Complete Mathematics CPD

Thinking Deeply about Primary Mathematics

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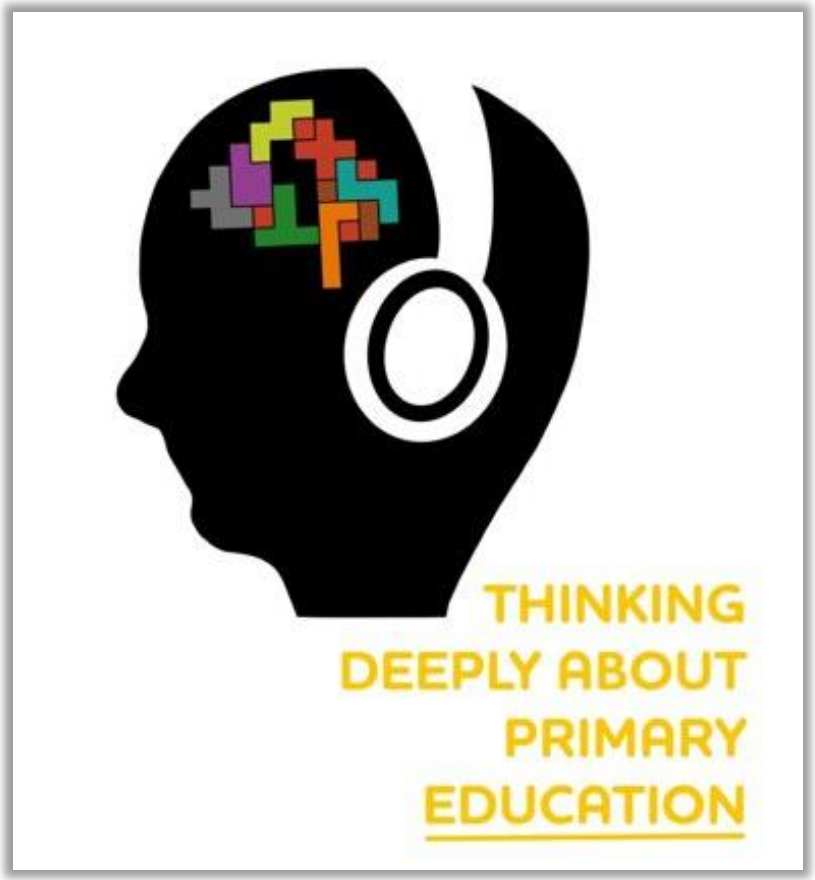

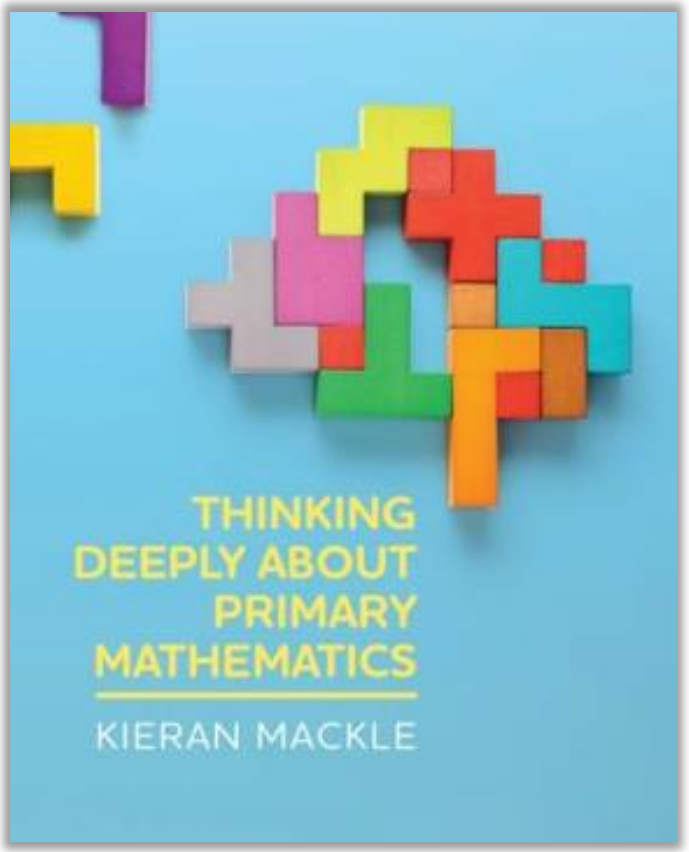

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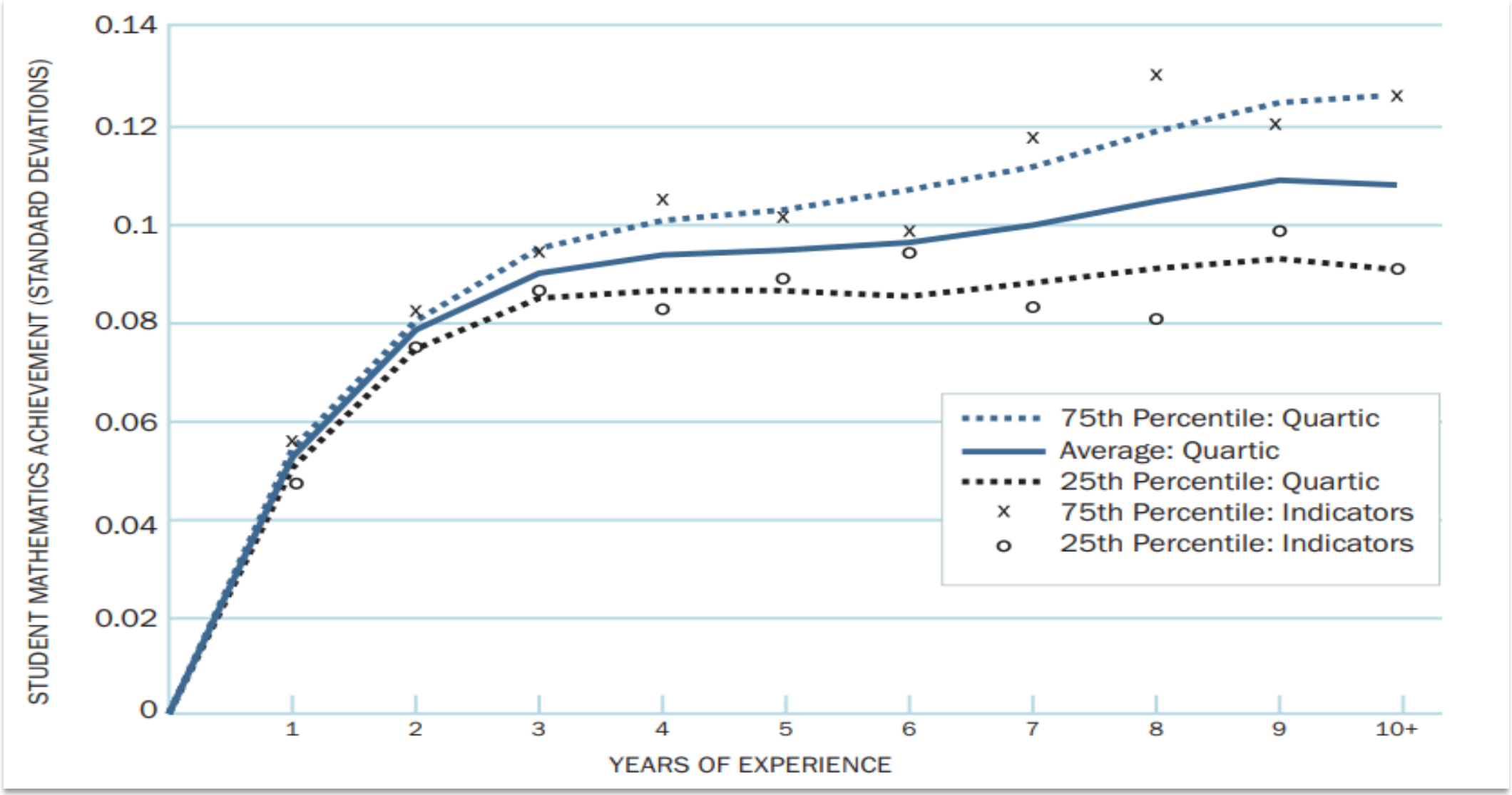
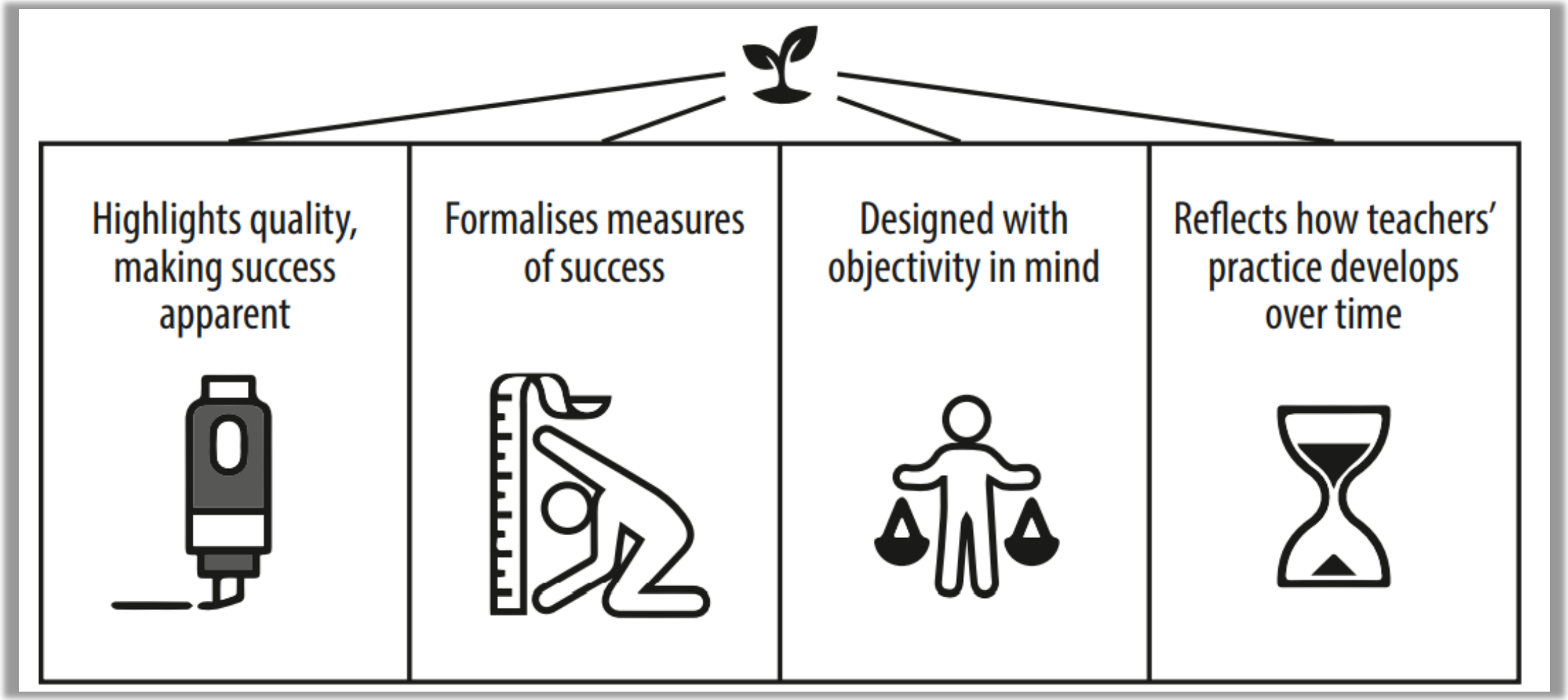
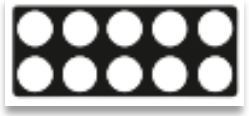
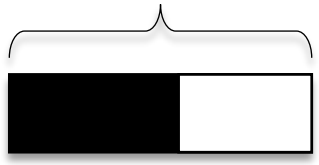




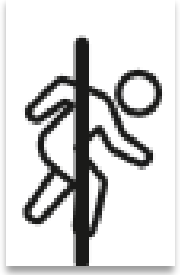
High Quality Textbooks



Models and Images

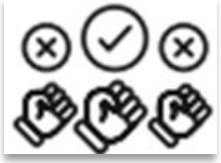


Bar Modelling



Threshold Concepts

Misconceptions



Variation Pedagogy

Instruction

Language

Reasoning

Storytelling

Planning

Reading for PD

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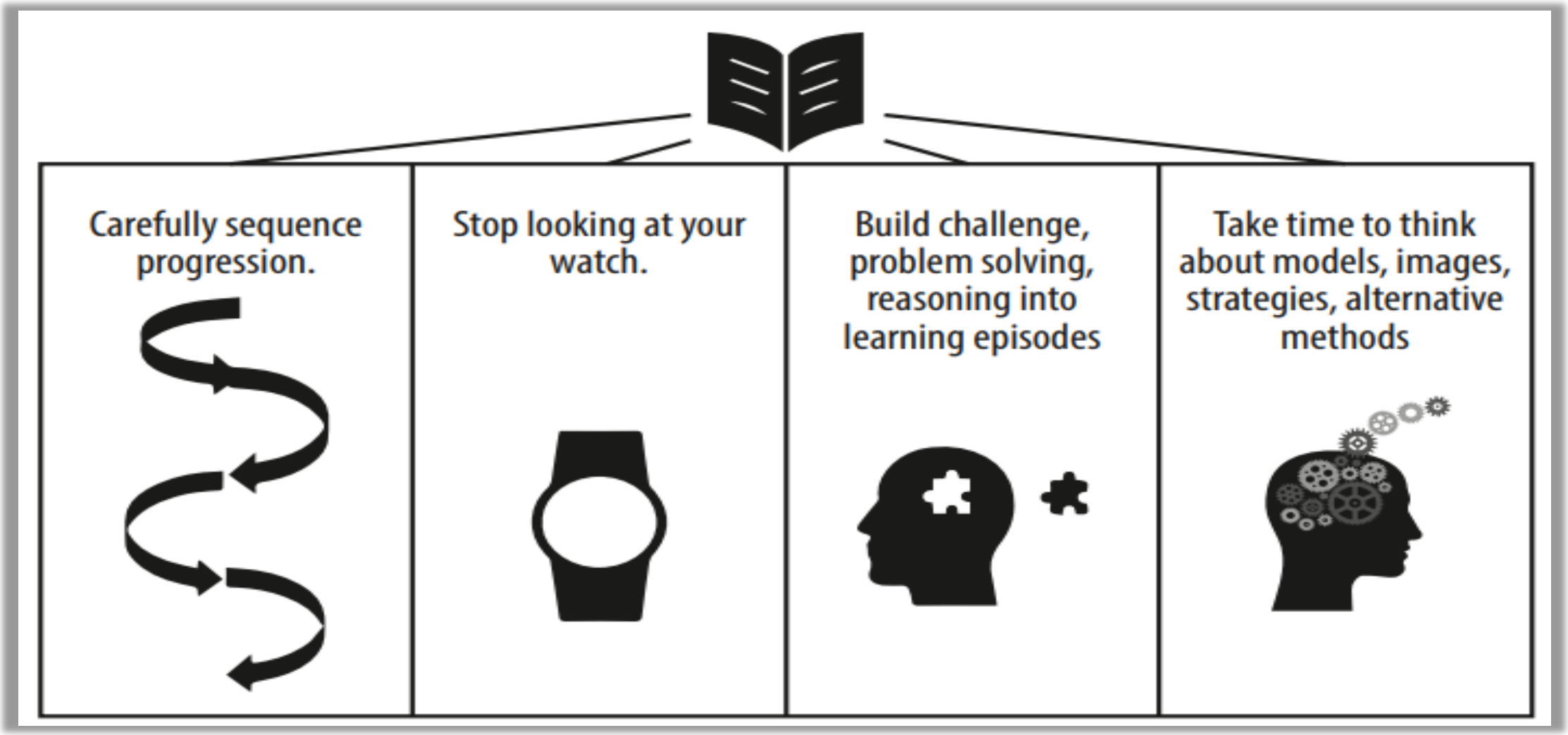
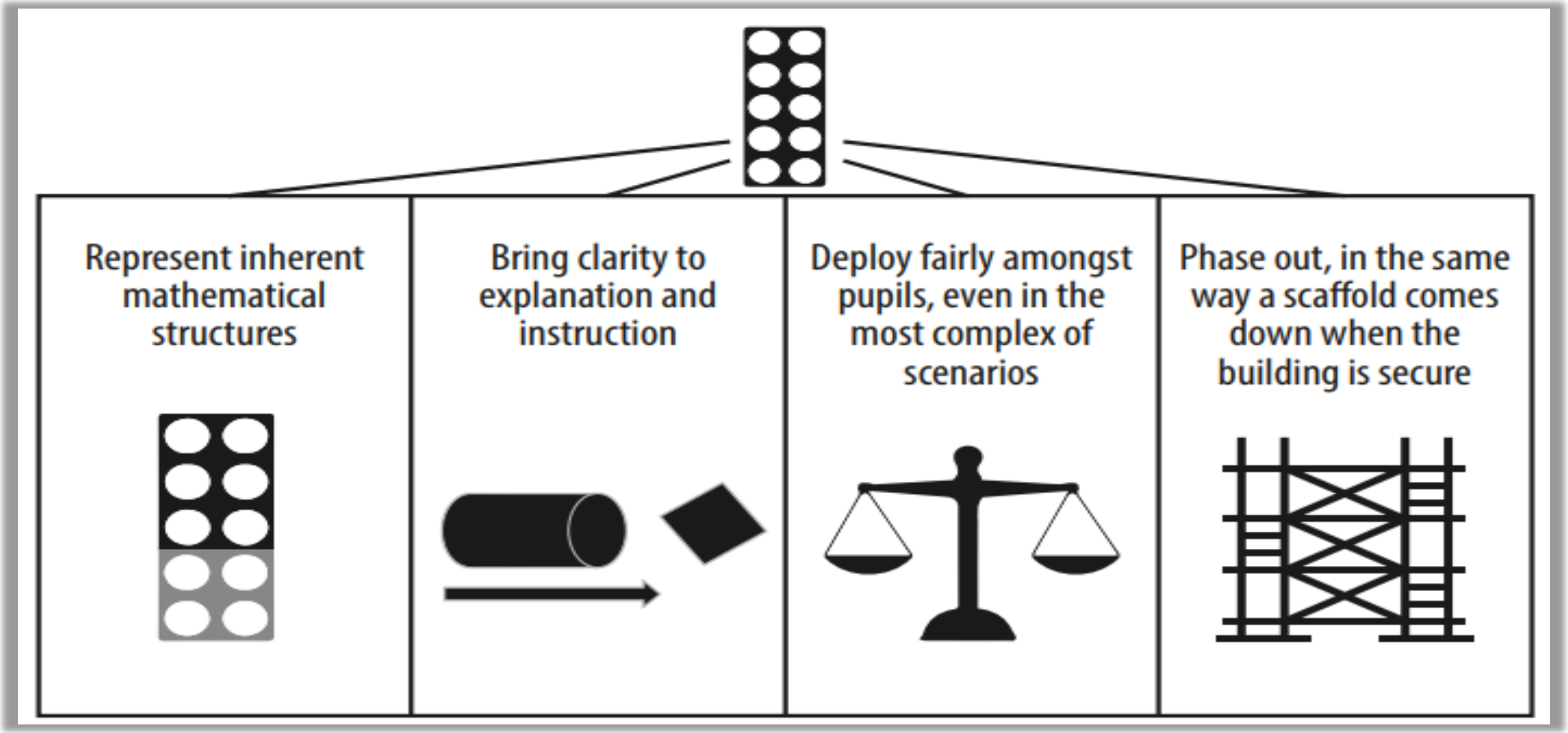


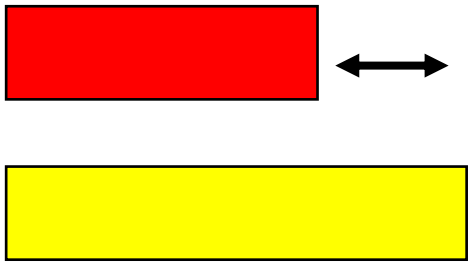


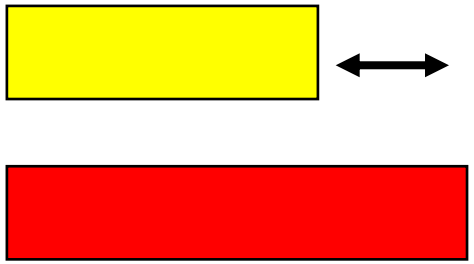
Cindy has 55 balloons. Kate has 44 balloons.
How many balloons do they have altogether?

Cindy has 55 balloons. Kate gives her 44 balloons.
How many balloons does Cindy have now?

The Kölntriangle is 103m tall.
LVA Hauptgebäude is 123m tall.
How much taller is the LVAH?

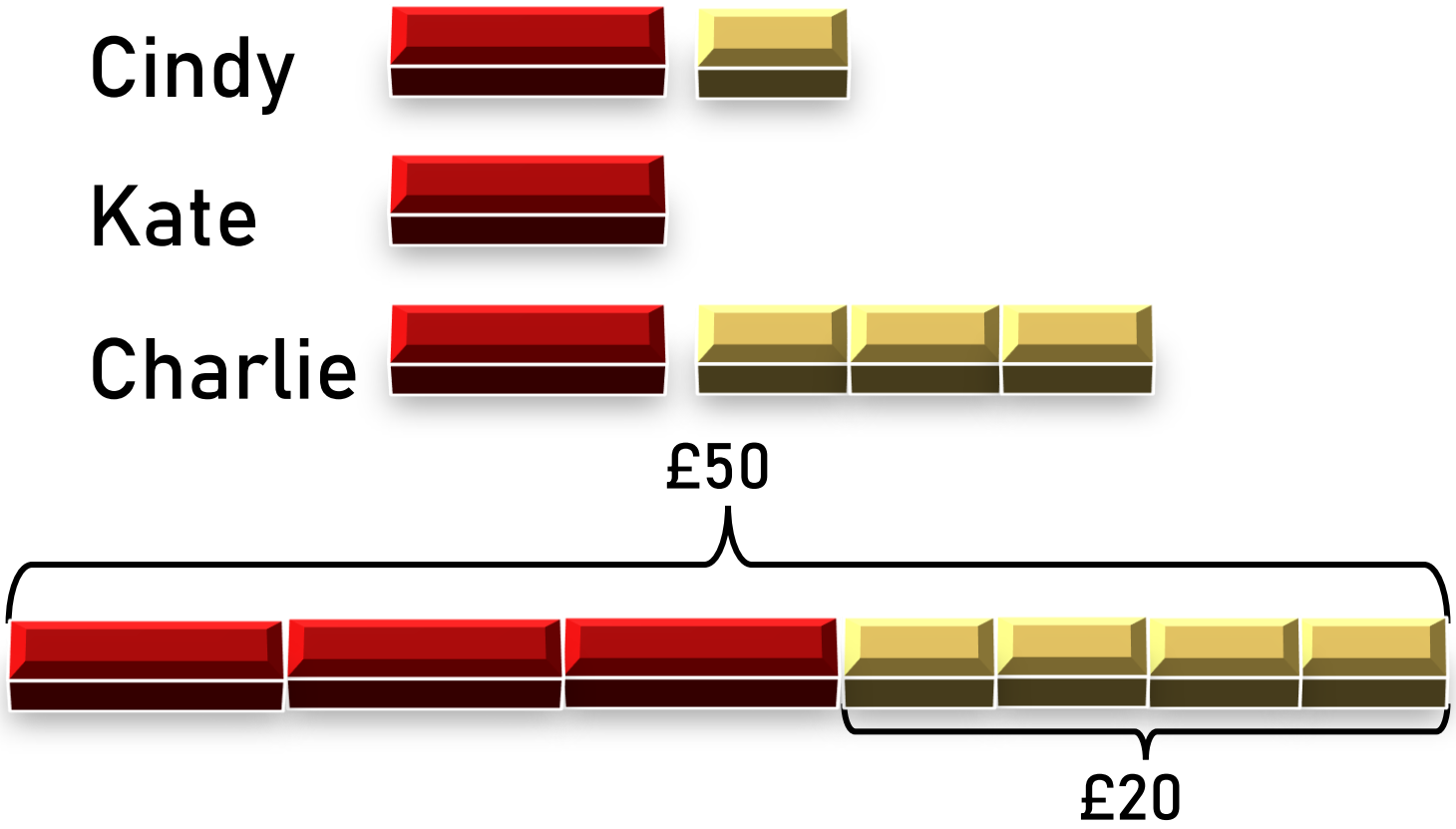
The Kölntriangle is 103.2m tall.
LVA Hauptgebäude is 123m tall.
How much taller is the LVAH?

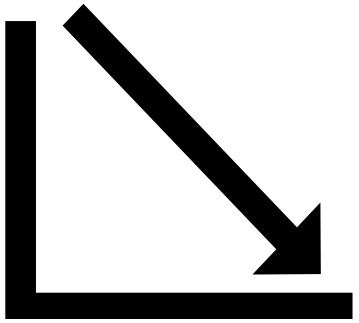




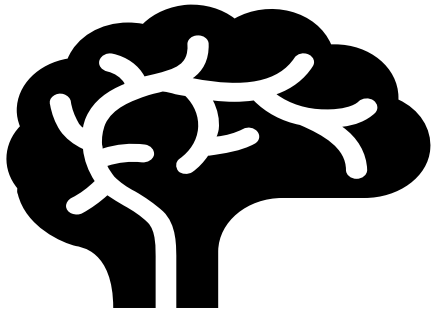
The Kölntriangle has 29 floors.
LVA Hauptgebäude has 26 floors.
How many more floors does the Kölntriangle have?

Siblings, Cindy, Kate and Charlie save £50 for a trip to the cinema.
Cindy has £5 more than Kate. Charlie has £10 more than Cindy.
How much does each child contribute to the kitty?

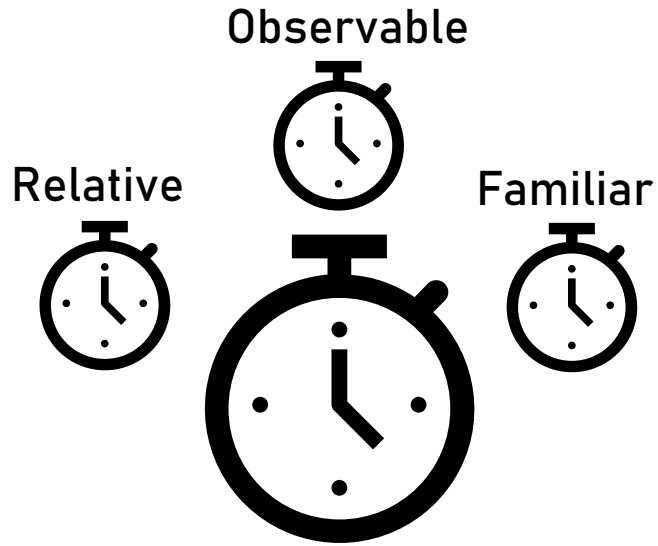




Demands on Attention



Mental Manipulation



Fluid

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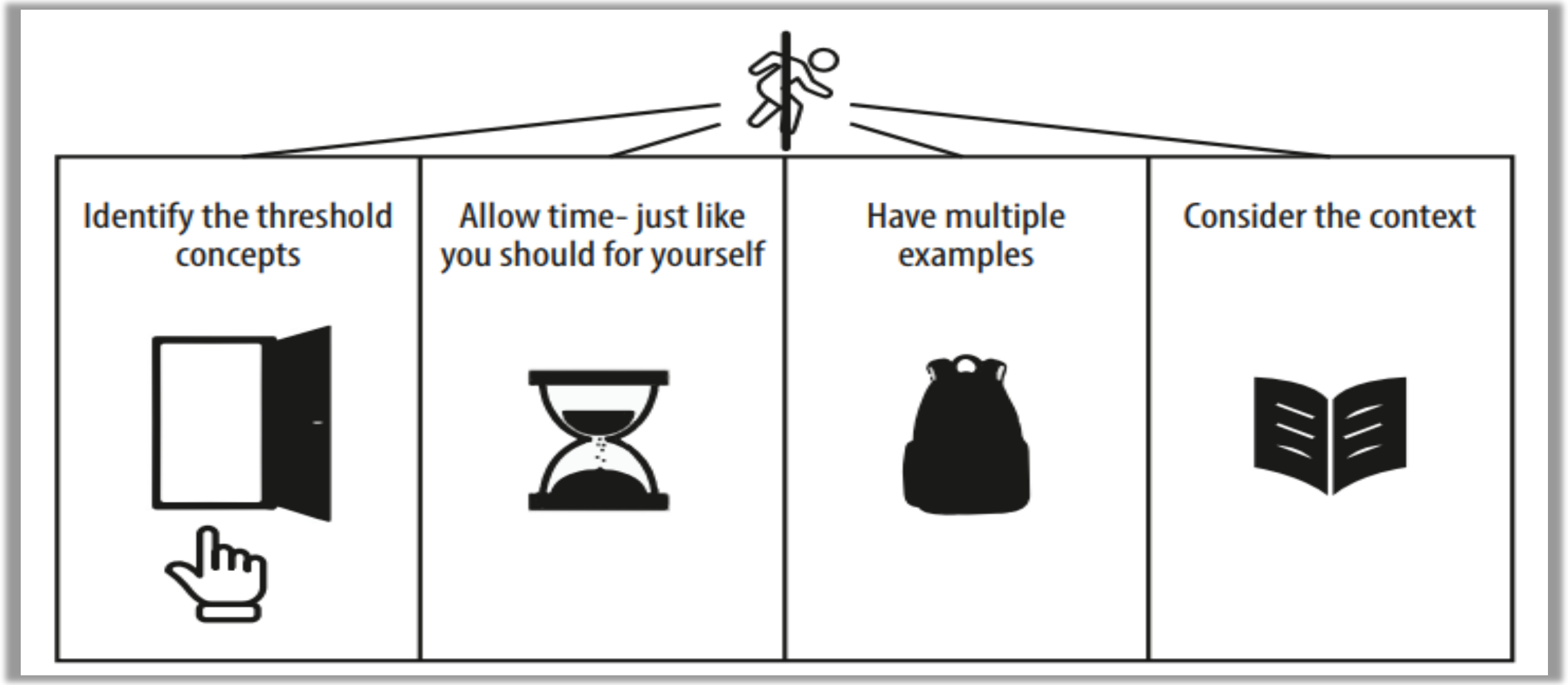
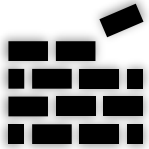


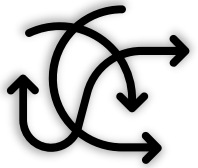
Integrative

Transformative

Irreversible



Reconstitutive



Troublesome

Discursive

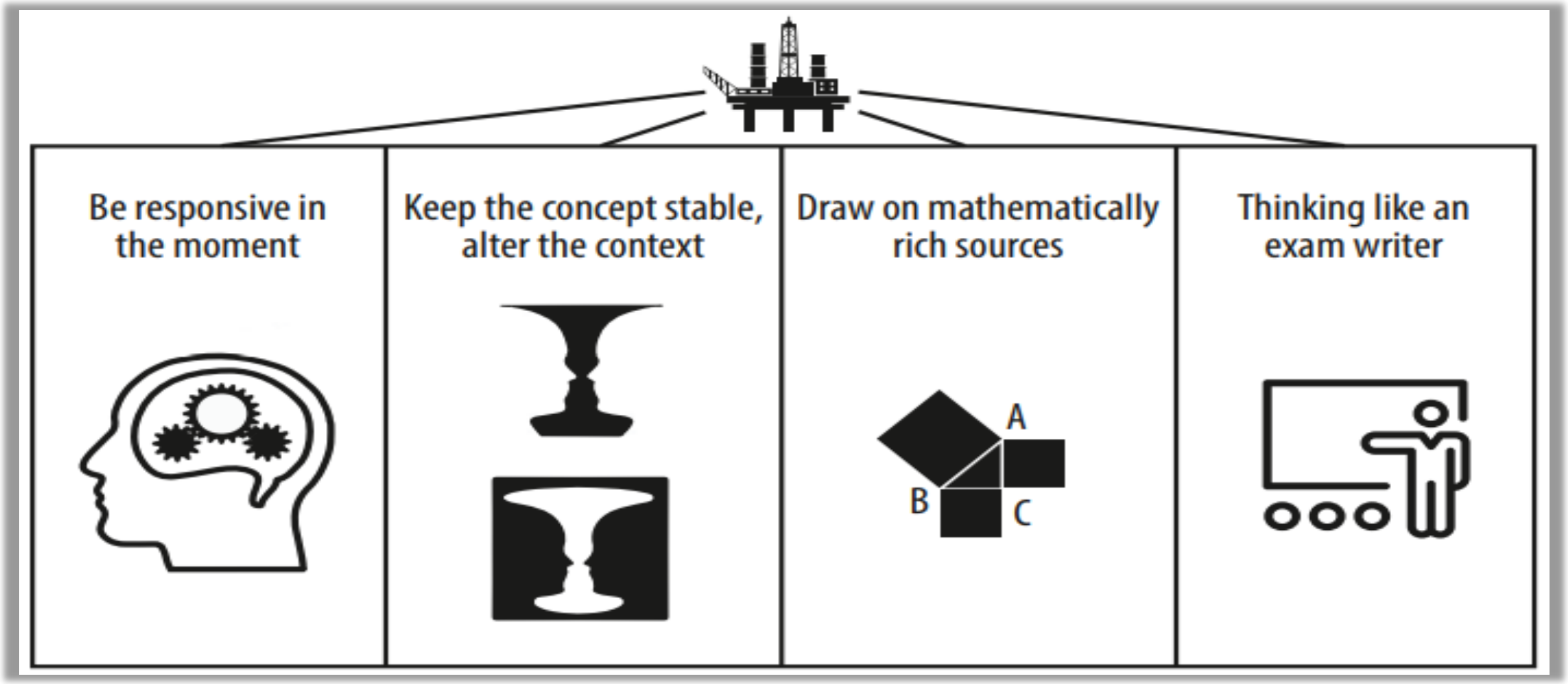
Thinking Deeply about Primary Education

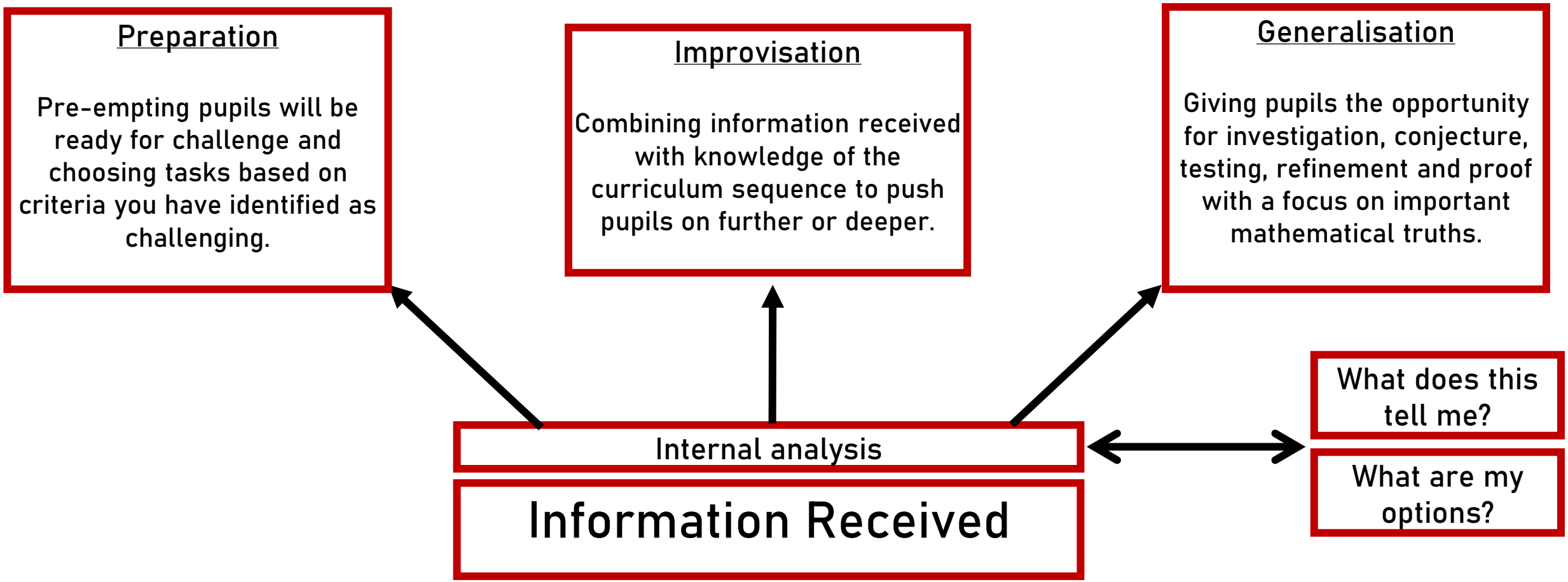
Home TDaPE Podcast Videos Blog

Threshold Concepts

In *"Thinking Deeply about Primary Mathematics"* we explore threshold concepts in the primary mathematics classroom. With a hierarchical subject such as mathematics it is extremely difficult to pin down precise threshold concepts, which is why I was reticent to commit a list to print. Instead, what follows is a fluid list comprised of those concepts and ideas which our pupils will find particularly difficult to navigate and which will demand some serious consideration on our part.

- The principles of counting (stable order, 1:1 correspondence, cardinality, order irrelevance, abstract principle)
- Unitising
- Equality/equivalence
- Moving from cumbersome strategies to automatic recall of number facts
- The field axioms (laws of arithmetic)





What are my options? Generalisation

TASK

Think of **three consecutive numbers**. These are your numbers.

Add your numbers.

Multiply your middle number by 3.

What do you notice? Explain.

Making Mathematical Generalisations

Identifying Patterns

$1+2+3=6$

$2+3+4=9$

"If I find the sum of 3 + 4 + 5 the total will be 12."

Making Conjectures

$1+2+3=6$

$2+3+4=9$

$3+5+7=15$

"If I find the sum of any 3 numbers the total will be a multiple of 3."

Providing Support for Mathematical Claims

Providing Non-Proof Arguments

$2+3+4=9$

$5+6+7=18$

$11+12+13=36$

$121+122+123=366$ $\frac{366}{3}=122$

$514+515+516=1545$

$\frac{1545}{3}=515$

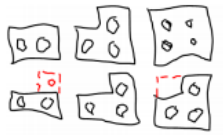
"The sum of 3 consecutive numbers is a multiple of 3."

Providing Proofs

"Any 3 consecutive integers can be described as n, n+1 and n+2"

$n + (n+1) + (n+2) = 9$ $\quad 11 + 12 + 13 = 36$

"The additional units can be redistributed to make 3 equal groups."



"Therefore, the sum of 3 consecutive integers is always a multiple of 3."

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EXPLAIN

Agree or disagree:

'When I add two consecutive numbers, the answer is never in the two times tables.'

Explain.

EXPLAIN

Agree or disagree:

'When I add two consecutive numbers, the answer is never in the two times tables.'

Explain.

Making Mathematical Generalisations

Identifying Patterns

Making Conjectures

Providing Support for Mathematical Claims

Providing Non-Proof Arguments

Providing Proofs

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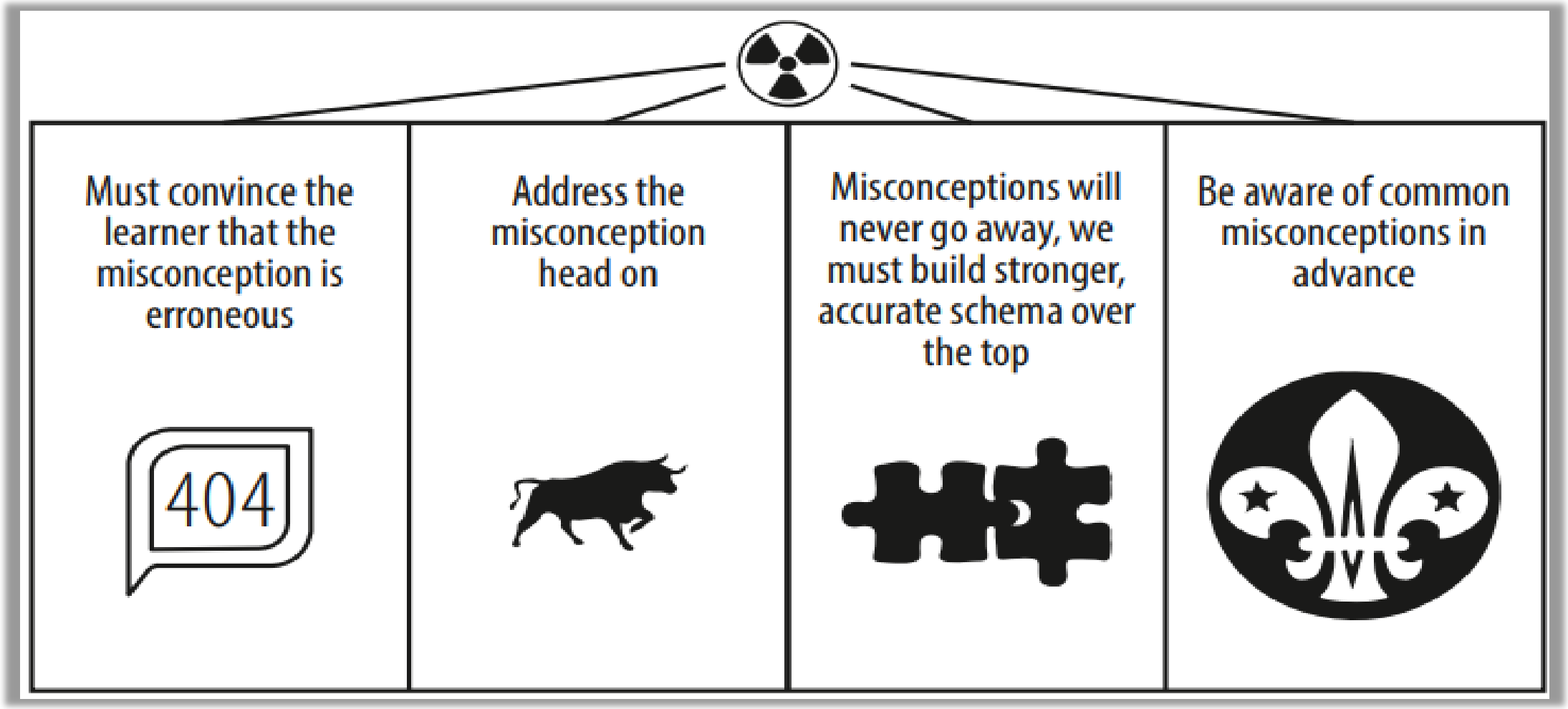

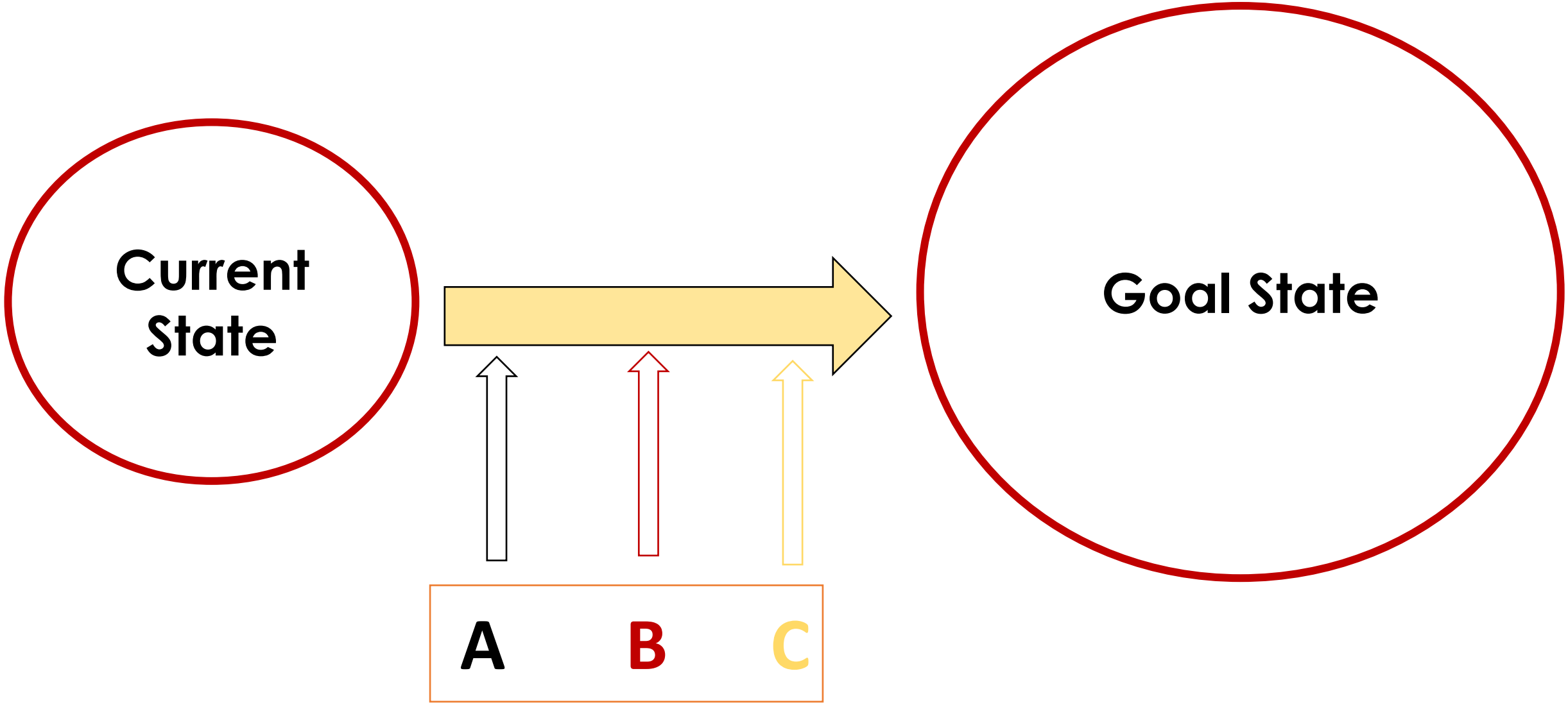

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$82 + 58$ $97 + 34$

$45 + 67$ $30 + 28$

Rearrange these number sentences into formal written columns.

$82 + 58$	$97 + 34$	$45 + 67$	$69 + 43$
$30 + 28$	$30 + 36$	$23 + 70$	$33 + 46$

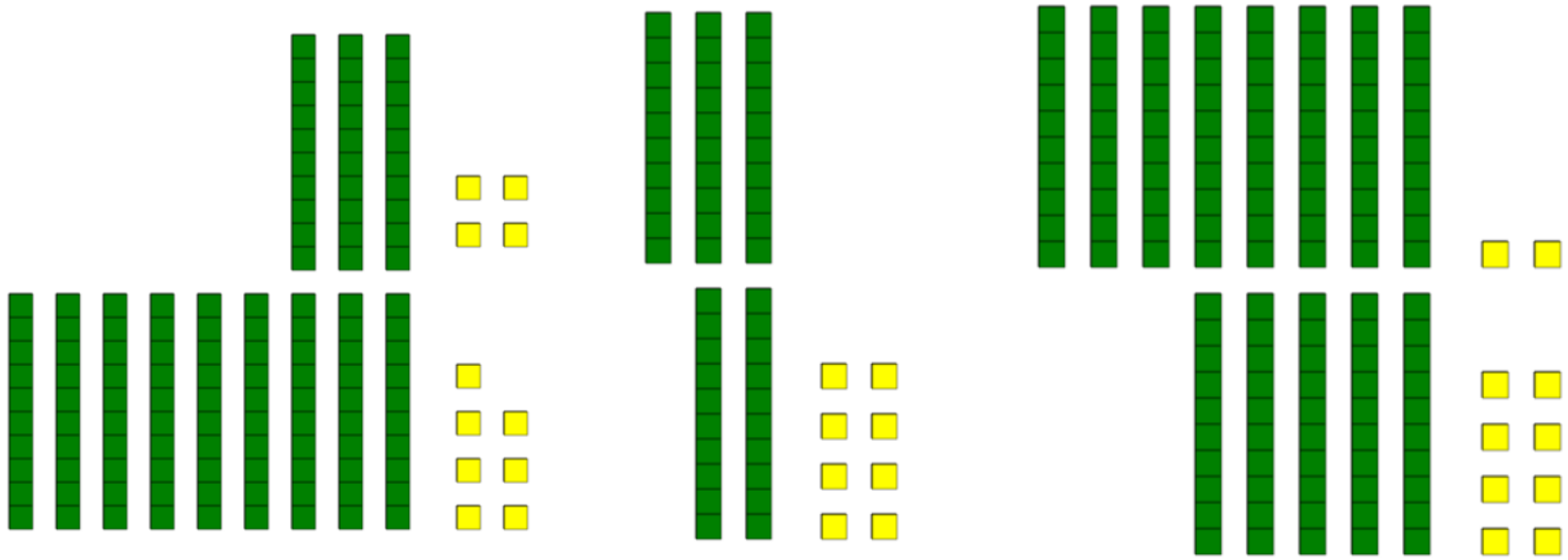
Tick the calculations which involve regrouping.

$$\begin{array}{r} 82 \\ +\ 58 \\ \hline \end{array}$$

$$\begin{array}{r} 97 \\ +\ 34 \\ \hline \end{array}$$

$$\begin{array}{r} 30 \\ +\ 28 \\ \hline \end{array}$$

$$\begin{array}{r} 30 \\ +\ 36 \\ \hline \end{array}$$

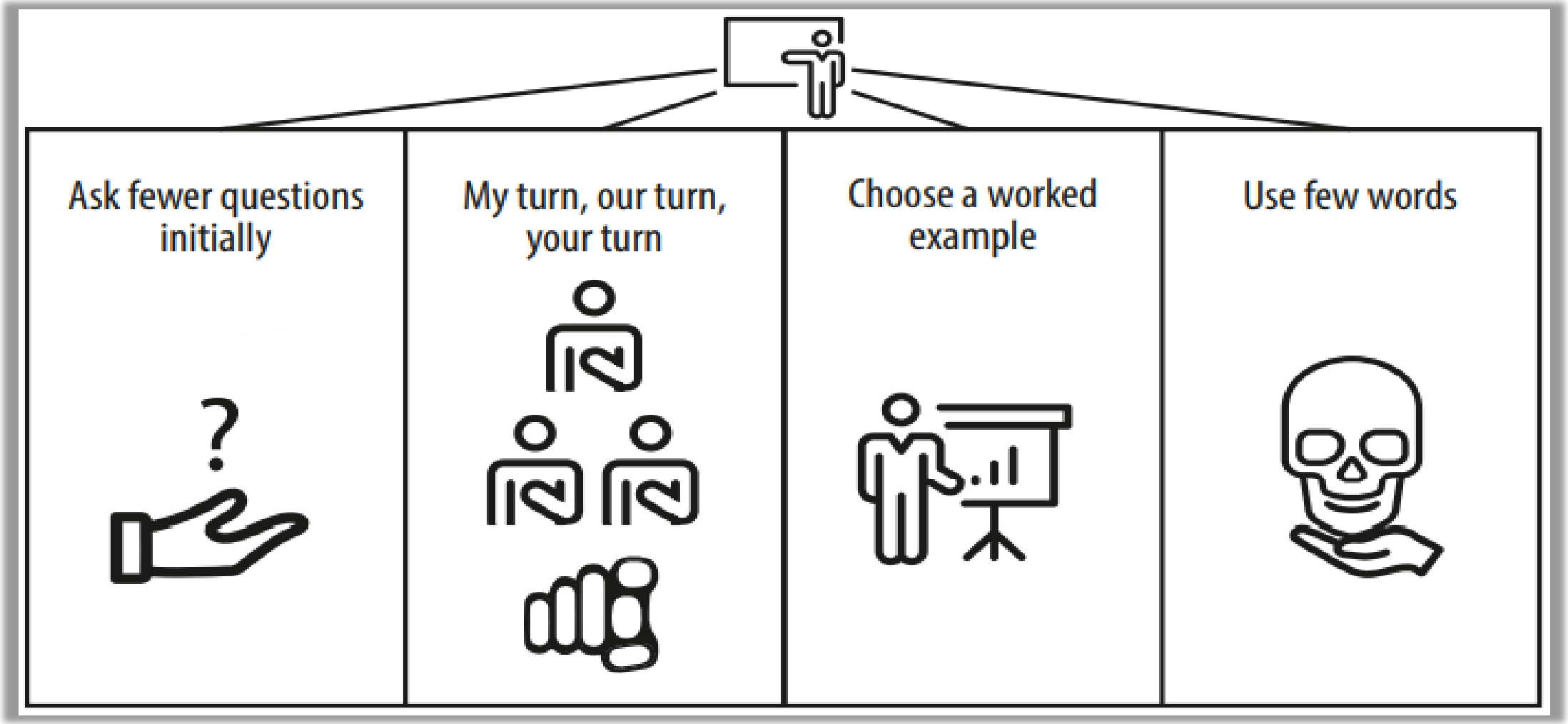


Match the calculations to their physical/pictorial representations

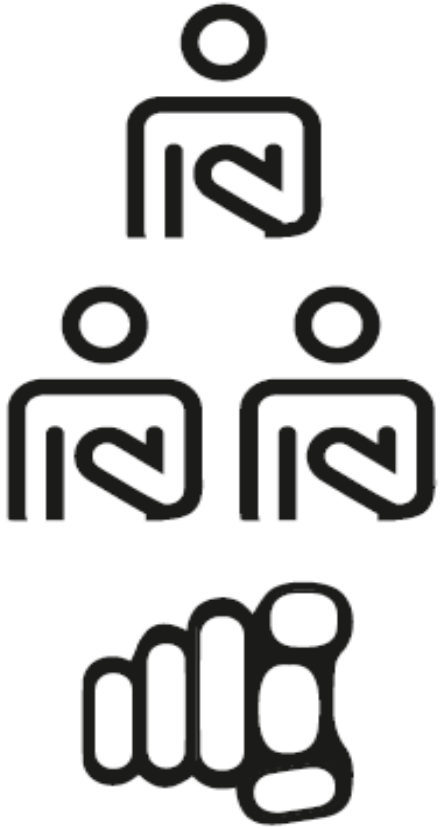
$$\begin{array}{r} 82 \\ +\ 58 \\ \hline \end{array} \qquad \begin{array}{r} 97 \\ +\ 34 \\ \hline \end{array}$$

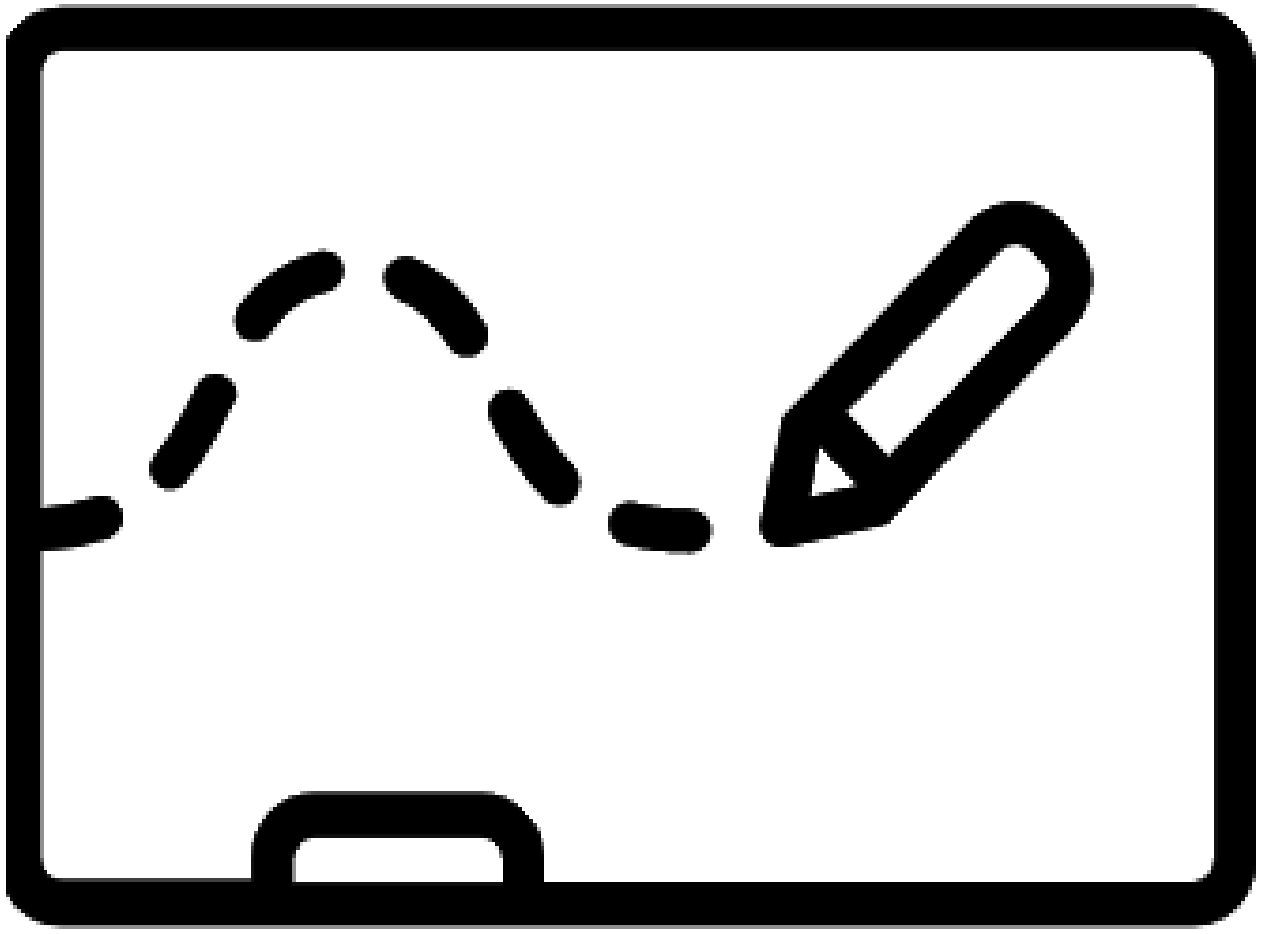
$$\begin{array}{r} 30 \\ +\ 28 \\ \hline \end{array} \qquad \begin{array}{r} 30 \\ +\ 36 \\ \hline \end{array}$$

Calculate the sum of these pairs of numbers



My turn, our turn,
your turn





My Turn

$$342 - 20$$

① $300 + 42$

② $42 - 20 = 22$

③ $300 + 22 = 322$

My Turn

342 - 20

① 300 + 42

② 42 - 20 = 22

③ 300 + 22 = 322

Our Turn

242 – 20

Your Turn

442 - 20

My Turn	Your Turn
342 - 20	442 - 20

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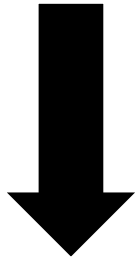
372 – 20

458 – 30



763 – 40

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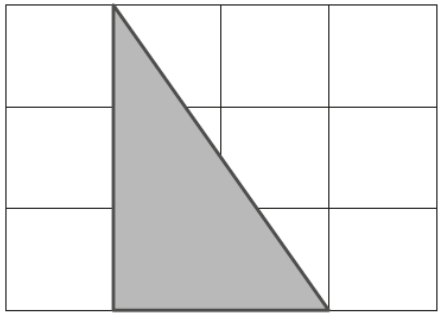
Paired worked examples

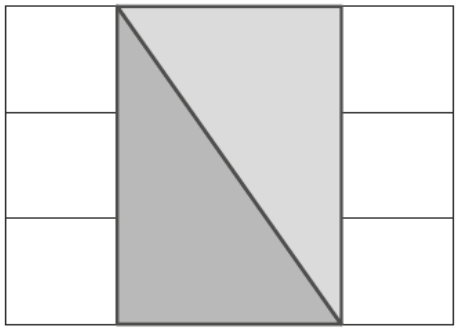
My Turn	Your Turn
342 - 20 ① 300 + 42 ② 42 - 20 = 22 ③ 300 + 22 = 322	240 – 20

Procedural worked example

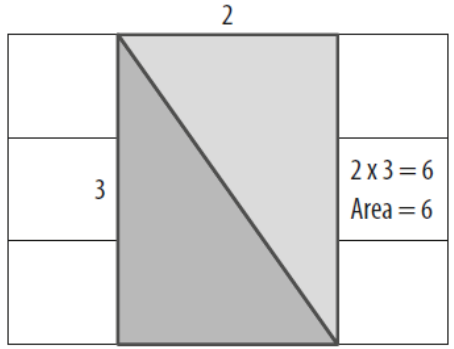
Pre-step one: (question selection)



Step one:

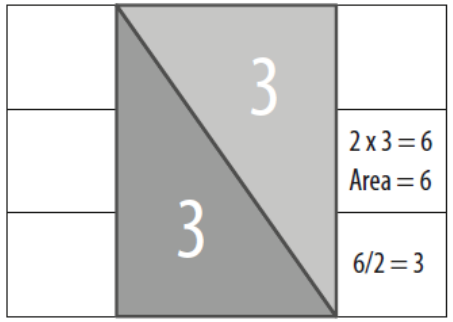


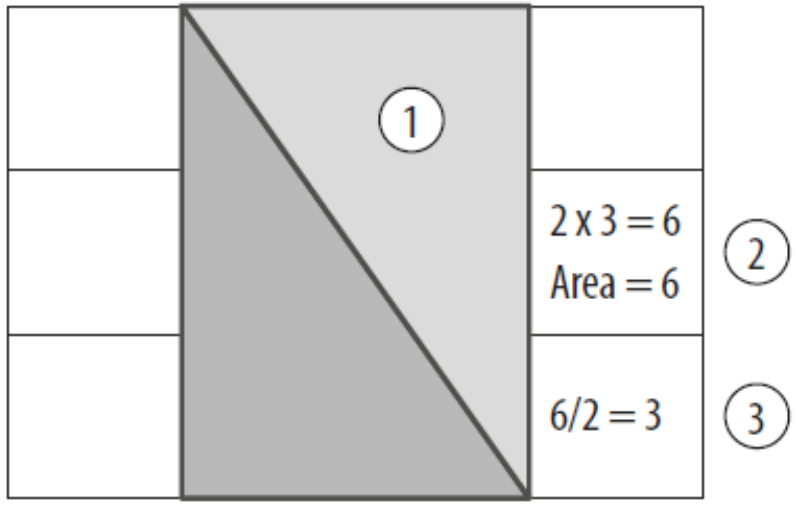
Step two:



'Using what you know about the area of rectangles, find the area of this triangle.'

Step three:





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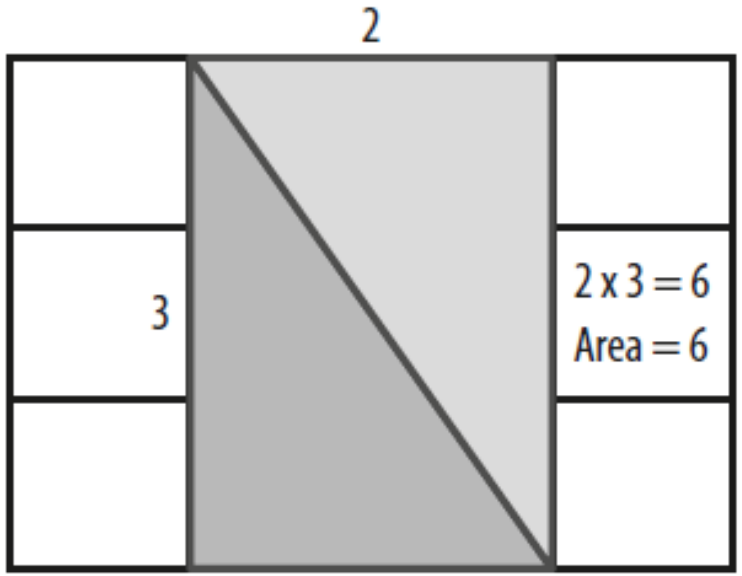
Reverse phased worked example

Calculate the area of the blue triangle.



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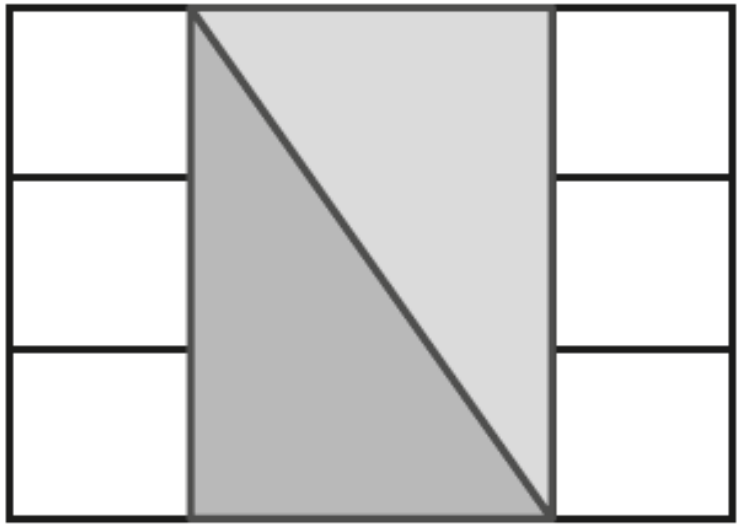

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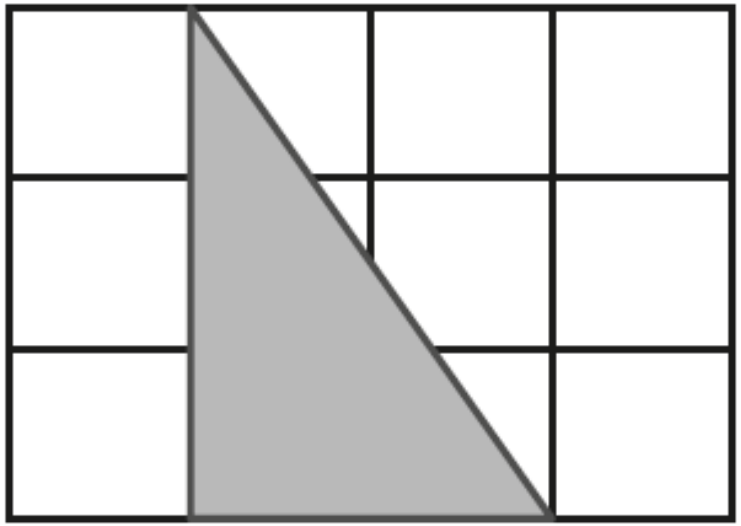

Reverse phased worked example

a.

$$\begin{array}{r} 325 \\ +192 \\ \hline 517 \\ {\scriptstyle 1} \end{array}$$

b.

$$\begin{array}{r} 335 \\ +192 \\ \hline 527 \\ {\scriptstyle 1} \end{array}$$

c.

$$\begin{array}{r} 325 \\ +194 \\ \hline 519 \end{array}$$

d.

$$\begin{array}{r} 335 \\ +194 \\ \hline \end{array}$$

Problem worked examples

Jack buys 6 packs of Euro 2021 football stickers. Each precious pack has 8 stickers with the images of famous football players. How many stickers does Jack buy altogether?

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My Turn

Jack buys 6 packs of Euro 2021 football stickers. Each precious pack has 8 stickers with the images of famous football players. How many stickers does Jack buy altogether?

Our Turn

Jack buys 4 packs of Euro 2021 football stickers. Each precious pack has 8 stickers with the images of famous football players. How many stickers does Jack buy altogether?

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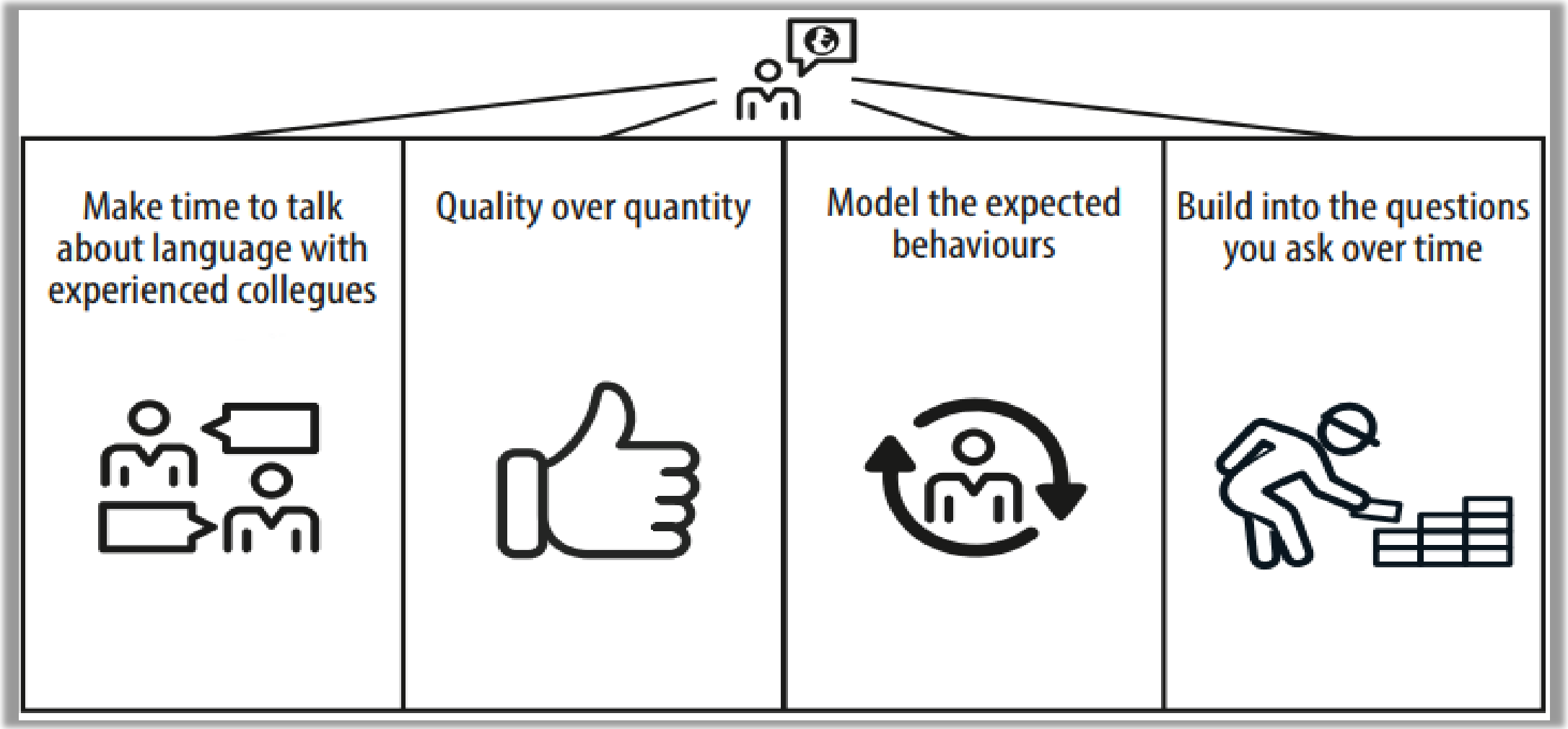
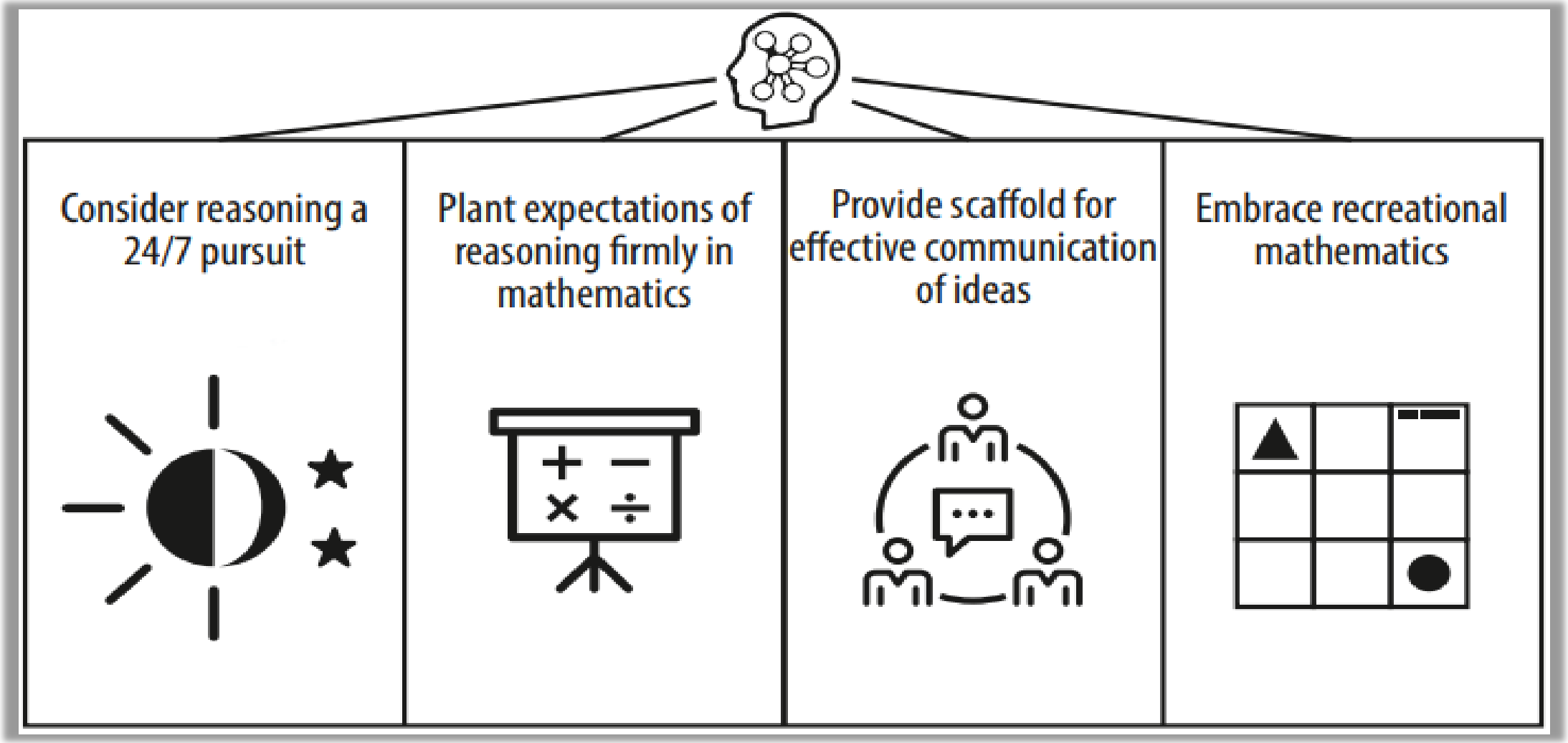
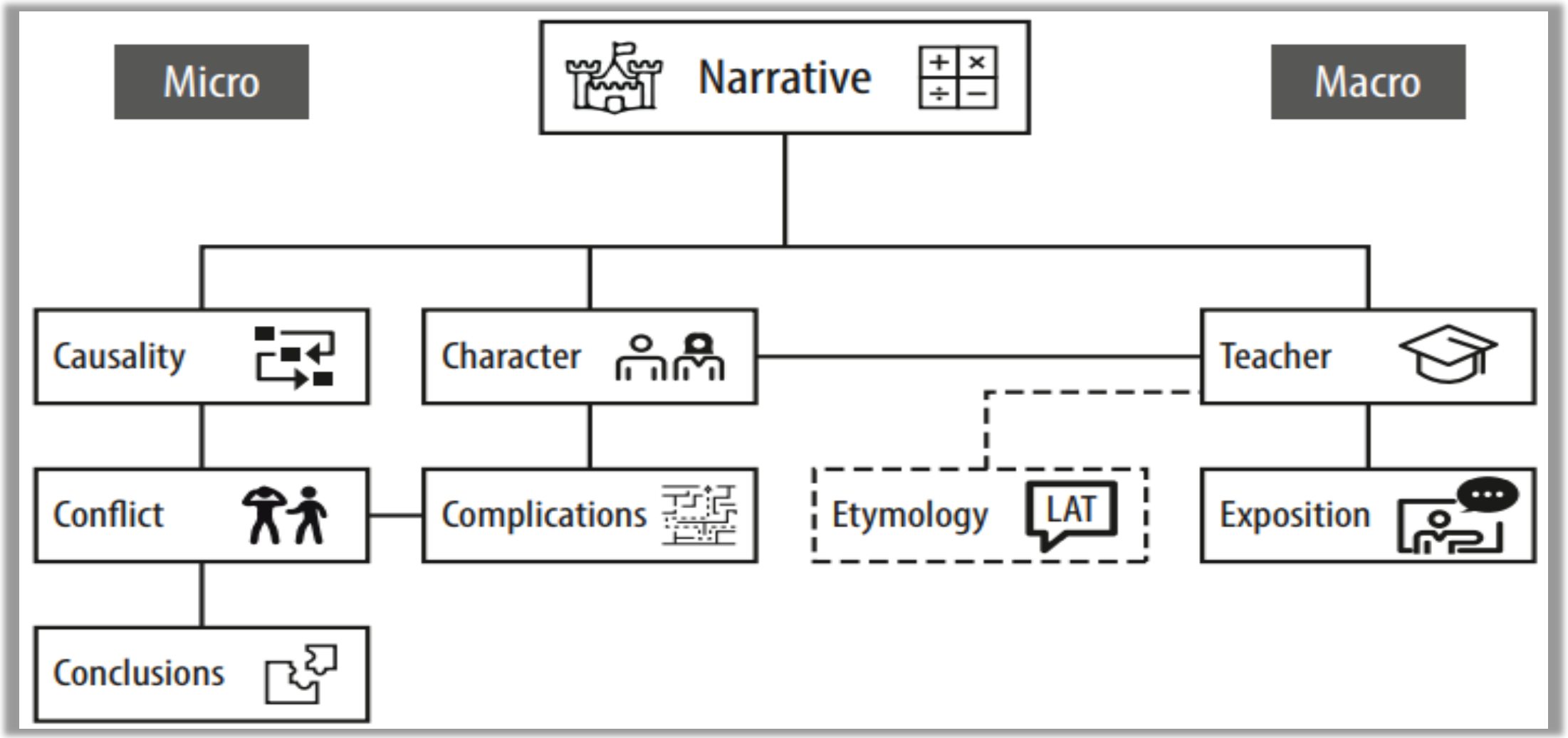
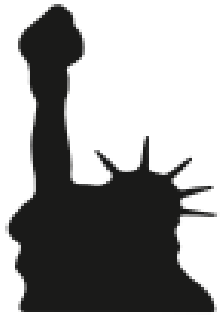
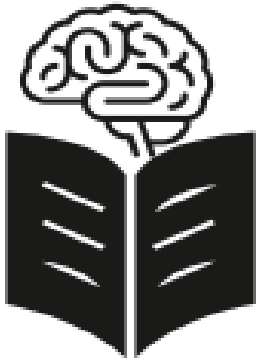
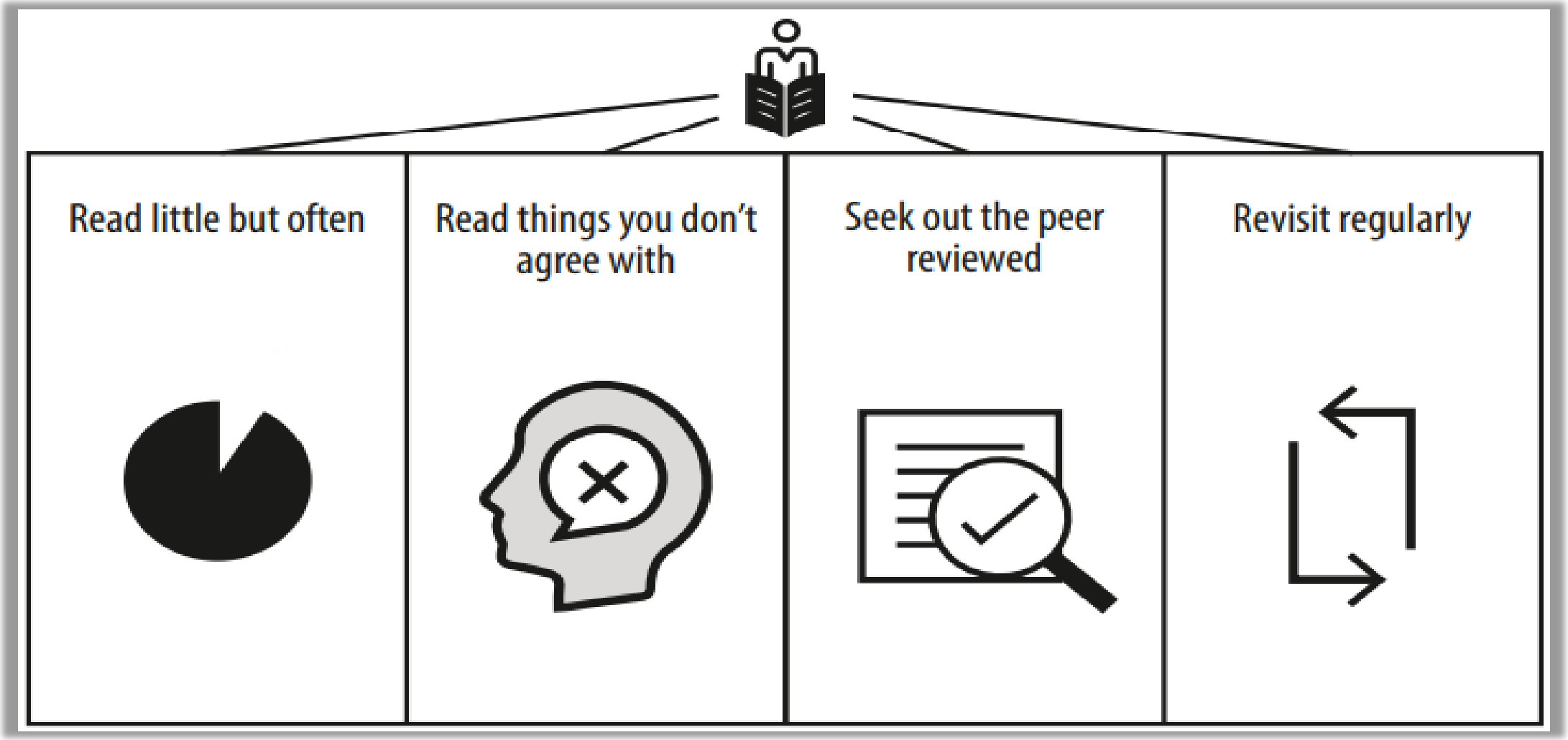
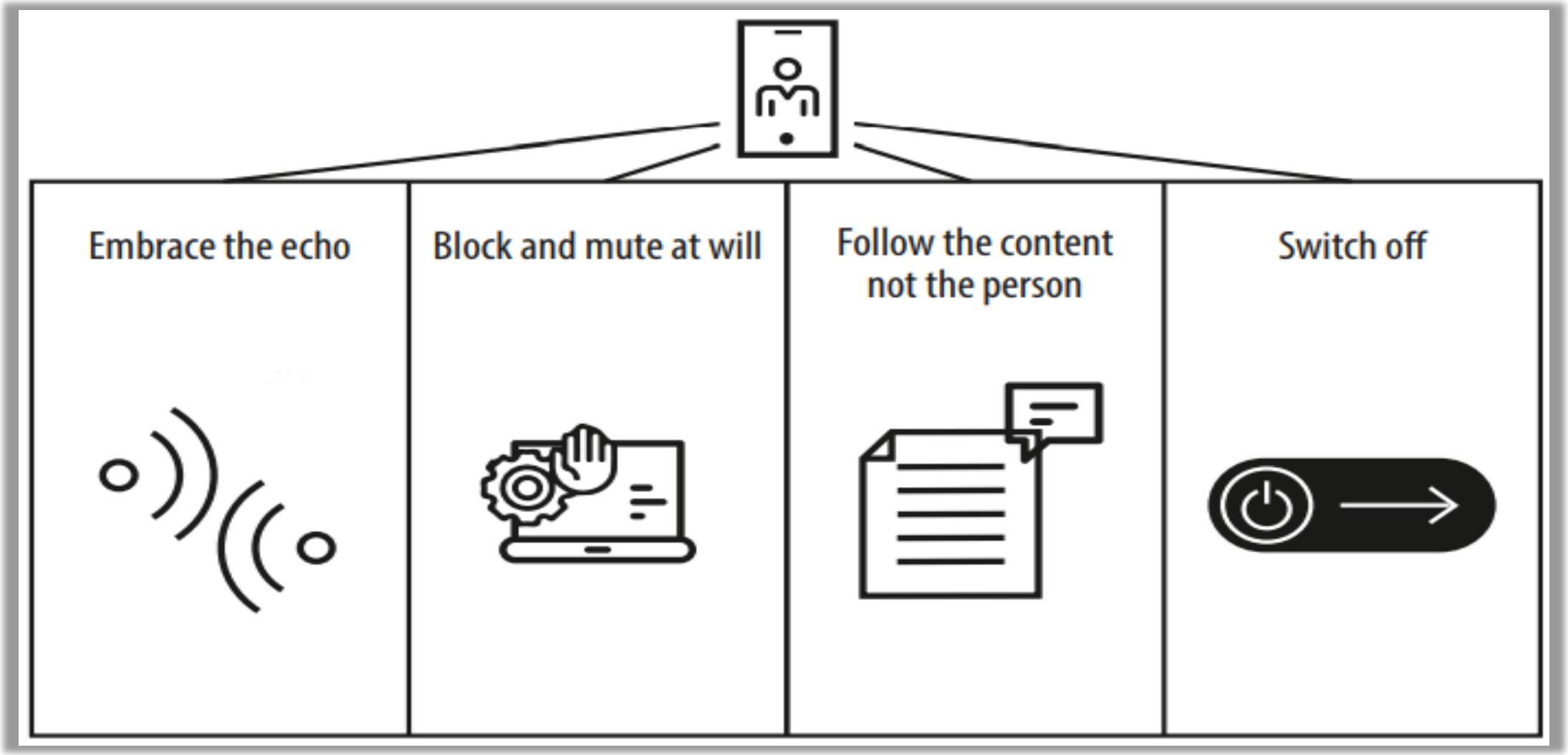


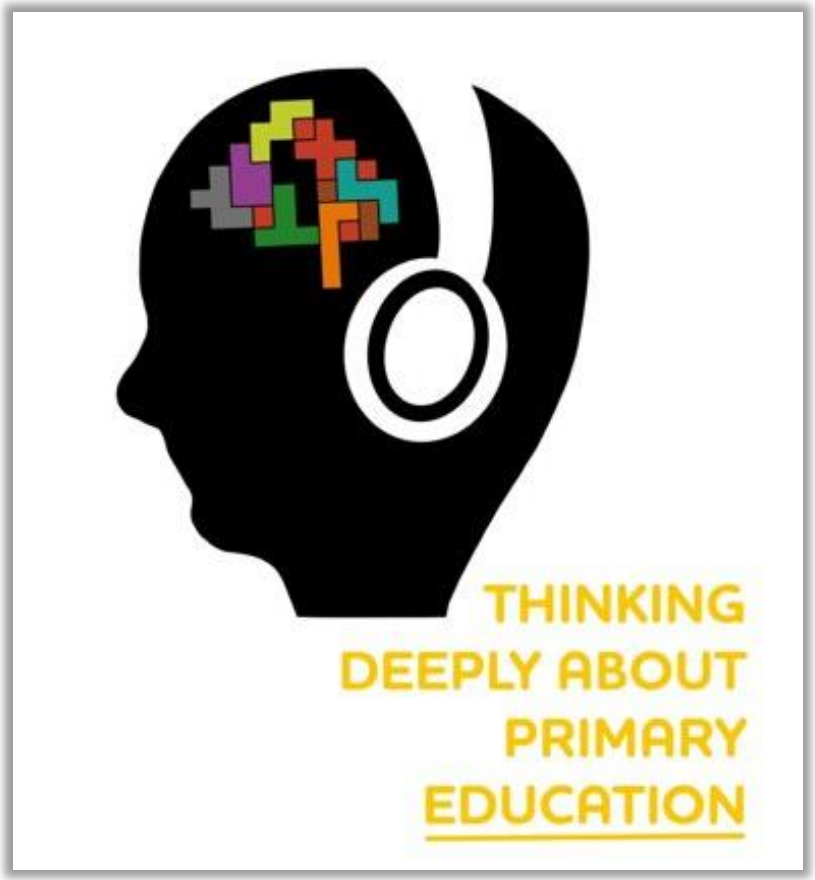


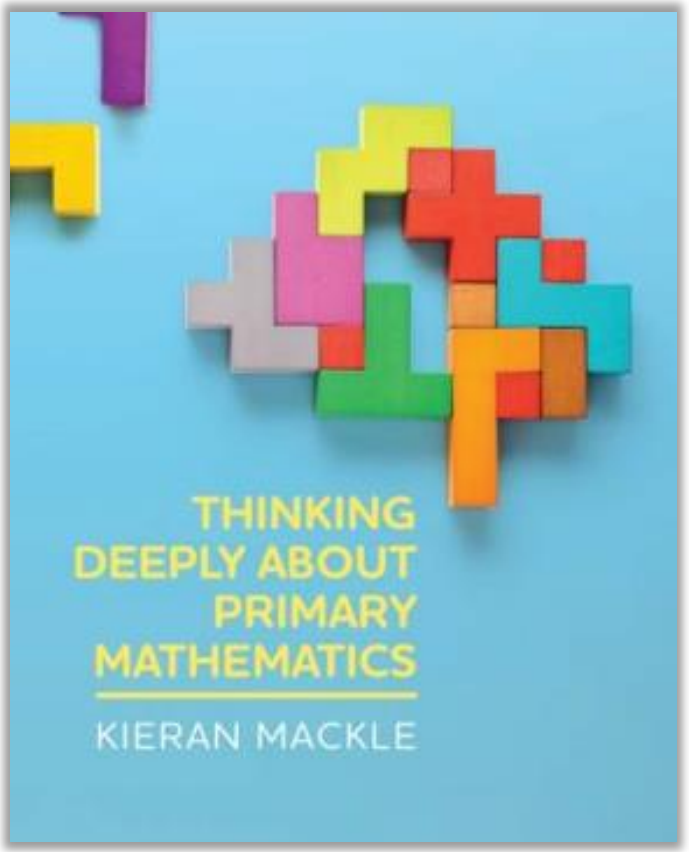


Free yourself from imagined pressures	Begin with an end goal in mind	Draw on established mental models	Build in frequency and familiarity
			









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