Year 1 Number, Addition and subtraction

Basic to subject specific (Beck's Tiers):

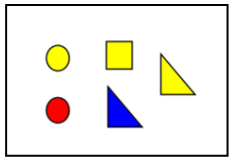
+, add, addition, more, plus, make, sum, total, forwards, put together, more than, altogether, distance between, difference between, equals to = same as, most, pattern, odd, even, digit, counting on, double, near double, one more, two more… ten more.
Subtraction, subtract, take away, distance between, difference between, more than, minus, less than, fewer, equals = same as, most, least, pattern, odd, even, digit,

Instructional vocabulary:
start from, start with, start at, look at point, to show me
What's the same? What's different?

Generalisations

- True or false? Addition makes numbers bigger.
- True or false? You can add numbers in any order and still get the same answer.
- True or false? Subtraction makes numbers smaller
- When introduced to the equals sign, children should see it as signifying equality. They should become used to seeing it in different positions.

Children could see the image below and consider, "What can you see here?" e.g.
3 yellow, 1 red, 1 blue. 3 + 1 + 1 = 5
2 circles, 2 triangles, 1 square. 2 + 2 + 1 = 5
I see 2 shapes with curved lines and 3 with straight lines. 5 = 2 + 3
5 = 3 + 1 + 1 = 2 + 2 + 1 = 2 + 3



Some Key Questions: What is the same? What is different? What can you see here? Is this true or false? How many altogether? How many more to make…? I add …more. What is the total? How many more is… than…? How much more is…? One more, two more, ten more… How many more to make…? How many more is… than…? How much more is…? How many are left/left over? How many have gone? One less, two less, ten less… How many fewer is… than…? How much less is…?

NC 2014: Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs.
Represent and use number bonds and related subtraction facts within 20.
Add and subtract one-digit and two-digit numbers to 20, including zero.
Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = □ – 9.

Mental Strategies (addition and subtraction)

Children should experience regular counting on and back from different numbers in 1s and in multiples of 2, 5 and 10.

Numbers from 0 -10

Counting and sorting – children must be able to use the counting principles and be able to sort and math as they are using the counting principles.

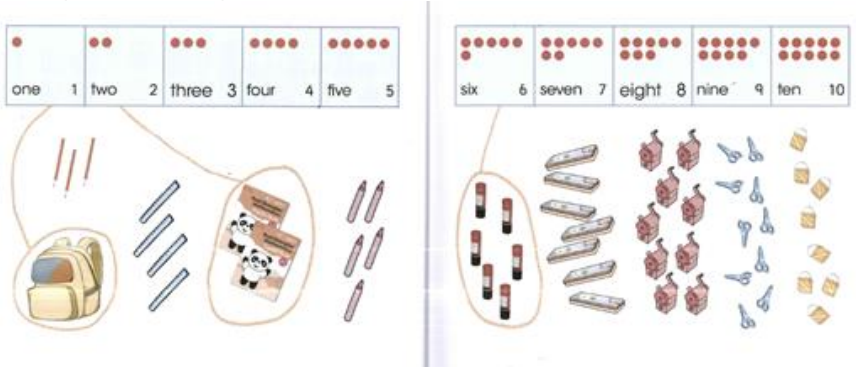
What do you already know about counting contexts?

- Sequence Context ; Counting context; cardinal context; measures context; ordinal context; non-numerical contexts?

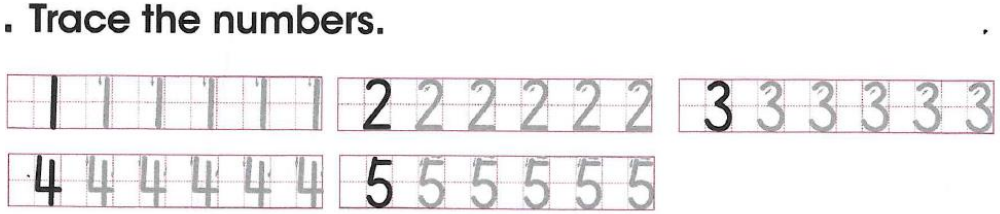
What do you already know about counting principles?

- One-one Principle; Stable Order Principle; Cardinal Principle; Abstraction Principle; Order- Irrelevance Principle

Counting and matching –



Count and write – children must be able to use the counting principles and practise writing the numerals correctly. Make sure reversals are dealt with prompt before they become muscle memory.



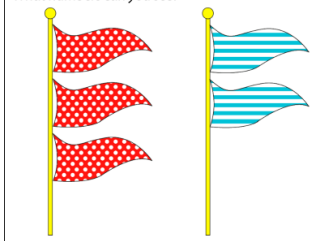
Number track:

1	2	3	4	5	6	7	8	9	10
one	two	three	four	five	six	seven	eight	nine	ten

Composition of numbers 0 – 5 (making five in different ways).

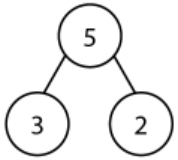
Partitioning into two parts:

'What numbers can you see?'



'I can see five flags. Three are spotty and two are stripy.'

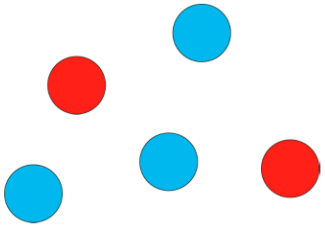
'I can see five flags. Three are spotty and two are stripy.'



Use both concrete and pictorial representations. Show the part whole model alongside with the abstract notation of the numerals. Provide examples depicting careful arrangements of five that can be subitized.

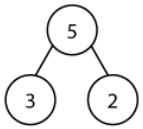
Begin to look systematically at the different ways a given whole number (0-5) can be partitioned into two part. Use double-sided counters. Focus on subiziting.

Maisie's counters:



'Maisie has these colours.'

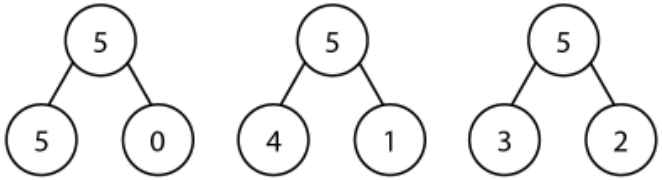
Part–part–whole cherry model:



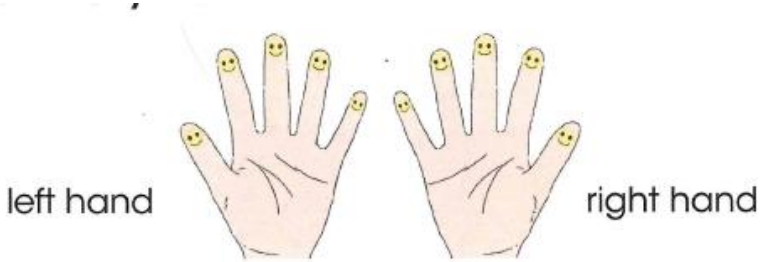
- *'The 5 represents all the counters.'*
- *'The 3 represents the three blue counters.'*
- *'The 2 represents the two red counters.'*

Introduce the idea that we can work systematically to find all possible combinations.

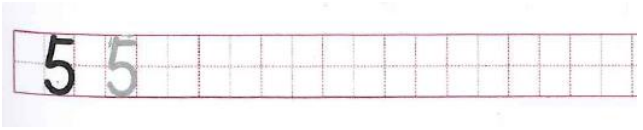
	Blue	Red
	0	5
	1	4
	2	3
	3	2
	4	1
	5	0



Continue to partition the number 0 - 5 in different ways.
Make sure children are secure with the understanding of fingers on each hand. " The left hand has 5 digits. The right hand has 5 digits."

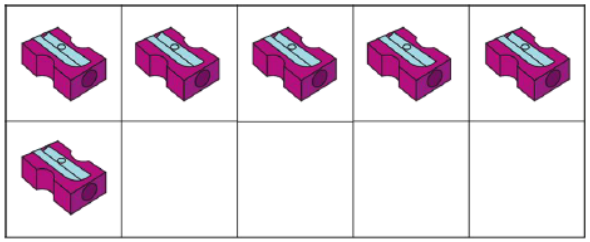


Circle and group 5 items. Practise writing the number.



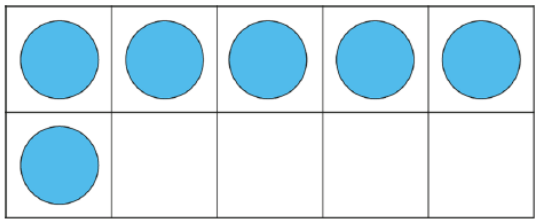
Composition of numbers 6 -10 (The numbers six to nine are composed of 'five and a bit'. Ten is composed of five and a five.

Represent the quantities in a systemic way to draw attention the 'five and a bit' structure.
Use concrete and pictorial resources. Tens frame must use the 'five-wise' layout as shown. Stem sentence: '____ is five and ___ more.'
Pictorial:

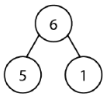


6

'Six is five and one more.'



Use the part, whole diagram.

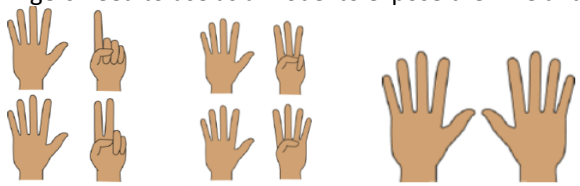


and or the bar model

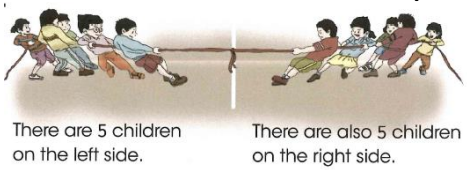
6	
5	1

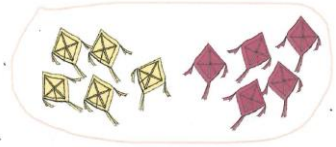
'Six is five and one more.'
'Six is the whole; five is a part; one is a part.'

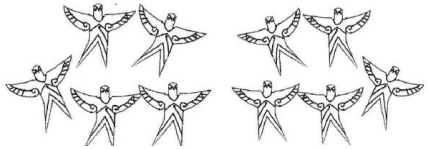
Fingers need to use as a model to expose the 'five and a bit' structure.



2 fives to make 10 – use context and practical equipment to develop conceptual understanding that 2 fives make 10.

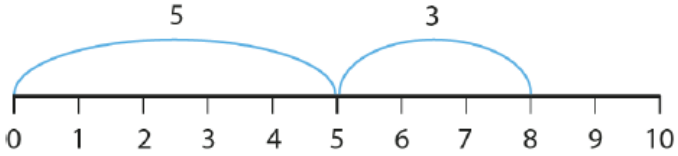




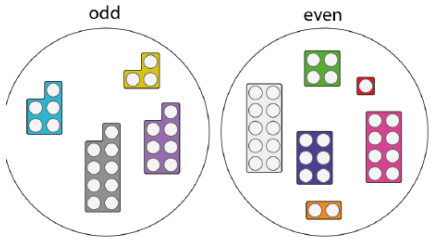


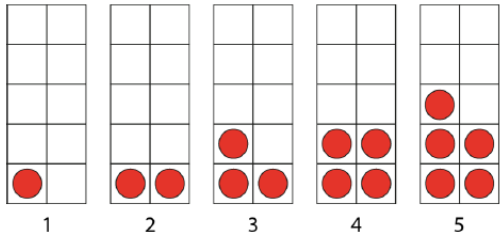
Use a number line to further support understanding the 'five and a bit structure'

Number line:

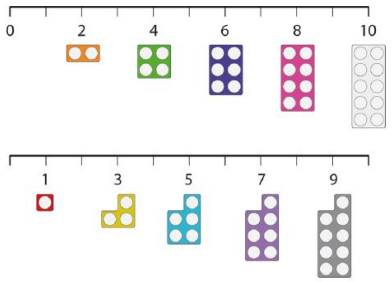


Understanding odd and even numbers – use representations to expose the concept.



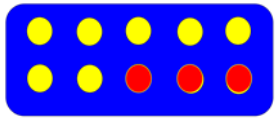


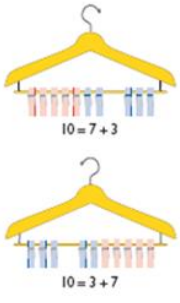
'Skip counting' – number lines with base-ten number boards:

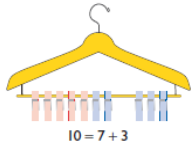


Partition each of the numbers 6-10 in different ways.

Children should memorise and reason with number bonds for numbers to 20, experiencing the = sign in different positions.
They should see addition and subtraction as related operations. E.g. 7 + 3 = 10 is related to 10 – 3 = 7, understanding of which could be supported by an image like this.

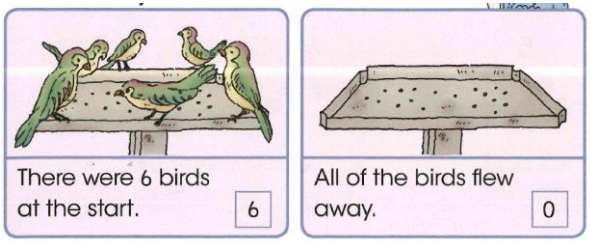


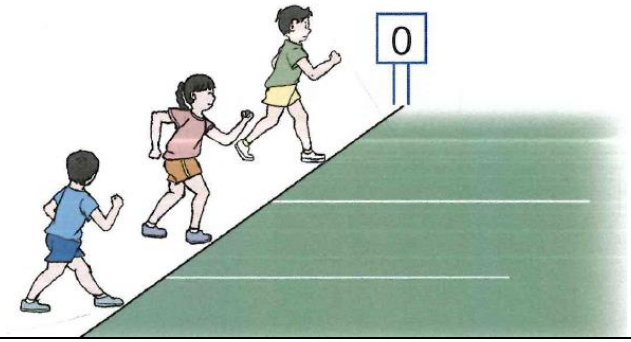




We have 10 pegs on the coathangers, how can we split them into 2 groups? Is there another way? How can you be sure you have got them all?

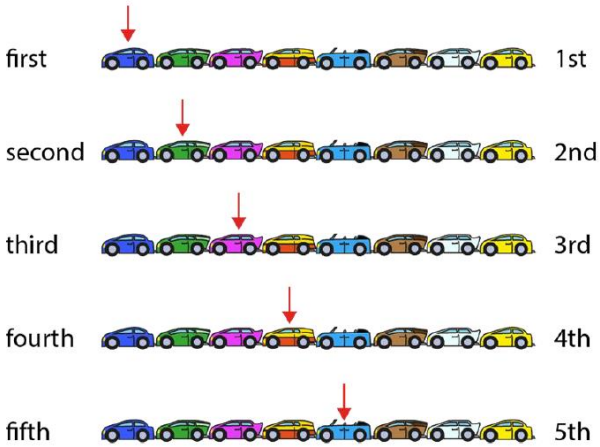
Zero – children must understand the concept of zero. The concept of zero is, both as a placeholder a symbol for nothing. These images support the understanding of zero as nothing. You need to address zero as a placeholder when looking at tens and ones.





Ordinal numbers

Counting with ordinals:



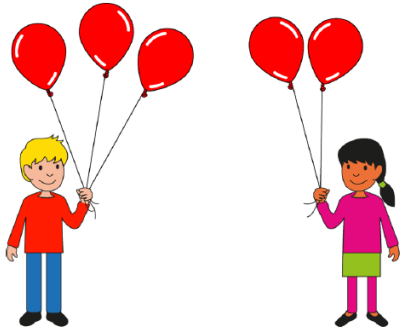
Important to explore the difference between ordinal and cardinal numbers.

Review how ordinal numbers are named and represented, starting with the shortened written form, (1^{st}, 2^{nd}, 3^{rd} etc.) and then linking with the full written names, first second etc.

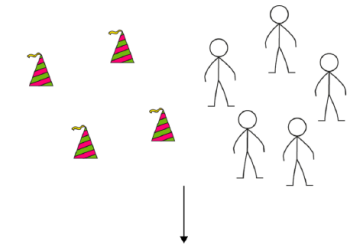
Comparing – more or fewer
Less than, equal to and greater than

The word fewer should be used when discussing countable nouns. Children should practise saying both sentences: 'The boy as more balloons than the girl.' 'The girl has fewer balloons than the boy.'

Compare sets of objects.

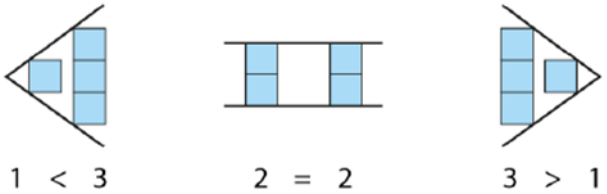


Using generalised representations:

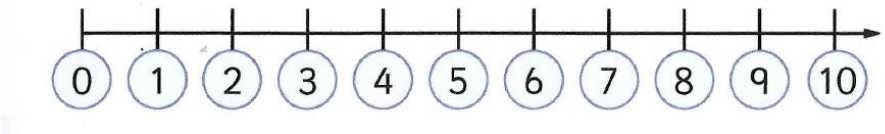


- *'There are more children than party hats.'*
- *'There are fewer party hats than children.'*

Once children have mastered comparing objects in two sets, progress to using mathematical symbols to express the relationships. Begin by using pictorial representations and use this to introduce the symbols.



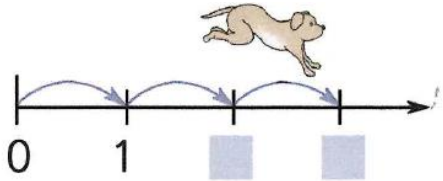
The number line – children need to understand that every number has a unique position on the number line.

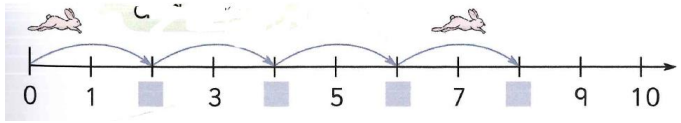


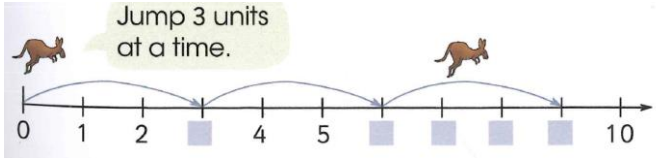
0 is the starting point. Each jump is one, one.

When counting from 0 to the numbers become larger and larger.

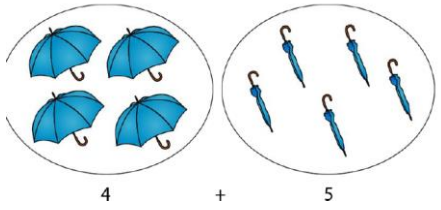
<u>Children need to practise using a number line in different jumps eg jump 1 one a time, jump two, ones a time, jump 3 ones a time.</u>







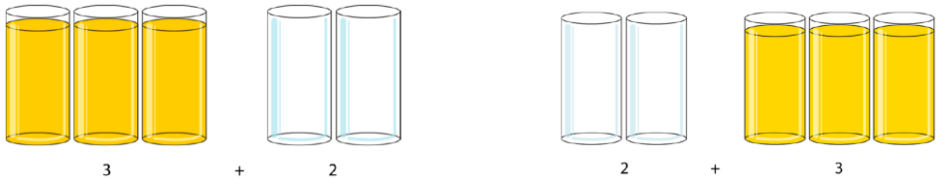
<u>Addition and subtraction of numbers up to 10 - Combing to 2 numbers</u>
<u>Aggregation structure – combing two or more parts to make as whole. Use the symbol +</u>



'We can write this as four plus five.'

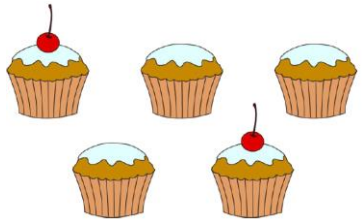
4 + 5

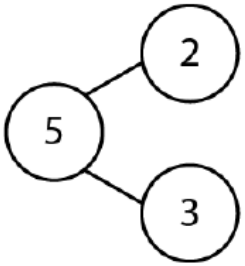
'The 4 represents the four open umbrellas.'
'The 5 represents the five closed umbrellas.'



This forms an introduction to commutative law.

The equals symbol, =, can be used to show equivalence between the whole and the sum of the parts.



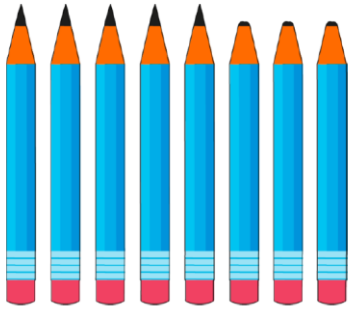


addend + addend = sum

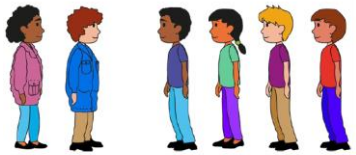
Emphasise that the = symbol represents 'is equal to'.

<u>Subtraction using partition (breaking a whole down into two or more parts is called partitioning) the symbol – should be used.</u>

'There are eight pencils. Five have been sharpened. How many have not been sharpened?'



'There are six children. Two of them have put their coats on. How many have not put their coats on?'



6 – 4 = 2

- *'The 6 represents all of the children.'*
- *'The minus 2 represents the children who have put their coats on.'*
- *'The 4 represents the children who have not put their coats on.'*

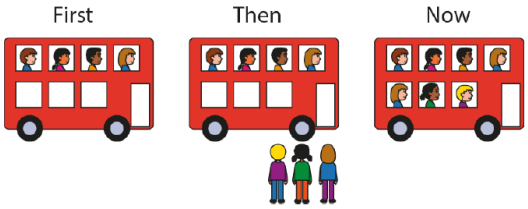
Addition structure – augmentation. (Addition context describes by a 'first…., then…., now…' story.

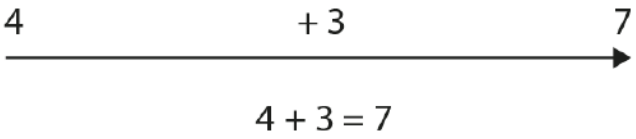
Concrete/practical:

*'**First**, four children were sitting on the bus.*
***Then**, three more children got on the bus.*
***Now**, seven children are sitting on the bus.'*

Chairs could be arranged to support acting out this story.

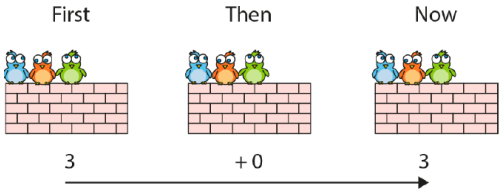
Pictorial:





$4 + 3 = 7$

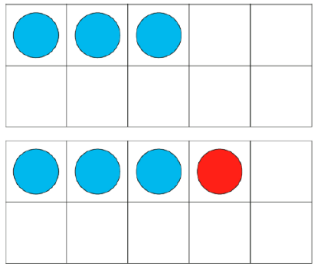
Ensure you use examples of adding zero.



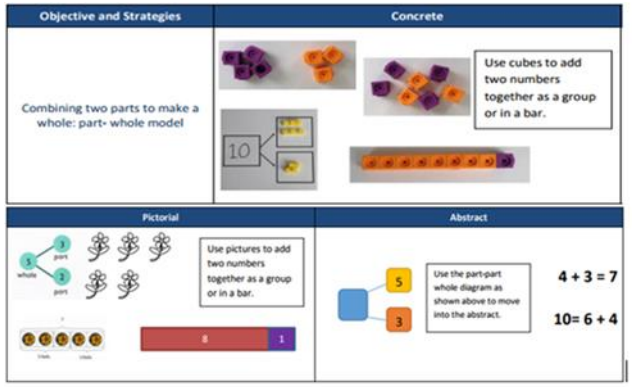
$3 + 0 = 3$

Use tens fames to show the addition structure.
Tens frame:

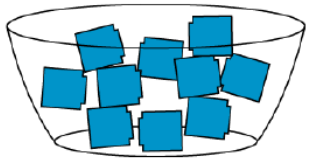
*'**First**, James wrote three sentences.*
***Then**, he wrote one more sentence.*
***Now**, he has four sentences written down.'*



$3 + 1 = 4$



One ten is equal to ten ones

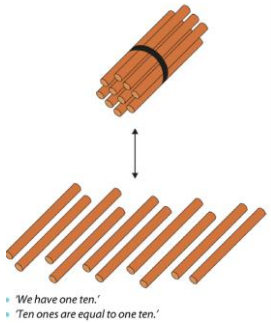


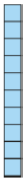
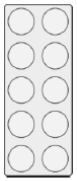
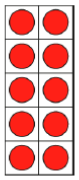
Children need to develop an understanding that they can group objects into groups of ten and recognise each group as 'one ten'. This develops the concept of unitising. Reinforce the equivalence between a stick of tens cubes and ten ones.

Compare ten cubes in a pot with a stick of ten cubes. Make sure they are happy to swap these.

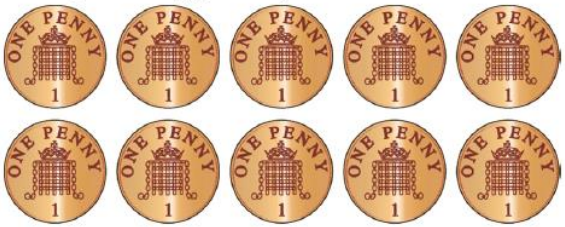
Gernailised statem,ent to embed the idea of untising: "Ten ones are equal to one ten. One group of ten. One ten."

Explore the ten-ness – one ten and ten ones.



Dienes ten rod	Base-ten number board	Tens frame
		

'Would you be happy to swap these…'

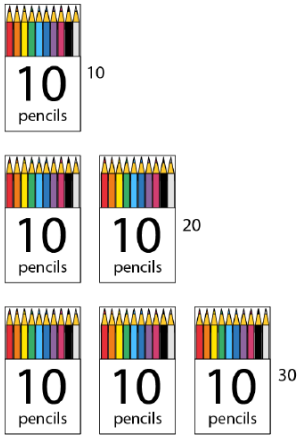


A tricky concept for children to understand that ten one pence coins are the same value as 1 ten pence coin. Children need to practise swapping to develop the understanding of unitising.

'…for this?'

Counting in multiples of ten.

Objects:



Practise counting in multiples of ten.

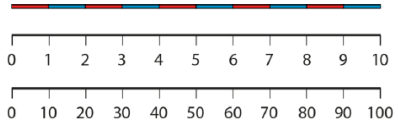
Thirty is also known as 3 tens.

Understand that the 3 represents 3 tens.

'All multiples of ten end in a zero' – this statement should support children writing tens correctly rather than 02.

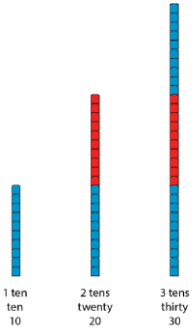
Digits	What it means
10	1 ten
20	2 tens
30	3 tens
40	4 tens
50	5 tens
60	6 tens
70	7 tens
80	8 tens
90	9 tens
100	10 tens

Knowledge of 0-10 number line can be used to estimate the position of multiples of ten and a 0-100 number line.

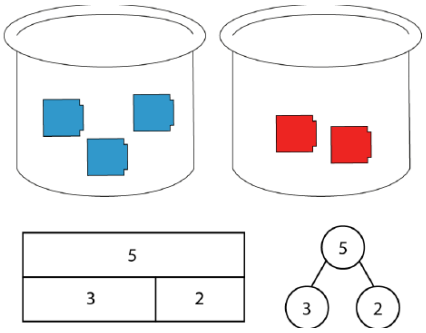


What's the same? What's different? Draw attention to the unit size of one and the unit size of ten.

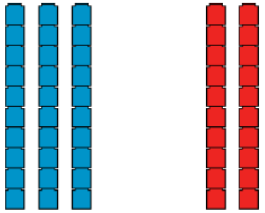
Adding and subtracting multiples of ten – always gives a multiple of ten

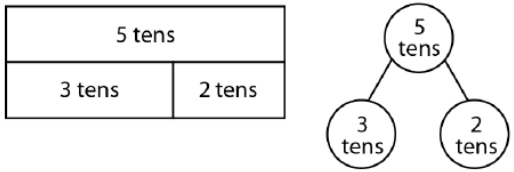


Known facts for the numbers within ten can be used to add and subtract in multiples of ten by unitising.
We know that three plus two is equal to five 3 +2 = 5, so three tens plus two tens is equal to five tens. 3 tens + 2 tens = 5 tens.



'I have three tens and two tens. How many tens do I have altogether?'

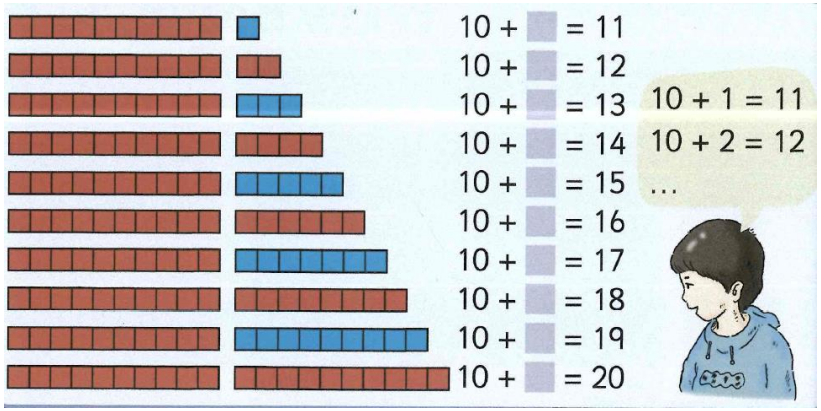




3 tens + 2 tens = 5 tens

'Three tens plus two tens is equal to five tens.'

Composition 11 – 19 – develop an understanding that the numbers 11 – 19 are made up of the 'ten and a bit structure'.
Give the children practice recording the composition of teen numbers as equations. By the end of this step, the children should be able to look at the tens frame representation of a given teen number and without counting any individual counters, write the equations.

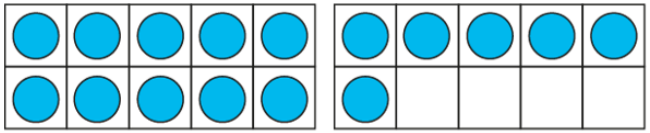


Tens and ones.

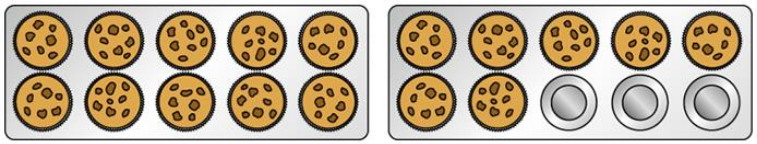
The 1 on the left of 15 means 1 ten, and then 5 on the right in 15 means 5 ones.

bar (ten blocks)	block

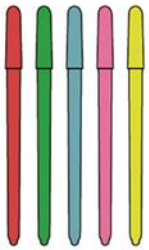
Ten(s)	One(s)
1	5

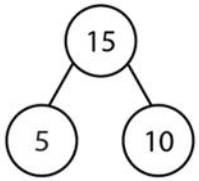


16 = 10 + 6

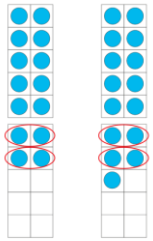


10 + 7 = 17



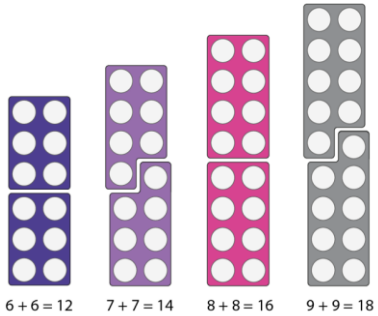


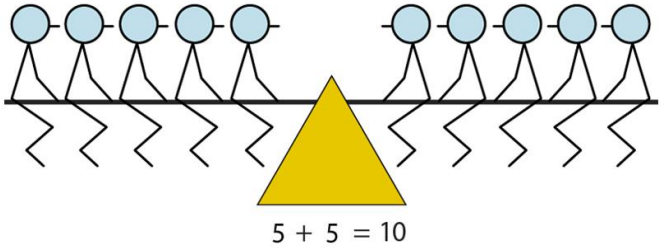
Look at the sturtcure of odd an even numbers within 11 -19

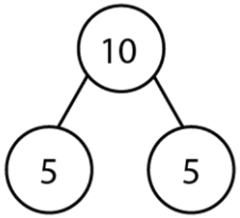


Use tens frames and counters (twos-wise), or base-ten number boards, to remind children that ten is a multiple of two, and therefore an even number. Demonstrate that the ones digit alone will indicate whether a number is odd or even.

Doubles and near doubles – numicon and tens frames are good represernations to expose the structure of doubles and near doubles

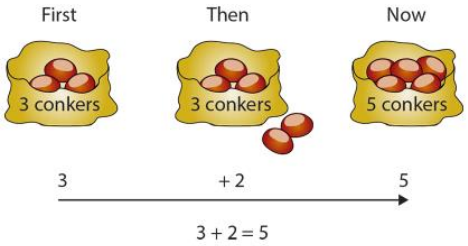


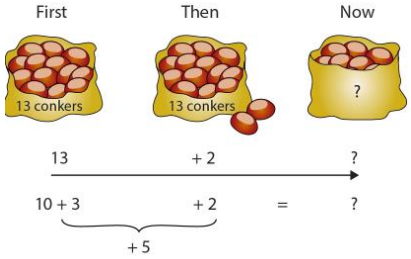


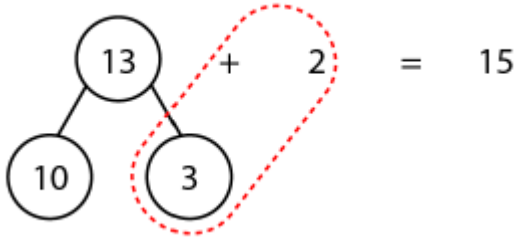


Addition and subtraction facts within ten can be applied to facts within 20

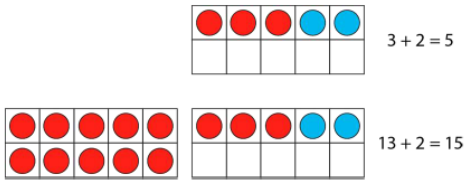
Introduce a context to make a link between an addition fact within ten and use the same addition fact within twenty.





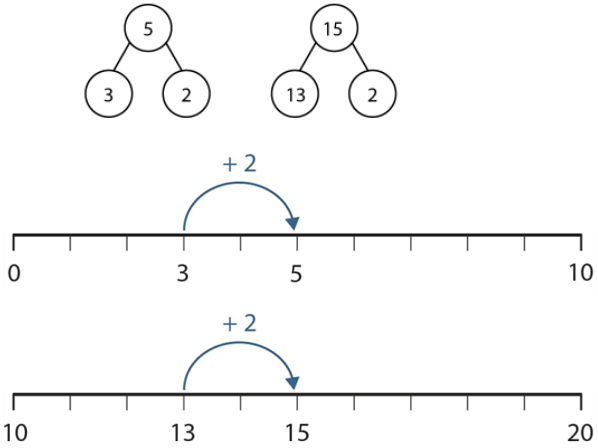


Tens frames and counters:



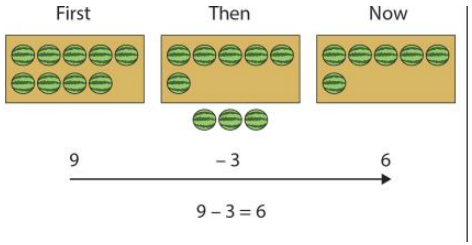
Use tens frames and counter as a generalised representation, showing a single-digit addition, then the corresponding teen addition. Eg 3 + 2 = then 13 + 2 = 15

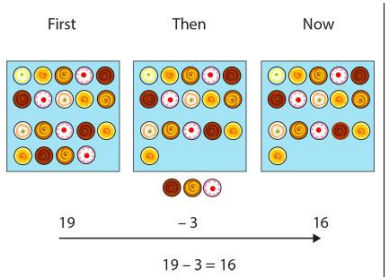
Part–part–whole cherry representation:

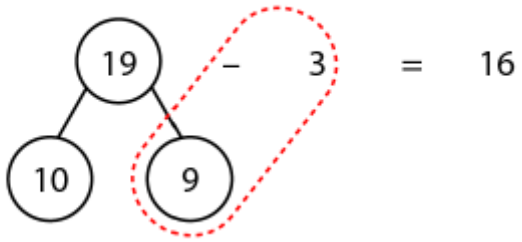


Show examples that make the link. Whe n using a numberline make sure it is not just used as a tool to calaculate jumping on 2 from 13. Keep the focus on the connection between the signle-digit calculation and the teen calculation.

Use the same procedure as for the addition facts to introduce the link between subtraction in ten and subtraction of a single-digit number from a teen.
Eg 9 – 3 = 6 then 19-3 = 16



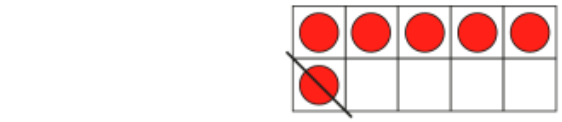


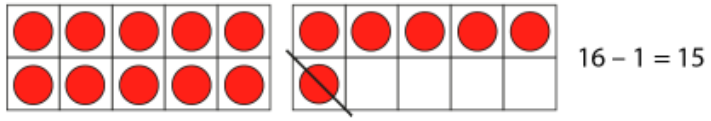


As before, generalise using a tens frame and counters, showing several different subtraction facts within 10 alongside the related facts within 20.

Eg 9-1 = 8 then 19 – 1 =18

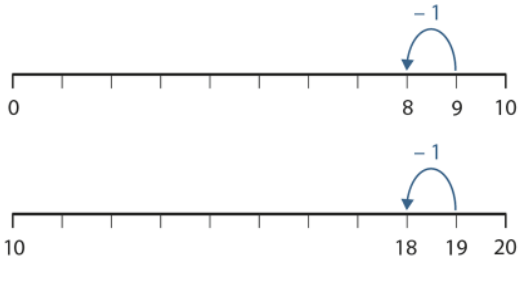
Tens frames and counters:



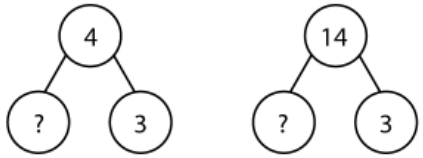


You can also use the part-part whole models and number lines to represent these relationships.

The facts 19 -1 = 18 are derived from 9 – 1 = 8. Use the number line to show the relationship, rather than a tool for calculating.



Part–part–whole cherry representation:



Number line:

Understand the set counting sequence for counting to 100 and beyond

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

Gattegno chart:

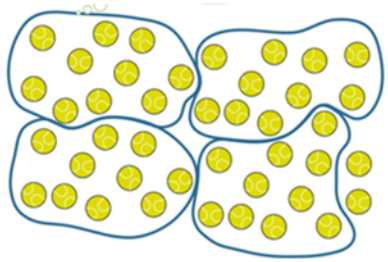
1000	2000	3000	4000	5000	6000	7000	8000	9000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

The Gattengo chart can be used to practise counting beyond 100.

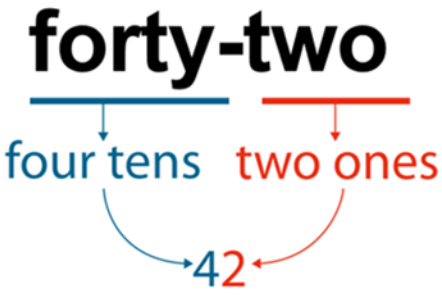
Objects can be counted efficiently by making groups of ten. The digits in the numbers 20 -99 tell us about their value.

Counting in tens

Model counting in ones and being distracted or losing count, and having to start again. Then model again, this time counting in ten and circling each group as you go. Emphasis that by organising into groups of ten, it doesn't matter if you lose count as you only have to go back to the current group of ten. Remind children that ten ones, is 1 ten.



10s	1s
4	2



The 4 shows we have 4 groups of ten.
The 2 shows us we have two extra ones.
We have four groups of ten and two more ones.

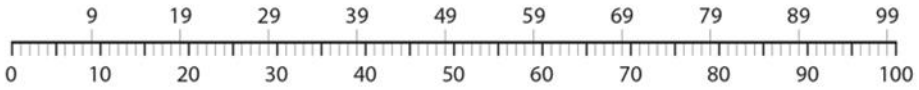
Forty-two is:

We write the ___tens and the __ ones.

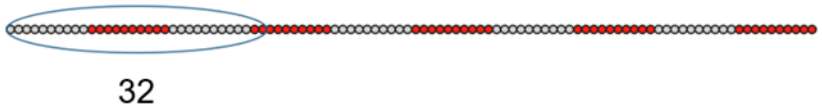
The number line to show that each number has a unique position –

Children need to focus counting forward and back in ones. Focus particular attention on counting forward and backwards over the tens boundaries.

If you are using a number line with only the multiples of ten marked, initially mark the numbers with the nine ones to support counting backwards. The Gattegno chart is also useful to support counting over these boundaries.

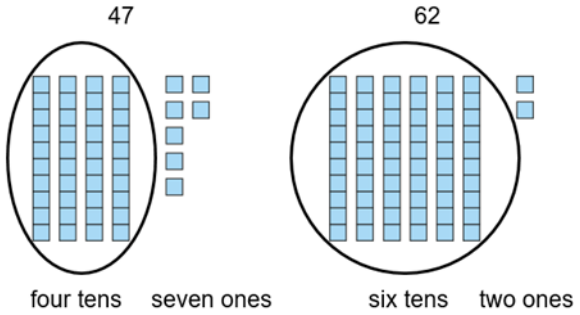


Children need to be able to identify the position of a number on a number line between 0-100. Bead sting and bead bars are useful representation for making the link between number as a quantity (32 things) and the position of a number on the number line,



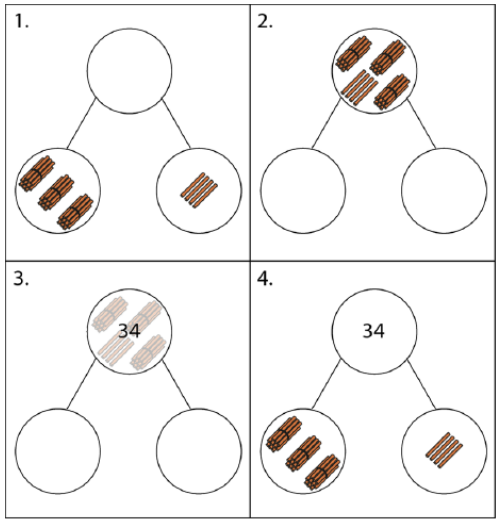
Representing numbers up to 100

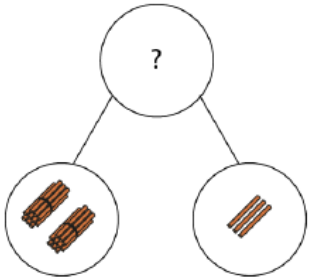
Children need to understand the relative size of two, two digit numbers and that these can be determined by first examining the tens digit and then, if necessary, examine the ones digit, with reference to the cardinal or ordinal value of the numbers.



Compare a range of numbers looking only at digits using < > = symbols

Two-digit numbers can be partitioned into a tens and a ones part.

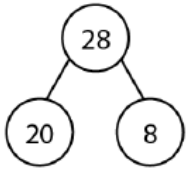


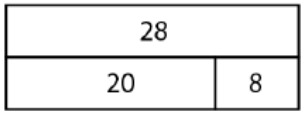


'There are two tens, which is twenty, and three ones, which is three. This makes twenty-three altogether: 23.'
'The 2 represents two tens; it has a value of twenty.'
'The 3 represents three ones; it has a value of three.'

Focus on the tens and ones structure.

The tens and ones structure of two digits numbers can be used to support additive calculation





$20 + 8 = 28$ $28 - 20 = 8$
$8 + 20 = 28$ $28 - 8 = 20$

$28 = 20 + 8$ $8 = 28 - 20$
$28 = 8 + 20$ $20 = 28 - 8$

Children should use jottings to support their conceptual understanding of number bonds.

Children should use jottings to show they understand combining two parts to make a whole and record the abstract alongside their pictorial model.
Children should use their jottings of the dienes to show their understanding and record the abstract to show what the dienes represent.
Vocabulary
Addition, add, forwards, put together, more than, total, altogether, distance between, difference between, equals = same as, most, pattern, odd, even, digit, counting on.
What's the same? What's different?
Generalisations

- True or false? Addition makes numbers bigger.
- True or false? You can add numbers in any order and still get the same answer.

(Links between addition and subtraction)

When introduced to the equals sign, children should see it as signifying equality. They should become used to seeing it in different positions.

Another example
here…promote balance in the equation.

10 = 7 + 3

7 + ? = 10

Known facts	Represent & use number bonds and related subtraction facts within 20 Add and subtract 1 digit and 2 digit numbers to 20, including zero	
Essential Knowledge	1 more	Number bonds: 5 and 6
	Largest number first.	Number bonds: 7 and 8
	Add 10.	Number bonds:9 and 10
	Ten plus ones.	Use number bonds of 10 to derive bonds of 11
	Doubles up to 10.	