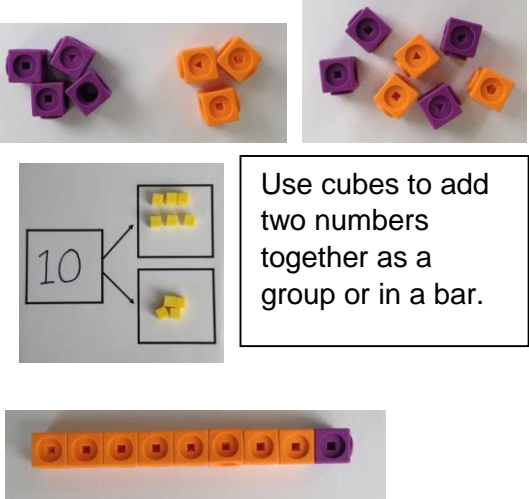
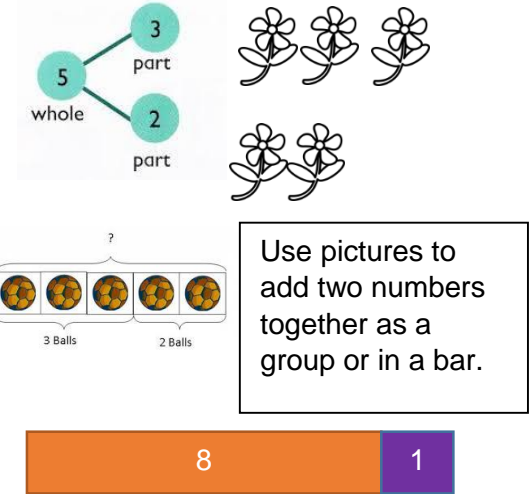
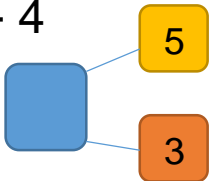

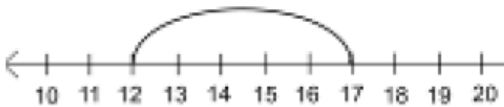


## Progression in Calculations

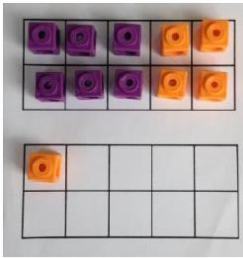
### Addition

| Objective and Strategies                                     | Concrete   | Pictorial  | Abstract  |
|--|--|--|---|
| <p>Combining two parts to make a whole: part-whole model</p> |  <p>Use cubes to add two numbers together as a group or in a bar.</p>   |  <p>Use pictures to add two numbers together as a group or in a bar.</p>   | <p><math>4 + 3 = 7</math></p> <p><math>10 = 6 + 4</math></p>  <p>Use the part-part whole diagram as shown above to move into the abstract.</p> |
| <p>Starting at the bigger number and counting on</p>         |  <p>Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.</p> | <p><math>12 + 5 = 17</math></p>  <p>Start at the larger number on the number line and count on in ones or in one jump to find the answer.</p> | <p><math>5 + 12 = 17</math></p> <p>Place the larger number in your head and count on the smaller number to find your answer.</p>  |

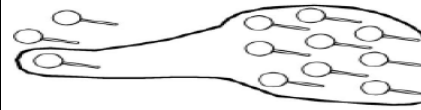
## Regrouping to make 10.



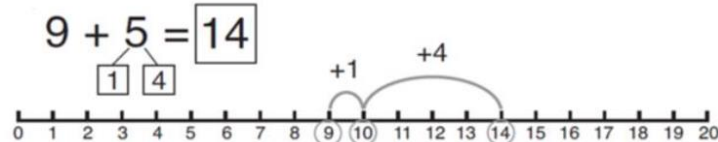
$$6 + 5 = 11$$



Start with the bigger number and use the smaller number to make 10.



$$3 + 9 =$$



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?

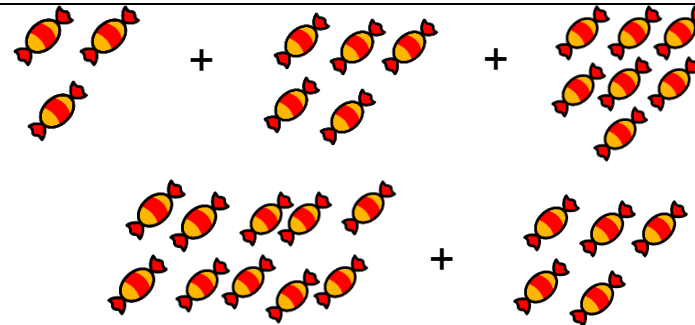
## Adding three single digits

$$4 + 7 + 6 = 17$$

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.

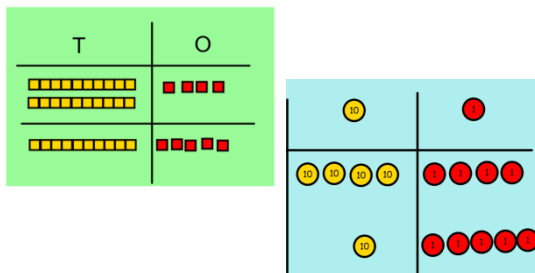
$$\begin{array}{l} (4 + 7 + 6) = 10 + 7 \\ \quad \quad \quad 10 \\ \quad \quad \quad = 17 \end{array}$$

Combine the two numbers that make 10 and then add on the remainder.

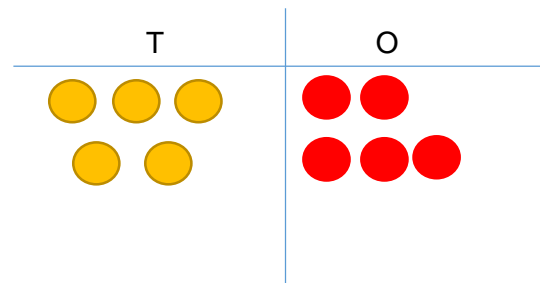
## Column method- no regrouping

$$24 + 15 =$$

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.

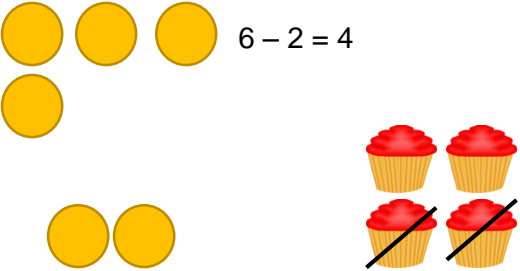
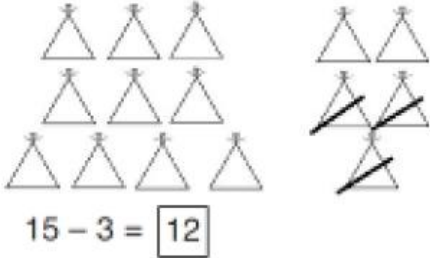


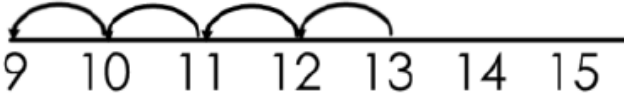
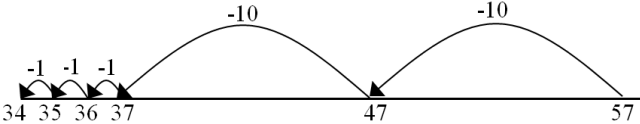


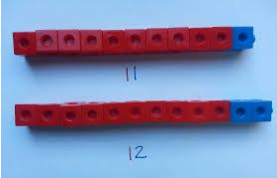
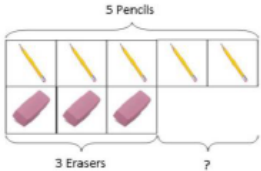
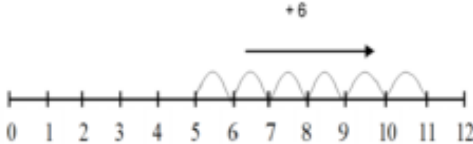
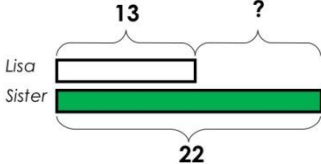
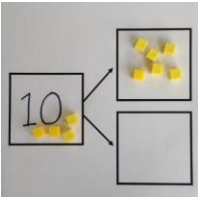
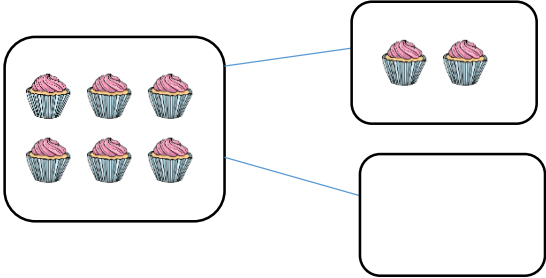
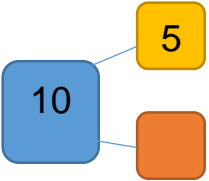

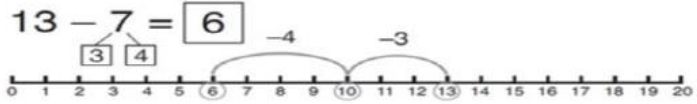
### Calculations

$$21 + 42 =$$

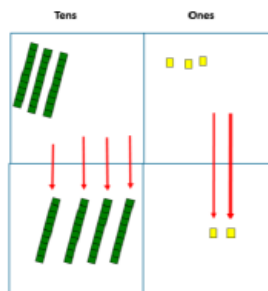
$$\begin{array}{r} 21 \\ + 42 \\ \hline \end{array}$$

## Subtraction

| Objective and Strategies       | Concrete   | Pictorial   | Abstract  |
|--------------------------------|--|---|---|
| <p><b>Taking away ones</b></p> | <p>Use physical objects, counters, cubes etc to show how objects can be taken away.</p>  <p>6 - 2 = 4</p>   | <p>Cross out drawn objects to show what has been taken away.</p>  <p>15 - 3 = 12</p>   | <p>18 - 3 = 15</p> <p>8 - 2 = 6</p>   |
| <p><b>Counting back</b></p>    | <p>Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones.</p>  <p>13 - 4</p> <p>Use counters and move them away from the group as you take them away counting backwards as you go.</p>  | <p>Count back on a number line or number track</p>  <p>9 10 11 12 13 14 15</p> <p>Start at the bigger number and count back the smaller number showing the jumps on the number line.</p>  <p>34 35 36 37 47 57</p> <p>This can progress all the way to counting back using two 2 digit numbers.</p> | <p>Put 13 in your head, count back 4. What number are you at? Use your fingers to help.</p> |

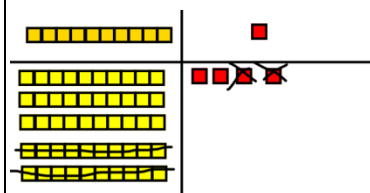
|                              |   |  |   |
|------------------------------|---|--|---|
| <h2>Find the difference</h2> | <p>Compare amounts and objects to find the difference.</p>  <p>Use cubes to build towers or make bars to find the difference</p>  <p>Use basic bar models with items to find the difference</p> |  <p>Count on to find the difference.</p> <h3>Comparison Bar Models</h3> <p>Lisa is 13 years old. Her sister is 22 years old.<br/>Find the difference in age between them.</p>  <p>Draw bars to find the difference between 2 numbers.</p> | <p>Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.</p>                               |
| <h2>Part Whole Model</h2>    |  <p>Link to addition- use the part whole model to help explain the inverse between addition and subtraction.</p> <p>If 10 is the whole and 6 is one of the parts. What is the other part?</p> $10 - 6 =$   | <p>Use a pictorial representation of objects to show the part whole model.</p>   |  <p>Move to using numbers within the part whole model.</p> |
| <h2>Make 10</h2>             | <p><math>14 - 9 =</math></p>  <p>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.</p>   |  <p>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.</p>  | <p><math>16 - 8 =</math></p> <p>How many do we take off to reach the next 10?</p> <p>How many do we have left to take off?</p>                |

# Column method without regrouping



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

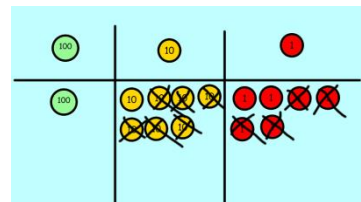
Show how you partition numbers to subtract. Again make the larger number first.



Calculations

$$\begin{array}{r} 54 \\ - 22 \\ \hline 32 \end{array}$$

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



Calculations

$$176 - 64 =$$

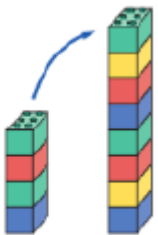

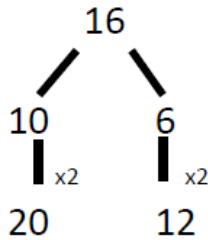


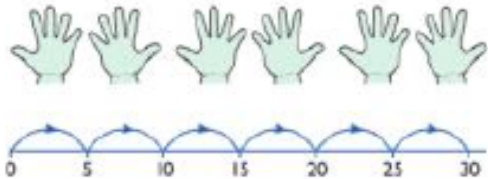
$$\begin{array}{r} 176 \\ - 64 \\ \hline 112 \end{array}$$

$$\begin{array}{r} 47 - 24 = 23 \\ - 20 + 7 \\ \hline 20 + 3 \end{array}$$

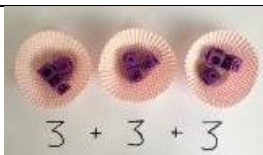
This will lead to a clear written column subtraction.

$$\begin{array}{r} 32 \\ - 12 \\ \hline 20 \end{array}$$

## Multiplication

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

## Repeated addition

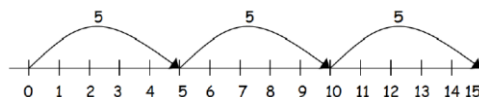


Use different objects to add equal groups.

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



2 add 2 add 2 equals 6



$$5 + 5 + 5 = 15$$

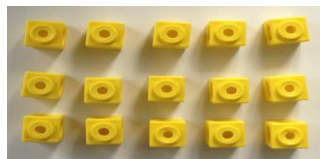
Write addition sentences to describe objects and pictures.



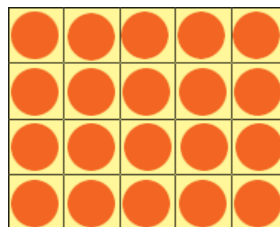
$$2 + 2 + 2 + 2 + 2 = 10$$

## Arrays- showing commutative multiplication

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.



$$5 + 5 + 5 = 15$$

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

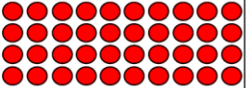

$$5 \times 3 = 15$$

$$3 \times 5 = 15$$





## Grid Method

Show the link with arrays to first introduce the grid method:  $4 \times 13$

| x | 10  | 3   |
|---|---|---|
| 4 |  |  |

4 rows of 10  
4 rows of 3

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

| x | T   | U   |
|---|---|---|
| 4 |  |  |

4 rows of 13

Then you have your answer:

$$4 \times 10 = 40$$

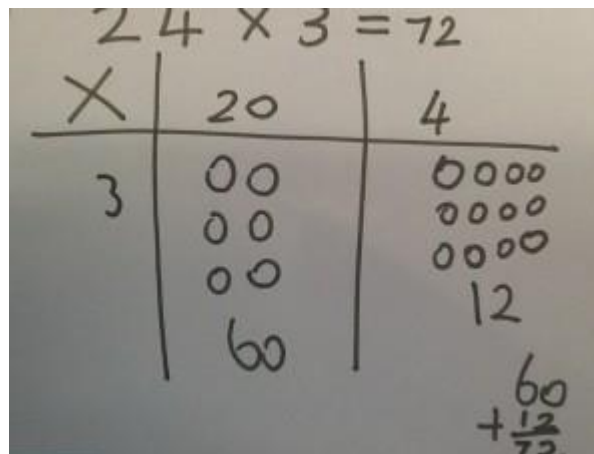
$$4 \times 3 = 12$$

$$40 + 12 = 52$$

$$\text{So, } 4 \times 13 = 52$$

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.



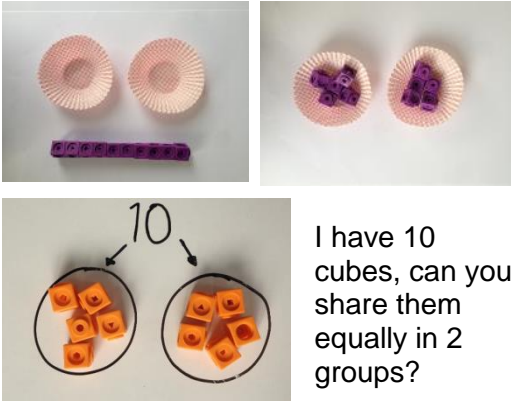
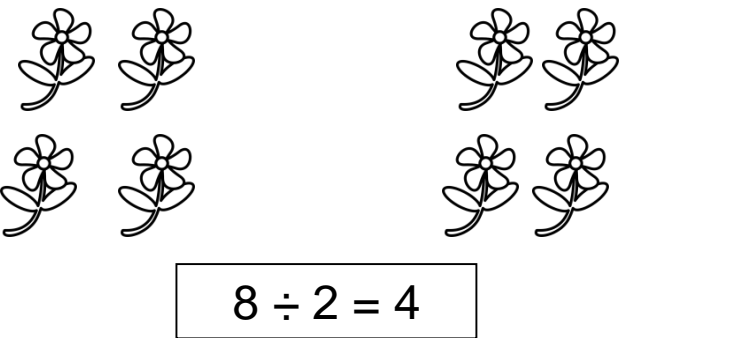
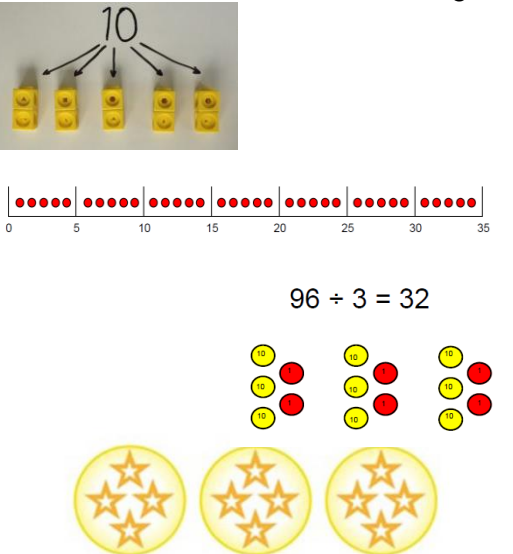
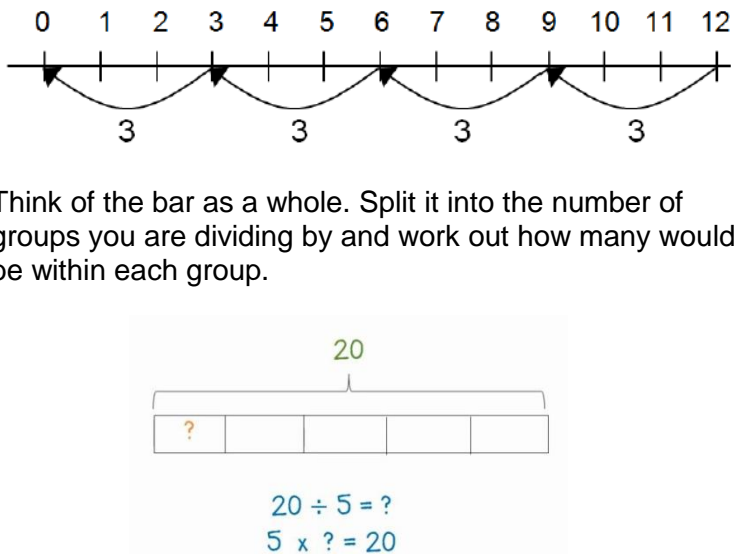
Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

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

|    | 10  | 8  |
|----|-----|----|
| 10 | 100 | 80 |
| 3  | 30  | 24 |



## Division

| Objective and Strategies           | Concrete   | Pictorial   | Abstract  |
|------------------------------------|--|---|---|
| <p>Sharing objects into groups</p> |  <p>I have 10 cubes, can you share them equally in 2 groups?</p>  | <p>Children use pictures or shapes to share quantities.</p>   | <p>Share 9 buns between three people.</p> $9 \div 3 = 3$                    |
| <p>Division as grouping</p>        | <p>Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.</p>  $96 \div 3 = 32$ | <p>Use a number line to show jumps in groups. The number of jumps equals the number of groups.</p>  <p>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.</p> $20 \div 5 = ?$ $5 \times ? = 20$ | $28 \div 7 = 4$ <p>Divide 28 into 7 groups. How many are in each group?</p> |

|                                  |  |  |   |
|----------------------------------|--|--|---|
| <p>Division within arrays</p>    | <div data-bbox="407 132 728 339"> </div> <p>Link division to multiplication by creating an array and thinking about the number sentences that can be created.</p> <p>Eg <math>15 \div 3 = 5</math>    <math>5 \times 3 = 15</math><br/> <math>15 \div 5 = 3</math>    <math>3 \times 5 = 15</math></p> | <div data-bbox="969 132 1630 408"> </div> <p>Draw an array and use lines to split the array into groups to make multiplication and division sentences.</p>   | <p>Find the inverse of multiplication and division sentences by creating four linking number sentences.</p> <p><math>7 \times 5 = 35</math><br/> <math>5 \times 7 = 35</math><br/> <math>35 \div 7 = 5</math><br/> <math>35 \div 5 = 7</math></p> |
| <p>Division with a remainder</p> | <p><math>14 \div 3 =</math><br/>         Divide objects between groups and see how much is left over</p> <div data-bbox="407 707 931 1078"> </div>   | <p>Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.</p> <div data-bbox="969 627 1668 754"> </div> <p>Draw dots and group them to divide an amount and clearly show a remainder.</p> <div data-bbox="1059 930 1514 1026"> </div> |   |