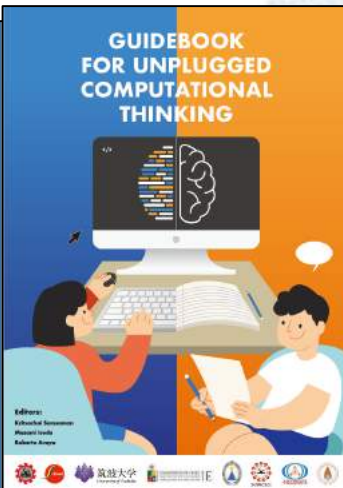


Unplugged Computational Thinking on the Mathematical Thinking

Masami Isoda

Professor of the Faculty of Human Sciences
Director of CRICED, University of Tsukuba, Japan



PhD in Education (Waseda University, Japan)
Honorary PhD in Mathematics Education (Khon Kaen University, Thailand)
Honorary Professor, Pontificia Universidad Católica de Valparaíso (Faculty of Science), Chile
Honorary Professor, Universidad San Ignacio de Loyola (Faculty of Education), Peru

What is Mathematics for you?

On the Era of Generative AI, Mathematics is the reasoning!

Primary School Mathematics

**Mathema: Any subject of Learning
= All Basic Literacy for Greek Reasoning**

Mathematics used to be any subject to develop Logical Thinking to grown up Philosopher on their languages.

- **In Ancient Greece, μάθημα (máthēma) means the “the subjects of instruction and learning” in Ancient Greek.**
- **At Roman Empire,** its focused-on Geometry, Arithmetic, Astronomy and Music (mathematical science with figural representations).
- **In the Middle Age,** it become the four subjects of seven liberal arts in **Latin.**

↓ **Arabic Numeral and Algebra**

After Renaissance, **Universal Mathematics** was proposed by **Descartes** to reintegrate mathematical sciences into one with **Algebraic language.**

↓ **Algebra become the bases for mathematical sciences.**

Primary School Mathematics is under local language!

- **Difficulty: Inconsistency in school mathematics curriculum.**
- **Through the overcoming, we develop human character!**

Mathema: Music, Astronomy,
Arithmetic & Geometry
= **Latin-Reasoning with
Figural Representation**

Universal Mathematics:
= **Algebraic Representation**

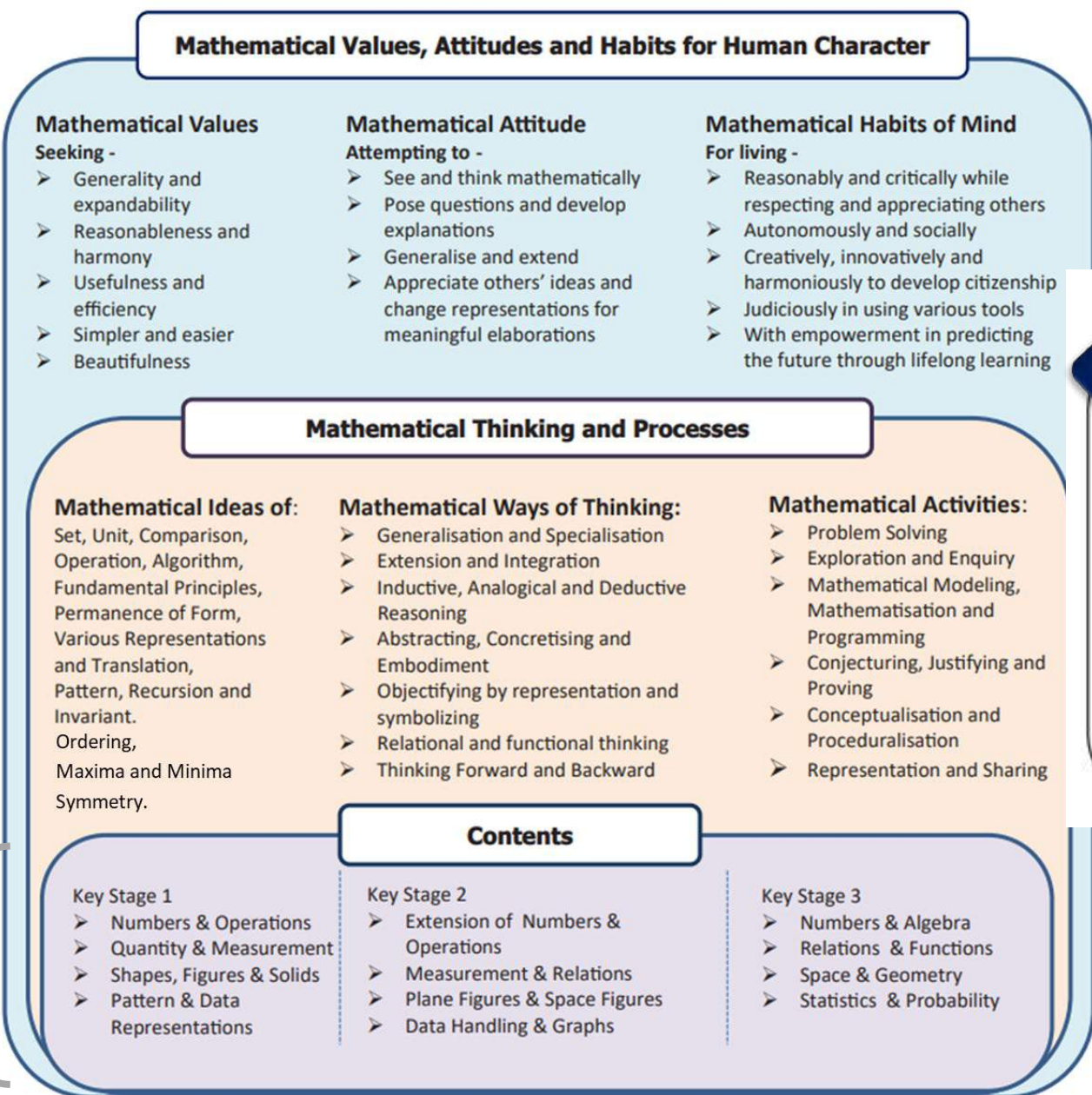
Mathematical Science on Digital Era
= **Computational & Visual
Representation**

Mathematics has been the ways of reasoning which have changed depending on the representations and Language.



Generative AI runs through Natural Language!!





Mathematical Thinking can be developed through the task sequence.

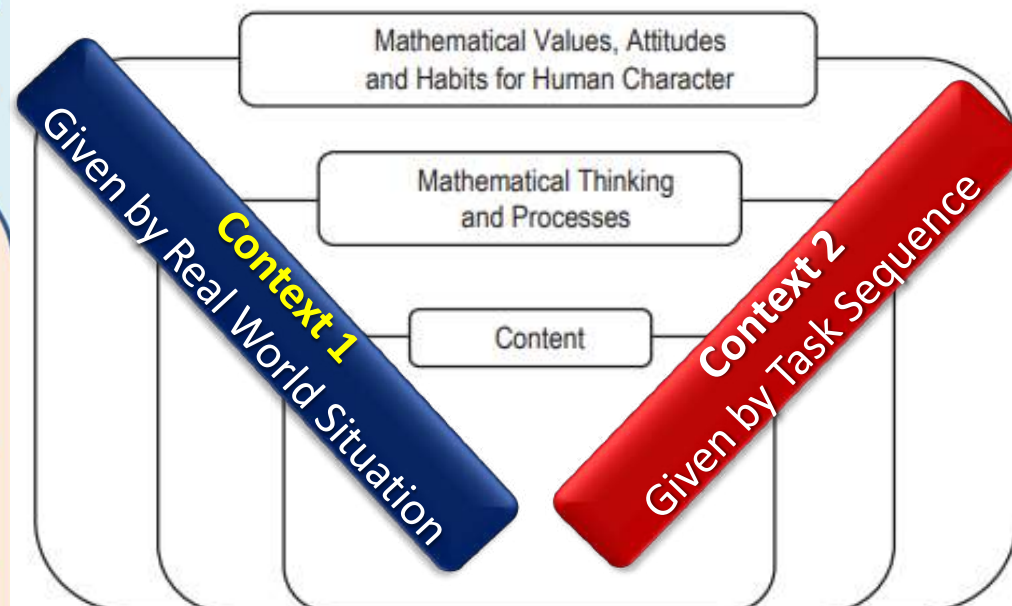
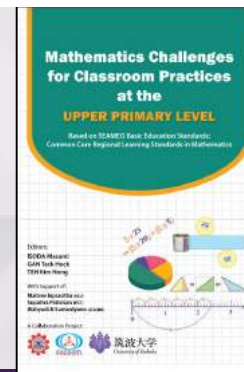


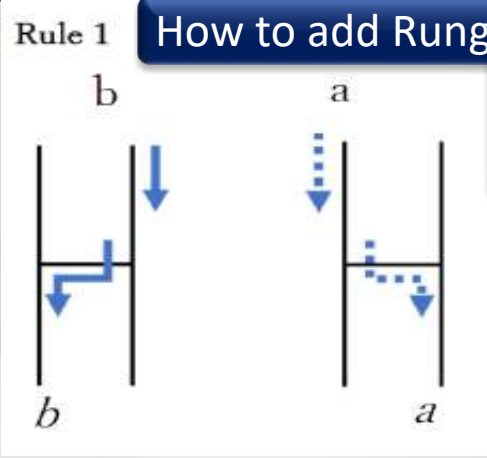
Figure 1. Revised CCRLS Framework in Mathematics



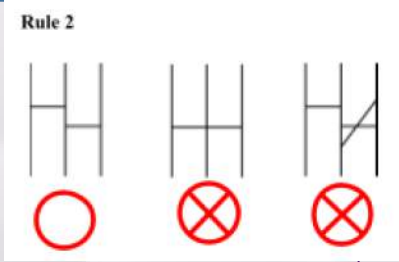
Chapter 2. Example 2.10

Connections: A Case of Ladder Lottery

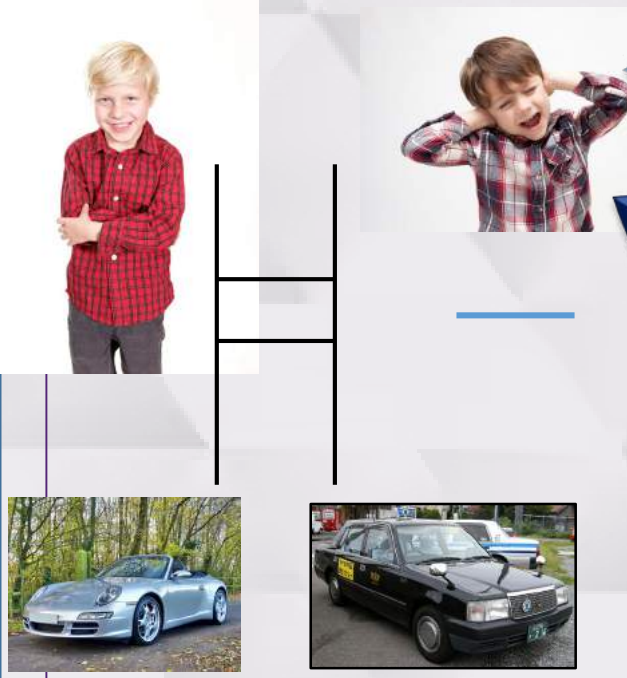
Let's think inductively to find the algorithm!
By Takao Seiyama



To change the Rule



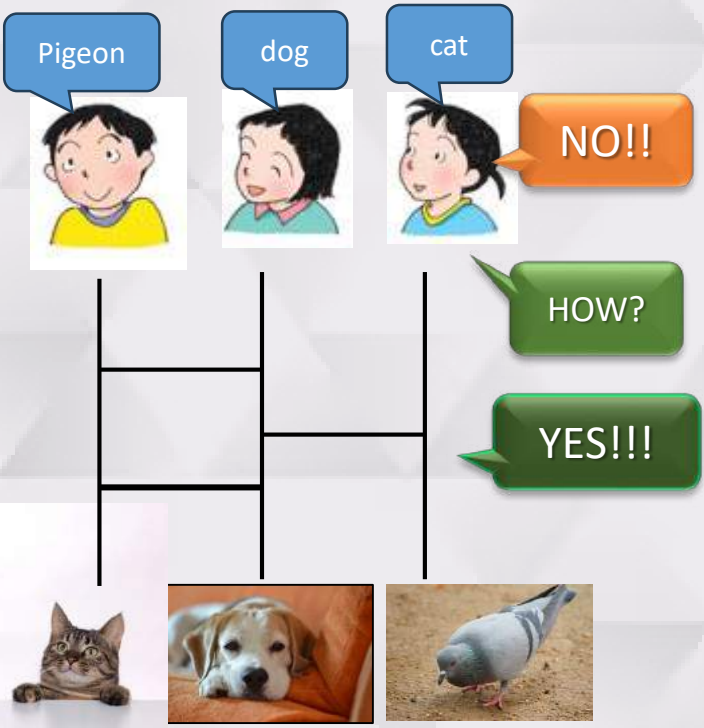
Task 1. Let's change the root!



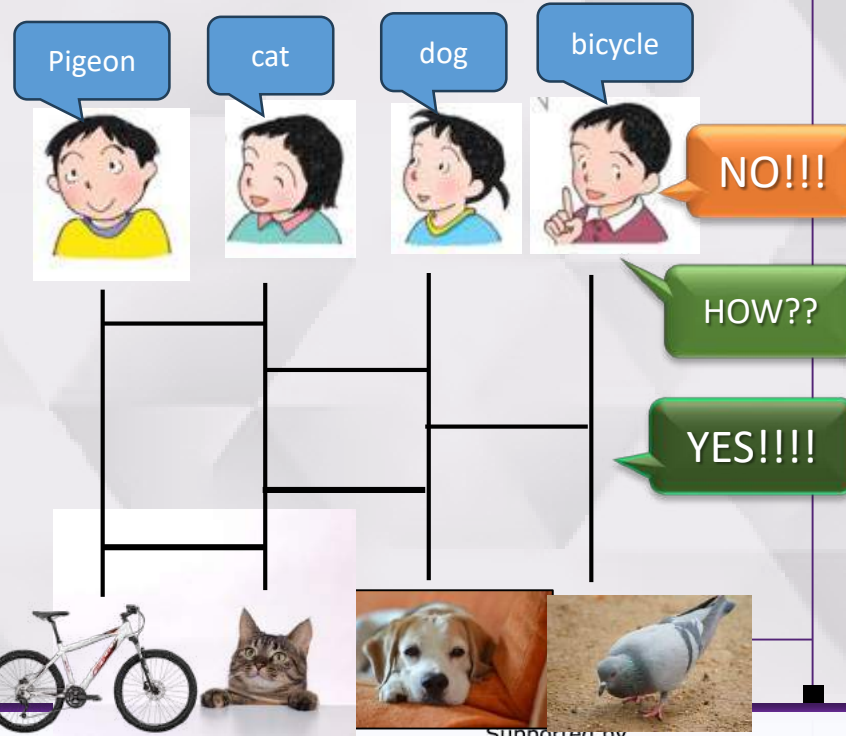
What will happen?

If I add one more then he add one more. It does not change!

Q1. How about three ladder?



Task 2. Let's develop further ladder lottery and pose questions to your friends!



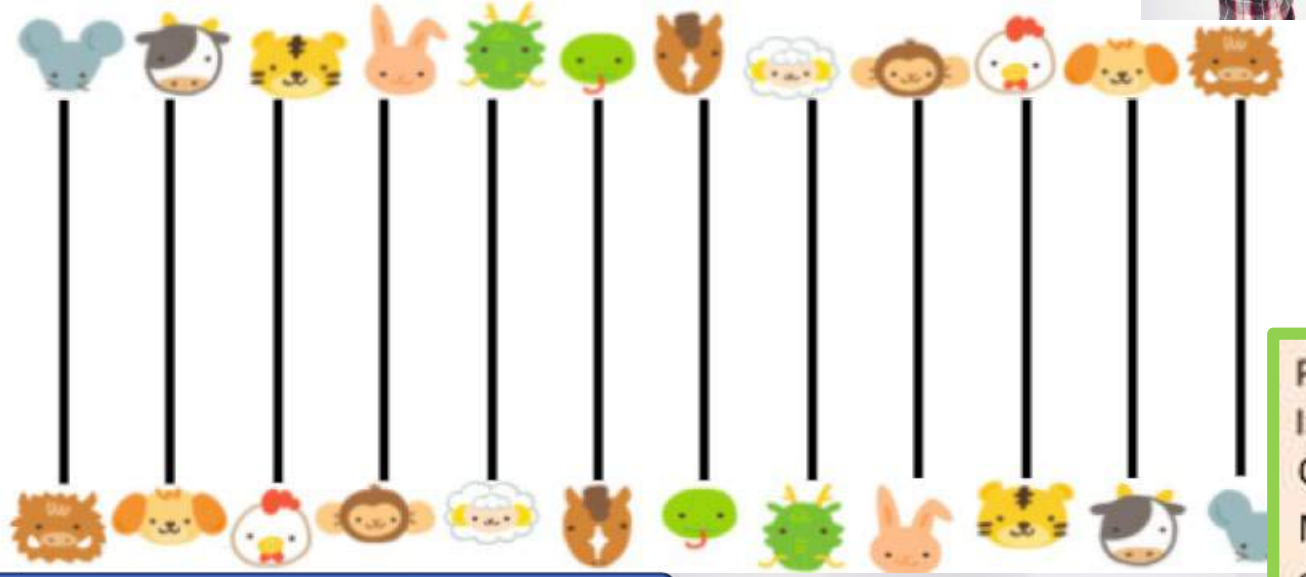
Connections: A Case of Ladder Lottery

Let's think inductively to find the algorithm!

Through Challenges of **Problematic**, and **Reflection & Appreciation** of their learned ways of thinking and values in the previous tasks, students are able to think by and for themselves.

Task 3. What shall we do?

Wow, to many ladders!



➤ **Beautyfulness**

➤ **Inductive, Analogical and Deductive Reasoning**

Algorithm,

Pattern, Recursion and Invariant. Ordering, Maxima and Minima Symmetry.

Let's reflect on what we learned!

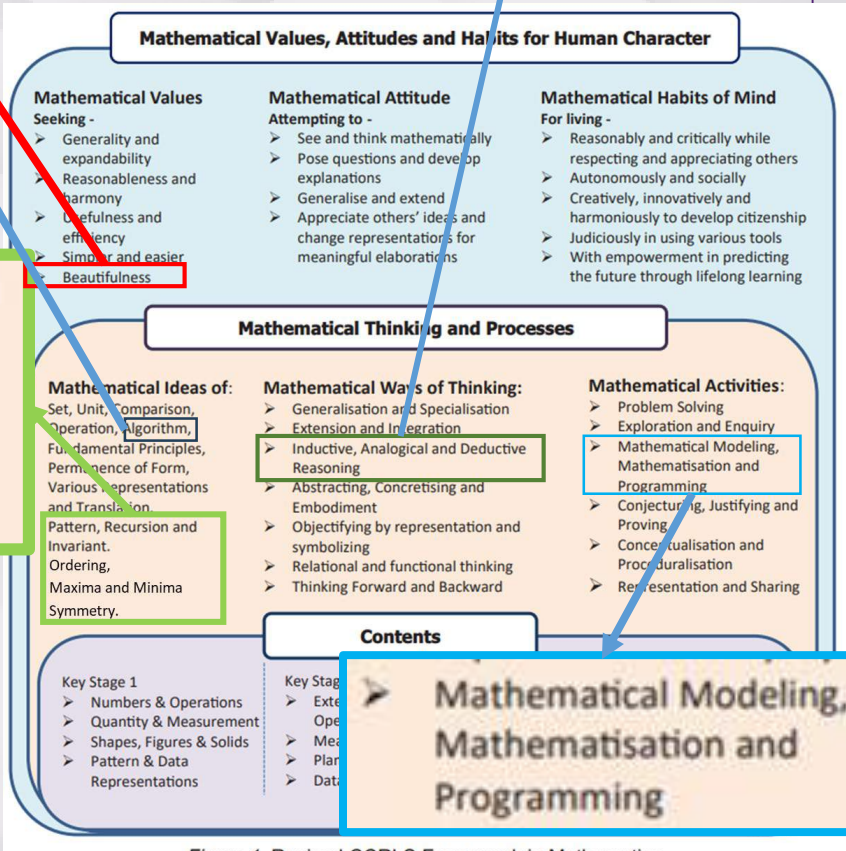


Figure 1. Revised CCRLS Framework in Mathematics

Mathematical Thinking can be developed through the **task sequence**.

Appreciation

Reflection

Acquisition

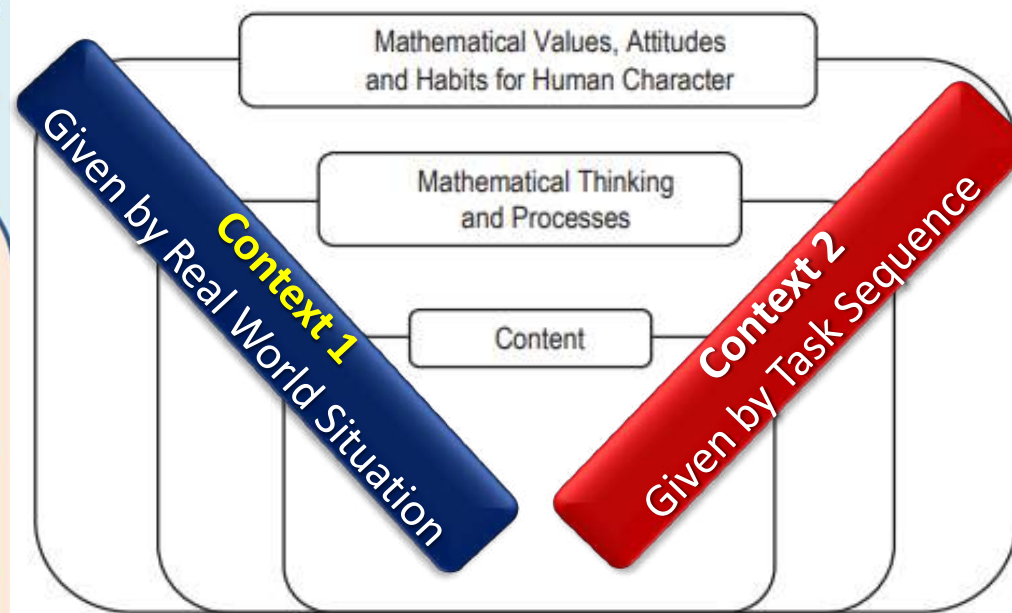
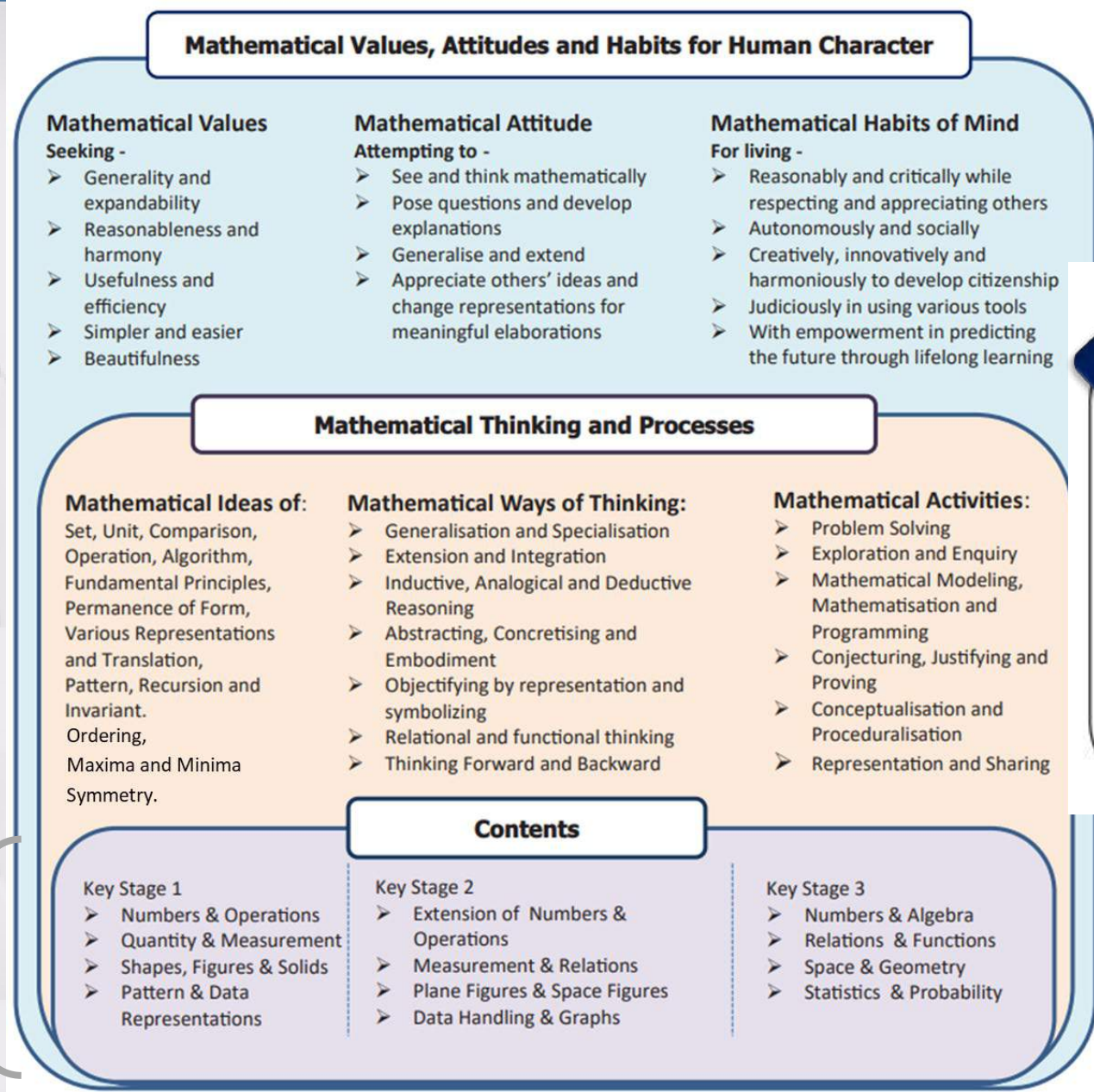
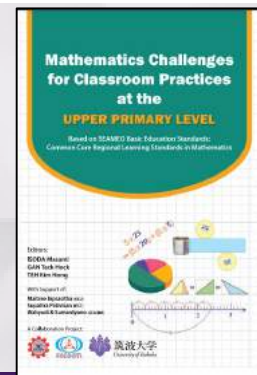


Figure 1. Revised CCRLS Framework in Mathematics



What is Mathematics for On the Era of Generative

Mathematics used to be any subject
Philosopher on their languages.

- In Ancient Greece, μάθημα (mathēma) means “learning” in Ancient Greek.
- At Roman Empire, its focus shifted to practical applications (mathematical science with figures).
- In the Middle Age, it became part of the liberal arts in Latin.

↓ Arabic Numeral and Algebra
After Renaissance, Universal Mathematics
by Descartes to reintegrate
into one with Algebra.

↓ Algebra
Consistency in school mathematics
Through the overcoming, we develop

GUIDEBOOK FOR UNPLUGGED COMPUTATIONAL THINKING



Mathematics is the subject to develop Mathematical Thinking and Values which can be applied any problem in our life with using our Natural Language!

Editors:
Kritsachai Somsaman
Masami Isoda
Roberto Araya



Inprasitha, Isoda & Araya(2023)

Primary School Mathematics

Mathema: Any subject
All Basic Literacy

Geometry
Reasoning with
Representation

CS:
Representation

on Digital Era
Mathematical and Visual
Representation

ways of reasoning which have
representations and Language.



ΚΛΑΥΔΙΟΥ ΠΤΟΛΕΜΑΙΟΥ
ΑΡΜΟΝΙΚΩΝ
ΒΙΒΛΙΑ V.
CLAUDII PTOLEMÆI
HARMONICORUM
LIBRI VTES.
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JOHANNES WALLIS, SS. TH. D. Geometriae Præfatus Serenissimi
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Rationibus, Libris, Versione & Notis Illustravit, & Antiquum adimplevit.



OXONII,
SHELDONIANO, An. Dom. 1682.