Sandwood Primary School

Numeracy Policy

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NUMERACY POLICY

Rationale: Sandwood Primary School is committed to educating pupils to the highest possible standard. Our hardworking staff are dedicated to completing Continuous Professional Development to enhance learning and teaching experiences in Numeracy and Mathematics. We have embraced and are now embedding the Glasgow Counts approach to Numeracy and Mathematics at all stages in our school. These approaches are recognised as inclusive practices which are also embraced, where appropriate, in the LCR part of the school.

"Our fundamental aim is to fill our young minds with a sense of agency and endow them with the motivation, courage and belief in their power to influence their own futures. We are driven by a commitment to create pathways to enable all stakeholders to possess skills for life, learning and work." Glasgow Counts

We want our young people to engage with mathematics and build their comprehension of the subject across the curriculum.

Society requires young people who are sophisticated mathematical thinkers, pattern spotters and problem solvers. Therefore, we aim to empower our young people as mathematicians. We aim to provide opportunities for learning that promote deep engagement with all areas of numeracy and mathematics.

Our purpose is to offer a better way to build mathematical understanding in, and beyond, our classrooms."

(S. Morrow, G. McNeil & G. Meharg - 'Glasgow Counts Framework' 2016)

Aims:

To motivate all pupils with high quality learning and teaching experiences in order to raise attainment for all.

Our Key Aims:

- to use the CPA approach to develop conceptual understanding
- to develop problem solving, reasoning and fluency
- to create mathematical mindsets
- to develop mastery learning
- to engage in Maths Talk
- to meet the needs of all learners.
- to encourage family learning in the area of Numeracy and Mathematics

Implementation

Planning:

Forward Planners will be completed termly using the Glasgow Counts Framework overview. There is an overview for each stage and pupils should experience the expected tracker for their stage. Each unit of work from the framework is linked to the benchmarks and experiences and outcomes from A Curriculum for Excellence. Plans should show the concepts which will be taught to the whole class each term. Units of work should be planned carefully to make meaningful, relevant links in learning and to create engaging contexts.

The framework for Mathematics has been organised into the Curriculum Organisers in line with the CfE Experiences and Outcomes. Progression in Numeracy relies on learners developing an understanding of the intrinsic links across each of these organisers. As such, it is essential that progression within each organiser is not achieved in isolation of the others. Classroom planning should therefore focus on developing progressive learning experiences that draw from each of the organisers. All organisers should be experienced by pupils each term. Links can readily be made to other areas of the curriculum when teaching and developing numeracy and maths skills.

Methodology:

EFFECTIVE TEACHING AND LEARNING- Key Expectations

- Early learning of number should focus on oral and mental methods before moving to formal written methods. Moving to formal written methods before understanding is embedded does not effectively support the development of conceptual understanding and number sense.

- Oral mental methods of calculations should be explicitly taught to children and should not exclude them from writing down their working. Mathematical jottings are part of CfE E's and O's.
- When using oral mental methods children should have access to concrete materials and pictorial representations that support them in explaining and recording their thinking—these should be used across all stages/levels to both support and challenge learners.

- Children's understanding should continue to be supported throughout their school experience by the use of the concrete—pictorial—abstract approach.

- Children should be taught times tables with conceptual understanding and through the use of concrete resources and pictorial representations, e.g. counting stick, arrays, counters etc. Discovery and exploration should add value to memorisation of facts and children should be able to use their knowledge of these facts to support further knowledge development e.g. I know 7 x 6 so I can work out 7 x 600.

- Addition and subtraction are the inverse process of each and these skills should be developed together from the earliest age e.g. reciting forward and backward number sequences.

- Multiplication and division are the inverse process of each other and these skills should be developed together e.g. 5 jumps of 4 is 20 so 20 shared by 4 is 5. By developing this understanding our pupils will be able to add subtract, multiply and divide in a variety of ways and not necessarily in the standard written form.

Lesson structure

Lessons should follow ‘the Good Lesson’ Model; having a beginning (mental maths), middle and a plenary.

We promote the ‘Number Talks’ approach to developing mathematical literacy in the mental maths slot. Number practice should take place **every day** allowing children opportunities to explore and extend their understanding of number through talk, think and share. **Counting should take place for at least 5 minutes per day**. Number talk should be evident in our classrooms—children should be able to explain their thinking and strategies used to solve problems.

Misconceptions should be addressed within the same lesson or, day if possible. Appropriate use of Formative Assessment strategies should allow these to be identified.

Enablers should be provided during lessons allowing pupils to be empowered in their use of concrete and visual materials.

Glasgow Counts recommend that pupils choose from three levels of challenge differentiation – referred to as ‘the chilli challenge’.

Support for Learning

Pupils will have planned support from Class Teachers activities will be planned within a comprehensive programme of work. Pupils may be supported by Support for Learning Workers where appropriate. CLOL groups for Numeracy have been set up as part of Glasgow’s improvement challenge, pupils have been allocated to these as deemed appropriate from consultation from SLT, CLOL Numeracy and class based practitioners. Peer support, talk partners and group tasks are recommended at Teacher discretion. Concrete resource enablers and appropriate scaffolding should be provided as appropriate to meet individual pupil needs within the classroom.

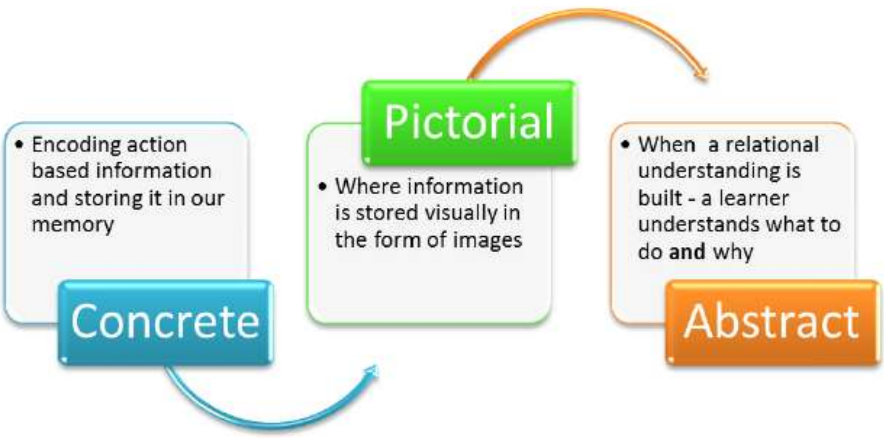
Key Pledges

Concrete- Pictorial- Abstract

We believe children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations then leading to formal methods. This method is known as the CPA (Concrete-Pictorial-Abstract) Approach.

The principle of the CPA Approach [Make it, Draw it, Write it] is for children to have a true understanding of a mathematical concept. This method has been recommended by the Glasgow Counts team and based on research from the world renound Singapore Maths programme.

Singapore Maths is based on recommendations from notable experts such as Jerome Bruner, Richard Skemp, Jean Piaget, Lev Vygotsky, and Zoltan Deines. Singapore Maths is based on ideas and research and delivered as a highly-effective programme of teaching methods and resources. Glasgow Counts have since developed a Progression Framework for Numeracy based on this research, which our teachers use to plan lessons.



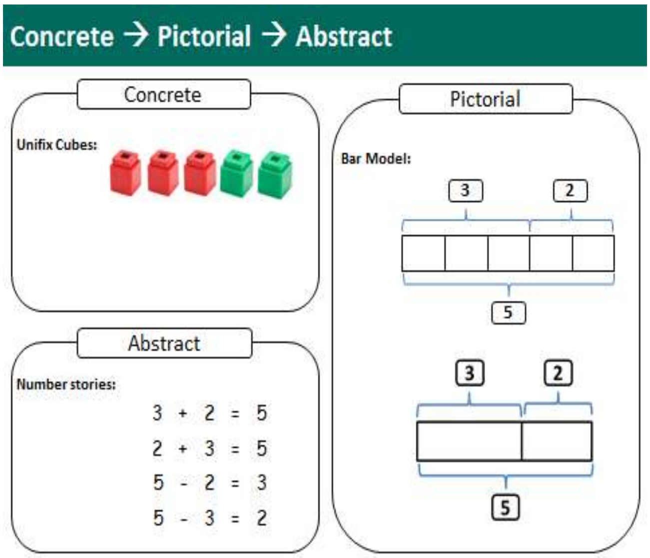
Problem Solving

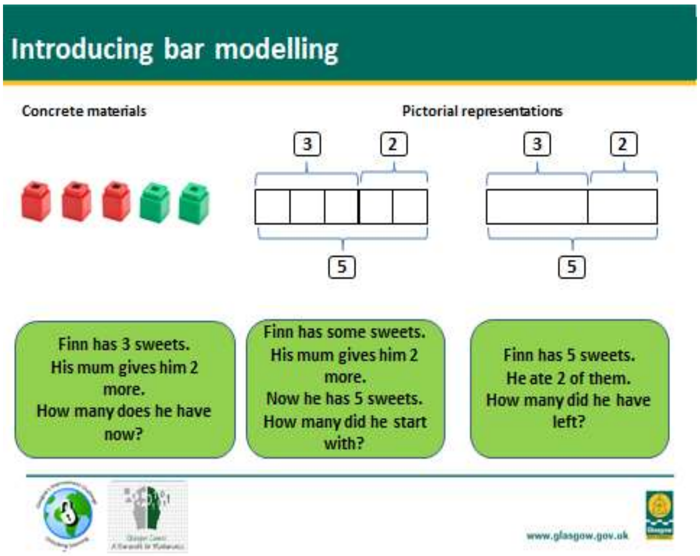
At Sandwood we believe that all children have the potential to succeed. We wish to deepen their conceptual understanding by tackling challenging and varied problems. Problem solving and reasoning should be the crux of every mathematics lesson and lessons should be based on a problem (anchor task) rather than this being a separate lesson.

Regular teaching of problem solving strategies is highly valued. It is recommended that these approaches are embedded within meaningful and relevant daily learning experiences. Teachers should apply these to a relevant context and these should not simply be taught in isolation. A number of strategies should be utilised in this with a focus upon developing the mathematical toolkit of each pupil. They should be able to select the most relevant strategy that fits the problem that they are trying to solve.

We promote the use of the Bar Model at our establishment as a consistent approach as it is considered as highly effective practice.

The bar model is introduced within the context of part – part – whole to solve problems that explore the relationship between addition and subtraction. Learners should be encouraged to analyse the actions and relationships within a problem and model these visually. Analysing the context of a problem rather than simply identifying mathematical language leads to deeper understanding and an enhanced ability to reason with and solve problems.





Assessment

A variety of assessment procedures are used within the school to establish a child's levels. Termly tracking assessments are completed by Class Teachers against the Glasgow Counts Framework Organisers. MALT assessments were carried out initially in September 2017 to establish a baseline and then carried out in May 2018 and are now completed annually. Teachers also use Formative Assessment to assess learner's on-going progress.

These are some of the assessment tools which can we use:

- Summative MALT Assessments (May)
- AiFL
- Teacher-made assessments to suit the needs of the learner
- TeeJay Maths Assessments
- Sumdog online assessments at end of a unit of work
- Learning Conversations held termly by SMT/ CLOL
- Photographic evidence
- SNSA

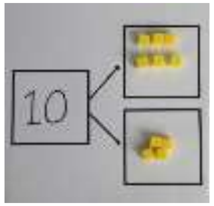
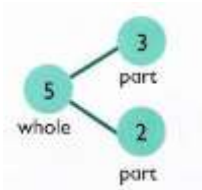
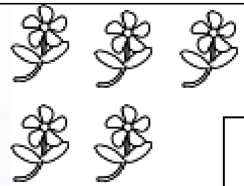
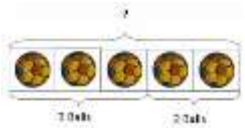
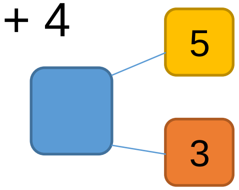
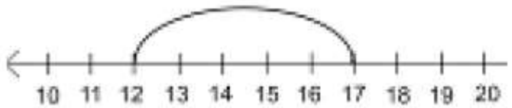
This Policy is supported by:

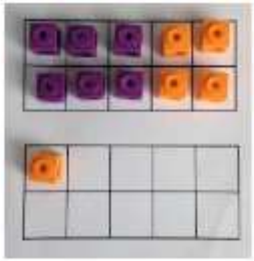
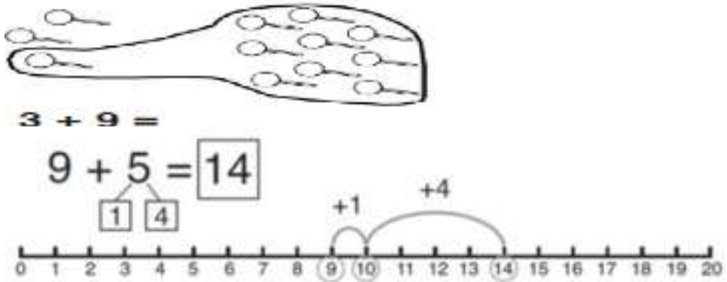
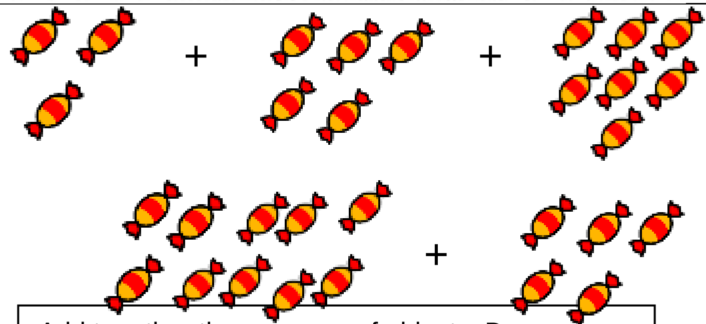
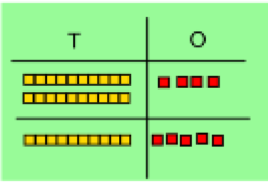
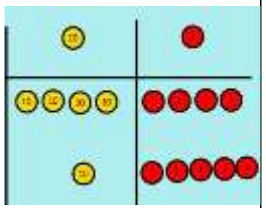
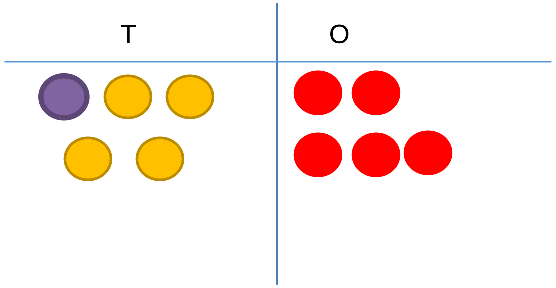
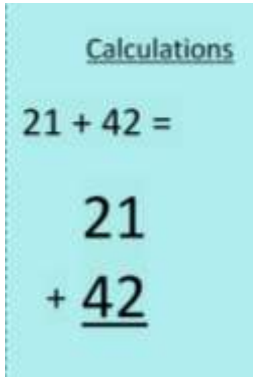
	Signed by	**Date**
The Senior Management Team	Head Teacher	
The Parent council	Chair of school council	
CLOL Numeracy	Class Teacher	
Pupil Council	Pupil representative	

Examples for staff: CPA through addition, subtraction, multiplication and division.

Progression in Calculations

Addition

Objective and Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part-whole model	   Use cubes to add two numbers together as a group or in a bar. 	  Use pictures to add two numbers together as a group or in a bar.  	4 + 3 = 7 10= 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.
Regrouping to make 10.	 6 + 5 = 11	Use pictures or a number line. Regroup or partition the smaller number to make 10.	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?

	 Start with the bigger number and use the smaller number to make 10.		
Adding three single digits	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 Add together three groups of objects. Draw a picture to recombine the groups to make 10.	$\underbrace{4 + 7 + 6}_{10} = \boxed{10} + \boxed{7}$ $= \boxed{17}$ Combine the two numbers that make 10 and then add on the remainder.
Column method- no regrouping	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. 	

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Column method- regrouping

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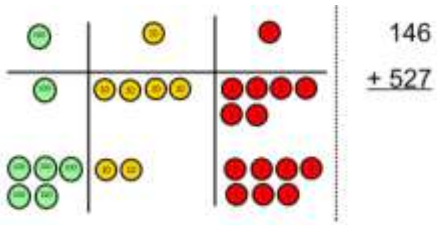
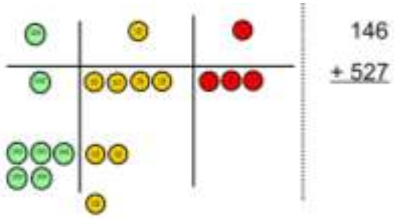
Make both numbers on a place value grid.



Add up the units and exchange 10 ones for one 10.



Add up the rest of the columns, exchanging the 10 counters from one column for the next place value column until every column has been added.

This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.

As children move on to decimals, money and decimal place value counters can be used to support learning.

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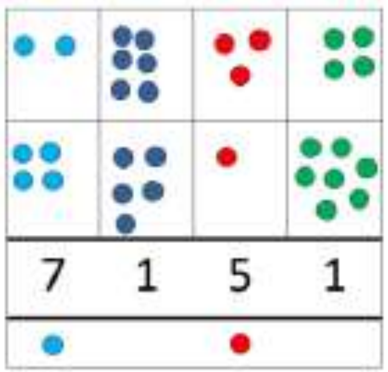
Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.



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Start by partitioning the numbers before moving on to clearly show the exchange below the addition.

20 + 5
40 + 8
60 + 13 = 73

536
+ 85
621
1 1

As the children move on, introduce decimals with the same number of decimal places and different. Money can be used here.

72.8
+ 54.6
127.4
1 1

£ 2 3 . 5 9
+ £ 7 . 5 5
£ 3 1 . 1 4
1 1 1

2 3 . 3 6 1
9 . 0 8 0
5 9 . 7 7 0
+ 1 . 3 0 0
9 3 . 5 1 1
2 1 2

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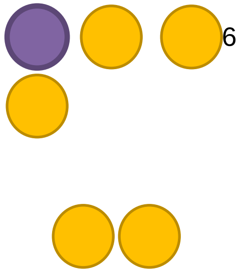
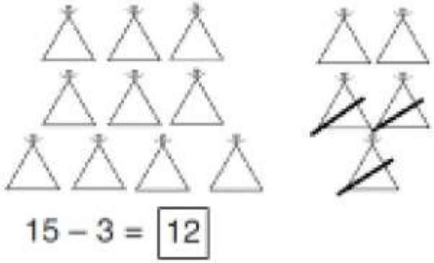
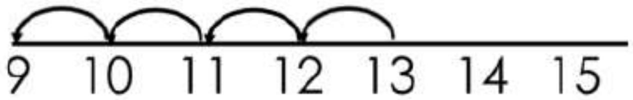
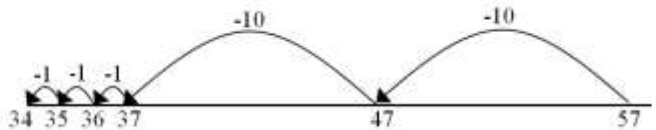
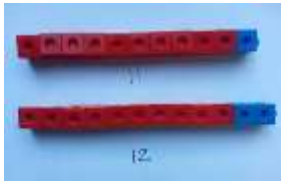
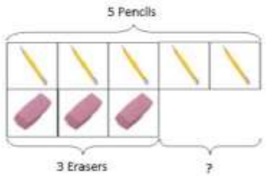
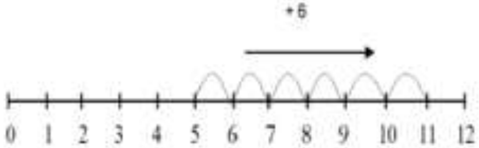
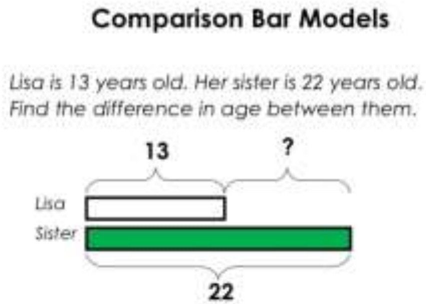
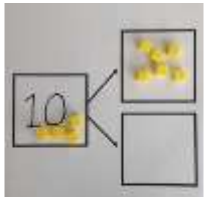
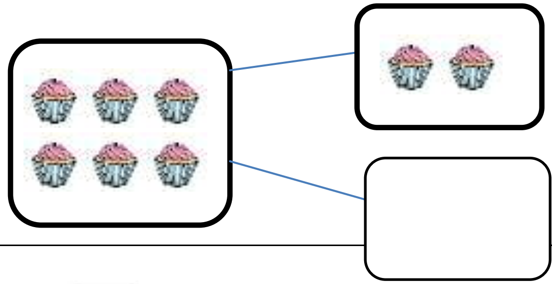
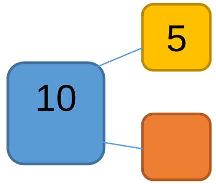
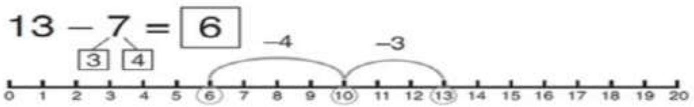
Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away.  6 – 2 = 4 	Cross out drawn objects to show what has been taken away.  	18 -3= 15 8 – 2 = 6
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4  Use counters and move them away from the group as you take them away counting backwards as you go. 	Count back on a number line or number track  Start at the bigger number and count back the smaller number showing the jumps on the number line.  This can progress all the way to counting back using two 2 digit numbers.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

Find the difference	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. Draw bars to find the difference between 2 numbers. 	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.
Part Part Whole Model	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 part whole model. 	 Move to using numbers within the part whole model.
Make 10	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?

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Column method without regrouping

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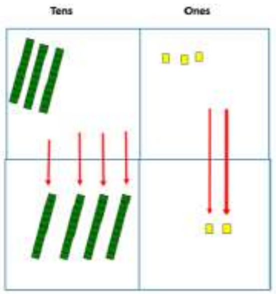
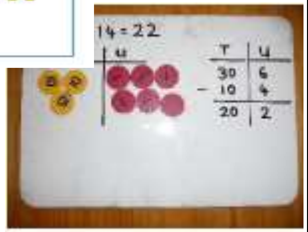


Use Base 10 to make the bigger number then take the smaller number away.



Show how you partition numbers to subtract. Again make the larger number first.
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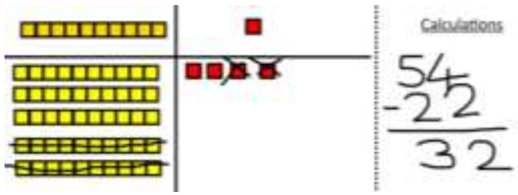
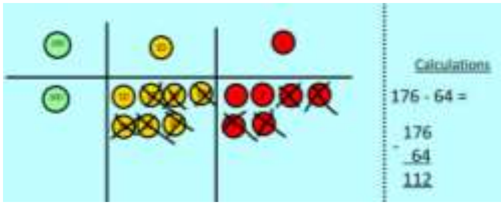


Draw the Base 10 or place value counters alongside the written calculation to help to show working.



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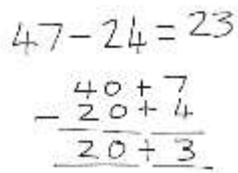
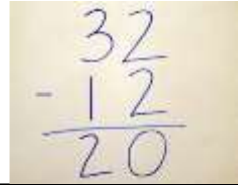


This will lead to a clear written column subtraction.



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Column method with regrouping

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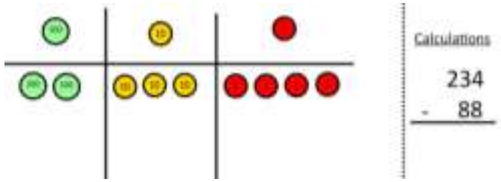
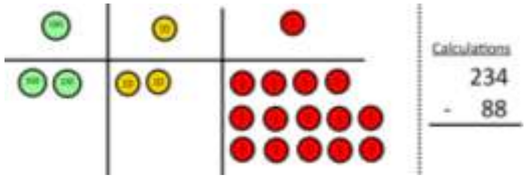
Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

Make the larger number with the place value counters



Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.



Now I can subtract my ones.
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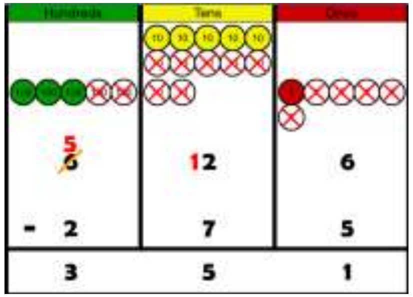

Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

When confident, children can find their own way to record the exchange/regrouping.

Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.
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Children can start their formal written method by partitioning the number into clear place value columns.

Moving forward the children use a more compact method.

This will lead to an understanding of subtracting any number including
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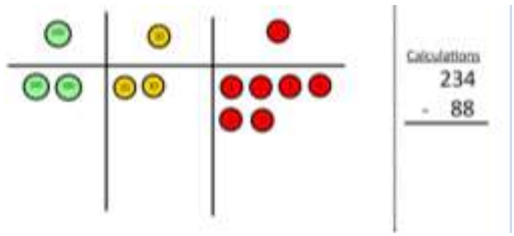
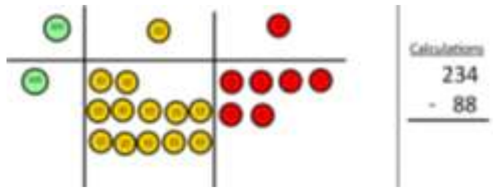
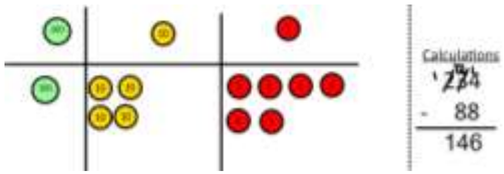
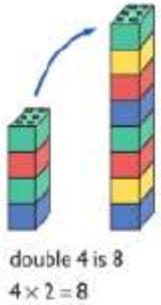
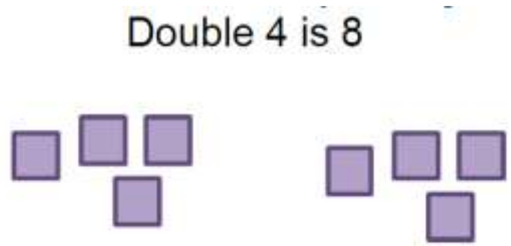
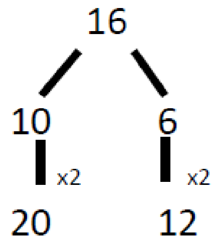
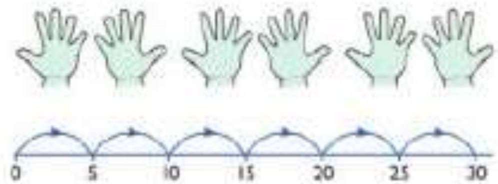
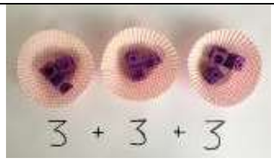
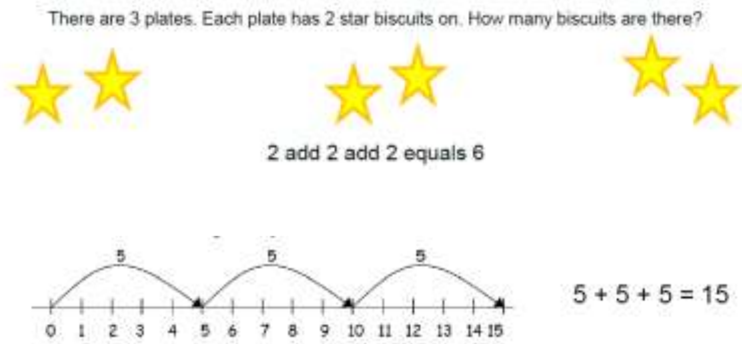
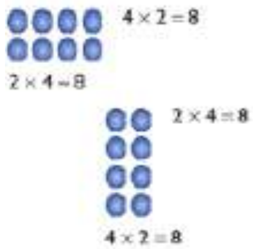
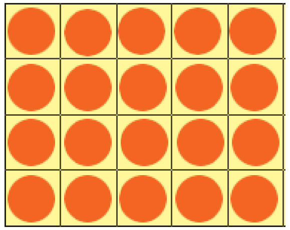
	 Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.  Now I can take away eight tens and complete my subtraction  Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.		decimals. $\begin{array}{r} 2\,\overset{5}{\cancel{6}}\,\overset{12}{\cancel{3}}\,.\,\overset{1}{0} \\ -\quad 2\,6\,.\,5 \\ \hline 2\,3\,6\,.\,5 \end{array}$

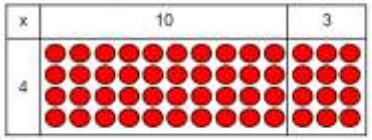
Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number. 	Draw pictures to show how to double a number. 	 Partition a number and then double each part before recombining it back together.
Counting in multiples	  Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30

Repeated addition	   Use different objects to add equal groups.	 	Write addition sentences to describe objects and pictures. 
Arrays- showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences.  	Draw arrays in different rotations to find **commutative** multiplication sentences.   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 x 3 = 15 3 x 5 = 15

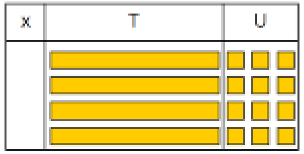
Grid Method

Show the link with arrays to first introduce the grid method.



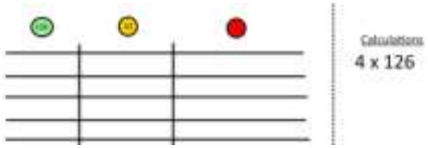
4 rows of 10
4 rows of 3

Move on to using Base 10 to move towards a more compact method.

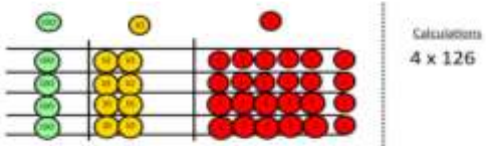


4 rows of 13

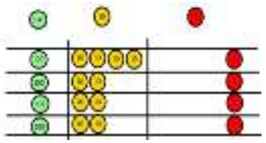
Move on to place value counters to show how we are finding groups of a number.We are multiplying by 4 so we need 4 rows.

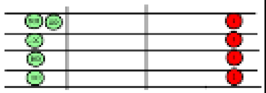


Fill each row with 126.



Add up each column, starting with the ones making any exchanges needed.

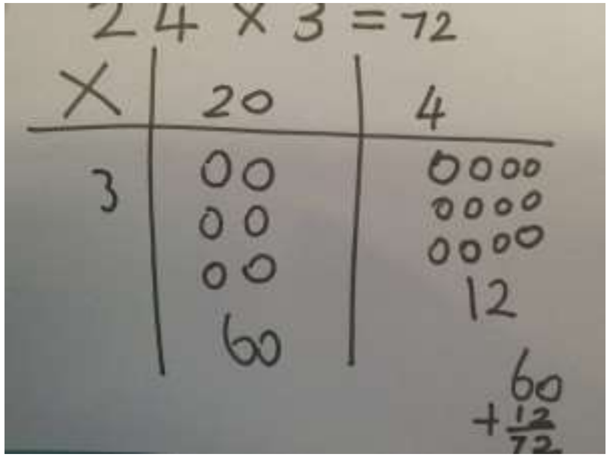




Then you have your answer.

Children can represent the work they have done with place value counters in a way that they understand.

They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.



Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

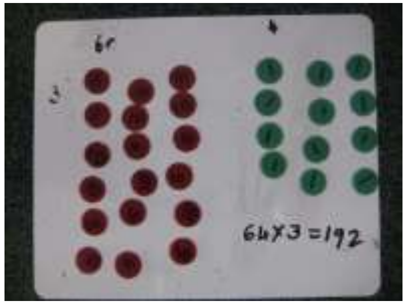
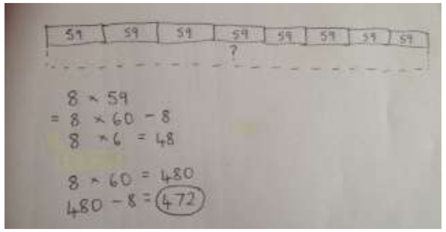
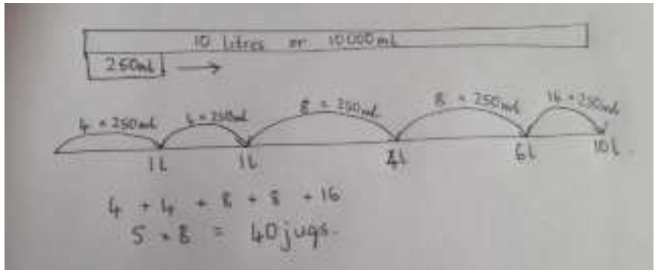
×	30	5
7	210	35

210 + 35 = 245

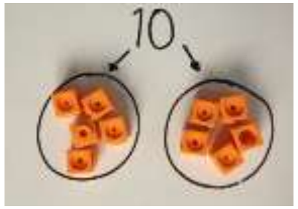
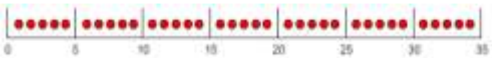
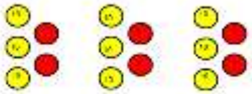
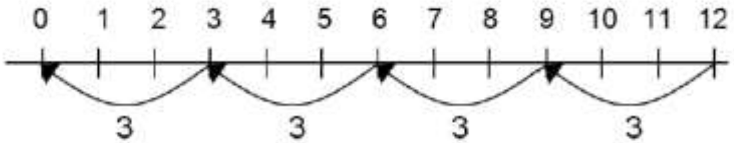
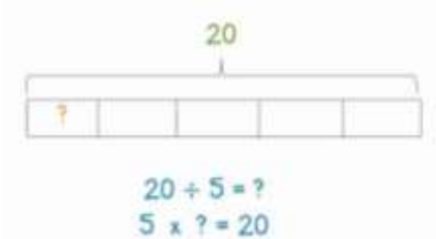
Moving forward, multiply by a 2 digit number showing the different rows within the grid method.

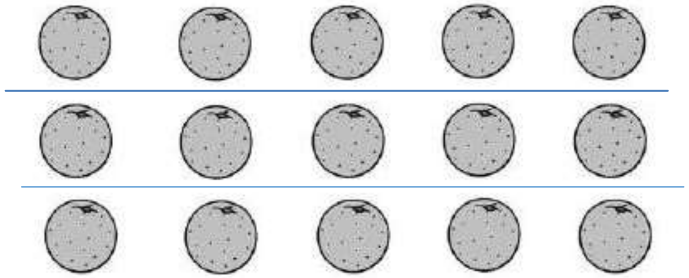
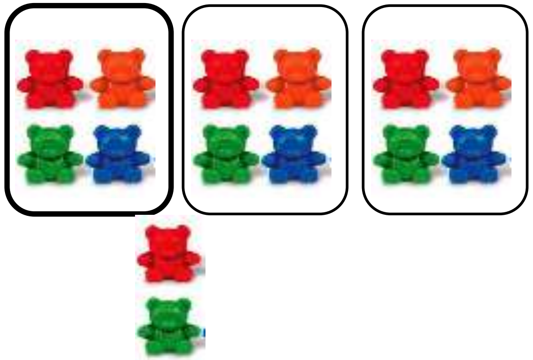
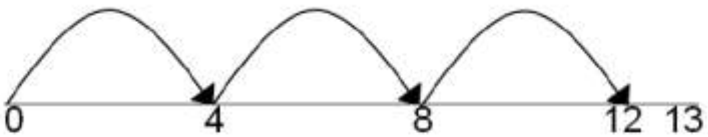
	10	8
10	100	80
3	30	24

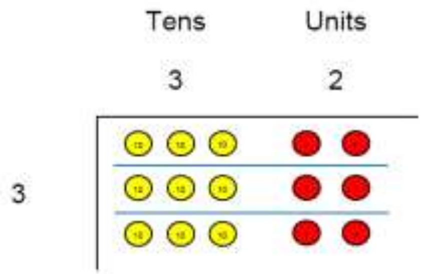
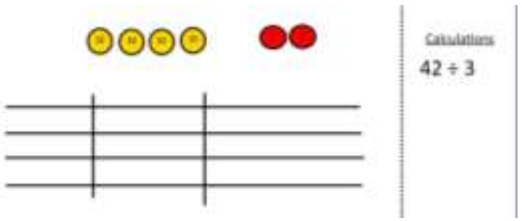
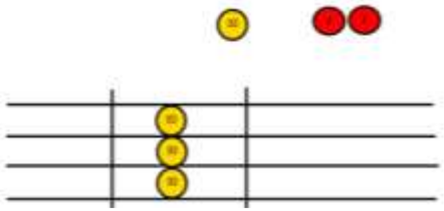
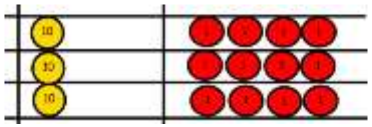
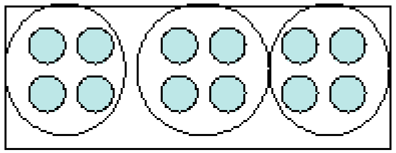
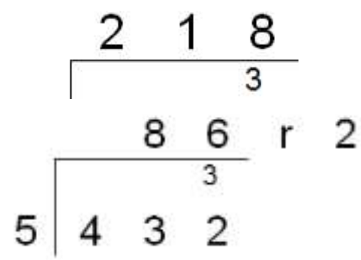
X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

## Column multiplication	Children can continue to be supported by place value counters at the stage of multiplication.  It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.	Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.   	Start with long multiplication, reminding the children about lining up their numbers clearly in columns. If it helps, children can write out what they are solving next to their answer. 32 x 24 8 (4 x 2) 120 (4 x 30) 40 (20 x 2) 600 (20 x 30) 768 7 4 x 6 3 1 2 2 1 0 2 4 0 + 4 2 0 0 4 6 6 2 This moves to the more compact method. 2 3 1 1 3 4 2 x 1 8 1 3 4 2 0 1 0 7 3 6 2 4 1 5 6 1

<u>Division</u>

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  $8 \div 2 = 4$	Share 9 buns between three people. $9 \div 3 = 3$
Division as grouping	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. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	 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. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7
Division with a remainder	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. 

Short division	 Use place value counters to divide using the bus stop method alongside  42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.  We exchange this ten for ten ones and then share the ones equally among the groups. We look how  much in 1 group so the answer is 14.	Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  Encourage them to move towards counting in multiples to divide more efficiently.	Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder. Finally move into decimal places to divide the total accurately.