# North Park Primary School


## Years 1, 2 and 3

## A Guide for Parents

At North Park Primary, we believe that children should be confident and proficient mathematicians. We have a 'Can do' attitude towards maths and the support of parents in developing this is crucial. When working together as a partnership, parents and school can foster an enthusiasm in maths to support children in their mathematical self-belief. At North Park Primary we follow the White Rose Maths Hub schemes of learning.

When planning lessons, teachers follow the cycle of 'concrete', pictorial, abstract' (CPA approach) and this guidance aims to set out examples of how we develop children's skills of addition, subtraction, multiplication and division using this cycle of teaching.

**'Concrete'-** Each skill is often first modelled with concrete materials (e.g. base ten, cubes, cuisenairre rods). This is the "doing stage". During this stage, students use concrete objects to model problems. The CPA approach brings concepts to life by allowing children to experience and handle physical (concrete) objects. For example, if a problem involves adding pieces of fruit, children can use counters or cubes which represent the fruit.

**'Pictorial'-** Pictorial is the "seeing" stage. Here, visual representations of concrete objects are used to model problems. This stage encourages children to make a mental connection between the physical object they just handled and the abstract pictures, diagrams or models that represent the objects from the problem.

**'Abstract'-** Abstract is the "symbolic" stage, where children use abstract symbols to model problems. Students will not progress to this stage until they have demonstrated that they have a solid understanding of the concrete and pictorial stages of the problem. The abstract stage involves the teacher introducing abstract concepts (for example, mathematical symbols). Children are introduced to the concept at a symbolic level, using only numbers, notation, and mathematical symbols (for example, +, –, x, /) to indicate addition, multiplication or division.

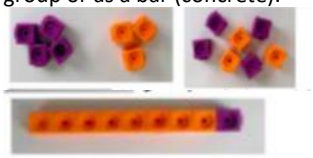
# Addition

## Year 1

Combine two parts to make a part whole model, starting at the bigger number and counting on, regrouping to make 10 using a ten frame.

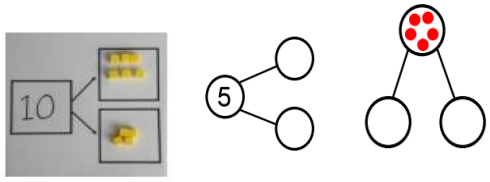
**Combining two parts to make a part whole model:**

**Concrete-** Use cubes to add two numbers together as a group or as a bar (concrete).



**Pictorial/Abstract-** Use pictures to add 2 groups together:


Complete the part whole models by using cubes and counters (concrete). Use the part whole diagram as shown below to move into abstract.




**Starting at the bigger number and counting on- using cubes:**

**Concrete-** Start with the larger number on the bead string and then count on using the smaller number one by one to find the answer.

e.g. 5+1=6

## Year 2

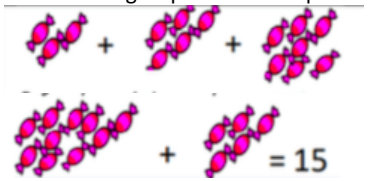
Adding three single digits, use of base 10 to combine two numbers.

Methods taught in Year 1 should continue to be used to consolidate learning and understanding in Year 2.

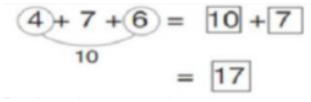
**Adding three single digits:**

**Concrete-** Combine to make 10 if possible, or bridge 10 then add the third digit e.g. 7+2+3=

**Pictorial-** Regroup and draw representation:

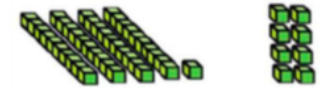



**Abstract-** Combine the two numbers that make/bridge ten then add on the third.




**Add a 2-digit number and ones**

**Concrete-**Continue to develop understanding of place value and partitioning.



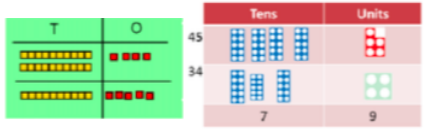
## Year 3

Column method-regrouping, using place value counters (up to 3 digits).

Pupils needing to use number lines from Year 2 into 3 should continue to do so depending on their ability.

**Column addition- no regrouping**

**Concrete-** Model using base 10 or Numicon. Add together the ones first, then the tens.




Using base **10 apparatus** for addition:

E,g 245+7=

**Pictorial-** Children move to drawing the counters using a tens and ones frame.

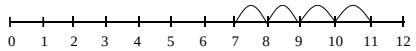

**Abstract-** Add the ones first, then the tens, then the hundreds.

$$\begin{array}{r} 223 \\ +\ 114 \\ \hline 337 \end{array}$$

**Column addition- Regrouping**

**Pictorial-** Start at the larger number on the number line and count on in ones or in one jump to find the answer.

7+4

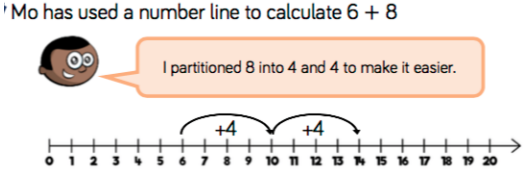



**Abstract-** Place the larger number in your head and count on in the smaller number to find the answer e.g. 5+12=17.

**Regrouping to make 10 using ten frame:**

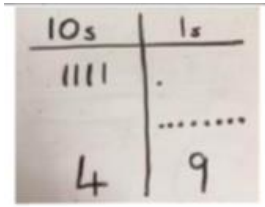
**Concrete-** Start with the bigger number and use the small number to make 10 e.g. 6 +5= 11

**Pictorial-** Use pictures or a number line. Regroup or partition the smaller number using the part whole model to make 10.

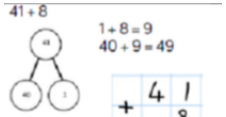



**Abstract-**

**Pictorial-**Children to represent the base 10 as symbols.

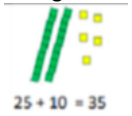



**Abstract-**Part-whole model which eventually leads onto column method.

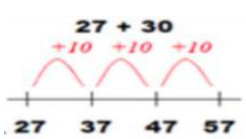



**Add a 2-digit number and tens**

**Concrete-** Explore the fact that the ones digit does not change.




**Abstract-**




27 + 10 = 37

27 + 20 = 47

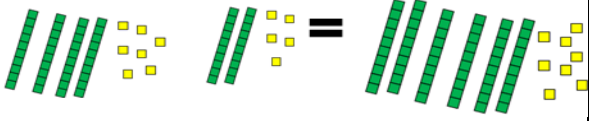
27 + □ = 57

**Add 2-digit numbers**

**Concrete-**

47+25=

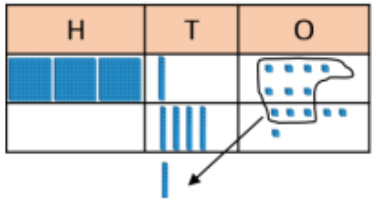
47 + 25 = 72



Children work towards using column method (abstract):

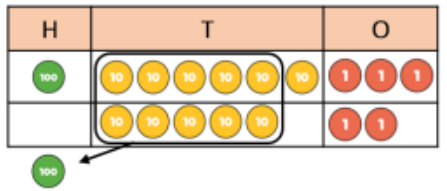
E.g. 28+7=

**Concrete-** Introduce column addition modelled with place value counters or Dienes. They will be introduced to regrouping.




| | | | |
|---|---|---|---|
| | 3 | 1 | 7 |
| + | | 4 | 6 |
| | 3 | 6 | 3 |

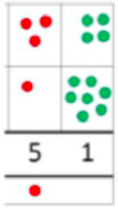
1




| | | | |
|---|---|---|---|
| | 1 | 6 | 3 |
| + | | 5 | 2 |
| | 2 | 1 | 5 |

1

**Pictorial-**Children can draw a representation of the grid to further support their understanding, carrying the ten underneath the line.




**Abstract-**Start by partitioning the numbers before using the formal column method, to show the exchange.

20 + 5
40 + 8
60 + 13 = 73

7+4=11

If I am at seven, how many more do I need to make 10? How many more do I need to add on now?

**Represent & use number bonds and related subtraction facts within 20**

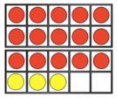
**Concrete-**

2 more than 5

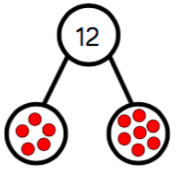
**Pictorial/Abstract-**Which number bond is represented in the picture?

There are ___ red counters.
There are ___ blue counters.
Altogether there are ___ counters.
___ + ___ = ___ ___ + ___ = ___

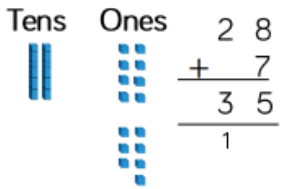
Circle the addition and subtraction number sentences that match the ten frames.



15 + 3 = 18 15 – 3 = 18
3 + 18 = 15 18 – 15 = 3
18 + 3 = 15 18 – 3 = 15
18 = 3 + 15 15 – 18 = 3

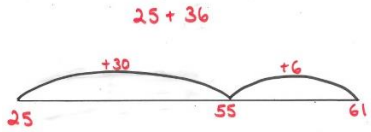



12 = 12 + 0
12 = 11 + ___
12 = 10 + ___

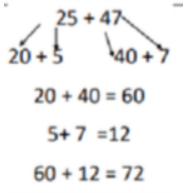



**Abstract-**

Use a number line and bridge ten where necessary.




Use part-whole/bar models where necessary.

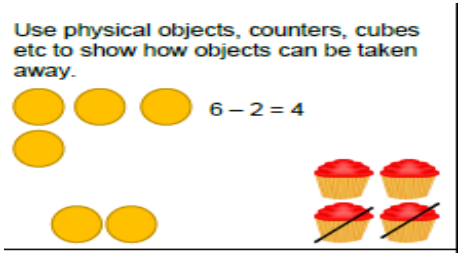
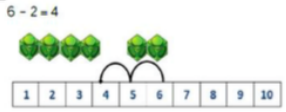
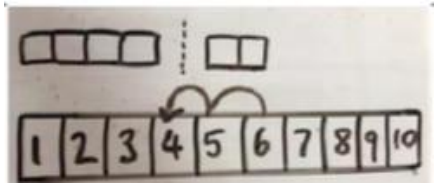
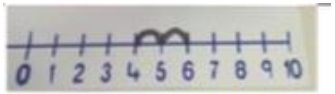
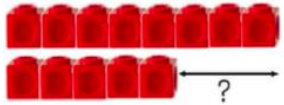
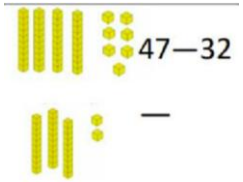
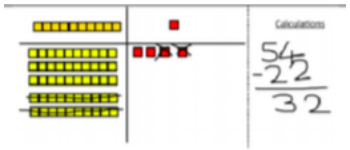
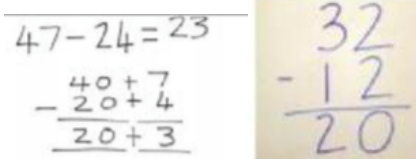



| 23 | 25 |
|---|---|
| ? | |

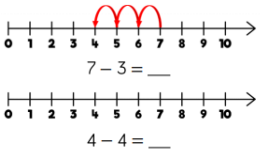
23 + 25 = 48

536
+ 85
621
1 1

# Subtraction

| Year 1 | Year 2 | Year 3 |
|---|---|---|
| Taking away ones, counting back, finding the difference, use part-whole models and make 10 using the ten frame. | Counting back, finding the difference, part-whole model, make 10 and use of base 10. | Column method with regrouping (up to 3 digits using place value counters) |
| **Take away ones**<br>**Concrete-**Use physical objects such as counters or cubes, to show how objects can be taken away.<br>  <br>4 – 2 = 2<br>**Pictorial-** Cross out drawn objects to show what has been taken away.<br>  <br>**Abstract-**<br>7—4 = 3<br>16—9 = 7<br>**Counting back**<br>Concrete- Move objects away from the group counting backwards.<br>  <br>Move the beads along the bead string as you count backwards. | **Counting back**<br>**Concrete-** Using number lines or number tracks, children start with the greatest number and count back.<br>  <br>**Pictorial-** Children to represent what they see pictorially:<br>  <br>**Abstract-** Represent the calculation on a number line and show their jumps. Encourage the children to use an empty number line.<br>  <br>  <br>**Find the difference**<br>**Concrete-** Using cubes, Numicon or other objects to find the difference between two numbers.<br>  | Pupil needing to use number lines from Year 2 into 3 should continue to do so depending on their ability.<br>**Column method without regrouping:**<br>**Concrete-** Use base 10 or Numicon to model.<br>  <br>**Pictorial-** Draw representations to support understanding.<br>  <br>**Abstract-**<br>  <br>**Column method with regrouping**<br>**Concrete-**Continue to Introduce column subtraction modelled with place value counters or Dienes.<br>e.g. 255-28= |

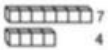
**Pictorial-**



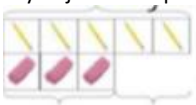

**Abstract-** Put 13 in your head, count back 4. What number are you?

**Find the difference**

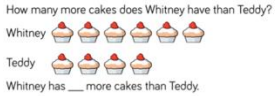
**Concrete-** 'Seven is 3 more than four'.



Lay objects to represent a bar model.



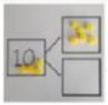
**Pictorial-**




**Abstract-** Hannah has 12 sweets and her sister has 5. How many more does Hannah have than her sister?

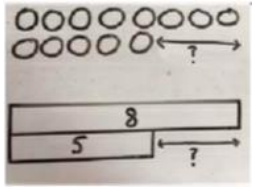
**Represent and use number bonds and related subtraction facts within 20 (Part-whole model)**

**Concrete-** Link to addition. Use PW model to model the inverse. If 10 is the whole and 6 is one of the parts, what is the other part?




**Pictorial-**Use pictorial representations to show the part.

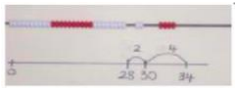
**Pictorial-**Children to draw the cubes or a bar model to illustrate what they need to calculate.




**Abstract-** Find the difference between 8 and 5.
Children to explore why 9-6, 8-5 and 7-4 have the same difference.

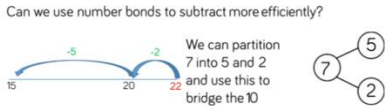
**Make 10**

**Concrete-**



Use bead strings to model counting to the next ten and then the remaining part of the number.

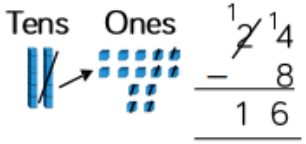
**Pictorial-**

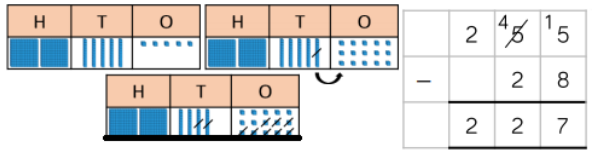



**Abstract-**
20 - ? = 13

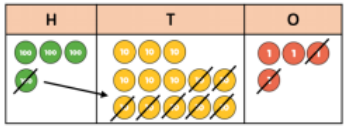
**Column method using base 10**

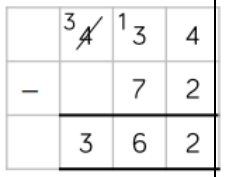
**Concrete-** Introduce column subtraction modelled with place value counters or Dienes.



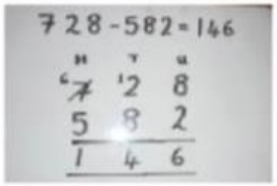

**Pictorial-** Children may draw base 10 or place value counters and cross off.

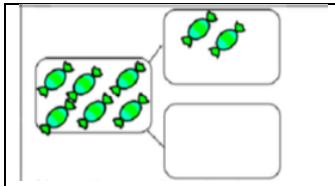



e.g. 434-72=

**Abstract-** Move onto the formal method.





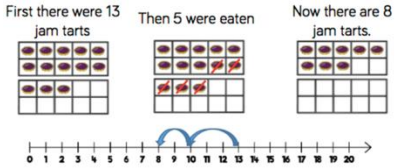
**Abstract-** Move to using numbers within the part-whole model.

**Make 10**

**Concrete-** Make 14 on a ten frame. Take away 4 to make ten, then take one more away so that you have taken 5.

14-5=

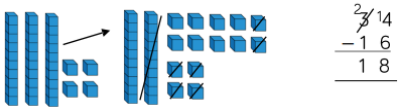
**Pictorial-**




Use ten as a stopping point on the number line.

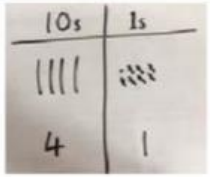
**Abstract-** 16-8. How many do we subtract first to get to 10? Then how many more do we need to subtract?

Take 16 away from 34

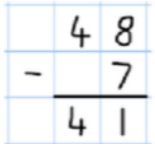


$$\begin{array}{r} {}^{2}\not{3}\,{}^{1}4 \\ -\,1\;6 \\ \hline 1\;8 \end{array}$$

**Pictorial-** Children to represent the base 10 pictorially.

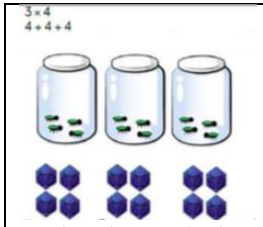



**Abstract-** Children to use the column method.

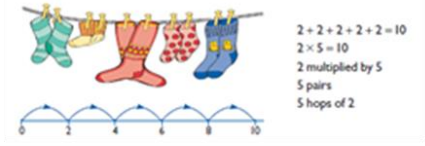


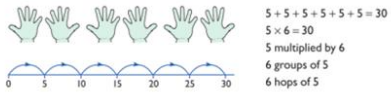

# Multiplication

| Year 1 | Year 2 | Year 3 |
|---|---|---|
| Recognise and make equal groups, doubling, counting in multiples, use cubes, Numicon and other objects in the classroom. | Multiply using arrays and repeated addition (using at least 2s, 5s and 10s.) | 2d × 1d using base 10 |
| **Recognising and making equal groups, using repeated addition**<br>**Concrete-** There are 3 equal groups with 4 in each group: | **Arrays showing commutative multiplication**<br>**Concrete-**Create arrays using counters, cubes and Numicon. | **Concrete/Pictorial-**<br>Use base ten and place value counters to represent multiplying 2d x 1d, before moving onto column method. |

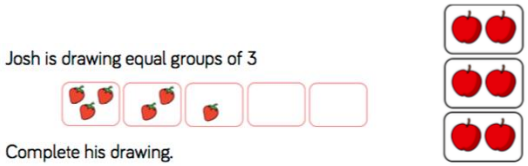


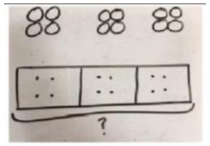

Washing line, and other practical resources for counting. Concrete objects. Numicon; bundles of straws, bead strings




**Pictorial-** Children to represent the practical resources in a picture, use a bar model and arrays.

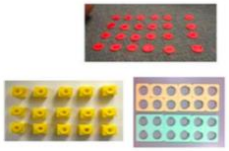


**Abstract-**

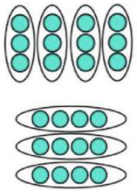
3 x 4 = 12

4 + 4 + 4 = 12



Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.

**Pictorial-** Use representations of arrays to show different calculations and explore commutativity.



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

5 + 5 + 5 = 15

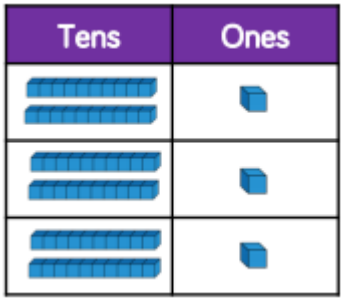
3 + 3 + 3 + 3 + 3 = 15

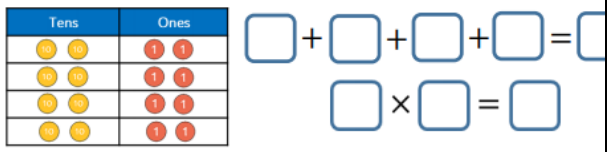
5 x 3 = 15

3 x 5 = 15

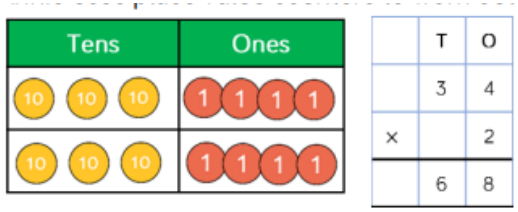
**<u>Towards written methods</u>**

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




**Abstract-** Use base ten and place value counters to introduce the children to column method.



**Doubling**

**Concrete-** Model doubling using base ten, Numico, place value counters, cubes etc.

| Build | Represent |
|---|---|
| | |
| | |
| | |
| | |


**Pictorial-**Draw pictures and representations to show how to double numbers.

**Abstract-**

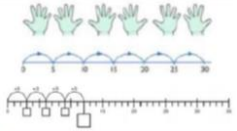
| Add | Double |
|---|---|
| 1 + 1 = 2 | Double 1 is 2 |
| 2 + 2 = __ | Double 2 is __ |
| 3 + 3 = __ | Double 3 is __ |
| __ + __ = __ | Double 4 is __ |

**Counting in multiples of two, five and ten.**

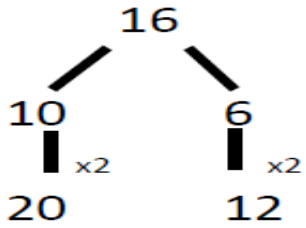
**Concrete-**

Use a 0-100 bead string to count in tens.
Can we count forwards and backwards in tens?

**Pictorial-** Number lines, number squares, counting sticks and bar models should be used to show representations of counting in multiples.

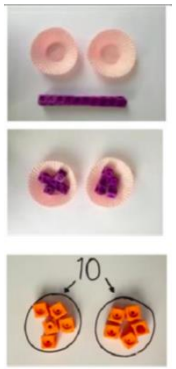
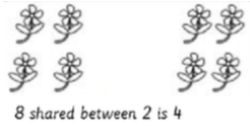
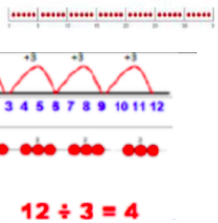
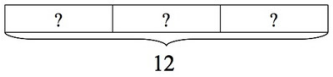
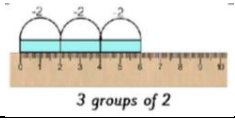
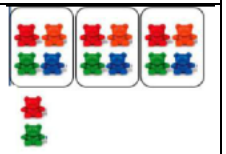
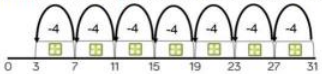
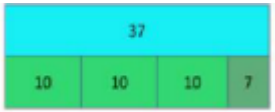


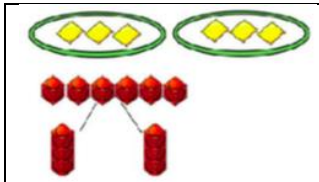
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |



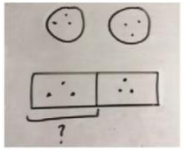
| | | |
|---|---|---|
| **Abstract-** Count in multiples of a number aloud.<br>10, 20, 30, 40, 50, 60 etc.<br><br>3 x 10= | | |

# Division

| Year 1 | Year 2 | Year 3 |
|---|---|---|
| Sharing objects into groups .Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups? Use cubes and draw round 3 cubes at a time. | Division as grouping. Division within arrays- linking to multiplication. Repeated subtraction. | Division with a remainder-using times tables facts and repeated subtraction. 2d divided by 1d using base 10 or place value . |
| **Division as sharing**<br>**Concrete-** I have 10 cubes. Can you share them equally in two groups?<br>  <br>**Pictorial-** Children use pictures or shapes to share quantities.<br>  <br>*8 shared between 2 is 4*<br>**Abstract-** 12 shared between 3 is 4.<br><br>**Division as grouping**<br>**Concrete-** Children to group using a range of objects. | **Division as grouping**<br>**Concrete-**Divide the quantities into equal groups. Use objects to aid understanding.<br>  <br>**Pictorial-** Use number lines for grouping.<br>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 in each group.<br>12÷ 3=?<br>  <br>  <br>**Abstract-**<br>28 ÷ 7 = 4<br><br>*Divide 28 into 7 groups. How many are in each group?*<br>**Repeated subtraction**<br>**Concrete-**Use rods or multilink above a ruler.<br>  <br>*3 groups of 2* | **Division with a remainder**<br>**Concrete-**Divide objects between groups and see how much is left over.<br>  <br>**Pictorial-** Becoming more efficient using a number line when solving division problems with a remainder<br>Tommy uses repeated subtraction to solve 31 ÷ 4<br>  <br>31 ÷ 4 = 7 r 3<br>Use bar models to show division with a remainder<br>  <br>**Abstract-** Complete written divisions and show the remainder using r.<br>  <br>**Dividing a 2-digit number by a 1-digit number** |



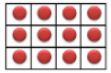
**Pictorial-**Represent the grouping pictorially.




**Abstract-** Children to represent repeated subtraction pictorially.

**Arrays**

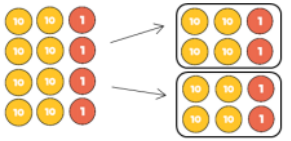
Continue work on arrays. Support children to understand how multiplication and division are inverse. Look a



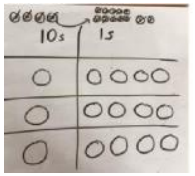
$3 \times 4 = 12$

$12 \div 4 = 3$

**Concrete-**Divide 2-digit numbers by a 1-digit number by partitioning into tens and ones and sharing into equal groups. Use place value counters to do this.



**Pictorial-** Children to represent the place value counters pictorially.




**Abstract-**

$42 \div 3$

$42 = 30 + 12$

$30 \div 3 = 10$

$12 \div 3 = 4$

$10 + 4 = 14$