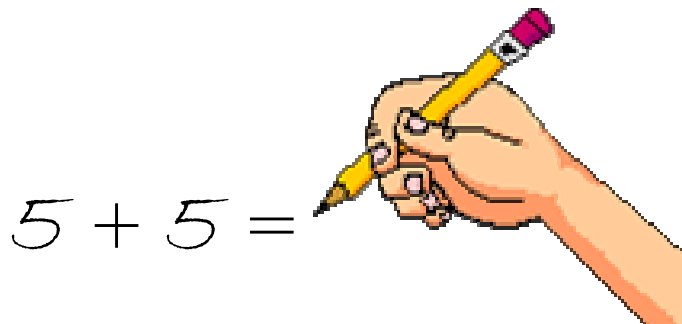
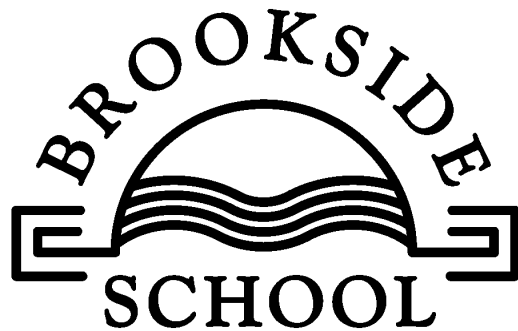


Progression In Numeracy



The four rules

Contents

1. Introduction
2. Place Value
3. Multiplication Facts
4. Problem Solving
5. Useful vocabulary
6. Addition
7. Subtraction
8. Multiplication
9. Division

Introduction

After talking to many parents, it has become apparent that it would be helpful if you had some knowledge of the strategies used to teach number and of the progression of methods throughout school.

Obviously there are some differences (and similarities) in the way you may recall being taught at school, or indeed, in the way in which you may calculate an answer.

Hopefully this booklet will illustrate some of the methods used at Brookside school and help you to support your child's education.

Place Value

Place value is vital in the understanding of the four rules. We talk about the value of each digit within a number.

This is a 20, not a 2 → **24** ← This is a 4

Multiplication Facts

Multiplication facts (x tables) are an essential part of Numeracy and we would appreciate your help in practising these at home. Children need to be able to recall multiplication facts at random and not just by rote.

$$5 \times 8 = 40 \quad 9 \times 3 = 27 \quad 6 \times 7 = 42$$

Problem Solving

Problem solving is sometimes an area in which children encounter difficulties. To help them become more confident talk through the problem, make estimations, encourage them to visualise, make jottings and then progress through until they work out the solution.

Three birds laid some eggs. Each bird laid an odd number of eggs. Altogether they laid 19 eggs. How many eggs did each bird lay? Find different ways to do it.

Vocabulary

Addition

add
plus
total
sum of
how many
count on
increase
more than
altogether

Multiplication

multiply
times
lots of
groups of
product
multiple of
repeated addition
double

General

digits and figures are the numbers 0 - 9
integers are whole numbers made up of one or more digits ~ 324
It is often helpful to think of the = sign as 'is the same as'

Subtraction

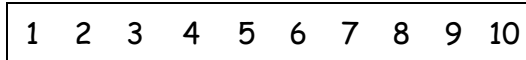
subtract
take away
minus
decrease
less than
count back
difference between
fewer than
decomposition

Division

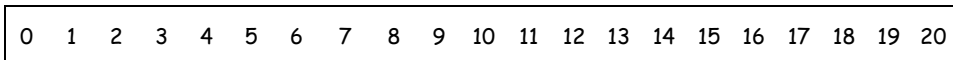
divide
share or group
remainder
share equally
factor
quotient
repeated subtraction
halve or half of

Addition

Stage 1 Counting and combining real objects up to 10
 Introduce numbers and the + sign
 Counting forwards and backwards
 Number lines used initially to 10



Stage 2 Using apparatus to count and combine bigger numbers
 Counting backwards and forwards up to 20
 Recognition that $13 + 6 = 6 + 13$
 Learn to count on from the largest number



Stage 3 Introduce numbers up to 100
 Counting backwards and forwards to 100
 Missing numbers in different places

$$14 + \square = 20 \quad \square + 14 = 20 \quad 20 = \square + 14$$

Adding tens and units horizontally

$$37 + 21 \longrightarrow 7 + 1 = 8$$

$$30 + 20 = 50$$

$$50 + 8 = 58$$

Stage 4 Working with hundreds, tens and units
 Partitioning and recombining numbers

$$29 + 34 \longrightarrow 9 + 4 = 13$$

$$20 + 30 = 50$$

$$50 + 13 = 63$$

Stage 5 Working with thousands, hundreds, tens and units
 Vertical methods introduced

$$\begin{array}{r}
 625 \\
 + 48 \\
 \hline
 13 \quad (5 + 8) \\
 60 \quad (20 + 40) \\
 600 \quad (600 + 0) \\
 \hline
 673
 \end{array}$$

Stage 6 Using carrying method

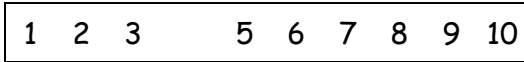
$$\begin{array}{r}
 625 \\
 + 48 \\
 \hline
 673 \\
 1
 \end{array}$$

Stage 7 Extend to bigger numbers and decimals

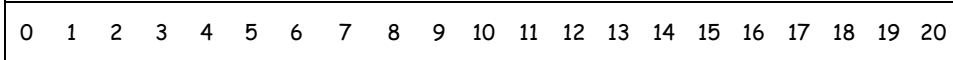
Addition is the inverse of subtraction.

Subtraction

Stage 1 Practical activities using real objects up to 10
 Reinforce numbers and introduce the - sign
 Counting backwards
 Placing numbers on a number line initially to 10



Stage 2 Using apparatus to subtract bigger numbers
 Counting backwards from 20 orally and using a number line
 Recognition that subtraction is not reversible
 (The largest number has to go at the start)



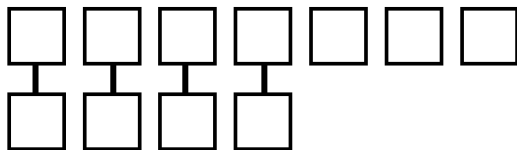
Stage 3 Continue with numbers up to 100
 Counting backwards from numbers up to 100
 Missing numbers in different places

$20 - \square = 6$ $\square - 14 = 6$ $14 = \square - 6$

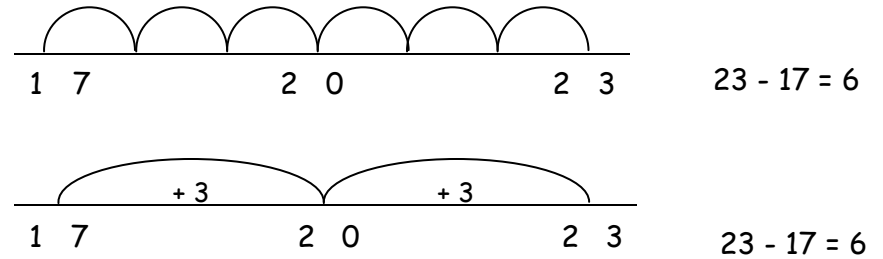
Simple horizontal subtraction

$27 - 14 \rightarrow 27 - 4 = 23$
 $23 - 10 = 13$

Finding the difference practically, e.g. $7 - 4$



Stage 4 Practise taking away multiples of 10
 Introduce blank number lines for finding the difference



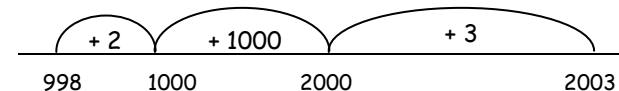
Stage 5 Working with bigger numbers
 Vertical methods are introduced

$$\begin{array}{r} 257 \\ - 23 \\ \hline 234 \end{array}$$

Stage 6 Using decomposition method

$$\begin{array}{r} 347 \\ - 128 \\ \hline 219 \end{array}$$

Stage 7 Extend to bigger numbers and decimals (money)
 Blank number lines are still relevant



$A = 1005$

Subtraction is the inverse of addition.

Multiplication

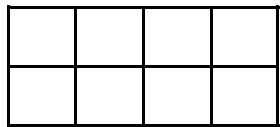
Stage 1 Practical activities using groups of objects
Counting in twos from 0 to 10



Stage 2 Oral counting in twos and tens
Introduce x sign meaning lots of
Link repeated addition to multiplication

$$2 + 2 + 2 + 2 = 4 \times 2$$

Stage 3 Counting in fives and threes
Doubles are linked to multiplying by 2
Understand that 2 lots of 4 is the same as 4 lots of 2



$$4 \times 2 = 8$$

$$2 \times 4 = 8$$

Stage 4 Horizontal partitioning methods

$$15 \times 3 \rightarrow 5 \times 3 = 15$$

$$10 \times 3 = 30$$

$$30 + 15 = 45$$

x	30	6
3	90	18

Grid methods are also used

$$90 + 18 = 108$$

$$36 \times 3 = 108$$

Stage 5 Vertical methods are used

$$\begin{array}{r} 27 \\ \times 4 \\ \hline 108 \end{array} \rightarrow \begin{array}{r} 27 \\ \times 4 \\ \hline 108 \\ \hline 2 \end{array}$$

Stage 6 Grid methods are used for long multiplication

x	100	30	6
20	2000	600	120
5	500	150	30

$$\begin{array}{r} 2720 \\ + 680 \\ \hline 3400 \end{array}$$

Stage 7 Shorter vertical methods are used to extend

$$\begin{array}{r} 27 \\ \times 63 \\ \hline 81 \\ 2 \\ \hline 1620 \\ 4 \\ \hline 1701 \end{array}$$

Multiplication is the inverse of division.

Division

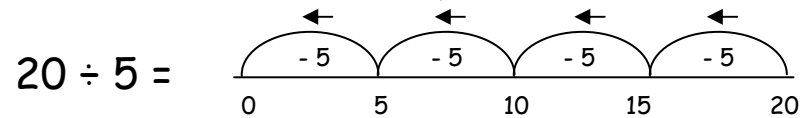
Stage 1 Practical activities sharing objects equally
Practical activities grouping objects together



Stage 2 Halving activities
Introduce ÷ sign meaning divide by and share between
Make the link between division and multiplication

$$8 \div 4 = 2 \text{ and } 2 \times 4 = 8$$

Stage 3 Use horizontal methods linked to multiplication tables
Understand division as repeated subtraction



Stage 4 Word and visual problems with remainders

Share 14 marbles between 5 children.
How many marbles does each child get?
How many will be left over?

$$14 \div 5 = 2 \text{ r } 4$$

Stage 5 Division of tens
and units by a unit

$$\begin{array}{r} 1 \ 6 \\ 6 \overline{) 9 \ 6} \\ - 6 \ 0 \quad 10 \text{ lots} \\ \hline 3 \ 6 \\ - 3 \ 6 \quad 6 \text{ lots} \\ \hline 0 \end{array}$$

Stage 6 Short division with remainders

$$\begin{array}{r} 3 \ 2 \text{ r } 4 \\ 6 \overline{) 1 \ 9 \ 6} \\ - 1 \ 8 \ 0 \quad 30 \text{ lots} \\ \hline 1 \ 6 \\ - 1 \ 2 \quad 2 \text{ lots} \\ \hline 4 \end{array}$$

Stage 6 Long Division

$$\begin{array}{r} 2 \ 7 \\ 3 \ 6 \overline{) 9 \ 7 \ 2} \\ - 7 \ 2 \ 0 \quad 20 \text{ lots} \\ \hline 1 \cancel{2} \ 15 \ 2 \\ - 1 \ 8 \ 0 \quad 5 \text{ lots} \\ \hline 7 \ 2 \\ 7 \ 2 \quad 2 \text{ lots} \\ \hline 0 \end{array}$$

Stage 7 Remainders can be written as fractions
Shorter vertical methods are used with decimals

$$\begin{array}{r} 3 \ 2 \text{ r } 4 \\ 6 \overline{) 1 \ 19 \ 16} \end{array} \qquad \begin{array}{r} 0 \ 8 \ . \ 1 \\ 12 \overline{) 9 \ 97 \ . \ 12} \end{array}$$

Division is the inverse of multiplication.