

Additional Notes

This is a working document and will be adapted by all of us as we use it.

When showing any calculation with the manipulatives, make sure you have the written calculation alongside it.

Vocabulary

- = equal to/is the same as Idea of balance so that one side is the same/equal to the other side. It's not to show where the answer goes! You can only have two equal signs on the same line if the calculations are actually equal. For example, $8 + 5 = 8 + 2 + 3 = 13$
- The 'sum' should only be used when referring to the operation of addition. 2×4 is an example of a number sentence or a calculation (it is not a sum).
- A number is made of digits. For example, the number is 58 (fifty-eight). Whereas the 5 is a digit not the number within this example.
- A digit is any one of these symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. For example, the number 23 is written with two digits, 2 and 3.
- 0.12 reads zero point one two not zero point twelve (unless in the context of money).

Other points to consider

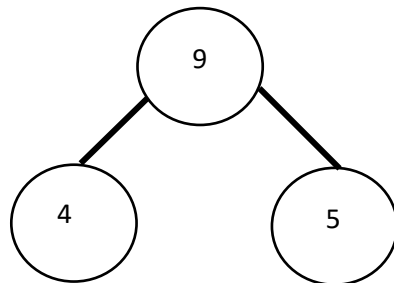
- Place value – the decimal point doesn't move. The digits move! When writing 0.105 the 0 in the ones column isn't a place holder it is there to highlight the decimal point whereas the 0 in the hundredths column is a place holder.
- Be aware that you can partition in different ways. For example, $94 = 90 + 4$
 $= 80 + 14$
 $= 70 + 24$ etc
- Manipulatives should be used for a short time to show the structure (not to work out the answer) and they shouldn't be relied upon.
- When writing challenges and modelling to the children, give a context to the maths as much as possible. For example, link to money, measure etc when you can.
- When writing number sentences using decimal points, please ensure they are modelled in the middle not on the line like a full stop.
- Children should be making decisions on whether to use a mental or written method themselves. They should ask themselves, "Can I do this in my head?" first before attempting a problem using a written method.
- When you're mentally adding you begin with the tens then go to the ones (largest column first). However, when using a written method, you would start with the ones column and then do the tens column (smallest column first). This is only for neatness though. It doesn't affect the maths.

Addition

Year 1

- Children need to be able to recall the number bonds to 6, 7, 8, 9 and 10 so they are aware that the numbers can be made in several different ways. For example, 6 can be 6 and 0, 5 and 1, 4 and 2 and 3 and 3.
- This can be linked to part/whole models e.g. the Bar Model.

9	
4	5



$$\begin{aligned}4 + 5 &= 9 \\5 + 4 &= 9 \\9 - 5 &= 4 \\9 - 4 &= 5\end{aligned}$$

$$\begin{aligned}9 &= 4 + 5 \\9 &= 5 + 4 \\5 &= 9 - 4 \\4 &= 9 - 5\end{aligned}$$

Year 2

- Children need to be able to recall the number bonds to 11, 12, 13, 14, 15, 16, 17, 18, 19 and 20 so they are aware that the numbers can be made in several different ways.
- Children need to be very aware of the inverse relationship between addition and subtraction so that they can find fact families e.g.

17	
4	13

- $4 + 13 = 17$ $13 + 4 = 17$ $17 - 4 = 13$ $17 - 13 = 4$ $17 = 13 + 4$ $17 = 4 + 13$ $4 = 17 - 13$ $13 = 17 - 4$
- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- When using the formal written method there should be no carrying initially and then later there should only be carrying from the ones into the tens.
- As well as round and adjust, use the equal sum strategy. For example, $25 + 29$ can be changed to $24 + 30$ (do practically first so children can see the link).

Year 3

- H, T, O
- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- Consider the numbers you use for calculations starting with no carrying, carrying from the ones only, carrying from the tens only and then both. Also consider the use of zero in your calculations as children need to be exposed to this.

Year 4

- Th, H, T, O
- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- As year three but progressing to hundreds for carrying.
- Consider challenges where the children have to choose whether to use mental or written methods and the children should discuss the most efficient method.

Years 5 and 6

- Y5 More than TH, H, T, O
- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- Consider the numbers you use for calculations, in order to ensure progression of difficulty especially when carrying. Also consider the use of zero in your calculations as children need to be exposed to this.
- Consider challenges where the children have to choose whether to use mental or written methods and the children should discuss the most efficient method.

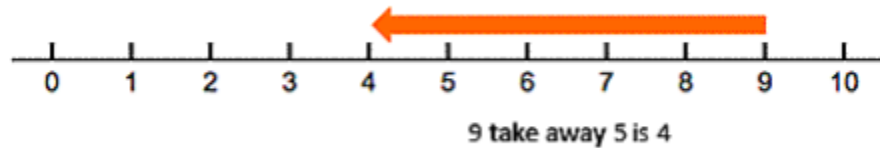
Subtraction

Subtraction has two parts: take away and find the difference. Difference is a big concept and should not be underestimated.

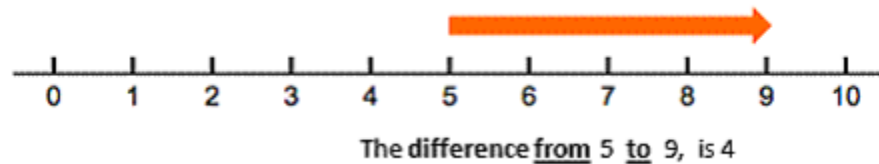
Language alert – When using the formal written methods, avoid saying you can't subtract 8 from 3 (for example), instead say you haven't got enough so need to exchange.

Year 1

- 9 take away 5 – the answer is on the number line = 4

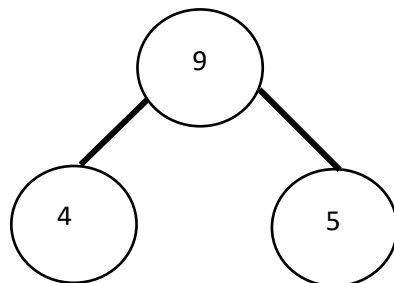


However, when finding the difference, you are actually asking yourself what do I add to 5 to make 9 and are therefore counting the steps.



This can be linked to part/whole models e.g. the Bar Model.

9	
4	5



$$\begin{aligned}4 + 5 &= 9 \\5 + 4 &= 9 \\9 - 5 &= 4 \\9 - 4 &= 5\end{aligned}$$

$$\begin{aligned}9 &= 4 + 5 \\9 &= 5 + 4 \\5 &= 9 - 4 \\4 &= 9 - 5\end{aligned}$$

Year 2

- T, O
- Children need to be very aware of the inverse relationship between addition and subtraction so that they can find fact families e.g.

17	
4	13

$$4 + 13 = 17 \quad 13 + 4 = 17 \quad 17 - 4 = 13 \quad 17 - 13 = 4 \quad 17 = 13 + 4 \quad 17 = 4 + 13 \quad 4 = 17 - 13 \quad 13 = 17 - 4$$

- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- Consider your examples when using the formal written method - no exchanging to begin with, then just exchanging the tens.
- When using the formal written methods, avoid saying you can't subtract 8 from 3 (for example), instead say you haven't got enough so need to exchange.

Year 3

- H, T, O but remember to subtract a 2 digit from a 3 digit number as well.
- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- Consider your examples when using the formal written method - no exchanging to begin with, then just exchanging the tens, then the hundreds and lastly both.
- When using the formal written methods, avoid saying you can't subtract 8 from 3 (for example), instead say you haven't got enough so need to exchange.

Year 4

- Th, H, T, O but remember to subtract 2 and 3 digit numbers from a 4 digit as well.
- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- Consider your examples when using the formal written method - no exchanging to begin with, then just exchanging the tens, then the hundreds, then the thousands and lastly all.
- When using the formal written methods, avoid saying you can't subtract 8 from 3 (for example), instead say you haven't got enough so need to exchange.

Years 5 and 6

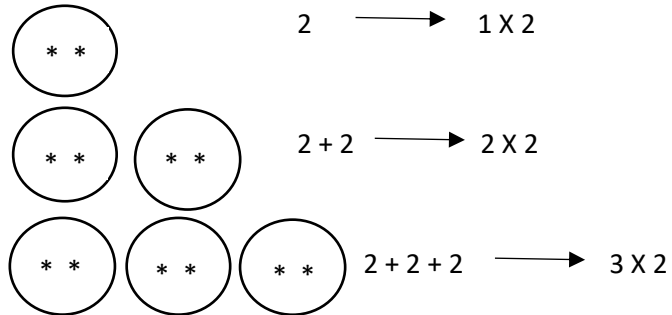
- Use of part/whole and bar models to explore relationship between addition and subtraction and to support problem solving.
- Teach to the children about equal difference (see separate document).
- When using the formal written methods, avoid saying you can't subtract 8 from 3 (for example), instead say you haven't got enough so need to exchange.

Multiplication

Year 1

- Make explicit link between multiplication and repeated addition. For example, using the frogs and lily pads so it's 2 + 2 + 2 so 3 (lily pads) lots of 2 (frogs).

Year 2



Break down each times table in this way with the children to develop conceptual understanding.

- Use of bar models to explore relationship between multiplication and division and to support problem solving.

Year 3

- Break down each times table for your year group (as above) with the children to develop conceptual understanding.
- Begin to explore multiplying by 0.
- Use of bar models to explore relationship between multiplication and division and to support problem solving.
- The formal written method needs to begin with looking at the mental method $4 \times 13 = 4 \times 10 + 4 \times 3 = 40 + 12 = 52$

This progresses to

$$\begin{array}{r} 13 \\ \times 4 \\ \hline 12 \quad (4 \times 3) \\ \underline{40} \quad (4 \times 10) \\ \hline 52 \end{array} \longrightarrow \begin{array}{r} 13 \\ \times 4 \\ \hline \underline{52} \\ \hline \end{array}$$

Language

4 lots of 3 = 12 (1 ten and 2 ones)

4 lots of 1 ten = 4 tens

Plus the 1 ten = 5 tens

Year 4

- Hundreds, tens and ones multiplied by ones.
- Multiply by 10 and 100.
- Develop using related facts to multiply. For example, 60×4 - use $6 \times 4 = 24$ $60 \times 4 = 6 \times 10 \times 4 = 24 \times 10 = 240$
- Use of bar models to explore relationship between multiplication and division and to support problem solving.

Years 5 and 6

- When modelling the formal written method, start with the ones first, followed by the tens.

$$\begin{array}{r} 243 \\ \times 36 \\ \hline \end{array} \quad \begin{array}{r} 243 \\ \times \quad 6 \\ \hline \end{array}$$

(6 x 243)

$$\begin{array}{r} 243 \\ \times \quad 3 \\ \hline \end{array}$$

(30 x 243)

_____ then x 10

$$\begin{array}{r} 243 \\ \times 36 \\ \hline 1458 \\ \underline{7290} \\ 8748 \\ \hline \end{array}$$

(6 X 243)

(30 X 243)

Language

Show $3 \times 10 = 30$

The 3 has moved so with the written method, we put the place holder in first.

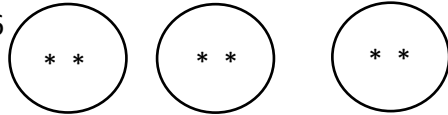
- Use related facts (see year 4).
- Use of bar models to explore relationship between multiplication and division and to support problem solving.

Division

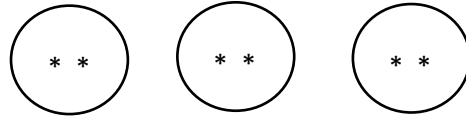
Division has two parts: sharing and equal grouping (which links to times tables).

Year 1

- Sharing $3 \times 2 = 6$ 3 lots of $2 = 6$



$$6 \div 3 = 2$$



Whereas grouping - $6 \div 3 = 2$ How many groups?



- Give children lots of different contexts: teddies, farmers, cubes etc.

Year 2

- Use of bar models to explore relationship between multiplication and division and to support problem solving.

Year 3

- Tens and ones divided by ones.
- Use of bar models to explore relationship between multiplication and division and to support problem solving.
- $64 \div 4 =$ When calculating using the formal written method of short division, write the 64 first, then the bus stop (and say, "Divided by...") and then lastly put the 4.
- Language – 6 tens put into groups of 4 is 1 group and 2 tens are left over. These are exchanged or regrouped into the ones, giving you 24 ones altogether. 24 put into groups of 4 makes 6 groups so altogether I have 16 groups (this language links to the manipulatives).
- No remainder when using formal written method (bus stop) but can calculate remainders when using manipulatives.
- Explore remainders with manipulatives.
- See Calculations Policy 2018 folder (Division 1 and 2 flipcharts for examples).

Year 4

- Hundreds, tens and ones divided by ones.
- Build in remainders once secure even though NC says no remainders.
- Use Place value counters initially but children should then be using the formal written method (bus stop) to divide. See language in year 3.
- Use of bar models to explore relationship between multiplication and division and to support problem solving.
- See Calculations Policy 2018 folder (Division 3, 4 and 5 flipcharts for examples).
- Divide by 10 and 100 going into hundredths.

Year 5

- Divide a four digit by a one digit.
- Only using formal written method of short division (don't use long division).
- Produce remainders as remainders (NC objective) and as fractions (NC doesn't require this).
- Interpret remainders in contexts (Do I need the extra car/box? etc).
- Use of bar models to explore relationship between multiplication and division and to support problem solving.

Year 6

- Divide a 4 digit by a 2 digit.
- Use formal method for short division (bus stop). List multiples (of divisor) first ((list 1, 10 and 5. Then 2, 4, 6 and 8. Then 3, 7 and 9) it may not be necessary to list all multiples).
- Express remainders as remainders, fractions, decimals and interpret remainders for both short and long division.
- Use of bar models to explore relationship between multiplication and division and to support problem solving.