

Designing Learning Activities to Raise Students' Fluency and Understanding in Arithmetic

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NCS students in Hong Kong seem to lack fluency in Mathematics?

Some Possible Reasons

- Learn in 2nd / 3rd language
- Limited family support (parents, even well educated, may not understand their children's text books)
- Diversity in expectation in comparing with Chinese parents
- Not well adapted to traditional drilling styles in Hong Kong

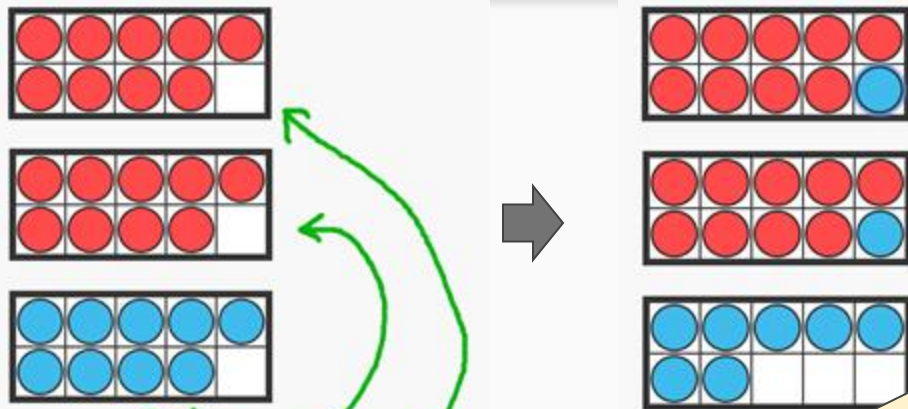
Rationale behind strategies

- Reduce Barrier (mainly language related)
 - More visual means to grasp concepts
- Increase Students' Engagement
 - More interesting learning activities
 - Learning (Drilling) in happy ways

Some strategies we are trying with teachers

- **Ten Frames:** Visualization of arithmetic operations
- **Fraction Squares:** Visualization of operations on fractions
- **Open-ended problems:**
 - Students make and solve their own problems

The multiplication of 9

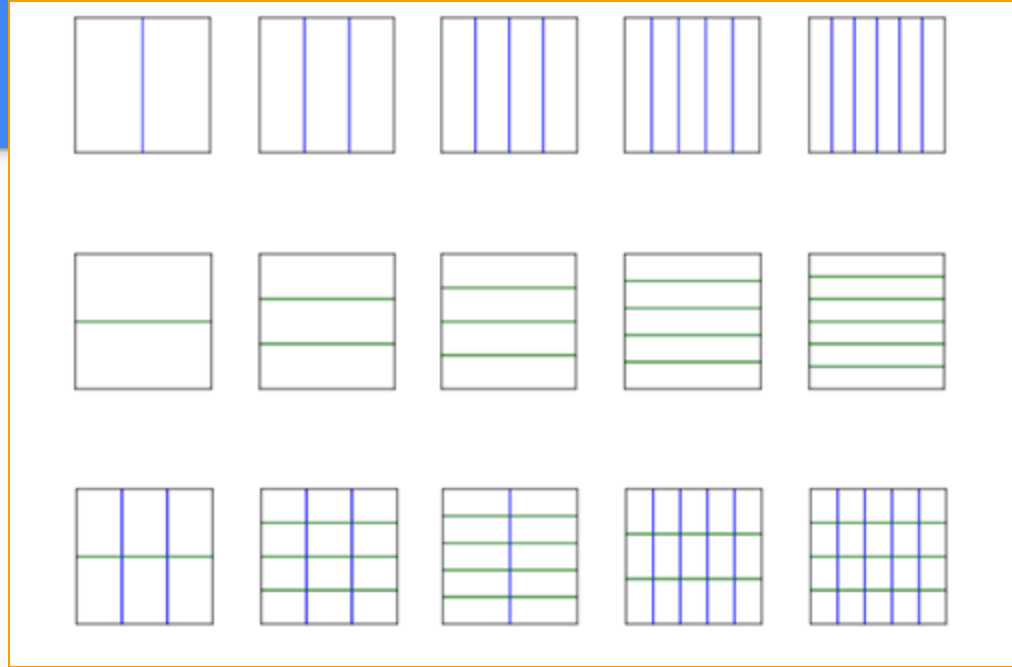


Allow students to **observe** and **find** their own formula

$$\begin{aligned} 1 \times 9 &= 9 \\ 2 \times 9 &= 18 \\ 3 \times 9 &= 27 \\ \dots &\dots \\ 6 \times 9 &= 54 \\ 7 \times 9 &= 63 \\ \dots &\dots \end{aligned}$$

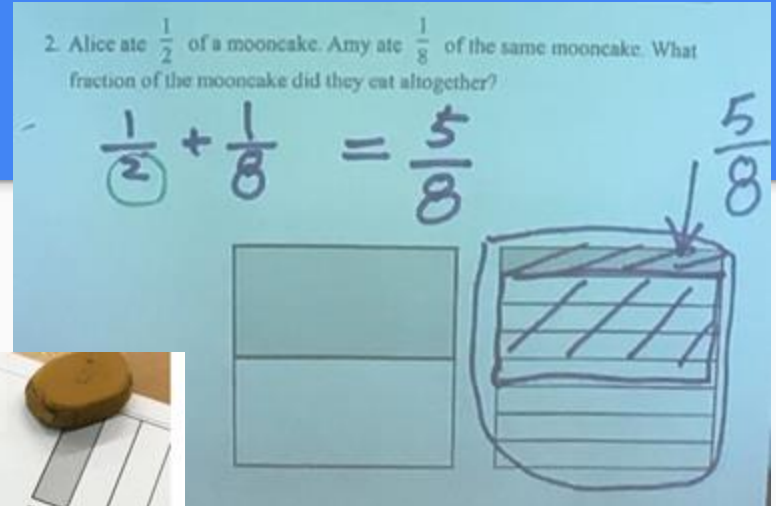
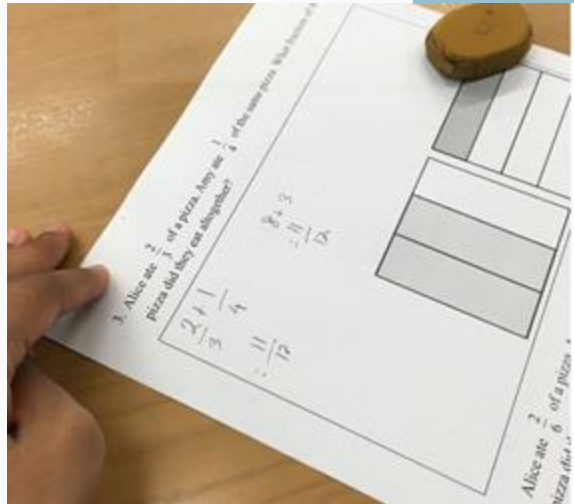
Fraction Squares

- Representation of fractions by graphical means
- Provide a visual meaning for finding common denominator

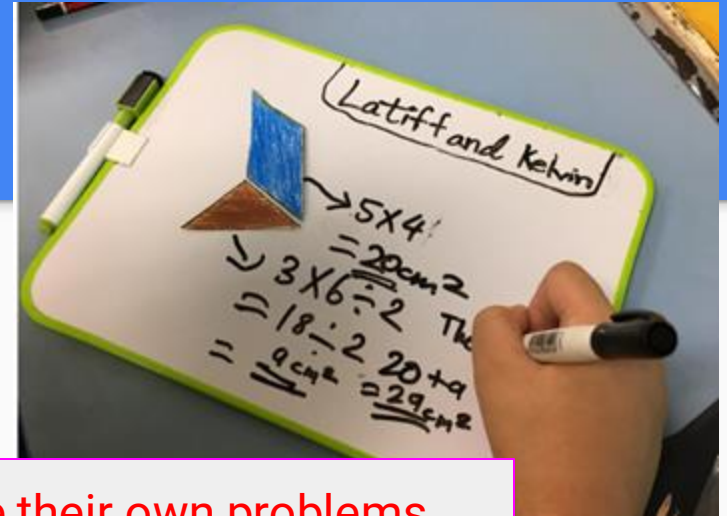
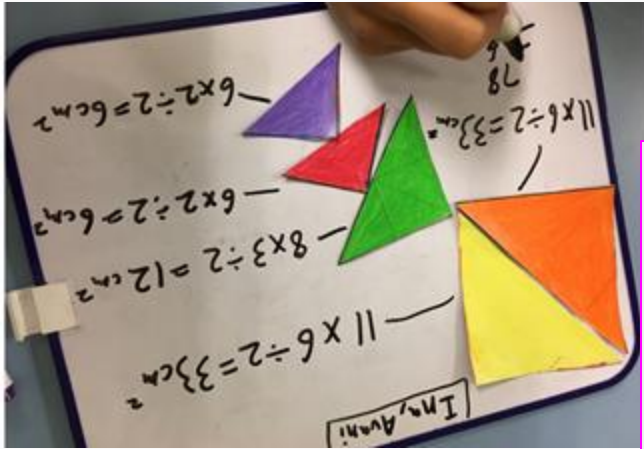


Fraction Squares

- Students got a **visual sense on the steps** they perform during addition of fractions



Open-ended problems

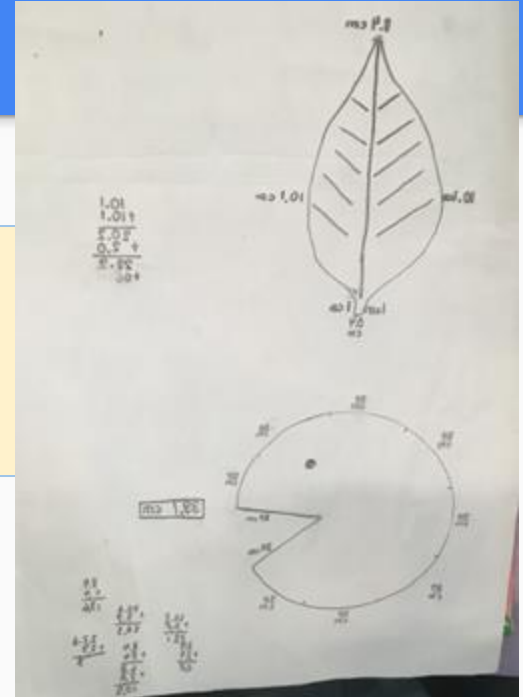


- Students make their own problems
- Solve with their own ways
- Review with peers
- Much better engaged and thus have deeper understanding

Open ended problems



- Provided the opportunity, NCS students are good problem solvers

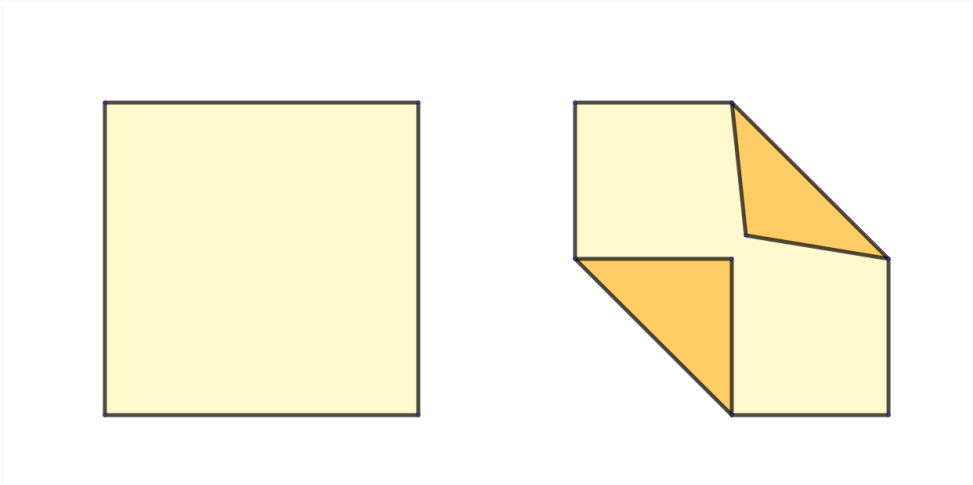


What is the perimeter of a \$1 coin?

- Guess and then measure to verify
 - Problem solving skill
 - Idea on the linkage of diameter and circumference
 - What is the important of π (pi)?

Using Paper to set questions

- Fractional and/or percentage area of a folded paper



Using Grid to make questions

