



St Thomas Progression in Number

At St Thomas Primary School we want all children to be confident in calculation. As a result, we have put together a clear progression of skills related to Number. These are the building blocks in calculation which will support and develop their ability to use all four number operations. If they can't do these things, we need to be thinking about why they can't.

The philosophy underpinning this is one based around three key ideas.

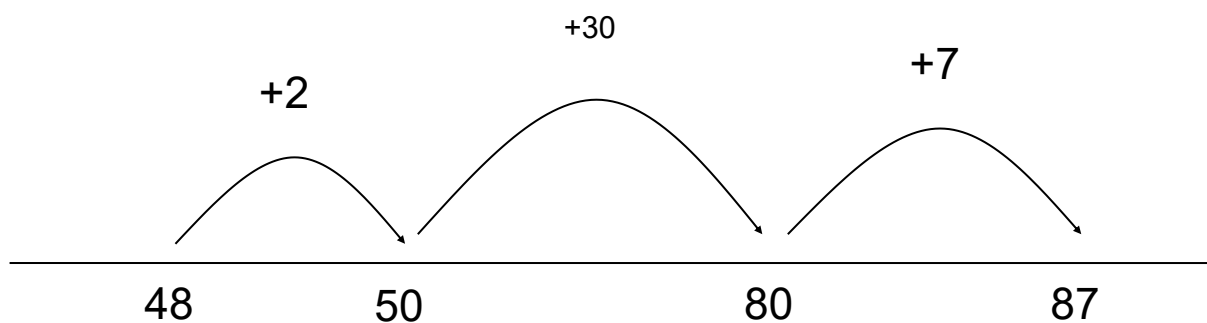
- Calculation for understanding - methods learnt with should develop children's understanding of the number system and the links within it.
- Error proof calculation - calculation methods taught should be as error proof as possible. Where mistakes are made, children should be easily able to check back and understand where they went wrong.
- Flexibility in approach

The key images/resources that we use at school to support calculation are:

- Numberlines (first with all integers marked moving until eventually children can use an empty numberline)
- 100 squares
- Numicon
- Cuisinaire rods
- Diene's blocks

How to use a numberline

- Numbers must be written underneath the numberline to show where the jump gets to.
- The size of the jump is indicated above the jump
- The direction is indicated by the sign written (+/-)
- Numbers increase from left to right



Key Vocabulary

- Family facts: $2+3=5$; $3+2=5$; $5-3=2$; $5-2=3$ (similar with $\times$ and $\div$)
- Number sentence - $2+3=5$
- Tea numbers - 10, 20, 30, etc... (these are in red)
- Nearly numbers - 9, 19, 29, 39, etc... (and also 21, 31, etc)
- Teen numbers - blue on 100 squares
- Number bonds for.... (e.g. For 20; $13+7=20$, $14+6$, etc)
- Story of ... All the addition facts for a number ($1+5$, $2+4$, $3+3$)
- Frog Method Subtraction (Finding the Difference)
- Spider Counting - up and back in tens
- Overjumping - adding or subtracting too much and then adjusting.

Use of Number Facts

As the children move through the school, there must be an emphasis placed on the learning and application of number facts. This must begin early in the school and be a thread that goes through every year group.

If children are to become confident mathematicians, they will be applying simple, known addition, subtraction, multiplication and division facts in their calculations. As a result, every opportunity should be found to:

- help children's learning of number facts.
- modelling of their application.
- commentary of an adult or child's thinking when calculating.
- use resources and visualisation to support learning in this way.

Examples of children who are able to calculate in this way.....

"I know $6+5$ is 11 because $5+5$ is 10 and 11 is 1 more."

"9 subtract 5 is 4 so 900 subtract 500 is 400."

"If I was multiplying 60 and 3 I would use the known fact $3 \times 6 = 18$. The answer to my calculation would be 10 times bigger."

" 9×8 is 72 because I know 10×8 is 80. 72 is one eight less than 80."

Early Steps in Number

For children to be confident with number as they move towards Year 6, they need to have mastered the main skills from each section before moving onto the next.

Reception

- Count forwards to 100 in unison with other children.
- Count backwards from at least 20.
- Know the next number for any number to at least 12 and the one less, e.g. eight, ____.
- Match numbers to fingers, e.g. hold up 7 fingers (without counting each finger).
- Begin to compare numbers up to 20, e.g. knowing that 6 is bigger than 4.
- Know the story of 6 ($3 + 3$, $2 + 4$, $1 + 5$, $6 + 0$), and the stories of 5 and of 4 and of 3...
- Read numbers up to 20
- Count up to 20 objects

Numberlines at this stage should always start from 0 and have all the numbers marked on them.

Year 1

- Read and Write numbers to 100.
- Count on and back in ones to and from 100 and from any number.
- Count on and back in tens from any number up to 100
- Know number bonds to 10 including what is left if objects are taken from 10, e.g. 10 fingers, fold down 4, leaves 6 standing.
- Know the story of all numbers to 10, e.g. 6: $3 + 3$, $2 + 4$, $1 + 5$, $6 + 0$,
- Begin to be aware of unit patterns, e.g.
 $2 + 4 = 6$ $7 + 4 = 11$
 $12 + 4 = 16$ $17 + 4 = 21$
 $22 + 4 = 26$ etc. $27 + 4 = 31$ etc.
- Use + and - and = signs for simple number sentences.
- Add and subtract small numbers by counting on and back in ones e.g. $18 + 5 = 23$; $23 - 5 = 18$ and begin to start using known facts.
- Know doubles to 6 and related halves.
- Know that when they add a single digit number to a multiple of 10 they don't need to count on. E.g. $20 + 6 = 26$

Numberlines will still have all numbers put on them when counting in singles digits.

Progression in Addition

Key Skills—Year 2

• Application of number bonds

$$3 + 4 = 7$$
$$30 + 40 = 70$$
$$300 + 400 = 700$$

$$37 + 40 =$$
$$3 + 4 = 7$$

so $30 + 40 = 70$

so $37 + 40 = 77$

• Bridging 10

$$4 + 7 = 11$$
$$4 + 6 = 10$$

so $4 + 7 = 4 + 6 + 1 = 11$

$$34 + 7 = 41$$
$$34 + 6 = 40$$

so $34 + 7 = 34 + 6 + 1 = 41$

Mental Methods—Years 2 and 3

$$34 + 57 = 91$$

Counting On

$$57 + 30 = 87$$
$$87 + 4 = 87 + 3 + 1 = 91$$
$$48 + 36 = 84$$

Overjumping

$$36 + 50 - 2 = 86 - 2 = 84$$
$$37 + 56 = 93$$

Partitioning

$$50 + 30 = 80$$
$$6 + 7 = 13$$
$$80 + 13 = 80 + 10 + 3 = 93$$

Expanded Column Addition—Year 3

$$\begin{array}{r} 425 \\ + 376 \\ \hline 11 \quad (6 + 5) \\ 90 \quad (20 + 70) \\ 700 \quad (400 + 300) \\ \hline 801 \\ 1 \end{array}$$

Compact Column Addition Year 4

$$\begin{array}{r} 467 \\ + 379 \\ \hline 846 \\ 11 \end{array}$$

Progression in Subtraction

Key Skills—Year 2

- Application of number bonds

$$8 - 5 = 3$$

so $80 - 50 = 30$

so $800 - 500 = 300$

$$86 - 50 =$$

$$8 - 5 = 3$$

so $80 - 50 = 30$

so $86 - 50 = 36$

- Bridging 10

$$13 - 7 = \underline{6}$$

$$13 - 3 = 10$$

$$10 - 4 = 6$$

because we've subtracted 3 and that leaves 4 left to subtract.

Mental Methods—Years 2 and 3

$$86 - 37 = \underline{49}$$

Counting Back

$$86 - 30 = 56$$

$$56 - 7 = 56 - 6 - 1 = 49$$

$$93 - 86 = \underline{7}$$

$$86 + \square = 93$$

Finding the Difference

$$4 + 3 = 7$$

$$72 - 49 = \underline{23}$$

Overjumping

$$72 - 50 + 1 = 22 + 1 = 23$$

Expanded Column Subtraction—Year 4

821	700 → 110 → 11
- 473	800 → 400 → 70 → 3
348	300 40 8

Compact Column Subtraction Year 4

711
822
- 473
348

Multiplication and Division

Both can be modelled as arrays and on a numberline. Children should be encouraged to see division as grouping rather than sharing from an early age as this is more powerful.

$4 \times 5 =$

$20 \div 4 =$

As an array:

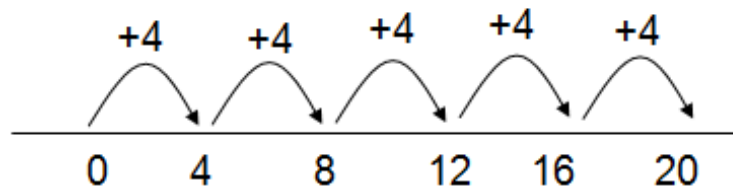


What is 5 lots of 4?

How many groups of 4 in 20?

As a numberline:

(Repeated addition)



This should help children see the link between $\times$ and $\div$.

Key Skills—Yr 3

• Using known facts

$$4 \times 70 = \underline{280}$$

I know $4 \times 7 = 28$ so 4×70 is ten times bigger

$$300 \times 5 = 1500$$

I know $3 \times 5 = 15$ so 300×5 is 100 times bigger

• Using known facts

$$320 \div 4 = \underline{80}$$

$$4 \times 8 = 32 \Rightarrow 4 \times 80 = 320$$

so $32 \div 4 = 8$ so $320 \div 4 = 80$

• Multiplying by 10 and 100

		Th	H	T	U
$4 \times 1 = 4$	$24 \times 1 = 24$			2	4
$4 \times 10 = 40$	$24 \times 10 = 240$		2	4	0
$4 \times 100 = 400$	$24 \times 100 = 2400$	2	4	0	0

• Dividing by 10 and 100

$70 \div 10 = 7$	$420 \div 10 = 42$
$700 \div 10 = 70$	$4200 \div 10 = 420$
$700 \div 100 = 7$	$4200 \div 100 = 42$

There must be a real focus on learning multiplication facts up to 12×12 and related division facts by the end of Year 4. If children do not know them off by heart they must have strategies for recalling them quickly.

Progression in Multiplication

Pencil and Paper Methods— Years 3 and 4

$$36 \times 4 = \underline{\underline{144}}$$

30 6

$$30 \times 4 = 120$$

$$6 \times 4 = 24$$

$$120 + 24 = 144$$

Multiplication
by
Partitioning

Written Methods —Yr 5

	36	
x	4	
	24	(4 × 6)
	120	(4 × 30)
	144	

Expanded
Column
Multiplication

	256	
x	4	
	24	(4 × 6)
	200	(4 × 50)
	800	(4 × 200)
	1024	

Expanded
Column
Multiplication

Written Methods—Year 6

	436	
x	24	
	24	(4 × 6)
	120	(4 × 30)
	1600	(4 × 400)
	120	(20 × 6)
	600	(20 × 30)
	8000	(20 × 400)
	10464	

Multiplying
by 2 digit
numbers

	436	
x	24	
	1744	
	8720	
	10464	

	23.6	
	8.9	
	213254	
	188880	
	21004	
	111	

Multiplying
by a
decimal

For every decimal place in the calculation, there needs to be the same number of decimal places in the answer. The decimal points do not need to be lined up.

	256	
x	4	
	1024	

Compact
Column
Multiplication

Progression in Division

Division in Year 2

Children's earlier understanding of division must put an emphasis on grouping. Physical resources are essential as are images to model this such as arrays, numberlines and drawings of groups of objects.

Years 3 and 4

It is not a requirement that children learn any formal ways of recording dividing. They should be encouraged to use physical resources, arrays and numberlines to support their understanding and show their reasoning. Drawing a numberline is not necessarily the way they work it out—this shows what is going on in their head.

The National Curriculum objective in Year 4 related to division is:

"To use place value, known and derived facts to divide mentally"

This would indicate that importance must be placed on learning and knowing multiplication and division facts and then applying these through place value.

$32 \div 4 = 8$ because I know $4 \times 8 = 32$

I can use this known fact and place value to solve

$320 \div 4 =$ and $320 \div 40 =$ and $3200 \div 80 =$ etc...

Years 5 and 6

The children use the skills developed in Year 4 to calculating HTU $\div$ U. They should be shown how to use known facts and place value.

E.g. $228 \div 3 = ?$ I know $21 \div 3 = 7$ so $210 \div 3 = 70$. They can then show this jump on a numberline. There is 18 left and $18 \div 3 = 6$ so there is no remainder. This jump is drawn in. The number of 3's are added together to give the answer. i.e. $70 + 6 = 76$ (see below).

Once children are confident with this they should quickly progress to 'Expanded Short Division' and then 'Compact Short Division' (Year 6 only).

