

8 Missing Links in Mandarin Mathematics

**DeConstruction in
Mathematics Education**

**Primary school: Slides 2-20
Secondary School: Slides 21-41**

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DeConstruction in Mathematics Education

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Mathematics IS hard

- or is it?

mathematics



MANY

how many ?

the Total is !

T = ||||

**T = IIII = 4
= four ones
= one fours**

I	II	III	IIII	IIII	IIII	IIII	IIII	IIII
I	L	4	4	5	6	9	8	9
1	2	3	4	5	6	7	8	9

Counting in 5s:

1, 2, 3, 4, B, 1B1, 1B2

1, 2, 3, 4, 10, 11, 12

T = | | | | | |
= |||| | |
= |) | |)
= 1)2)
= 1.2 4s

T = 7 1s

= 1.2 5s

= 1.3 4s

= 2.1 3s

= 3.1 2s

= 0.7 tens = 7

ReCount formula

$$\begin{aligned} T &= 8 = (8/4)^*4 \\ &= 2^*4 \\ &= 2 \ 4s \end{aligned}$$

$$T = (T/b)^*b$$

$$\begin{aligned} T &= 4\text{-ty } 2 \\ &= 4 \text{ ten } 2 \\ &= 4.2 \text{ tens} \\ &= 42 \end{aligned}$$

$$T = 4 \quad 5s = ? \quad 6s$$

$$\begin{aligned} T &= \text{|||||} \quad \text{|||||} \quad \text{|||||} \quad \text{|||||} \\ &= \text{||||||||||||||||} \\ &= \text{|||||} \quad \text{|||||} \quad \text{|||||} \quad \text{||} \end{aligned}$$

$$T = 4 \quad 5s = 3.2 \quad 6s$$

$$T = 4 \quad 5s = ? \quad 6s$$

$$\begin{aligned} T &= (4*5)/6 \quad 6s \\ &= 3 \quad 6s + \text{rest} \end{aligned}$$

$$\text{rest} = 4*5 - 3*6 = 2$$

$$T = 4 \quad 5s = 3.2 \quad 6s$$

Two Language-Houses

WORD-lang.
describes

NUMBER-lang.
predicts

Grammar

Jo is a subject

y is a function

Language

Jo eats apples

$y = b + a * x$

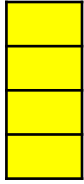
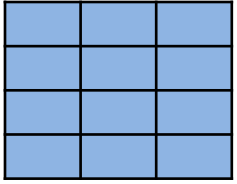
World

Operations predict

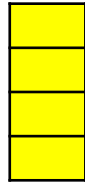
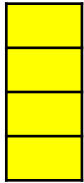
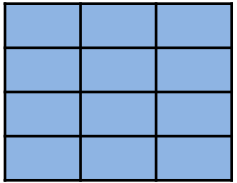
$3+5$ predicts $3+1+1+1+1+1$

$3*5$ predicts $3+3+3+3+3$

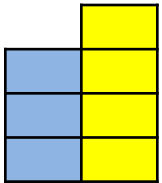
3^5 predicts $3*3*3*3*3$



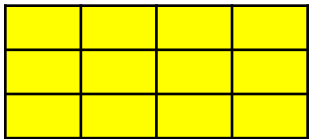
$$-4$$



$$/4$$



$$3 + 4$$



$$3 \times 4$$

Rebundle: $T = (T/b)^*b$

Restack: $T = (T-b)+b$

1. the Total
2. from sticks to icons
3. cup-writing
4. re-counting
5. predicting calculations
6. soft and hard operations
7. reversed calculations
8. per-numbers

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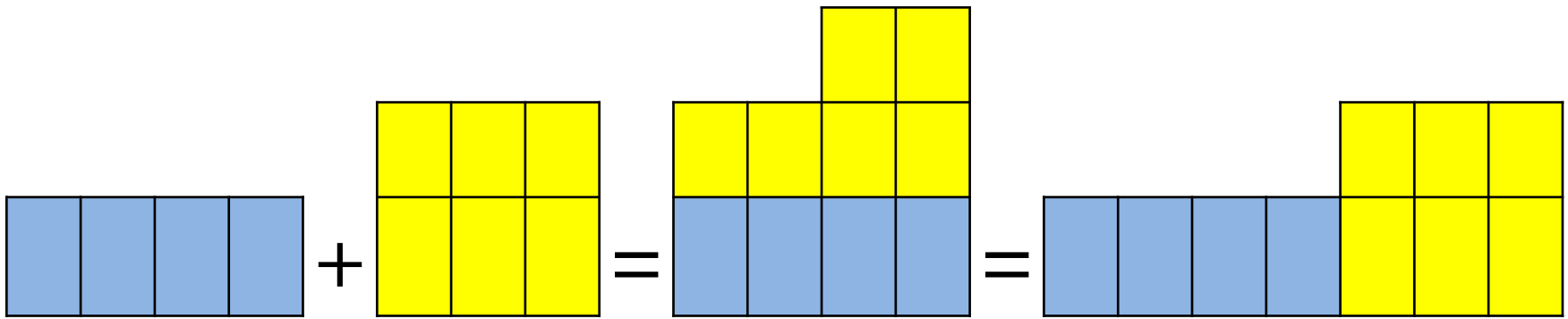


MANY

1. the Total
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$$T = 456$$

$$= 4 * 10^2 + 5 * 10 + 6 * 1$$



$$T = 1.4s + 2.3s = 2.24s = 1.37s$$

$$T = 4\ 5\ 6$$

$$= 4 * 10^2 + 5 * 10 + 6 * 1$$

$$4^*5 = 20 ?$$

$$4^*5 = 4 \ 5s$$

$$= 3.2 \ 6s$$

$$= 2.6 \ 7s$$

$$= 2.0 \ \text{tens etc.}$$

Multiplication

Soft:

$$2 * 3 \text{ 7s} = 6 \text{ 7s}$$

Hard:

$$2 * 3 \text{ 7s} = 4.2 \text{ tens}$$

Reversed Calculation

Forwards: $2 + 3 = ?$

Back: $2 + ? = 5$

$2 + x = 5$

$$2 + x = 5$$

$$x = 5 - 2$$

$$2 * x = 6$$

$$x = 6/2$$

$$x^3 = 8$$

$$x = \sqrt[3]{8}$$

$$2^x = 8$$

$$x = \log_2(8)$$

Per-numbers

$$\begin{aligned} & 8 \text{ \$ per } 5 \text{ kg} \\ & = 8/5 \text{ \$/kg} \end{aligned}$$

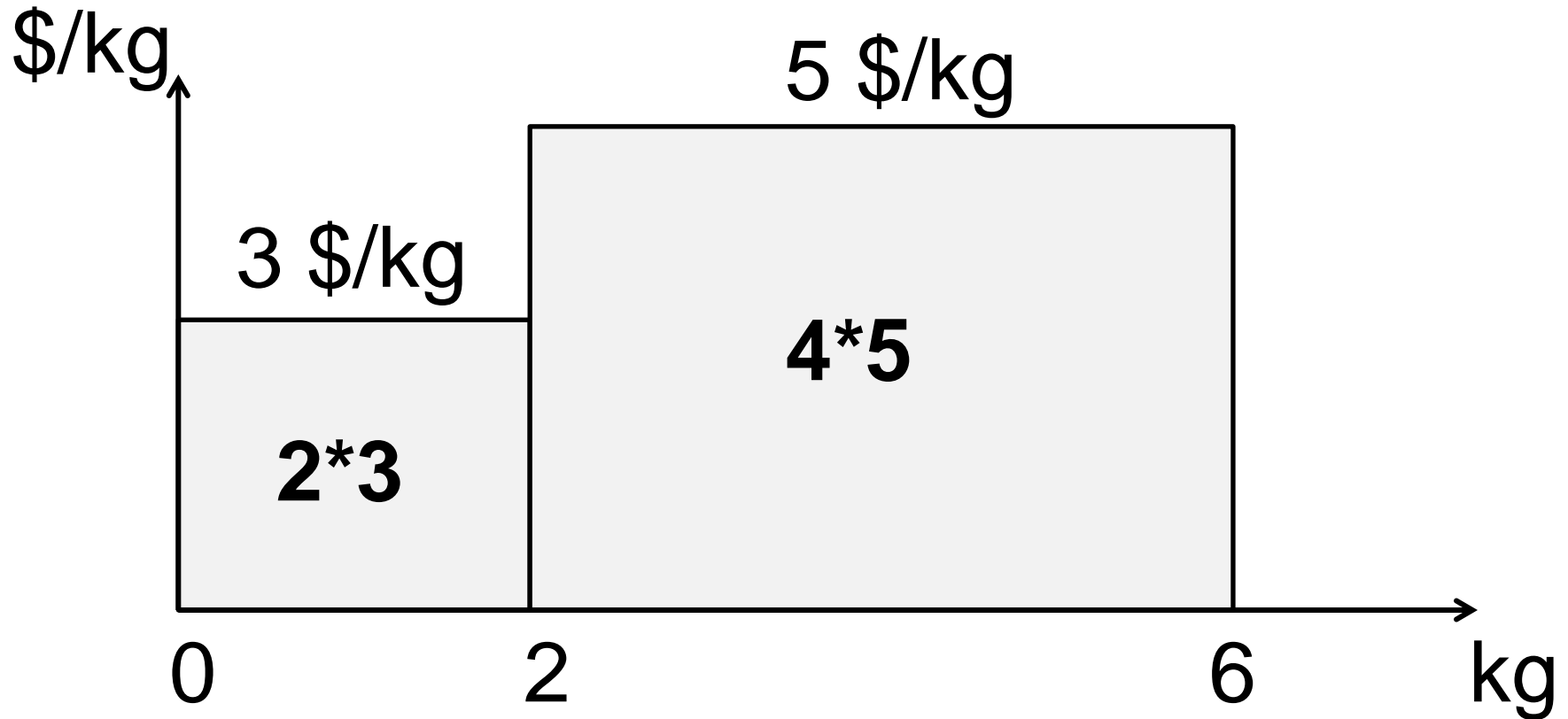
Per-number 8\$/5kg

$$\begin{aligned} T &= 20 \text{ kg} \\ &= (20/5) * 5\text{kg} \\ &= (20/5) * 8\$ \\ &= 32\$ \end{aligned}$$

Add per-numbers

$$\begin{array}{r} T = 2 \text{ kg at } 3 \text{ \$/kg} \\ + 4 \text{ kg at } 5 \text{ \$/kg} \\ \hline = 6 \text{ kg at } ? \text{ \$/kg} \end{array}$$

PerNumbers Add by Area



$$\begin{aligned} T &= 2 \text{ kg at } 3 \text{ } \$/\text{kg} + 4 \text{ kg at } 5 \text{ } \$/\text{kg} \\ &= 6 \text{ kg at } (2*3 + 4*5) \text{ } \$ / 6 \text{ kg} \end{aligned}$$

MANY: Count & Add

Count: decimal-numbers with units

Add on-top: Recount to shift unit

Add next-to: Integration

Add per-numbers by areas

Reversed Calculation = Equation

Move to opposite side with opposite sign

漢字

China

언어

Korea

Bourdieu

Mathematics is symbolic violence,
keeping public offices to a mandarin class

Foucault

A discourse that becomes a discipline,
disciplines itself and its subject

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