Dawley C of E Primary Academy

'Enriching learning, enriching life'

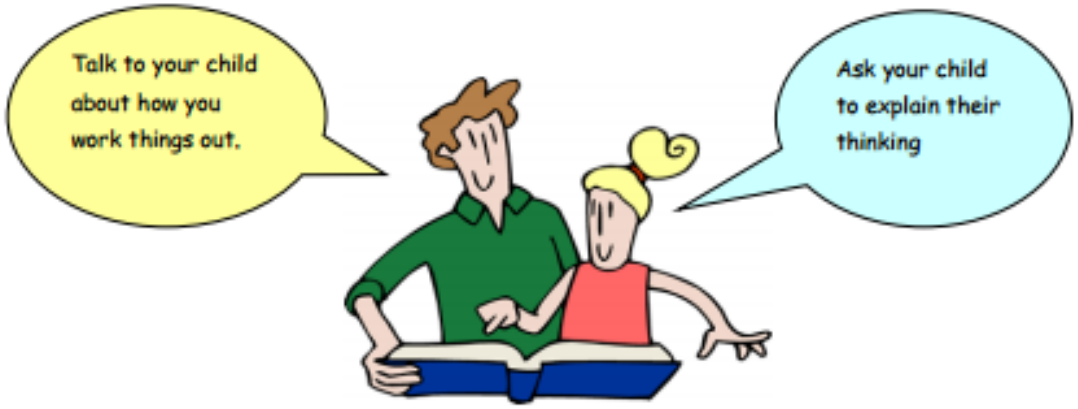
Calculation Strategies Unveiled

A parent handbook

Years 1, 2 & 3

CALCULATIONS

The maths work your child is doing at school may look very different to the kind of 'sums' you remember. This is because children are encouraged to use more formal written methods to explain their mathematical thinking and systematic approach to word problems and problem solving tasks.



When faced with a calculation problem, encourage your child to ask…

- Can I do this in my head?
- Could I do this in my head using drawings or jottings to help me?
- Do I need to use a written method?
- Also help your child to estimate and then check the answer.
- Encourage them to ask… Is the answer sensible?

Year 1 Addition

+ = signs and missing numbers

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

2 = 1+ 1

2 + 3 = 4 + 1

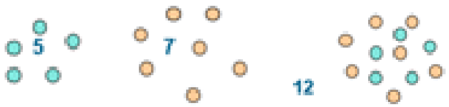
Missing numbers need to be placed in all possible places.

3 + 4 = □ □ = 3 + 4

3 + □ = 7 7 = □ + 4

Counting and Combining sets of Objects

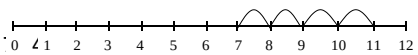
Combining two sets of objects which will progress onto adding on to a set



Understanding counting on with a numbertrack.

The numbertrack is already pre made meaning children can start at the biggest number and use their fingers, pens or counters to jump on by the second number.

Understanding of counting on with a numberline (supported by models and images).



- Start at the biggest number (7)
- Jump on by 4
- Answer is 11

$$\begin{array}{r} 40 + 7 \\ +\ \underline{20 + 5} \\ 60 + 12 = 72 \end{array}$$

Year 2 Addition

Missing number problems e.g 14 + 5 = 10 + □ 32 + □ + □ = 100

35 = 1 + □ + 5

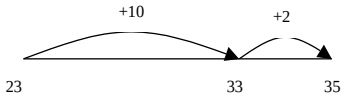
It is valuable to use a range of strategies/approaches (also see Y1) but continue to use numberlines to develop understanding of:

1. Counting on in tens and ones using an empty numberline.

23 + 12 = 23 + 10 + 2

= 33 + 2

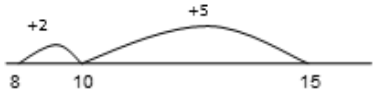
= 35



2. Separating tens and unites and bridging through 10.

The steps in addition often bridge through a multiple of 10 e.g. Children should be able to seperate the 7, adding the 2 to get to the nearest 10, then add the remaining 5.

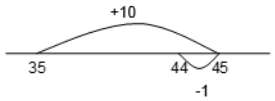
8 + 7 = 15



3. Adding 9 or 11 by adding 10 and adjusting by 1

e.g. Add 9 by adding 10 and subtracting by 1

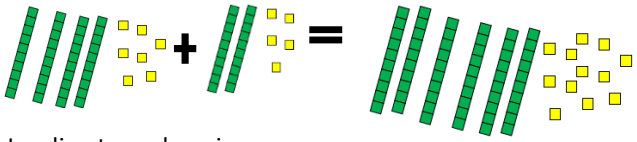
35 + 9 = 44



Towards a Written Method

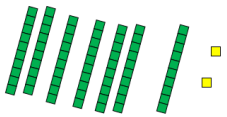
Separating tens and units in different ways and recombine

47+25



Leading to exchanging:

72



Expanded written method

40 + 7 + 20 + 5 =

40+20 + 7 + 5 =

60 + 12 = 72

Year 3 Addition

Missing number problems using a range of equations as in Year 1 and 2 but with appropriate, larger numbers.

Separate numbers into tens and ones

Seperate both numbers and recombine.

Count on by partitioning the second number only e.g.

247 + 125 = 247 + 100 + 20+ 5

= 347 + 20 + 5

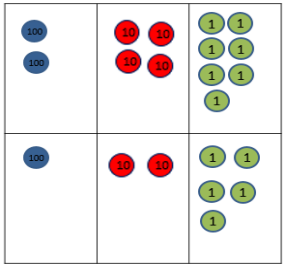
= 367 + 5

= 372

Children need to be secure adding multiples of 100 and 10 to any three-digit number.

Towards a Written Method

Introduce expanded column addition modelled with place value counters 247 + 125 =



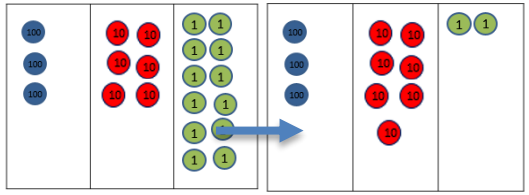
200 + 40 + 7

100 + 20 + 5

300 + 60 +12 = 372

$$\begin{array}{r} 247 \\ +125 \\ \hline 12 \\ 60 \\ \underline{300} \\ 372 \end{array}$$

Leading to children understanding the exchange between tens and ones.



Some children may begin to use a formal column method, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

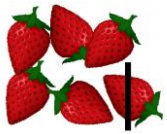
$$\begin{array}{r} 247 \\ +125 \\ \hline 372 \\ {\scriptstyle 10} \end{array}$$

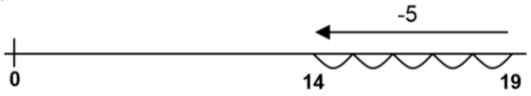
Year 1 Subtraction

Missing number problems e.g. 7 = □ - 9; 20 - □ = 9; 15 – 9 = □; □ - □ = 11; 16 – 0 = □

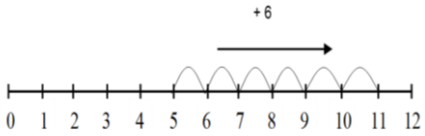
Use objects and pictorial representations. If appropriate, progress from using number lines with every number shown to number lines with significant numbers shown.

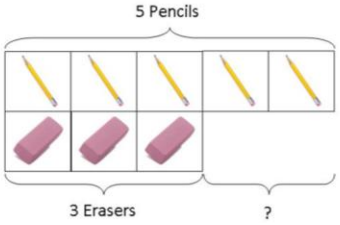
Understand subtraction as take-away:





Understand subtraction as finding the difference:





The above model would be introduced with objects which children can move (including cards with pictures) before progressing to pictorial representation.

The use of other images is also valuable for modelling subtraction e.g.bundles of straws, place value apparatus, multi-link cubes, bead strings.

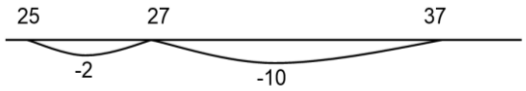
Year 2 Subtraction

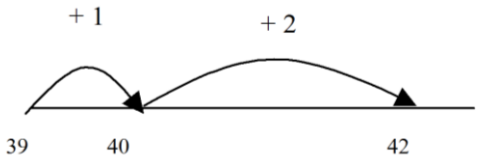
Missing number problems e.g. 52 – 8 = □; □ – 20 = 25; 22 = □ – 21; 6 + □ + 3 = 11

It is valuable to use a range of representations (also see Y1).

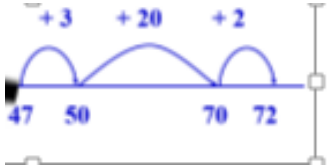
Continue to use number lines to model take-away and difference.

E.g.





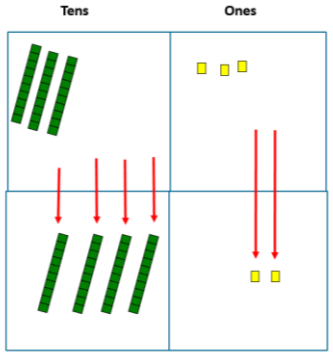
The link between the two may be supported by an image like this, with 47 being taken away from 72, leaving the difference, which is 25.



The bar model should continue to be used, as well as images in the context of **measures**.

Towards written methods

Recording addition and subtraction in expanded columns can support understanding of the quantity aspect of place value and prepare for efficient written methods with larger numbers. The numbers may be represented with place value apparatus (as shown below). E.g. 75 – 42



$$\begin{array}{r} 70\ \ 5 \\ -\ 40\ \ 2 \\ \hline 30\ \ 3 \end{array}$$

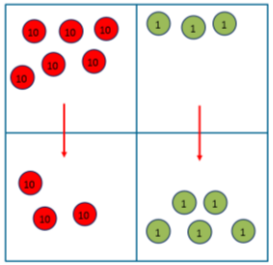
Year 3 Subtraction

Missing number problems e.g. □ = 43 – 27; 145 – □ = 138; 274 – 30 = □; 245 – □ = 195; 532 – 200 = □; 364 – 153 = □

Mental methods should continue to develop, supported by a range of models and images, including the number line. The bar model should continue to be used to help with problem solving (see Y1 and Y2). Children should make choices about whether to use complementary addition or counting back, depending on the numbers involved.

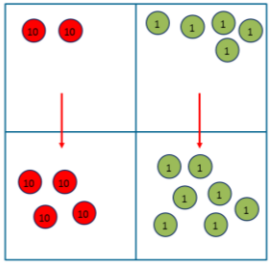
Written methods (progressing to 3-digits)

Introduce expanded column subtraction without exchanging from the left hand column, modelled with place value counters. (Place value apparatus could be used for those who need a less abstract representation)



$$\begin{array}{r} 90\ \ 8 \\ -\ 30\ \ 5 \\ \hline 60\ \ 3 \end{array}$$

For some children this will lead to exchanging, modelled using place value counters



$$\begin{array}{r} {}^{60}\cancel{70}\ {}^{1}2 \\ -\ 40\ \ 7 \\ \hline 20\ \ 5 \end{array}$$

A number line and expanded column method may be compared next to each other.

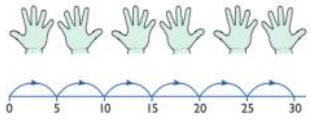
Some children may begin to use a formal column method, initially introduced alongside the expanded method. The formal method should be seen as a more streamlined version of the expanded method, not a new method.

Year 1 Multiplication

Understand multiplication is related to doubling and combing groups of the same size (repeated addition).

Practical(washing lines) and concrete objects such as; Numicon; bundles of straws, bead strings can be used to support multiplication.

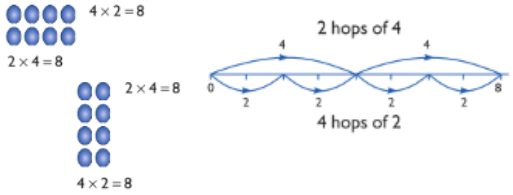
2 + 2 + 2 + 2 + 2 = 10
2 × 5 = 10
2 multiplied by 5
5 pairs
5 hops of 2



5 + 5 + 5 + 5 + 5 + 5 = 30
5 × 6 = 30
5 multiplied by 6
6 groups of 5
6 hops of 5

Problem solving with concrete objects (including money and measures.

Use arrays to understand multiplication can be done in any order.



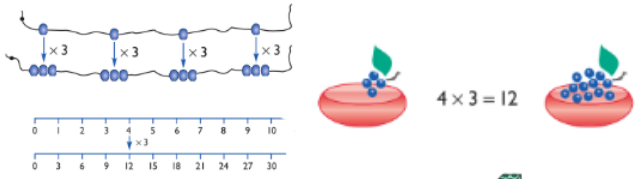
Year 2 Multiplication

Expressing multiplication as a number sentence using x.
Using understanding of the inverse and practical resources to solve missing number problems.

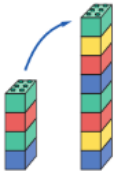
7 x 2 = □	□ = 2 x 7
7 x □ = 14	14 = □ x 7
□ x 2 = 14	14 = 2 x □
□ x ◯ = 14	14 = □ x ◯

Develop understanding of multiplication using array and number lines (see Year 1). Include multiplications not in the 2, 5 or 10 times tables.

Begin to develop understanding of multiplication as scaling (3 times bigger/taller).

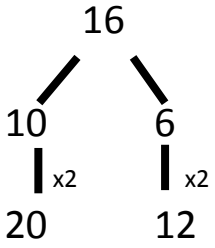


Doubling numbers up to 10 + 10.
Using known doubles to work out double 2 digit numbers
(double 15 = double 10 + double 5)



Towards written methods

Use jottings to develop an understanding of doubling two digit numbers.



Year 3 Multiplication

Continue with a range of equations as in Year 2 but with appropriate numbers.

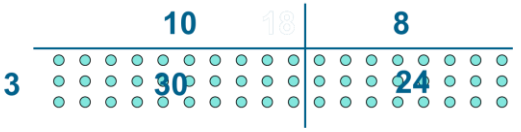
Mental methods
Doubling 2 digit numbers using partitioning (separating tens and units).

Demonstrating multiplication on a number line – jumping in larger groups of amounts (separating tens and units)

13 x 4 =
10 groups of 4 = 40 + 3 groups of 4 = 12

Written methods (progressing to 2digit x 1digit)

Developing written methods using understanding of visual images 3 x 18 =



Develop onto the grid method

Give children opportunities to explore this and deepen their understanding using place value apparatus such as place value counters.

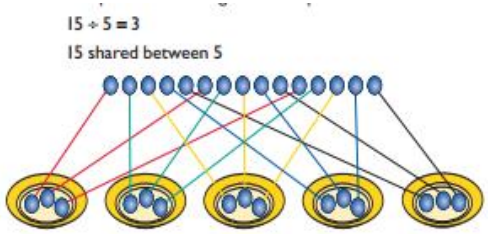
Year 1 Division

Children must have secure counting skills- being able to confidently count in 2s, 5s and 10s.
Children should be given opportunities to talk about what they notice in number patterns.

Group AND **share small quantities- understanding the difference between the two concepts.**

Sharing

Develops importance of one-to-one correspondence.

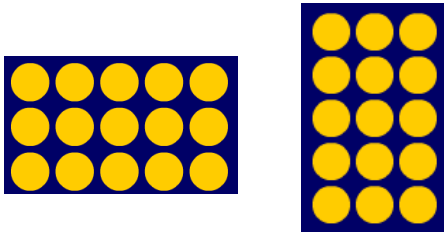


Children should be taught to share using concrete apparatus.

Grouping

Children should apply their counting skills to develop some understanding of grouping.

Use of arrays as a pictorial representation for division.
15 ÷ 3 = 5 There are 5 groups of 3.
15 ÷ 5 = 3 There are 3 groups of 5.



Children should be able to find ½ and ¼ and simple fractions of objects, numbers and quantities.

Year 2 Division

÷ = signs and missing numbers

6 ÷ 2 = □	□ = 6 ÷ 2
6 ÷ □ = 3	3 = 6 ÷ □
□ ÷ 2 = 3	3 = □ ÷ 2
□ ÷ ∇ = 3	3 = □ ÷ ∇

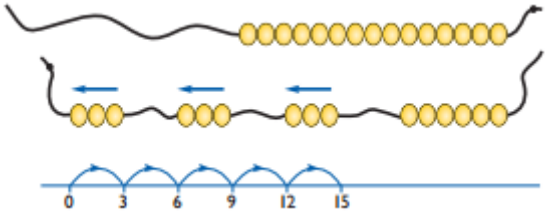
Know and understand sharing and grouping. Introducing children to the ÷ sign.

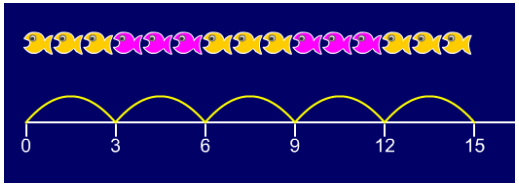
Children should continue to use grouping and sharing for division using practical apparatus, arrays and pictorial representations.

Grouping using a numberline

Group from zero in jumps of the number you are dividing by to find our 'how many groups of 3 are there in 15?'.

15 ÷ 3 = 5





Continue work on arrays. Support children to understand how multiplication and division are the inverse to one another. Look at an array – what do you see?

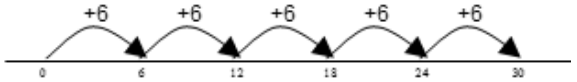
Year 3 Division

÷ = signs and missing numbers

Continue using a range of equations as in Year 2 but with appropriate numbers.

Grouping

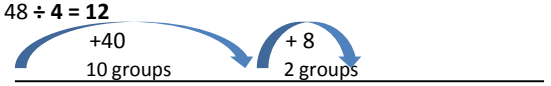
How many 6's are in 30?
30 ÷ 6 can be modelled as:



Becoming more efficient using a numberline

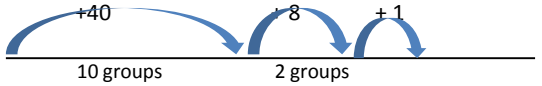
Children need to be able to partition (separate a number into tens and units) the number being divided in different ways.

48 ÷ **4 = 12**



Remainders

49 ÷ 4 = 12 r1



Sharing – 49 shared between 4. How many left over?
Grouping – How many 4s make 49. How many are left over?

Place value counters can be used to support children apply their knowledge of grouping.
For example:
60 ÷ 10 = How many groups of 10 in 60?
600 ÷ 100 = How many groups of 100 in 600?

Parent Activities To Do At Home		
FS2/Year 1	**Year 2**	**Year 3**
Play simple counting games such as: • snakes and ladders • counting buttons • choose two dominoes and count the total number of spots  **Play simple ordering games such as:** • choose ten buttons and order them by size from smallest to largest • from a pack of cards take out the Jacks, the Queens and the Kings and shuffle up the numbered cards. Choose any ten of them and put them in order **Play simple pattern-making games such as:** • with a collection of tiddlywinks make patterns such as 2 red,1 blue, 2 red 1 blue… • make patterns out of ten tiddlywinks **Play simple sorting games such as:**	**Game of 'pairs'** • Turn over two dominoes so the total number of spots is 12 **Talk** • about shapes that can be found in the house **Play** • a game of estimating then measuring the lengths of objects in the house **Play** • a game of ordering everyday objects according to their weight, and then weigh them **When** • someone opens a door, talk about the angle the door has turned through **Draw** • your child's attention to the clock so they learn to match times with events **Talk** • about what whole numbers mean when they appear in everyday situations such as; car number plates, road signs, on a clock face, a flat or a house number. For example, counting out odd and even house numbers on a street **Play** • a game of 'find the number' somewhere in the house or on way to school. **Look at** • http://www.coolmath4kids.com/ or	**Make a calculation:** • from a pack of cards (without the tens, the Jacks, the Queens and the Kings) play a game where each player is dealt four cards and everyone has 1 minute to make up a calculation using cards they have in their hand so the answer is the value of the next card turned over • a scoring system can be used such as 1 point for using two cards, 2 points for using three cards and 3 points for using all four cards **Dice bingo:** • throw 2 dice and multiply the numbers together • cross off the numbers on a 'Bingo' card, such as: **Talk** • about numbers that you see on packets or tins of food. This could include talking about how healthy different foods are **Identify** • symmetrical objects, for example, look for symmetrical wheel trims on cars **Find** • out how many millilitres different containers hold, such as a cup, perhaps estimating answers first then using a measuring jug to check the estimates **Use** • a real clock to talk about the times certain events happen at home, for example, getting up in the morning, meal times, etc. Also, you could talk about times when certain television or radio programmes begin and end, and how long they last for **Help**

- sorting a collection of buttons,shells or leaves by colour or by size

Lay the table for a meal. Ask children to:

- select the correct number of items and matching them.

Play with wooden blocks. Ask children to:

- build towers and other structures. Is it possible to build two towers of the same height, whatever number of blocks you start with?

From a pack of cards (without the tens, the Jacks, the Queens and the Kings)

- play a game of pairs where you try to turn over two cards that add up to 10

When you go to the shops...

How many blue cars can you see?
What numbers do you spot on signs? How many more items do we need to buy?
What change will we get back? What number bus do we need to get on?
What number is the house? (learning about even/odd numbers)
What number will the next house be? Can you guess?
We picked up 5 apples but we need 7 so how many more do we need?

http://www.bbc.co.uk/schools/ks1bitesize/numeracy/ for ideas.

Encourage

- children to handle money.

Play

- fun board games with your children like dominoes, snakes and ladders, snap, connect 4, uno.

- when cooking by measuring ingredients and using the timer.

Play

- Connect 4, Uno, Battleships.

Practise

- multiplication tables or play multiplication songs (2, 3, 4, 5, 6, 7, 10 multiplication table).

Encourage

- your child to handle money. Ask questions...How much more do we need? How much change will we get? How many of these can we afford?

Play

- computer games with your children. Look at http://www.coolmath4kids.com/ or http://www.bbc.co.uk/schools/ks2bitesize/maths/ for ideas.