# St Ives Infant School

## Calculation Policy 2016

July 2016

**St Ives Infant School**

**Our aim is to develop a curriculum to enable each child at St Ives Infant school to set out confidently on the adventure of learning: curious about the world, excited about their future, positive about their ability and caring towards other people.**

The 2014 national curriculum for mathematics has been designed to raise standards in maths, with the aim that the large majority of pupils will achieve mastery of the subject. Mathematics programme state that:

"All pupils should become fluent in the fundamentals of mathematics, including through varied and frequent practice, so that pupils develop conceptual understanding and are able to recall and apply their knowledge rapidly and accurately to problems.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. The decision about when to progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage.

Pupils who grasp concepts rapidly should be challenged through rich and sophisticated problems before any acceleration through new content. Those pupils who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on."

We are currently working on our school's vision statement for maths which, together with our calculation policy, will form part of our school's maths policy.

**Vision Statement**

**In Maths we aim to develop in children:**

- a positive attitude to learning mathematics
- an ability to think logically and the opportunity to deepen their learning using concrete and practical resources
- an ability to use a range of mental calculation strategies, aided by informal jottings
- an ability to think more deeply by reasoning, making connections and applying their maths skills to unfamiliar contexts
- the confidence to express ideas fluently using the language of mathematical concepts
- the ability to read and record mathematical statements using correct terminology and symbols
- the ability to apply mathematics across the curriculum and in real life
- the ability to work independently, as well as sharing ideas with others, and to sustain interest to solve a problem
- an enthusiasm and enjoyment for maths and an awareness that maths is fun!

# Progression in Calculations

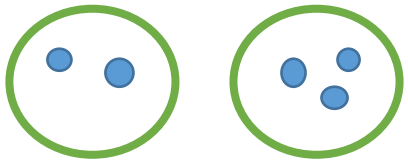
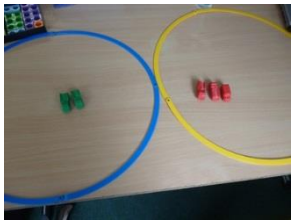
# Addition

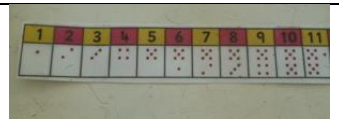
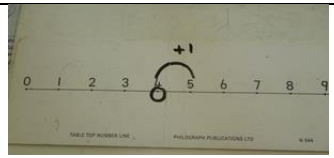
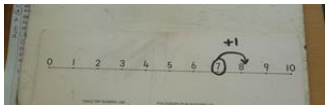
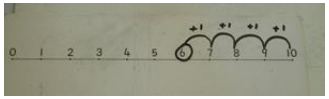
## Vocabulary

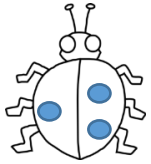
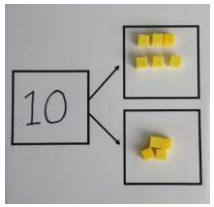
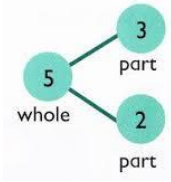
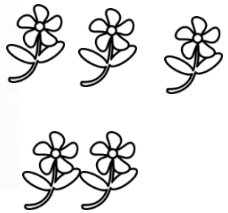
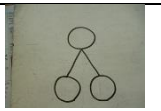
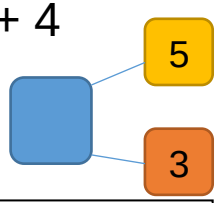
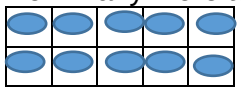
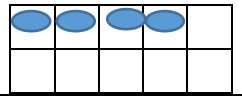
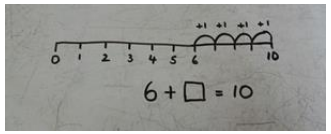
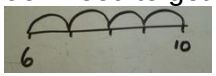
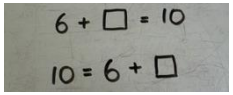
add
more
plus
make
total
altogether
double
near double
score
one more, ten more
How many more to make…?  How many more is … than …?

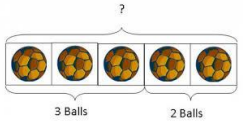
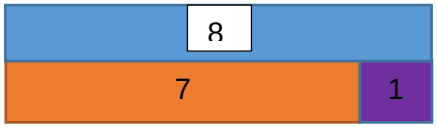
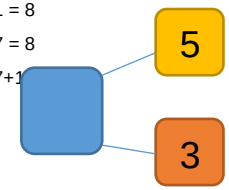
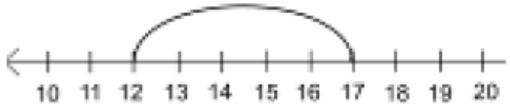
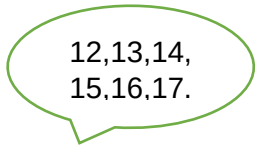
Addition

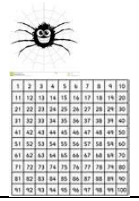
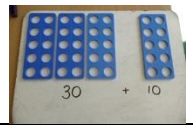
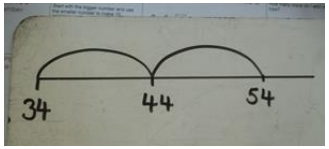
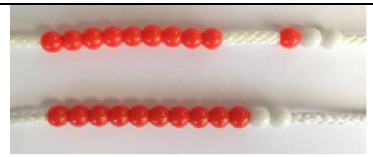
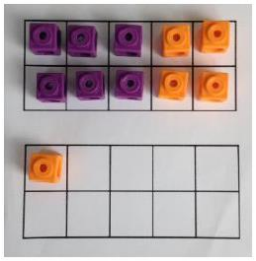
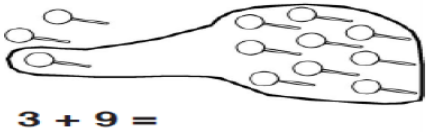
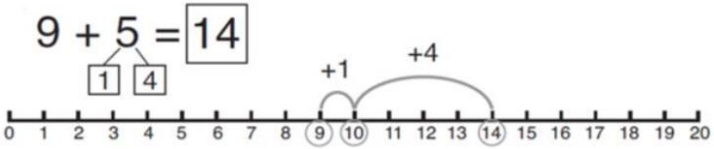
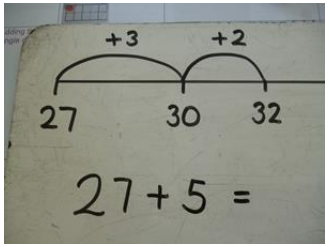
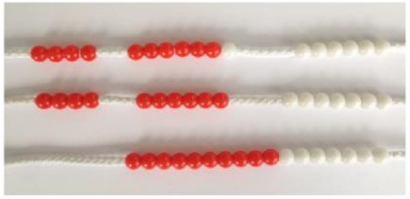
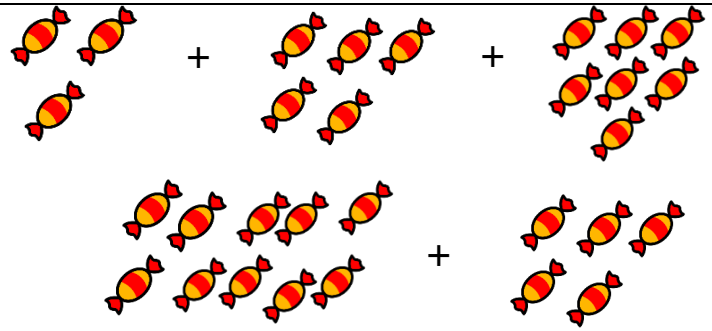
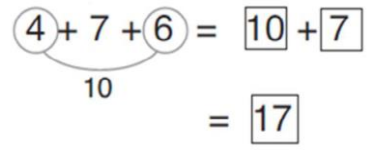
| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| 30 - 50 months<br>Knows that numbers identify how many objects are in a set. | The key focus of counting sets is developing children's understanding of cardinality. This means that children understand when you count items in a set, the last number counted tells the size of the set.<br><br>Counting sets in practical situations.<br><br> <br><br>Children use their fingers for counting and showing amounts.<br> | <br> <br><br>Make a link to a number track | Encourage children to use mark-making to support their thinking about numbers and simple problems. |
| 40 – 60 months<br>Be able to show one more | Children count the number in a set and add one more.<br> <br><br>There were five dinosaurs on the hill. One more joined in. How many dinosaurs are there altogether? | <br>Count the amount of the first set on a number track and then jump one more.<br> | Encourage children to use mark-making to support their thinking about numbers and simple problems. |

| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| 40 – 60 months<br>Combining two groups in a practical way. | Use two large hoops with objects.<br> <br> <br>two dice<br> <br>coat hanger and pegs | Show the amount using dots in two circles.<br>  <br>Encourage children to use mark-making to support their thinking about numbers and simple problems. | Use numerals in two circles.<br> |
| ELG<br>Count out two sets of objects and combine. | The key focus of counting sets is developing children's understanding of cardinality. This means that children understand when you count items in a set, the last number counted tells the size of the set. Two cars in the first set and three cars in the second set.<br>  <br>Use two large hoops to count out two sets of loose parts. | Show the amount using dots.<br> <br>To combine 2 and 3 children will first count out 1, 2 from the first set and 1, 2 ,3 from the second set, then physically join the sets and counting them all 1, 2, 3, 4, 5. | Use numerals.<br>Introduce the + and =<br>**2 + 3 = 5** |

| | | | |
|---|---|---|---|
| ELG<br>Be able to say which number is one more than a given number. (numbers from 1 to 20) | <br>Numicon<br><br> <br>Bead strings<br><br>Loose parts |  <br><br> <br><br>One more than 6 is<br>Find 6 on the number track or number line. One more is… |  <br><br>Show one jump on the number line. One more than 4 is 5.<br><br>  |
| Combine two amounts to make a whole | Once children understand cardinality and the forward and backward counting of number sequences they can count on to solve problems. They can also look at patterns on dice and Numicon to subitise.<br><br> <br>One and six.<br>Six and one. | <br><br>6 add 4 equals 10<br>4 add 6 equals 10 | 6 + 4 = 10<br><br>  |

| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| Number bonds<br><br>Reception Number bonds to 6 | Using loose parts in context of story. Ladybird family of three. All the ladybirds have three spots.<br> | Show the spots on the ladybird. Show it a different way. Show it another way. Have you found all the combinations?<br>  | 1 and 2 makes 3<br>One add 2 makes three altogether.<br><br>1 + 2 = 3 |
| Combining two parts to make a whole: part-whole model<br><br>Year One | <br>  <br>Use cubes to add two numbers together as a group.<br> |   <br>Number bonds.<br> |  <br>4 + 3 = 7<br>10= 6 + 4<br>  <br>Use the part-part whole diagram as shown above to move into the abstract. |
| Year 1 – how many to get to the next 10 | Using a 10's frame.<br> <br>How many more to get to the next 10?<br>  <br>  | Use pictures and a number line.<br>Using number bonds of 10.<br>  | If I am at 6 how many more do I need to get to 10?<br>  <br>  <br>I have 54p. How much more do I need to get to the next 10? |

| | | | |
|---|---|---|---|
| Combining two parts to make a whole: part-whole model<br><br>Year 2 | <br>Use cubes to add two numbers together as a group or in a bar. |  <br>Use pictures to add two numbers together as a group or in a bar.<br>  | 7 + 1 = 8<br>1 + 7 = 8<br>8 = 7+1<br>  <br>Use the part-part whole diagram as shown above to move into the abstract. |
| Starting at the bigger number and counting on | <br>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.<br><br>12 + 5 | 12 + 5 = 17<br>  <br>Start at the larger number on the number line and count on in ones or in one jump to find the answer.<br> Start at the larger number on the hundred number square and count on in ones to find the answer. | 5 + 12 = 17<br>  <br>Put the larger number in your head and count on the smaller number to find your answer.<br><br>Use blank number line<br>12 jump in ones to 17 |

| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| Adding in 10s | Use numicon and base 10 materials<br> | Use spider – spider lives up in the ceiling and come down in a straight line.<br>   | 34 + 20 =<br>  |
| Bridging<br>Regrouping to make10, bridge to the next 10's number |  <br>6 + 5 = 11<br>Start with the bigger number and use the smaller number to make 10.<br>  |  <br>3 + 9 =<br>Use pictures or a number line. Regroup or partition the smaller number to make 10.<br>  | 7 + 4= 11<br>If I am at seven, how many more do I need to make 10. How many more do I add on now?<br>  <br>Use blank number lines |
| Adding three single digits | 4 + 7 + 6= 17<br>Put 4 and 6 together to make 10. Add on 7.<br>  |  |  <br>Combine the two numbers that make 10 and then add on the remainder. |

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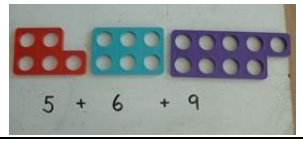
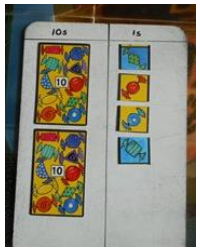
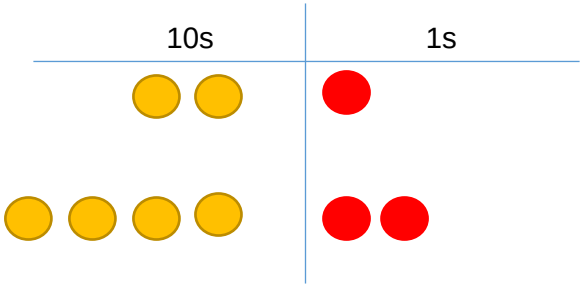
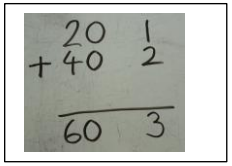
|---|---|---|---|
| | Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.<br> <br>4 add six makes 10 and then add 7.<br>  | Spot number bonds of 10 and then add the 3rd amount.<br>Spot doubles.<br>Add together three groups of objects. Draw a picture to recombine the groups to make 10. | |
| Column method- no regrouping<br>(step one add 10 and then multiples of ten) | 24 + 15=<br>Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.<br>Sweet counter<br>  <br>20 4 + 10 5 =<br> 39 | After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions.<br>  <br>Use a numberline<br>spider counting on a hundred square<br> <br> | Expanded method<br>(leave a gap to add the carry on)<br>  <br>Calculations<br>21 + 42 =<br>21<br>+ 42 |

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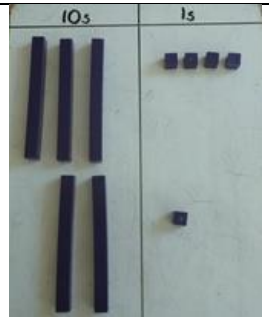
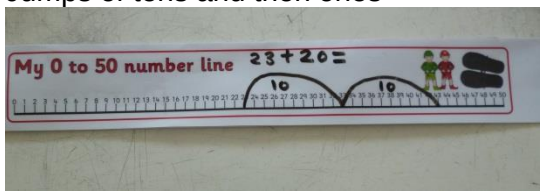
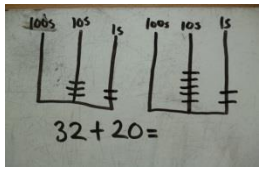
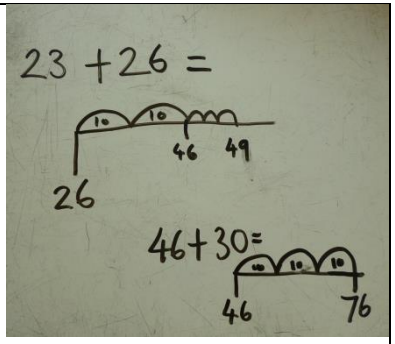
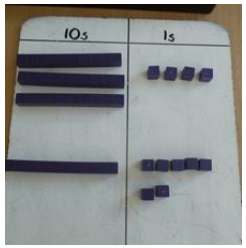
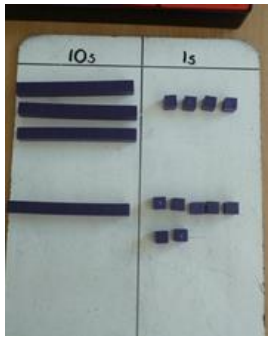
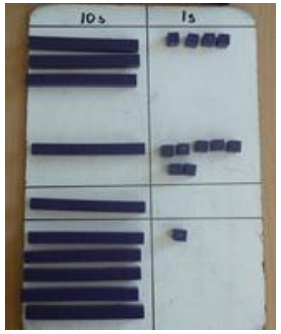
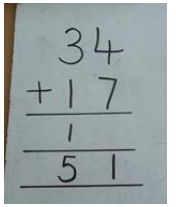
|---|---|---|---|
| |  <br>30 4 + 20 1 = 55 | Jumps of tens and then ones<br>  <br>  abacus |  |
| Column method- regrouping | Use base 10 materials<br>  | Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.<br><br>34 + 17 =<br>  <br>  | Start by partitioning the numbers before moving on to clearly show the exchange below the addition.<br>  ( leave a line) |

# Progression in calculations

# Subtraction

## Vocabulary

**Subtract**

**Take away**

**Minus**

**Leave**

**Less than**

**Difference between**

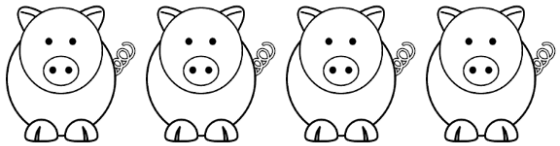
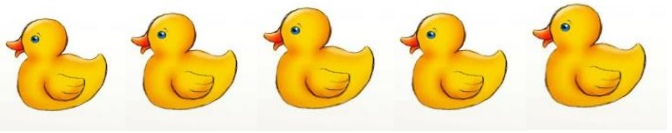
**One less, ten less…**

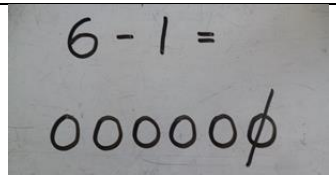
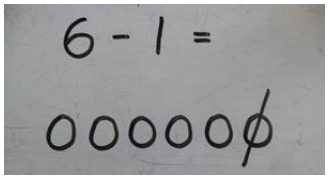
**Half  halve**

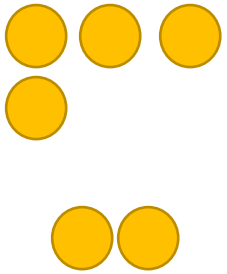
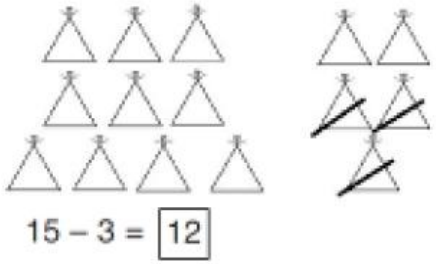
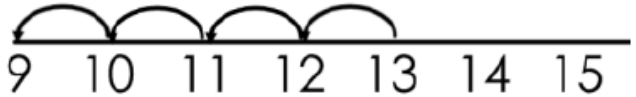
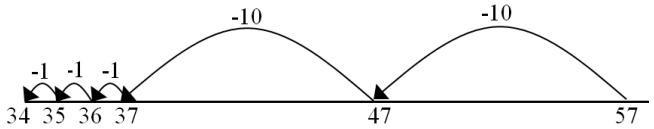
**How many are left?**

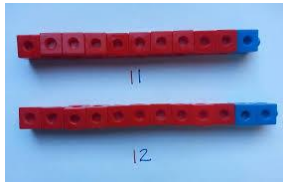
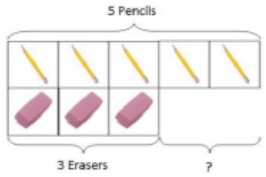
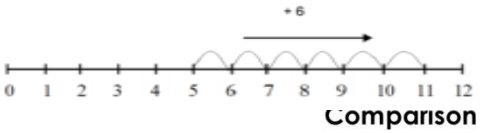
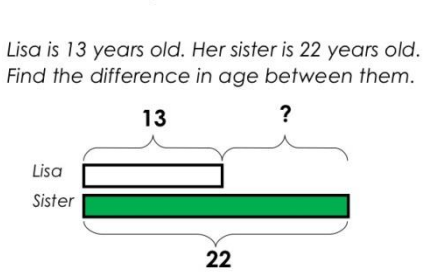
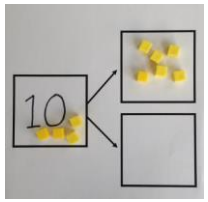
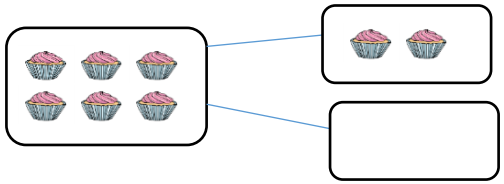
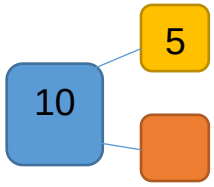
**How many are gone?**

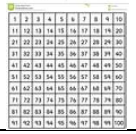
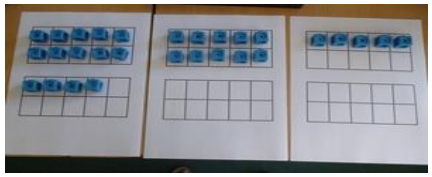
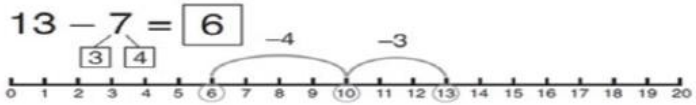
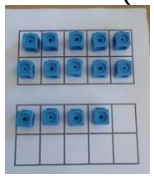
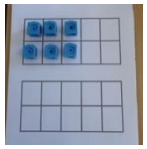
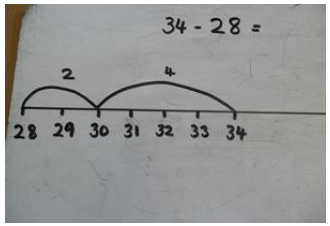
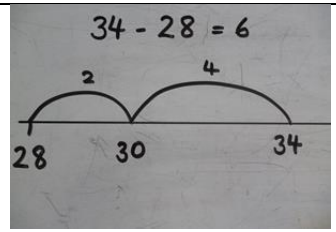
# Subtraction

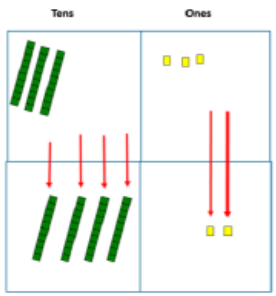
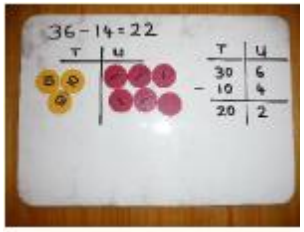
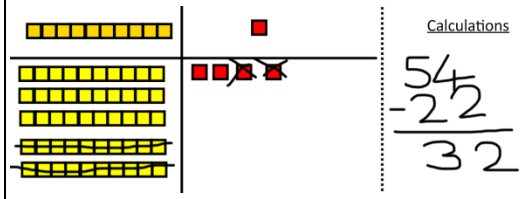
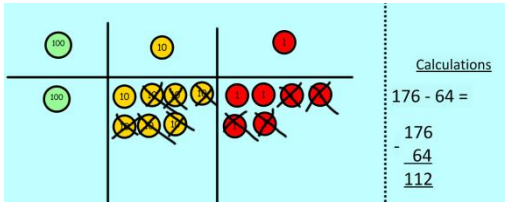
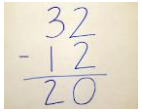
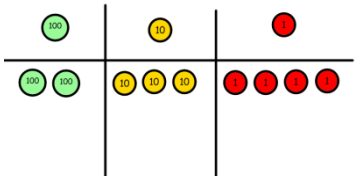
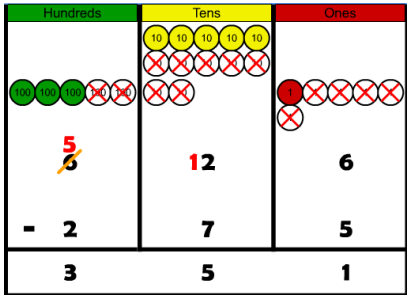
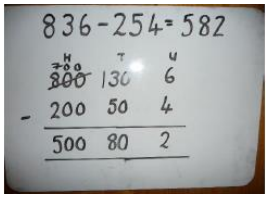
| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| 30 - 50 months Knows that numbers identify how many objects are in a set. | The key focus of counting sets is developing children's understanding of cardinality. This means that children understand when you count items in a set, the last number counted tells the size of the set.<br><br>Counting sets in practical situations.<br><br> | | Encourage children to use mark-making to support their thinking about numbers and simple problems. |
| 40 – 60 months Using the vocabulary of subtraction | Using practical situations in role play indoors and outdoors.<br> <br>Four little pigs living at home. One pig went to build a house. How many were left?<br><br>In context of nursery rhymes.<br>Five little ducks went swimming one day… |  <br>Take one pig away (physically remove one pig)<br><br> use fingers<br><br>  <br>Take one duck away (physically remove one duck) | Encourage children to use mark-making to support their thinking about numbers and simple problems. |

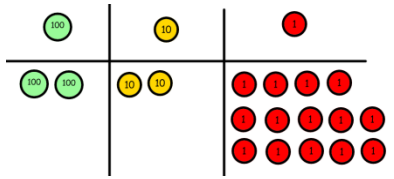
| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| 40 – 60 months<br>Be able to show one less | Children count the number in a set and take away one<br> | <br>Children make marks to show amount and cross one out. Count the amount of the first set on a number track and then jump one back. |  |
| ELG<br>Use quantities and objects they subtract two single-digit numbers | Link to real life situations.<br>Shopping using baskets with fruit and vegetables or sweets in a jar.<br> <br>I have nine apples in my basket. | Take away by removing the apples and counting how many apples are left in the basket.<br> <br>I take 3 apples away. I have 6 apples left in my basket. | Cross out how many have been taken away. Write the numeral for what is left.<br>  |
| Use quantities and objects they subtract two single-digit numbers | Link to real life situations.<br> | Show take away by crossing out the amount. Count how many are left behind.<br> | Model how to write the calculation.<br>4 – 2 = 2 |

| | | | |
|---|---|---|---|
| Taking away ones<br><br>( take away ones from single-digit and two-digit numbers) | Use physical objects, counters, cubes etc to show how objects can be taken away.<br>  <br>6 – 2 = 4<br> | Cross out drawn objects to show what has been taken away.<br>  <br>15 – 3 = 12 | 18 -3= 15<br><br>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.<br><br>13 – 4<br> <br><br>Use counters and move them away from the group as you take them away counting backwards as you go.<br> | Count back on a number line or number track<br>  <br>9 10 11 12 13 14 15<br><br>Start at the bigger number and count back the smaller number showing the jumps on the number line.<br>  <br>-10 -10 -1 -1 -1<br>34 35 36 37 47 57<br><br>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. |

| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| Find the difference Encourage to use when subtracting a number that is close to the total amount. | Compare amounts and objects to find the difference.<br>  <br>Use cubes to build towers or make bars to find the difference<br>  <br><br>Use basic bar models with items to find the difference | Baby frog (jumps on in ones: can't jump back)<br> <br>Count on to find the difference.<br>  <br><br>Draw bars to find the difference between 2 numbers.<br>  <br> | Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches. |
| Part Part Whole Model |  <br><br>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.<br>If 10 is the whole and 6 is one of the parts. What is the other part?<br>10 - 6 = | Use a pictorial representation of objects to show the part part whole model.<br>  |  <br><br>Move to using numbers within the part whole model. |

| | | | |
|---|---|---|---|
| Subtracting 10s | Use numicon and base 10 materials<br> | Use spider – spider lives up in the ceiling and come down and goes back up in a straight line. Counting in 10s.<br>  | 34 - 20 = |
| Make 10 bridging | 14 – 9 =<br>  <br>Make 14 on the ten frame. Take away the four first to make 10 and then take away five more so you have taken away 9. You are left with the answer of 5. |  <br>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=<br><br>How many do we take off to reach the next 10?<br><br>How many do we have left to take off? |
| Bridging: Daddy frog jumps to the next 10 | 14 – 8 = (14 – 4 – 4)<br>  14 – 8 =<br> 14 – 4=10<br>  10- 4 = 6 | 34 – 28 =<br>  |  |

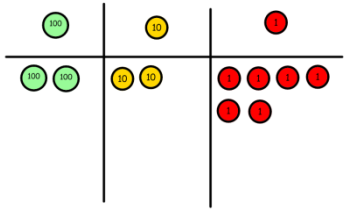
| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| Column method without regrouping |  <br>Use Base 10 to make the bigger number then take the smaller number away.<br><br>Show how you partition numbers to subtract. Again make the larger number first.<br>  |  <br>Draw the Base 10 or place value counters alongside the written calculation to help to show working.<br>  | 47 – 24 = 23<br><br>40 7<br>20 4<br><br>20 3<br><br>  <br>This will lead to a clear written column subtraction. |
| Column method with regrouping | Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.<br><br>Make the larger number with the place value counters<br>  <br>Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones. |  <br>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. |  <br>Children can start their formal written method by partitioning the number into clear place value columns. |



Calculations

234
- 88

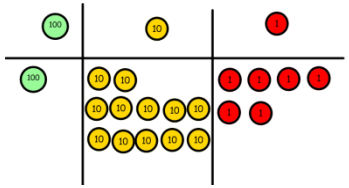
Now I can subtract my ones.



Calculations

234
- 88

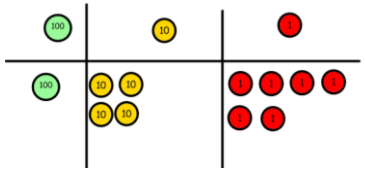
Now look at the tens, can I take away 8 tens easily? I need to exchange one hundred for ten tens.



Calculations

234
- 88

Now I can take away eight tens and complete my subtraction



Calculations

234
- 88
146

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.

# Progression in calculations

# Multiplication

# X

**Vocabulary**

**multiplication**

**times**

**groups of**

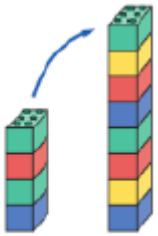
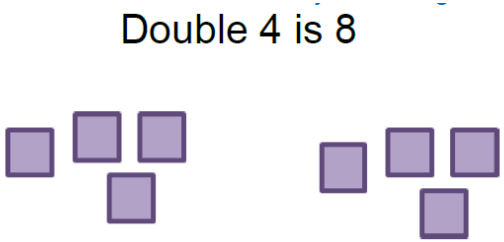
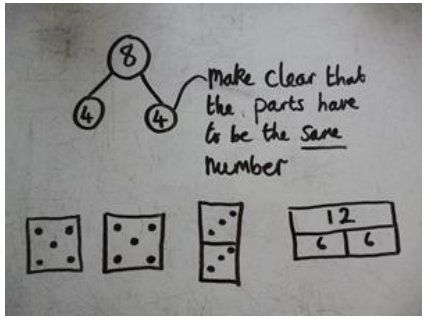
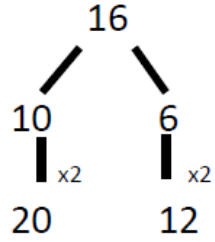
**multiplied by**

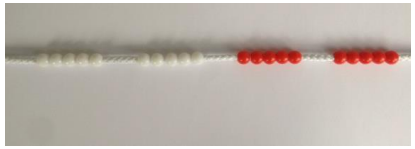
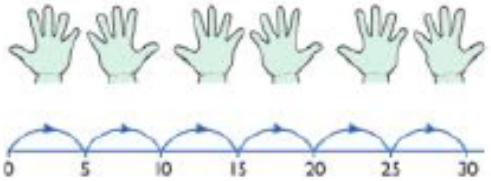
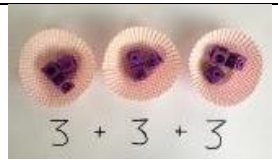
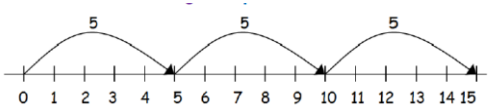
**multiple of**

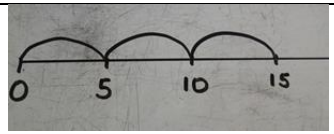
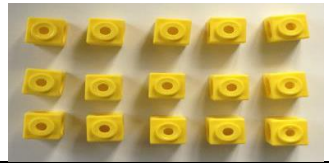
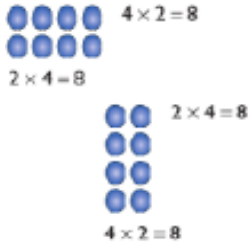
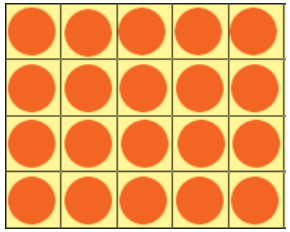
**lots of**

**repeated addition**

Multiplication

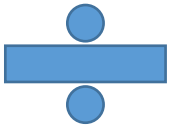
| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| Doubling | Use practical activities to show how to double a number.<br> <br>Use practical activities to show how to double a number.<br>  <br>double 4 is 8<br>4 × 2 = 8 | Draw pictures to show how to double a number.<br>  <br>Draw pictures to show how to double a number.<br>  <br> | 4 + 4 = 8<br>4 x 2 = 8<br>2 x 4 = 8<br>  <br><br>Partition a number and then double each part before recombining it back together. |

| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| Counting in multiples |  <br> <br>Count in multiples supported by concrete objects in equal groups.<br> <br> | Kangaroo I always jump equal jumps eg 5 + 5 + 5<br>3+ 3+ 3<br>  <br><br>Use a number line or pictures to continue support in counting in multiples. | Count in multiples of a number aloud.<br><br>Write sequences with multiples of numbers.<br><br>2, 4, 6, 8, 10<br><br>5, 10, 15, 20, 25 , 30<br><br>4 x 2 = 8<br>2 x 4 = 8 |
| Repeated addition |  <br><br> <br> <br>Use different objects to add equal groups. | There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?<br> <br>2 add 2 add 2 equals 6<br>  <br><br>5 + 5 + 5 = 15 | Write addition sentences to describe objects and pictures.<br> <br><br>2 x 5 = 10 |

| | | | |
|---|---|---|---|
| | | |  <br>5 x 3 = 15 |
| Arrays- showing commutative multiplication | Create arrays using counters/ cubes to show multiplication sentences.<br> <br>  | Draw arrays in different rotations to find **commutative** multiplication sentences.<br>  <br>  | Use an array to write multiplication sentences and reinforce repeated addition.<br> <br>5 + 5 + 5 = 15<br>3 + 3 + 3 + 3 + 3 = 15<br>5 x 3 = 15<br>3 x 5 = 15 |
| Times tables Using known facts | X10 for year 1<br>X2, x5 for year 2<br> <br>Counting in 5s | Using know facts to find other facts.<br>5 x 3 = 15<br>3 x 5 = 15<br> | 5 x 3 = 15 chant up<br>3 x 5 = 15<br>5 x 3 = ☐<br>3 x 5 = ☐<br>☐ = 5 x 3<br>☐ = 3 x 5<br>15 = 5 x ☐<br>Use known facts |

# Progression in calculations

# Division



**Vocabulary**

**divided by**

**share**

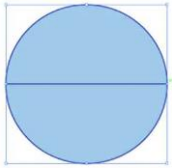
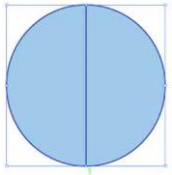
**divide**

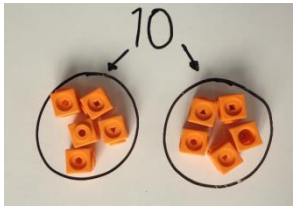
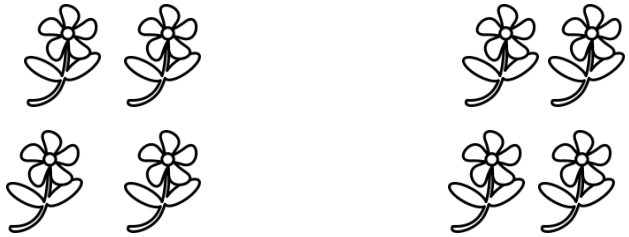
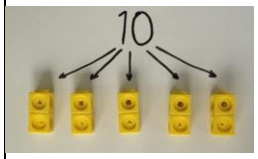
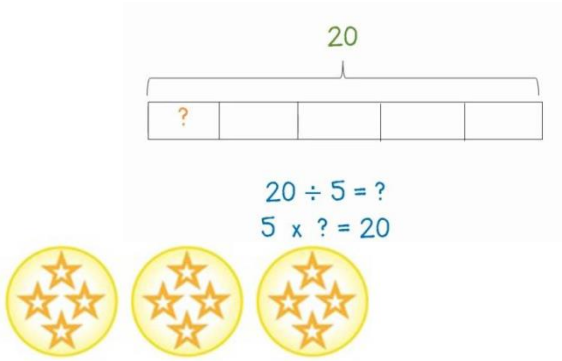
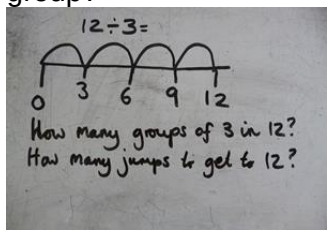
**divided into**

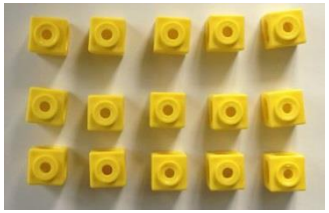
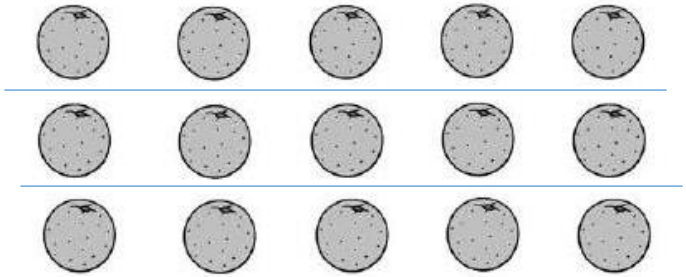
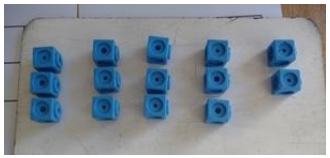
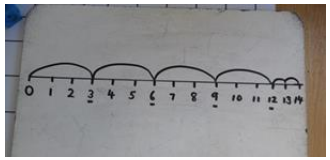
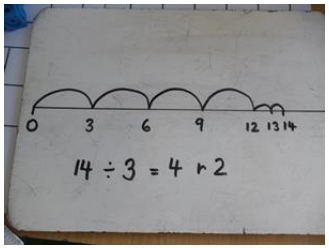
**equal groups of**

**share equally**

Division

| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| ELG<br>Halving in practical contents linked to simple problem solving. | Start with links to real life events. Cut a cake into halve. Both halves being exactly the same size.<br> <br>Use play dough. |   | Encourage children to use mark-making to support their thinking about numbers and simple problems. |
| Sharing objects into two groups linked to simple problem solving. | Share four cars between two friends.<br> <br><br>Link to real life events. | <br>Four cars shared between two friends. Each friend gets two cars. | Encourage children to use mark-making to support their thinking about numbers and simple problems. |

| Objective and Strategies | Concrete | Pictorial | Abstract |
|---|---|---|---|
| Sharing objects into groups (Year one focus) |   I have 10 cubes, can you share them equally in 2 groups? Two equal groups. | Children use pictures or shapes to share quantities.  8 ÷ 2 = 4 | Share 9 buns between three people. 9 ÷ 3 = 3 Write the calculation. |
| Division as grouping |   Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding. | 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 ÷ 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.<br><br>Eg 15 ÷ 3 = 5 5 x 3 = 15<br>15 ÷ 5 = 3 3 x 5 = 15 |  <br>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.<br><br>7 x 4 = 28<br>4 x 7 = 28<br>28 ÷ 7 = 4<br>28 ÷ 4 = 7 |
| **Division with a remainder** | 14 ÷ 3 =<br>Divide objects between groups and see how much is left over<br><br>  <br><br>Group into 3s 2 left over | Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.<br><br>  <br><br>Draw dots and group them to divide an amount and clearly show a remainder.<br><br> | Complete written divisions and show the remainder using r.<br><br>14 ÷ 3 = 4 r 2<br><br>  |