TOWNVILLE INFANTS' SCHOOL
Head teacher: Caroline Burden

Aspire - Collaborate - Explore

'Together we learn – United we achieve'

CALCULATION POLICY

Our vision

At Townville Infants' and Nursery School we aspire to offer the best possible early education for our children in a happy, safe, inclusive environment. We build firm foundations through a welcoming, holistic community approach placing the individual needs of the child at the heart. With high expectations and aspirations for every child we seek to ensure all children develop the skills and attributes they need to thrive and succeed both now and in the future.

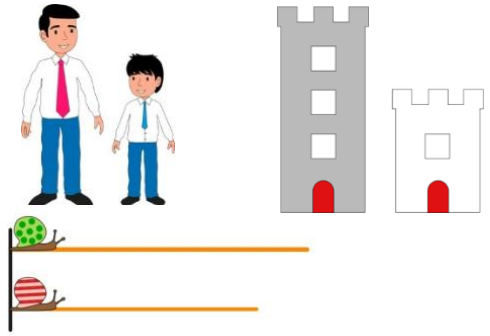
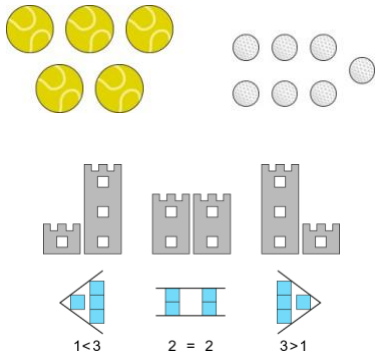
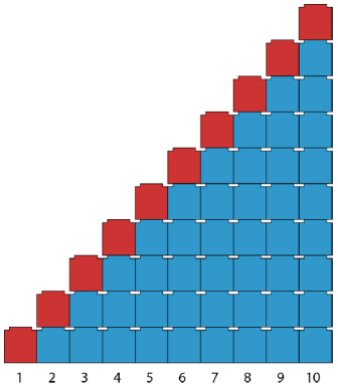
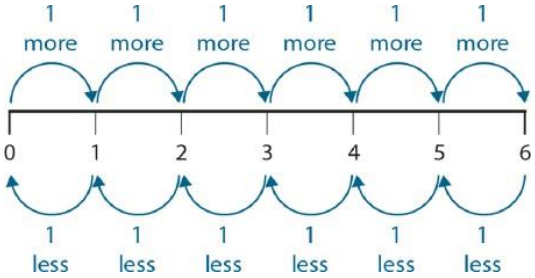
Approved by:	*C Burden*	***Date:*** *02/05/2024*
Last reviewed on:	*March 2022* *May 2024*	
Next review due by:	*May 2026*	

This policy is a working document and will be revised and amended as necessary.

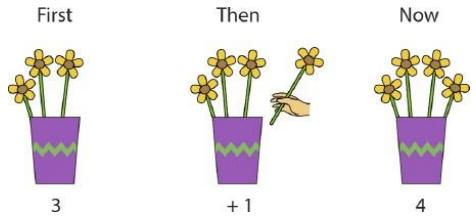
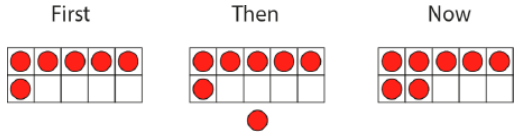
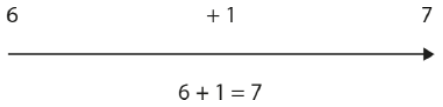
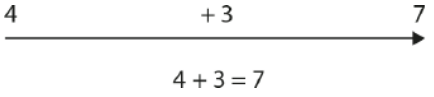
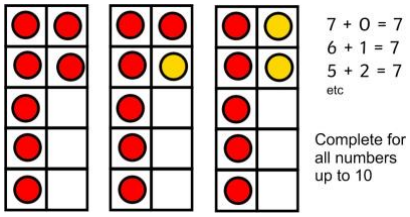
This policy lays out the expectations for both mental and written calculations for the 4 number operations and has been created to support the teaching of a mastery approach to mathematics. This is underpinned by the use of models and images that support conceptual understanding and this policy promotes a range of representations to be used across the primary years. Mathematical understanding is developed through use of representations that are first of all concrete (e.g. Dienes apparatus and place value counters), and then pictorial (e.g. bar models) to then facilitate abstract working (e.g. standard written methods). This policy is a guide through an appropriate progression of representations and if at any point a pupil is struggling with the abstract, they should revert to familiar pictorial and/or concrete materials/representations as appropriate.

This policy uses materials directly from the NCETM guidance in line with teaching a mastery approach.

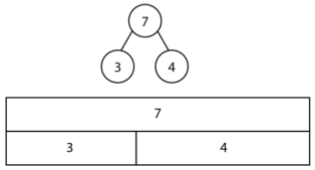
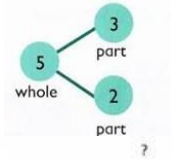
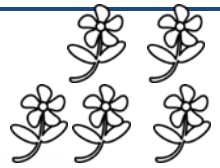
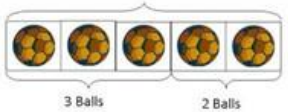
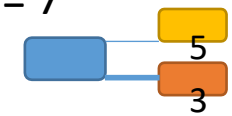
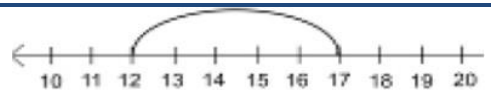
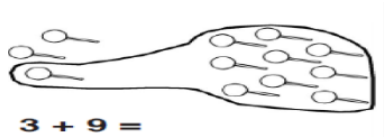
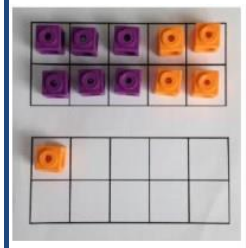
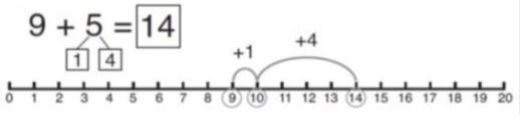
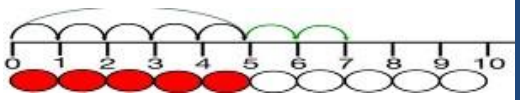
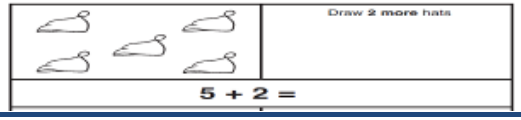
Y1 ADDITION

Objective, Strategy & Key Vocabulary	Concrete	Pictorial	Abstract
Comparing Objects, groups of objects Length, weight, mass, heavier, light-er, same, equal	People's height, distance, mass. Use of pan balances using numicon to show equivalence, < > Comparing multiple objects Use of concrete materials eg. Compare bears, jewels, cubes etc to create groups of different sizes to compare		
Using < > and = Fewer, more, less than, more than, equal to, fewer than	Use a multilink staircase in two colours		Use variation with missing boxes and missing symbols. 3 ◯ 4 4 > □ 2 ◯ 2 □ < 6
Finding one more, finding one less			One more/less sentences – example one: 1 more than 3 is □ 1 less than 2 is □ 1 more than □ is 1 1 less than □ is 1

Y1 ADDITION

Objective, Strategy & Key Vocabulary	Concrete	Pictorial	Abstract
Adding 1 gives 1 more			
Augmentation—increasing an amount	Use FIRST, THEN, NOW and range of practical situations for showing augmentation. E.g. first there were three chn on carpet then 2 more came. Now there are 5 chn on the carpet.		
Stories of numbers within 10	Children should work with doubled sided counters and ten frame. Start with 7 red, turn one over, tell me the 'story'? Turn one more over. What is the 'story'? Continue. Complete this for stories of all numbers up to 10.		7 + 0 = 7 6 + 1 = 7 5 + 2 = 7 4 + 3 = 7 3 + 4 = 7 2 + 5 = 7 1 + 6 = 7 0 + 7 = 7

Y1 ADDITION

Objective & Strategy & Key Vocabulary	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part- whole model	Use part part whole model. Use cubes to add two numbers together as a group or in a bar. 	   Use pictures to add two numbers together as a group or in a bar.	4 + 3 = 7  10= 6 + 4 Use the part-part whole diagram as shown above to move into the abstract.
Regrouping to make 10. *This is an essential skill for column addition later.*	6 + 5 = 11 2 more than 5.	 Start at the larger number on the number line and count on in ones or in one jump to find the answer. 	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?
Represent & use number bonds and related subtraction facts within 20	 Start with the bigger number and use the smaller number to make 10. Use ten frame	Use pictures or a number line. Regroup or partition the smaller number using the part part whole model to make 10.   	Emphasis should be on the language *'1 more than 5 is equal to 6.'* *'2 more than 5 is 7.'* *'8 is 3 more than 5.'*

Adding 1 and 2

Bonds to 10

Adding 10

Bridging/ compensating

Doubles

Adding 0

Near doubles

Y1 facts

Y2 facts

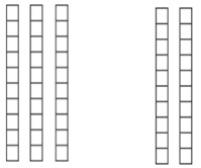
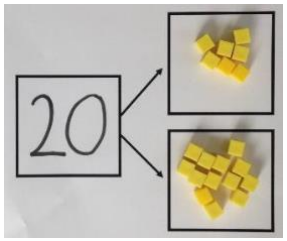
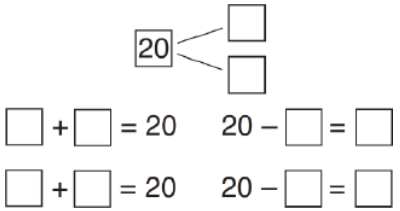
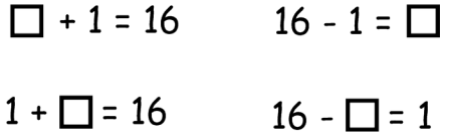
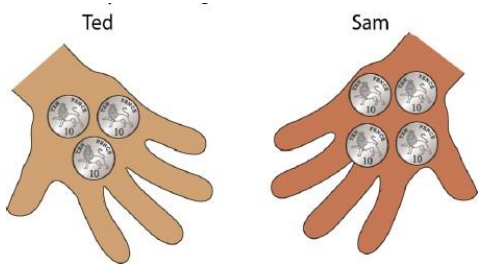
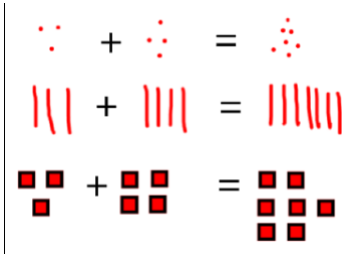
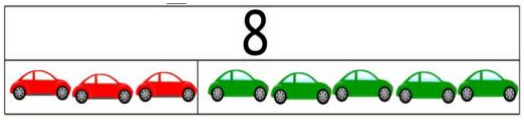
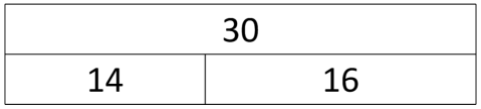
Y1/2

ADDITION +

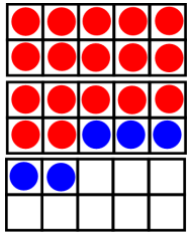
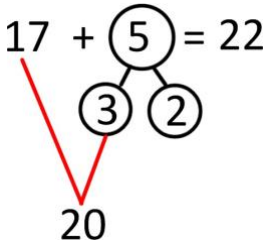
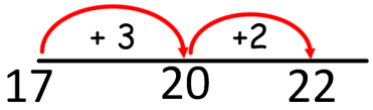
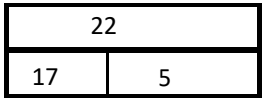
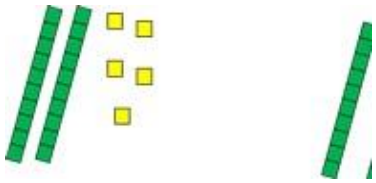
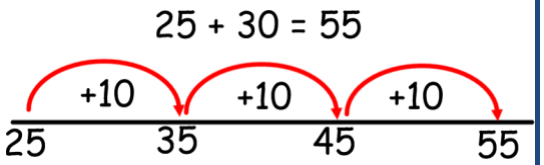
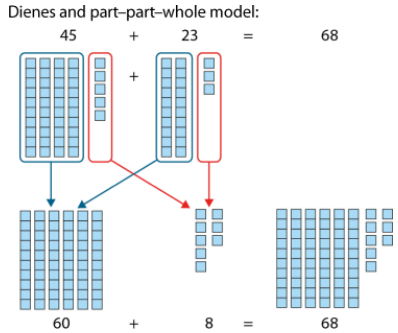
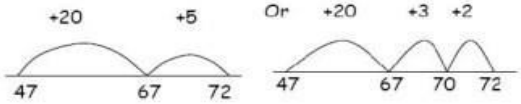
SUBTRACTION -

+	0	1	2	3	4	5	6	7	8	9	10
0	0 + 0	0 + 1	0 + 2	0 + 3	0 + 4	0 + 5	0 + 6	0 + 7	0 + 8	0 + 9	0 + 10
1	1 + 0	1 + 1	1 + 2	1 + 3	1 + 4	1 + 5	1 + 6	1 + 7	1 + 8	1 + 9	1 + 10
2	2 + 0	2 + 1	2 + 2	2 + 3	2 + 4	2 + 5	2 + 6	2 + 7	2 + 8	2 + 9	2 + 10
3	3 + 0	3 + 1	3 + 2	3 + 3	3 + 4	3 + 5	3 + 6	3 + 7	3 + 8	3 + 9	3 + 10
4	4 + 0	4 + 1	4 + 2	4 + 3	4 + 4	4 + 5	4 + 6	4 + 7	4 + 8	4 + 9	4 + 10
5	5 + 0	5 + 1	5 + 2	5 + 3	5 + 4	5 + 5	5 + 6	5 + 7	5 + 8	5 + 9	5 + 10
6	6 + 0	6 + 1	6 + 2	6 + 3	6 + 4	6 + 5	6 + 6	6 + 7	6 + 8	6 + 9	6 + 10
7	7 + 0	7 + 1	7 + 2	7 + 3	7 + 4	7 + 5	7 + 6	7 + 7	7 + 8	7 + 9	7 + 10
8	8 + 0	8 + 1	8 + 2	8 + 3	8 + 4	8 + 5	8 + 6	8 + 7	8 + 8	8 + 9	8 + 10
9	9 + 0	9 + 1	9 + 2	9 + 3	9 + 4	9 + 5	9 + 6	9 + 7	9 + 8	9 + 9	9 + 10
10	10 + 0	10 + 1	10 + 2	10 + 3	10 + 4	10 + 5	10 + 6	10 + 7	10 + 8	10 + 9	10 + 10

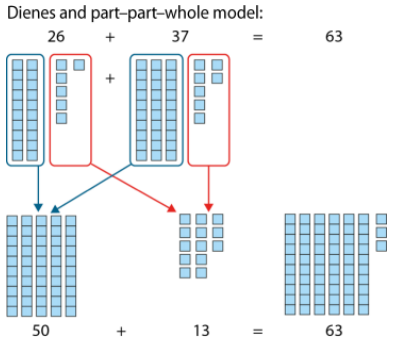
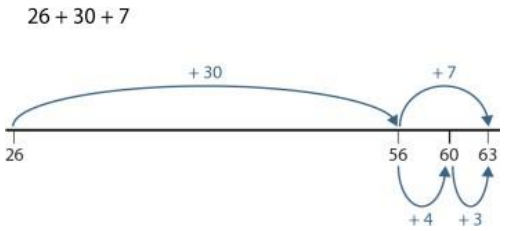
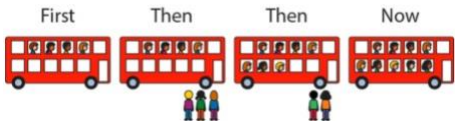
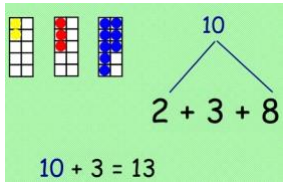
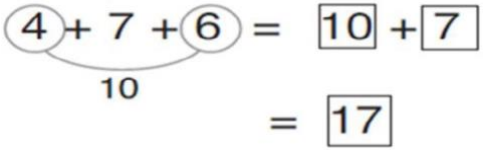
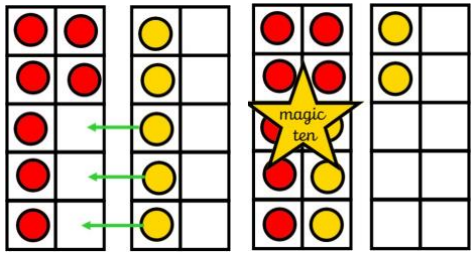
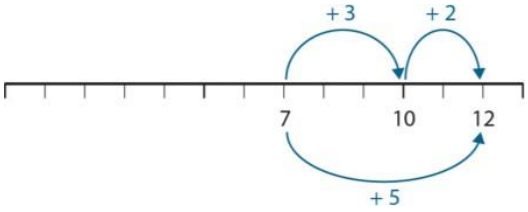
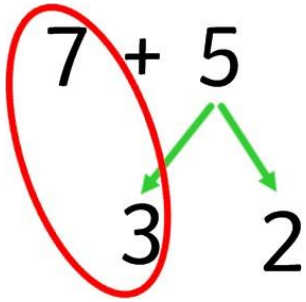
Y2 ADDITION +

Objective & Strategy & Key Vocabulary	Concrete	Pictorial	Abstract
Adding multiples of ten	50= 30 + 20 Model using dienes and bead strings	 ___tens and____tens makes____tens Use representations for base ten.	20 + 30 = 50 70 = 50 + 20 40 + □ = 60 □ + 30 = 50
Use known number facts Part part whole	 Children explore ways of making numbers within 20		
Using known facts		 Children draw representations of H,T and O	3 + 4 = 7 Leads to 30 + 40 = 70 Leads to 300 + 400 + 700 *'3 things and 4 things is always 7 things'*
Bar model	 3 + 4 = 7	 3 + 5 = 8	 14 + 16 = 30

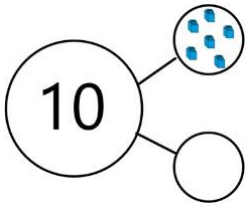
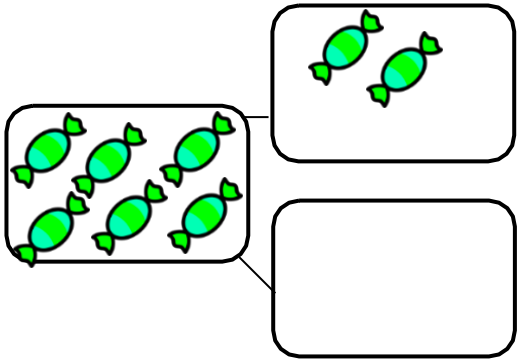
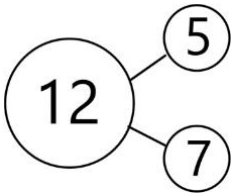
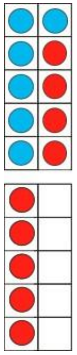
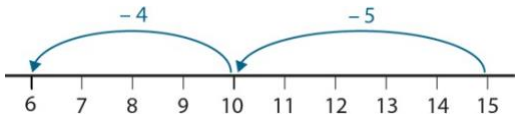
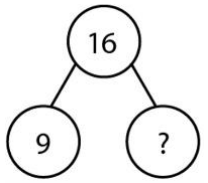
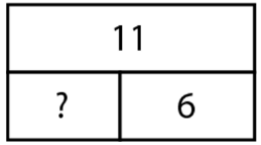
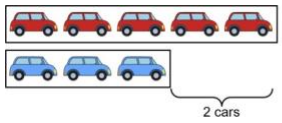
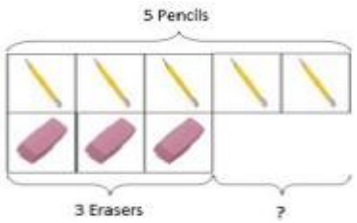
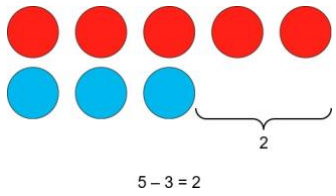
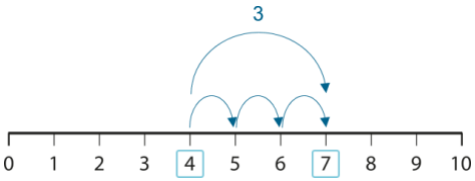
Y2 ADDITION +

Objective & Strategy & Key Vocabulary	Concrete	Pictorial	Abstract
Add a two digit number and ones	 17 + 5 = 22 Use ten frame to make 'magic ten Children explore the pattern. 17 + 5 = 22 27 + 5 = 32	Use part part whole and number line to model.  	17 + 5 = 22  Explore related facts 17 + 5 = 22 22 = 17 + 5 5 + 17 = 22 22 = 5 + 17 22—17 = 5 17 = 22 - 5 22—5 = 17 5 = 22 - 17
Add a 2 digit number and tens	 25 + 10 = 35 Explore that the ones digit does not change		27 + 10 = 37 27 + 20 = 47 27 + □ = 57 □ + 30 = 67
Add two 2-digit numbers without bridging. 'Friendly numbers'	Model using dienes , place value counters and numicon 	 Use number line and bridge ten using part whole if necessary.	25 + 47 20 + 5 40 + 7 20 + 40 = 60 5+ 7 =12 60 + 12 = 72

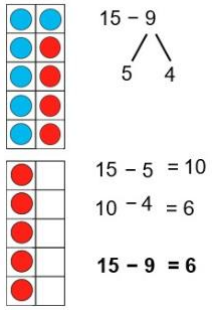
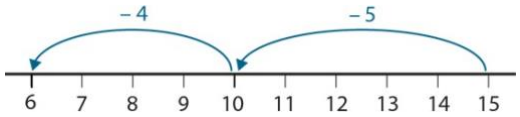
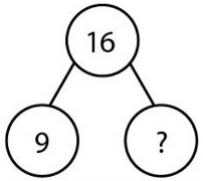
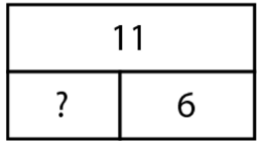
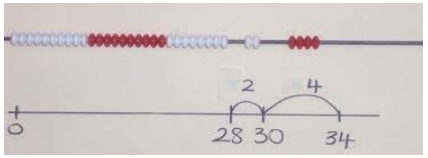
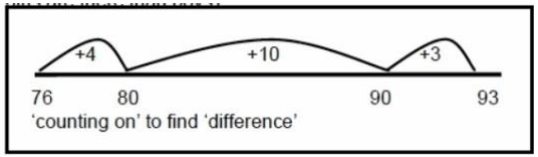
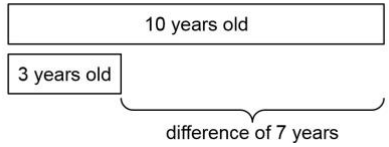
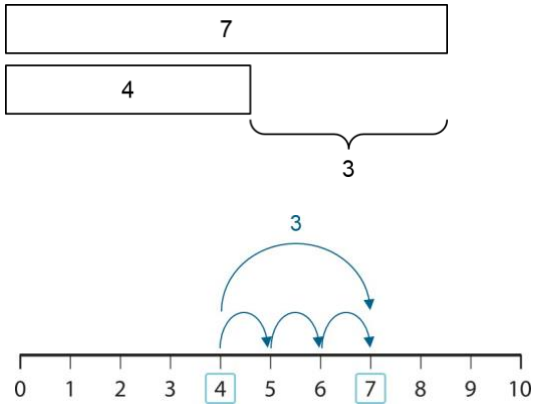
Y2 ADDITION +

Objective & Strategy & Key Vocabulary	Concrete	Pictorial	Abstract
Add any two 2-digit numbers			24 + 38 = ☐ 38 + 24 = ☐ 29 + ☐ = 51 ☐ + 22 = 51
Add three 1-digit numbers	 Combine to make magic 10 first where relevant, or bridge 10 then add third	Use language of fist, then, then, now Pictorial:  Use part part whole to show magic ten 	 Combine the two numbers that make/ bridge ten then add on the third.
Adding two numbers that bridge 10.	 Use double sided counters and ten frames. Move counters to fill the ten frame and make Magic 10	 Show on a number line how 5 is portioned into adding three, then adding 2.	

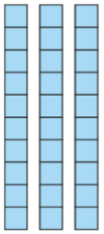
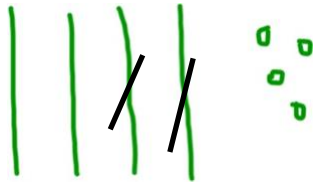
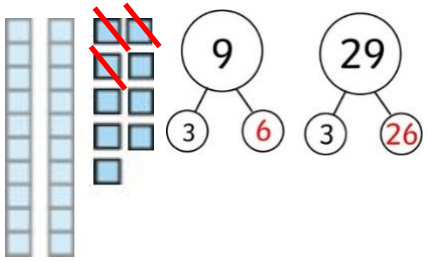
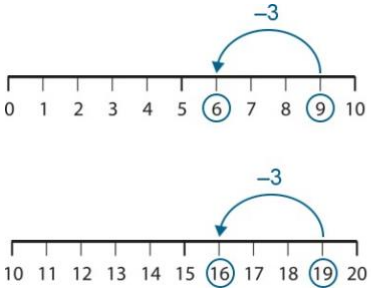
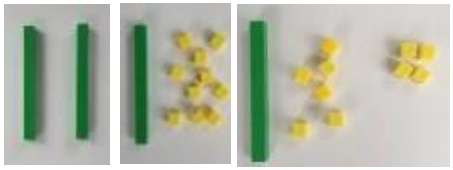
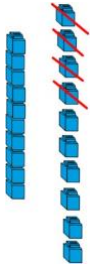
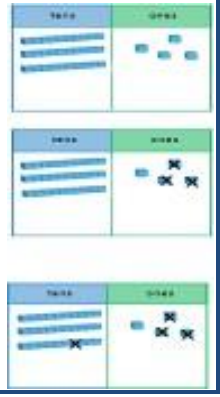
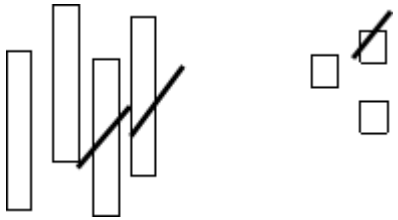
Y1 SUBTRACTION

Objective & Strategy	Concrete	Pictorial	Abstract
Represent and use number bonds and related subtraction facts within 20 Part-Part-Whole model	 Link to addition. Use PPW model to model the inverse. If 10 is the whole and 6 is one of the parts, what s the other part? 10—6 = 4	 Use pictorial representations to show the part.	Move to using numbers within the part whole model.  12 - 5 = 7 12 - 7 = 5 7 = 12 - 5 5 = 12 - 7
Subtract by making ten	15—9 Make 15 on the ten frame. Take 5 away to make ten, then take 4 more away so that you have taken 9.  15 – 5 = 10 10 – 4 = 6 **15 – 9 = 6**	15 – 9  Jump back 5 first, then another 4. Use ten as the stopping point.	16—9 How many do we take off first to get to 10? How many left to take off?  
Compare numbers by finding the difference.	 There are 2 more red cars than blue cars.  There are 2 more pencils than erasers.	 Use a number line to count on.. 	Hannah has12 sweets and her sister has 5. How many more does Hannah have than her sister?

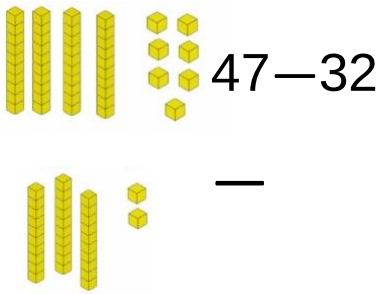
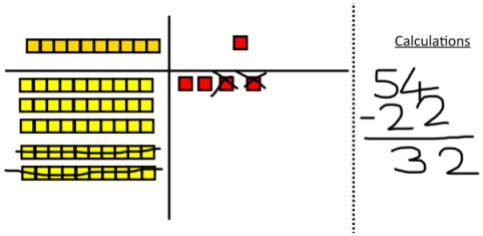
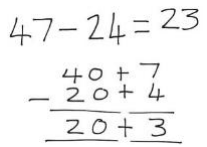
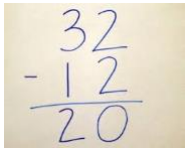
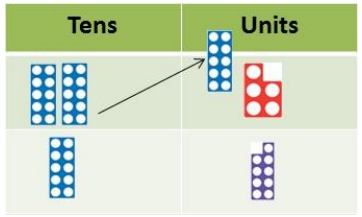
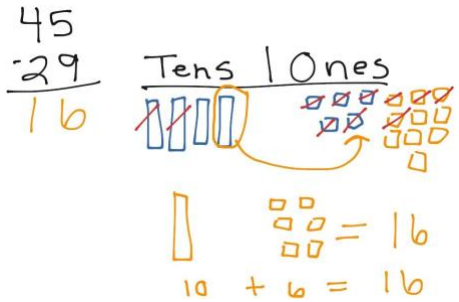
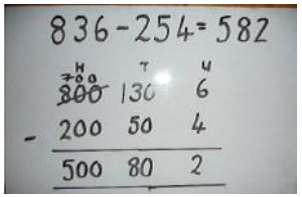
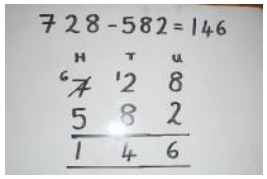
Y1 SUBTRACTION

Objective & Strategy	Concrete	Pictorial	Abstract
Subtracting by making 10	Make 15 on the ten frame. Take 5 away to make ten, then take 4 more away so that you have taken 9. 15 - 9 =  	15 - 9 =  Jump back 5 first, then another 4. Use ten as the stopping point.	16 - 9 = How many do we take off first to get to 10? How many left to take off?  
Counting on to next ten *Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.*	34 - 28 =  34—28 Use a bead bar or bead strings to model counting to next ten and the rest. 28 to 30 is 2, 30 to 34 is 4. So, 34 - 28 = 6	 Use a number line to count on to next ten and then the rest. Begin with bead line, move to landmarked line then to ENL.	93—76 = 17 76 ⟶ 80 = 4 80 ⟶ 93 = 13 13 + 4 = 17
Subtractions as difference	 Ben is ten years old Charlotte is three years old  	 	The difference between 24 and 16 is 8.

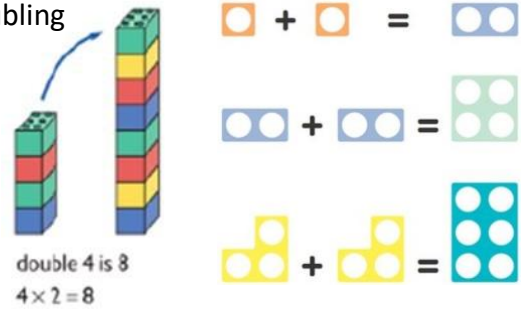
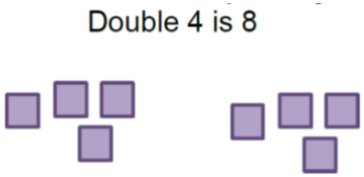
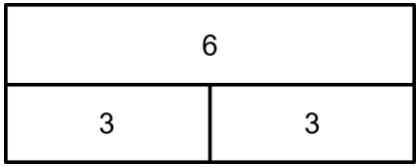
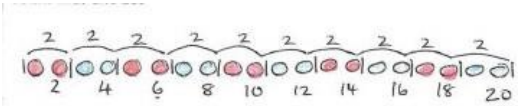
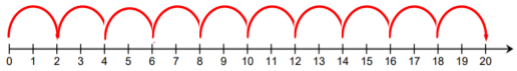
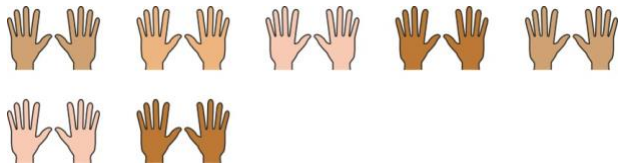
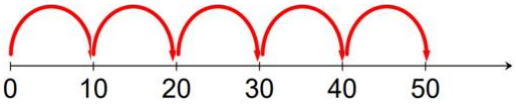
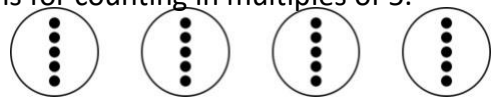
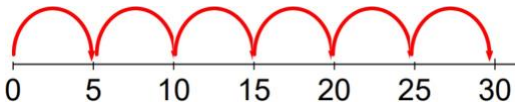
Y1 SUBTRACTION

Objective & Strategy	Concrete	Pictorial	Abstract
Subtracting a multiple of 10	3  32 - 10 = 22 Children use dienes, PV counters or Numicon. They remove the correct number of tens	 Children draw rods and cubes and cross off multiples of ten.	64 - 10 = ☐ 64 - 20 = ☐ 64 - 30 = ☐ 64 - ☐ = 24 ☐ - 50 = 14
Subtract a single digit from a two digit number No regrouping	 Explore that 9 - 3 = 6 so 29 - 3 = 26 etc	 9 – 3 = 6 19 – 3 = 16	9 - 3 = 6 19 - 6 = 13 29 - 6 = 23 etc
Regroup a ten into ten ones	 Use a PV chart to show how to change a ten into ten ones, use the term 'take and make'.	20 - 4 = 16 	20—4 = 16
Partitioning to subtract without regrouping. *'Friendly numbers'*	34—13 = 21 Use Dienes to show how to partition the number when subtracting without regrouping. 	43—21 = 22 Children draw representations of Dienes and cross off. 	43—21 = 22

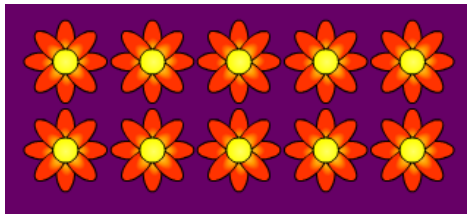
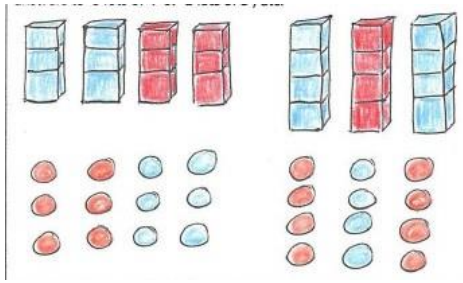
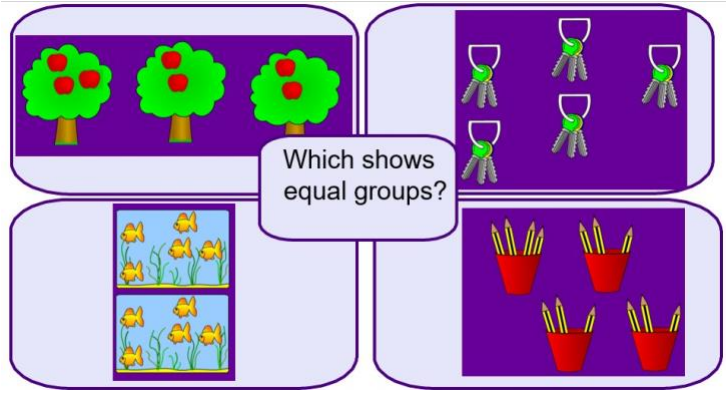
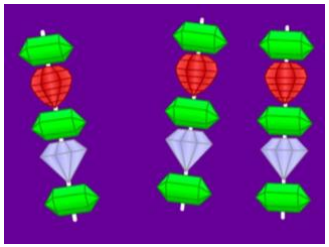
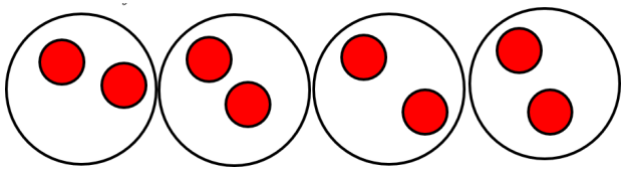
Y1 SUBTRACTION

Objective & Strategy	Concrete	Pictorial	Abstract
Column subtraction without regrouping (friendly numbers)	 Use base 10 or Numicon to model	 Draw representations to support under-standing	Intermediate step may be needed to lead to clear subtraction understanding.  Leading to compact method. 
Column subtraction with regrouping	 Begin with base 10 or Numicon. Move to pv counters, modelling the exchange of a ten into tten ones. Use the phrase 'take and make' for exchange.	 Children may draw base ten or PV counters and cross off.	Begin by partitioning into pv columns  Then move to formal method. 

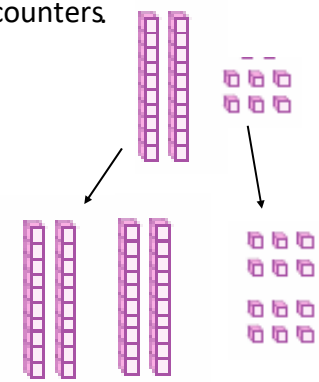
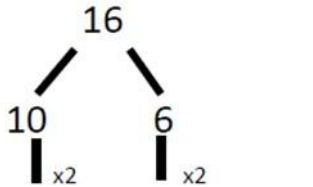
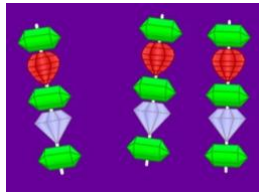
Y1 MULTIPLICATION

Objective & Strategy	Concrete	Pictorial
Double numbers to 10	Use practical activities using manipultives including cubes and Numicon to demonstrate doubling 	Draw pictures and bar models to show how to double numbers  
Counting in groups of 2	Count in 2s using real life objects and contexts. 	Children make representations to show counting in multiples of 2.Count in multiples of a number aloud.  Show jumps of 2 on a number line 
Counting in groups of 10	Use real life objects and contexts to count in groups of 10 	Use and draw representations for counting in multiples of 10. Count in multiples of 10 aloud Show jumps of 10 on a number line 
Counting in groups of 5	Use real life objects and contexts to count in groups of 5 	Use and draw representations for counting in multiples of 5. Count in 5s aloud.  

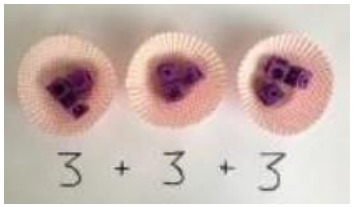
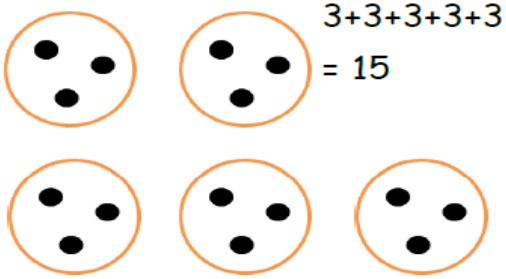
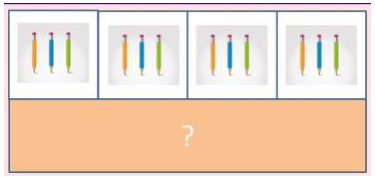
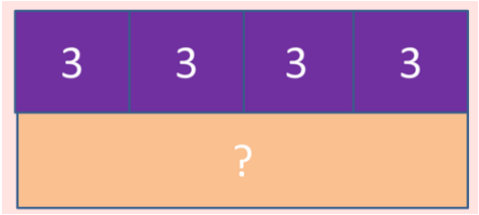
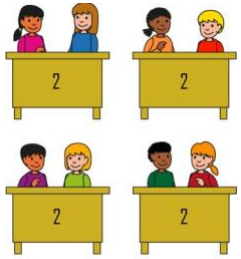
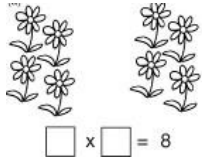
Y1 MULTIPLICATION

Objective & Strategy	Concrete	Pictorial
Understand and use arrays	Use objects laid out in arrays to find the answers to 2 lots of 5, 3 lots of 2 etc. 	Make and draw representations of arrays to show understanding 
Equal/non equal groups	Use real life objects and contexts to examine equal and non-equal groups.   There are 3 equal groups. There are 5 in each group.	Children make/match representations of real life problems to show equal groups and find the total.  There are 4 equal groups. There are 2 in each group. There are 8 altogether.

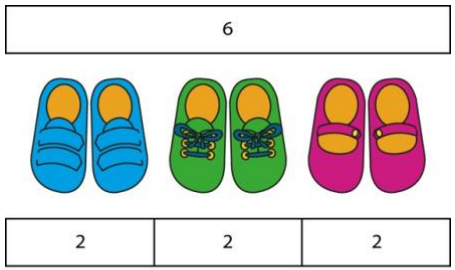
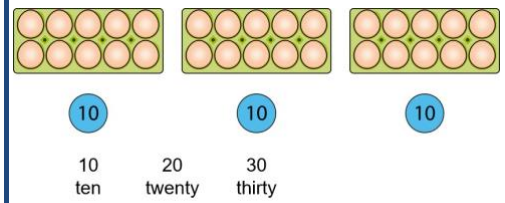
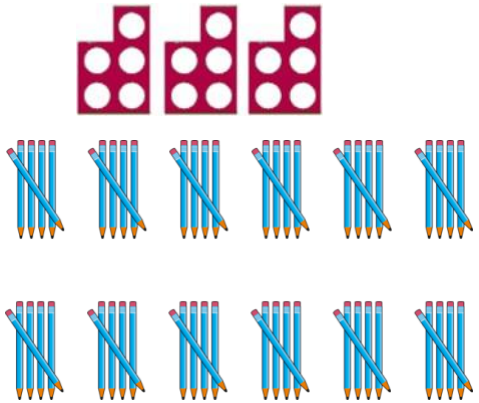
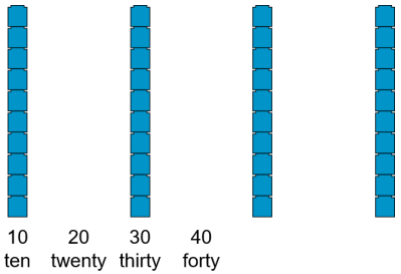
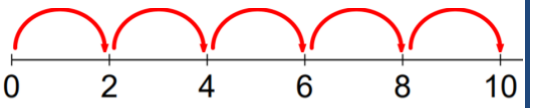
Y1 MULTIPLICATION

Objective & Strategy	Concrete	Pictorial	Abstract
Double a 2-digit number	Model doubling using dienes and PV counters.  40 + 12 = 52	Draw pictures and representations to show how to double numbers	Partition a number and then double each part before recombining it back toget 
Understand equal and non-equal groups	These are non– equal groups These are equal groups  There are 5 equal groups. Each group has 3 cakes.	Make representations and drawings of equal groups I have 4 groups of 3.	

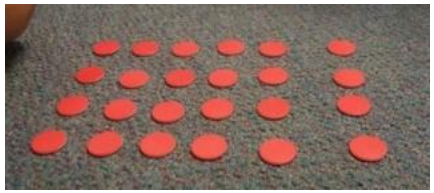
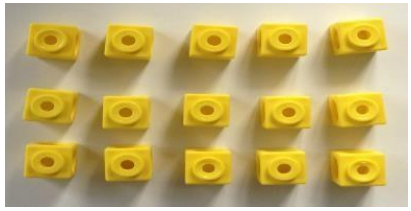
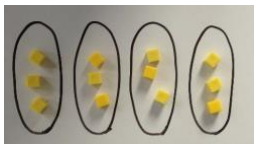
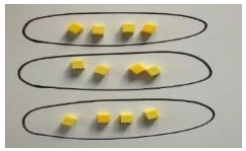
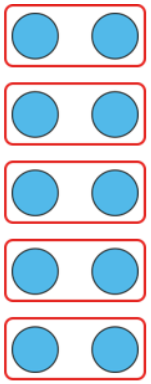
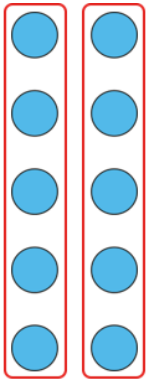
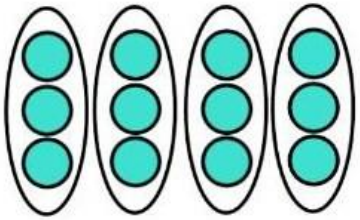
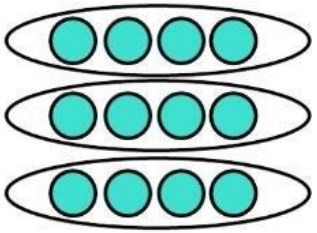
Y2 MULTIPLICATION

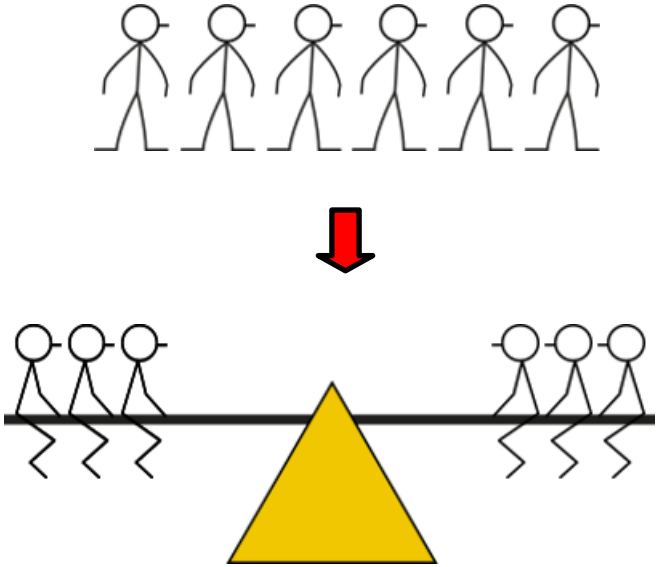
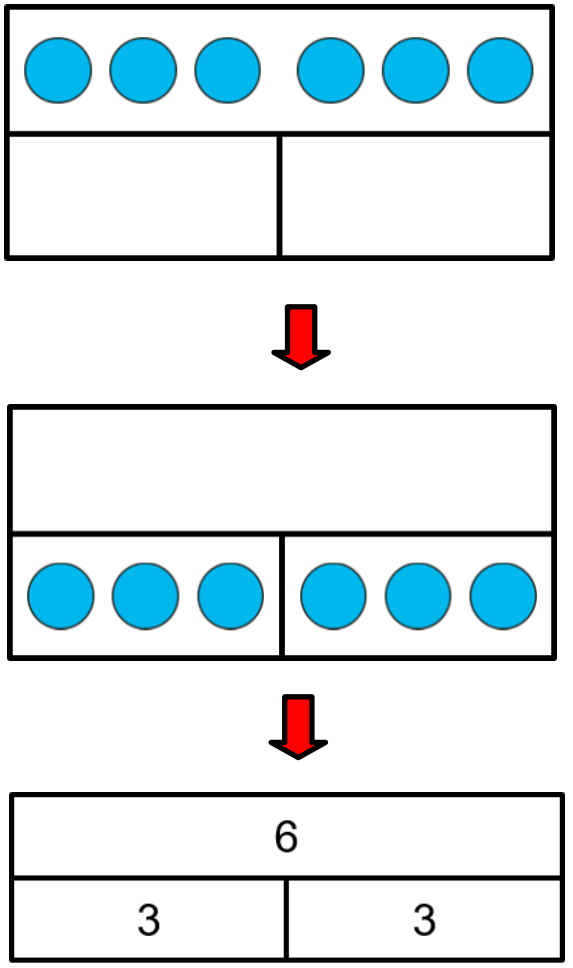
Objective & Strategy	Concrete	Pictorial	Abstract
Use repeated addition for multiplications	Use objects and real life contexts. There are 5 groups of 2. There are 10 socks altogether.  There are 3 groups of 3. There are 9 altogether.	Make and draw representations to show repeated addition There are 3 sweets in one bag. How many sweets are in 5 bags altogether?  Use bar models for representations of repeated additions.  	Create number sentences using repeated addition to match representations.  3 + 3 + 3 + 3 = 12
Relate repeated addition to multiplication using the x sign.	Write multiplication sentences to match repeated addition.  	Children make and draw representations and record both an addition sentence and a multiplication sentence. 1 + 1 + 1 + 1 + 1 + 1 = 6 6 x 1 = 6  	Write multiplication sentences to match repeated addition, without the support of representations. 2 + 2 + 2 + 2 + 2 = 10 5 x 2 = 10

Y2 MULTIPLICATION

Objective & Strategy	Concrete	Pictorial	Abstract
Understand the 2, 5 and 10 times table	Use objects and real life contexts for multiples of 2, 5 and 10  3 × 2 = 6 6 = 3 × 2  3 × 10 = 30 	Make and draw representations for 2, 5 and 10 times tables 12 = 6 × 2  4 × 10 = 40 Number lines, bead strings, counting sticks and bar models should be used to show representation of counting in multiples.  5 x 2 = 10 	Understand the terms factor and product 3 × 2 = 6 factor × factor = product 6 = 3 × 2 product = factor × factor Count in multiples of a number aloud.

Y2 MULTIPLICATION

Objective & Strategy	Concrete	Pictorial	Abstract
Multiplication is commutative	Create arrays using counters and cubes and Numicon.   Pupils should understand that an array can represent different equations and that, as multiplication is commutative, the order of the multiplication does not affect the answer.  	Use representations of arrays to show different calculations and explore commutativity.   5 × 2 = 10 5 groups of 2 2, five times 5 × 2 = 10 2 groups of 5 5, two times  	12 = 3 × 4 12 = 4 × 3 Use an array to write multiplication sentences and reinforce repeated addition. 5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

Objective & Strategy	Concrete	Pictorial
Find half of numbers to 20.	Real life and practical contexts are used to find half of numbers up to 20. 	Children use manipulatives to represent real life problems.  half of 6 = 3 double 3 = 6

Y1

DIVISION

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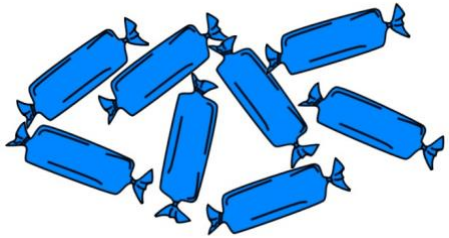
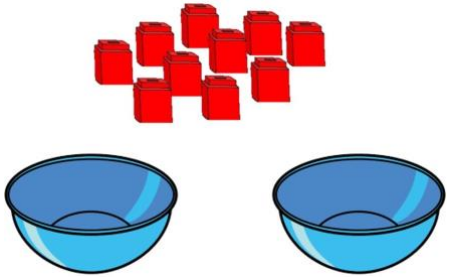
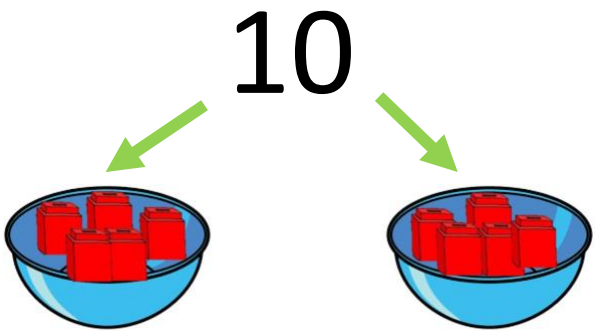
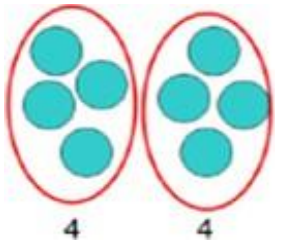
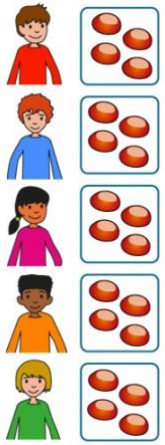
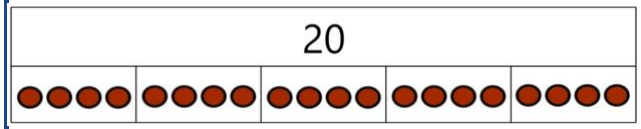
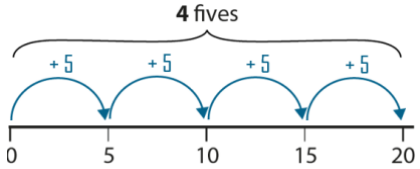
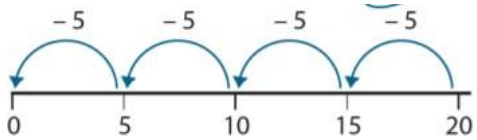
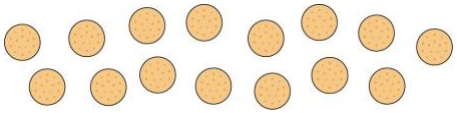
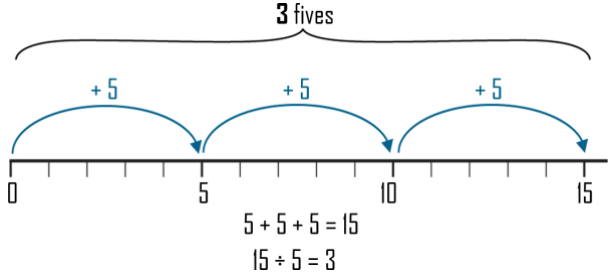
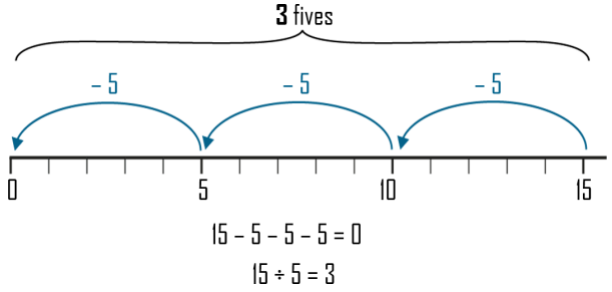
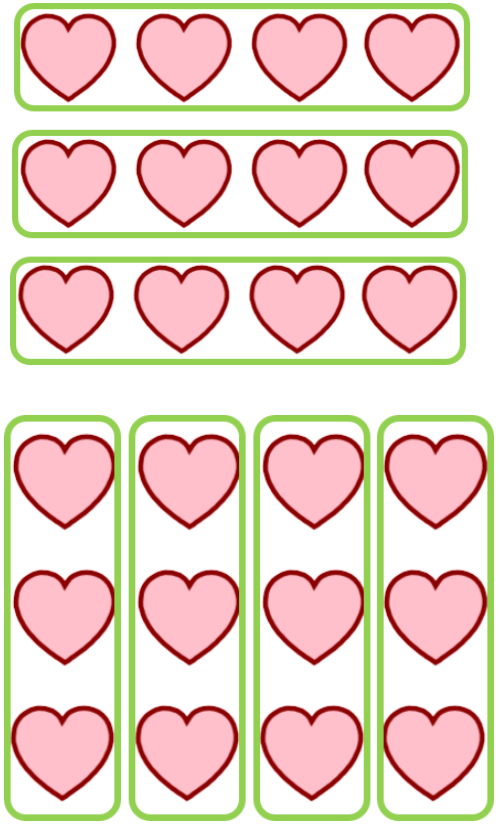
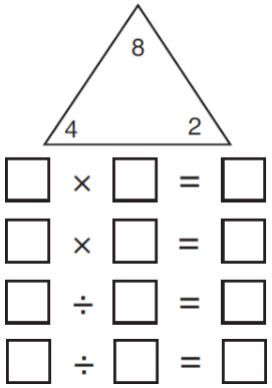
Y1 DIVISION ÷

Objective & Strategy	Concrete	Pictorial
Understand division as sharing into equal groups *Use Gordon ITPs for modelling*	Children solve real life problems using real objects.  There are eight sweets. Daisy and Will share these equally. How many do they get each? I have 10 cubes, can you share them equally in 2 groups?  There are 2 equal groups. Each group has 5. 	Children use pictures or shapes to share quantities.  8 shared between 2 is 4 10 shared between 2 is 5

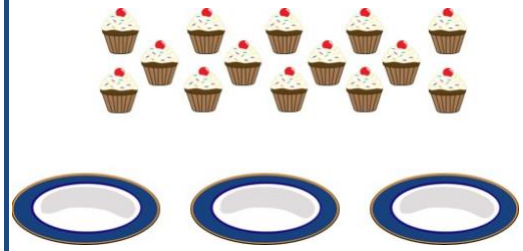
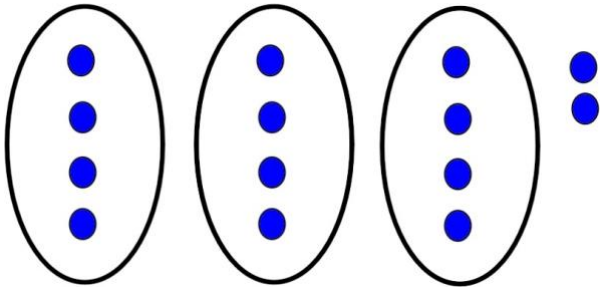
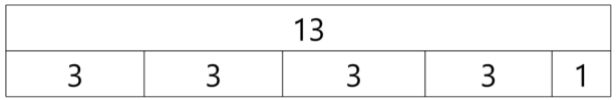
Y1 DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing (partitive)	There are 20 conkers shared equally between 5 children.  Each child gets 4 conkers.	Children use pictures or shapes to share quantities. They may use bar modelling to show and support understanding.  Number lines are used to show skip counting (counting forwards)  and repeated subtraction (counting backwards).  	20 ÷ 5 = 4
Division as grouping (quotitive)	Use cubes, counters or real objects or to aid understanding. There are 15 biscuits, there are 5 in each bag. How many bags?  	  	15 divided into groups of 5 is 3 15 ÷ 5 = 3

Y1 DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Understanding the Inverse			3 x 4 = 12 12 ÷ 4 = 3 4 x 3 = 12 12 ÷ 3 = 4 2 x 4 = 8 4 x 2 = 8 8 ÷ 2 = 4 8 ÷ 4 = 2 8 = 2 x 4 8 = 4 x 2 2 = 8 ÷ 4 4 = 8÷ 2 Show all 8 related fact family sentences.

Y1 DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Division with remainders. (partitive)	I divide 14 cakes between 3 plates. How are the cakes shared? 	Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. 14 ÷ 3 = 4 r 2 dividend divisor quotient remainder
Division with remainders. (quotitive)	13 eggs are put into boxes. Each box holds 3 eggs. How are the eggs boxed? 	Children may draw representations to show their understanding. Use bar models to show division with remainders.  13 3 3 3 3 1	13 ÷ 3 = 4 r 1

Divisibility rules in ‘families’ – 5 and 10	
5	A number is divisible by 5 if the ones digit is 5 or 0.
10	A number is divisible by 10 if the ones digit is 0.

2	A number is divisible by 2 if the ones digit is even.

DIVISION