Calculation Policy for

Mathematics

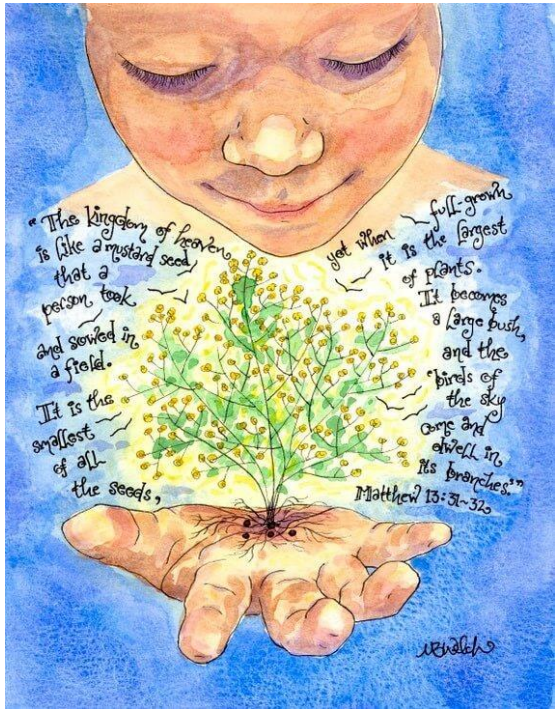
2022-23

St Mary's Vision

Although a small school, St Mary's has a big impact. Our wish is that children leave the school with rich and happy memories. That they ask big questions, have a sense of their own spirituality and strive for their best and the best for their community.

"The kingdom of heaven is like a mustard seed, which a man took and planted in his field. ***32*** *Though it is the smallest of all seeds, yet when it grows, it is the largest of garden plants and becomes a tree, so that the birds come and perch in its branches."*

Matthew 13:31-32



St Mary's Aims

Children have:

- Strong, happy memories
- Enjoyment and fun
- Strong relationships and friendships with caring and approachable staff
- Thought provoking lessons which enable children to flourish and develop a love of learning
- Ability to ask lots of questions and work as a team
- Local and global community awareness
- Self-esteem and confidence with great communication
- Ability to be flexible, improve learning and problem solve
- Developed a sense of faith and spirituality within a Catholic context
- Ability to be independent and know how to keep themselves safe and healthy physically and mentally
- A wealth of cultural experience
- Manage conflict, risk and disappointment
- An education that recognises the uniqueness of each individual so they can achieve their maximum potential - growing in all areas of learning
- A broad, balanced, challenging and relevant curriculum which caters for the needs of individual children.

Calculation Policy 2022

This policy has been designed in accordance with the National Curriculum 2014 and helps to develop the three main aims; Fluency, Reasoning and problem Solving. It is designed to provide staff, parents and pupils a clear understanding of the expected skill progression with the four main operations. This policy aims to build on recognised best practice nationally as well as catering for the learning needs of all the children at St Mary's Catholic Primary School.
The calculation policy is organised according to the expectations set out in the 2014 National Curriculum. The National Curriculum outlines year group expectations however here at St Mary's Primary we believe that children should be treated as individuals and as such should be taught to their developmental stage and should move on when their understanding is secure.

Aims

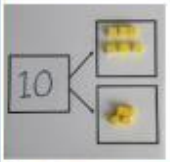
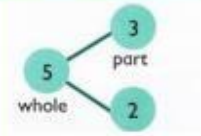
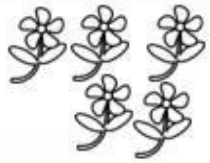
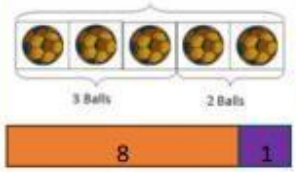
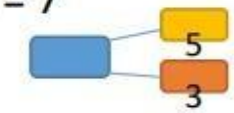
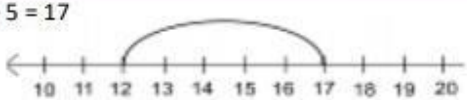
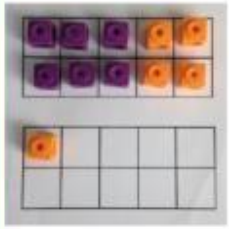
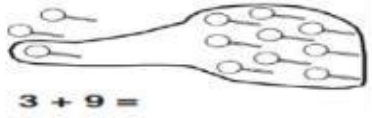
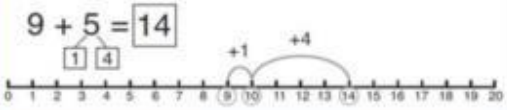
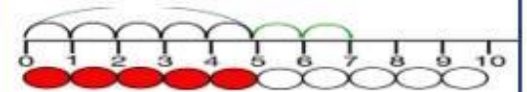
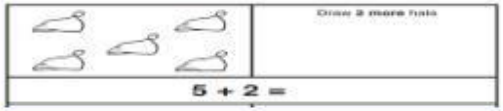
- To provide a consistent approach to calculation across the school.
- To strengthen continuity and progression in the children's written calculations.
- To form a core set of methods that the children are able to build upon.
- To build on models and images to promote conceptual understanding.
- Develop and reinforce problem-solving strategies
- Practise and understand a range of mathematics vocabulary.
- To encourage the children to think independently and to persevere when faced with challenges, showing a confidence of success.
- To encourage the children to embrace the value of learning from mistakes and false starts.
- To nurture the children's ability to reason, generalise and make sense of solutions.
- To enthuse a commitment to and passion for the subject.

Representations

Key to successful implementation of the school calculation policy is consistent use of representations (model and images that support conceptual understanding of the mathematics) and this policy promotes a range of relevant representations, across the primary years.
Mathematical understanding is developed through use of representations that are first of all concrete (e.g. Numicon, Base Ten apparatus), and then pictorial (e.g. Array, place value counters) to then facilitate abstract working (e.g. Columnar addition, long multiplication).
This policy guides teachers through an appropriate progression of representations, and if at any point a pupil is struggling they should revert to familiar pictorial and/or concrete materials/ representations as appropriate. Whilst a mathematically fluent child will be able to choose the most appropriate representation and procedure to carry out a calculation, whether written or mental, pupils should be supported with carefully selected representations that underpin calculation methods (as detailed in this policy), and ensure there is consistency across year groups. The 'Representations to support mental and written calculation' box on each page provides a range of models and images that underpin calculating in that year group. It is not an exhaustive collection, and applies to both mental and written calculation in most circumstances. Staff are encouraged to use additional representations and models to meet the needs of the individual children.

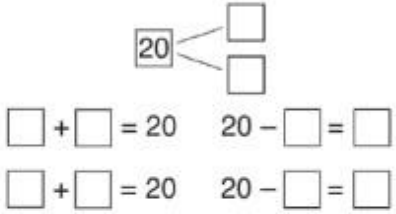
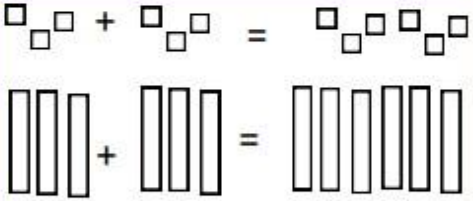
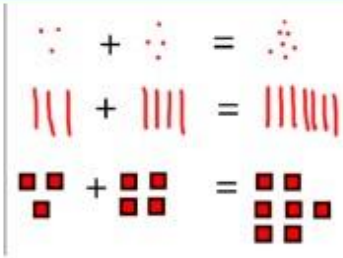
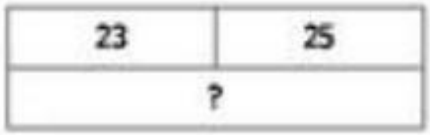
Addition

Year 1

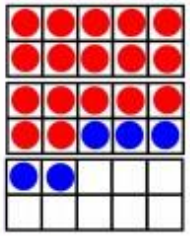
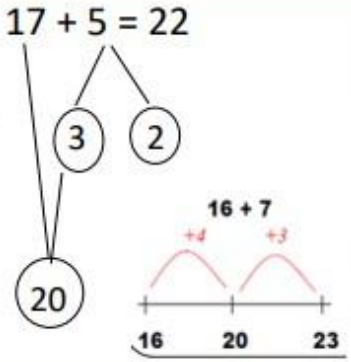
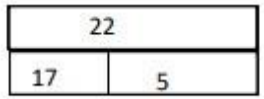
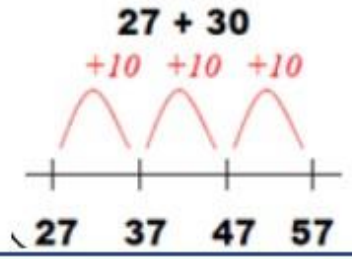
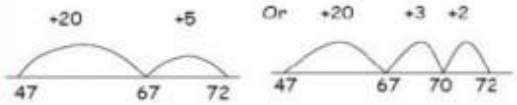
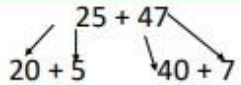
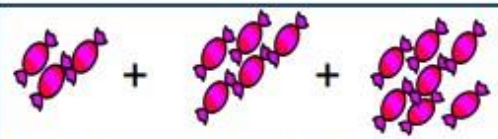
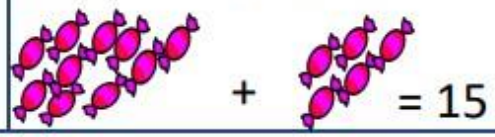
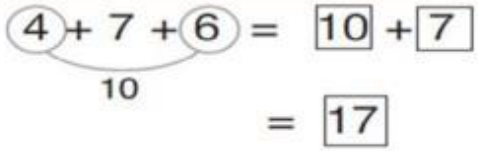
Objective & Strategy	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part- whole model	   Use part part whole model. Use cubes to add two numbers together as a group or in a bar. 	   Use pictures to add two numbers together as a group or in a bar.	4 + 3 = 7  10= 6 + 4 Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17 Place the larger number in your head and count on the smaller number to find your answer.
Regrouping to make 10. *This is an essential skill for column addition later.*	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10. Use ten frames.	 Use pictures or a number line. Regroup or partition the smaller number using the part part whole model to make 10. 	7 + 4= 11 If I am at seven, how many more do I need to make 10. How many more do I add on now?
Represent & use number bonds and related subtraction facts within 20	 2 more than 5.	 	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.'*

Addition

Year 2

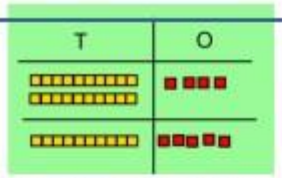
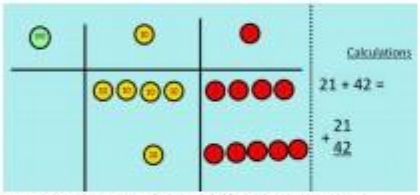
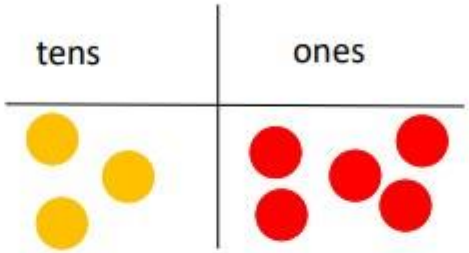
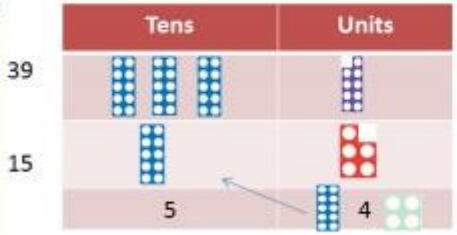
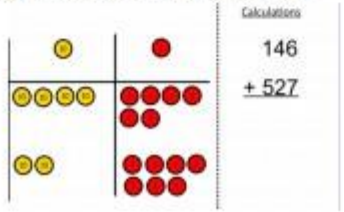
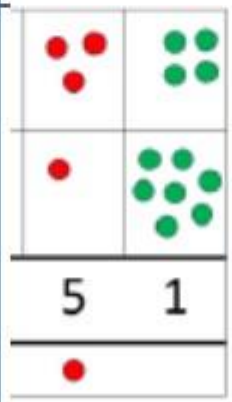
Objective & Strategy	Concrete	Pictorial	Abstract
Adding multiples of ten	50= 30 = 20  Model using dienes and bead strings	 3 tens + 5 tens = _____ tens 30 + 50 = _____ Use representations for base ten.	20 + 30 = 50 70 = 50 + 20 40 + □ = 60
Use known number facts Part part whole	 Children explore ways of making numbers within 20	 □ + □ = 20 20 − □ = □ □ + □ = 20 20 − □ = □	□ + 1 = 16 16 − 1 = □ 1 + □ = 16 16 − □ = 1
Using known facts		 Children draw representations of H,T and O	3 + 4 = 7 *leads to* 30 + 40 = 70 *leads to* 300 + 400 = 700
Bar model	 3 + 4 = 7	 7 + 3 = 10	 23 + 25 = 48

Year 2 Addition

Objective & Strategy	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 5 + 17 = 22 22—17 = 5 22—5 = 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
Add two 2-digit numbers	 Model using dienes , place value counters and numicon	 Use number line and bridge ten using part whole if necessary.	 20 + 40 = 60 5+ 7 =12 60 + 12 = 72
Add three 1-digit numbers	 Combine to make 10 first if possible, or bridge 1o then add third digit	 Regroup and draw representation. 	 Combine the two numbers that make/ bridge ten then add on the third.

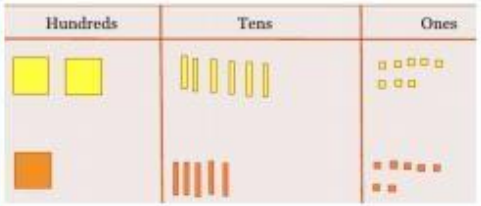
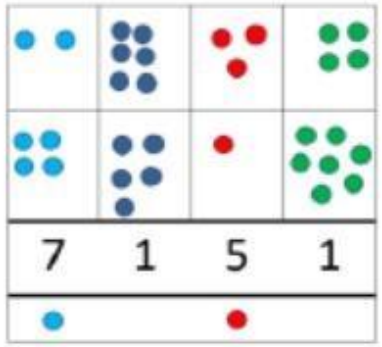
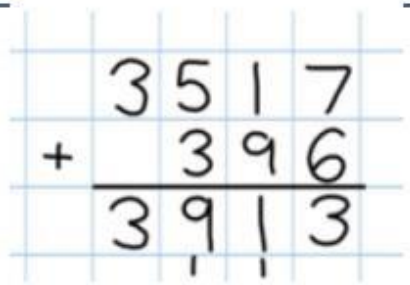
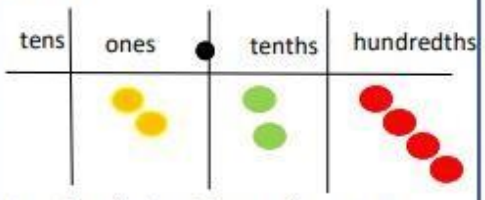
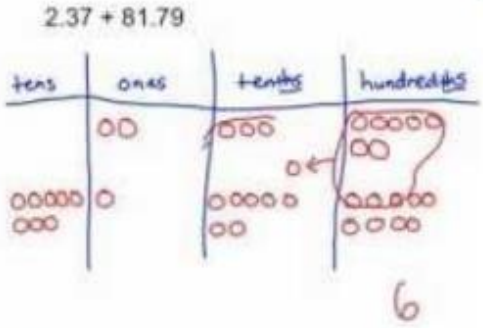
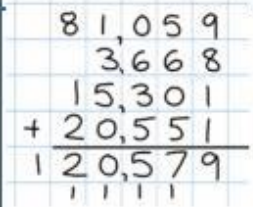
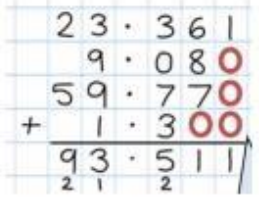
Addition

Year 3

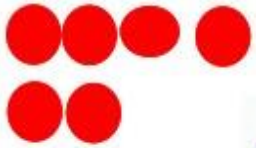
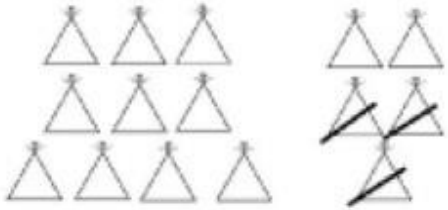
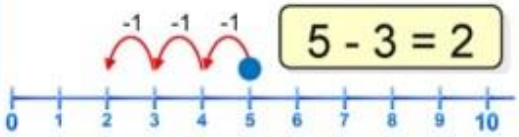
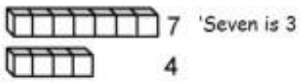
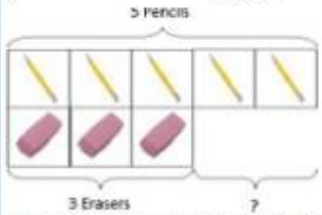
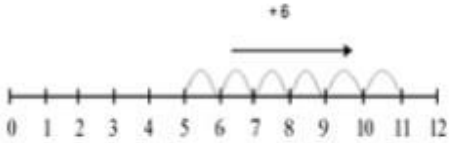
Objective & Strategy	Concrete	Pictorial	Abstract
Column Addition—no regrouping (friendly numbers) Add two or three 2 or 3-digit numbers.	 Model using Dienes or numicon Add together the ones first, then the tens.   Move to using place value counters	Children move to drawing the counters using a tens and one frame. 	$$\begin{array}{r} 223 \\ +\ 114 \\ \hline 337 \end{array}$$ Add the ones first, then the tens, then the hundreds.
Column Addition with regrouping.	 Exchange ten ones for a ten. Model using numicon and pv counters. 	 Children can draw a representation of the grid to further support their understanding, carrying the ten **underneath** the line	$$\begin{array}{rcrr} 20 & + & 5 & \\ 40 & + & 8 & \\ \hline 60 & + & 13 & = 73 \end{array}$$ Start by partitioning the numbers before formal column to show the exchange. $$\begin{array}{r} 536 \\ +\ 85 \\ \hline 621 \\ \hline 11 \end{array}$$

Addition

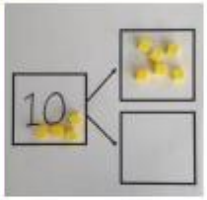
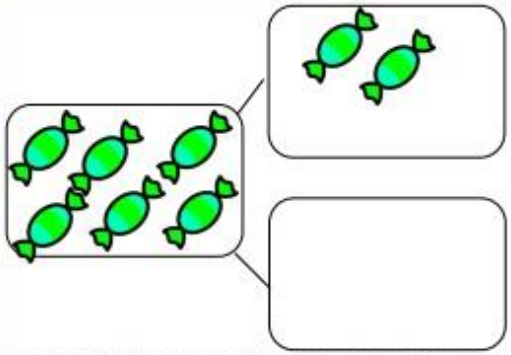
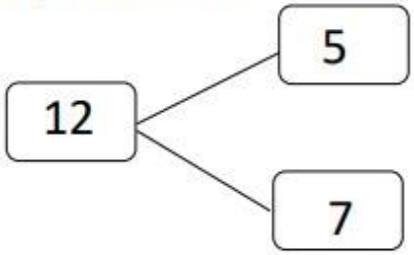
Years 4,5,6

Objective & Strategy	Concrete	Pictorial	Abstract
Y4—add numbers with up to 4 digits	~~Children continue to use dienes or pv~~ counters to add, exchanging ten ones for a ten and ten tens for a hundred and ten hundreds for a thousand. 	 Draw representations using pv grid.	 Continue from previous work to carry hundreds as well as tens. Relate to money and measures.
Y5—add numbers with more than 4 digits. Add decimals with 2 decimal places, including money.	As year 4  Introduce decimal place value counters and model exchange for addition.		72.8 + 54.6 127.4 1 1 
Y6—add several numbers of increasing complexity Including adding money, measure and decimals with different numbers of decimal points.	As Y5	As Y5	 Insert zeros for place holders. 

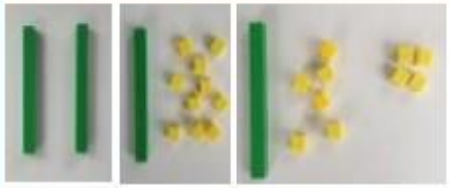
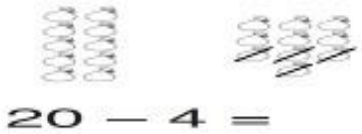
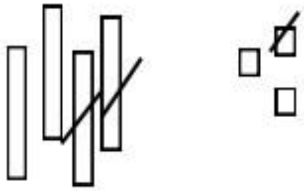
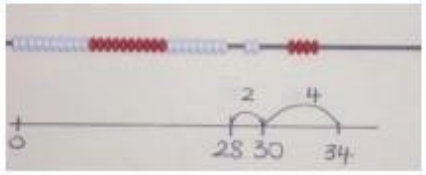
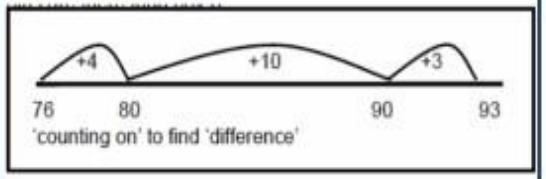
Year 1 Subtraction

Objective & Strategy	Concrete	Pictorial	Abstract
Taking away ones.	Use physical objects, counters , cubes etc to show how objects can be taken away.  6—4 = 2  4—2 = 2	 15 – 3 = 12 Cross out drawn objects to show what has been taken away.	7—4 = 3 16—9 = 7
Counting back	 Move objects away from the group, counting backwards.  Move the beads along the bead string as you count backwards.	 Count back in ones using a number line.	Put 13 in your head, count back 4. What number are you at?
Find the Difference	Compare objects and amounts  'Seven is 3 more than four' 'I am 2 years older than my sister'  Lay objects to represent bar model.	Count on using a number line to find the difference. 	Hannah has12 sweets and her sister has 5. How many more does Hannah have than her sister.?

Year 1 Subtraction

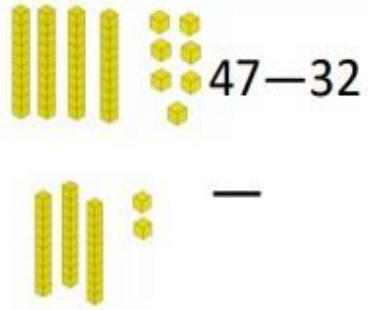
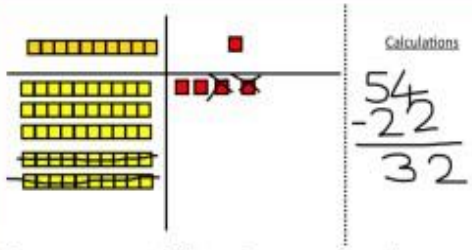
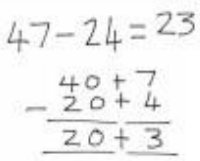
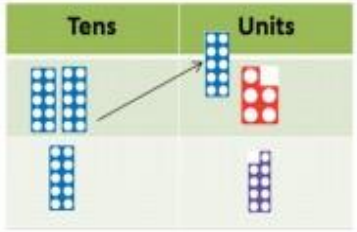
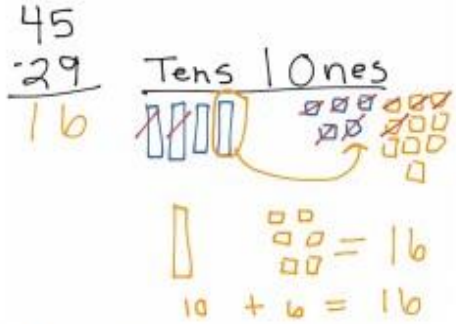
Objective & Strategy	Concrete	Pictorial	Abstract
Represent and use number bonds and related subtraction facts within 20 Part Part Whole model	 Link to addition. Use PPW model to model the inverse. If 10 is the whole and 6 is one of the arts, what s the other part? 10—6 = 4	 Use pictorial representations to show the part.	Move to using numbers within the part whole model. 
Make 10	14—9  Make 14 on the ten frame. Take 4 away to make ten, then take one more away so that you have taken 5.	13—7  Jump back 3 first, then another 4. Use ten as the stopping point.	16—8 How many do we take off first to get to 10? How many left to take off?
Bar model	 5—2 = 3		 10 = 8 + 2 10 = 2 + 8 10—2 = 8 10—8 = 2

Year 2 Subtraction

Objective & Strategy	Concrete	Pictorial	Abstract
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
Partitioning to subtract without regrouping. *'Friendly numbers'*	34—13 = 21  Use Dienes to show how to partition the number when subtracting without regrouping.  	Children draw representations of Dienes and cross off.  43—21 = 22	43—21 = 22
Make ten strategy *Progression should be crossing one ten, crossing more than one ten, crossing the hundreds.*	 34—28 Use a bead bar or bead strings to model counting to next ten and the rest.	 Use a number line to count on to next ten and then the rest.	93—76 = 17

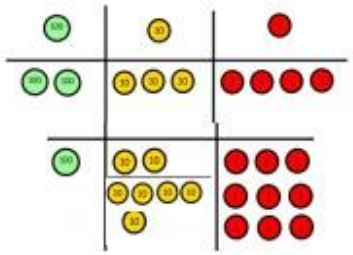
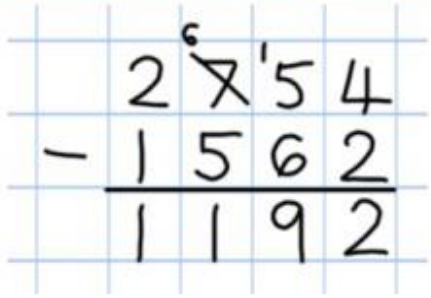
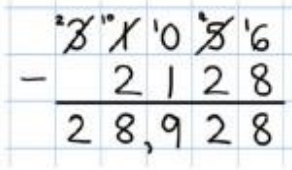
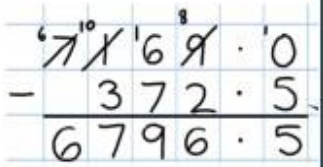
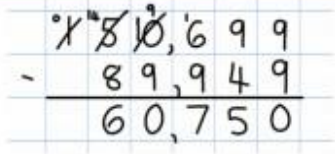
Year 3

Subtraction

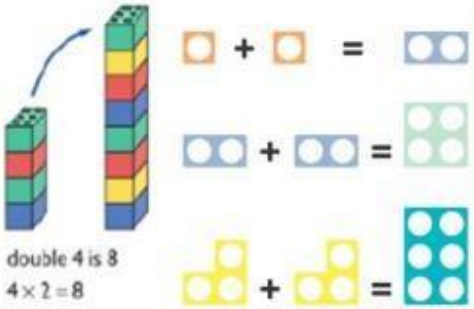
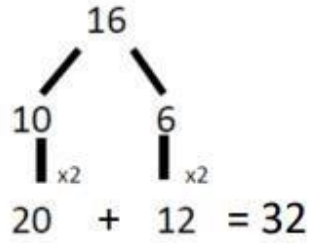
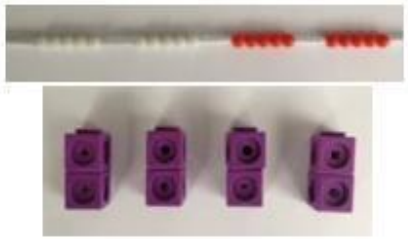
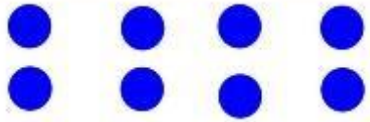
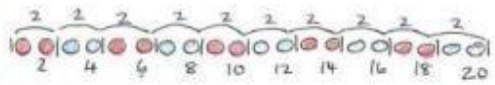
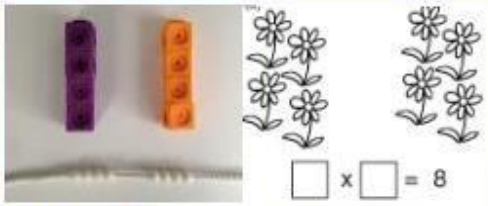
Objective & Strategy	Concrete	Pictorial	Abstract
Column subtraction without regrouping (friendly numbers)	 Use base 10 or Numicon to model	 Darw representations to support under-standing	 Intermediate step may be needed to lead to clear subtraction under-standing. 
Column subtraction with regrouping	 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 parti-tioning into pv columns  Then move to formal method.

Subtraction

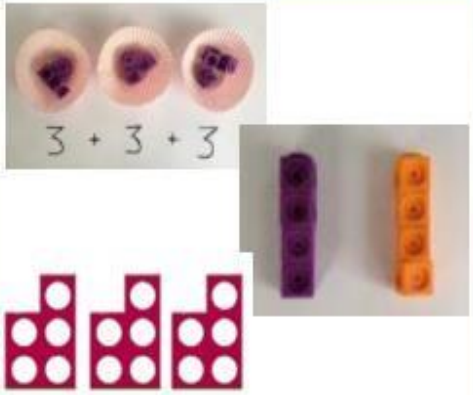
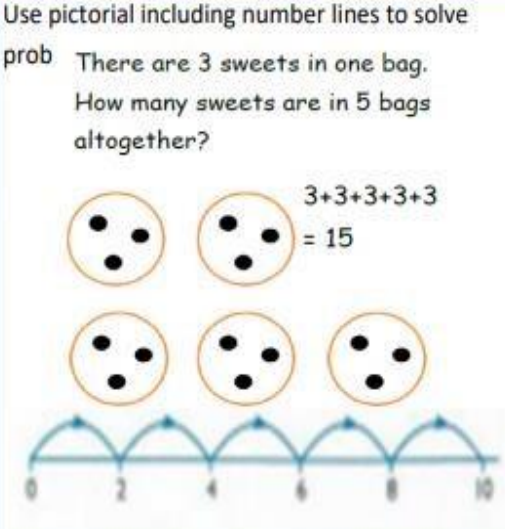
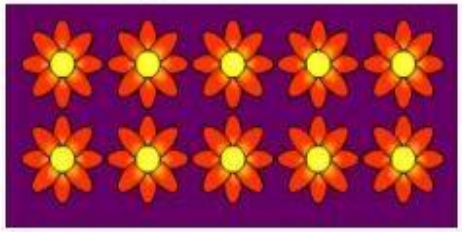
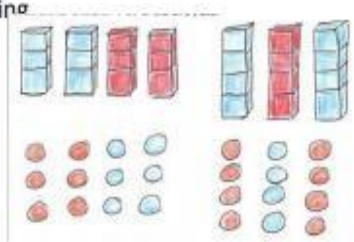
Years 4,5,6

Objective & Strategy	Concrete	Pictorial	Abstract
Subtracting tens and ones Year 4 subtract with up to 4 digits. *Introduce decimal subtraction through context of money*	234 - 179  Model process of exchange using Numicon, base ten and then move to PV counters.	Children to draw pv counters and show their exchange—see Y3	 Use the phrase 'take and make' for exchange
Year 5- Subtract with at least 4 digits, including money and measures. *Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal*	As Year 4	Children to draw pv counters and show their exchange—see Y3	 Use zeros for placeholders. 
Year 6—Subtract with increasingly large and more complex numbers and decimal values.			 

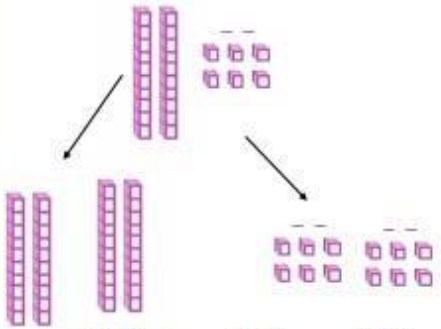
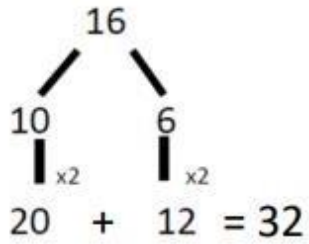
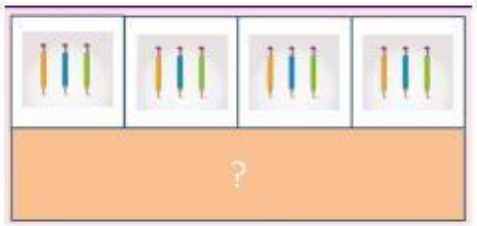
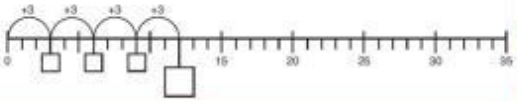
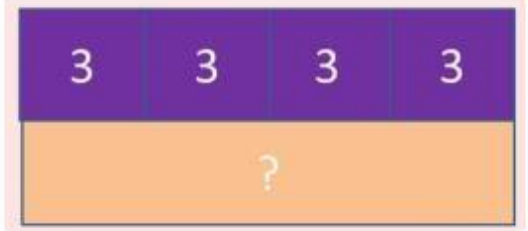
Year 1 Multiplication

Objective & Strategy	Concrete	Pictorial	Abstract
Doubling	Use practical activities using manipultives including cubes and Numicon to demonstrate doubling 	Draw pictures to show how to double numbers Double 4 is 8 	Partition a number and then double each part before recombining it back together. 
Counting in multiples	Count the groups as children are skip counting, children may use their fingers as they are skip counting. 	 Children make representations to show counting in multiples. 	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30
Making equal groups and counting the total	 Use manipulatives to create equal groups.	Draw  to show 2 x 3 = 6 Draw and make representations	2 x 4 = 8

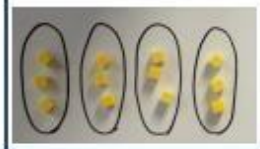
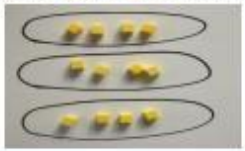
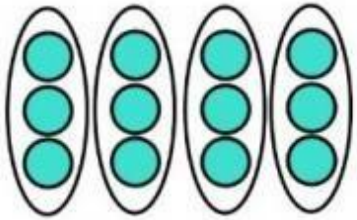
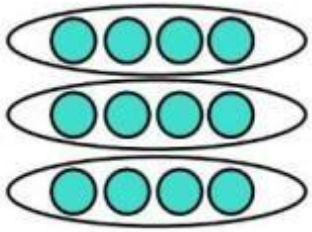
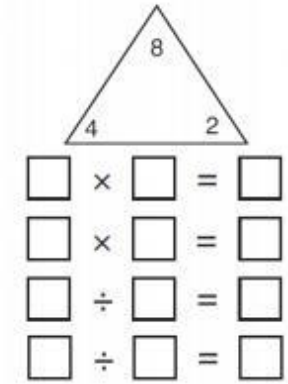
Year 1

Objective & Strategy	Concrete	Pictorial	Abstract
Repeated addition	 Use different objects to add equal groups	Use pictorial including number lines to solve prob 	Write addition sentences to describe objects and pictures. 
Understanding arrays	Use objects laid out in arrays to find the answers to 2 lots 5, 3 lots of 2 etc. 	Draw representations of arrays to show understanding 	3 x 2 = 6 2 x 5 = 10

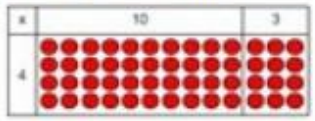
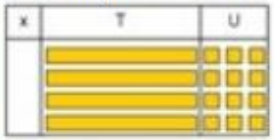
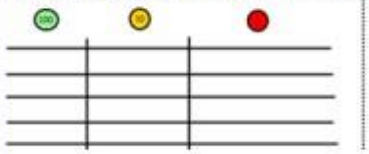
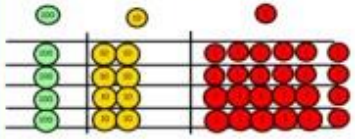
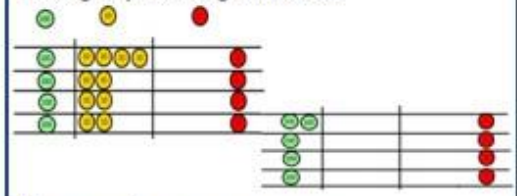
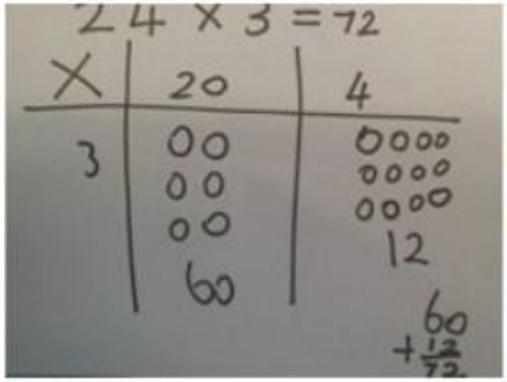
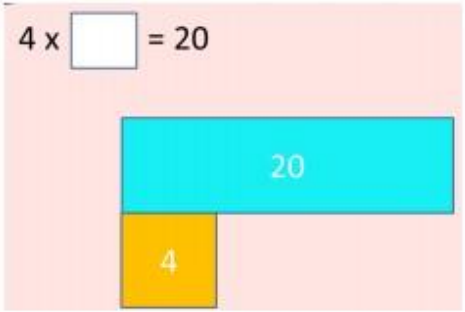
Year 2

Objective & Strategy	Concrete	Pictorial	Abstract
Doubling	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 together.  16 10 x2 6 x2 20 + 12 = 32
Counting in multiples of 2, 3, 4, 5, 10 from 0 (repeated addition)	Count the groups as children are skip counting, children may use their fingers as they are skip counting. Use bar models.  5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40   ?	Number lines, counting sticks and bar models should be used to show representation of counting in multiples.     3 3 3 3 ?	Count in multiples of a number aloud. Write sequences with multiples of numbers. 0, 2, 4, 6, 8, 10 0, 3, 6, 9, 12, 15 0, 5, 10, 15, 20, 25 , 30 $4 \times 3 = \square$

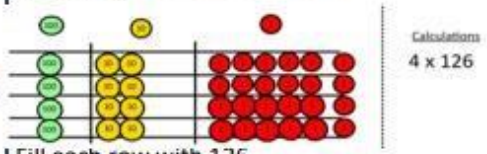
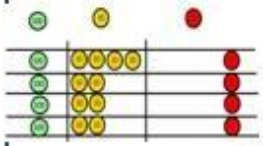
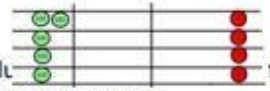
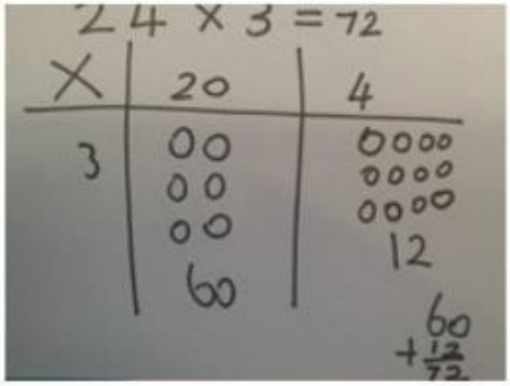
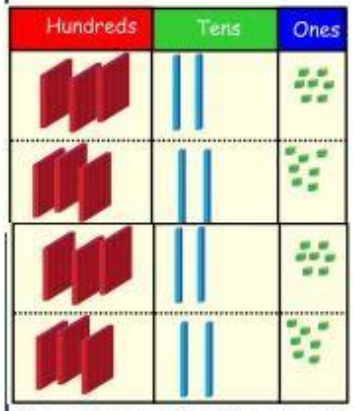
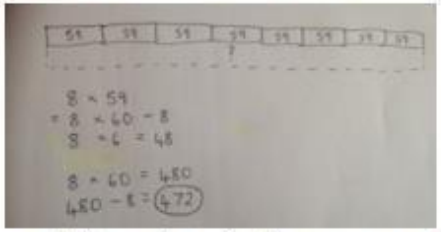
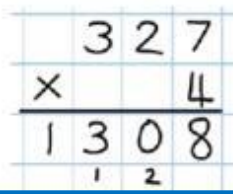
Year 2

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.  	$12 = 3 \times 4$ $12 = 4 \times 3$ Use an array to write multiplication sentences and reinforce repeated addition.  $5 + 5 + 5 = 15$ $3 + 3 + 3 + 3 + 3 = 15$ $5 \times 3 = 15$ $3 \times 5 = 15$
Using the Inverse *This should be taught alongside division, so pupils learn how they work alongside each other.*			$2 \times 4 = 8$ $4 \times 2 = 8$ $8 \div 2 = 4$ $8 \div 4 = 2$ $8 = 2 \times 4$ $8 = 4 \times 2$ $2 = 8 \div 4$ $4 = 8 \div 2$ Show all 8 related fact family sentences.

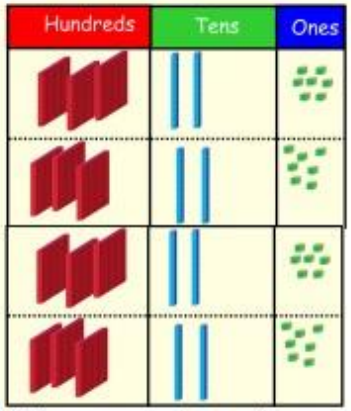
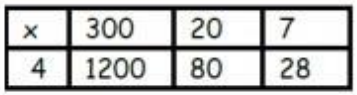
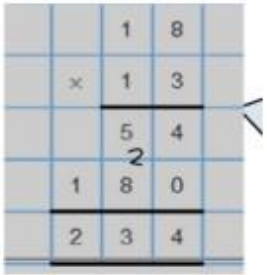
Year 3

Objective & Strategy	Concrete	Pictorial	Abstract
Grid method	Show the links with arrays to first introduce the grid method.  4 rows of 10 4 rows of 3 Move onto base ten to move towards a more compact method.  4 rows of 13 Move on to place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows  Calculations 4 x 126 Fill each row with 126  Calculations 4 x 126 Add up each column, starting with the ones making any exchanges needed  Then you have your answer.	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.  24 x 3 = 72 X | 20 | 4 3 | 60 | 12 60 + 12 = 72 Bar model are used to explore missing numbers  4 x ☐ = 20 20 4	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. | × | 30 | 5 | | 7 | 210 | 35 | 210 + 35 = 245 Moving forward, multiply by a 2 digit number showing the different rows within the grid method. | | 10 | 8 | | 10 | 100 | 80 | | 3 | 30 | 24 |

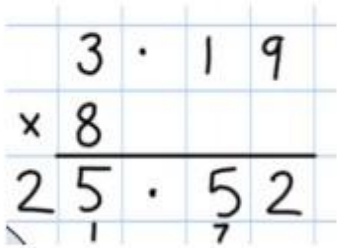
Year 4

Objective & Strategy	Concrete	Pictorial	Abstract
Grid method recap from year 3 for 2 digits x 1 digit Move to multiplying 3 digit numbers by 1 digit. (year 4 expectation)	Use place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows  Calculations 4 x 126 Fill each row with 126   Add up each col… …es making any exchanges needed	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below.  	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. | × | 30 | 5 | | 7 | 210 | 35 | 210 + 35 = 245
Column multiplication	Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. 321 x 2 = 642  It is important at this stage that they always multiply the ones first. The corresponding long multiplication is modelled alongside	| x | 300 | 20 | 7 | | 4 | 1200 | 80 | 28 | The grid method my be used to show how this relates to a formal written method.  Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.	327 x 4 28 80 1200 1308  This may lead to a compact method.

Years 5 & 6

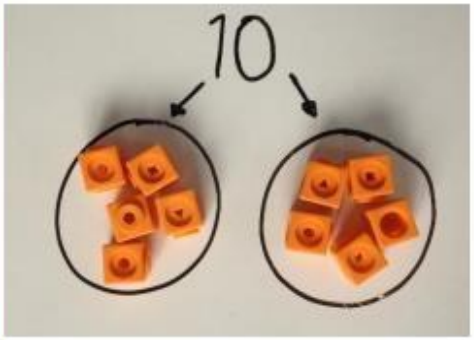
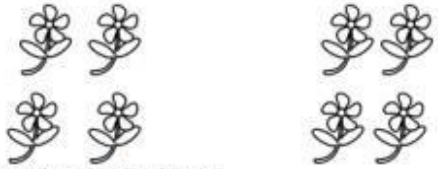
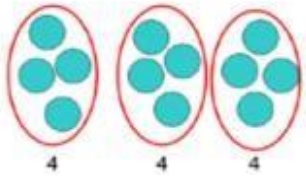
Objective & Strategy	Concrete	Pictorial	Abstract
Column Multiplication for 3 and 4 digits x 1 digit.	 It is important at this stage that they always multiply the ones first. Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. 321 x 2 = 642		327 x 4 = 28, 80, 1200 = 1308 3 2 7 x 4 = 1 3 0 8 (1 2) This will lead to a compact method.
Column multiplication	Manipulatives may still be used with the corresponding long multiplication modelled alongside.	 Continue to use bar modelling to support problem solving	 18 x 3 on the first row (8 x 3 =24, carrying the 2 for 20, then 1 x 3) 18 x 10 on the 2nd row. Show multiplying by 10 by putting zero in units first 1 2 3 4 x 1 6 = 7 4 0 4 (1234 x 6), 1 2 3 4 0 (1234 x 10), 1 9 , 7 4 4

Year 6

Objective & Strategy	Concrete	Pictorial	Abstract
Multiplying decimals up to 2 decimal plac-es by a single digit.			Remind children that the single digit belongs in the units column. Line up the decimal points in the question and the answer. 

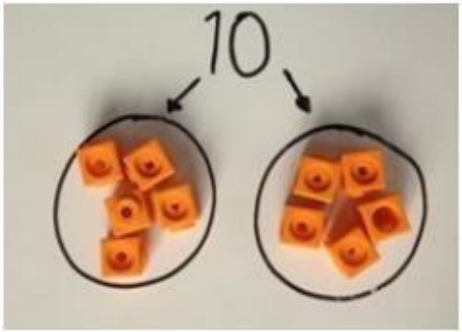
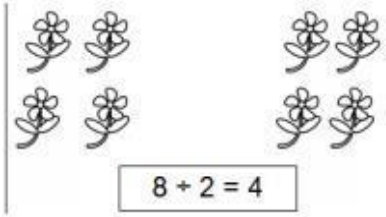
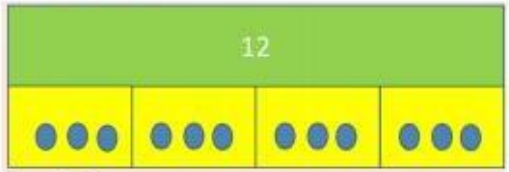
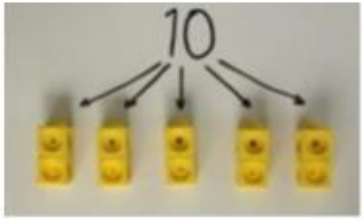
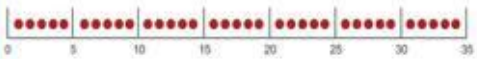
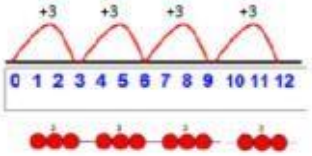
Year 1

Division

Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing *Use Gordon ITPs for modelling*	   I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 shared between 2 is 4 Sharing:  4 4 4 12 shared between 3 is 4	12 shared between 3 is 4

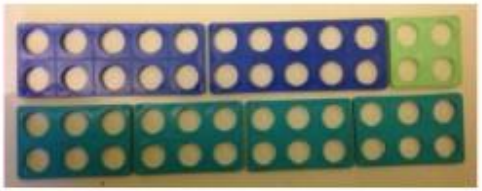
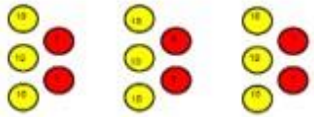
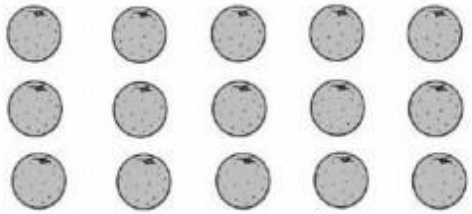
Year 2

Division

Objective & Strategy	Concrete	Pictorial	Abstract
Division as sharing	 I have 10 cubes, can you share them equally in 2 groups?	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4 Children use bar modelling to show and support understanding.  12 ÷ 4 = 3	12 ÷ 3 = 4
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.  	Use number lines for grouping  12 ÷ 3 = 4 Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group.  20 ÷ 5 = ? 5 x ? = 20	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?

Year 3

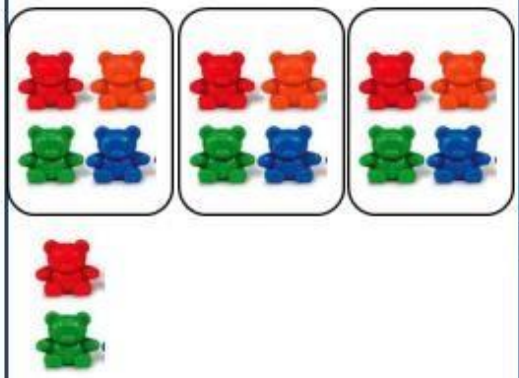
Division

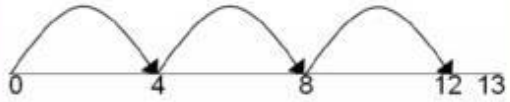
Objective & Strategy	Concrete	Pictorial	Abstract
Division as grouping	Use cubes, counters, objects or place value counters to aid understanding.  24 divided into groups of 6 = 4 96 ÷ 3 = 32 	Continue to use bar modelling to aid solving division problems.  20 ÷ 5 = ? 5 x ? = 20	How many groups of 6 in 24? 24 ÷ 6 = 4
Division with arrays	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	Draw an array and use lines to split the array into groups to make multiplication and division sentences 	Find the inverse of multiplication and division sentences by creating eight linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7 28 = 7 x 4 28 = 4 x 7 4 = 28 ÷ 7 7 = 28 ÷ 4

Year 3

Division

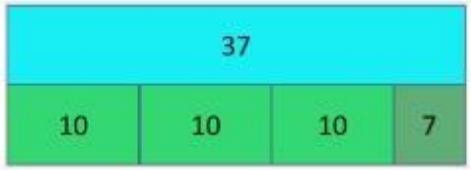
Objective & Strategy	Concrete	Pictorial	Abstract
Division with remainders.	14 ÷ 3 = Divide objects between groups and see how much is left over	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.	Complete written divisions and show the remainder using r.





Draw dots and group them to divide an amount and clearly show a remainder.

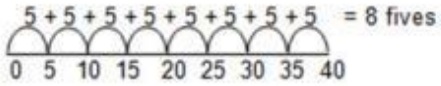
Use bar models to show division with remainders.



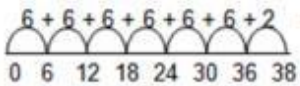
29 ÷ 8 = 3 REMAINDER 5

↑ dividend ↑ divisor ↑ quotient ↑ remainder

Example without remainder:
40 ÷ 5
Ask "How many 5s in 40?"



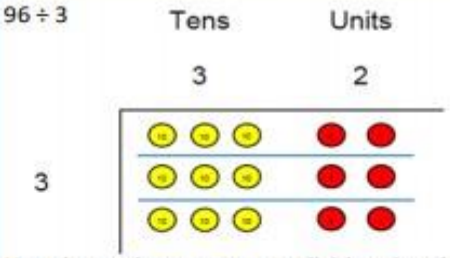
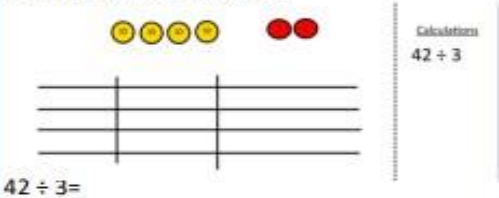
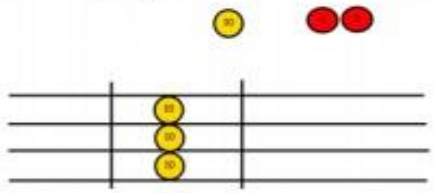
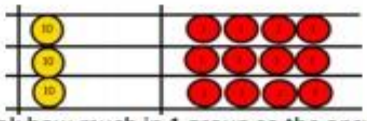
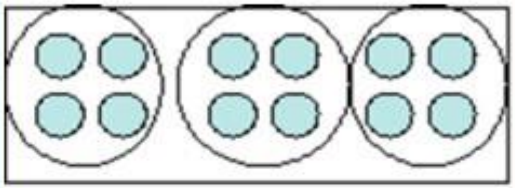
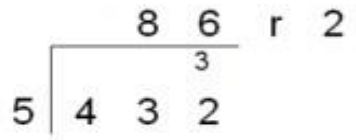
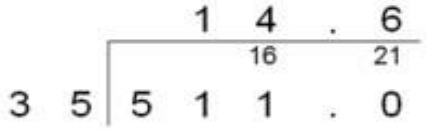
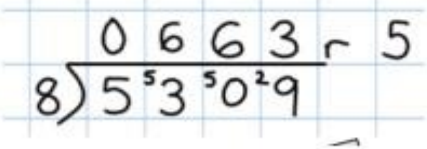
Example with remainder:
38 ÷ 6



For larger numbers, when it becomes inefficient to count in single multiples, bigger jumps can be recorded using known facts.

Years 4,5,6

Division

Objective & Strategy	Concrete	Pictorial	Abstract
Divide at least 3 digit numbers by 1 digit. Short Division	96 ÷ 3  Use place value counters to divide using the bus stop method alongside  42 ÷ 3= Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.  We exchange this ten for ten ones and then share the ones equally among the groups.  We look how much in 1 group so the answer is 14.	Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.  Encourage them to move towards counting in multiples to divide more efficiently.	Begin with divisions that divide equally with no remainder.  Move onto divisions with a remainder.  Finally move into decimal places to divide the total accurately.  

Long Division

Step 1—a remainder in the ones

```
   h t o
   0 4 1 R1
4 ) 1 6 5
```

4 does not go into 1 (hundred). So combine the 1 hundred with the 6 tens (160).

4 goes into 16 four times.

4 goes into 5 once, leaving a remainder of 1.

```
     th h t o
     0 4 0 0 R7
8 ) 3 2 0 7
```

8 does not go into 3 of the thousands. So combine the 3 thousands with the 2 hundreds (3,200).

8 goes into 32 four times (3,200 ÷ 8 = 400)
8 goes into 0 zero times (tens).
8 goes into 7 zero times, and leaves a remainder of 7.

Division

Long Division

Year 6

Division

Step 1 continued...

h	t	o
	6	1
4)	2	4 7
	−	4
		3

When dividing the ones, 4 goes into 7 one time. Multiply 1 × 4 = 4, write that four under the 7, and subract. This finds us the remainder of 3.

Check: 4 × 61 + 3 = 247

th	h	t	o
	4	0	2
4)	1	6	0 9
		−	8
			1

When dividing the ones, 4 goes into 9 two times. Multiply 2 × 4 = 8, write that eight under the 9, and subract. This finds us the remainder of 1.

Check: 4 × 402 + 1 = 1,609

Long Division

Step 2—a remainder in the tens

1. Divide.	2. Multiply & subtract.	3. Drop down the next digit.
t o 2 2)5 8	t o 2 2)5 8 -4 1	t o 2 9 2)5 8 -4 ↓ 1 8
Two goes into 5 two times, or 5 tens ÷ 2 = 2 whole tens -- but there is a remainder!	To find it, multiply 2 × 2 = 4, write that 4 under the five, and subtract to find the remainder of 1 ten.	Next, drop down the 8 of the ones next to the leftover 1 ten. You combine the remainder ten with 8 ones, and get 18.

1. Divide.	2. Multiply & subtract.	3. Drop down the next digit.
t o 2 9 2)5 8 -4 1 8	t o 2 9 2)5 8 -4 1 8 -1 8 0	t o 2 9 2)5 8 -4 1 8 -1 8 0
Divide 2 into 18. Place 9 into the quotient.	Multiply 9 × 2 = 18, write that 18 under the 18, and subtract.	The division is over since there are no more digits in the dividend. The quotient is 29.

Division

Long Division

Step 2—a remainder in any of the place values

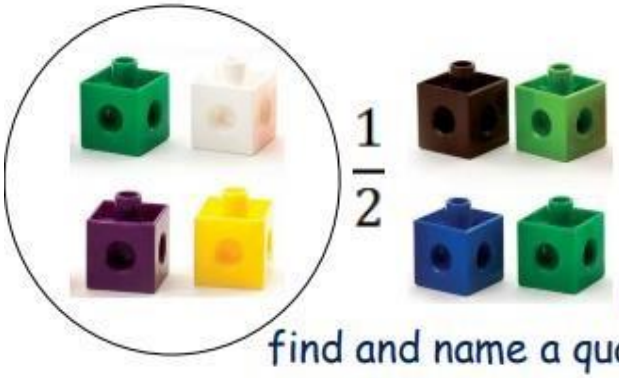
1. Divide.	2. Multiply & subtract.	3. Drop down the next digit.
h t o 1 2)278	h t o 1 2)278 -2 0	h t o 18 2)278 -2↓ 07
Two goes into 2 one time, or 2 hundreds ÷ 2 = 1 hundred.	Multiply 1 × 2 = 2, write that 2 under the two, and subtract to find the remainder of zero.	Next, drop down the 7 of the tens next to the zero.
Divide.	**Multiply & subtract.**	**Drop down the next digit.**
h t o 13 2)278 -2 07	h t o 13 2)278 -2 07 -6 1	h t o 13 2)278 -2 07 -6 18
Divide 2 into 7. Place 3 into the quotient.	Multiply 3 × 2 = 6, write that 6 under the 7, and subtract to find the remainder of 1 ten.	Next, drop down the 8 of the ones next to the 1 leftover ten.
1. Divide.	**2. Multiply & subtract.**	**3. Drop down the next digit.**
h t o 139 2)278 -2 07 -6 18	h t o 139 2)278 -2 07 -6 18 -18 0	h t o 139 2)278 -2 07 -6 18 -18 0
Divide 2 into 18. Place 9 into the quotient.	Multiply 9 × 2 = 18, write that 18 under the 18, and subtract to find the remainder of zero.	There are no more digits to drop down. The quotient is 139.

Division

Fractions

Recognise, find and name a half as one of two equal parts of an object, shape or quantity.

Concrete



$\frac{1}{2}$

Pictorial

A whole apple

1

Half an apple

$\frac{1}{2}$

Abstract

Half of 10 = ☐

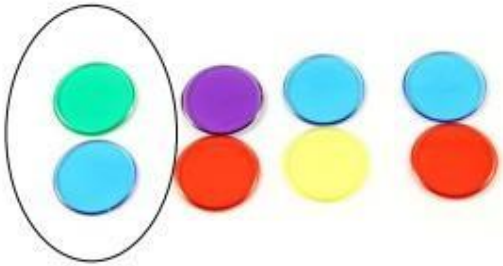
Half of 8 = ☐

$\frac{1}{2}$ of 14 = ☐

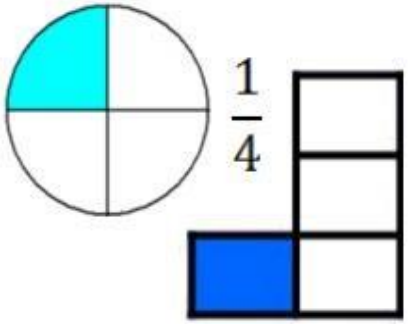
Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity.

Concrete

$\frac{1}{4}$



Pictorial



$\frac{1}{4}$

Abstract

A quarter of 20 = ☐

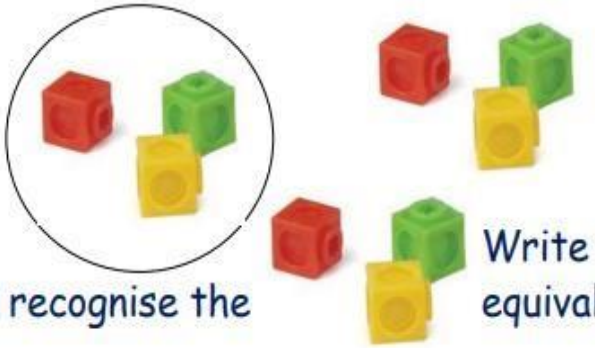
A quarter of 12 = ☐

$\frac{1}{4}$ of 8 = ☐

Fractions

Recognise, find and name and write fractions 1/3, 1/4, 2/4 and 3/4 of a length, shape, set of objects or quantity.

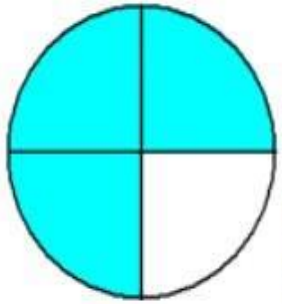
Concrete



and recognise the 1/2.

Write simple equivalence

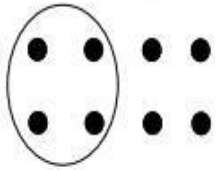
Pictorial



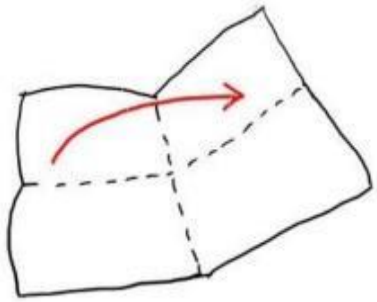
fractions of 2/4 and

Abstract

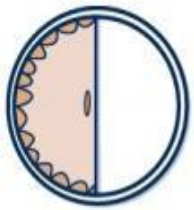
$\frac{2}{4}$ of 8 = ☐



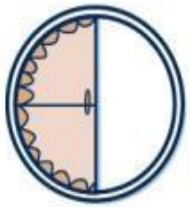
Concrete



Pictorial



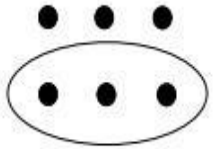
I have $\frac{1}{2}$ a pie



You have $\frac{2}{4}$ of a pie

Abstract

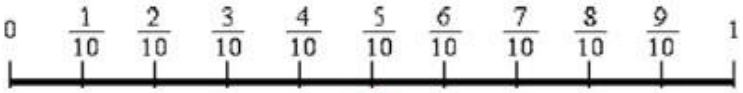
$\frac{1}{2}$ of 6 = ☐



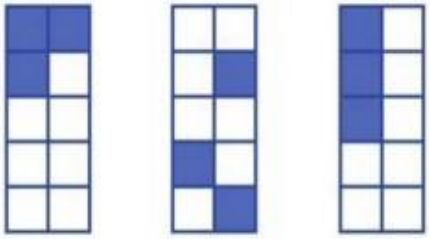
Fractions

Count up and down in tenths: recognise that tenths arise from dividing an object into ten equal parts and in dividing one-digit numbers or quantities by ten.

Concrete



Pictorial



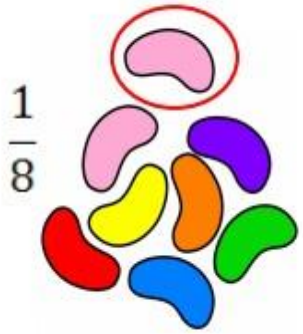
Abstract

$\frac{1}{10}$ of 6 = 0.6 because 6 ÷ 10 = 0.6

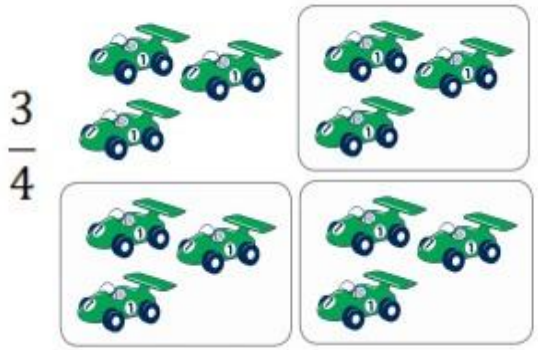
$\frac{1}{10}$ of 7 = 0.7 because 7 ÷ 10 = 0.7

Recognise, find and write fractions of a discrete set of objects: unit fractions and use $\frac{1}{2}$ and non-unit fractions as numbers.

Concrete



Pictorial



Abstract

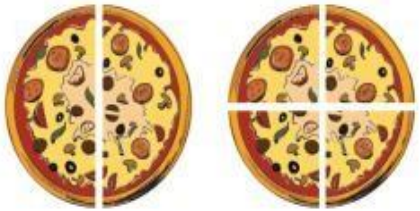
$\frac{1}{5}$ of 15 sweets = 3 because 15 ÷ 5 = 3

$\frac{2}{5}$ of 15 sweets = 6 because 15 ÷ 5 = 3 and 3 x 2 = 6

Fractions

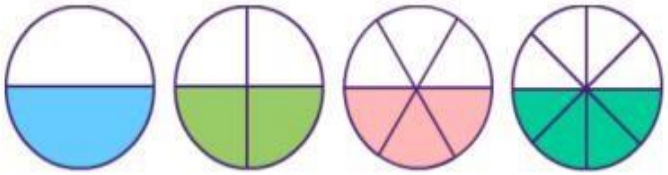
Recognise and show, using diagrams, equivalent fractions with small denominators.

Concrete



two halves $\frac{2}{2}$ four quarters $\frac{4}{4}$

Pictorial



$\frac{1}{2}$ $\frac{2}{4}$ $\frac{3}{6}$ $\frac{4}{8}$

Abstract

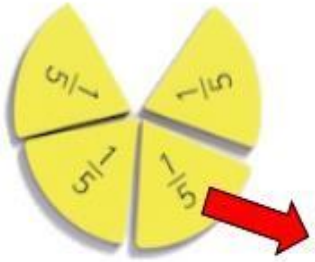
Sam says that two quarters is the same as one half.

Is he correct?

How do you know?

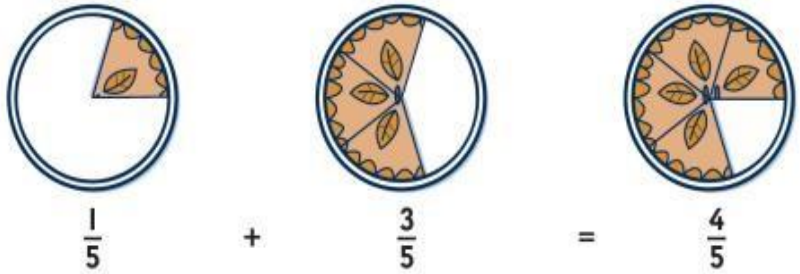
Add and sub-tract fractions with the same denominator.

Concrete



Recognise and order unit fractions with the same denominators.

Pictorial



$\frac{1}{5}$ + $\frac{3}{5}$ = $\frac{4}{5}$

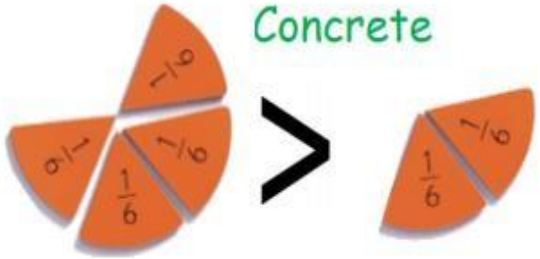
Abstract

$\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$

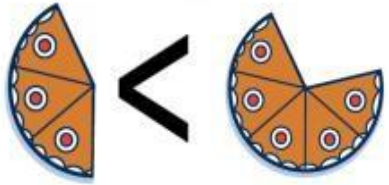
$\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$

Compare with

Concrete



Pictorial



Abstract

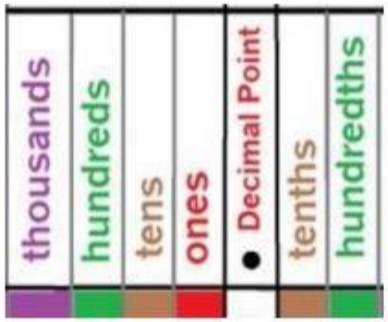
$\frac{2}{8}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{7}{8}$

Count up and down in hundredths: recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10.

Concrete

Recog- $\frac{3}{100}$ nise and $\frac{7}{100}$ write decimal equiva- lents to 1/2, 1/4 and 3/4.

Pictorial

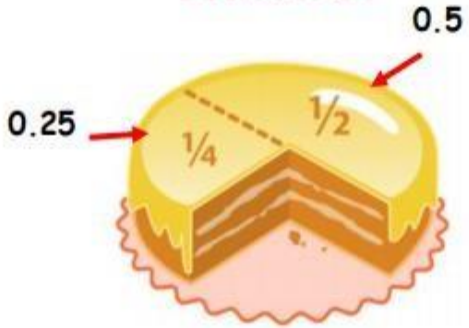


Abstract

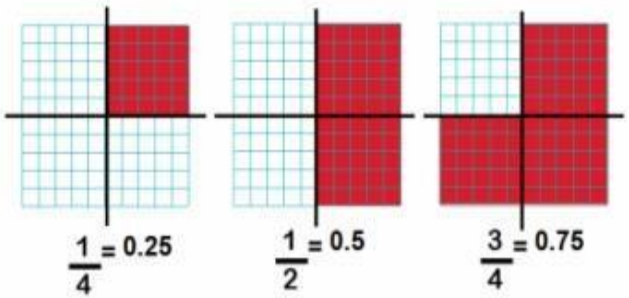
$\frac{1}{100}$ of 60 = 0.6
because 60 ÷ 100 = 0.6

$\frac{1}{10}$ of 70 = 0.7
so $\frac{1}{100}$ of 70 = 0.07

Concrete



Pictorial



Abstract

$\frac{1}{2}$ = 0.5
$\frac{1}{4}$ = 0.25
$\frac{3}{4}$ = 0.75

Fractions

Fractions

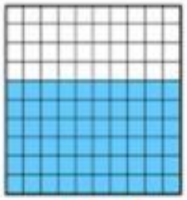
Year 4

Concrete

Rec- $\frac{1}{10}$ of the chocolate bar = 0.1

Pictorial

0.6
six tenths



0.60
sixty hundredths

ognise and show, using diagrams, families of common equivalents.

Abstract

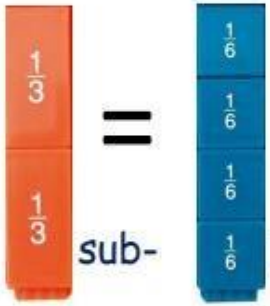
$\frac{1}{10} = 0.1$

$\frac{3}{10} = 0.3$

$\frac{5}{10} = \frac{1}{2} = 0.5$

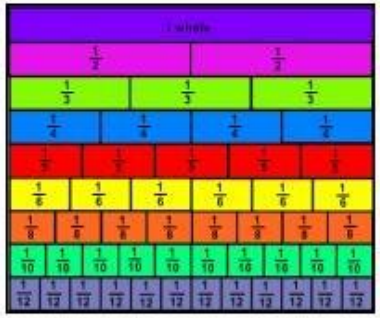
$\frac{8}{100} = 0.08$

Concrete



Add and sub- tract fractions with the same denominator.

Pictorial



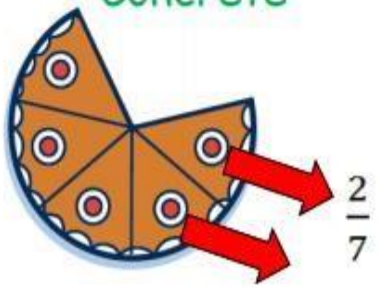
Abstract

$\frac{2}{3} = \frac{4}{6}$

$\frac{3}{5} = \frac{6}{10}$

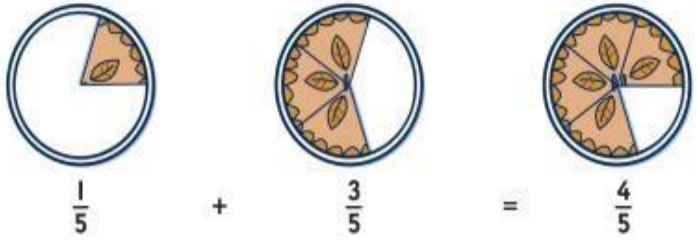
$\frac{2}{12} = \frac{1}{6}$

Concrete



$\frac{2}{7}$

Pictorial



Abstract

Sam eats $\frac{2}{7}$ of a whole pizza. How much does he have left?

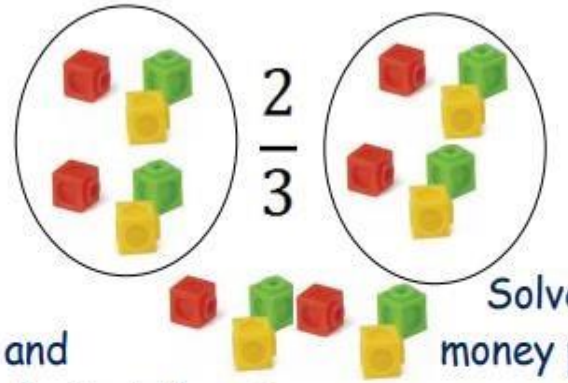
Lucy and Ben both eat $\frac{3}{8}$ of a cake. How much have they eat altogether?

Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number.

Year 4

Fractions

Concrete



Pictorial

Abstract

$\frac{2}{3}$ of £18

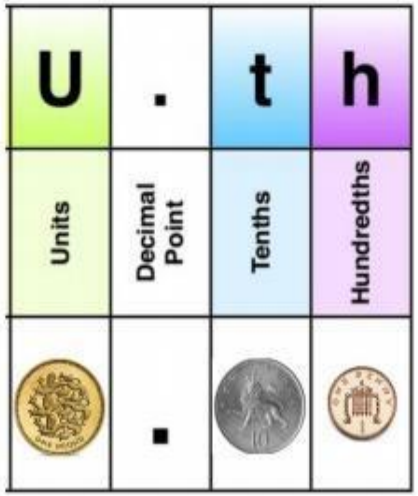
£18 ÷ 3 = £6

£6 x 2 = £12

Solve simple measure and money problems involving fractions and decimals to two decimal places.

Concrete

Pictorial



Abstract

100cm = 1m

50cm = $\frac{1}{2}$ = 0.5m

25cm = $\frac{1}{4}$ = 0.25m

10cm = $\frac{1}{10}$ = 0.1m

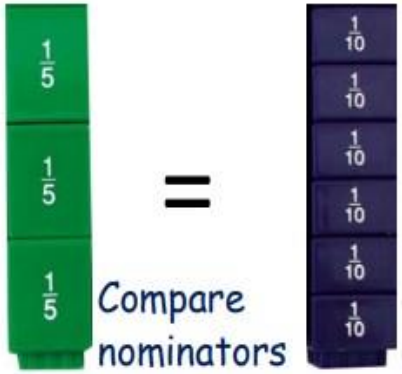
30cm = $\frac{3}{10}$ = 0.3m

Year 5

Fractions

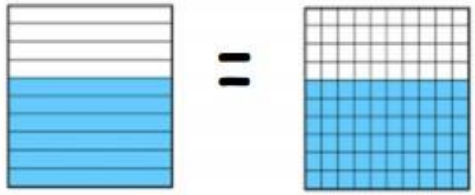
Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.

Concrete



Compare de- nominators and order same number.

Pictorial



$$\frac{6}{10} = \frac{60}{100}$$

are all multi- ples of the fractions whose

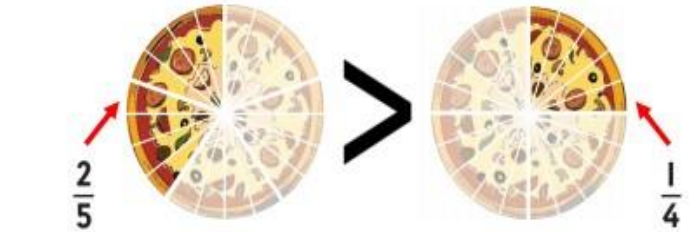
Abstract

$$\frac{3}{5} = \frac{6}{10} = \frac{60}{100}$$

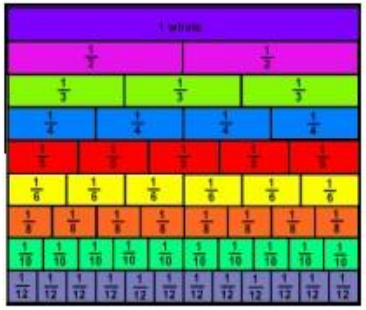
$$\frac{3}{4} = \frac{75}{100}$$

$$\frac{1}{5} = \frac{2}{10} = \frac{20}{100}$$

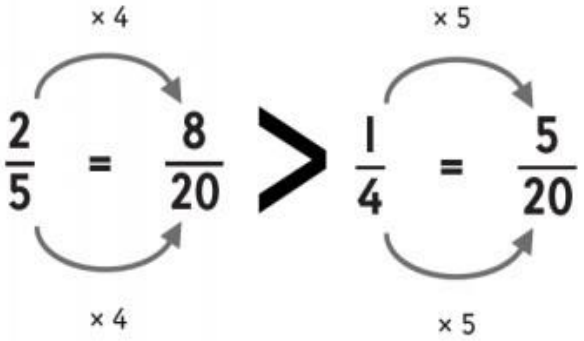
Concrete



Pictorial



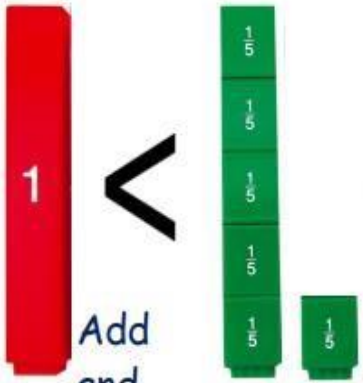
Abstract



Fractions

Recognise mixed numbers and improper fractions. Convert from one form to the other and write mathematical statements >1 as a mixed number.

Concrete



Pictorial

$\frac{3}{5} + \frac{4}{5} = \frac{7}{5} = 1\frac{2}{5}$

Abstract

$\frac{7}{2} = 3\frac{1}{2}$

because 7 ÷ 2 = 3 with 1 half left over

$2\frac{1}{3} = \frac{7}{3}$

because 2 x 3 = 6 with 1 third left to add

Add and subtract fractions with the same denominators and denominators that are multiples of the same numbers.

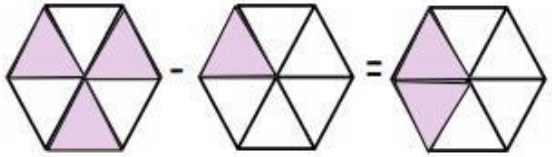
Concrete

So,

$\frac{8}{20} + \frac{5}{20} = \frac{13}{20}$

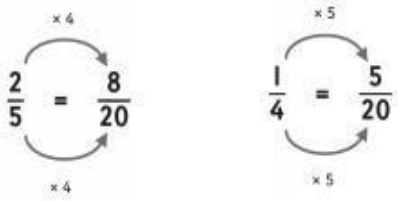
$\frac{2}{5} + \frac{1}{4} = \frac{13}{20}$

Pictorial



Abstract

$\frac{2}{5} - \frac{1}{4}$



So,

$\frac{8}{20} - \frac{5}{20} = \frac{3}{20}$

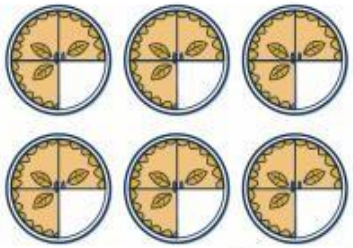
$\frac{2}{5} - \frac{1}{4} = \frac{3}{20}$

Year 5

Fractions

Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.

Concrete



6 lots of $\frac{3}{4}$

Pictorial

$4\frac{2}{4}$ altogether

Abstract

Multiply a proper fraction by a whole number:

$$\frac{3}{4} \times 6 = \frac{18}{4}$$

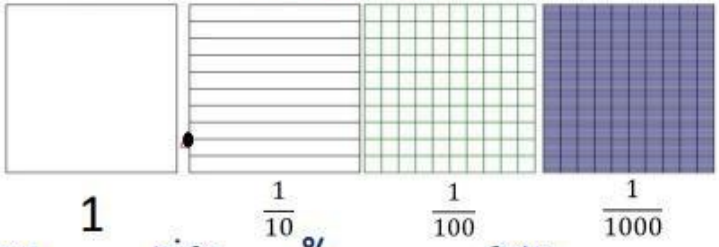
Change to a mixed number:

$$\frac{18}{4} = 4\frac{2}{4}$$

Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.

Concrete

Pictorial



Abstract

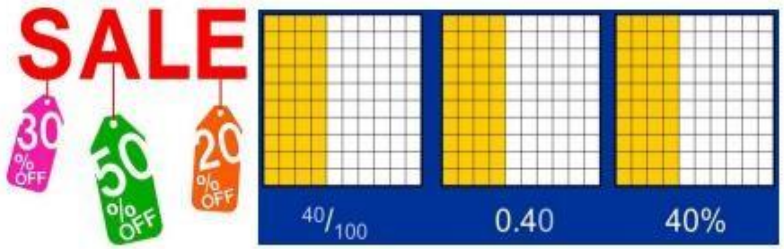
67.153

How many thousandths does this number have? How many more thousandths do you need to add to make 67.16?

Recog- nise % sym- bol and understand the meaning: write % as a fraction, decimal and percentage.

Concrete

Pictorial



Abstract

$\frac{4}{10} = 40\% = 0.4$

$\frac{32}{100} = 32\% = 0.32$

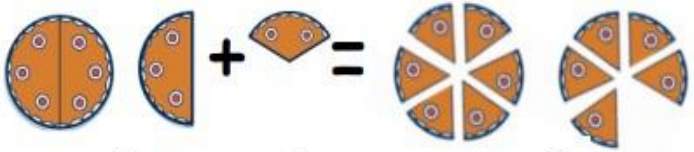
$\frac{75}{100} = 75\% = 0.75$

$\frac{2}{25} = \frac{8}{100} = 8\% = 0.08$

Fractions

Add and subtract fractions with different denominators and mixed numbers using the concept of equivalent fractions.

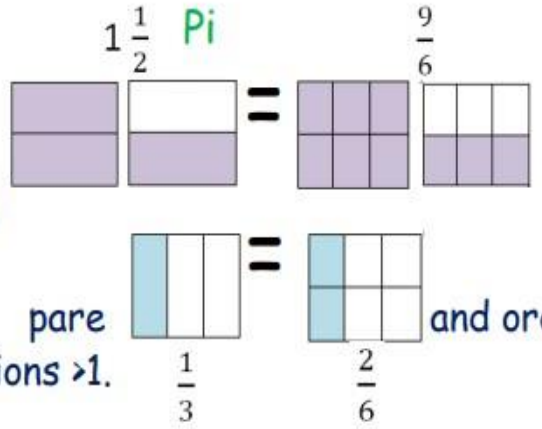
Concrete



$1\frac{1}{2}$ Com- $\frac{1}{3}$ $1\frac{5}{6}$

tions including

Pi



$1\frac{1}{2}$ $\frac{9}{6}$

pare and order fractions >1.

Abstract

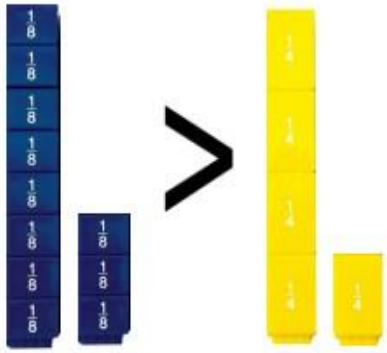
$1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$

because $1\frac{1}{2} = \frac{3}{2}$ frac-

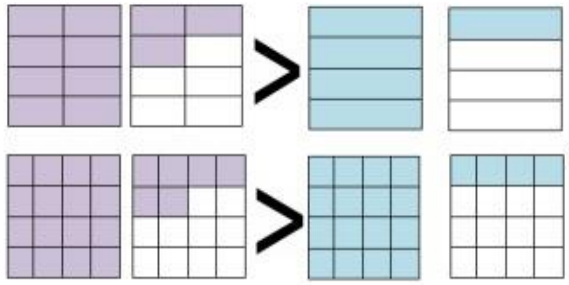
$\frac{3}{2} = \frac{9}{6}$ and $\frac{1}{3} = \frac{2}{6}$

so $\frac{9}{6} + \frac{2}{6} = \frac{11}{6} = 1\frac{5}{6}$

Concrete



Pictorial



Abstract

Which is greater?

$\frac{2}{8} < \frac{6}{16}$

Ordering from smallest to largest by using equivalent fractions:

$\frac{5}{12}, \frac{2}{3}, \frac{5}{6}$

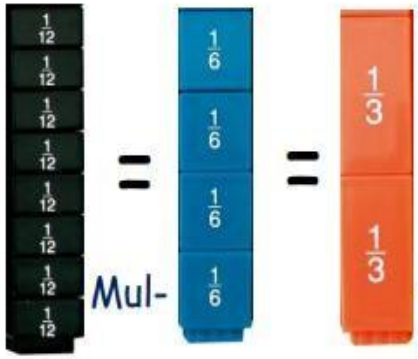
$\frac{5}{12}, \frac{8}{12}, \frac{10}{12}$

Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.

Year 6

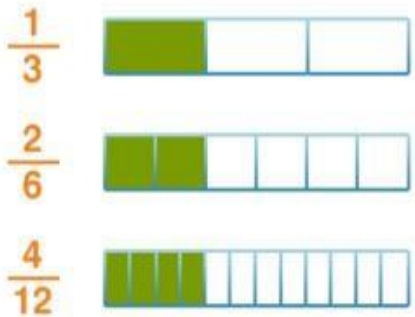
Fractions

Concrete



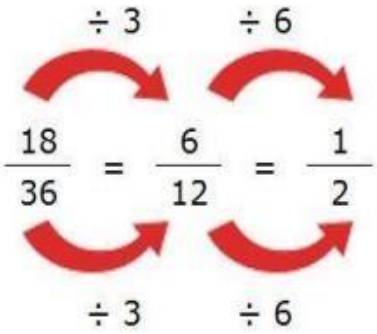
Mul-

Pictorial



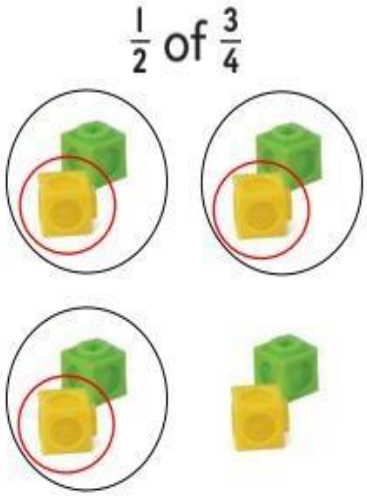
pairs of

Abstract

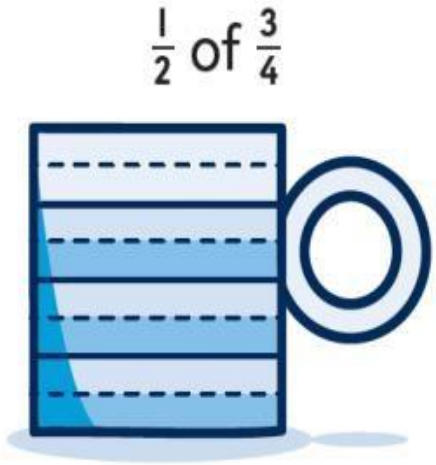


tiply simple proper fractions, writing the answer in its simplest form.

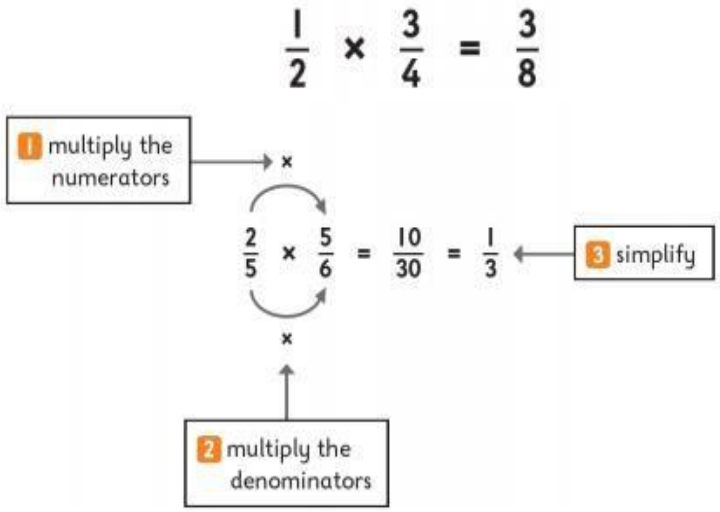
Concrete



Pictorial



Abstract



Recall and use equivalences between simple fractions, decimals and percentages including in different contexts.

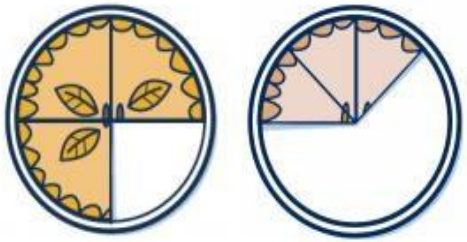
Year 6

Fractions

Concrete

Pictorial

Which would you prefer 75% or $\frac{3}{8}$ of a pie?



75% $\frac{3}{8}$

Divide proper fractions by whole numbers.

Abstract

John scored $\frac{40}{80}$ in his spelling test and Hannah scored 40%. Who scored more?

John = $\frac{40}{80}$ = 50%

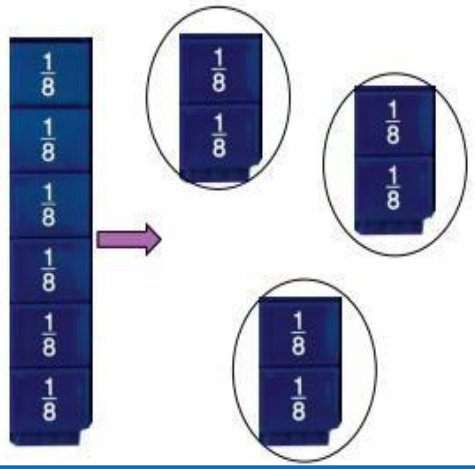
Hannah = 40%

One paving slab is 0.3m long and another is $\frac{1}{4}$ of a metre. Which is longer?

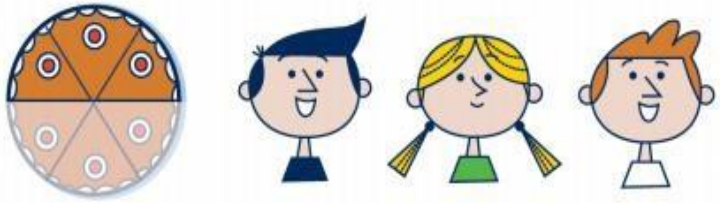
$\frac{1}{4}$ = 0.25m

0.3m is larger than $\frac{1}{4}$ 0.25m

Concrete



Pictorial



$\frac{1}{2} \div 3 = \frac{1}{6}$

Abstract

$\frac{1}{2} \div 3 = \frac{1}{6}$

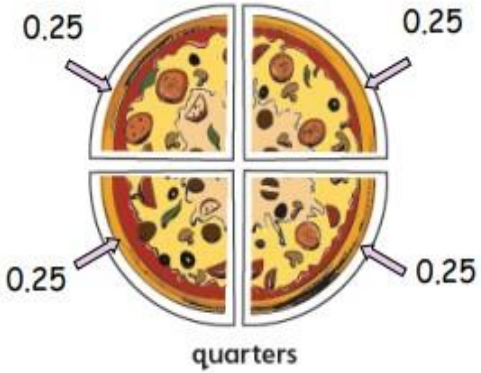
Keep it, change it, flip it!

$\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

Fractions

Associate fractions with division and calculate decimal fraction equivalents.

Concrete



Pictorial

3 slices of pie 'out of' 8

$\frac{3}{8}$

Abstract

$\frac{3}{8}$

3 'out of' 8 is the same as 3 'divided by' 8

$3 \div 8 = 0{\cdot}375$

So $\frac{3}{8} = 0{\cdot}375$