Deepdale Community Primary School

Progression in Calculations Year 3 and 4 Parent Workshop

Subject Leader : S . Brightcliffe

School Policy

- Although methods chosen are split into year groups, we understand that the development of calculations is developmental
- By the end of Year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.
- Children will not go onto the next stage if:

- They are not ready.

- They are not confident.

- Children will be encouraged to consider if a mental calculation would be appropriate before using written methods.

Aims:

- To look at ways in which the teaching of mathematics has changed
- To ensure a consistent approach to calculations at home and at school

Overview

Up to Year 3 the emphasis is on:

- working mentally,
- calculations recorded in horizontal number sentences
- some jottings for more challenging numbers

In Years 3-6 children will be gradually taught more formal written methods of calculation but they will still use mental methods and jottings where appropriate.

So - how can we give children the best foundations for success with written calculations?

- We need to encourage children to use mental calculation strategies for smaller/ simpler numbers.

- We need to encourage children to ask the question "Can I do it in my head?" or "Can I do it in my head with jottings/ a number line?"

ADDITION

Addition:

Children need to understand the concept of addition, that it is:

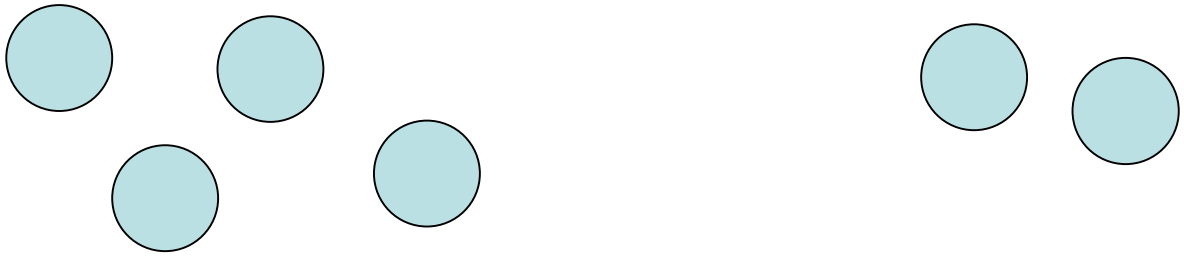
-Combining two or more groups to give a total or sum

-Increasing an amount

-Inverse of subtraction i.e. 5+3=8 8-3=5

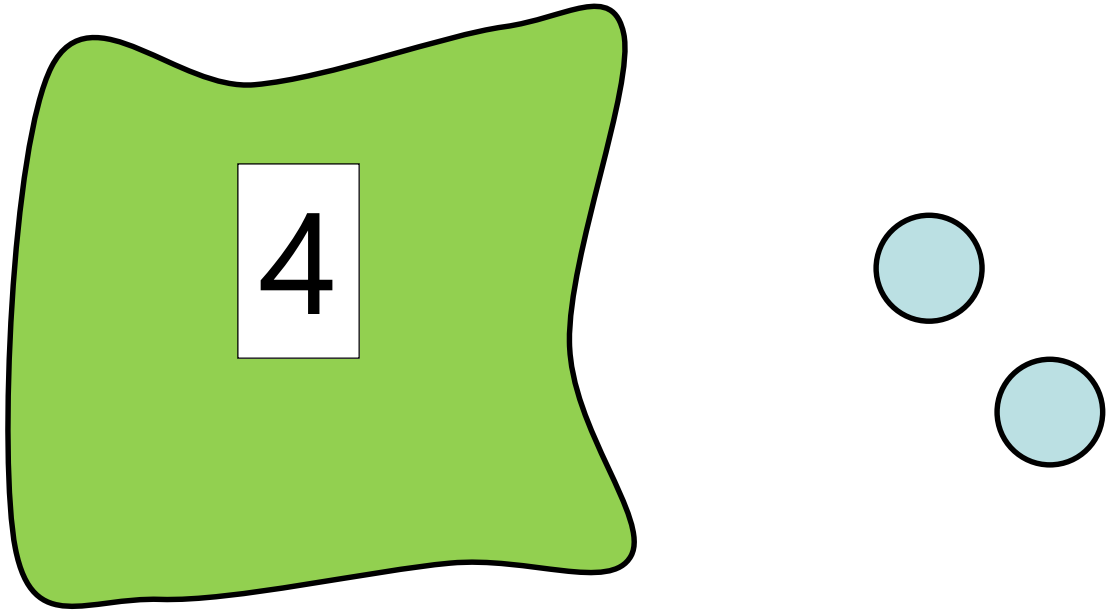
Counting All

Using practical equipment to count out the correct amount for each number in the calculation and then combine them to find the total, e.g. 4 + 2



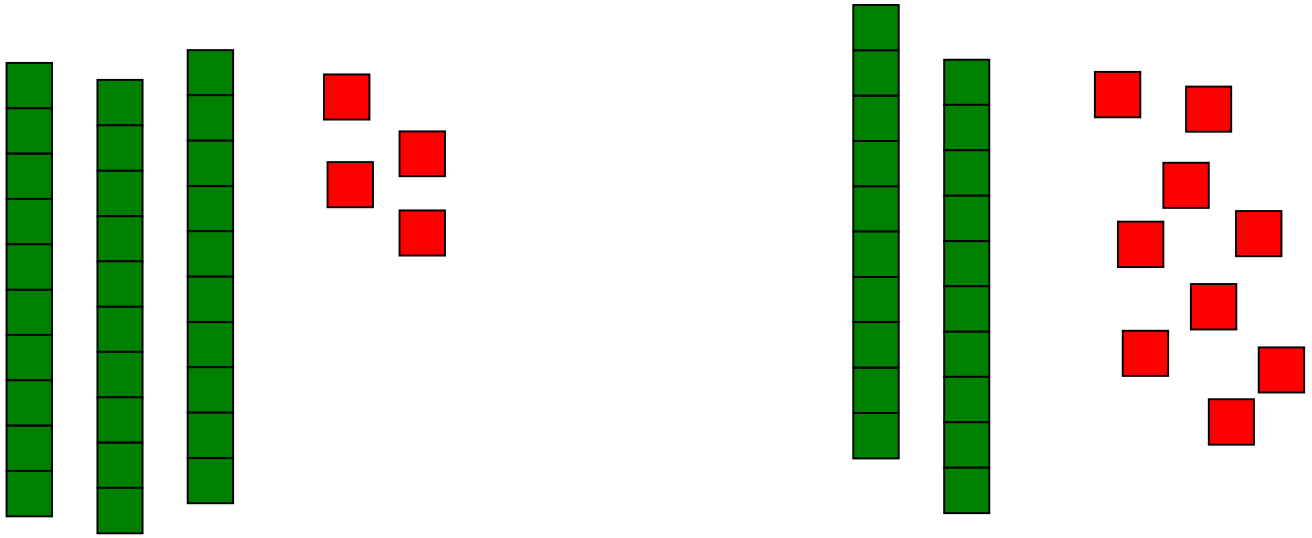
From Counting All to Counting On

To support children in moving from counting all to counting on, have two groups of objects but cover one so that it can not be counted, e.g. 4 + 2



Adding Two Digit Numbers

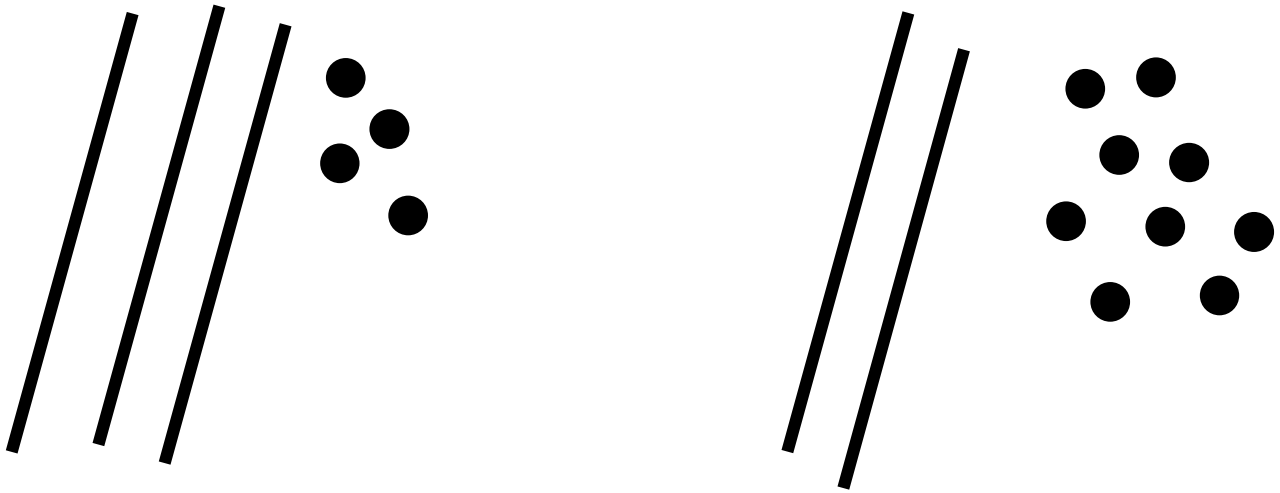
Children can use base 10 equipment to support their addition strategies by basing them on counting, e.g. 34 + 29



Children need to be able to count on in 1s and 10s from any number and be confident when crossing tens boundaries.

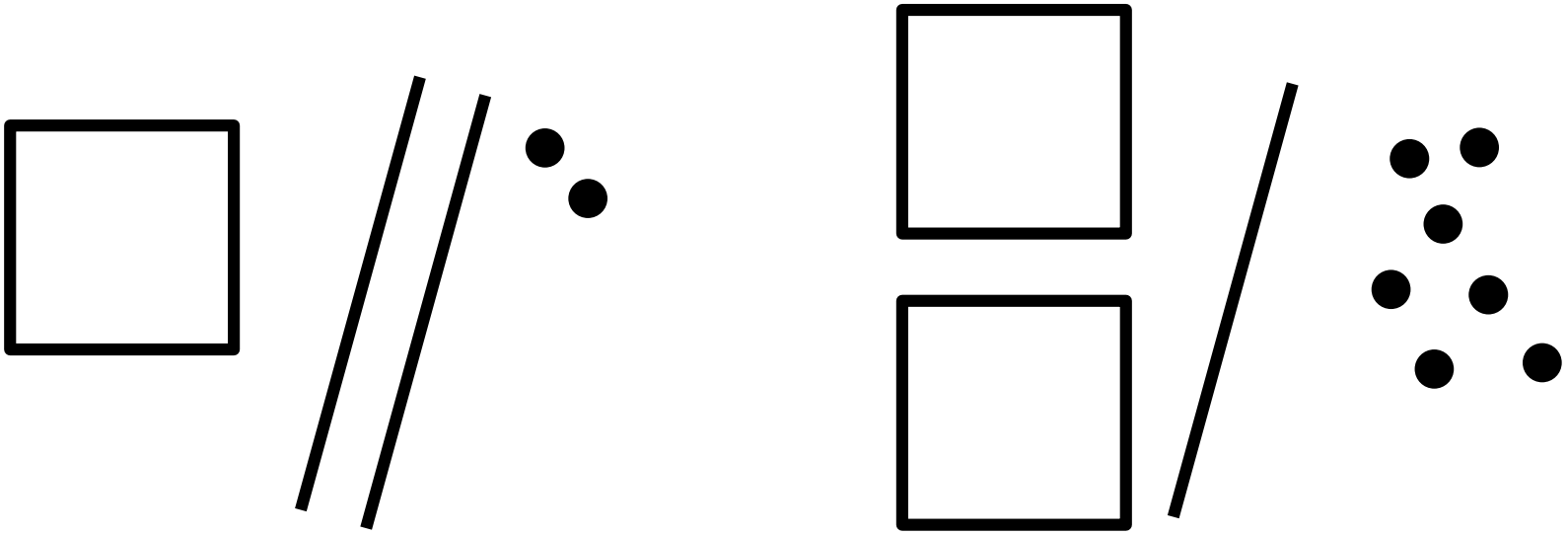
Adding Two Digit Numbers

Children can support their own calculations by using jottings, e.g. 34 + 29

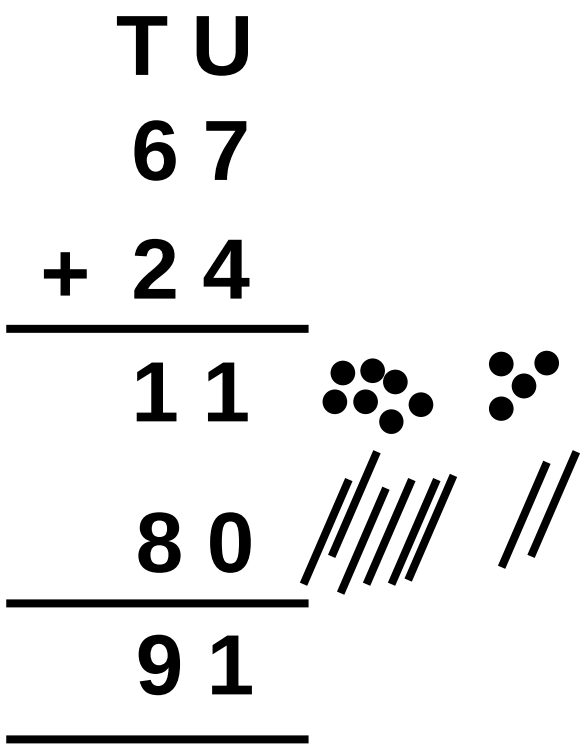


Adding Three Digit Numbers

Children can support their own calculations by using jottings, e.g. 122 + 217

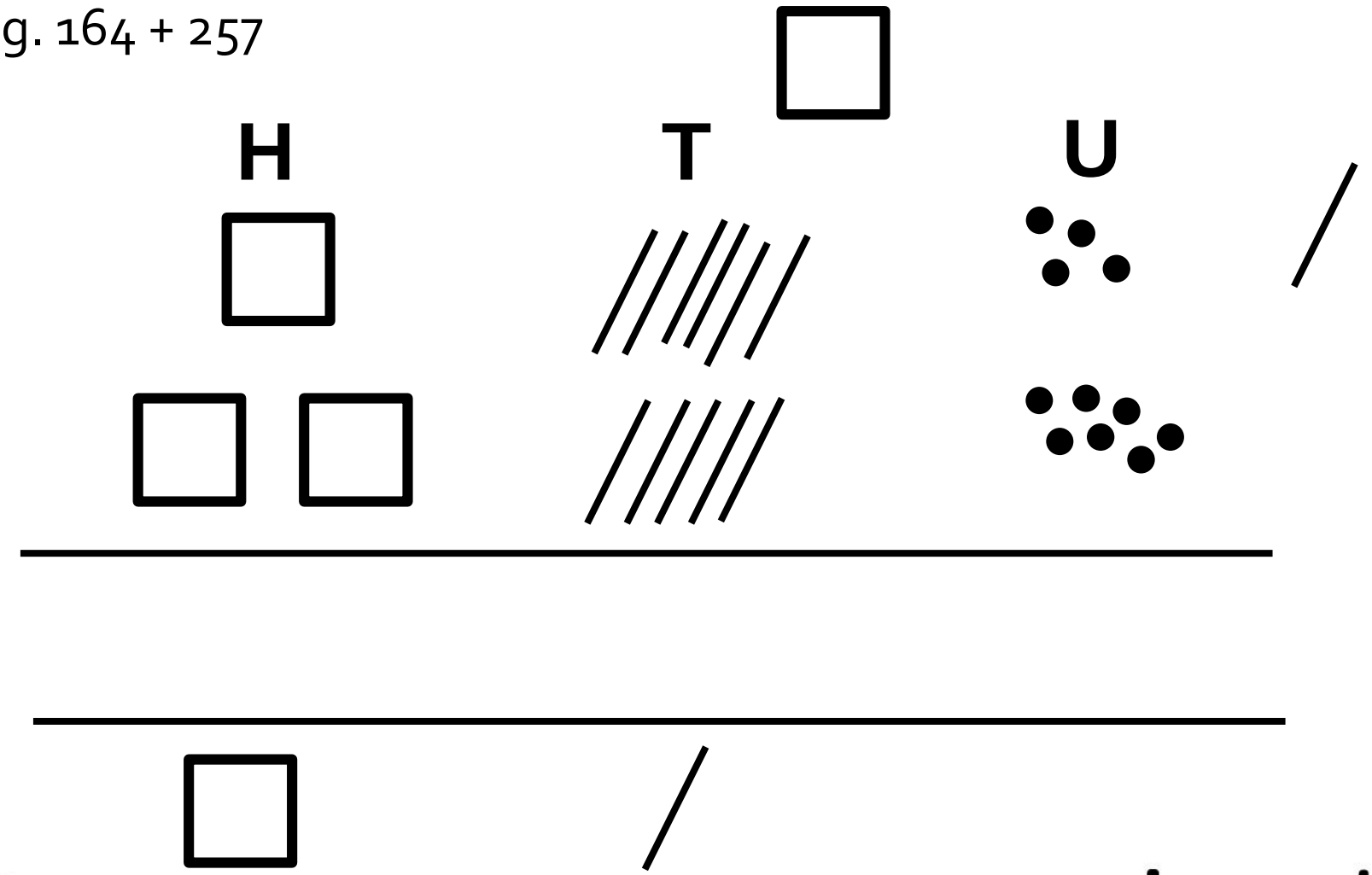


Beginning Column Addition



Continuing Column Addition

e.g. 164 + 257



Efficient Column Addition

H	T	U
	1	6	4
+	2	5	7
	4	2	1
	1	1	

Common errors: Addition

SUBTRACTION

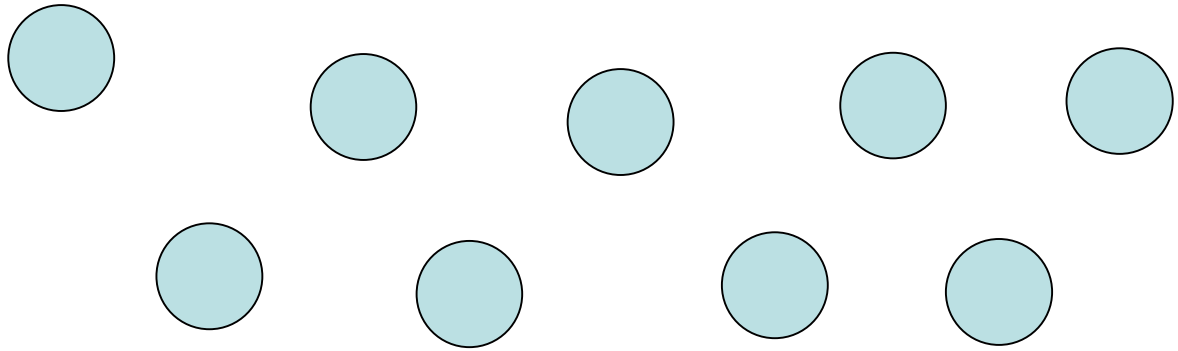
Subtraction:

Children need to understand the concept of subtraction, that it is:

- **Removal of an amount from a larger group (take away)**
- **Comparison of two amounts (difference)**
- **The inverse of addition i.e. 7-2=5**
  2+5=7

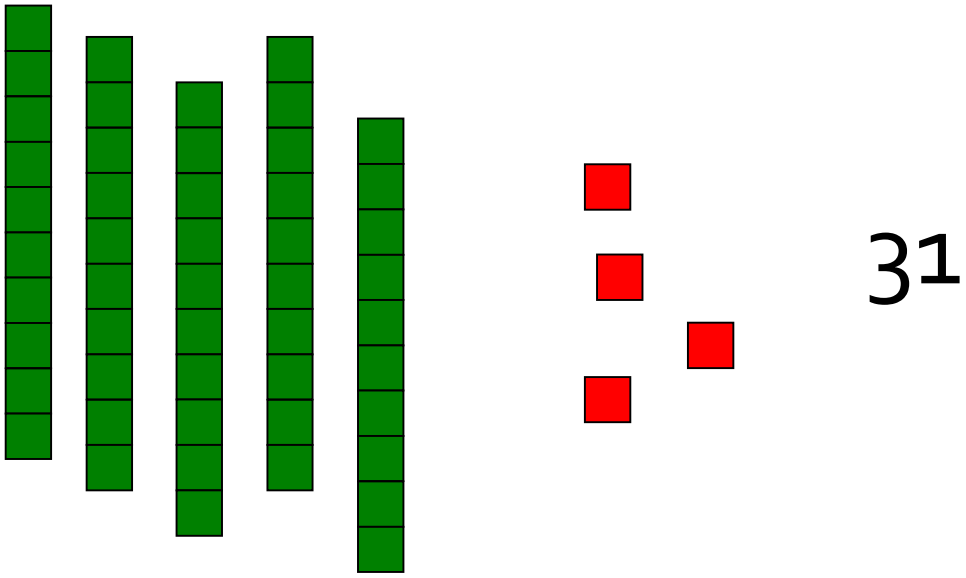
Taking Away

Using practical equipment to count out the first number and removing or taking away the second number to find the solution, e.g. 9 - 4



Taking Away Two Digit Numbers

Children can use base 10 equipment to support their subtraction strategies by basing them on counting, e.g. 54 - 23



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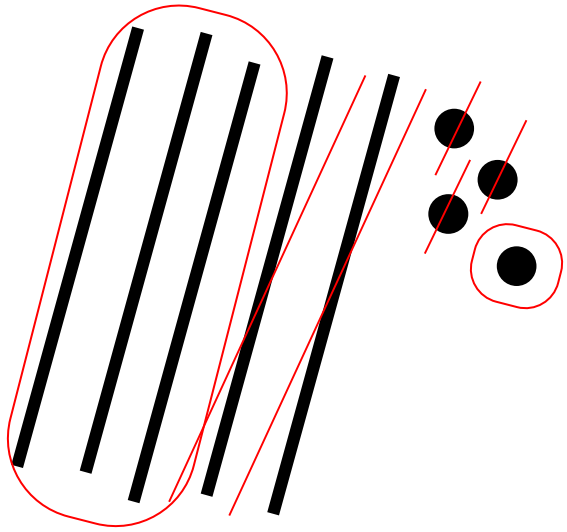
Taking Away Two Digit Numbers

Children can support their own calculations by using jottings, e.g. 54 - 23



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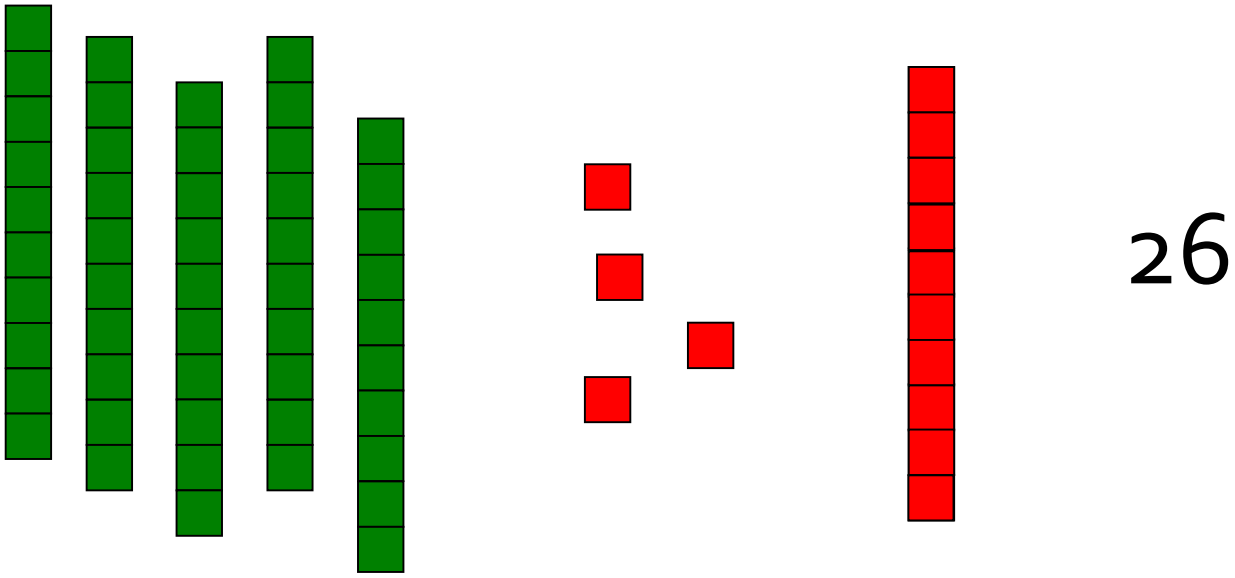
Taking Away Two Digit Numbers (Exchange)

Children can use base 10 equipment to support their subtraction strategies by basing them on counting, e.g. 54 - 28



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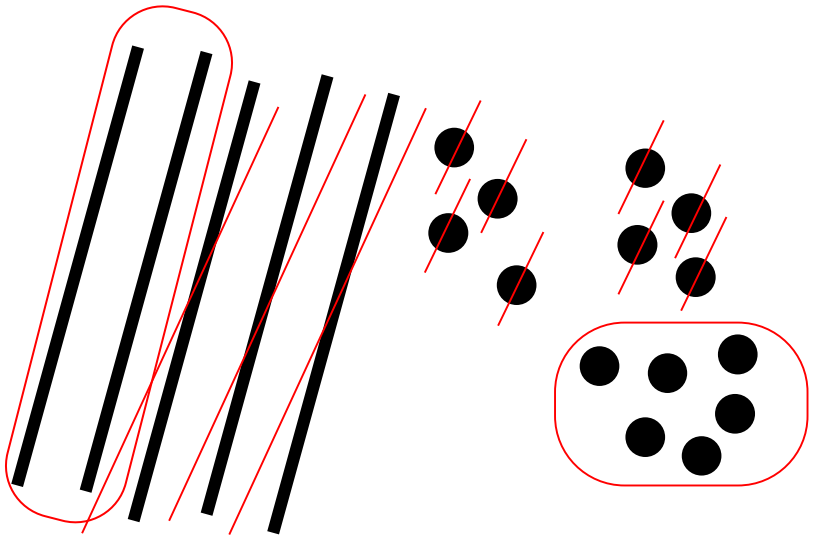
Taking Away Two Digit Numbers (Exchange)

Children can support their own calculations by using jottings, e.g. 54 - 28



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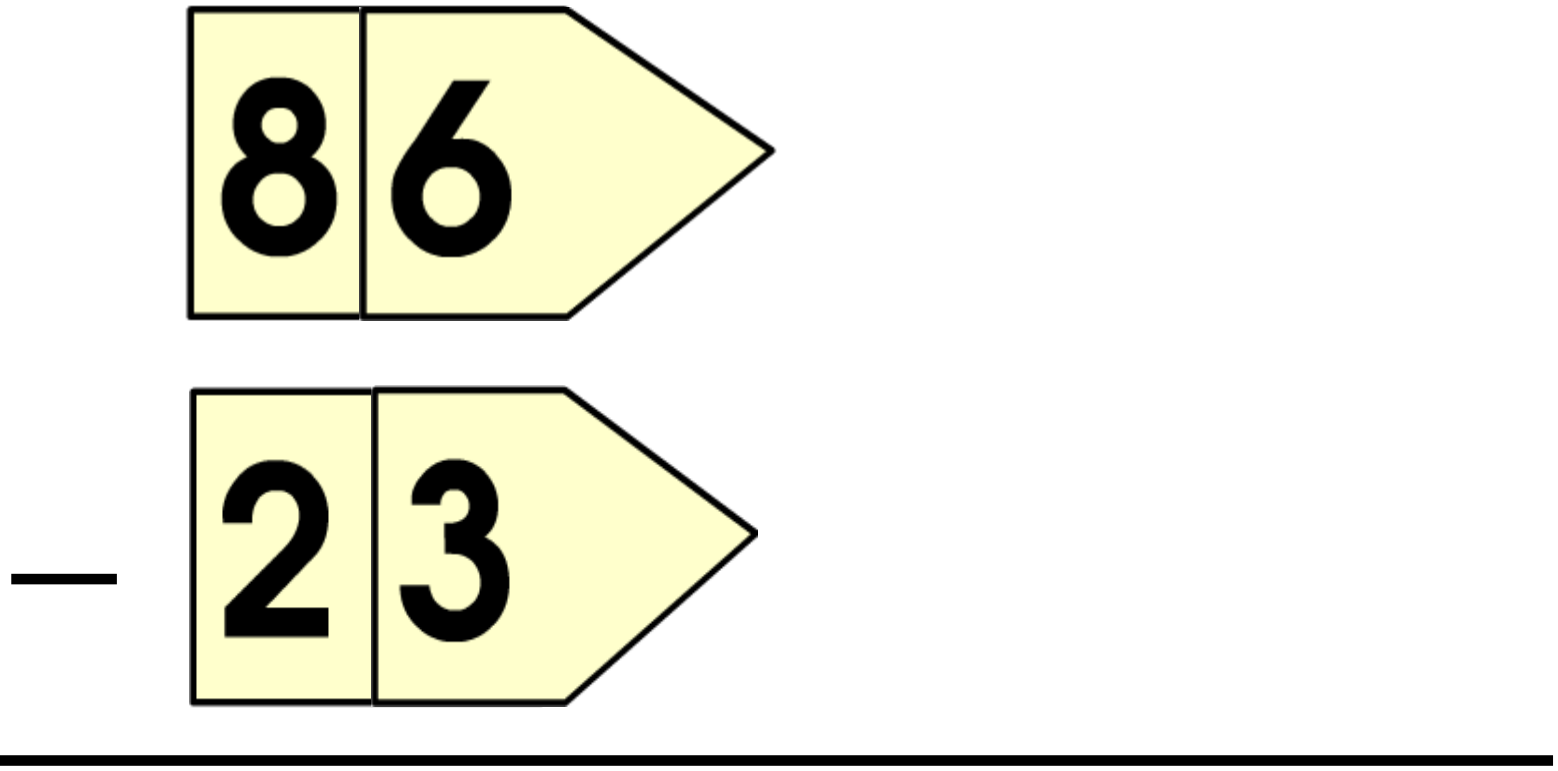
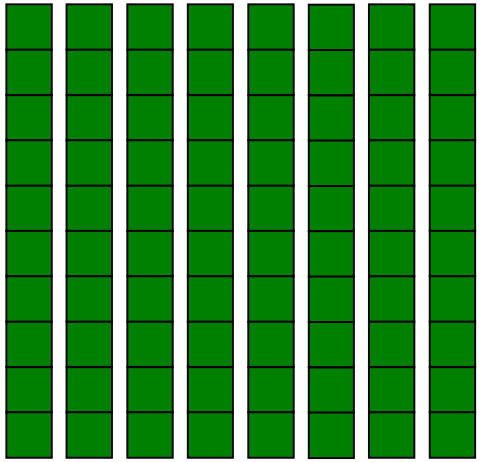
Beginning Column Subtraction





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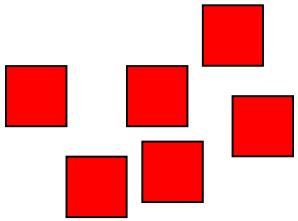

6

−

20

3

60

3

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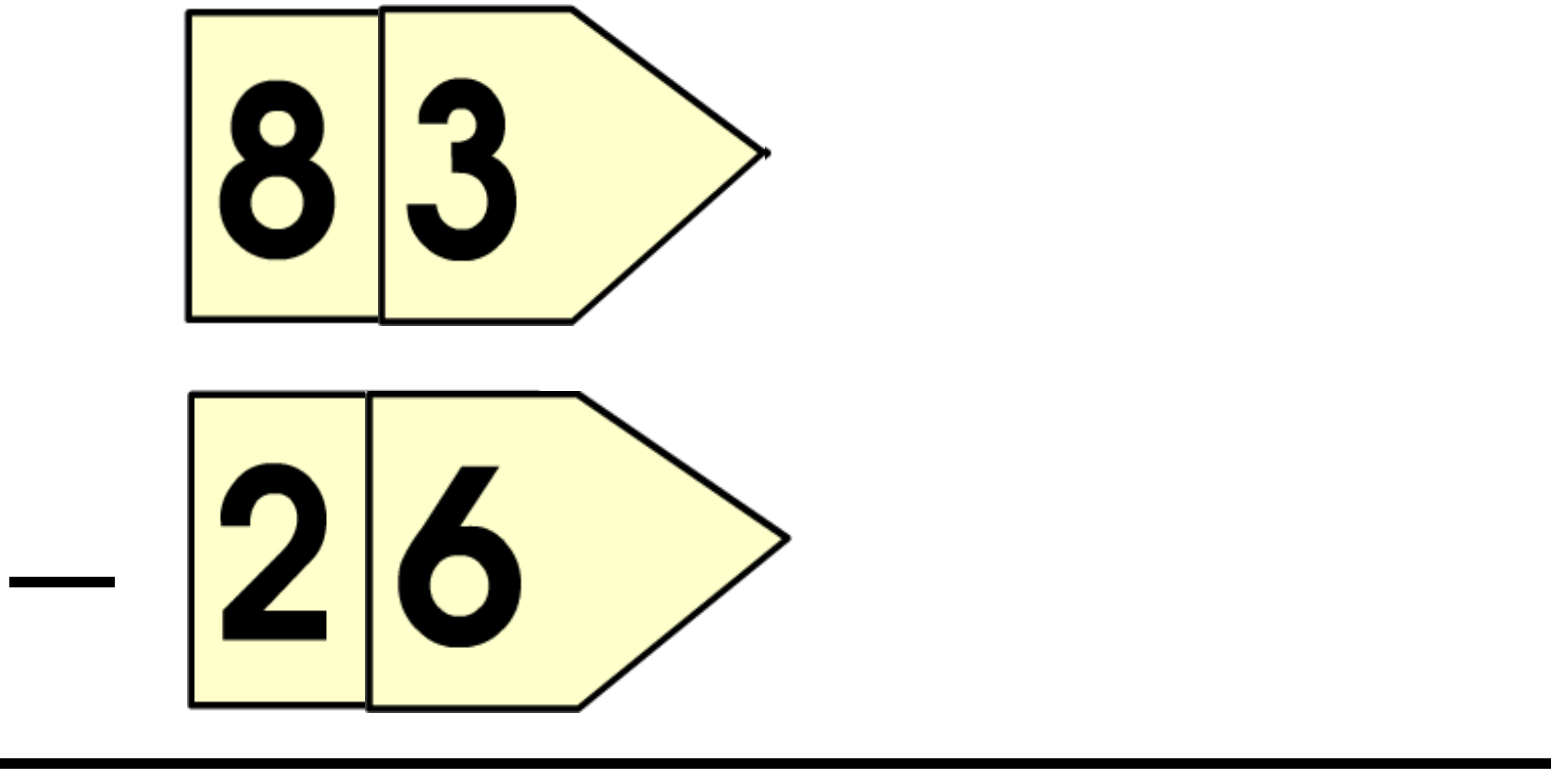
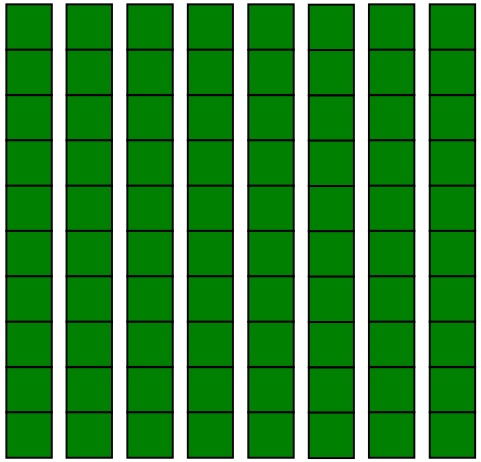
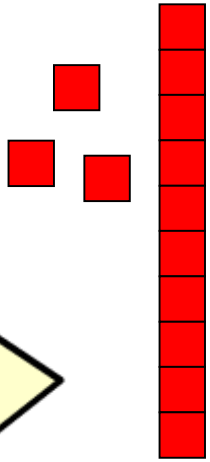
Beginning Column Subtraction (Exchange)







70

13

−

20

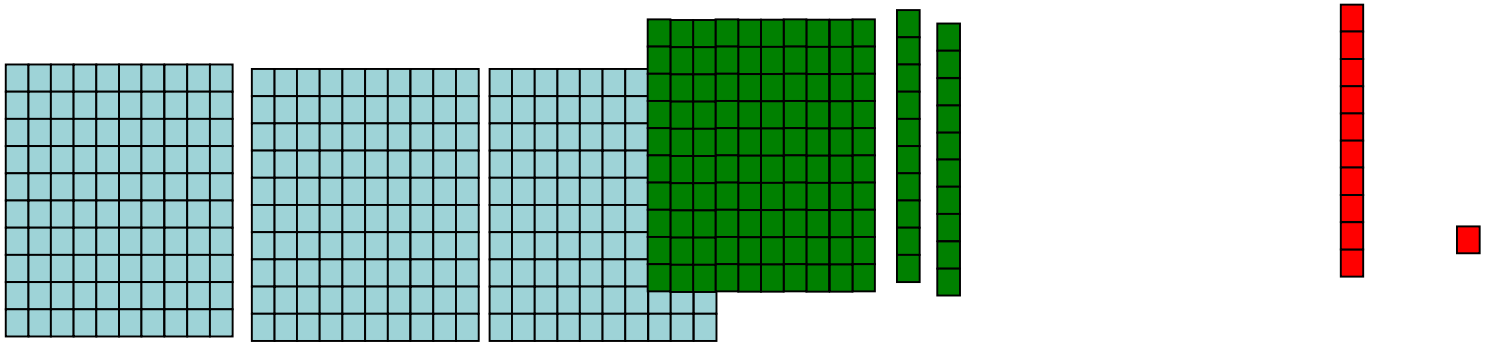
6

50

7

Continuing Column Subtraction

e.g. 321 - 157



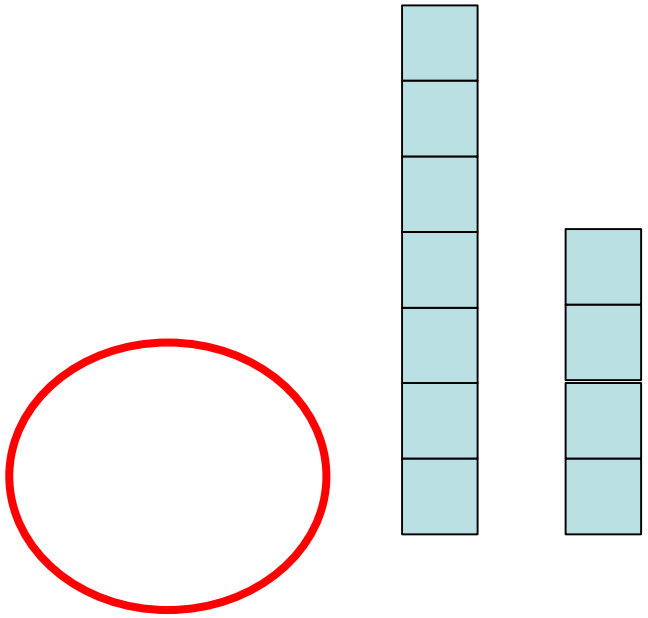
	H	T	U	
	200	110		
	~~300~~	~~20~~	11	
-	100	50	7	
	100	60	4	= 164

Efficient Decomposition

H	T	U
2	11	1
~~3~~	~~2~~	1
- 1	5	7
1	6	4

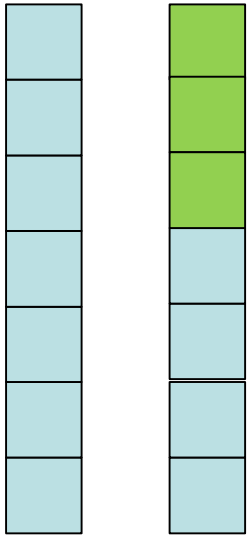
Finding the Difference (Counting Back)

Children need to understand how counting back links to subtraction, e.g. 7 – 4
Make the large tower the same size as the small tower.



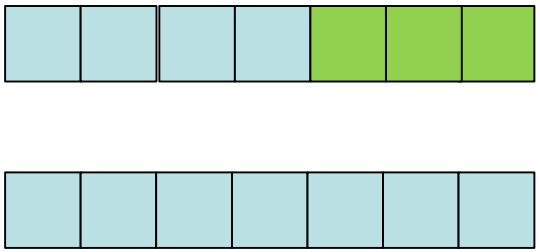
Finding the Difference (Counting On)

Children need to understand how counting on links to subtraction, e.g. 7 – 4
Make the small tower the same size as the large tower.



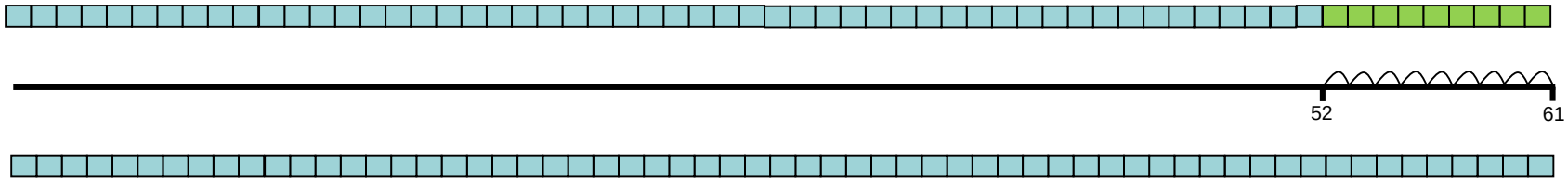
Finding the Difference (Counting On)

To begin linking to number lines, this can be looked at horizontally instead of vertically.



Moving on to Number lines

61 - 52



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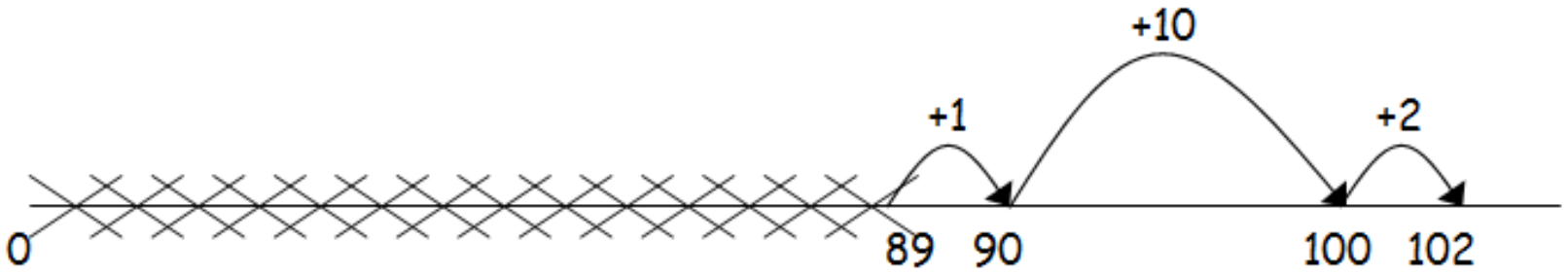
Consolidating Number Lines



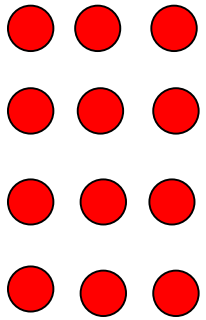
Common errors: Subtraction

MULTIPLICATION

Multiplication

Children need to understand the concept of multiplication, that it is:

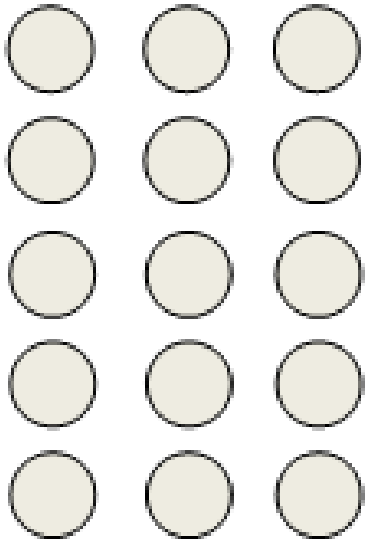
- **Repeated addition 3+3+3+3= 12 4x3=12**
- **Can be represented as an array**



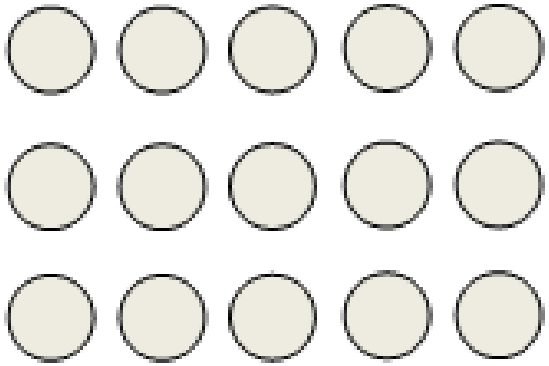
- **Inverse of division 4x3=12 12 ÷4=3**

Use of Arrays

Children need to understand how arrays link to multiplication through repeated addition and be able to create their own arrays.



3 + 3 + 3 + 3 + 3 = 15

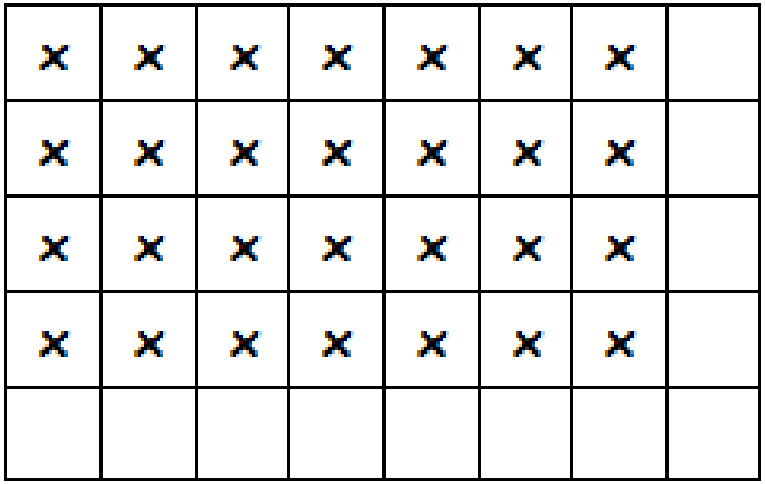


5 + 5 + 5 = 15

Continuation of Arrays

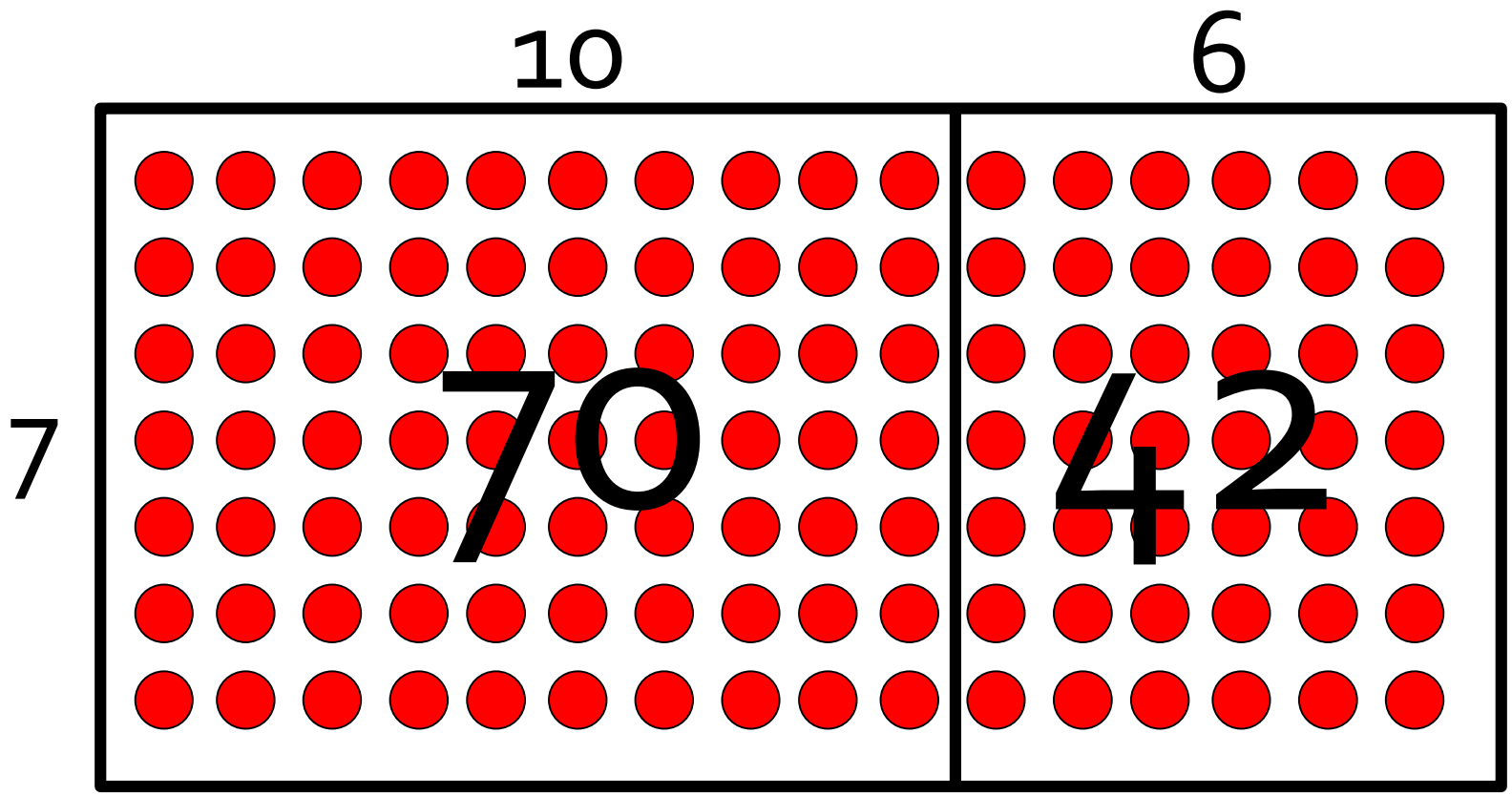
Creating arrays on squared paper (this also links to understanding area).

4 x 7 =



4 x 7 = 7 + 7 + 7 + 7 = 28

Arrays to the Grid Method



Grid Method

	10	6
7	70	42

$$\begin{array}{r} 70 \\ +\ 42 \\ \hline 112 \end{array}$$

Grid Method

Children have to develop their understanding of related facts.

e.g. 23 x 35

x	20	3
30	600	90
5	100	15

600
100
90
+ 15
805

Formal vertical method: expanded form

Th	H	T	U	
	3	6	8	
x			6	
		4	8	(8 x6)
	3	6	0	(60x6)
+ 1	8	0	0	(300 x 6)
2	2	0	8	

Formal vertical method: compact form

Th	H	T	U	
		3	6	8
x				6
		4	8	(8 x 6)
		3	6	0 (60 x 6)
+ 1		8	0	0 (300 x 6)
	2	2	0	8

becomes

Th	H	T	U
	3	6	8
x			6
2	2	0	8
	4		4

Common errors: Multiplication

- Carrying should always be under the line in an addition or multiplication

DIVISION

Division

Children need to understand the concept of division, that it is:

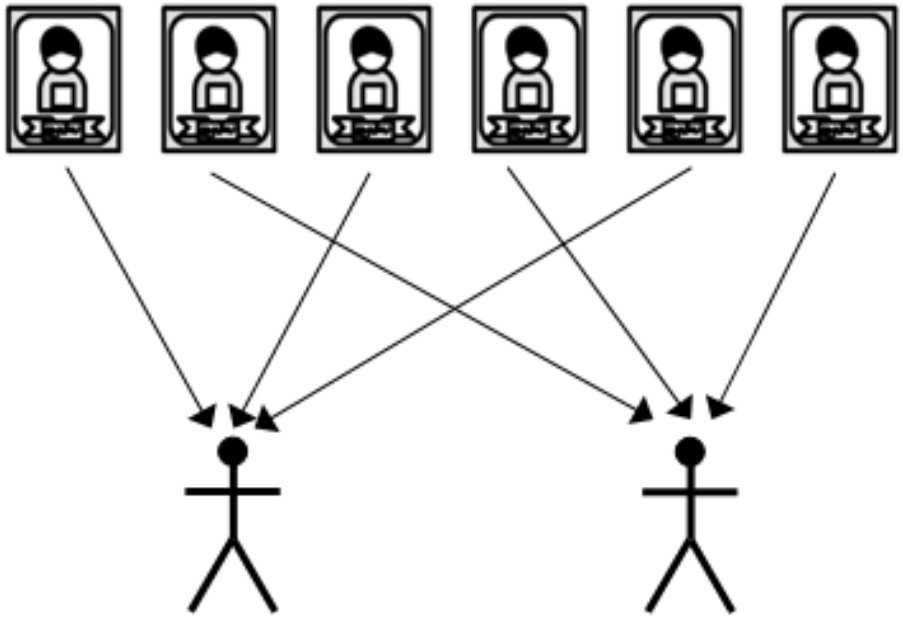
- **Repeated subtraction**

They also need to understand and work with certain principles:

- **Inverse of multiplication**
- **Is not commutative i.e. $15 \div 3 \neq 3 \div 15$**
- **Is not associative i.e. $30 \div (5 \div 2) \neq (30 \div 5) \div 2$**

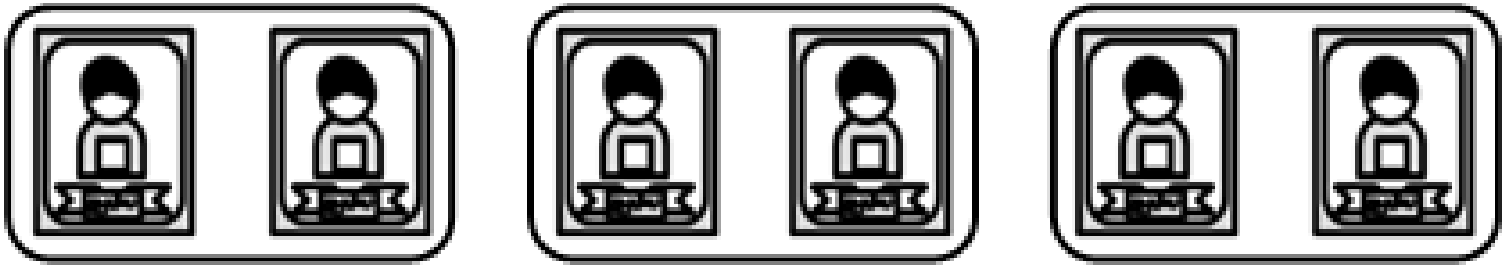
Division as Sharing

Children naturally start their learning of division as division by sharing, e.g. $6 \div 2$.



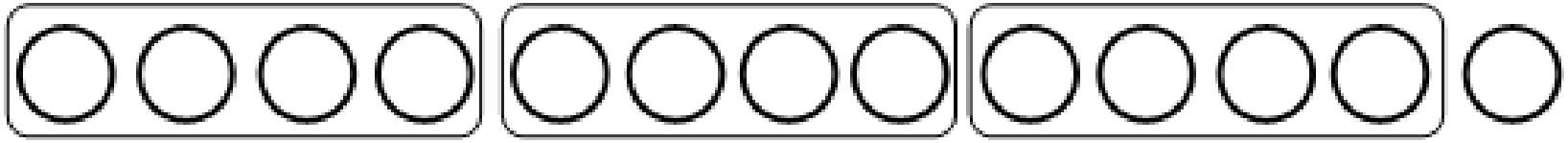
Division as Grouping

To become more efficient, children need to develop the understanding of division as grouping, e.g. 6 ÷ 2.



Division as Grouping

To continue their learning, children need to understand that division calculations sometimes have remainders, e.g. 13 ÷ 4.

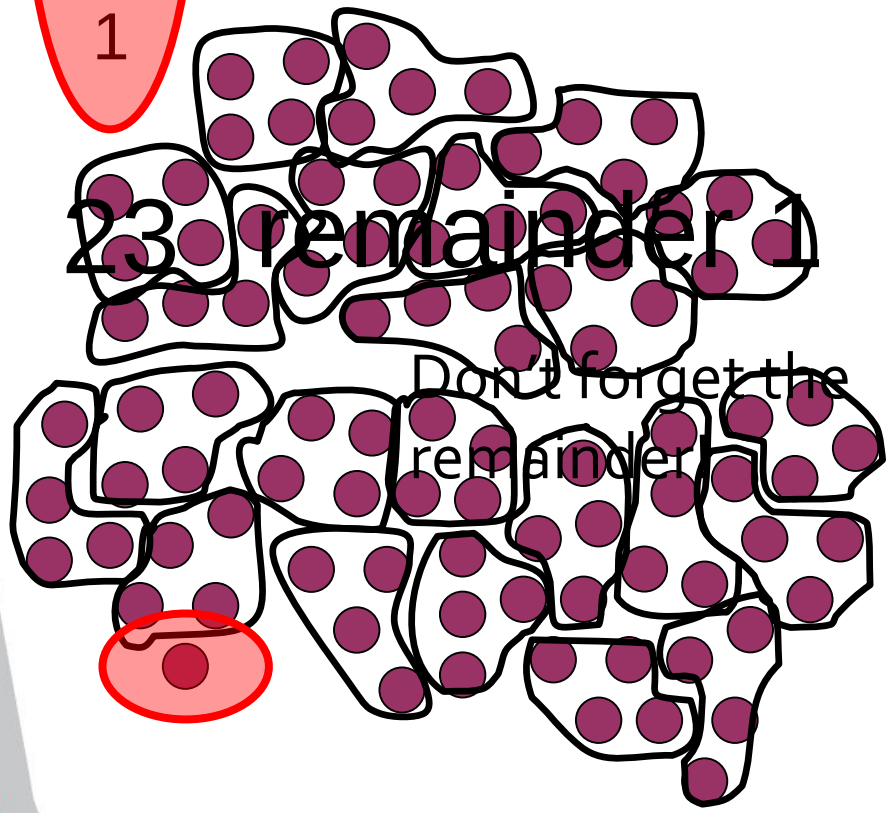


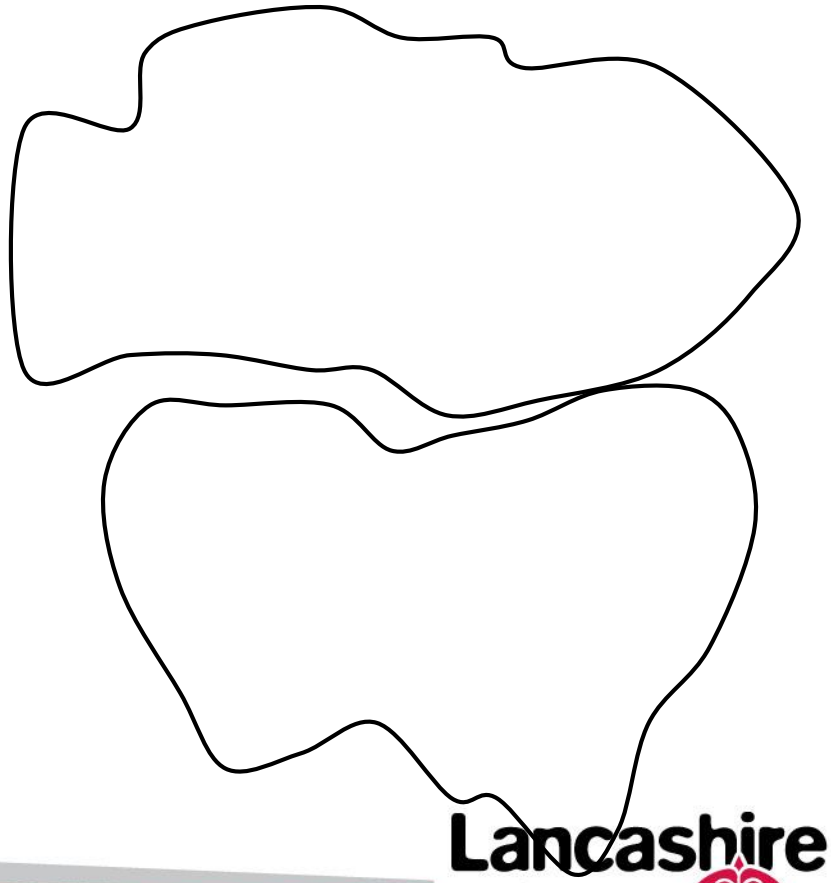
They also need to develop their understanding of whether the remainder needs to be rounded up or down depending on the context.

10
10
1
1
1

Add these together to find your answer.

$93 \div 4 = 23r1$





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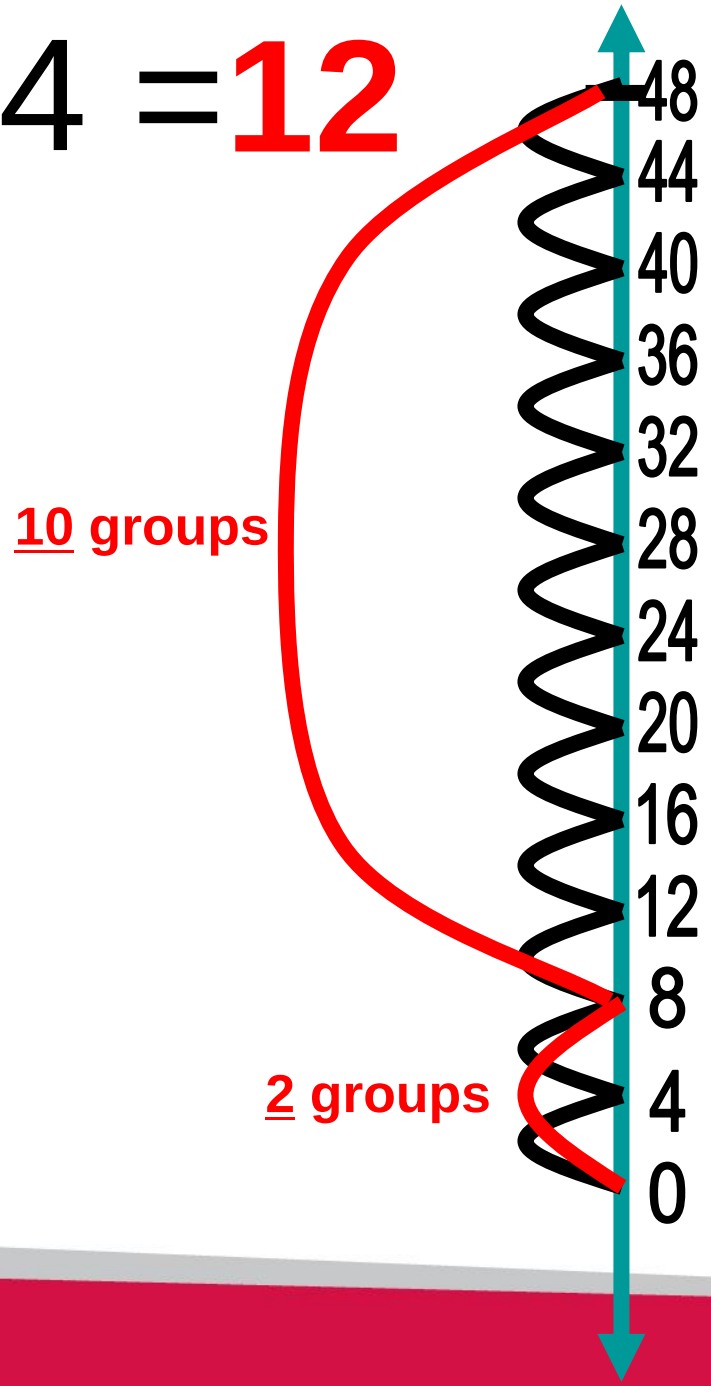
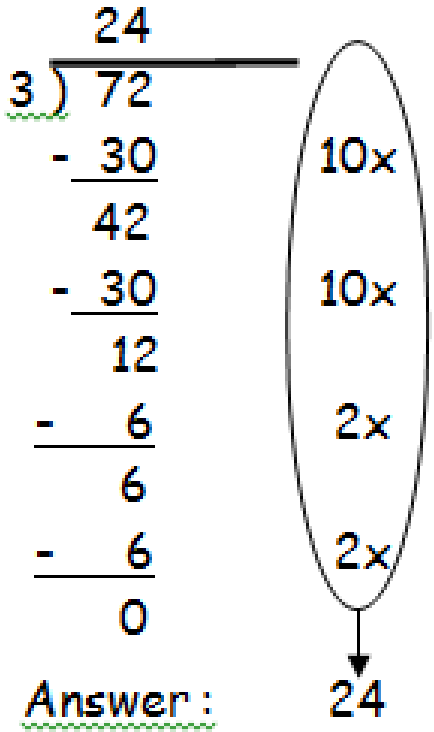
$48 \div 4 = 12$



Division by Chunking

Recall of multiplication tables helps make this method more efficient, e.g. 72 ÷ 3.



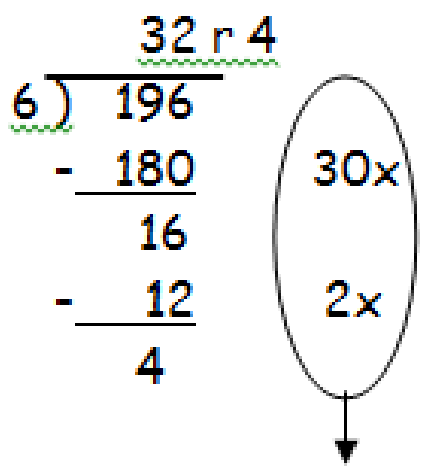
1x	3
2x	6
5x	15
10x	30

Children should write key facts in a menu box. This will help them in identifying the largest group they can subtract in one chunk.

Division by Chunking

e.g. 196 ÷ 6

196 ÷ 6



1x	6
2x	12
4x	24
5x	30
10x	60
20x	120

The key facts in the menu box should be extended to include 4x and 20x.

Answer : 32 remainder 4 or 32 r 4

Key Messages

- Please follow the school methods
- Secure understanding of each stage before moving onto the next
- Allow children to decide on the most appropriate method i.e. mental, mental with jottings or written method . A formal written method is the last option !!!