, rank and inverse

Elementary matrix operations play a vital role in applications of algebra. It helps in solving linear equations in finding the inverse of a matrix and also finding the matrix rank.

The three basic elementary operations or transformation of a matrix are:
-Interchange of any two rows or two columns.
-Multiplication of row or column by a non-zero number.
-Multiplication of row or column by a non-zero number   and add the result to the other row or column.

Level: higher secondary level & university level

Download LG via this code in the app: g49195

#Main Tasks	#Challenge Tasks	#Support Tasks
7	3	1

https://www.asymptote-project.eu/de/portal-de/#!/graph/g49195

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of the European Union
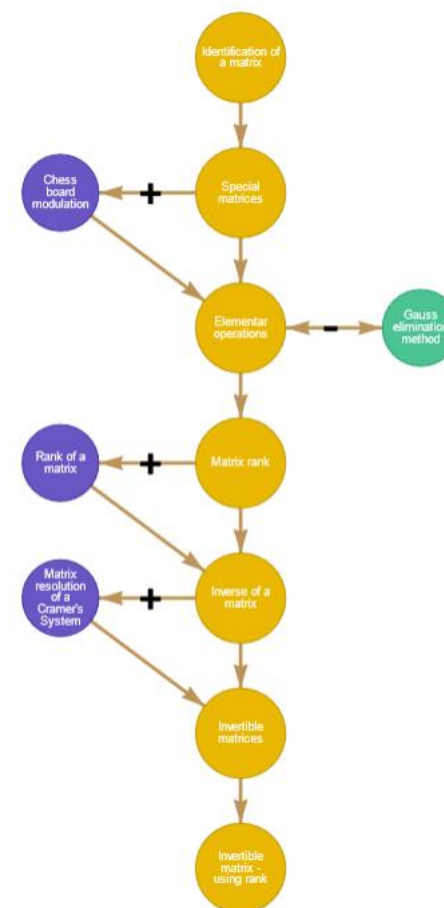
Matrices 4

Gauss Elimination Method and Applications

Gauss Elimination Method and Applications (to solve linear systems, to find the matrix rank, to find inverse of a matrix)

Level: higher secondary level & university level
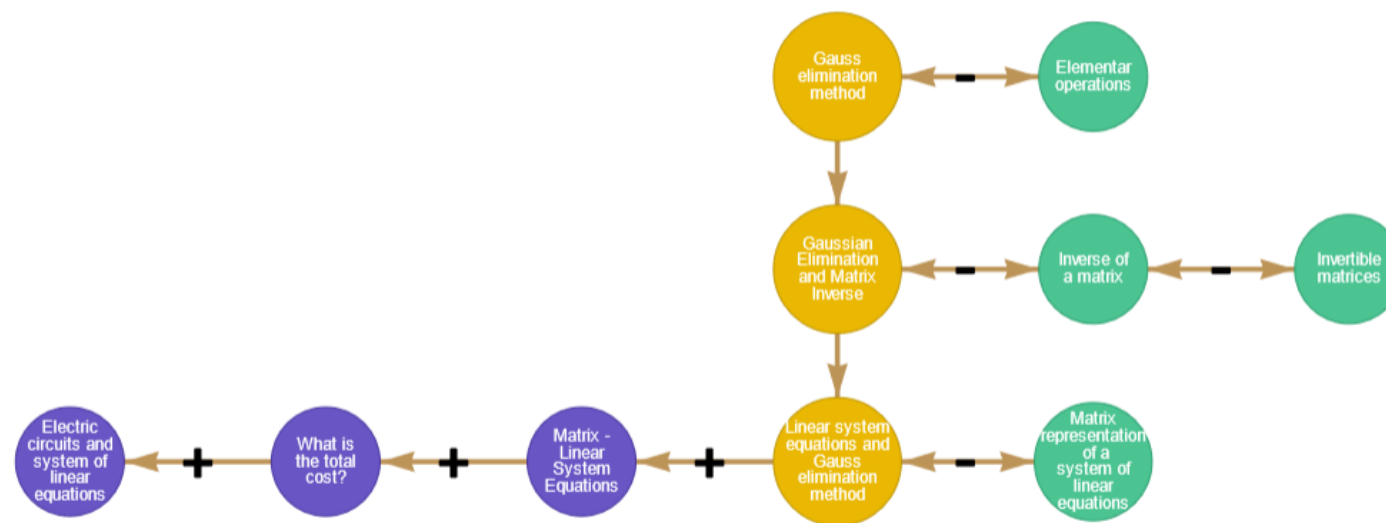
Download LG via this code in the app: g17203

#Main Tasks	#Challenge Tasks	#Support Tasks
3	3	4

https://www.asymptote-project.eu/en/portal-en/#!/graph/g17203

Chapter 6:
Video Tutorials and Theoretical Background

ASYMTPOTE Video Tutorials and Theoretical Background

Below this link you find a playlist of video tutorials developed for the ASYMPTOTE MOOC. The videos are in English with provided subtitles in English, German, Greek, Italian, Portuguese and Spanish.

Further, you have access to the ASYMPTOTE Theoretical Background.

E2_The ASYMPTOTE web portal: Creation and sharing of tasks

The ASYMPTOTE Web Portal

Module 2 | Creating & Sharing of Tasks

0:10 / 5:40

ASYMPTOTE THEORETICAL BACKGROUND
Teaching and learning mathematics online

IO6 - Research and Validation

Deliverable: IO6.01
Delivery Date: March 2022
Version: V1.7
Scope-State: Internal
Leading Organisation: University of the Aegean (UoAEG)

Chapter 7: References

Co-funded by the
Erasmus+ Programme
of the European Union

References

- Aldon, G., Cusi, A., Schacht, F., & Swidan, O. (2021). Teaching mathematics in a context of lockdown: A study focused on teachers' praxeologies. Education Sciences, 11(2), 38.

- Barlovits, S.; Caldeira, A.; Fesakis, G.; Jablonski, S.; Koutsomanoli-Filippaki, D.; Lázaro, C.; Ludwig, M.; Mammana, M. F.; Moura, A.; Oehler, D.-X. K., Recio, T.; Taranto, E.; Volika, S. (2022). Adaptive, Synchronous, and Mobile Online Education: Developing the ASYMPTOTE Learning Environment. Mathematics. 10. 1628. 10.3390/math10101628.

- Barlovits, S., Jablonski, S., Milicic, G., & Ludwig, M. (2021). Distance Learning in Mathematics Education: Synchronous and Asynchronous Learning with MathCityMap@home. In L. G. Chova, A. Lopez, & I. Candel Torres. Proceedings of EDULEARN21 Conference 5th-6th July 2021. Online Conference: IATED, pp. 10179–10189.

- Barlovits, S., Jablonski, S., Lázaro, C., Ludwig, M., Recio, T. (2021) Teaching from a Distance - Math Lessons during COVID-19 in Germany and Spain. Education Science, 11(406).

- Drijvers, P.; Thurm, D.; Vandervieren, E.; Klinger, M.; Moons, F.; van der Ree, H.; Mol, A.; Barzel, B.; Doorman, M. Distance mathematics teaching in Flanders, Germany and the Netherlands during COVID-19 lockdown. Educ. Stud. Math. 2021, 108, 35–64.

- Greene, J.; Moos, D.; Azevedo, R. Self-regulation of learning with computer-based learning environments. New Dir. Teach. Learn. 2011, 449, 107–115.

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References

- Hodges, C.; Moore, S.; Lockee, B.; Trust, T.; Bond, A. The difference between emergency remote teaching and online learning. Educ. Rev. 2020, 27, 1–12.

- Jablonski, S., Taranto, E., Ludwig, M., Mammana, F. (2022). Go online to go outdoors – A MOOC on MathCityMap.In U.T. Jankvist, R. Elicer, A. Clark-Wilson, H.-G. Weigand, & M. Thomsen (Hrsg.), Proceedings of the 15th International Conference on Technology in Mathematics Teaching (ICTMT 15) (S. 63-70). Aarhus University.

- Lichti, M.; Roth, J. How to foster functional thinking in learning environments using computer-based simulations or real materials. J. STEM Educ. Res. 2018, 1, 148–172.

- Ludwig, M., & Jablonski, S. (2021). Step by step: simplifying and mathematizing the real world with MathCityMap. Quadrante, 30(2), 242-268.

- Salmon, G. (2012). E-moderating: The key to online teaching and learning. Routledge.

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