Welcome to the KS1 Workshop for Maths☺

PLAY

PRAY LEARN

TOGETHER

Respect, Responsibility, Resilience

Welcome Parents!

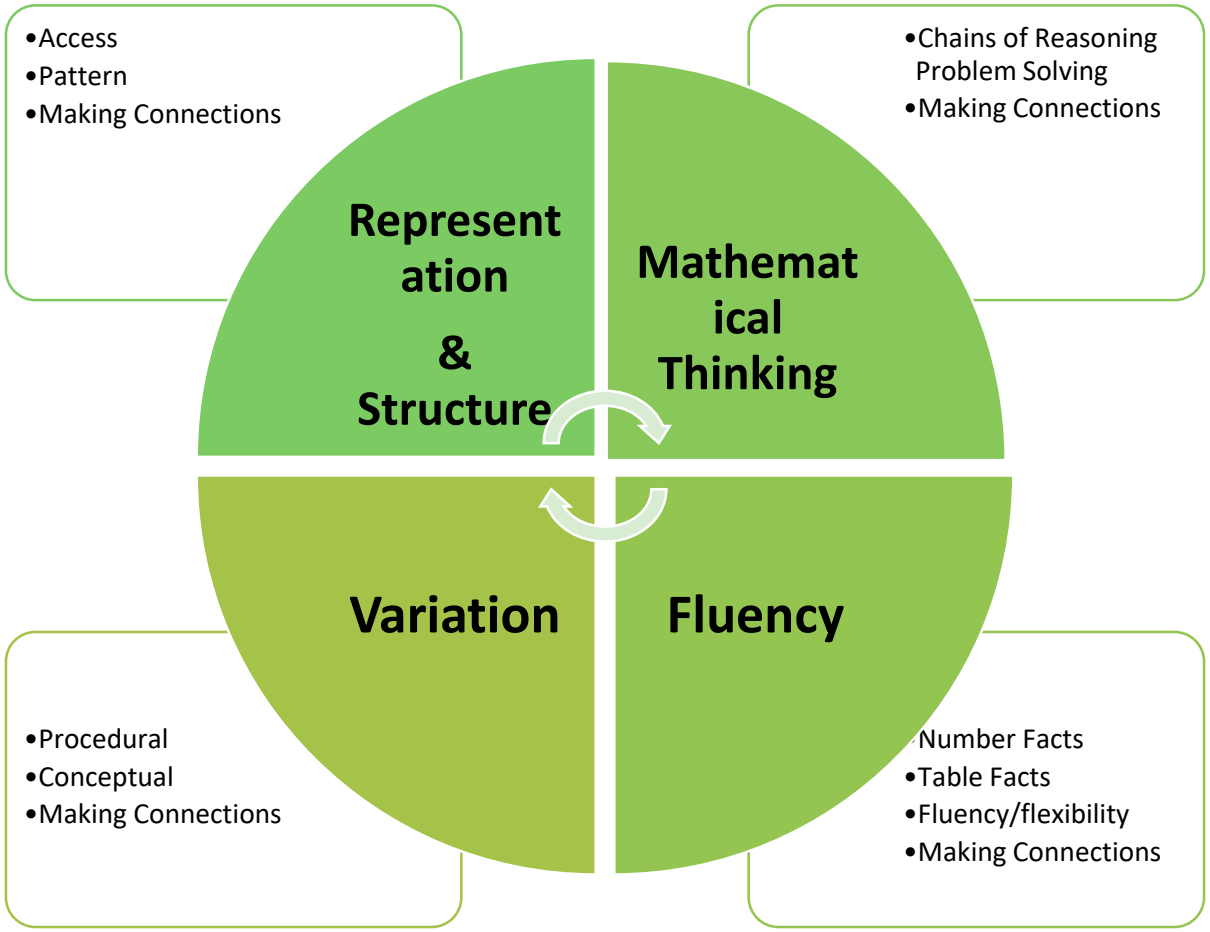
- **Welcome! This session will cover:**
- An introduction on how we teach maths, including Teaching for Mastery.
- Progression in Calculation (4 operations).
- How you can support your child at home.
- Questions.

Maths at Holy Family

At Holy Family, children are taught through a mastery approach – whole class interactive teaching, where the expectation is that the majority of pupils will move through the programmes of study at broadly the same pace.

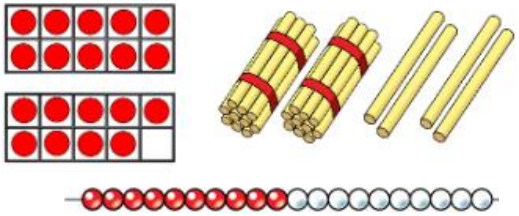
Teachers use the White Rose Small Steps to build up on previous learning, embedding knowledge and ensure the confident use of mathematical vocabulary. We use these small connected steps alongside a variety of resources to provide tasks for fluency, reasoning and problem solving e.g. White Rose documents, MathShed, I See Maths, NRICH tasks and NCTEM Spine materials.

What is a ‘mastery’ approach?

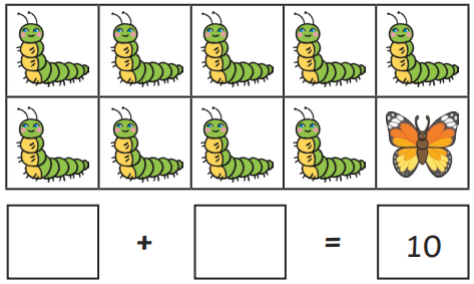


Mastery Approach to Teaching New Concepts

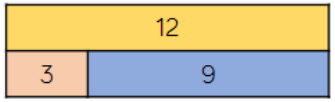
- Concrete
- Pictorial
- Abstract



Circle the greatest number.

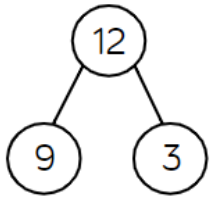


Which of the representations are equivalent to the bar model?

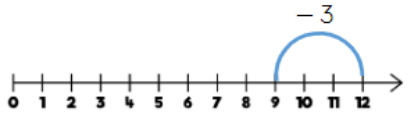


$12 = 9 + 3$

There are 9 cars in a car park, 3 cars leave.



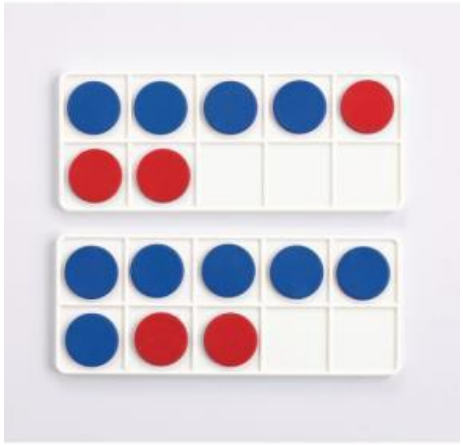
$9 - 3 = 12$



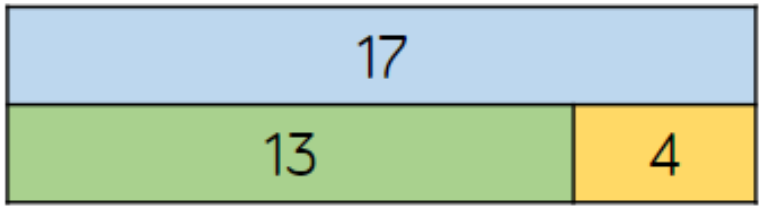
CPA- Concrete/Pictorial/Abstract

- Our pupils are encouraged to physically represent mathematical concepts. Objects and pictures are used to demonstrate and visualise abstract ideas, alongside numbers and symbols.
- Concrete – children have the opportunity to use concrete objects and manipulatives to help them understand and explain what they are doing.
- Pictorial – children then build on this concrete approach by using pictorial representations, which can then be used to reason and solve problems.
- Abstract – With the foundations firmly laid, children can move to an abstract approach using numbers and key concepts with confidence.

Just a few of the concrete tools we use to support children that you can use too…



Pictorial Representation: Bar model…

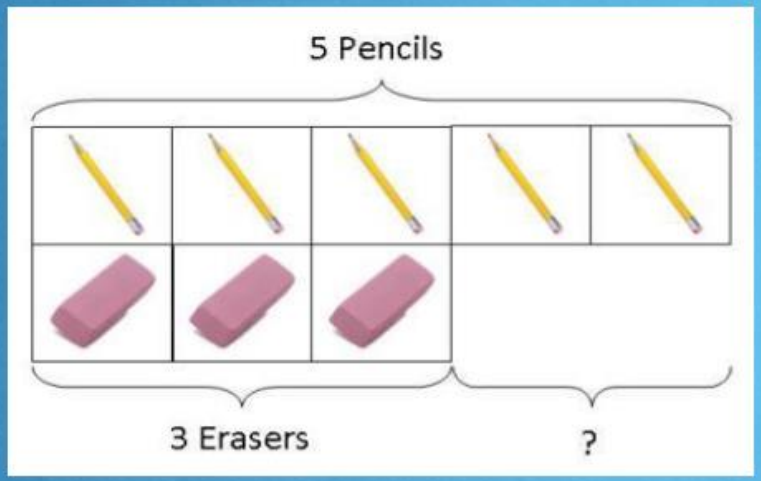


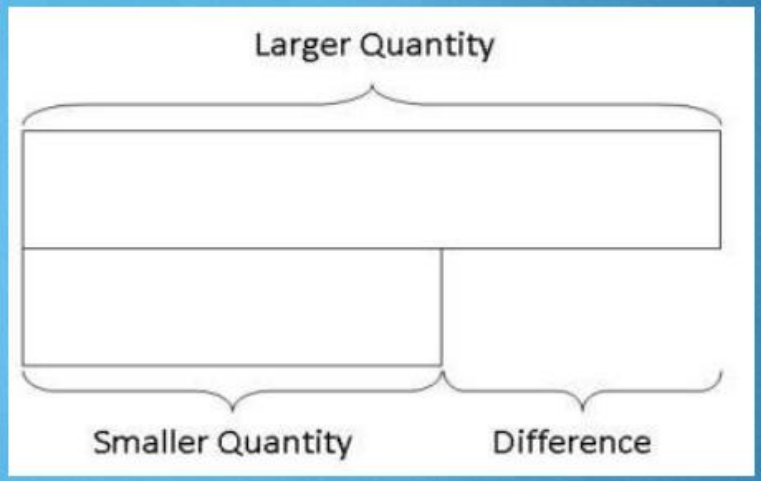
- It is a mathematical representation of a problem.. A way of modelling …
- the knowns and unknowns, the parts and the whole.

- It is a representation that **reveals the relationship of the numbers.**

Peter has 5 pencils and 3 rubbers.

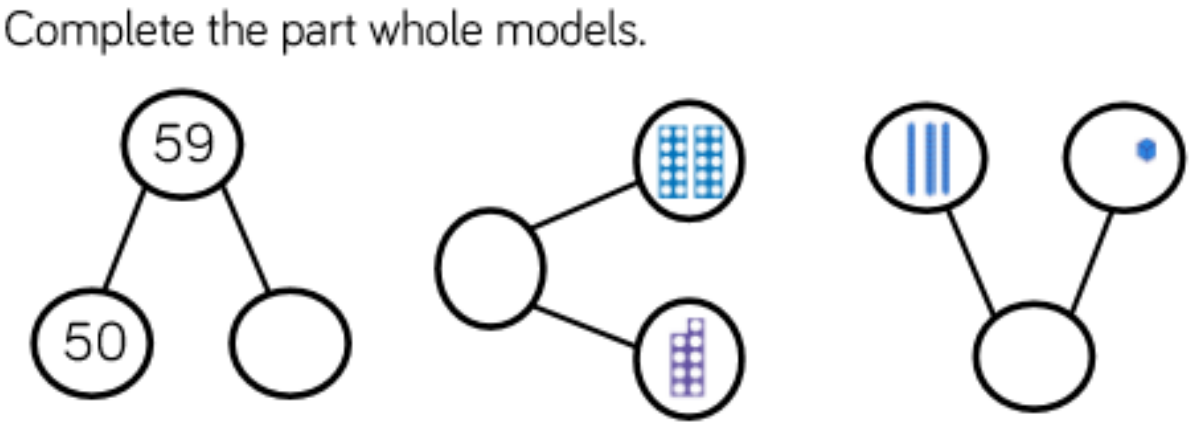
How many more pencils than rubbers does he have?



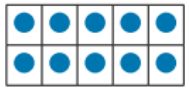


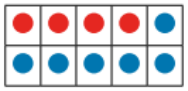
Part, Part, Whole model…

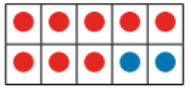
- It is a mathematical representation of a problem.. A way of modelling ...
- the knowns and unknowns, the parts and the whole.

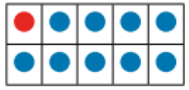


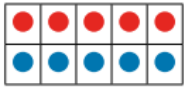
Number Bonds

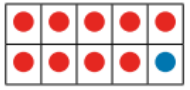
0+10=10 

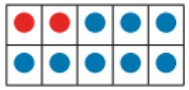
4+6=10 

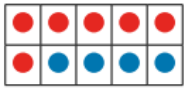
8+2=10 

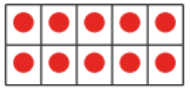
1+9=10 

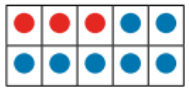
5+5=10 

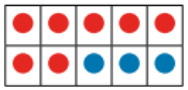
9+1=10 

2+8=10 

6+4=10 

10+0=10 

3+7=10 

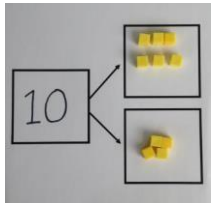
7+3=10 

Part-whole model, bar model,

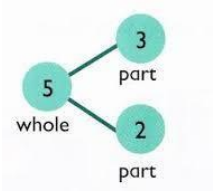
Combining two parts to make a whole: part- whole model

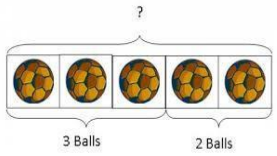
Concrete - Use cubes to add two numbers together as a group or in a bar.



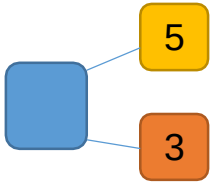
Pictorial - Use pictures to add two numbers together as a group or in a bar.





Abstract - Use the part-part whole diagram as shown above to move into the abstract

4 + 3 = 7 3 + 2 = 5



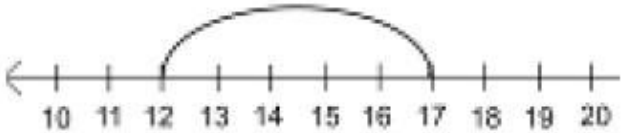
Bead string and number line

Starting at the bigger number and counting on

Concrete - Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.

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

12 + 5 = 17



Abstract - Place the larger number in your head and count on the smaller number to find your answer.

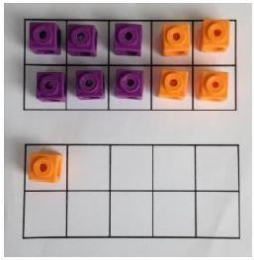
5 + 12 = 17

Tens frame, bead string, number line

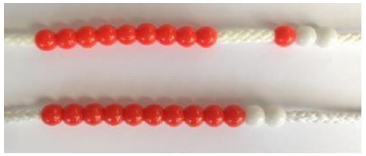
Regrouping to make 10

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

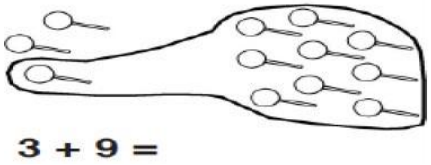
6 + 5 = 11

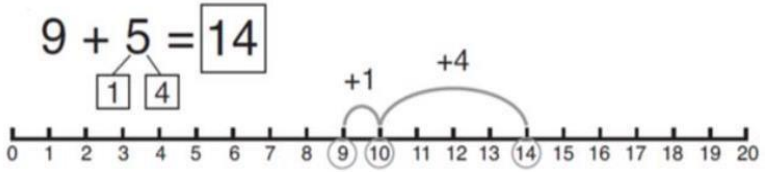


9 + 3 = 12



Pictorial - Use pictures or a number line. Regroup or partition the smaller number to make 10.





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

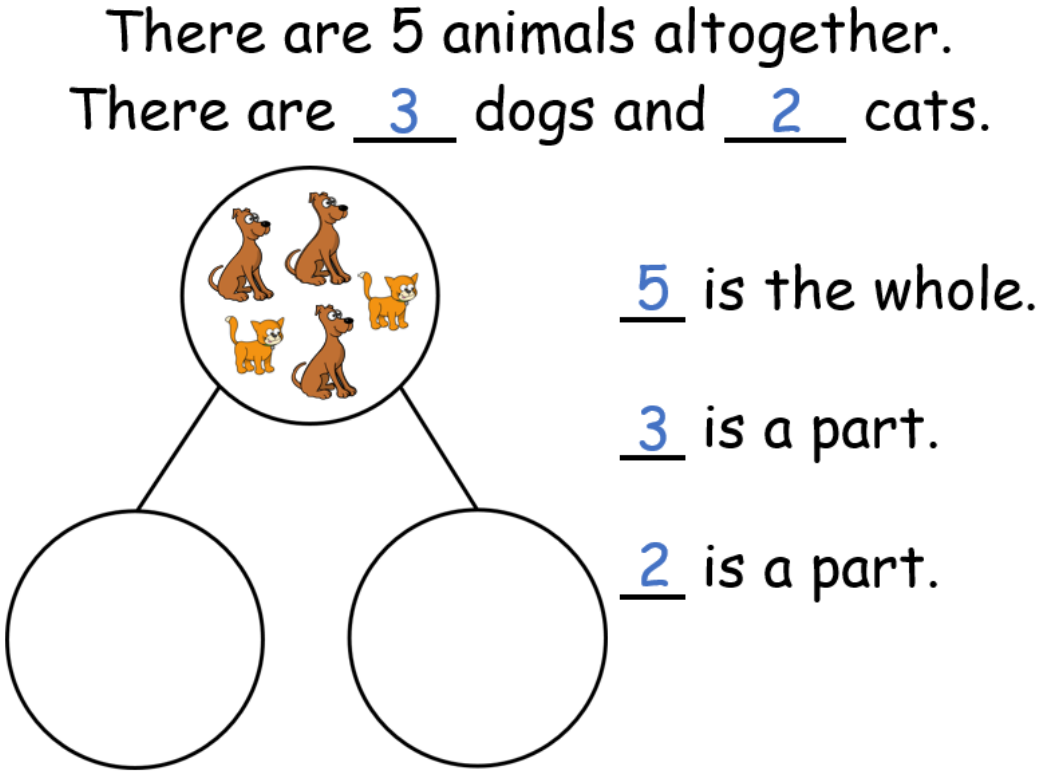
7 + 4= 11

What does maths look like at Holy Family?

- The lesson design, used at Holy Family, allows the children vital opportunities to make connections between areas covered in the maths curriculum. We start each small step with a 'Focus Task' to get the children thinking mathematically and making links to other areas of the maths curriculum.
- Stem sentences – to make generalisations
- Vocabulary – displayed to reinforce
- Concrete materials – ten frame, bead strings, counters
- Different representations – ten frame, bar model, part-whole

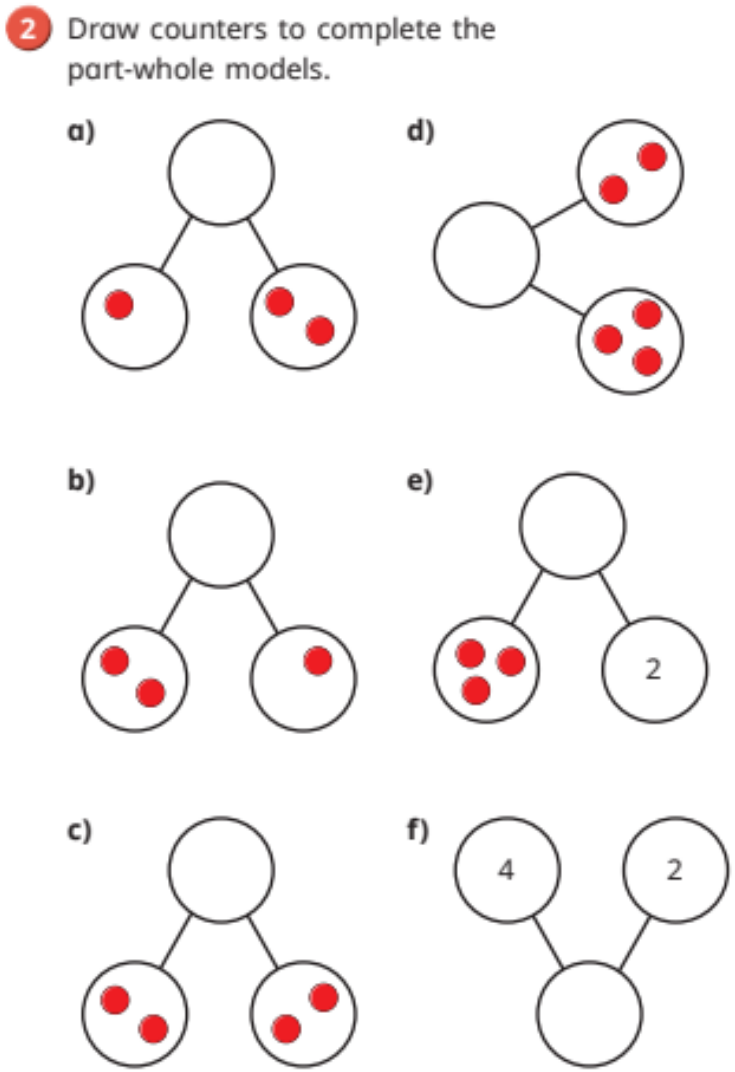
Guided Practice

Guided practice - a series of related tasks that the children complete independently or in pairs at first. After each one the children are asked to come back together to review and discuss their findings. This gives an opportunity for self/teacher assessment and make corrections. It is during these sections that a lot of really impressive discussion and reasoning takes place. Lots of manipulatives used to build concepts.



Independent Work

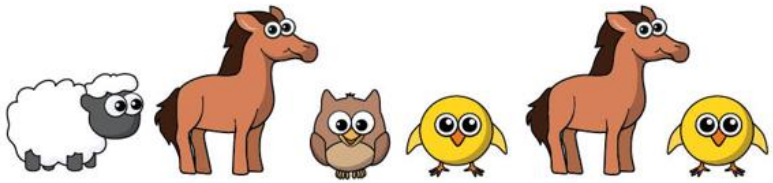
- Independent activities (use of White Rose/MNP worksheets or other tasks)these are tasks graduating in difficulty. Here children are encouraged (under guidance) to complete to the level that they felt comfortable with after completing the guided practice.



Star Work

- ‘Star Work’ is available for any child who shows a greater understanding of the small step covered.

Here are six animals.

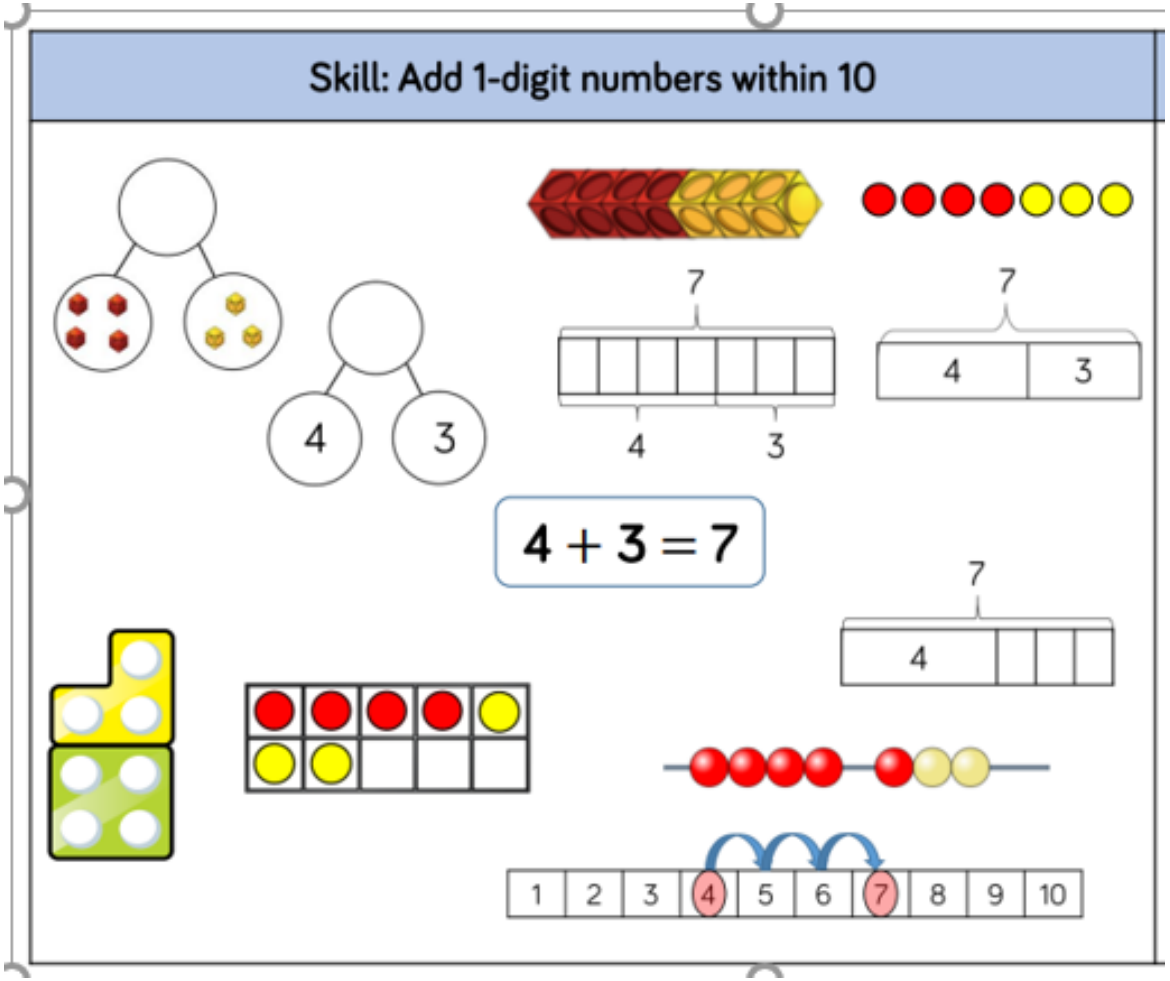


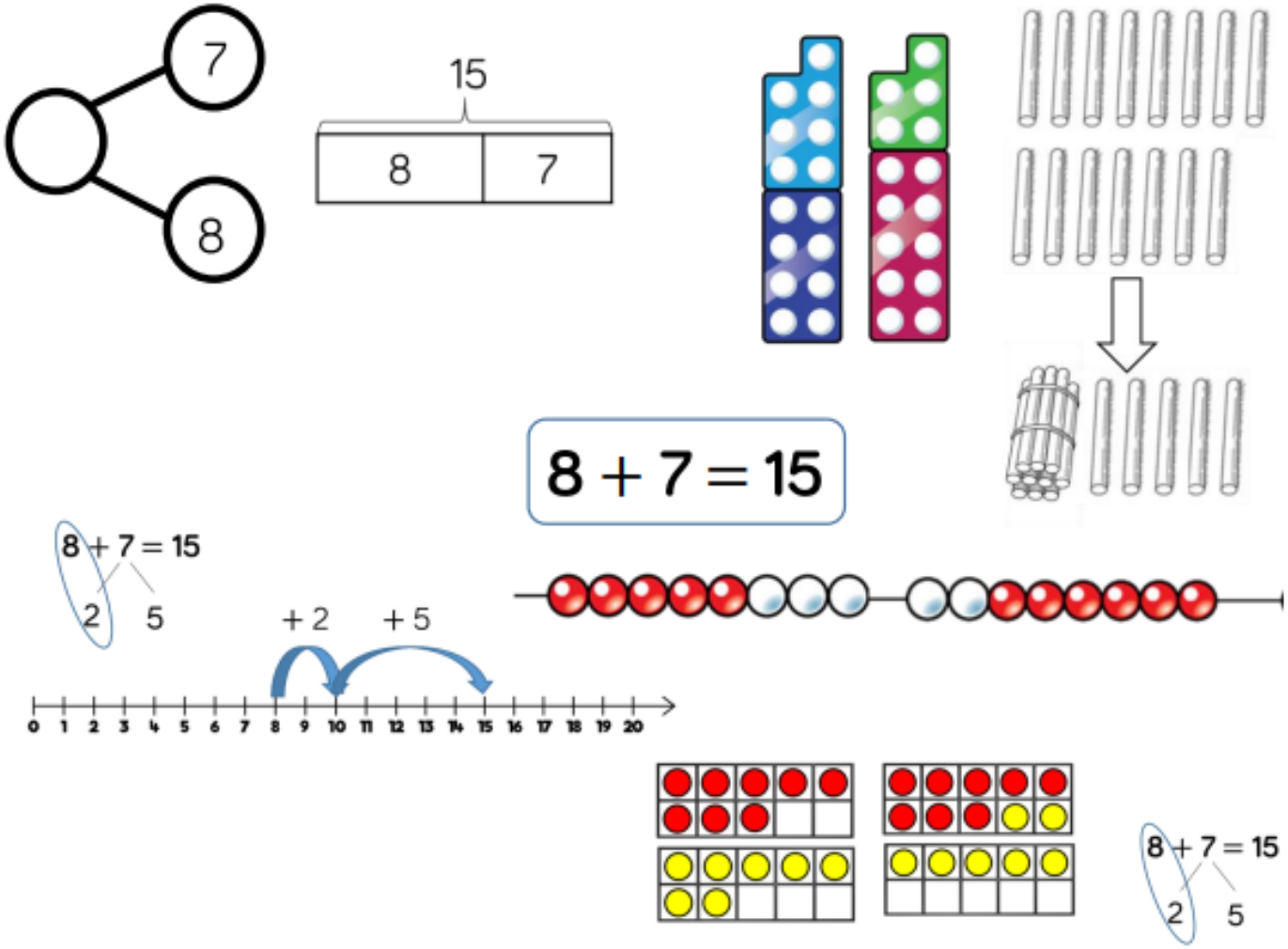
How many different ways can you group the animals?

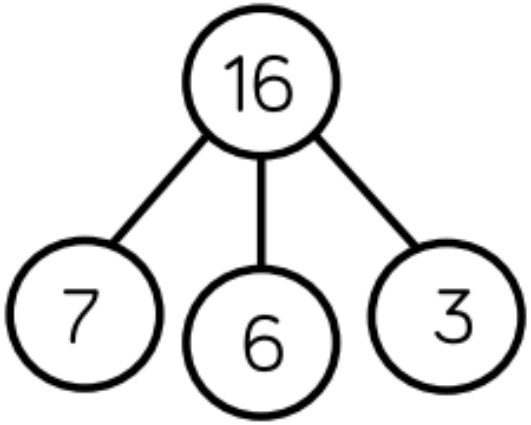
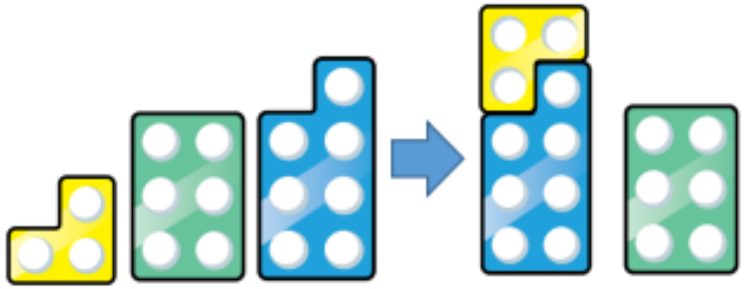
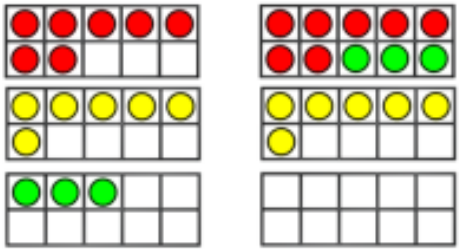
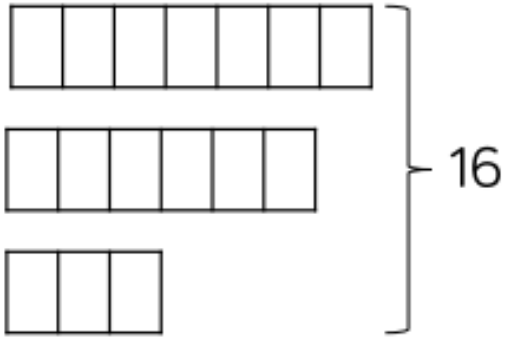
Draw a part-whole model for each way.

Can you make more than two groups?

Manipulatives and Pictorials used to build progression in Addition

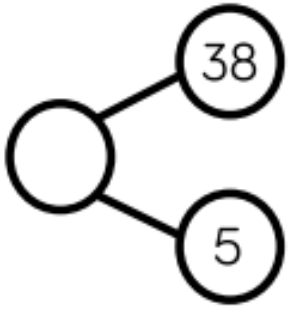


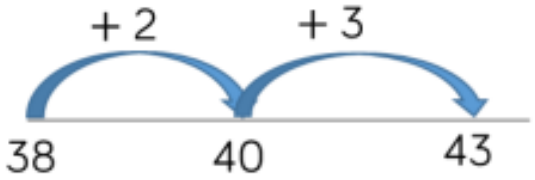
Skill: Add 1 and 2-digit numbers to 20	Year: 1/2
	When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten. Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.

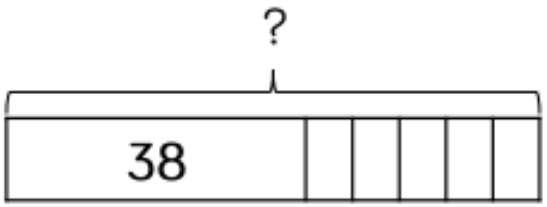
Skill: Add three 1-digit numbers	Year: 2
  $7 + 6 + 3 = 16$  $7 + 6 + 3 = 16$ 10 	When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently. This supports children in their understanding of commutativity. Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

Skill: Add 1-digit and 2-digit numbers to 100

Year: 2/3

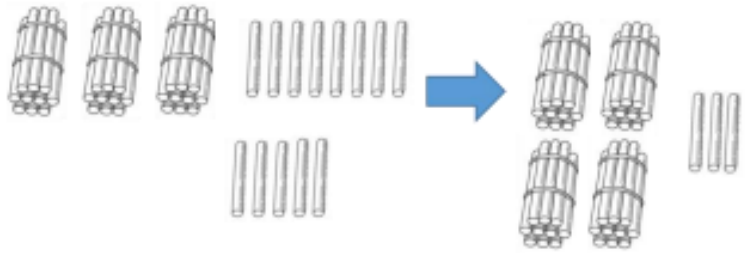






$$38 + 5 = 43$$

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
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



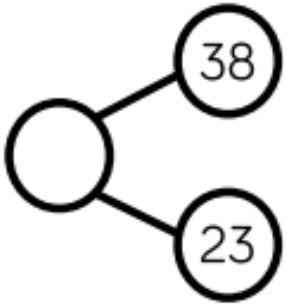
When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

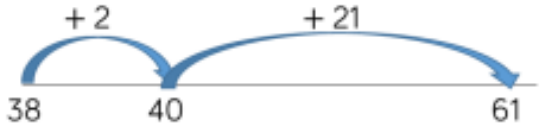
They should also apply their knowledge of number bonds to add more efficiently e.g. $8 + 5 = 13$ so $38 + 5 = 43$.

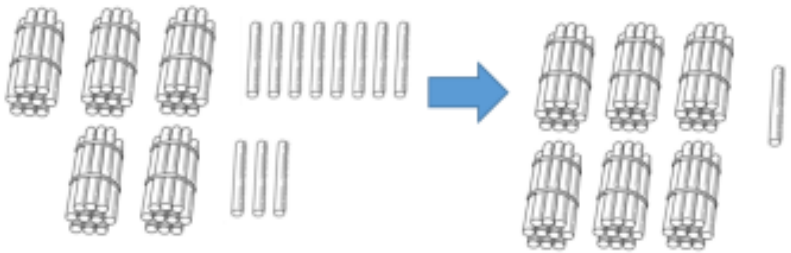
Hundred squares and straws can support children to find the number bond to 10.

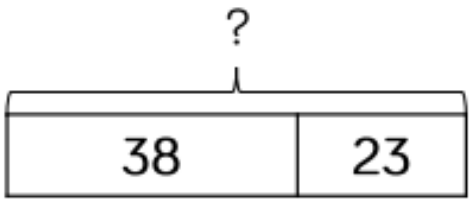
Skill: Add two 2-digit numbers to 100

Year: 2/3

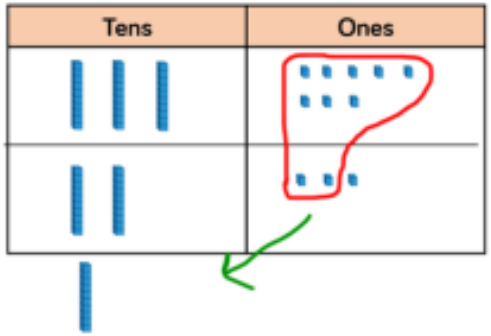




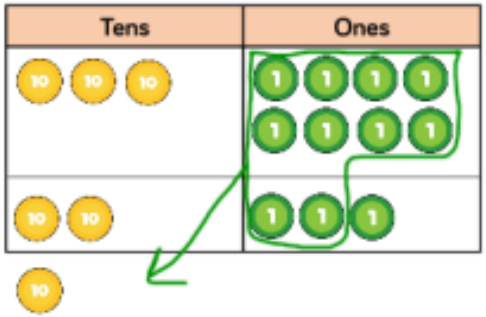




$$38 + 23 = 61$$



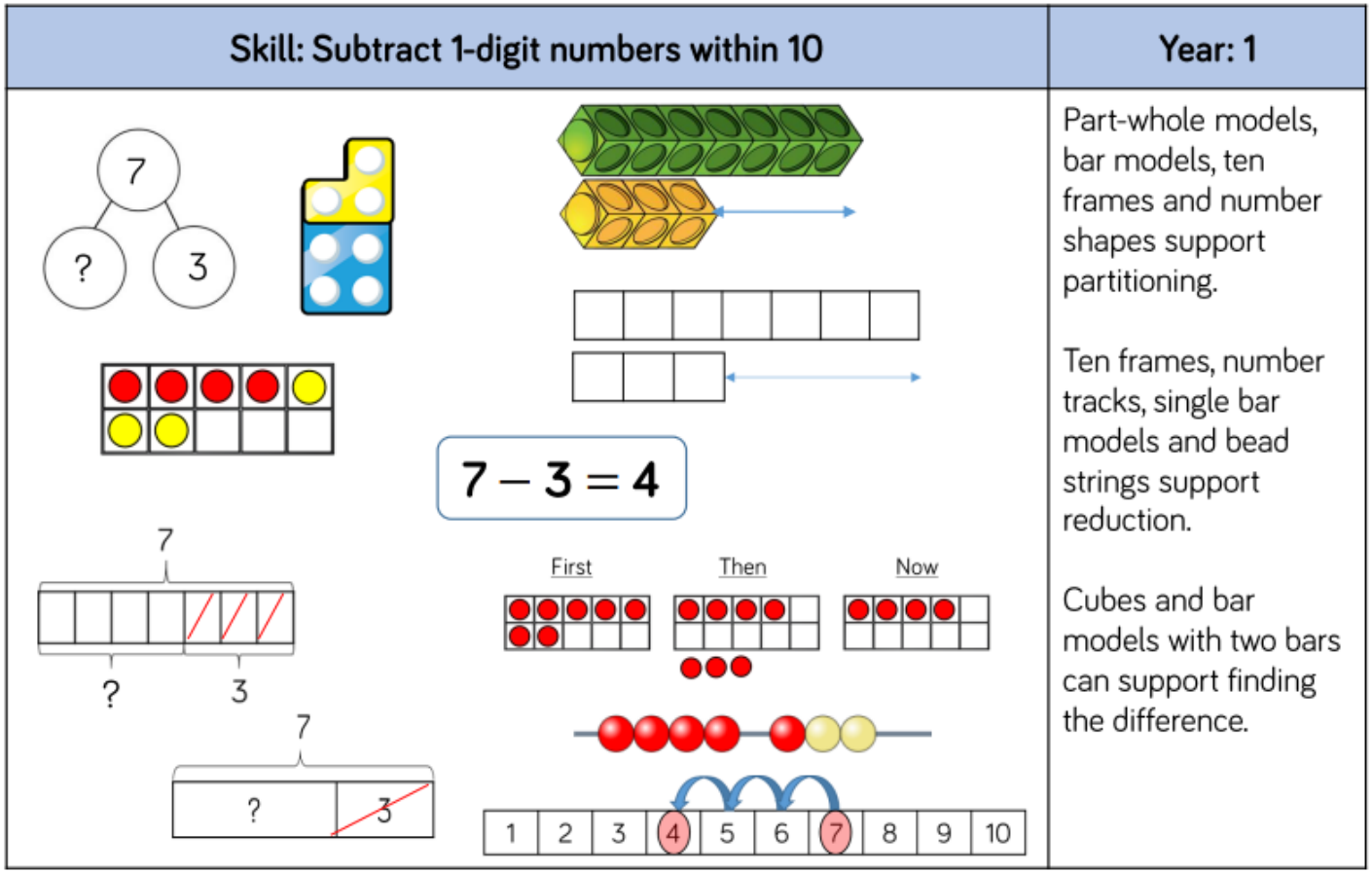
$$\begin{array}{r} 38 \\ +\ 23 \\ \hline 61 \\ \hline 1 \end{array}$$



At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

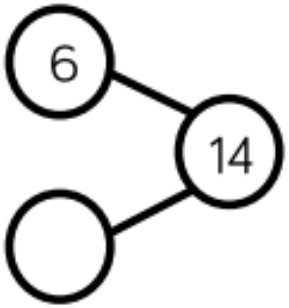
Children can also use a blank number line to count on to find the total. Encourage them to jump to multiples of 10 to become more efficient.

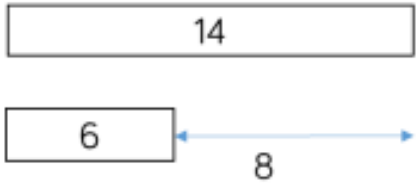
Manipulatives and Pictorials used to build progression in Subtraction

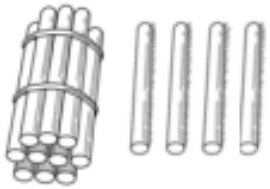


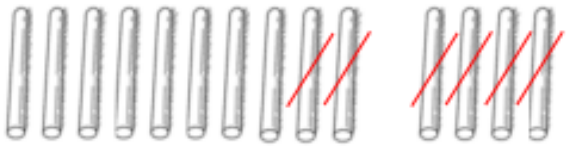
Skill: Subtract 1 and 2-digit numbers to 20

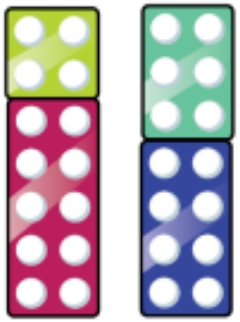
Year: 1/2



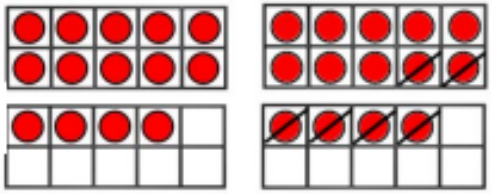


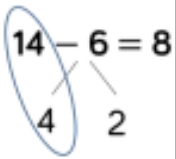






$$14 - 6 = 8$$



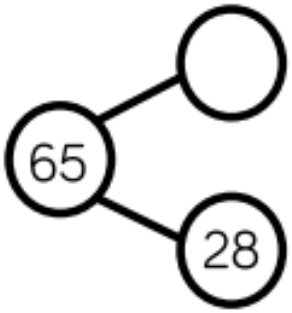


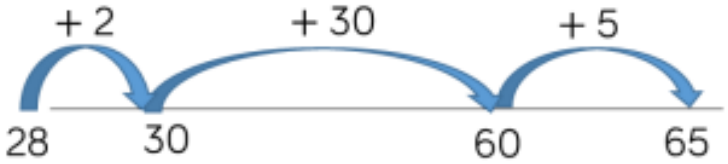
When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.

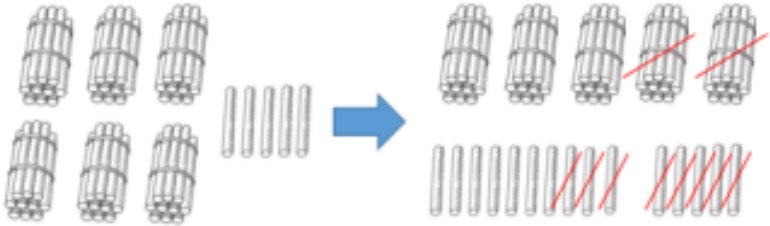
Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, number shapes and number lines are particularly useful for this.

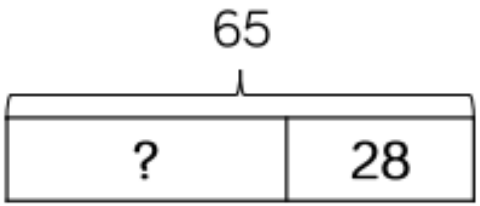
Skill: Subtract 1 and 2-digit numbers to 100

Year: 2

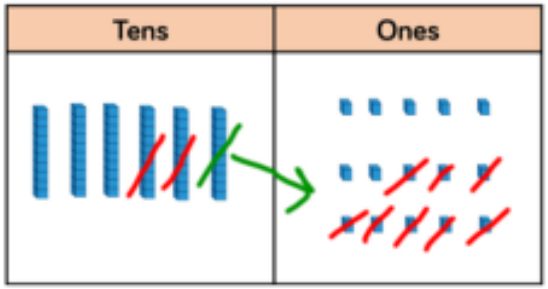




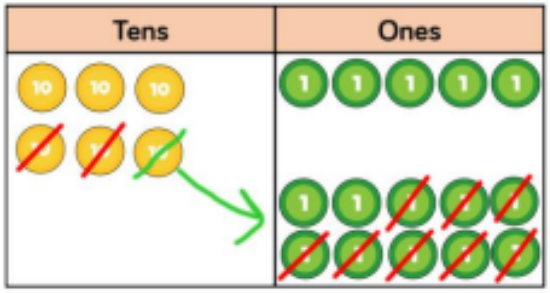




$$65 - 28 = 37$$



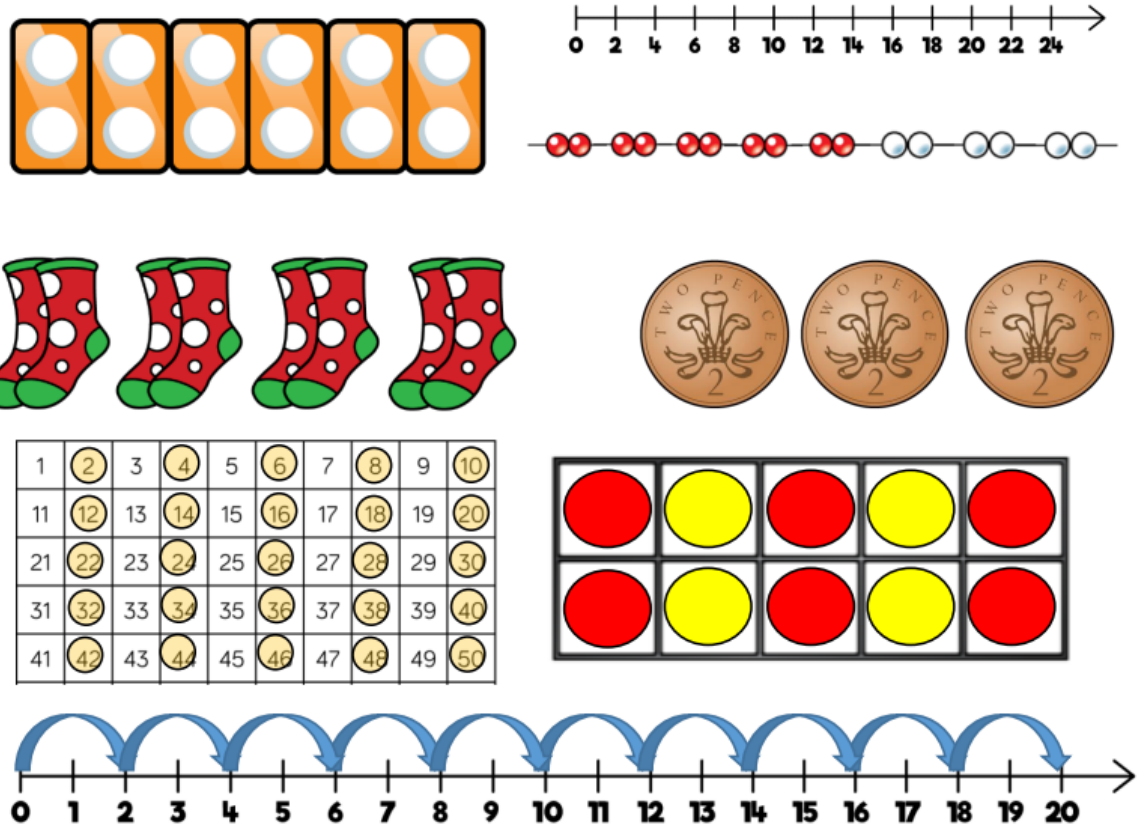
$$\begin{array}{r} {}^{5}\not{6}\,{}^{1}5 \\ -\ 28 \\ \hline 37 \end{array}$$



At this stage, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

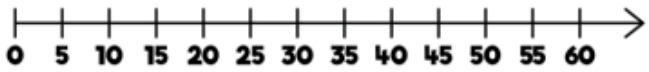
Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.

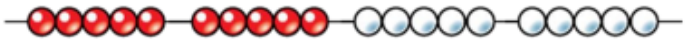
Manipulatives and Pictorials used to build progression in Multiplication

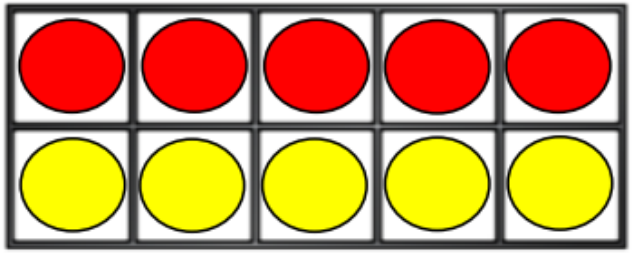
Skill: 2 times table	Year: 2
	Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square. Look for patterns in the two times table, using concrete manipulatives to support. Notice how all the numbers are even and there is a pattern in the ones. Use different models to develop fluency.

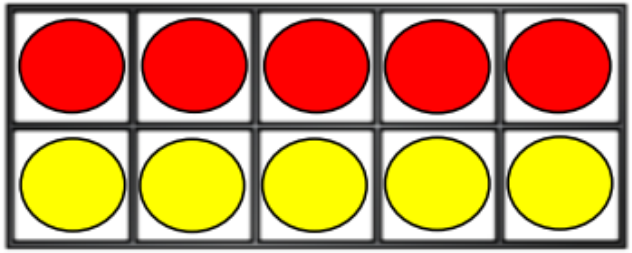
Skill: 5 times table

Year: 2

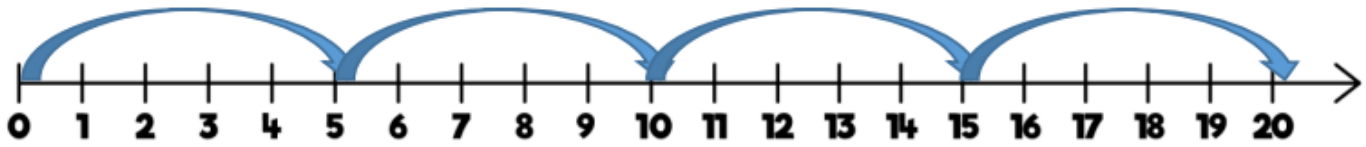








1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

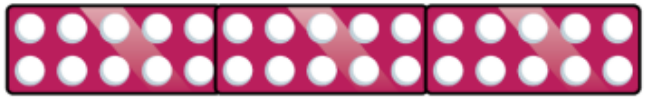


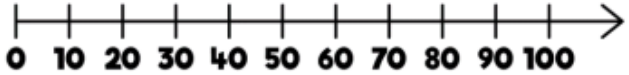
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

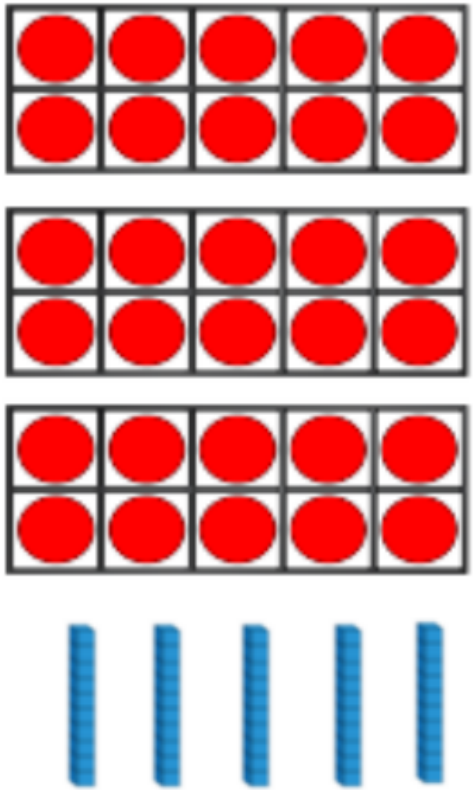
Look for patterns in the five times table, using concrete manipulatives to support. Notice the pattern in the ones as well as highlighting the odd, even, odd, even pattern.

Skill: 10 times table

Year: 2







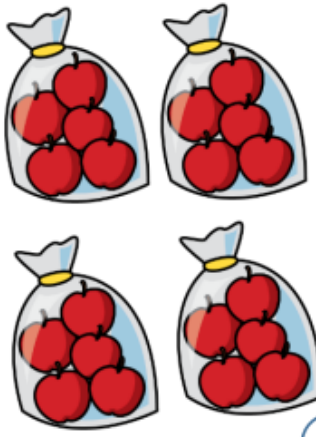
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

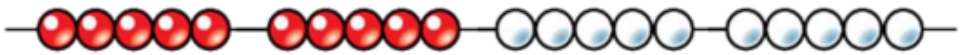
Encourage daily counting in multiples both forwards and backwards. This can be supported using a number line or a hundred square.

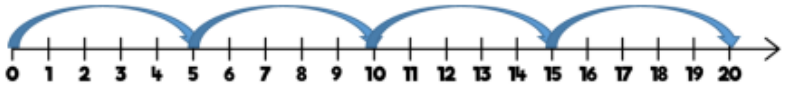
Look for patterns in the ten times table, using concrete manipulatives to support. Notice the pattern in the digits- the ones are always 0, and the tens increase by 1 ten each time.

Skill: Solve 1-step problems using multiplication

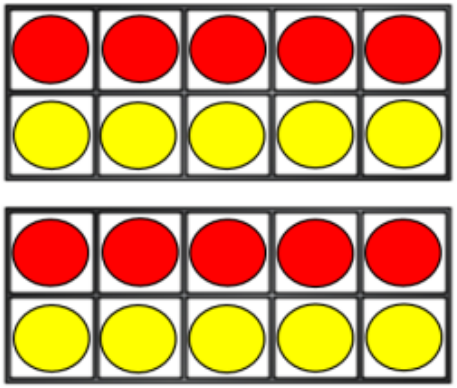
Year: 1/2

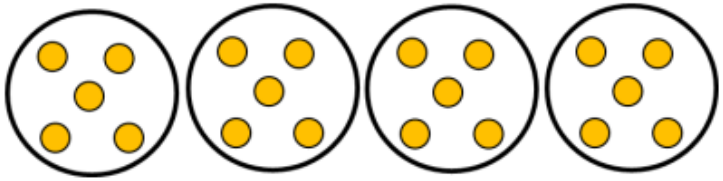


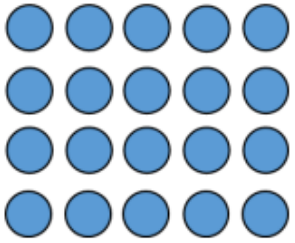




One bag holds 5 apples.
How many apples do 4 bags hold?







$5 + 5 + 5 + 5 = 20$

$4 \times 5 = 20$

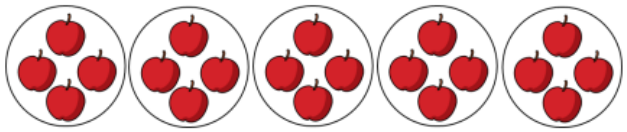
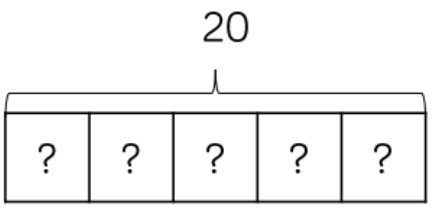
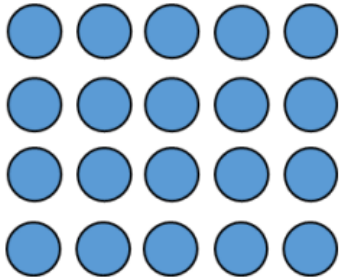
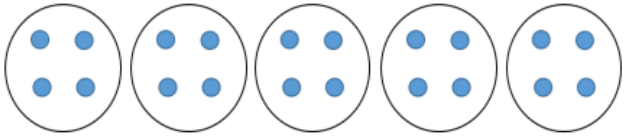
$5 \times 4 = 20$

Children represent multiplication as repeated addition in many different ways.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.

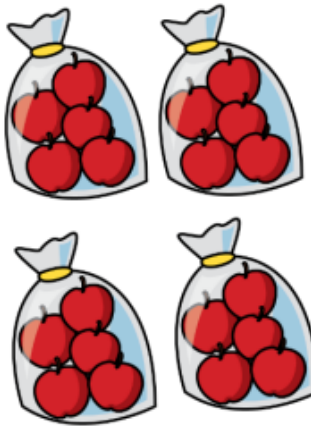
In Year 2, children are introduced to the multiplication symbol.

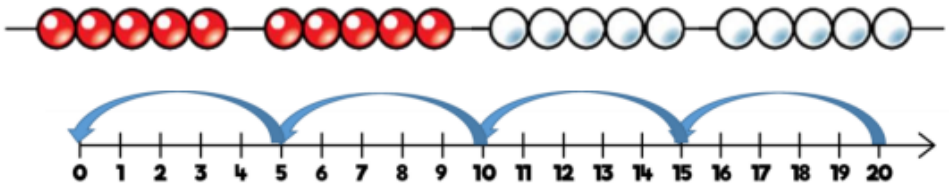
Manipulatives and Pictorials used to build progression in Division

Skill: Solve 1-step problems using multiplication (sharing)	Year: 1/2
  There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag?   $20 \div 5 = 4$	Children solve problems by sharing amounts into equal groups. In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally. In Year 2, children are introduced to the division symbol.

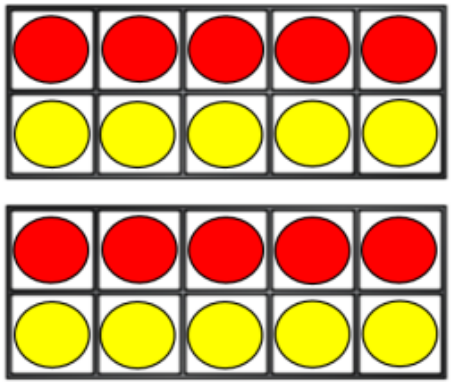
Skill: Solve 1-step problems using division (grouping)

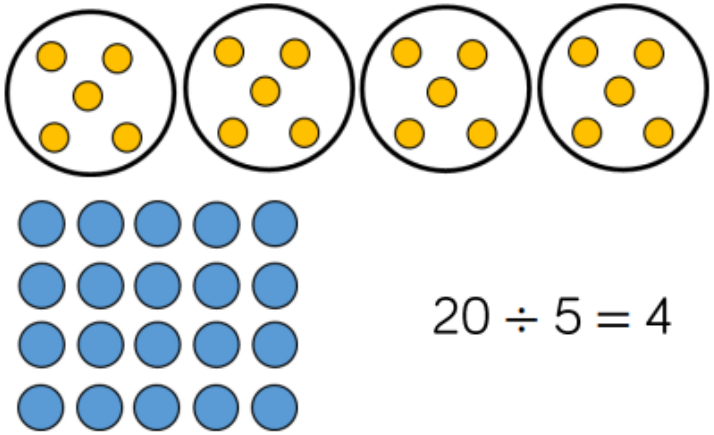
Year: 1/2





There are 20 apples altogether.
They are put in bags of 5.
How many bags are there?





$20 \div 5 = 4$

Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.

Times Tables

Why children need to be fluent with times tables

Top Times Table Hints

It may seem a daunting task to learn so many multiplication facts, but because of the commutative property of multiplication, there are fewer facts than you may think.
For example, 3 x 4 and 4 x 3 give the same answer so you need to only learn this once. Zero Times Table
Anything multiplied by zero will always equal zero.
Multiplication is repeated addition so 3 x 0 is 0 + 0 + 0, which equals 0.

One Times table: Any number multiplied by one is itself.

Two Times Table: Any number multiplied by two is double the number. 7 x 2 =14 7 + 7 = 14 double 7 is 14

Three Times Table: Digits within this times table add up to multiples of 3. For example: 3, 6, 9, 12 (1+2=3), 15 (1+5=6), 18 (1+8=9) 21 (2+1=3), 24 (2+4=6) etc. The numbers also follow the pattern of: odd, even, odd, even (3,6,9,12).

Four Times Table: The four times table is double the two times table. 4 x 2 = 8, 4 x 4 = 16, 16 is double 8. Alternatively the fours can be thought of as double double. So double 3 (6) and double again (12) is the same as 3 x 4 = 12.

Five Times Table: All multiples of 5 end in five or zero. For even numbers (e.g. 8 x 5) you can halve the number (4) and then put a zero after it (40). For odd numbers (e.g. 7 x 5) you can subtract one from the number (6), halve it (3) and then put a 5 after it (35). Any odd number times 5 ends in a 5. Any even number times 5 ends in 0.

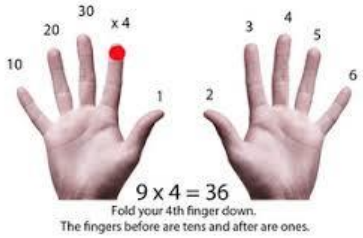
Six Times Table: The six times table is double the three times table. So 5 x 3 = 15, 5 x 6 = 30, 30 is double 15.

Seven Times Table: Combine the 5 and the 2 times table: 7 x 4 = 28 or (5x4) + (2x4) = 28

Eight Times Table: The eight times table is double the four times table. So 7 x 4 = 28, 7 x 8 = 56, 56 is double 28. The units in the multiples of eight also go down in twos. 8, 16, 24, 32, 40, 48, 56, 64, 72, 80 (8, 6, 4, 2, 0, 8, 6, 4, 2, 0).

Nine Times Tables

Fingers can be used to work out the nine times table up to 10 x 9. The first finger is put down for 1 x 9 and the remaining fingers show 9 units (1 x 9 =9). Then the second finer is put down for 2 x 9 and the remaining fingers show 1 ten (to the left) and 8 units (to the right) which equals 18, and so on. For example:



9 x 0 = 0
9 x 1 = 9
9 x 2 = 18
9 x 3 = 27
9 x 4 = 36
9 x 5 = 45
9 x 6 = 54
9 x 7 = 63
9 x 8 = 72
9 x 9 = 81
9 x 10 = 90

The digits found in the multiples of nine when added together also equal nine. For example: 9 = 9, 18 (1 + 8) = 9, 27 (2 + 7) = 9, 36 (3 + 6) = 9, 45 (4 + 5) = 9 etc.

See the pattern shown:

Ten Times Table: All the digits in the ten times table end in zero.

Eleven Times Table: Most of the multiples in the eleven times table are recalled by putting two of the number side by side. 7 x 11 = 77, 8 x 11 =88.

Twelve Times Table: The units in the twelve times table go up in twos. 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144 (2, 4, 6, 8, 0, 2, 4, 6, 8, 0). The multiples of 12 are also the multiples of 10 and the multiples of 2 combined

Practical and pictorial resources

Numicon

- Is a system of flat plastic shapes with holes in, with each shape representing a number from one to 10. Each number has its own colour.
- The aim of Numicon is to make numbers real for children through them being able to see and touch them.
- Each Numicon shape gives children an image of what a number looks like. They begin to see the relationship between numbers, with each piece having one hole more than the previous one.
- It appeals to their strong sense of pattern, and helps them understand how numbers fit together.

Numicon

Children using Numicon typically progress through four stages:

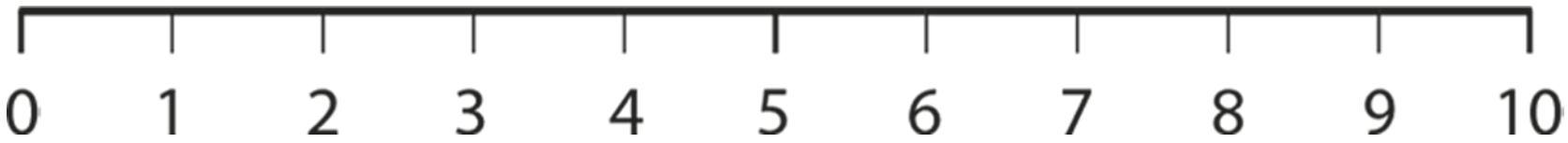
- **Pattern:** for example, finding shapes that match and stacking them on the peg board.
- **Ordering:** putting the shapes into sequence from the smallest to largest number, and vice versa.
- **Counting:** counting each hole one by one to find out what number the piece represents.
- **Early calculating:** using the pieces to solve simple problems, for example working out that a three-piece and a four-piece are equal to a seven-piece.

Bead Strings

- Bead strings are brilliant for visualising numbers with a moveable object. You can hide or cover certain parts of a bead string so children find it easier to count each individual bead.
- It's important that children know how each bead string works, typically a 100 bead string counts up in tens by alternating from red to white beads. A 10 bead string has five white and five red.
- So many opportunities with a bead string – counting 1:1, counting in 10s, addition and subtraction practically, place value etc.

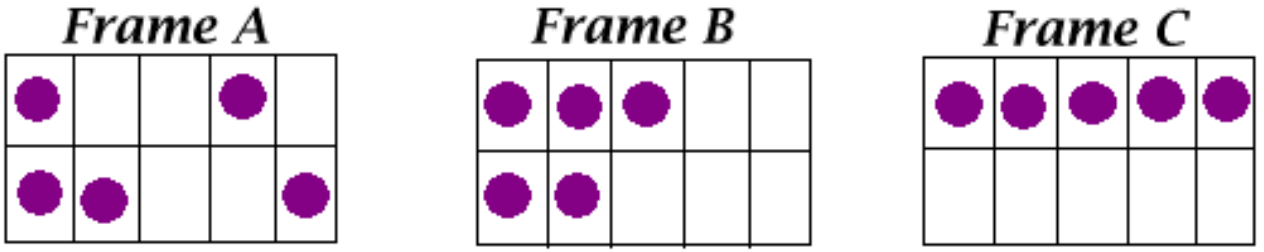
Number Lines

- Number lines are a brilliant too and related closely to a bead string. They are effectively the pictorial representation of a bead string.
- Like bead strings, number lines can have different representations 0 – 10, 0 – 20, 0 – 30, 0 – 50, 0 – 100 and blank ones for any range of number.
- They are useful tool for jottings and can be used to support counting forwards and backwards, addition, subtraction, multiplication and division.



Tens Frames

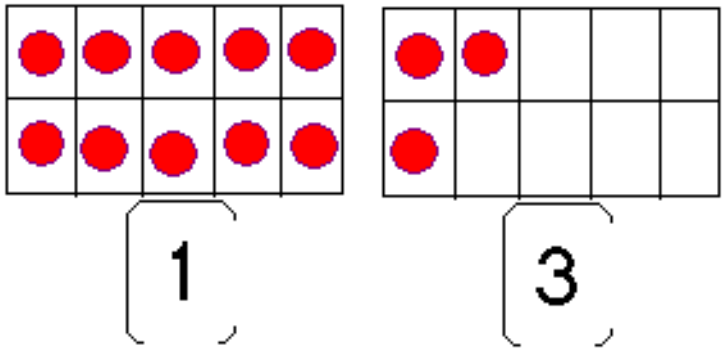
- Tens frames are another tool that work within base ten.
- Ten-Frames are two-by-five rectangular frames into which counters are placed to illustrate numbers less than or equal to ten, and are therefore very useful devices for developing number sense within the context of ten.



- What numbers are illustrated? What does the particular arrangement of the counters prompt you to think about the numbers? What can you say about each number's relationship to ten?

Tens Frames

- Ten-frames can provide a first step into understanding two-digit numbers simply by the introduction of a second frame.
- Placing the second frame to the right of the first frame, and later introducing numeral cards, will further assist the development of place-value understanding.



Dienes / Base Ten

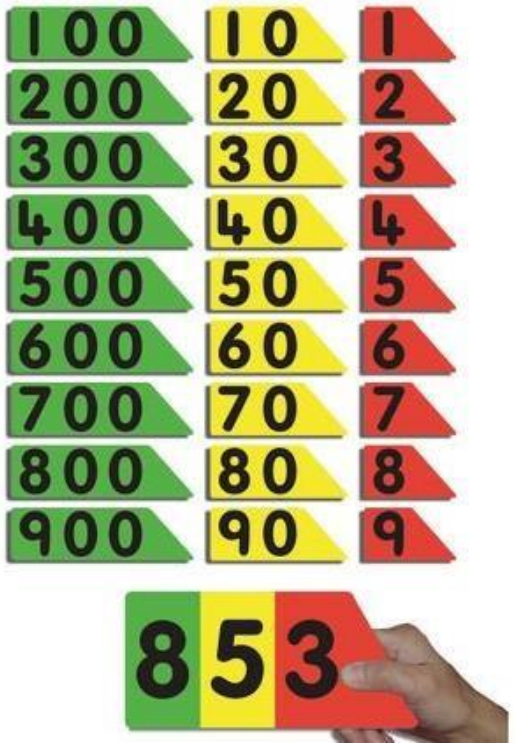
- A series of blocks, sticks, flat 3D shapes which help children to represent our number system with larger number.
- They are particularly helpful for place value and number sense concepts, but also for supporting methods of addition, subtraction and multiplication.
- Physically being able to build number and ‘manipulate’ them, supports a deeper understanding.

Place Value Counters and Cards

- These are different representations of the base tens structure. Becoming a bit more abstract.
- **Place Value Counters** are circular counters with the place value representation written on.
- All the same size but the colour indicates their value = 1s, 10s or 100s
- A great tool for seeing the place value of a number as well as for addition, subtraction, multiplication and division when moving to more formal methods but children still need a practical and visual took to support their understanding.

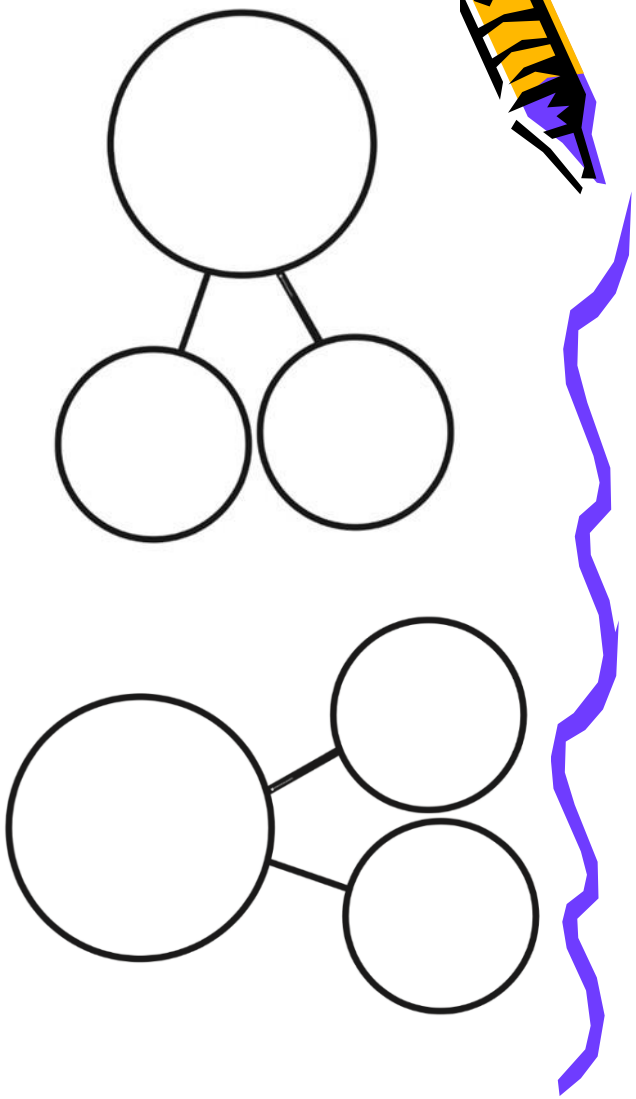
Place Value Counters and Cards

- These are a different representation of the base tens structure. Becoming a bit more abstract.
- **Place Value Cards** are strips of card with the place value written on.
- Great to build numbers alongside tools like dienes to support the sense of number. Helps children to see what is happening when we partition numbers and recombine.



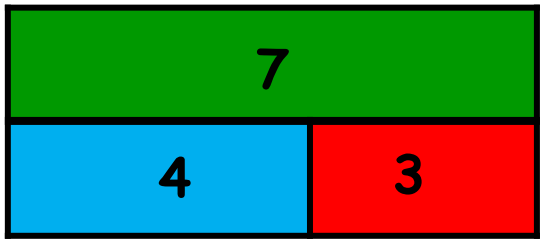
Part-whole Models

- These are technically know as whole, part, part model. Can be used with concrete apparatus or pictorially as a jotting.
- Part-part-whole thinking refers to how numbers can be split into parts.
- It allows children to see the relationship between a number and its component parts.
- Children need to understand that the parts are smaller than the whole.
- When the parts are added together (recombined) they make the whole.



Bar Models

- Bar models are pictorial representations of problems or concepts that can be used for any of the operations: addition, subtraction, multiplication and division.
- It also relates to a whole, part, part model. Another way of showing how numbers can be split into parts.
- Allows children to see the relationship between a number and its component parts.
- Children need to understand that the parts are smaller than the whole.



When the parts are added together (recombined) they make the whole.