

Calculation Workshop

Monday 13th March 2023

Aims and objectives

- To share with parents the strategies and method employed at school so that they are mirrored at home.
- To give parents the knowledge and skill to develop their children's understanding of calculation methods.

Calculating in the Early Years

There are four skills we consider to be the essential foundations to counting:

- 1) Pattern
- 2) subitising
- 3) comparison
- 4) classification.

Children are not asked to “count reliably numbers 1 to 20...” anymore but to:

“Have an understanding of number to 10, linking names, numerals, their value and their position in the counting order”

(Yes! It's all about the value behind the numerals at last.)

“Subitise (recognise quantities without counting) up to 5”

ELG: Number

Children at the expected level of development will:

- have a deep understanding of number to 10, including the composition of each number;
- subitise (recognise quantities without counting) up to 5;
- automatically recall (without reference to rhymes, counting or other aids)
- number bonds up to 5 (including subtraction facts)
- some number bonds to 10, including double facts

ELG: Numerical Patterns

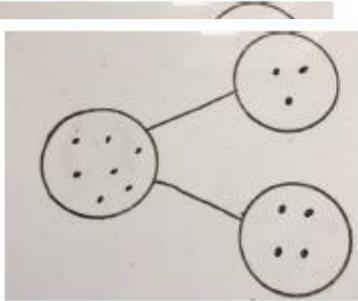
Children at the expected level of development will:

- verbally count beyond 20, recognising the pattern of the counting system;
- compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity;
- explore and represent patterns within numbers up to 10, including evens and odds, double facts and how quantities can be distributed equally

Children are encouraged to use objects to support the calculation (Concrete)

They are then supported to use pictorial representations for example, part, part whole. (Pictorial)

Then to put the biggest number in their head and count on. (Abstract)



Yr 1 Addition

Year 2

Column method with regrouping

Solve problems with addition and subtraction:

- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- applying their increasing knowledge of mental and written methods.

Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100.

Add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

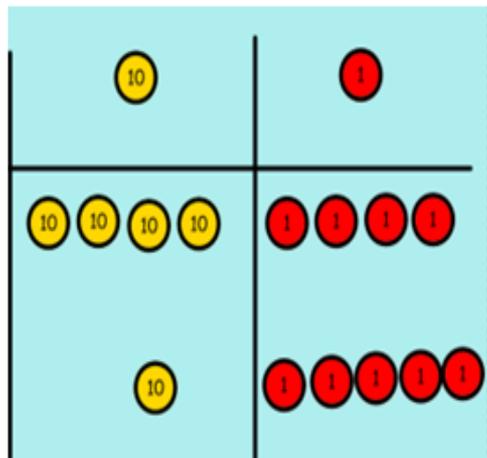
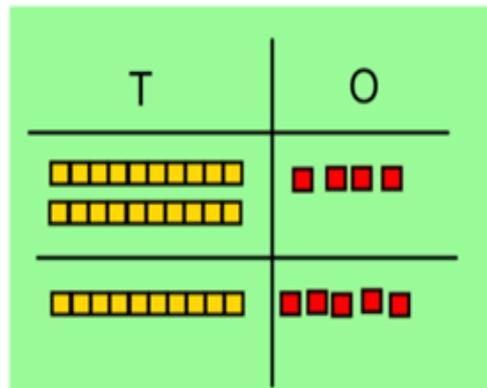
- a two-digit number and ones
- a two-digit number and tens
- two two-digit numbers
- adding three one-digit numbers.

Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.

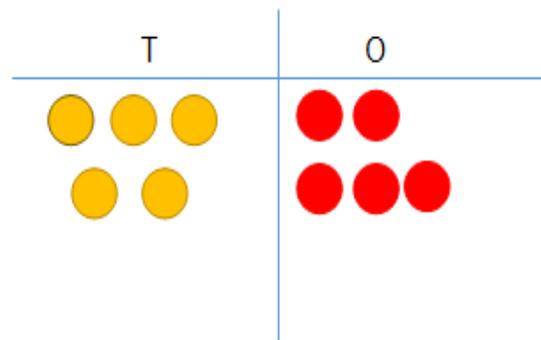
Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

$$24 + 15 =$$

Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.



After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.



Calculations

$$21 + 42 =$$

$$\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$$

Language

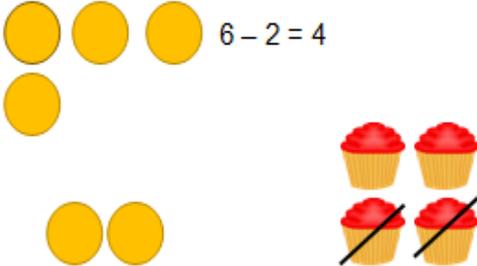
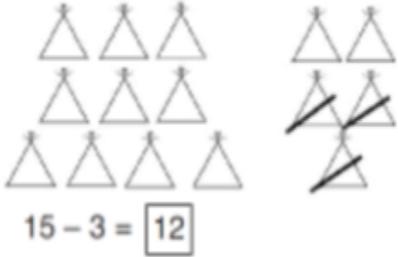
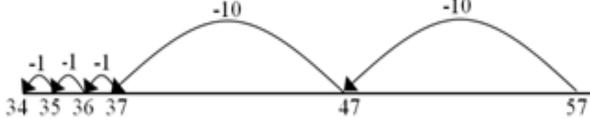
- +, add, more, plus
- make, sum, total
- altogether
- score
- double, near double
- one more, two more... ten more
- how many more to make...?
- how many more is... than...?
- how much more is...?

Steps to proficiency

- Addressing misconceptions. Does the answer make sense?
If I am adding, will the total be bigger or smaller?
- Quick recall is vital. Counting one by one is not the most efficient method.
- Missing number questions –
 - 3 add what is 5?
 - I have got 6, how many more do I need to get to 10?
- Number bonds to 10 and 20.
- Variation learning.
- Part of everyday play and conversation.
- Educational apps.



Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
<p>EY Taking away ones When this is first introduced, the concrete representation should be based upon the diagram. Real objects should be placed on top of the images as one – to – one correspondence so that pupils can take them away, progressing to representing the group of ten with a tens rod and ones with ones cubes</p>	<p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  <p>6 – 2 = 4</p>	<p>Cross out drawn objects to show what has been taken away.</p>  <p>15 – 3 = 12</p>	<p>8 – 1 = 7</p> <p>5 – 1 = 4</p>
<p>Year 1 Counting back Subtracting 1, 2, or 3 by counting back Pupils should be encouraged to rely on number bonds knowledge as time goes on, rather than using counting back as their main strategy</p>	<p>Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.</p>  <p>13 – 4</p> <p>Use counters and move them away from the group as you take them away counting backwards as you go.</p> 	<p>Count back on a number line or number track</p>  <p>9 10 11 12 13 14 15</p> <p>Start at the bigger number and count back the smaller number showing the jumps on the number line.</p>  <p>34 35 36 37 47 57</p> <p>This can progress all the way to counting back using two 2 digit numbers.</p>	<p>Put 13 in your head, count back 4. What number are you at? Use your fingers to help.</p>

Year 2

Find the difference

Solve problems with addition and subtraction:

- i. using concrete objects and pictorial representations, including those involving numbers, quantities and measures
- ii. applying their increasing knowledge of mental and written methods.

Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100.

Add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

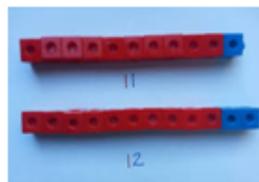
- i. a two-digit number and ones
- ii. a two-digit number and tens
- iii. two two-digit numbers
- iv. adding three one-digit numbers.

Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot.

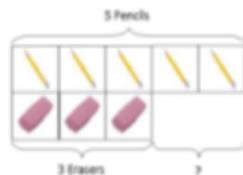
Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems.

Part Whole Model

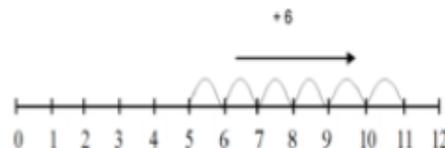
Compare amounts and objects to find the difference.



Use cubes to build towers or make bars to find the difference



Use basic bar models with items to find the difference

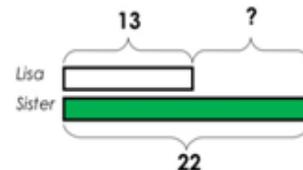


Count on to find the difference.

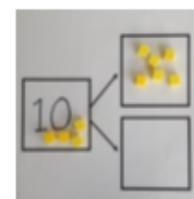
Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.

Comparison Bar Models

Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.



Draw bars to find the difference between 2 numbers.

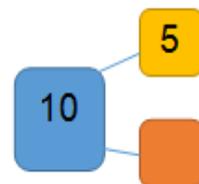
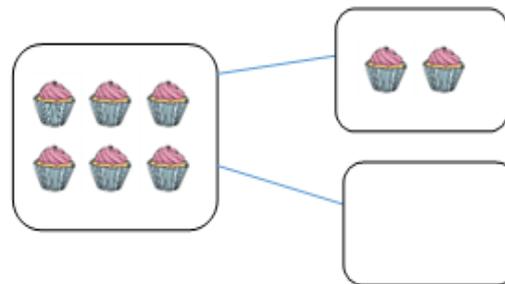


Link to addition- use the part whole model to help explain the inverse between addition and subtraction.

If 10 is the whole and 6 is one of the parts. What is the other part?

$$10 - 6 =$$

Use a pictorial representation of objects to show the part whole model.



Move to using numbers within the part whole model.

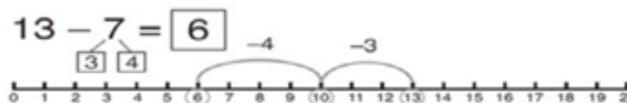
Make 10

As with addition, chd see that it is more efficient to subtract to get to ten first then subtract again from ten. Knowledge of number bonds to and from ten and twenty are vital.

$14 - 9 =$



Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.



Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.

$16 - 8 =$

How many do we take off to reach the next 10?

How many do we have left to take off?

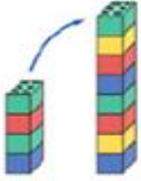
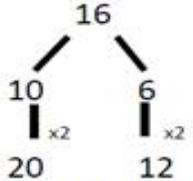
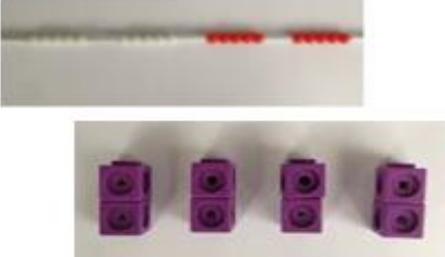
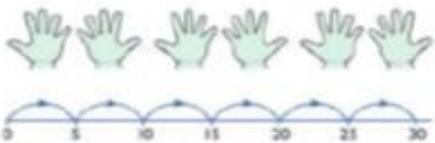
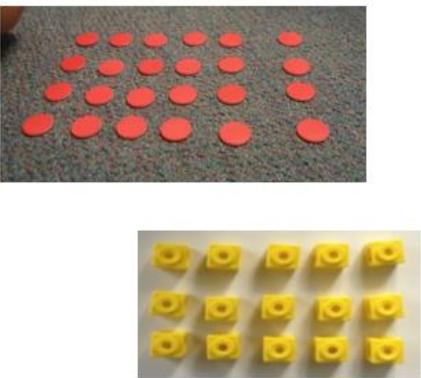
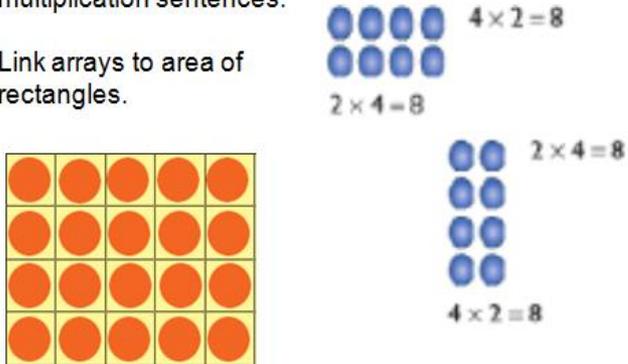
Language

- –, subtract, take (away), minus
- leave
- how many are left/left over?
- how many have gone?
- one less, two less, ten less...
- how many fewer is... than...?
- how much less is...?
- difference between

Steps to proficiency

- Addressing misconceptions. Does the answer make sense? If I am subtracting, will the total be bigger or smaller?
- Can you switch numbers when subtracting like you can when adding?
- Understanding difference.
- Variation learning.
- Use of knowledge of number bonds to 10 and 20 to make links to subtraction fact. Fact families –
 - $6 + 4 = 10$ $10 - 4 = 6$
 - $4 + 6 = 10$ $10 - 6 = 4$
- Link to real life – There are 6 biscuits in the packet. If Daddy eats 4. How many are left for Yusuf?

Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
<p>Year 1 Doubling Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.</p>	<p>Use practical activities to show how to double a number.</p>  <p>double 4 is 8 $4 \times 2 = 8$</p>	<p>Draw pictures to show how to double a number.</p> <p>Double 4 is 8</p> 	 <p>Partition a number and then double each part before recombining it back together.</p>
<p>Counting in multiples</p>	 <p>Count in multiples supported by concrete objects in equal groups.</p>	 <p>Use a number line or pictures to continue support in counting in multiples.</p>	<p>Count in multiples of a number aloud.</p> <p>Write sequences with multiples of numbers.</p> <p>2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30</p>
<p>Arrays- showing commutative multiplication</p>	<p>Create arrays using counters/ cubes to show multiplication sentences.</p> 	<p>Draw arrays in different rotations to find commutative multiplication sentences.</p> <p>Link arrays to area of rectangles.</p>  <p>$4 \times 2 = 8$ $2 \times 4 = 8$ $2 \times 4 = 8$ $4 \times 2 = 8$</p>	<p>Use an array to write multiplication sentences and reinforce repeated addition.</p>  <p>$5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $3 \times 5 = 15$ $5 \times 3 = 15$</p>

Year 2

Repeated addition

Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.

Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs.

Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.

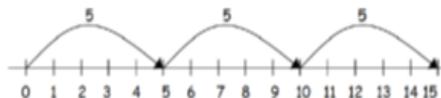


Use different objects to add equal groups.

There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?



2 add 2 add 2 equals 6



$$5 + 5 + 5 = 15$$

Write addition sentences to describe objects and pictures.



$$2 + 2 + 2 + 2 + 2 = 10$$

Arrays- showing commutative multiplication

Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.

Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

Create arrays using counters/ cubes to show multiplication sentences.



Draw arrays in different rotations to find **commutative** multiplication sentences.



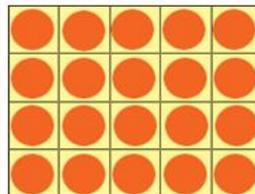
$$4 \times 2 = 8$$

$$2 \times 4 = 8$$



$$2 \times 4 = 8$$

$$4 \times 2 = 8$$



Link arrays to area of rectangles.

Use an array to write multiplication sentences and reinforce repeated addition.



$$5 + 5 + 5 = 15$$

$$3 + 3 + 3 + 3 + 3 = 15$$

$$5 \times 3 = 15$$

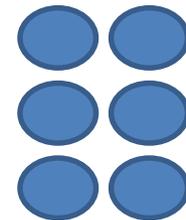
$$3 \times 5 = 15$$

Language

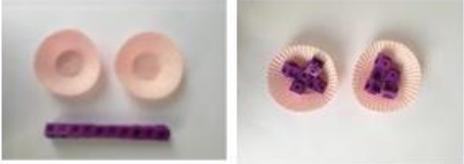
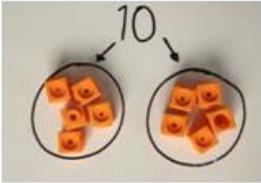
- lots of, groups of
- \times , times, multiply, multiplied by
- how many times have I got?
- once, twice, three times... ten times...
- repeated addition
- array
- double

Steps to proficiency

- Understanding commutative law –
 - $2 \times 3 = 6$ is the same as $3 \times 2 = 6$
- Learning by rote
- Multiplication songs
- Missing number –
 - $2 \times ? = 6$
- Show me how to represent 6 in an array -



Division

Objective and Strategies	Concrete	Pictorial	Abstract
<p>Year 1 Sharing objects into groups</p> <p>Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.</p>	  <p>I have 10 cubes, can you share them equally in 2 groups?</p>	<p>Children use pictures or shapes to share quantities.</p>  <div data-bbox="1000 625 1273 694" style="border: 1px solid black; padding: 5px; display: inline-block;">$8 \div 2 = 4$</div>	<p>Share 9 buns between three people.</p> $9 \div 3 = 3$

Year 2

Division as grouping

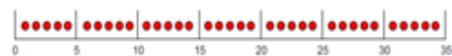
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Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (\times), division (\div) and equals ($=$) signs.

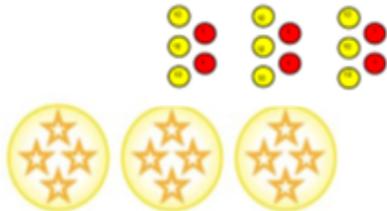
Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.

Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

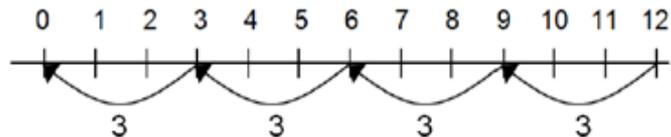
Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.



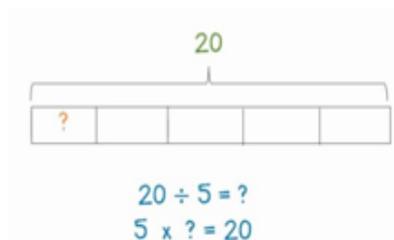
$$96 \div 3 = 32$$



Use a number line to show jumps in groups. The number of jumps equals the number of groups.



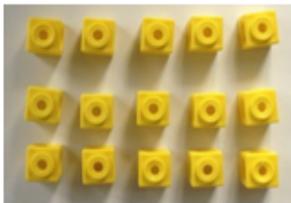
Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.



$$28 \div 7 = 4$$

Divide 28 into 7 groups. How many are in each group?

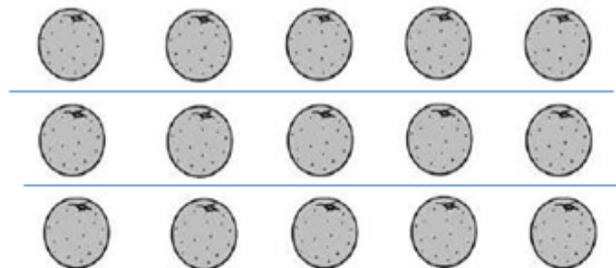
Division within arrays



Link division to multiplication by creating an array and thinking about the

number sentences that can be created.

$$\begin{array}{ll} \text{Eg } 15 \div 3 = 5 & 5 \times 3 = 15 \\ 15 \div 5 = 3 & 3 \times 5 = 15 \end{array}$$



Draw an array and use lines to split the array into groups to make multiplication and division sentences.

Find the inverse of multiplication and division sentences by creating four linking number sentences.

$$\begin{array}{l} 7 \times 4 = 28 \\ 4 \times 7 = 28 \\ 28 \div 7 = 4 \\ 28 \div 4 = 7 \end{array}$$

Language

- share, share equally
- one each, two each, three each...
- group in pairs, threes... tens
- equal groups of
- \div , divide, divided by, divided into
- left, left over
- halve

Steps to proficiency

- Understanding that groups must have equal amounts
- Make links between multiplication and division facts.

- Understanding inverse to master concepts
- Home school learning schemes
- Please take a copy of our calculation policy
- Parental input is vital

Thank you for coming.
Any questions?