

# Teaching for Mastery

How do we do it  
Features of a Lesson



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# Overview

Features of a Mastery lesson

How is a mastery lesson inclusive?

How does it provide access to the mathematics?

How does it develop deep and sustainable learning?

**Before**

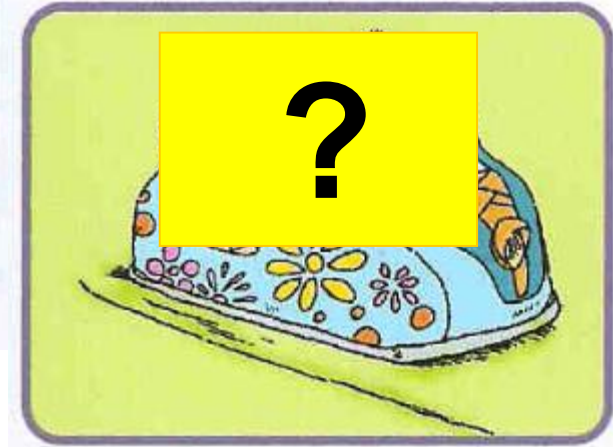


**4**

**then**



**- 1**



**?**

**At first**

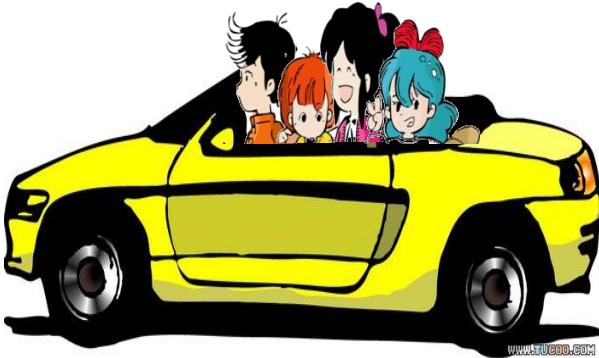
**Go away**

**Left?**

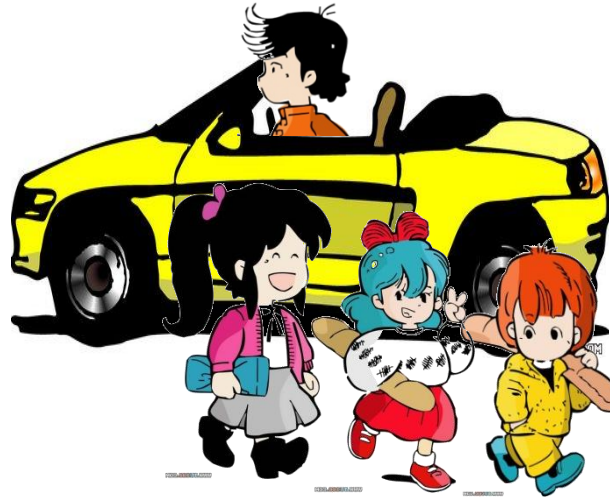
$$4 - 1 = 3$$

Thank you to Li Dong (Kris)  
for the slides

**Before**



**then**

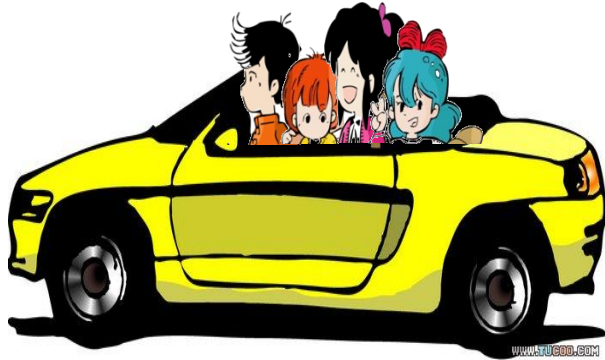


$$4 - 3 = 1$$

What does the 4 represent?  
What does the 3 represent?  
What does the 1 represent?

Thank you to Li Dong (Kris)  
for the slides

**Before**



**then**

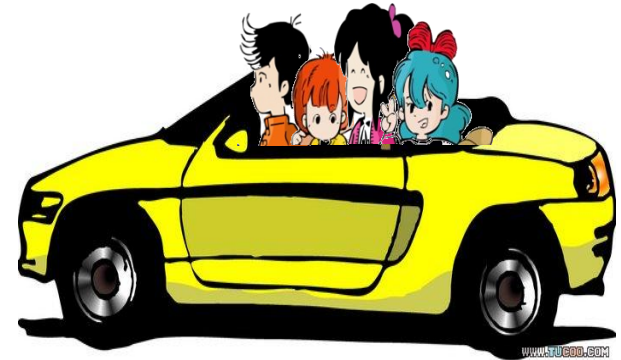
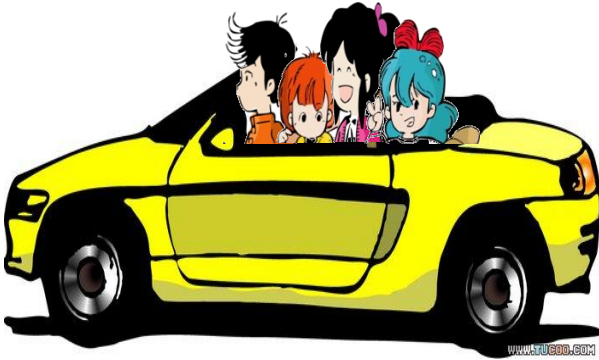


$$4 - 4 = 0$$

**Before**

**then**

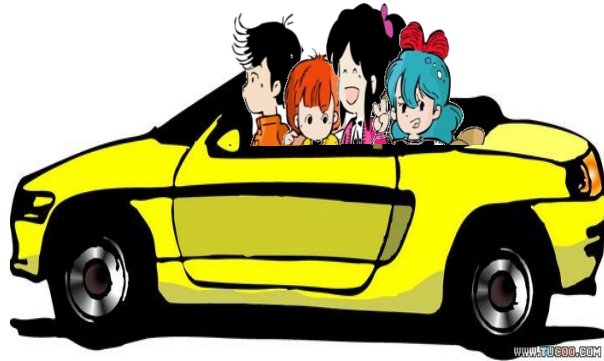
**now**



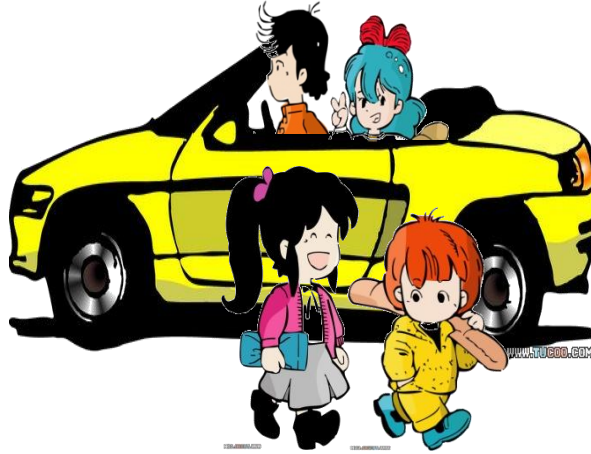
$$4 - 0 = 4$$



**Before**



**then**



$$4 - 2 = 2$$



**At first 7?**

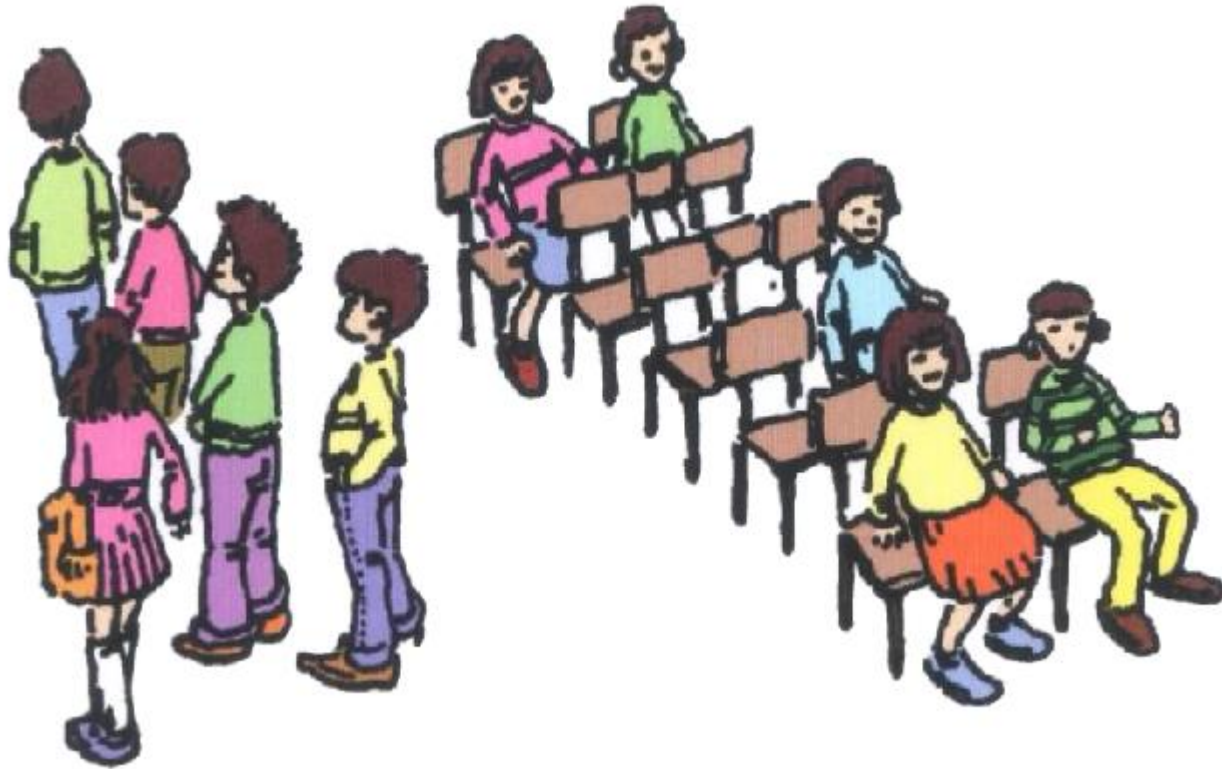
$$7 - 3 = 4$$





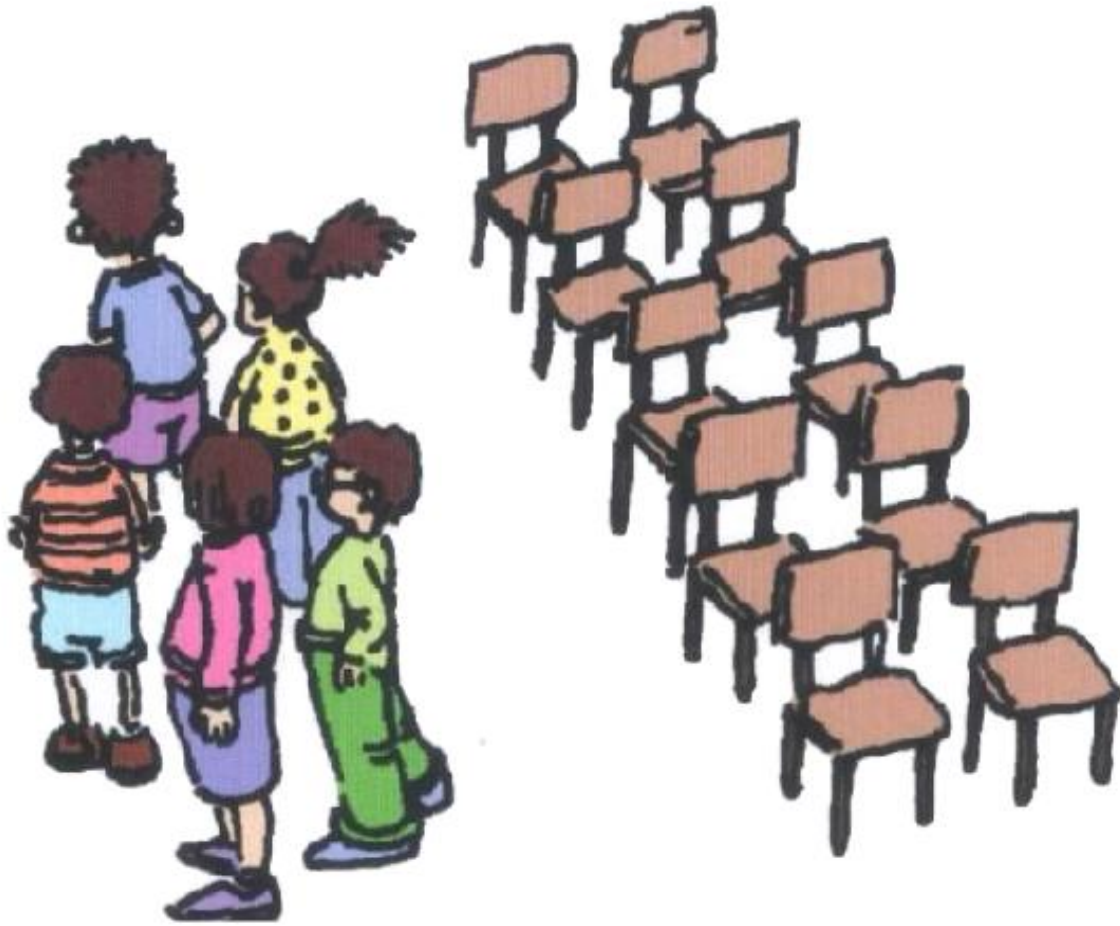
At first: 9

$$9 - 3 = 6$$



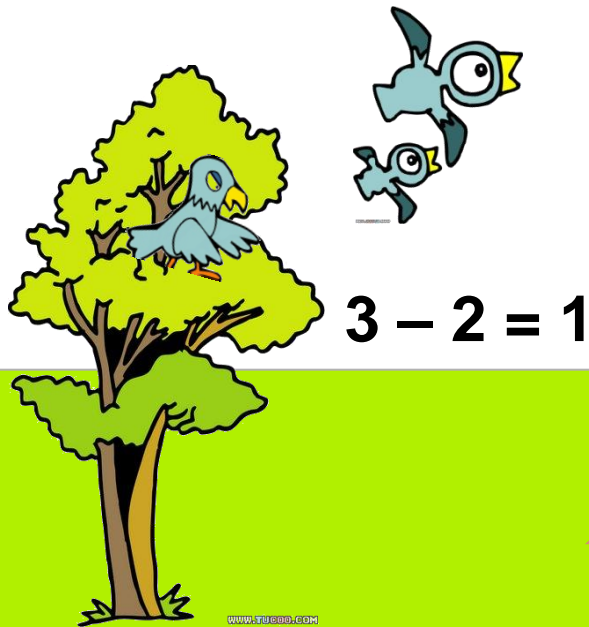
At first 10

$$10 - 5 = 5$$

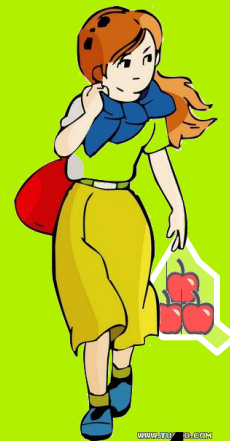
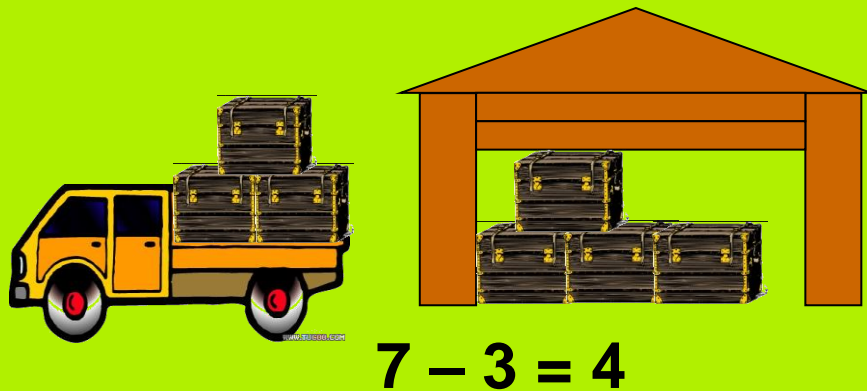
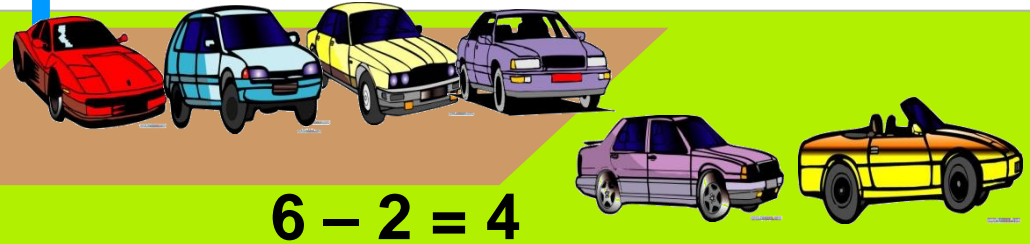


At first:5

$$5 - 5 = 0$$

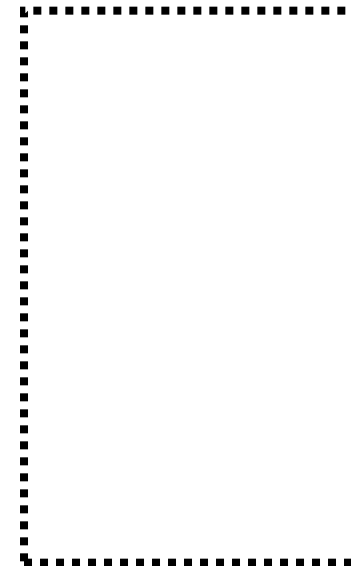
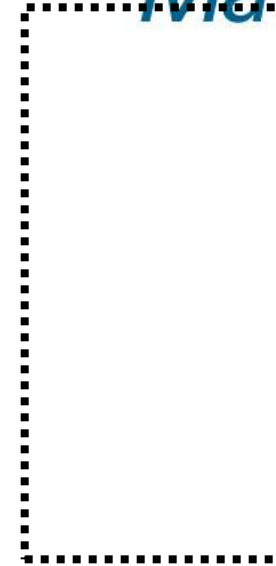


停车场





$$5 - 2 - 2 = 1$$



# Subtraction number sentence : MathsHUBS

$$\begin{array}{ccccccc} 4 & - & 1 & = & 3 \\ \vdots & & \vdots & & \vdots & & \vdots \\ \text{Minuend} & & \text{minus sign} & & \text{Subtrahend} & & \text{Difference} \end{array}$$

**Minuend — Subtrahend = Difference**



# Teaching for Mastery

## Exploring teaching strategies



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# Key Features of the lesson

- Repetition – providing a conceptual framework
- Conceptual variation – moving from one representation of the concept to another
- Simple but deep
- Small focus

# Teaching strategies to support mastery

- Discussion – the answer is only the beginning
- Ping-Pong style – providing sufficient scaffold for all pupils to access
- Repetition and chorusing
- Precision in the use of mathematical language
- Carefully chosen examples and representations to draw out the essence of the concept (conceptual variation)
- Intelligent practice (often outside of the lesson)
- Dong Nao Ting

# Ping Pong Style of Teaching



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# Ping Pong

Provides a clear and coherent journey through the mathematics

Provides detail

Provides scaffolding for all to achieve

Provides the small steps

# Letting go! But then reining back in Ping Pong and Discussion





# Pupil Support

*One of the most important tasks of the teacher is to help his students...*

*If he is left alone with his problem without any help or insufficient help, he may make no progress at all...*

*If the teacher helps too much, nothing is left to the student*

(Polya 1957)

# Repetition and Chorusing



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# The role of repetition

***I say, you say, you say, you say, we all say***

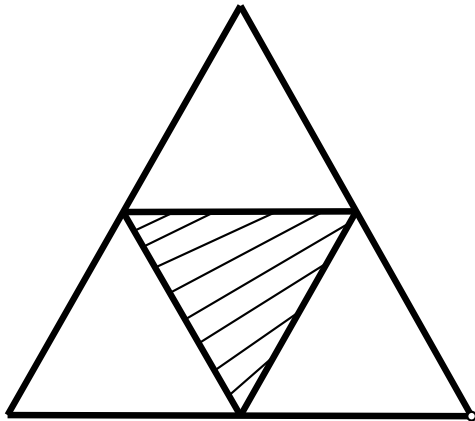
This technique enables the teacher to provide a sentence stem for children to communicate their ideas with mathematical precision and clarity. These sentence structures often express key conceptual ideas or generalities and provide a framework to embed conceptual knowledge and build understanding. For example:

*If the whole is divided into three equal parts, one part is one third of one third of the whole.*

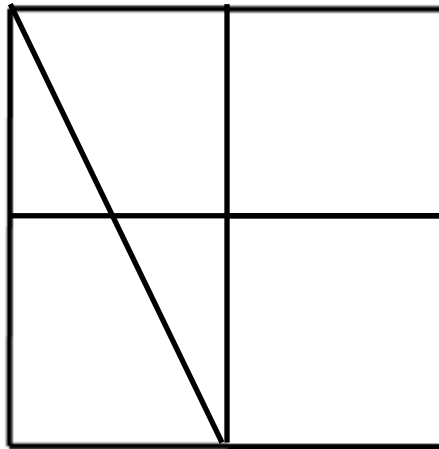
Having modelled the sentence, the teacher then asks individual children to repeat this, before asking the whole class to chorus chant the sentence. This provides children with a valuable sentence for talking about fractions. Repeated use helps to embed key conceptual knowledge.

<https://www.ncetm.org.uk/resources/48070>

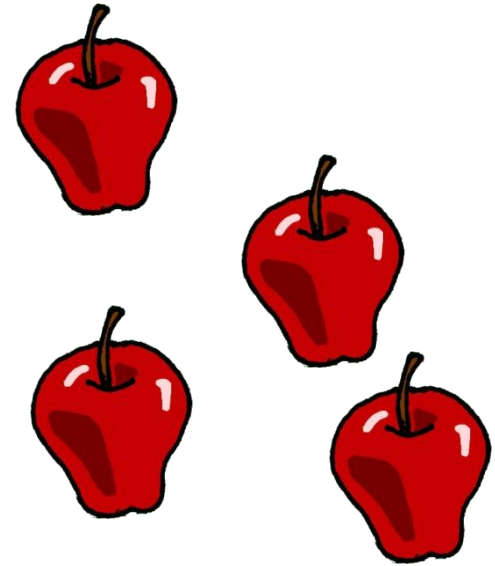
The whole is divided into (    ) equal parts,  
each part is (    ) of the whole.



same shape



same size



same amount

What's the Same What's different?  
An example of conceptual variation

# Teaching with variation



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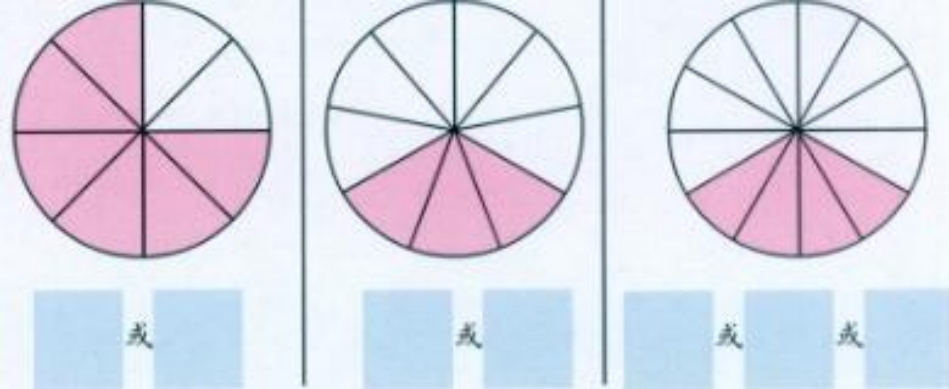
# Teaching with variation

Conceptual Variation

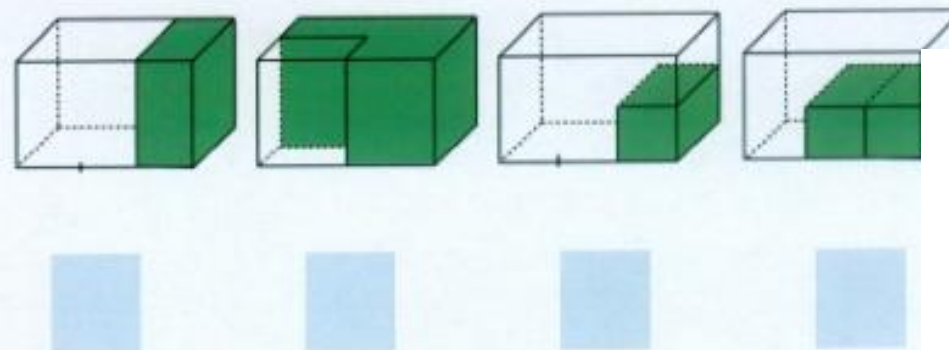
Procedural Variation



# Conceptual Variation



2. 绿色部分是长方体的几分之几？用分数表示。



他们得到的巧克力一样多吗？



我得到下面一堆巧克力的  $\frac{1}{2}$ 。



我也得到下面一堆巧克力的  $\frac{1}{2}$ 。



A. Use fractions to express the coloured parts.



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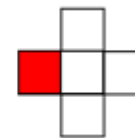


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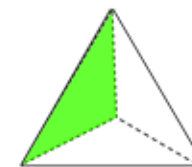
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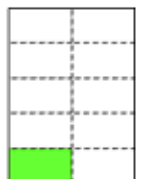
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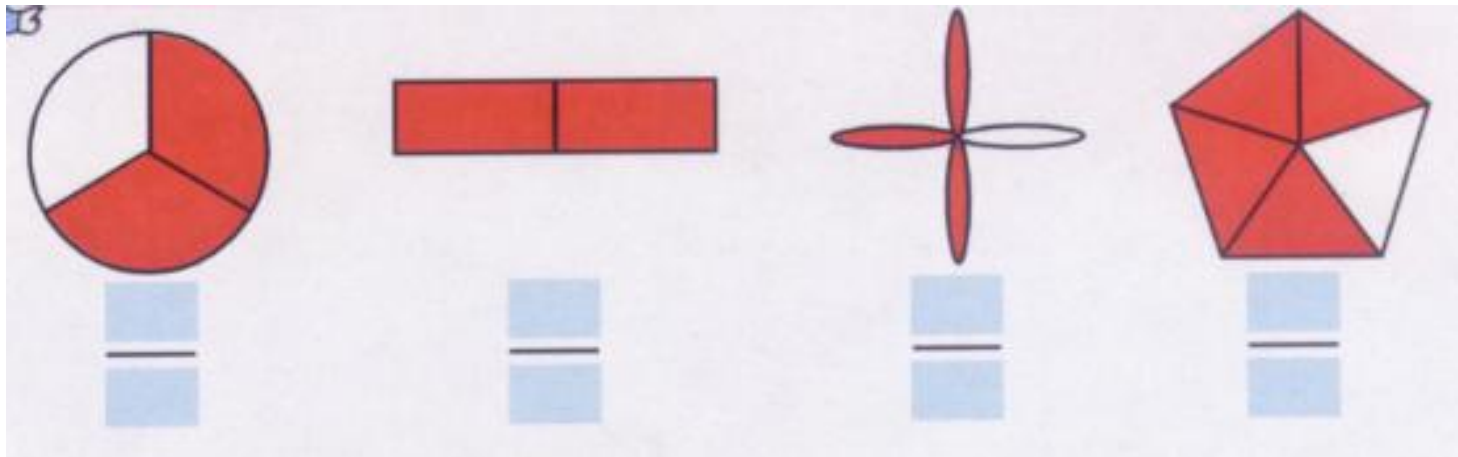


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# Providing Challenge



Shanghai Textbook Grade 3

# Variation Theory in Practice

Compare the two sets of calculations

What's the same, what's different?

Set A

$$120 - 90$$

$$235 - 180$$

$$502 - 367$$

$$122 - 92$$

$$119 - 89$$

$$237 - 182$$

Set B

$$120 - 90$$

$$122 - 92$$

$$119 - 89$$

$$235 - 180$$

$$237 - 182$$

$$502 - 367$$

Consider how variation can both narrow and broaden the focus

Taken from Mike Askew, Transforming Primary Mathematics, Chapter 6

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# 动脑筋 (dong nao jin)

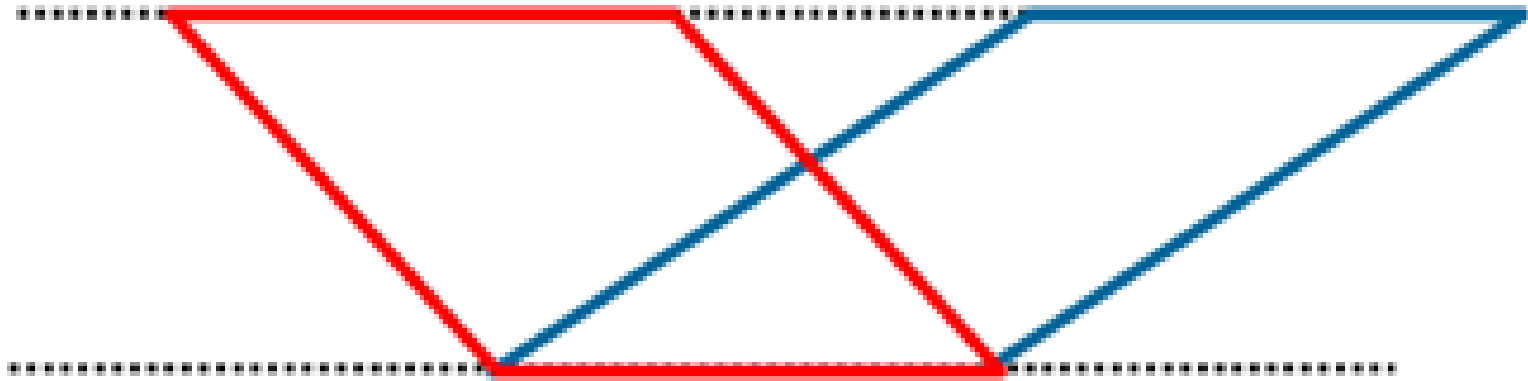
A regular part of a lesson

In general ,this part is not from the textbook.

Sometimes it is:

- A challenging question for students,
- A “trap” for students.
- Very “tricky” which may let the students “puzzle” again
- It is an opportunity help student think about the knowledge in another way.

# 动脑筋 (dong nao jin)



There are two parallelograms, the areas are same or not?

Can you draw other parallelograms which have the same area?

*(Let the students pay attention to the bottom and height, it is the key point of the whole lesson.)*