

# M2

# Counting in Icons

**Mathematics as MANYmatics**

**A Natural Science about Many**

Material for

MicroCurriculum 2

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## **Curricula**

Micro-curriculum 1. Creating Icon-numbers

Micro-curriculum 2. Counting in Icons

Micro-curriculum 3. Re-counting Icon-numbers in the Same Icon

Micro-curriculum 4. Re-counting Icon-numbers in a Different Icon

Micro-curriculum 5. Adding Icon-numbers OnTop

Micro-curriculum 6. Adding Icon-numbers NextTo

Micro-curriculum 7. Reversing Adding Icon-numbers OnTop

Micro-curriculum 8. Reversing Adding Icon-numbers NextTo

# Preface

M2, Counting in Icons, is the second of 8 micro-curricula in mathematics for preschool and home schooling. They present mathematics as MANYmatics, a natural science about the physical fact Many. They all build upon the following observation:

”How old will you be next time?” I asked the child. “Four”, he answered and showed me four fingers. “Four, you said?” I asked and showed him four fingers held together two by two. “No, that is not four, that is two twos!” the child replied thus insisting upon the difference between four ones and two twos. Likewise, preschool children have no difficulties counting in other units than ten, even if they only learn how to count in tens.

The micro-curricula use activities with concrete material to obtain its learning goals in accordance with Piaget’s principle ‘greifen vor begrifen’ (grasp to grasp).

In the first, children learn to use sticks to build the number icons up to nine, and to use strokes to draw them, thus realizing there are as many sticks and strokes in the icon as the number it represents, if written less sloppy. In the second, children learn to count a given total in icons manually, using an abacus and by using a calculator. In the third, children learn to recount a total in the same unit. In the fourth, children learn to recount a total in a different unit. In the fifth, children learn to add two icon-numbers on top of each other. In the sixth, children learn to add two icon-numbers next to each other. In the seventh, children learn to reverse on-top addition. And in the eights, children learn to reverse next-to addition

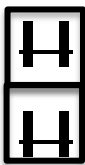
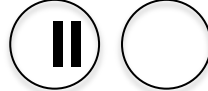
As to concrete material, anything goes in the first micro-curriculum. The others will use sticks and strokes, beads on an abacus (e.g. from IKEA), LEGO-like blocks and squares, and a calculator respecting the priority of the operations. Fingers, pegs on a pegboard and other concrete material might also be used.

Some of the curricula can use silent education where the instructor is allowed to demonstrate and guide through actions, but not through words; or by using words form a foreign language not understood by the child.

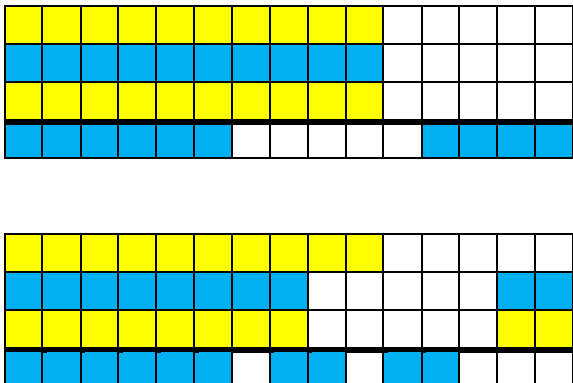
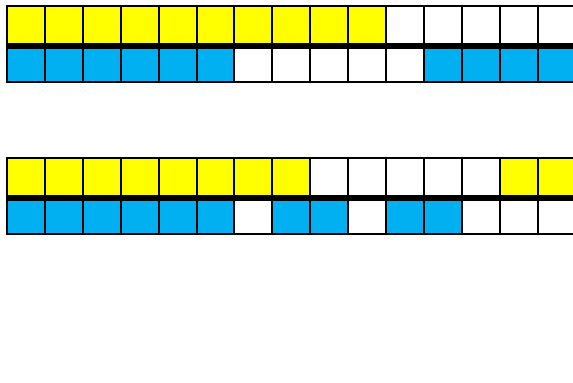
G stands for Geometry and A stands for Algebra.

# 4 Counted in 2s

## Sticks

G-counting		A-counting	
IIII	<i>lay out</i>	IIII	<i>lay out</i>
HH	<i>bundle</i>	HH	<i>bundle</i>
	<i>stack</i>		<i>cups</i>
T = 2 2s	Total	2) )	<i>cup-writing</i>
		T = 2 2s	Total

## Abacus

G-mode	A-mode
	

## Calculator

4 / 2	2
4 - 2 x 2	0

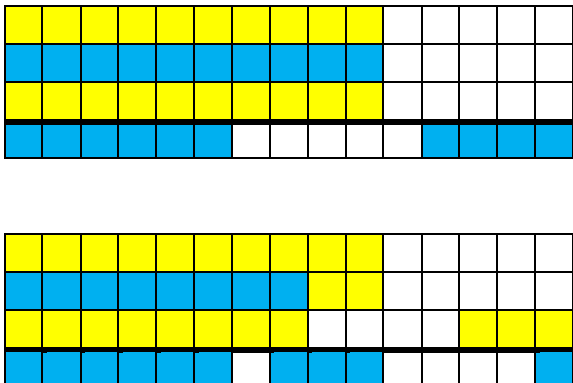
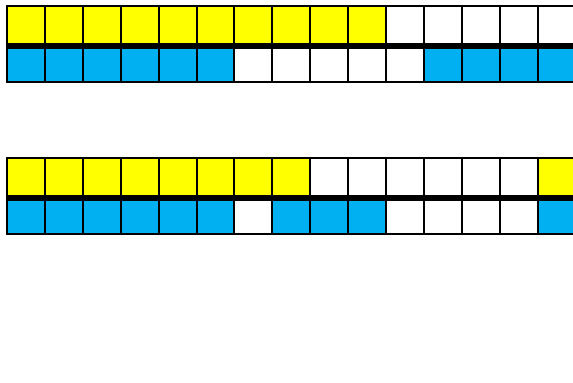
$$T = 4 = 2 \text{ 2s}$$

# 4 Counted in 3s

## Sticks

G-counting		A-counting	
IIII	<i>lay out</i>	IIII	<i>lay out</i>
HHI	<i>bundle</i>	HHI	<i>bundle</i>
<span style="border: 1px solid black; padding: 2px;">HHI</span> I	<i>stack</i>	⊙ I ⊙ I	<i>cups</i>
		1) 1)	<i>cup-writing</i>
<b>T = 1.1 3s</b>	<b>Total</b>	<b>T = 1.1 3s</b>	<b>Total</b>

## Abacus

G-mode	A-mode
	

## Calculator

4 / 3	1.some
4 - 1 x 3	1

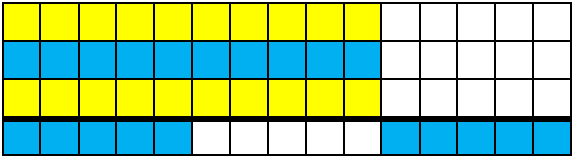
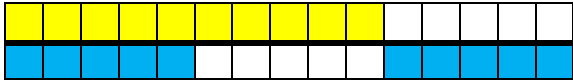
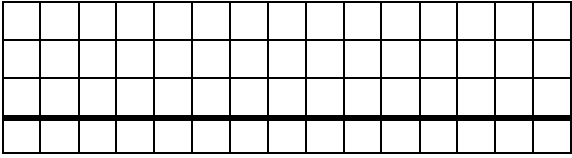

$$\mathbf{T = 4 = 1.1\ 3s}$$

# 5 Counted in 2s

## Sticks

G-counting		A-counting	
I	<i>lay out</i>	I	<i>lay out</i>
H	<i>bundle</i>	H	<i>bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
T =	Total	T =	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

5 / 2
5 -

$$T = 5 = 2s$$

# 5 Counted in 3s

## Sticks

G-counting		A-counting	
	<i>lay out</i>		<i>lay out</i>
	<i>bundle</i>		<i>bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode

## Calculator

5 / 3
5 -

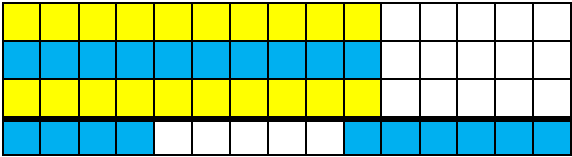
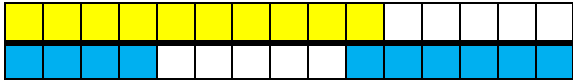
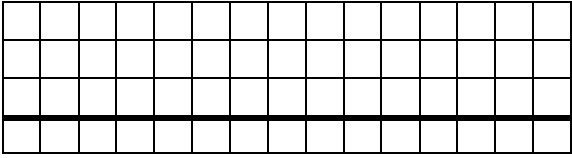

$$T = 5 = 3s$$

# 6 Counted in 2s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

**T = 6 =**

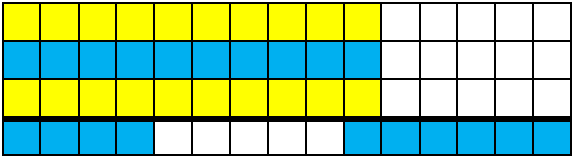
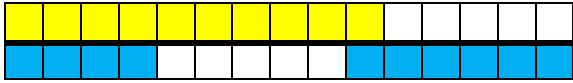
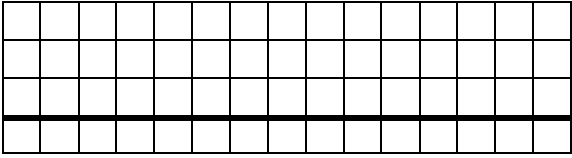



# 6 Counted in 3s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

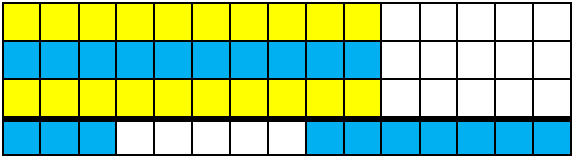

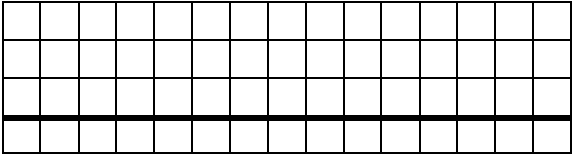

**T = 6 =**

# 7 Counted in 2s

## Sticks

G-counting		A-counting	
	<i>lay out</i>		<i>lay out</i>
	<i>bundle</i>		<i>bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

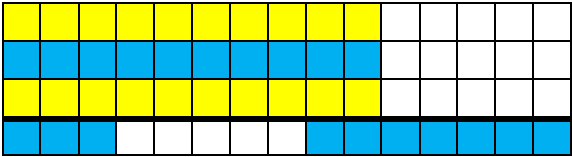

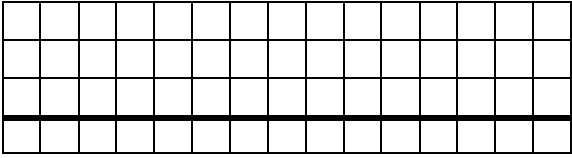
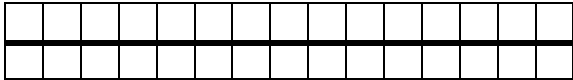
**T = 7 =**

# 7 Counted in 3s

## Sticks

G-counting		A-counting	
	<i>lay out</i>		<i>lay out</i>
	<i>bundle</i>		<i>bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

**T =**

# 7 Counted in 4s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode

## Calculator

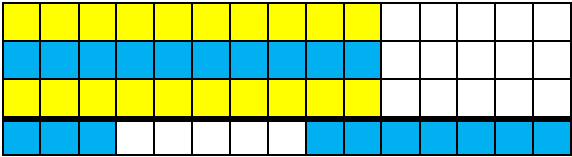

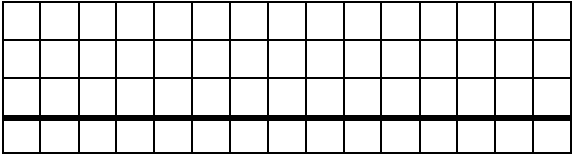

**T = 7 =**

# 7 Counted in 5s

## Sticks

G-counting		A-counting	
	<i>lay out</i>		<i>lay out</i>
	<i>bundle</i>		<i>bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

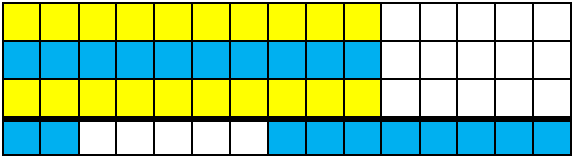

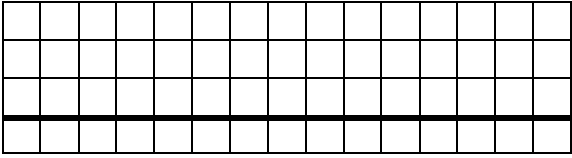

**T =**

# 8 Counted in 2s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

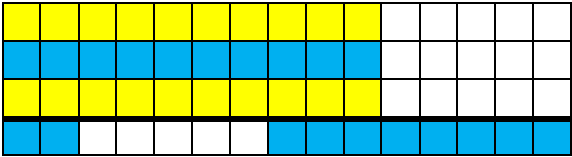

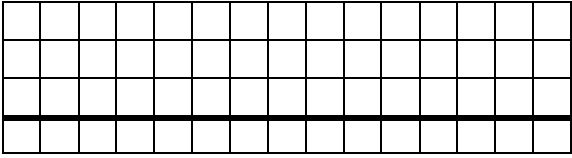
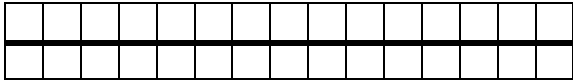
**T =**

# 8 Counted in 3s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

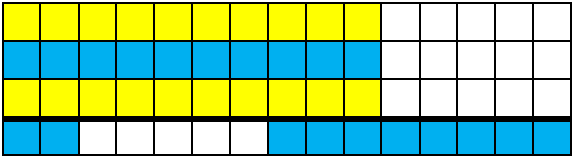

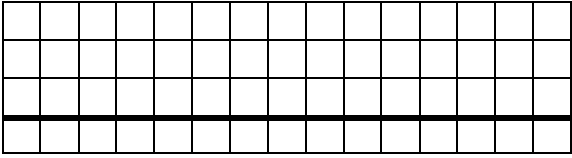
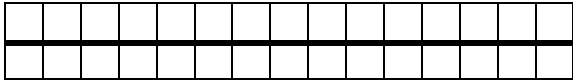
**T =**

# 8 Counted in 4s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

**T =**

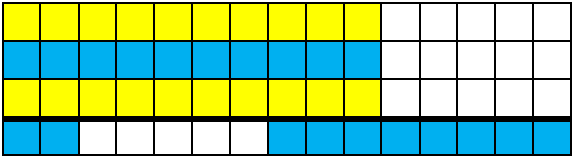

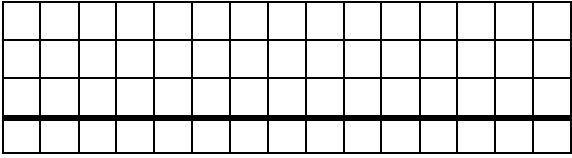



# 8 Counted in 5s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

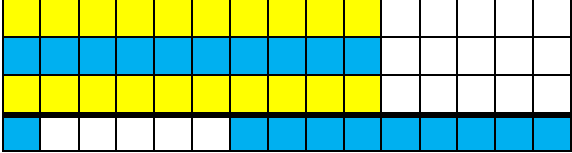

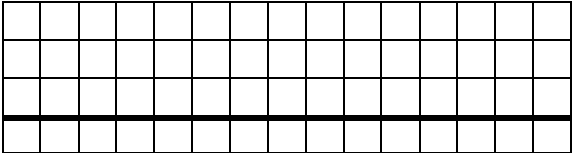
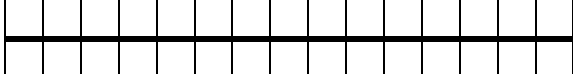
**T =**

# 9 Counted in 2s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

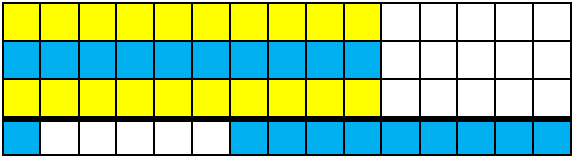

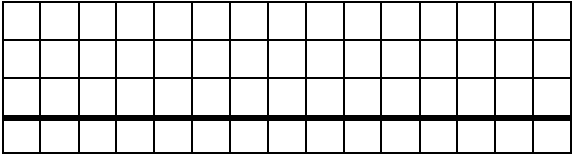

**T =**

# 9 Counted in 3s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

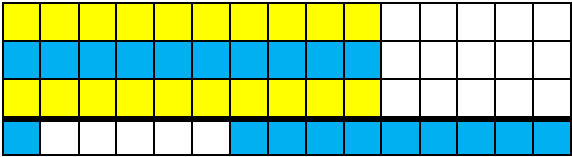

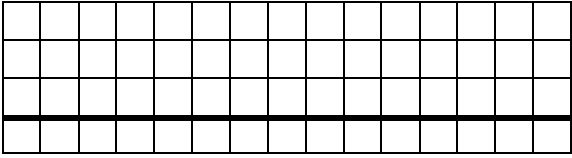

**T =**

# 9 Counted in 4s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

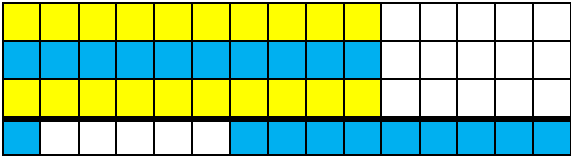

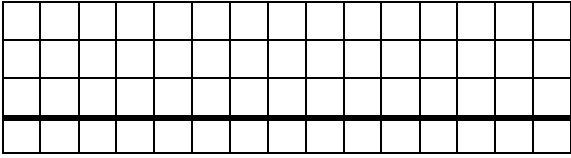

**T =**

# 9 Counted in 5s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

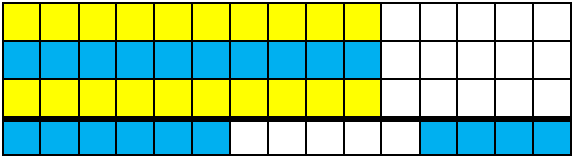
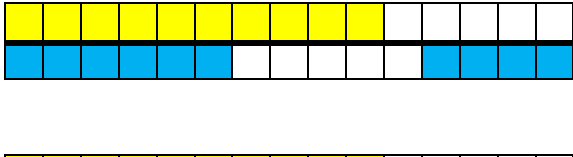
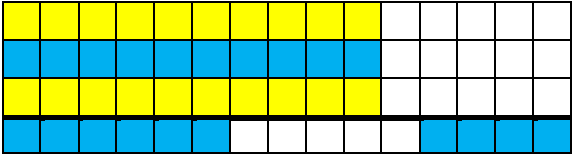
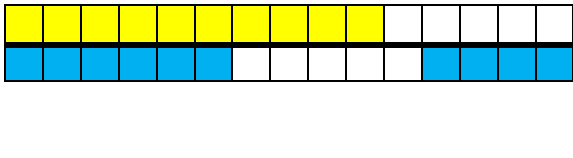
**T =**

# 4 Counted in 5s

## Sticks

G-counting		A-counting	
IIII	<i>lay out</i>	IIII	<i>lay out</i>
IIII	<i>bundle</i>	IIII	<i>bundle</i>
IIII	<i>stack</i>	○ ⊖ IIII	<i>cups</i>
IIII	<i>stack</i>	0) 4)	<i>cup-writing</i>
<b>T = 0.4 5s</b>	Total	<b>T = 0.4 5s</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

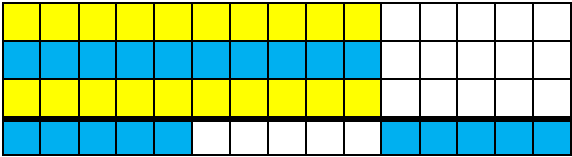
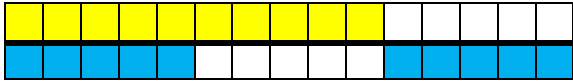
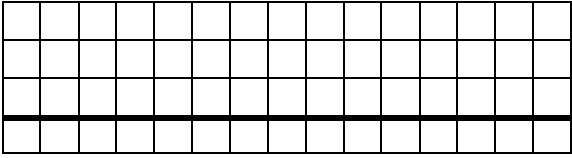

**T =**

# 5 Counted in 7s

## Sticks

G-counting		A-counting	
	<i>lay out bundle</i>		<i>lay out bundle</i>
		○ ○	<i>cups</i>
	<i>stack</i>	) )	<i>cup-writing</i>
<b>T =</b>	Total	<b>T =</b>	Total

## Abacus

G-mode	A-mode
	
	

## Calculator

**T =**

# 3 4s Enumerated

as 5s

1	2	3	4	B	B1	B2	B3	B4	2B	2B1	2B2
1	2	3	4	10	11	12	13	14	20	21	22

as 6s

1	2	3	4	5	10	11	12	13	14	15	20

as 7s

1	2	3	4	5	6	10	11	12	13	14	15

as 8s

1	2	3	4	5	6	7	10	11	12	13	14

as 9s

1	2	3	4	5	6	7	8	10	11	12	13

as tens

1	2	3	4	5	6	7	8	9	10	11	12



# 4 3s Enumerated

as 5s

1	2	3	4	B							
1	2	3									

as 6s

1	2	3									

as 7s

1	2	3									

as 8s

1	2	3									

as 9s

1	2	3									

as tens

1	2	3									

# 5 3s Enumerated

as 5s

I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	2	3												

as 6s

I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	2	3												

as 7s

I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	2	3												

as 8s

I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	2	3												

as 9s

I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	2	3												

as tens

I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
1	2	3												

# 3 5s Enumerated

as 4s

1														

as 3s

1														

as 2s

1														

as 5s

1	2	3												

as 7s

1	2	3												

as tens

1	2	3												

# 3 6s Enumerated

as 2s

1																	

as 3s

1																	

as 4s

1																	

as 5s

1																	

as 7s

1																	

as tens

1																	

# 2 9s Enumerated

as 2s

1																	

as 3s

1																	

as 4s

1																	

as 5s

1																	

as 7s

1																	

as tens

1																	

# 3 4s Enumerated

$B_2$  : *B short of 2*

as 5s

1	2	$B_2$	$B_1$	B	B1	B2	2B $_2$	2B $_1$	2B	2B1	2B2
1	2	3	4	10	11	12	13	14	20	21	22

as 6s

1	2	3	$B_2$	$B_1$	10	11	12	13	14	15	20

as 7s

1	2	3	4	$B_2$	$B_1$	10	11	12	13	14	15

as 8s

1	2	3	4	5	$B_2$	$B_1$	10	11	12	13	14

as 9s

1	2	3	4	5	6	$B_2$	$B_1$	10	11	12	13

as tens

1	2	3	4	5	6	7	$B_2$	$B_1$	10	11	12

# 4 3s Enumerated

as 5s

1	2	<u>B2</u>	<u>B1</u>	B							
1	2	3									

as 6s

1	2	3									

as 7s

1	2	3									

as 8s

1	2	3									

as 9s

1	2	3									

as tens

1	2	3									