Hexham Partnership of Schools

Maths Calculation Policy

Reception - Year 6

Why we use a Mastery Approach to Maths in the Hexham Partnership.

We have high expectations.

We believe no child should be left behind. We focus on children 'keeping up over catching up'. By making high expectations clear – and emphasising the high value of mathematics education – learners are encouraged to build confidence and resilience

We believe in developing a growth mindset

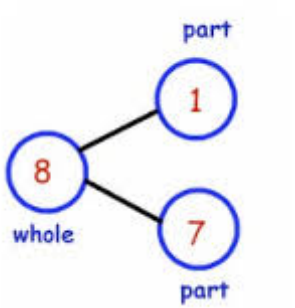
Children's 'abilities' are neither fixed nor innate, but can be developed through practice, support, dedication and hard work. 'Natural talent' is just a starting point and does not determine who has more or less potential to achieve. This belief encourages a love of learning and resilience that enables everyone to achieve.

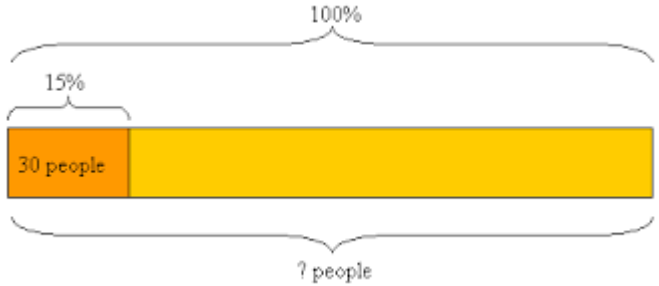
We believe children learn best by using a Concrete, pictorial, abstract approach

When faced with a key new concept children learn best and build confidence by using this approach

Concrete- Use of concrete objects and manipulatives to understand what they are doing

Pictorial - By using pictorial representations children are able to build on the understanding gained by using concrete objects.





Abstract- Once foundations are firmly laid children should then be able to move to an abstract approach using numbers and key concepts

We believe in depth before breadth

All learners benefit from deepening their conceptual understanding of mathematics, regardless of whether they've previously struggled or excelled. We believe children must be given time to fully understand, explore and apply ideas - rather than accelerate through new topics. This approach enables learners to truly grasp a concept, and the challenge comes from investigating it in new, alternative and more complex ways.

We believe in a problem solving approach to learning

Mathematical problem-solving is at the heart of our approach. Children are encouraged to identify, understand and apply relevant mathematical principles and make connections between different ideas. This builds the skills needed to tackle new problems, rather than simply repeating routines without grasping the principles.

We believe in the importance of using Mathematical language

The way children speak and write about mathematics transforms their learning. We use a carefully sequenced, structured approach to introduce and reinforce mathematical vocabulary. We always ask pupils to explain the mathematics in full sentences (not just what the answer is, but how they know it’s the right answer). This is key to building mathematical language and reasoning skills.

Yr R Addition

ELG Expected Criteria:

- **Count reliably to 20 and place in order**
- **Say one more than given number**
- **Add 2 single digit numbers using quantities and objects. Count on or back to find the answer.**
- **Solve problems including doubling**

Big Ideas

1. **'Altogether' - children understand that by putting 2 groups together there is a total eg five pigs and 8 pigs makes 13 pigs altogether.**
2. **Counting on - eg, if a three is rolled whilst a player is on 5, they count on three from five to reach eight. Although still recorded as 5+3=8, this is not about combining 2 groups, but increasing a number.**
3. **Commutativity**

Language

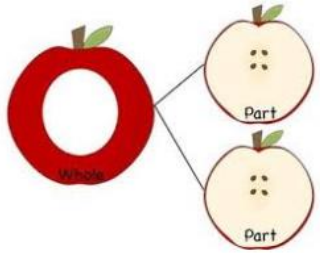
How many?
before, after, next
altogether
add, more, plus
sum
total
makes
count on
enough
digit
first
second
part
whole
double
is the same as, is equal to

Concrete

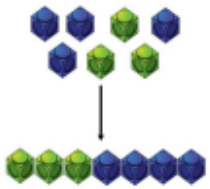
Opoortunities of everyday scenarios to develop concrete understanding of addition prior and as well as models eg:

- boys + girls
- dinner registers
- shopping
- scoring games
- snack time
- cooking

Part-Whole models with real objects



Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).



Familiarisation with ten frame and to help organise counting all

Pictorial

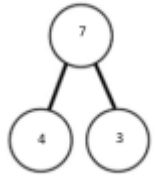
Recording calculations in their own ways to develop a solid understanding of the practical aspect of calculation before the use of symbols

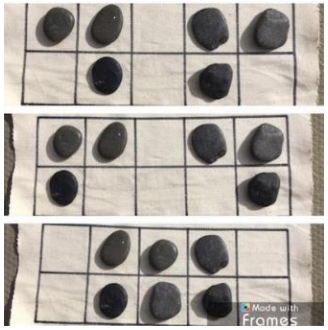
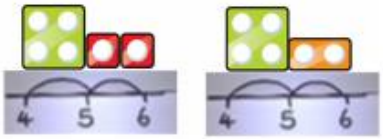
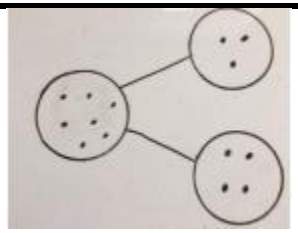
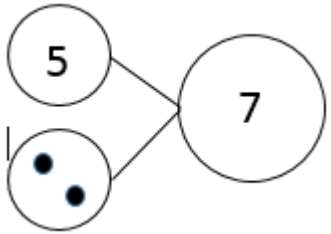
Part Whole Model - counting all of them to find total

Abstract

$4 + 3 = 7$

Four is a part, 3 is a part and the whole is seven.



	 **Counting on using number lines** using cubes or Numicon.   	 Counting on using a part-whole model  	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 Abstract number line: 

Yr R Subtraction

ELG Expected Criteria:

- **Count reliably to 20 and place in order**
- **Say one less than given number**
- **Subtract 2 single digit numbers using quantities and objects and count back to find the answer.**

Building Blocks

Building up an understanding of 3 main structures of subtraction.

1. 'Taking away' – you have five sweets and you eat tow, how many are left?
2. 'Difference' - you have three sweets and I have five, how many more do I have than you? This requires children to compare numbers to find how much more/fewer on has/is than the other.
3. 'Counting back' – I am on five, I move back two and I am now on three.

Language

How many/how many more
take away
subtract
less
fewer
one less, two less…, ten less..
how many fewer is…. than…..
count back
part
whole

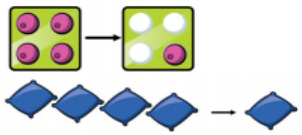
Concrete

Opportunities of everyday scenarios to develop concrete understanding of subtraction prior to and as well as models eg:

- whole class take away who is absent
- snack time
- shopping
- scoring games
- snack time
- cooking

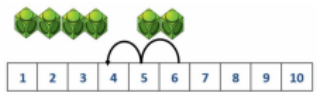
Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).

4 – 3 = 1



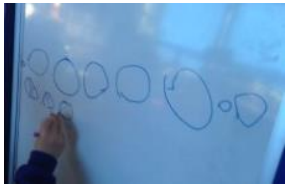
Counting back (using number lines or number tracks) children start with 6 and count back 2.

6 – 2 = 4

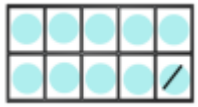


Pictorial

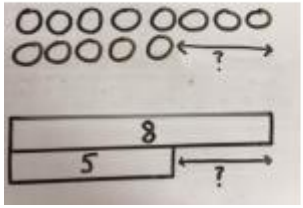
Recording calculations in their own ways to develop a solid understanding of the practical aspect of calculation before the use of symbols. eg 11 children are on the carpet and 3 have gone to wash their hands.



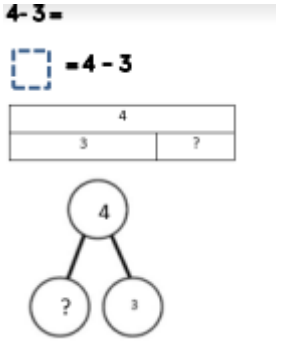
Drawing a ten frame 10-1



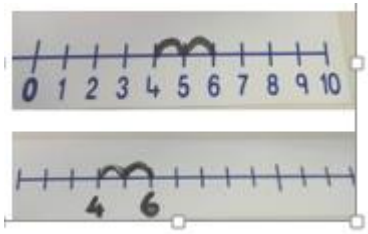
Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.

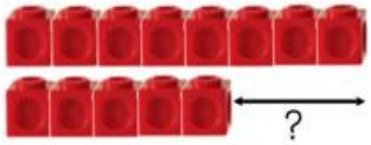


Abstract



Children become familiar with the image of a number line or track and use them to jump on or back



	Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5.  		

Yr 1 Addition and Subtraction

National Curriculum Program of Study Statement

Pupils should be taught to:

read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs

represent and use number bonds and related subtraction facts within 20

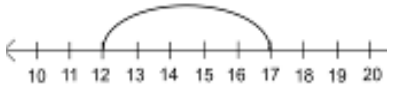
add and subtract one-digit and two-digit numbers to 20, including zero

solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ☐ – 9.

Big Ideas

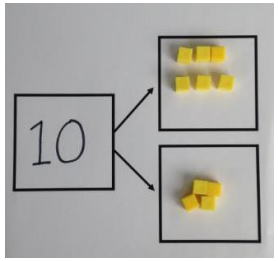
Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5 and adding the 2 to 8 to make 10 and then the 5 to total 15.

Thinking of part whole relationships is helpful in linking addition and subtraction. For example, where the whole is 6, and 4 and 2 are parts. This means that 4 and 2 together form the whole, which is 6 and 6 subtract 4 leaves the 2 and 6 subtract 2 leaves the 4

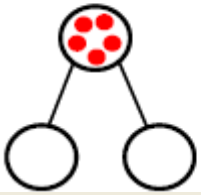
Language	Concrete	Pictorial	Abstract
add plus total more than altogether sum of is equal to one more addition facts to 10 then to 20 teen numbers	Combining two parts to make a whole Use numicon, counters, dienes, part whole bead strings  Numicon 	Adding more: the meaning of addition as an increase. 	Number lines can be used to show addition as counting on  Include addition that involves 0 Discussion about what each number represents in an addition calculation

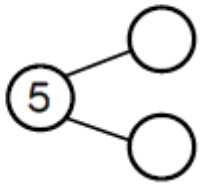
fact families

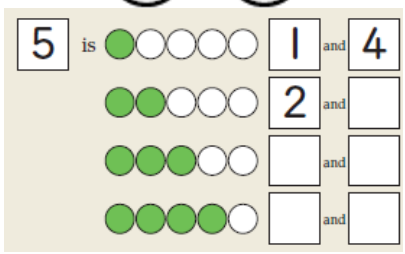
number bonds



Complete the part whole models by drawing the counters th
writing the numerals.







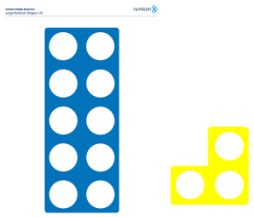
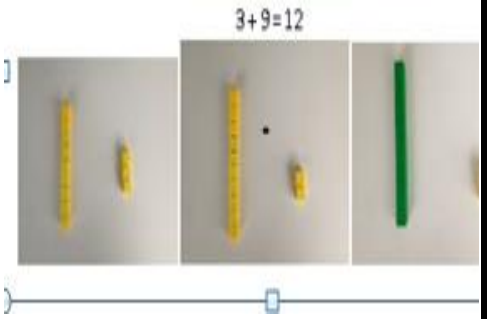
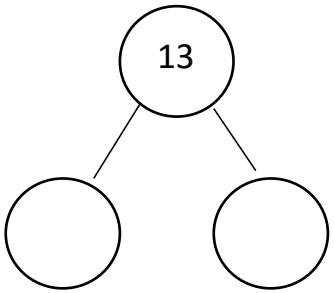
Fact Families

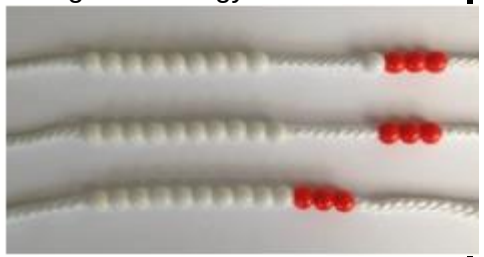
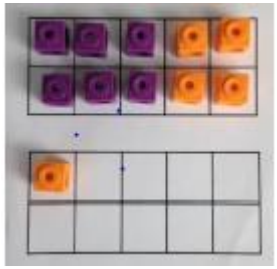
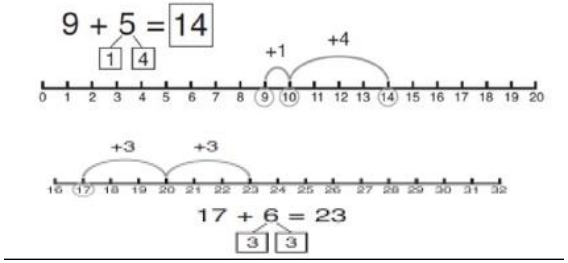
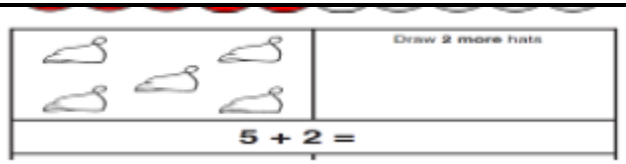
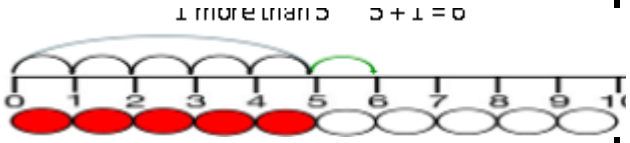
___ + ___ = 7

___ + ___ = 7

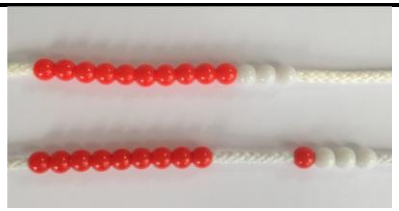
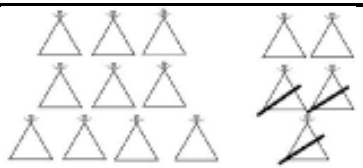
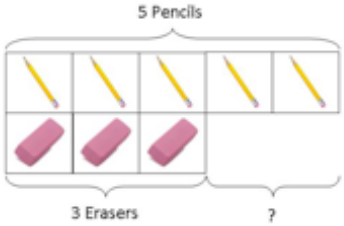
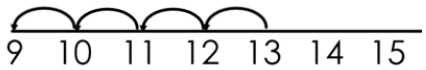
7 - ___ = ___

7 - ___ = ___

Language	Concrete	Pictorial	Abstract
	 Regrouping ten ones to make ten 		Teen numbers 10 + __ = 13 different combinations of bonds for teen numbers

Language	Concrete	Pictorial	Abstract
	Making ten strategy   6 + 5 = 6 + 4 = 10 10 + 1 = 11		9 + 5 = ___ 17 + ___ = 23
Adding 1, 2, 3 more	As pupils are using the beadstring, ensure that they are explaining using language such as: ‘1 more than 5 is equal to 6’ ‘2 more than 5 is 7’ ‘8 is 3 more than 5’ 		

Subtraction

Language	Concrete	Pictorial	Abstract
Less than Fewer than Least Minus Difference between What is left? The meaning of subtraction as decrease	 	 15 – 3 = 12 	 13 – 4 = 9  7 - 3 = ?

Yr 2 Addition and Subtraction

tional Curriculum Program of Study Statement:

solve problems with addition and subtraction:

- using concrete objects and pictorial representations, including those involving numbers, quantities and measures
  - applying their increasing knowledge of mental and written methods

Big Ideas

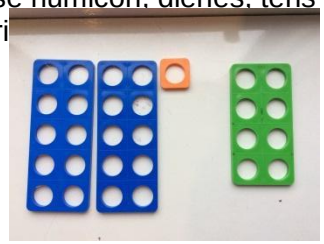
- **Understanding the importance of the equals sign meaning 'equivalent to' (i.e. that 6+4=10, 10 =6+4 and 5+5=6+4 are all valid uses of the equals sign) is crucial for later work in algebra. Empty box problems can support the development of this key idea. Correct use of the equals sign should be reinforced at all times. Altering where the equals sign is placed develops fluency and flexibility.**

Language

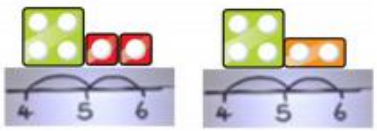
Part
whole
represent
number bonds
bar model
plus
Add
total
altogether
sum of
digits
same as
equal to

Concrete

Combining two parts to make a whole
Use numicon, dienes, tens frames, bead stri

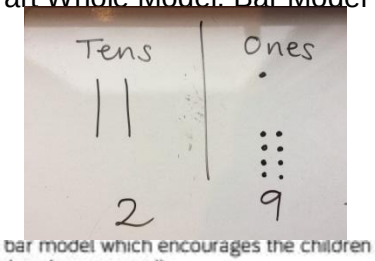


Counting on using number lines using cubes or Numicon.

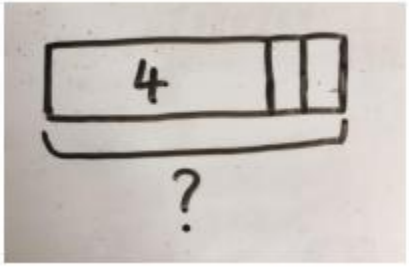


Pictorial

Children to reperesent using dots on Part, Part Whole Model, Bar Model or dienes

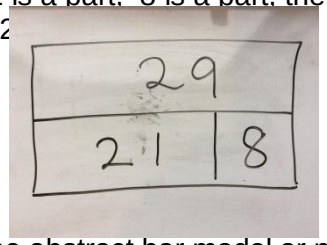


A bar model which encourages the children to count on, rather than count all.

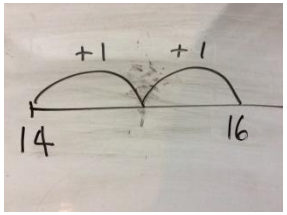


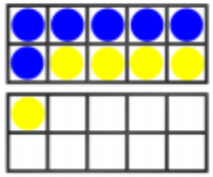
Abstract

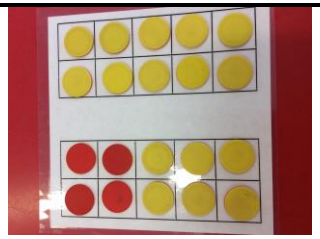
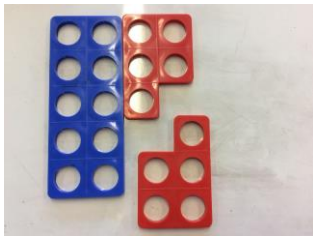
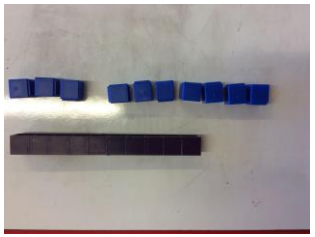
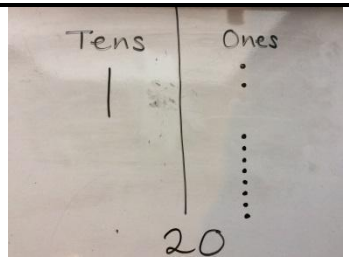
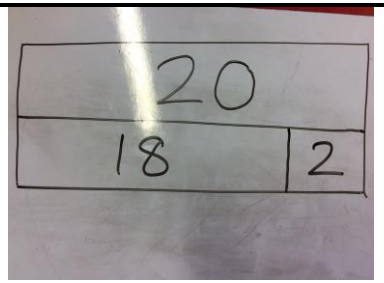
21 + 8 = 29
21 is a part, 8 is a part, the whole is 2



The abstract bar model or number line.
2 and what make 16? What is 2 more than 14? What is the sum of 2 and 14? What is the total of 14 and 2?
14+2=
14+ …… = 16
…….. = 14 + 2



	Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$ Sam has 4 apples. He is given two more. How many does he have altogether?
National Curriculum Program of Study Statement: • recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100		**Big Ideas**	

Language	Concrete	Pictorial	Abstract
Number bonds Addition, add Subtraction, subtract, take away Inverse equals	   		 18 + 2 = 20 2 + 18= 20 20 – 18 = 2 20 -2 =18

National Curriculum Program of Study Statement:

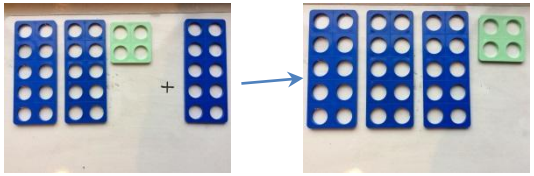
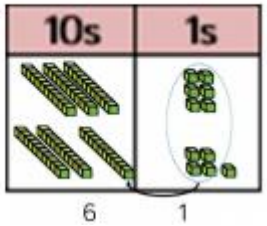
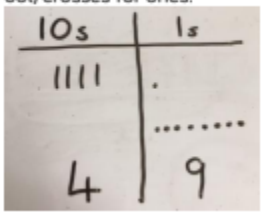
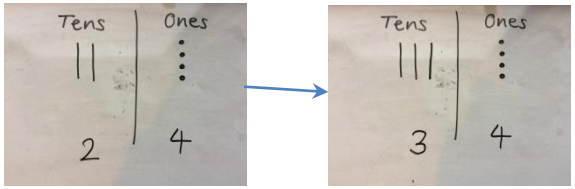
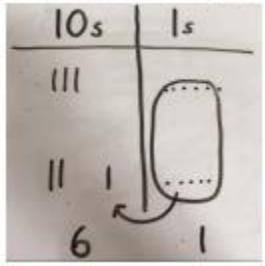
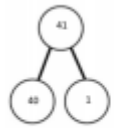
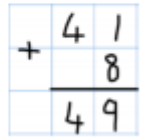
add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

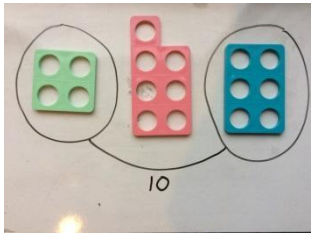
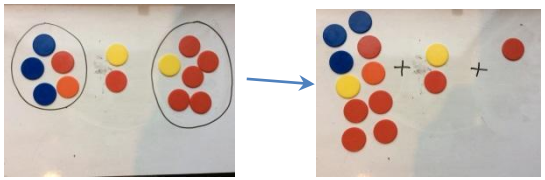
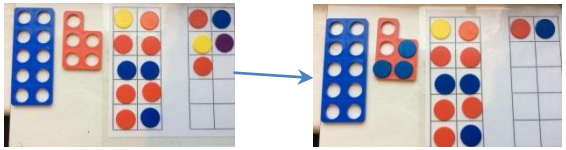
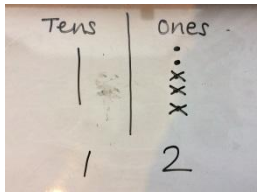
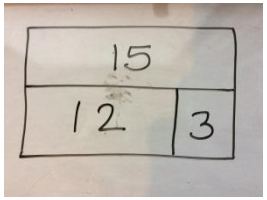
- a two-digit number and 1s

Big Ideas

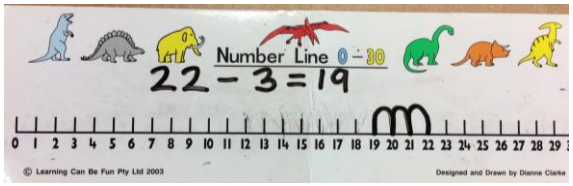
- **When adding three or more numbers it is helpful to look for pairs of numbers that are easy to add. For example, given 5+8+2 it is easier to add 8+2 first than to begin with 5+8.**

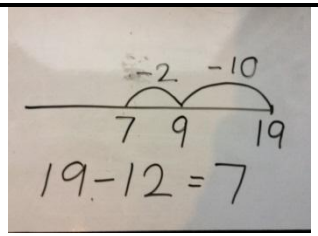
- a two-digit number and 10s
- 2 two-digit numbers
- adding 3 one-digit numbers

Language	Concrete	Pictorial	Abstract
Digits Tens Ones Equal to, same as Add	ADDING TENS AND ONES **TO + O using base 10**. Continue to develop understanding of partitioning and place value. 41 + 8  Make a 2 digit number using dienes or numicon. Add tens.  **TO + TO using base 10.** Continue to develop understanding of partitioning and place value. 36 + 25 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones.  Draw dienes showing adding tens  Chidlren to represent the base 10 in a place value chart. 	41 + 8  1 + 8 = 9 40 + 9 = 49  Look at 100 square. Note what happens when tens are added. 24 + 10=34 Partitioning 36 + 25= 30 6 20 5 30 + 20 = 50 6 + 5 = 11 50+ 11 = 61

	Numicon, dienes adding 3 one digit numbers – Looking for bonds to 10.   SUBTRACTING Physically taking away and removing objects from a whole. 	Concrete resources drawn and then crossed out or a bar model drawn. Children represent what they see pictorially  	Looking for ways to make 10. 36 + 25= 1 5 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 Formal method: 36 +25 61 1 Look for ways to make ten or bonds to 10. 3 + 6 +7= 4 + 7 + 4=  15-3= …..= 15-3 15-12 = 15 - ….= 3

Counting back using number lines or number tracks

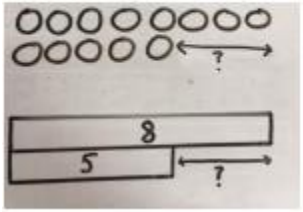


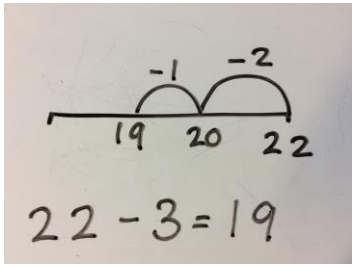


Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used).

Calculate the difference between 8 and 5.

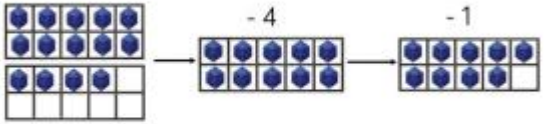
Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.





Children may count back in ones, but may also choose to use their knowledge of numbers bonds or counting in tens to help them.

Making 10 using ten frames.
14 - 5



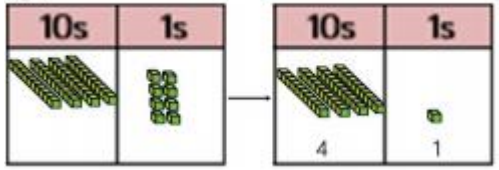
Children to present the ten frame pictorially and discuss what they did to make 10.

Find the difference between 8 and 5.

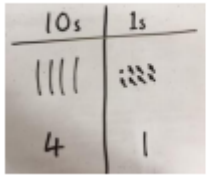
8 - 5, the difference is ☐

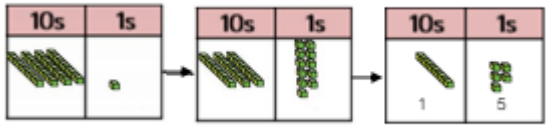
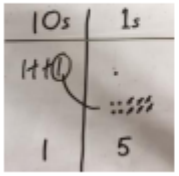
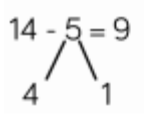
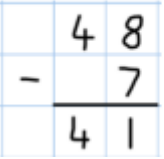
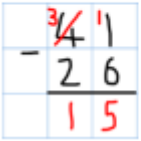
Children to explore why
9 - 6 = 8 - 5 = 7 - 4 have the same difference.

Column method using base 10.
48-7



Children to represent the base 10 pictorially.



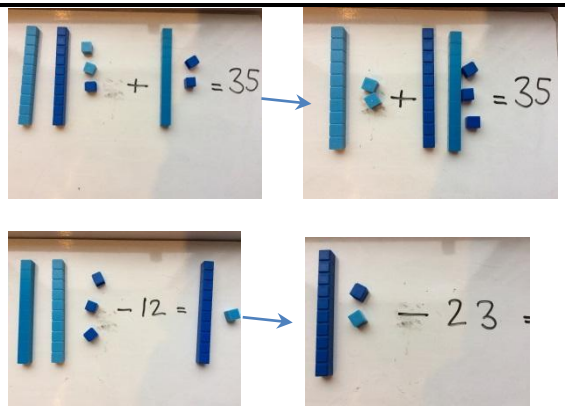
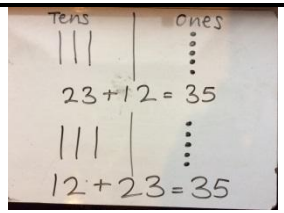
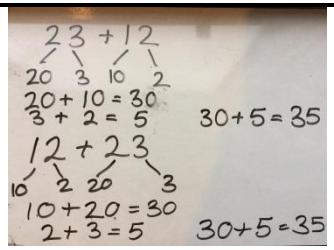
	Column method using base 10 and having to exchange. 41 - 26  	Represent the base 10 pictorially, remembering to show the exchange.  	Children to show how they can make 10 by partitioning the subtrahend.  14 - 4 = 10 10 - 1 = 9 Column method or children could count back 7.  Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11. 

National Curriculum Program of Study Statement:

- show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot

Big Ideas

Understanding that addition of two or more numbers can be done in any order is important to support children's fluency. When adding two numbers it can be more efficient to put the larger number first. For example, given 3+8 it is easier to calculate 8+3.

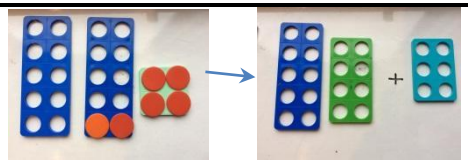
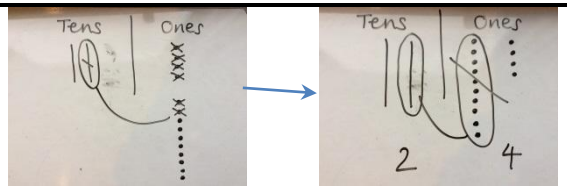
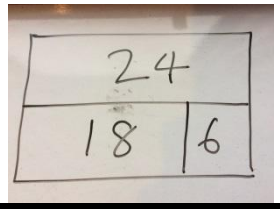
Language	Concrete	Pictorial	Abstract
Addition Subtraction Inverse Order Equal to, same as			

National Curriculum Program of Study Statement:

- recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

Big Ideas

Understanding that addition of two or more numbers can be done in any order is important to support children's fluency. When adding two numbers it can be more efficient to put the larger number first. For example, given 3+8 it is easier to calculate 8+3.

Language	Concrete	Pictorial	Abstract
Inverse Addition Subtraction Order Equal to Same as			24 – 6 =18 18 +6 = 24 

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Yr3 Addition/Subtraction

National Curriculum Program of Study Statement

- to add and subtract numbers mentally, including:
  a 3-digit number and ones
  a 3-digit number and tens
  a 3-digit number and hundreds

Big Ideas

- Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. For example, given 8 + 7, thinking of 7 as 2 + 5, and adding the 2 and 8 to make 10, then the 5 to 15. This should then be applied when calculating with larger numbers.

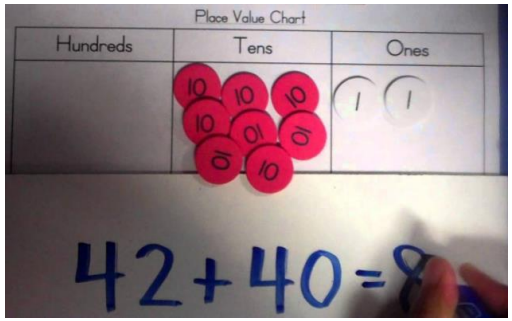
Language

Regroup
Number bond
Partition

Concrete

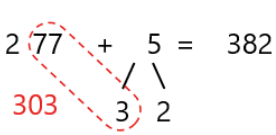
Start with the bigger number and use the smaller number to make 10.

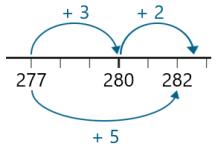
Relate this to larger numbers 236 + 5



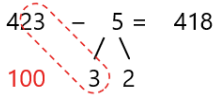
Pictorial

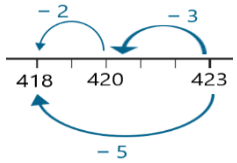
277+5=282



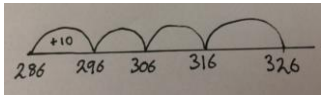


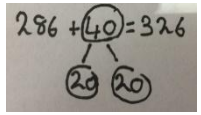
423-5=418



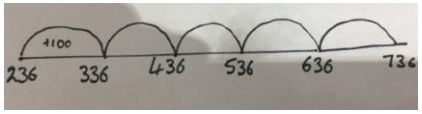


286+40=





236+500=



Abstract

277+5=282

" 236 add 4 would make 240 add 1 more would make 24"

233-5=228

" 233 subtract 5. So I need to partition the 5. 233 subtract 3 is 230. Subtract 2 more would make 228

236 +40 =326

I know I am adding units of 10 so the 10s will change. 30+40 =70

286 +40 =326

I know that 286 add 20 would make 306. Add the other 20 equals 326

Yr3 Formal Addition

National Curriculum Program of Study Statement

- to add and subtract numbers with up to three digits, using formal written methods of column addition and subtraction

Big Ideas

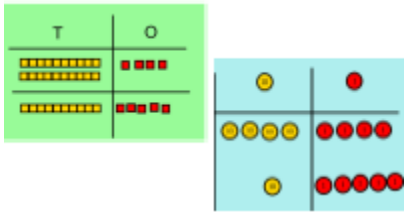
- Understanding of a unit of 1, 10 and 100. To know that 10 ones is equal to 1 ten and so can be exchanged for 1 unit of 10
- To know the importance of rounding to estimate the answer.

Language

- Column addition/subtraction
- Formal written method
- Regroup
- Exchange/ carry
- Unit of 100, 10, 1
- Total
- Sum of
- Calculation
- Inverse
- Estimate

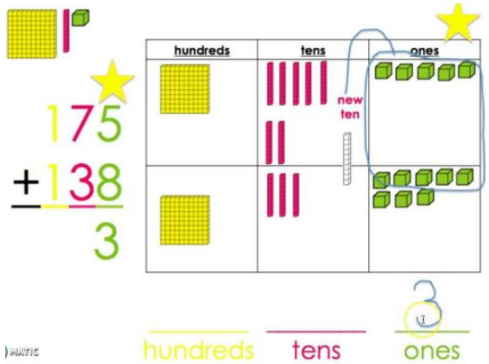
Concrete

No Regrouping

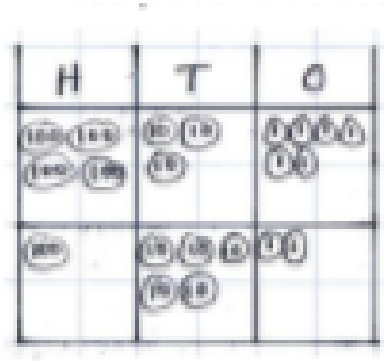


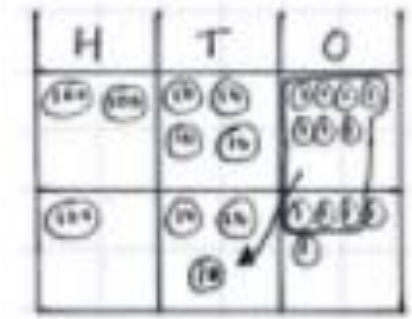
Use of base 10 first before moving on to place value counters or unmarked counters

Regrouping

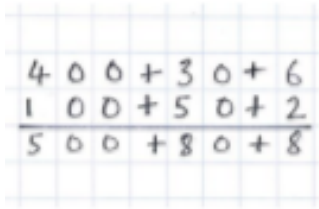


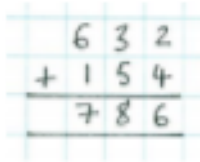
Pictorial



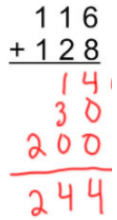


Abstract

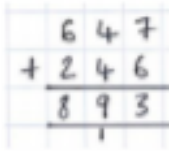




116 add128. That rounds to 120 add 130 so the answer will be close to 250.



Start by adding the 1s 6 add 8 is 14 ….



7 add 6 is 13. 3 ones and carry the 10. 40 add 40 is 80. Add 10 is 90. 600 add 200 is 800. 893

Yr3 Formal Subtraction

National Curriculum Program of Study Statement

- to add and subtract numbers with up to three digits, using formal written methods of column addition and subtraction

Big Ideas

- Understanding of a unit of 1, 10 and 100. To know that 10 ones is equal to 1 ten and so can be exchanged for 1 unit of 10
- To know the importance of rounding to estimate the answer.

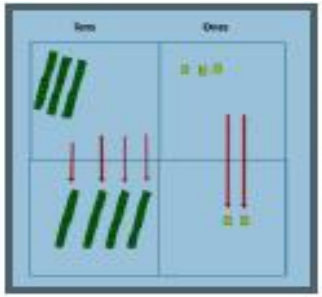
Language

- Column addition/subtraction
- Formal written method
- Regroup
- Exchange/ carry
- Unit of 100, 10, 1
- Total
- Sum of
- Calculation
- Inverse
- Estimate

Concrete

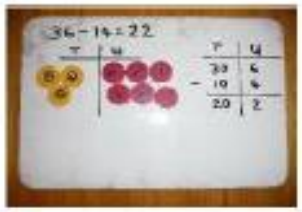
No Regrouping

Use of base 10 first before moving on to place value counters or unmarked counters



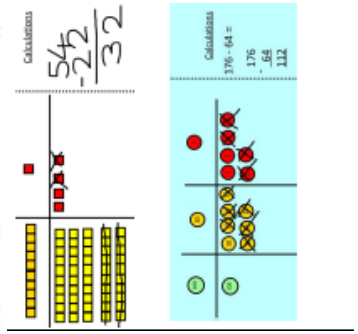
Use Base 10 to make the bigger number then take the smaller number away.

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



Pictorial

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

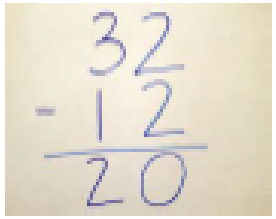


Abstract

$47 - 24 = 23$

$$\begin{array}{r} 40+7 \\ -\ 20+4 \\ \hline 20+3 \end{array}$$

This will lead to a clear written column subtraction.



Yr3 Formal Subtraction

National Curriculum Program of Study Statement
to add and subtract numbers with up to three digits, using formal written methods of column addition and subtraction

Big Ideas
- Understanding of a unit of 1, 10 and 100. To know that 10 ones is equal to 1 ten and so can be exchanged for 1 unit of 10

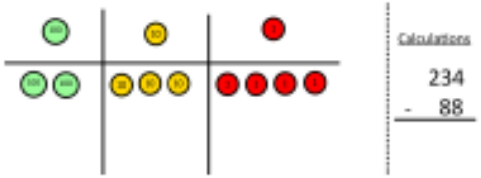
To know the importance of rounding to estimate the answer.

Language

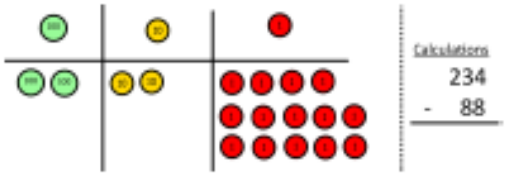
Concrete

With Regrouping

Make the larger number with the place value counters

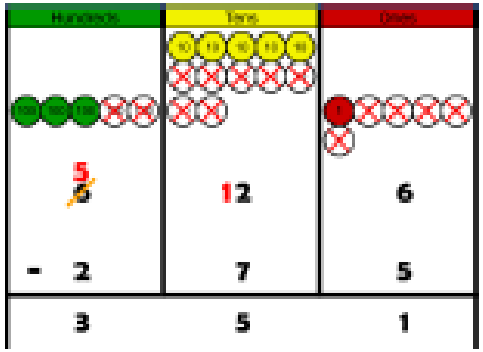


Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.



Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

Pictorial



Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

Abstract

Children can start their formal written method by partitioning the number into clear place value columns.

Moving forward the children use a more compact method.

Yr4 Addition

National Curriculum Program of Study Statement

- Add and subtract numbers with up to 4 digits using the formal written methods of column addition where appropriate.
- Estimate and use inverse operations to check answers to a calculation.
- Solve addition and subtraction two step problems in contexts, deciding which operations and methods to use and why

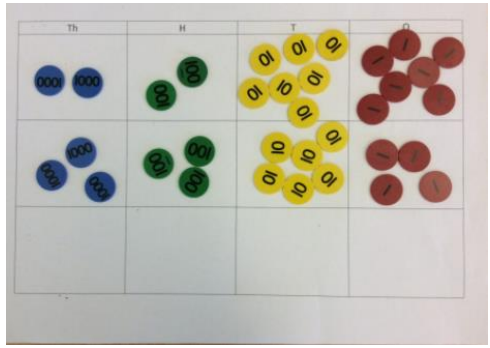
Big Ideas

- It helps to round numbers before carrying out a calculation to get a sense of the size of the answer. For example, 4786 – 2135 is close to 5000 – 2000, so the answer will be around 3000.
- Looking at the numbers in a calculation and their relationship to each other can help make calculating easier. Eg 1234+999 could be done mentally
  1234+1000 =2234
  2234-1 =2233

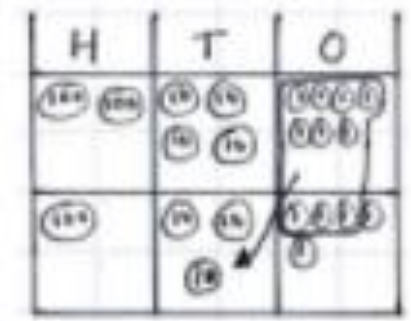
Language

- Column addition
- Formal written method
- Regroup
- Exchange/ carry
- Unit of 100, 10, 1
- Total
- Sum of
- Calculation
- Inverse
- Estimate

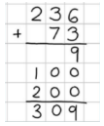
Concrete



Pictorial

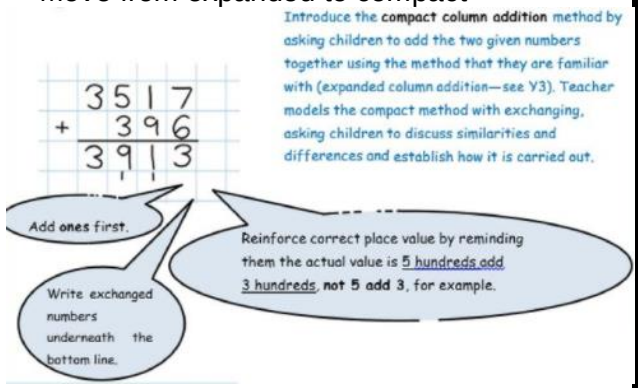


Abstract

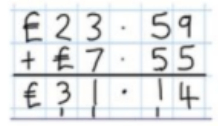


Revise expanded method if necessary

Move from expanded to compact



Introduce decimals in the form of money



Yr4 Subtraction

National Curriculum Program of Study Statement

- Add and subtract numbers with up to 4 digits using the formal written methods of column addition where appropriate.
- Estimate and use inverse operations to check answers to a calculation.
- Solve addition and subtraction two step problems in contexts, deciding which operations and methods to use and why

Big Ideas

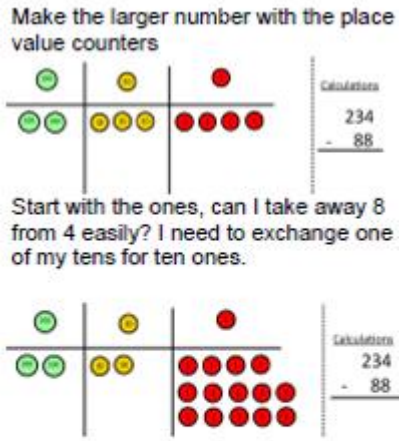
- It helps to round numbers before carrying out a calculation to get a sense of the size of the answer. For example, 4786 – 2135 is close to 5000 – 2000, so the answer will be around 3000.
- Looking at the numbers in a calculation and their relationship to each other can help make calculating easier. Eg 1234+999 could be done mentally
  1234+1000 =2234
  2234-1 =2233

Language

- Column subtraction
- Formal written method
- Regroup
- Exchange/ carry
- Unit of 100, 10, 1
- Total
- Sum of
- Calculation
- Inverse
- Estimate
- difference

Concrete

As with yr3 but up to 4-digit numbers
Introduce decimal via money.



Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.

Pictorial

Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.

Abstract

Some children will still use an expanded method

Most children will now use a compact method

Yr 5 and 6 Addition

National Curriculum Program of Study Statement

- **add and subtract whole numbers with more than 4 digits, including using formal written methods (column addition and subtraction)**
- **add and subtract numbers mentally with increasingly large numbers**
- **use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy**
- **solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.**

Big Ideas

Year 5

- Before starting any calculation is it helpful to think about whether or not you are confident that you can do it mentally. For example, 3689 + 4998 may be done mentally, but 3689 + 4756 may require paper and pencil.
- Carrying out an equivalent calculation might be easier than carrying out the given calculation. For example 3682 – 2996 is equivalent to 3686 – 3000 (constant difference).

Year 6

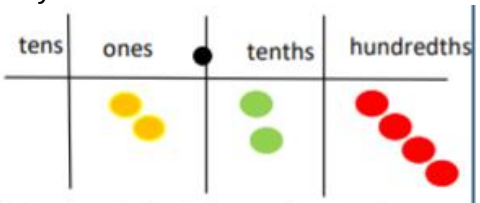
- Deciding which calculation method to use is supported by being able to take apart and combine numbers in many ways. For example, calculating 8·78 + 5·26 might involve calculating 8·75 + 5·25 and then adjusting the answer.
- The associative rule helps when adding three or more numbers: 367 + 275 + 525 is probably best thought of as 367 + (275 + 525) rather than (367 + 275) + 525.

Language

integer
decimal
digits
decimal place
total
column
tenths
hundredths
thousandths
aligned
carry
efficiency

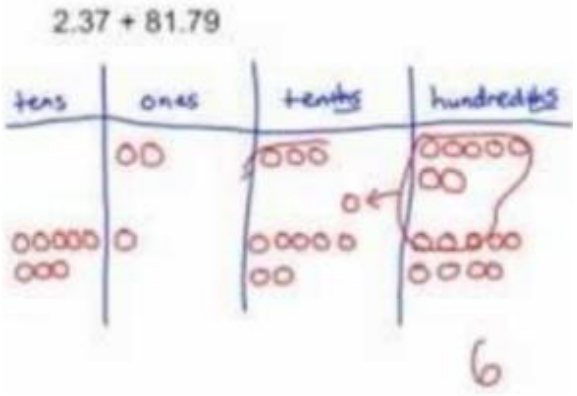
Concrete

as year 4

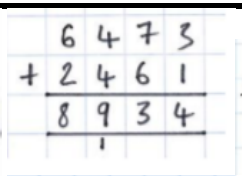


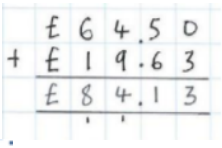
Introduce decimal place value counters and model exchange for addition.

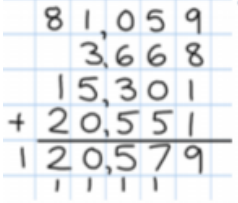
Pictorial



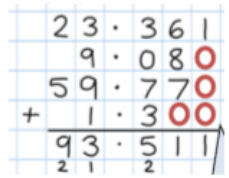
Abstract







Insert zeros for place holders.



Yr 5 and 6 Subtraction

onal Curriculum Program of Study Statement

- **add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)**
- **add and subtract numbers mentally with increasingly large numbers**
- **use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy**
- **solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.**

Big Ideas

Year 5

- Pupils should be able to subtract numbers with at least 4 digits using the compact column method
- Pupils should be able to subtract with decimals values, including mixtures of integers and decimals, aligning the decimal point (e.g.subtract a decimal from a whole number)

Year 6

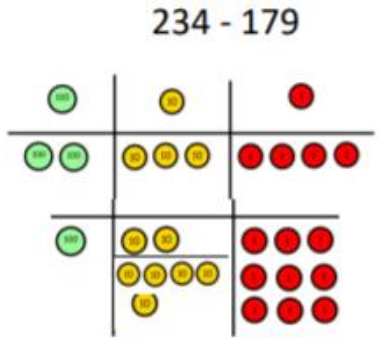
- Pupils should be able to subtract more complex integers using the compact column method
- Pupils should be able to subtract decimals with different number of decimals places using the compact column method

Language

minus
subtract
difference

Concrete

see year 4

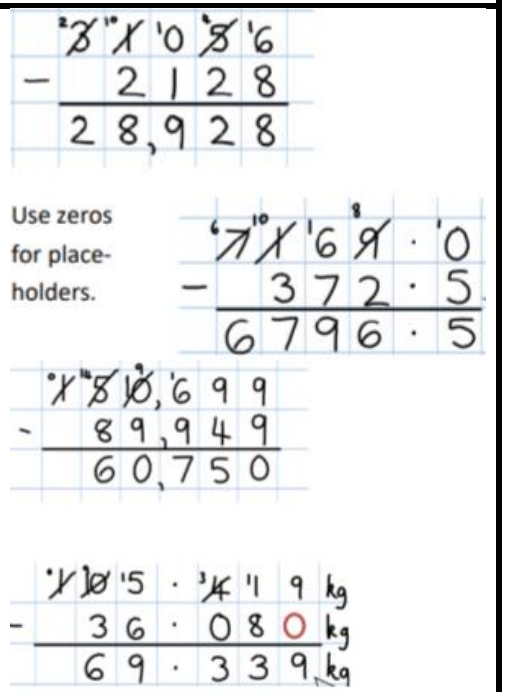


Model process of exchange using Numicon, base ten and then move to PV counters.

Pictorial

Children to draw pv counters and show their exchange—see Y3

Abstract



Yr R Multiplication

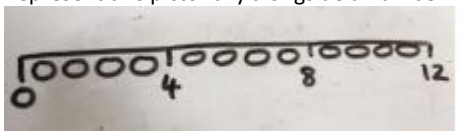
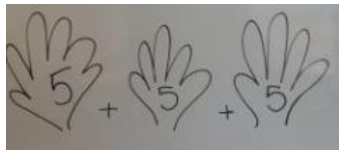
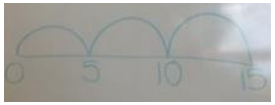
ELG Expected Criteria:

- **solve problems involving doubling, halving and sharing**

Although there is no explicit reference to multiplication within the current ELG for number, exposure to lots of practical experiences of counting repeated groups and learning the language necessary for multiplication would be expected.

Building Blocks

1. Recognising when groups of objects have the same number in.
2. Practical experiences of counting repeated groups.
3. Repeated addition – understanding that 4 lots of two is 2+2+2+2 – that is 2 four times – that is 2 x 4
4. Describing these experiences and concepts in a variety of ways to build up mathematical vocabulary.

Language	Concrete	Pictorial	Abstract
Lots of Groups of add same again	4 + 4 + 4 3 lots of 4 or three 4's  2 conkers in each group. Five groups altogether. 2 + 2 + 2 + 2 + 2  4 pairs of wellies. Four groups of 2.  Five fingers on each hand. Two hands both with 5 fingers. Two lots of 5. 5+5. Five two times 	 Represent this pictorially alongside a numberline     	4 + 4 + 4 = 12 3 groups of 4 = 12 altogether 5+5+5 = 15 5,10, 15…

Yr R Division

ELG Expected Criteria:

- **Solve problems including doubling, halving and sharing.**

Building Blocks

1. Children need to understand the most basic structure of dividing – sharing into equal groups.
2. Plenty of authentic opportunities to solve problems

Language	Concrete	Pictorial	Abstract
share half spilt divide groups of part whole	Opportunities where language can be modelled and used in a meaningful way: - Snack time – sharing out fruit. eg 7 apples for 14 people. - birthday cake - sharing limited toys eg cars. - mud kitchen play - cars and passengers	 	

Yr 1 Multiplication and Division

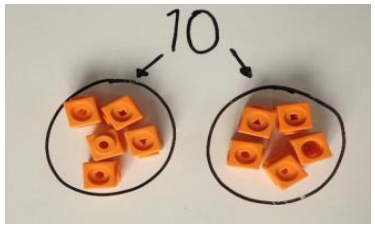
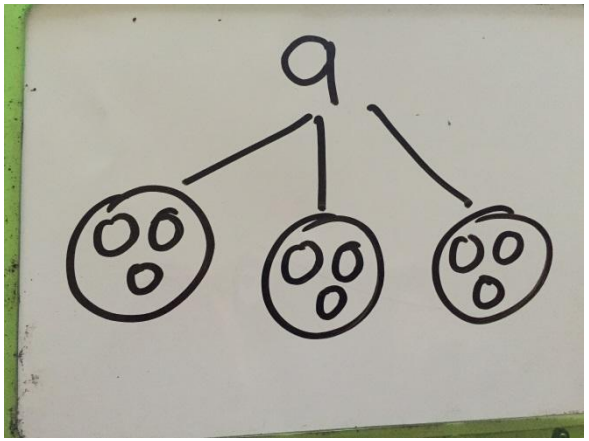
National Curriculum Program of Study Statement

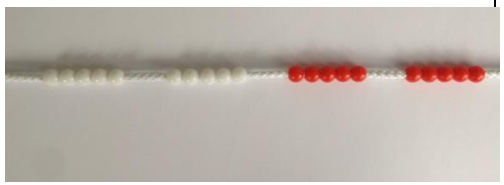
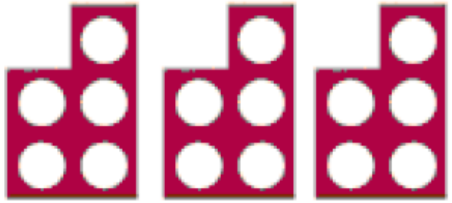
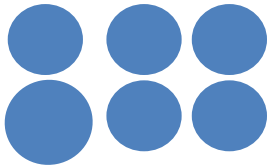
Count in 10s, fives and twos

Solve one step problems involving multiplication and division, using concrete objects, pictorial representations and arrays with the support of the teacher

Big Ideas

Counting in steps of equal sizes is based on the big idea of 'unitising' ; treating a group of, say, five objects as one unit of five. Working with arrays helps pupils to become aware of the commutative property of multiplication, that 2 × 5 is equivalent to 5 × 2.

Language	Concrete	Pictorial	Abstract
Calculation, Calculate Odd, Even Multiply, Multiplication, Times, Product Repeated addition Array Divide, Division Equal groups Grouping Sharing into equal groups,	  		Share 9 buns between three people. 9 ÷ 3= 3

	A variety of concrete apparatus – Numicon, Cuisenaire, 10 Frame, Counters -, are used to help pupils visualise odd /even numbers, doubling/halving and solve multiplication and division problems. *Teachers say 'share equally' and not just 'share' when solving problems involving division.* *Grouping into sets of 2, 5, 10 , then counting the number of groups*   	Drawing sets of objects in groups of 2,5,10  2 + 2 + 2 + 2 + 2 = 10  3 groups of 2	Recalling doubles facts to 10 1 + 1 = 2 2+ 2 = 4 Continuing number sequences 2,4,6, 5,10,15 10.20.,30 Introduction to sign x meaning lots of times Division sign meaning sharing or grouping 2 x 2 2 x 5 2 x 10 Writing multiplication as repeated addition 5 + 5 + 5 + 5 = 20

Yr 2 Multiplication and Division

tional Curriculum Program of Study Statement

- recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers
- calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs
- show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot
- solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

Big Ideas

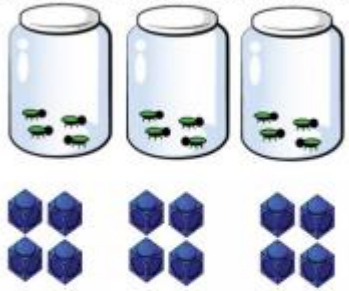
To commit facts to memory and develop an understanding of conceptual relationships.
To look for an recognise patterns in tables
To recognise multiplication and division as inverse and use this to help solve problems.
Recognise division as both grouping and sharing.
Use patterns in multiplication to help commit facts to memory eg halving a multiple of ten gives you a multiple of 5.

Language

Double
Times
Multiply
Groups of
Lots of
The Product of
Share
Group
Divide
Divided by
Half
Array
remainder

Concrete

Repeated grouping/repeated addition
3 × 4
4 + 4 + 4
There are 3 equal groups, with 4 in each group.

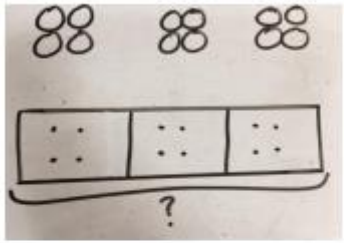


Number lines to show repeated groups-
3 × 4

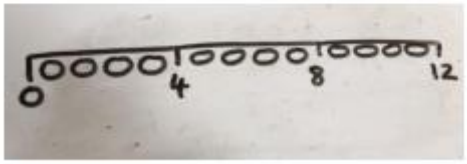
Cuisenaire rods can be used too.

Pictorial

Children to represent the practical resources in a picture and use a bar model.



Represent this pictorially alongside a number line e.g.:



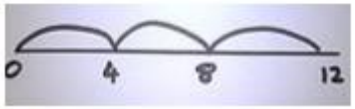
Abstract

3 × 4 = 12

4 + 4 + 4 = 12

Abstract number line showing three jumps of four.

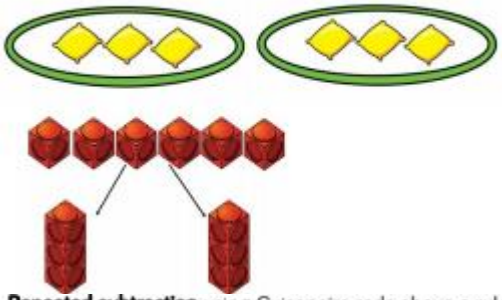
3 × 4 = 12



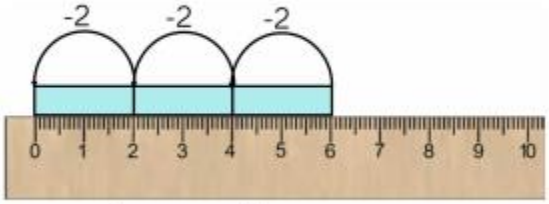
Use arrays to illustrate commutativity counters and other objects can also be used.
$2 \times 5 = 5 \times 2$

2 lots of 5 5 lots of 2

Sharing using a range of objects.
$6 \div 2$



Repeated subtraction using Cuisenaire rods above a ruler.
$6 \div 2$



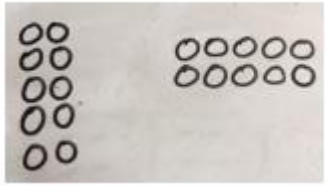
3 groups of 2

2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used.
$13 \div 4$

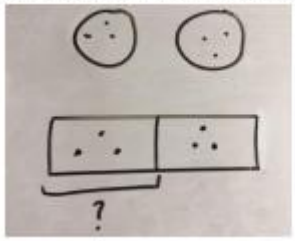
Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.

There are 3 whole squares, with 1 left over.

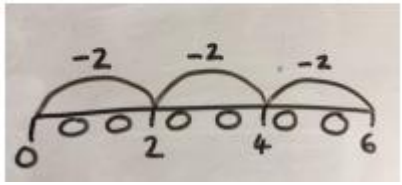
Children to represent the arrays pictorially.



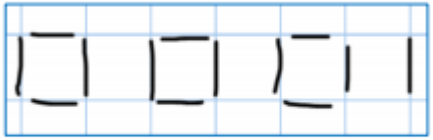
Represent the sharing pictorially.



Children to represent repeated subtraction pictorially.



Children to represent the lollipop sticks pictorially.



There are 3 whole squares, with 1 left over.

Children to be able to use an array to write a range of calculations e.g.

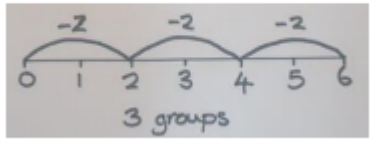
$10 = 2 \times 5$
$5 \times 2 = 10$
$2 + 2 + 2 + 2 + 2 = 10$
$10 = 5 + 5$

$6 \div 2 = 3$

3	3

Children should also be encouraged to use their 2 times tables facts.

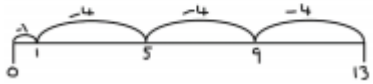
Abstract number line to represent the equal groups that have been subtracted.

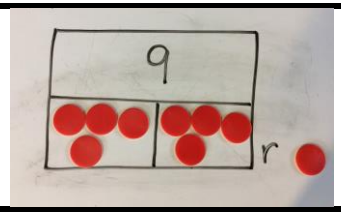
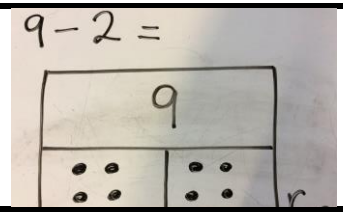
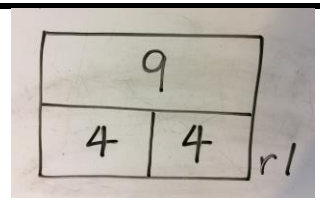


$13 - 4 - 3$ remainder 1

Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'



	 9 r	 9 − 2 = 9 r	 9 4 4 r 1

Yr 3 Multiplication and Division

National Curriculum Program of Study Statement

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including 2-digit numbers times 1-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence
- problems in which n objects are connected to m objects

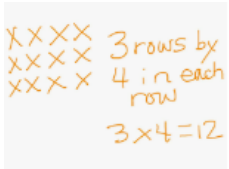
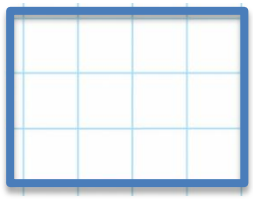
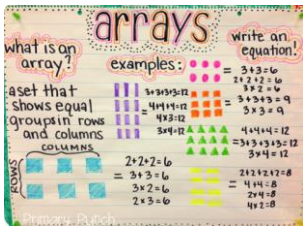
Big Ideas

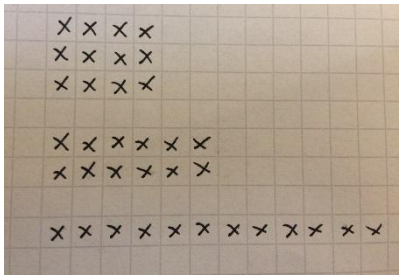
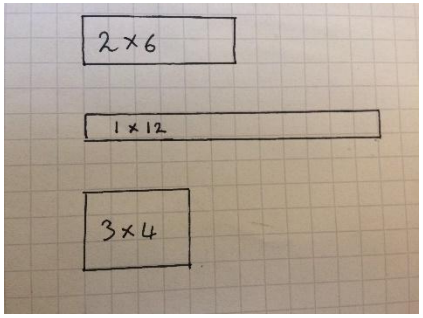
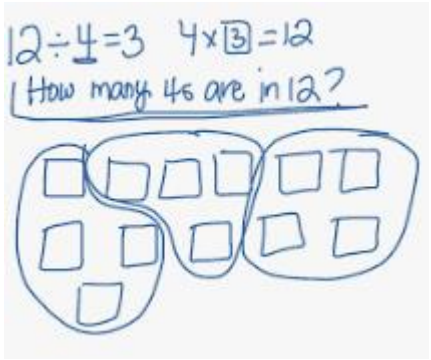
It is important for children not just to be able to chant their multiplication tables but also to understand what the facts in them mean,

to be able to use these facts to work out others and to use in problems.

It is also important for children to be able to link facts within the tables (e.g. 5× is half of 10×).

They understand what multiplication means, see division as both grouping and sharing, and see division as the inverse of multiplication.

Language	Concrete	Pictorial	Abstract
multiplication ,multiply, multiplied by, times multiple, factor product repeated addition	 	  	3 multiplied by 4 equals 12 12 divided by 4 =3 The product of 3 multiplied by 4 is 12 3+3+3+3=12 3x4=12 4x3=12 3x ☐ = 12 3x n =12 How many ways can you make 12 A x B = 12 What could A and B =

		   12 4 4 4	How many ways can you make 12 How many ways can you share/ group/ divide 12 without a remainder A x B = 12 What could A and B = 12÷ 3=4 12÷4=3

Division, dividing, divide, divided by, divided into,left, left over, remainder

Grouping.sharing, share, share equally

group in pairs, threes … tens

equal groups of

array

row, column

number patterns

multiplication table

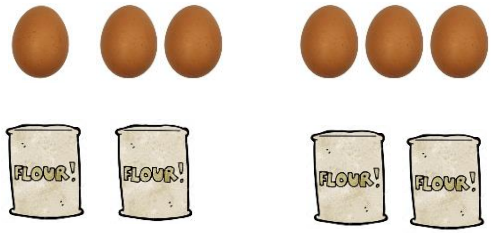
multiplication fact, division fact

12			
3	3	3	3

12					
2	2	2	2	2	2

12											
1	1	1	1	1	1	1	1	1	1	1	1

120			
30	30	30	30



How many ways can you make 12
A x B = 12

What could A and B =

How many ways can you share/ group …. without a remainder

12÷6=2
12÷4=3
12÷12=1

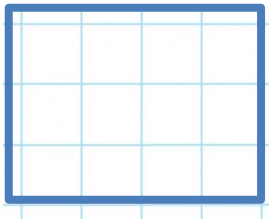
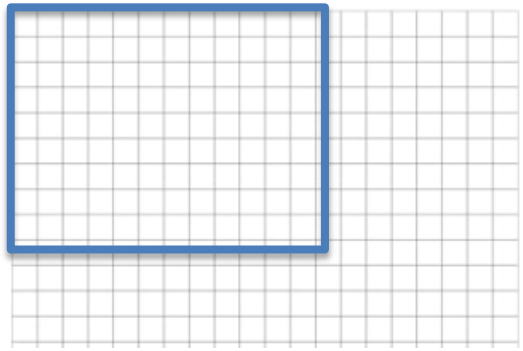
“Which numbers can only be shared into groups of one?

30x4=120
120÷4=30

32x4=
30x4=120
2x3= 6
126

I am cooking and I double the recipe. How much do I need of each ingredient?

3 eggs
200g of flour
120g of butter

		 120g  120g  	Draw the rectangle 3 times bigger 3x4=12 9x12=108

Yr 4 Multiplication and Division

National Curriculum Program of Study Statement

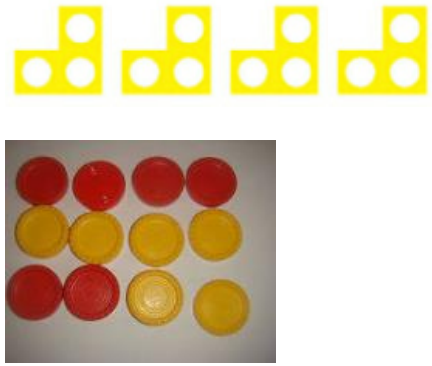
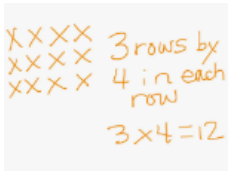
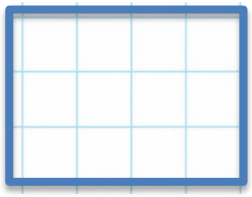
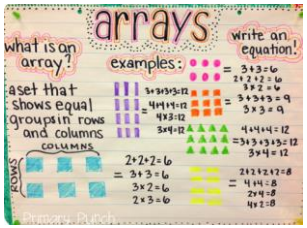
- recall multiplication and division facts for multiplication tables up to 12 × 12
- use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers
- recognise and use factor pairs and commutativity in mental calculations
- multiply 2-digit and 3-digit numbers by a 1-digit number using formal written layout
- solve problems involving multiplying and adding, including using the distributive law to multiply 2-digit numbers by 1-digit, integer scaling problems and harder
- correspondence problems such as n objects are connected to m objects

Big Ideas

It is important for children not just to be able to chant their multiplication tables but to understand what the facts in them mean, to be able to use these facts to figure out others and to use them in problems.

It is also important for children to be able to link facts within the tables (e.g. 5× is half of 10×).
They understand what multiplication means and see division as both grouping and sharing, and to see division as the inverse of multiplication.

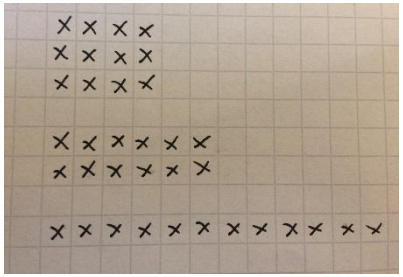
The distributive law can be used to partition numbers in different ways to create equivalent calculations. For example, 4 × 27 = 4 × (25 + 2) = (4 × 25) + (4 × 2) = 108.
Looking for equivalent calculations can make calculating easier. For example, 98 × 5 is equivalent to 98 × 10 ÷ 2 or to (100 × 5) – (2 × 5). The array model can help show equivalences.

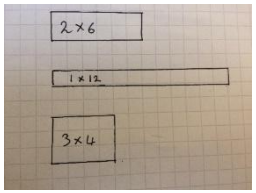
Language	Concrete	Pictorial	Abstract
Multiplication and division Multiplication, multiply multiplied by, multiple, factor groups of, times, product repeated addition array row, column number patterns multiplication table		  	(As with yr3 but to 12x12) 3 multiplied by 4 equals 12 12 divided by 4 =3 The product of 3 multiplied by 4 is 12 3+3+3+3=12 3x4=12 4x3=12 3x ☐ = 12 3x n =12 How many arrays can you make

multiplication fact, division fact

inverse

square, squared

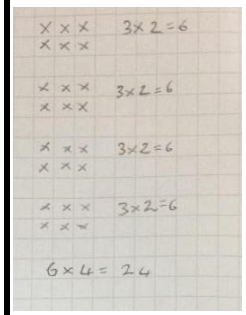


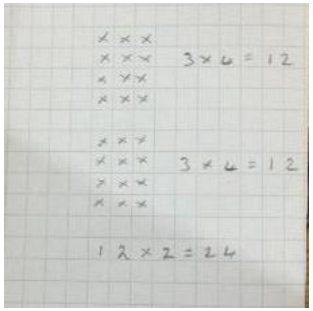


12		
4	4	4

12			
3	3	3	3

Etc





for 12
A x B = 12

What could A and B =

How many ways can you make 12
How many ways can you share/ group/ divide 12 without a remainder
A x B = 12

What could A and B =

Find all the factor pairs for ?

12÷ 3=4
12÷4=3

Does it matter which way round you carry out a calculation?

How can that help you?

Investigate
3x2x4=
2x4x3
4x3x2=

What do you notice?
How is this useful?

division, dividing, divide, divided by, divided into,

left, left over, remainder

grouping, sharing, share, share equally

equal groups of

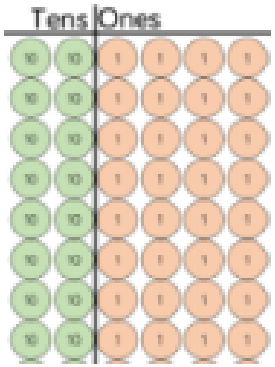
division facts

12					
2	2	2	2	2	2

12			
3	3	3	3

12											
1	1	1	1	1	1	1	1	1	1	1	1

120			
300	300	300	300



Each row has ___ tens and ___ ones so each row has a value of ___.
There are ___ rows.
The calculation is ___ × ___ = ___

"Which numbers can only be shared into groups of one or 1 big group?

300x4=1200
1200÷4=300

24x8=
20x8=160
4x8= 32
196

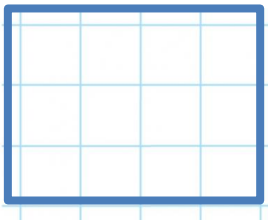
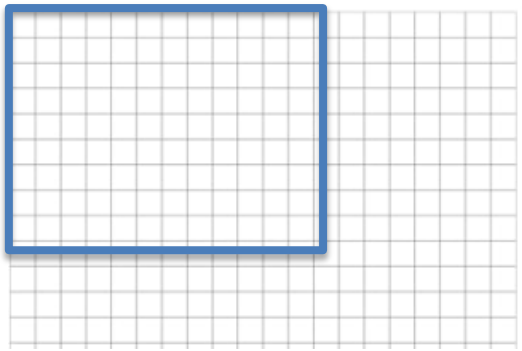
Leading to

24
x 8
32
160
196

Leading to 24 234

x 8 x 6
19 2 1404
3 2 2

I am cooking and I double the

		     120g  120g  	recipe. How much do I need of each ingredient? 3 eggs 200g of flour 120g of butter Draw the rectangle 3 times bigger 3x4=12 9x12=108

Yr 5 and 6 Division

National Curriculum Program of Study Statement

Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

Big Ideas

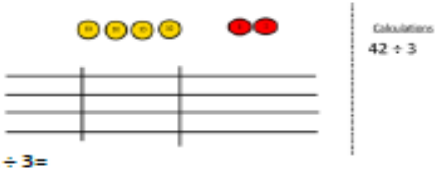
Language

Share
Divide
group
quotient
remainder

Concrete

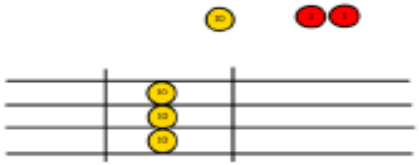
96 ÷ 3

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.

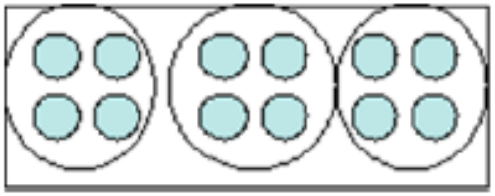


We exchange this ten for ten ones and then share the ones equally among the groups.

We look how much in 1 group so the answer is 14.

Pictorial

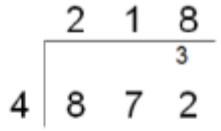
Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.



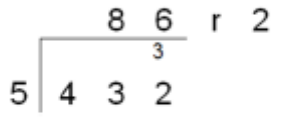
Encourage them to move towards counting in multiples to divide more efficiently.

Abstract

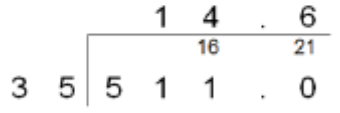
Begin with divisions that divide equally with no remainder.

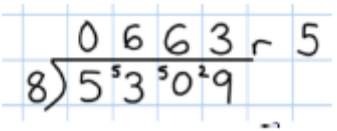


Move onto divisions with a remainder.



Finally move into decimal places to divide the total accurately.





Year 5 and 6 Division

Long Division - 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.

Year 5 and 6 Division

Long Division - a remainder in the ones - continued

```
   h  t  o
      0  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
       0  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

Year 5 and 6 Division

Long Division - 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.

Year 5 and 6 Division

Long Division - a remainder in any of the place values

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

Yr 5/6 Multiplication

National Curriculum Program of Study Statement

- multiply numbers up to four digits by a 1 or 2-digit number using a formal written method, including long multiplication for 2-digit numbers
- multiply and divide numbers mentally drawing upon known facts
- multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- ***multiply 1-digit numbers with up to two decimal places by whole numbers (Year 6 FDP only)***

Big Ideas

Pupils have a firm understanding of what multiplication and division mean and have a range of strategies for dealing with large numbers, including both mental and standard written methods. They see the idea of factors, multiples and prime numbers as connected and not separate ideas to learn.

They recognise how to use their skills of multiplying and dividing in new problem solving situations. Fractions and division are connected ideas: 36 ÷ 18 = 36/18 = 2; 18/36 = ½ .

Factors and multiples are connected ideas: 48 is a multiple of 6 and 6 is a factor of 48.

Language

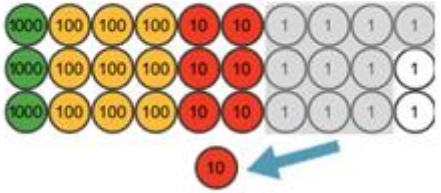
Multiply
Multiplication
Product
Times
Lots of

Concrete

Without exchanging
e.g. 1323 x 3 – make 3 lots of 1323

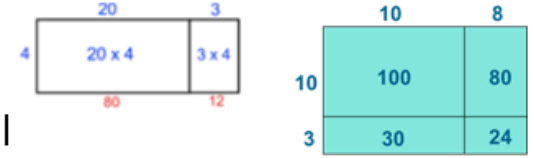
Use place value counters to reinforce.

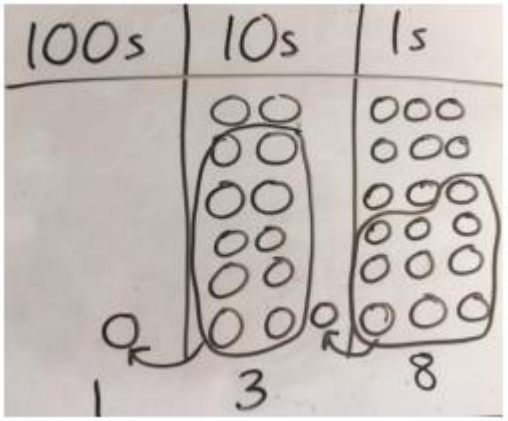
With exchanging
e.g. 1324 x 3 – make 3 lots of 1324



Pictorial

Progression to a model that uses the 'area of a rectangle'.
Children to draw the rectangles.
Often called 'Grid method' e.g. 23 x 4 = 92





Abstract

If not secure, use expanded method to understand the methods.

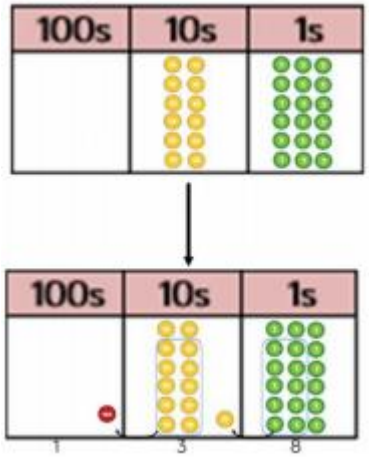
234
X 7
28 (4 x 7)
210 (30 x 7)
1400 (200 x 7)
1638

Move on to compact written method.

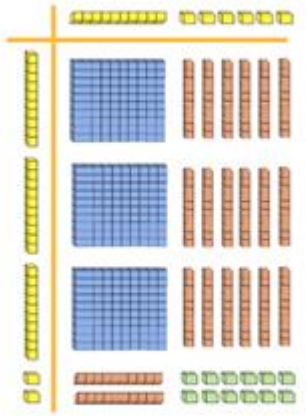
	Th	H	T	1s
	1	3	2	4
x				3
	3	9	7	2
			1	

Understand and use the formal method of long multiplication and explain 'why' the zero is included.

6 x 23

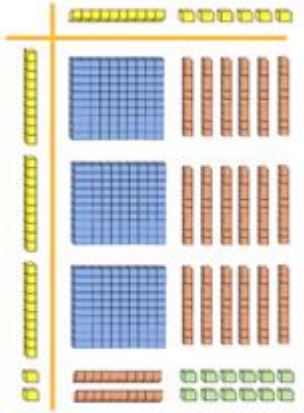


32 x 16



300 + 200 + 12 =
512

32 x 16



300 + 200 + 12 =
512

-

	1	2	4
×		2	6
	7	4	4
2	4	8	0
3	2	2	4
1	1		

Answer: 3224

Yr 1 Fractions

National Curriculum Program of Study Statement

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

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

Big Ideas

Fractions express a relationship between a whole and equal parts of the whole. Ensure children express this relationship when talking about fractions. For example, *'If the circle* (where the circle is divided into four equal parts with one part shaded) *is the whole, one part is one quarter of the whole circle.'*
Halving involves partitioning an object, shape or quantity into two equal parts.

The two parts need to be equivalent in, for example, area, mass or quantity.

Language

Part
Equal
Whole
Half, halves
Quarter
Fraction

Concrete

Folding shapes into 2 equal parts

Halving real objects such as cake, pizza

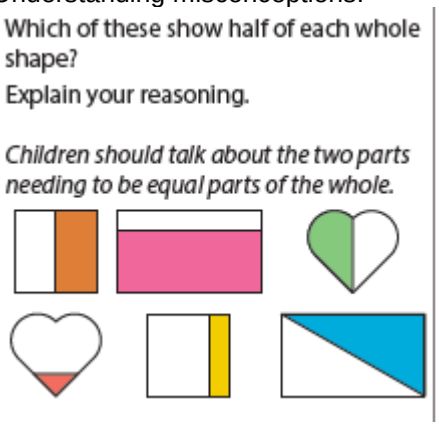
Emphasis that each part is equal for it to be a half, quarter

Sorting groups of objects into 2 equal groups

Pictorial

Shading half, quarter of shapes

Understanding misconceptions:



Abstract

Word problems discussing together

Such as

There are 12 children in a class.
Sammy says half of the class is 7.
Do you agree?
Explain your reasoning.

Yr 2 Fractions

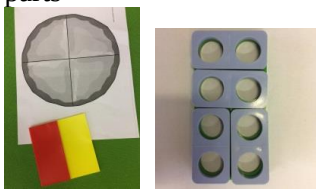
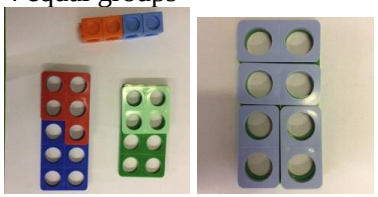
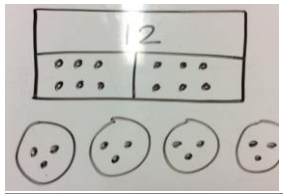
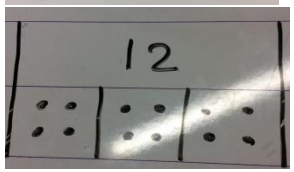
National Curriculum Program of Study Statement

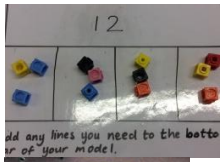
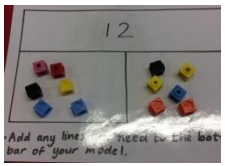
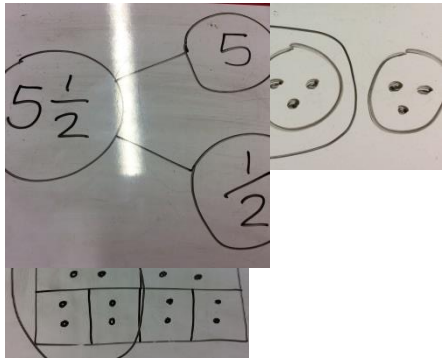
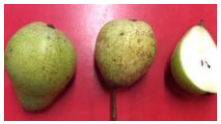
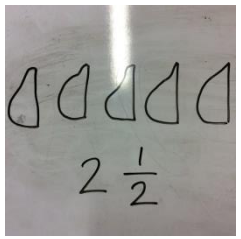
Pupils should be taught to:

- recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity.
- recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity.

Big Ideas

The Big Ideas Fractions involve a relationship between a whole and parts of a whole. Ensure children express this relationship when talking about fractions. For example, 'If the bag of 12 sweets is the whole, then 4 sweets are one third of the whole.' Partitioning or 'fair share' problems when each share is less than one gives rise to fractions. Measuring where the unit is longer than the item being measured gives rise to fractions.

Language	Concrete	Pictorial	Abstract
Part Equal Equivalent Whole Half, halves Quarter Fraction Three quarters	Children split shapes into 2 or 4 equal parts  Children share out objects into 2, 3 or 4 equal groups 	   	2 halves make a whole 4 quarters make a whole ½ + ½ = 1 ¼ + ¼ + ¼ + ¼ =1 12 ÷ 2 =6 2 x6 =12 12 ÷ 4 =3 3x4=12

	  		
	Children find ¾ of a shape or number.  Understand that 2/4 is equivalent to ½  To understand whole and parts.  To be able to count in halves or quarters. 		¾ of 12 = 9 ½ of 8 = 2/4 of 8 2 and a half is the same as 5 ½ s ½, 1, 1 ½, 2, 2 ½

Yr 3 Fractions (including Decimals)

National Curriculum Program of Study Statement

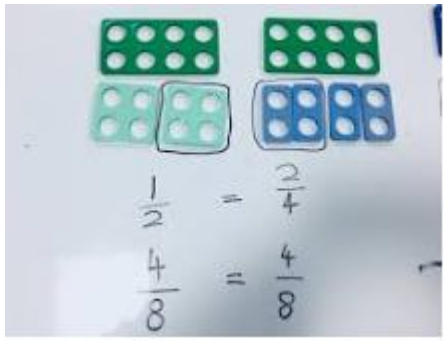
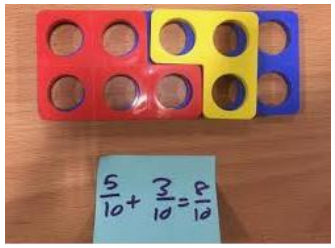
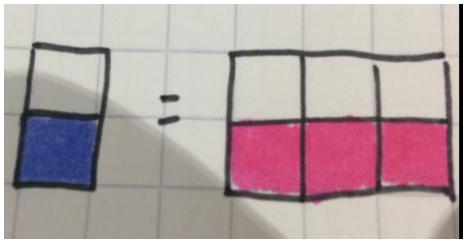
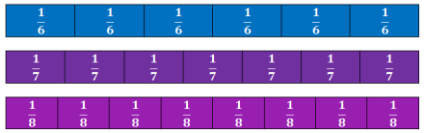
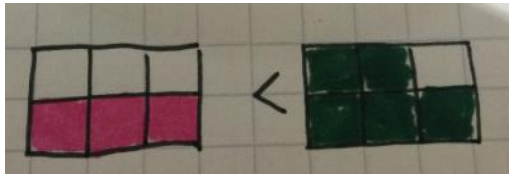
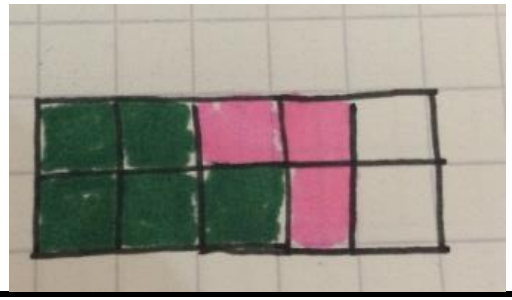
Pupils should be taught to:

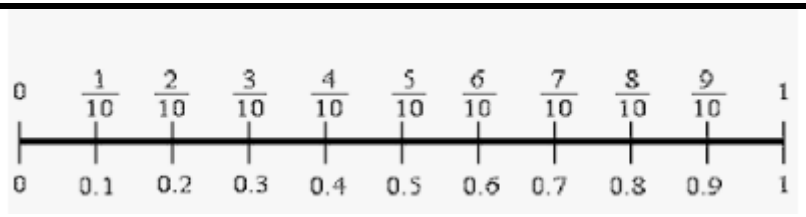
- find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- recognise and show, using diagrams, equivalent fractions with small denominators
- recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- add and subtract fractions with the same denominator within one whole (for example, 5/ 7 + 1/ 7 = 6/ 7)
- compare and order unit fractions, and fractions with the same denominator
- count up and down in tenths;
- recognise that tenths arise from dividing an object into ten equal parts and in dividing 1-digit numbers or quantities by ten recognise,
- denominators solve problems that involve all of the above

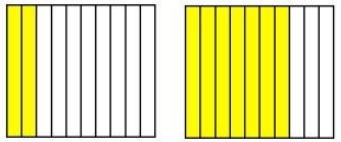
Big Ideas

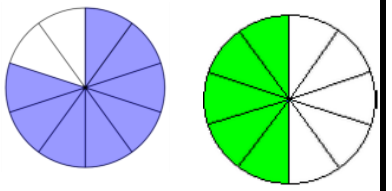
- Fractions are equal parts of a whole.
- Equal parts of shapes do not need to be congruent but need to be equal in area.
- Decimal fractions are linked to other fractions.
- The number line is a useful representation that helps children to think about fractions as numbers.

Language	Concrete	Pictorial	Abstract
Fraction, equivalent fraction, mixed number, numerator, denominator, equal part, equal grouping, equal sharing, parts of a whole, half, two halves, one of two equal parts,		 	1/3 of the group is … 2/3 of the group is …. Describe the picture using fractions

quarter, two quarters, three quarters, one of four equal parts, one third, two thirds, one of three equal parts, sixths, sevenths,	  	   	¼ of the children are wearing glasses 2/4 or ½ the children have blond hair 1/2 = 3/6 ½ = /4 = /8 = /16 5/8 = /16 Continue fraction chains: ¼ = 2/8 = 3/12 Write these fractions in the correct order 2/6 1/6 4/6 5/10 + 3/10=8/10







0.1, 0.2, 0.3, 0.4..

2/10=0.2

7/10 = 0.7

8mm = ___ cm

8/10= 0.8

½ = 5/10 = 0.5

Problem Solving:

I have 8 cakes. If 2/8 are chocolate and 3/8 are vanilla. How many are lemon?

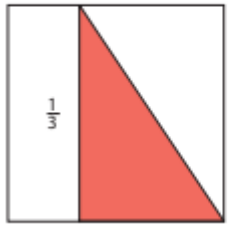
I have 12 stickers 2/3 are red. How many are blue

Sarah ate 2/8 of ham pizza and 3/8 of margarita. How much did she eat all together

This is 0-4 or $\frac{2}{5}$ of a bag of marbles. How many marbles are in a full bag?

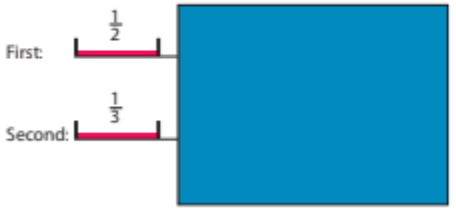
What fraction of the square is shaded?

Explain your reasoning.



Only a fraction of each line is shown. The rest is hidden behind the blue screen.
Which whole line is the longer?

Explain your reasoning.



Yr 4 Fractions (including Decimals & Percentages)

National Curriculum Program of Study Statement

- recognise and show, using diagrams, families of common equivalent fractions
- count up and down in hundredths; recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten
- solve problems involving increasingly harder fractions to calculate quantities, including non-unit fractions where the answer is a whole number
- add and subtract fractions with the same denominator
- recognise and write decimal equivalents of any number of tenths or hundredths
- recognise and write decimal equivalents to $^1/_4$; $^1/_{2,}$ $^3/_4$
- find the effect of dividing a one or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths
- round decimals with one decimal place to the nearest whole number
- compare numbers with the same number of decimal places up to two decimal places
- solve simple measures and money problems involving fractions and decimals to two decimal places

Big Ideas

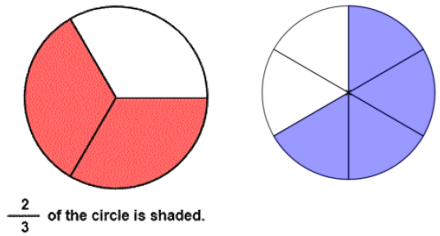
Fractions arise from solving problems, where the answer lies between two whole numbers.

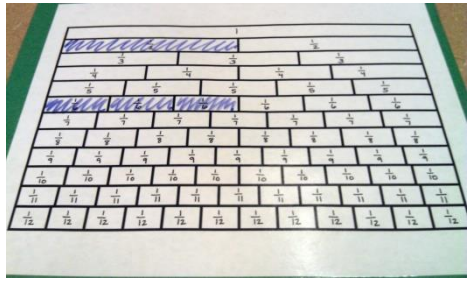
Fractions express a relationship between a whole and equal parts of a whole.

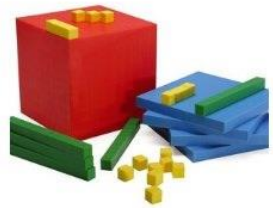
Children should recognise this and speak in *full sentences* when answering a question involving fractions.

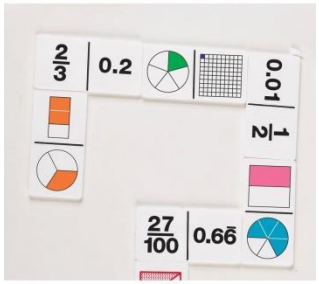
For example, in response to the question What fraction of the chocolate bar is shaded? The pupil might say two sevenths of the whole chocolate bar is shaded.

Equivalency in relation to fractions is important. Fractions that look very different in their symbolic notation can mean the same thing.

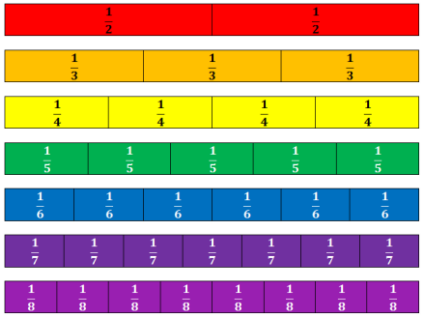
Language	Concrete	Pictorial	Abstract
Fraction, equivalent fraction, mixed number, numerator, denominator, equal part, equal grouping, equal sharing, parts of a whole, half, two halves, one of two equal parts, quarter, two quarters, three quarters, one of four equal parts, one third, two thirds, one of three equal parts, sixths, sevenths,		Write the equivalent fractions shown in each pair of diagrams  $\frac{2}{3}$ of the circle is shaded.	2/3 = 4/6 ?/5 = 4/10



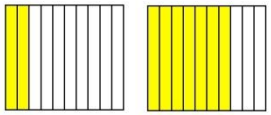




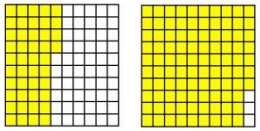
Using cookery



1 ÷ 10 = 1/10



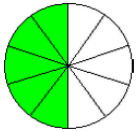
1 ÷ 100 = 1/100



97/100 = 0.97

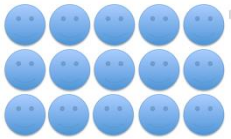
Decimal equivalents

8/10 = 0.8



½ = 5/10 = 0.5

Using arrays to find fractions of amounts



½ = /4 = /8 = /16

5/8 = /16

Continue fraction chains:

¼ = 2/8 = 3/12

Copy and complete:

7/10 = ?/100

Start at 73/100, count back 5 hundredths.

Challenge:
Start at 57/100, count on 4 tenths.

Start at 0.5, count on four hundredths

Give the value of the underlined digit:

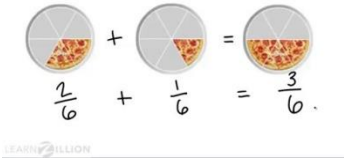
2.4 = 4/10 or 0.4

Give the next four terms:
0.1 0.3 0.5 0.7

Challenge:
8/10 + 7/100 = ?/100 = 0.87

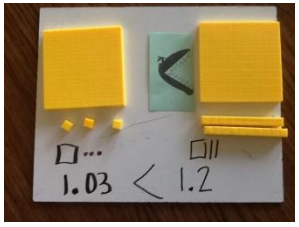
1/3 of 15 = 5
1/5 of 15 = 3

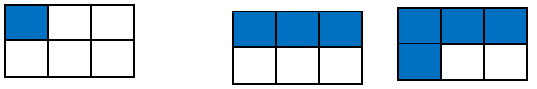
There are12 eggs in a box. Five sixths are used. How many eggs have been used?
5/6 of 12= (12÷6) x 5



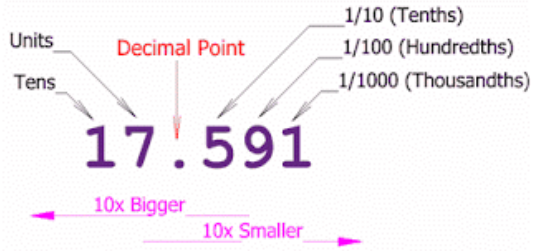
Place value slider:

Compare:

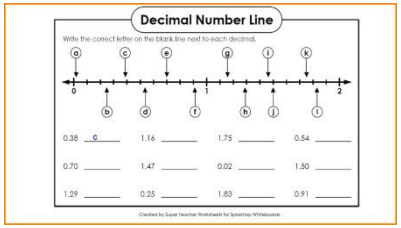




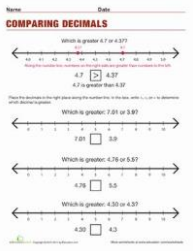
1/6 + 3/6 = 4/6



Locate decimals on a number line to help rounding to the nearest whole number.



And comparing of decimals.



= 2 x 5
= 10
10 eggs have been used.

8/12 + 3/12 = 11/12

8/9 - / = 6/9

? - 3/5 = 3/5

47 ÷ 10 = 4.7

53 ÷ 100 = 0.53

145.1 x 100 = 14,510

8mm = ___ cm

Round to the nearest whole one:
5.3 12.9 151.4

Round to the nearest pound:
£2.80 £36.10 £165.40

Approximate by rounding to the nearest whole one:
24.3 + 8.5 6.8 x 9.1

5.42 > 5.27

Order these decimals:
4.0 4.4 3.3 3.4 4.3
8.17 7.88 7.78 8.07 7.77

Challenge:
3.7 3.07 3.17 0.73

Problem Solving:

To find fractions of quantities:

1. There are 27 children in a class. Eight ninths are at school. How many children are absent?
2. There are 48 children in Year 4. Three eighths of the children walk to school. One third come by car. The rest cycle. How many cycle to school?

To compare and order decimals:

1. What number lies half way between 5 and 5.4?

To use conversion of measures to solve problems:

1. Arlene's finger is 8.3cm long. Chandra's is 9mm shorter. How long is Chandra's finger.

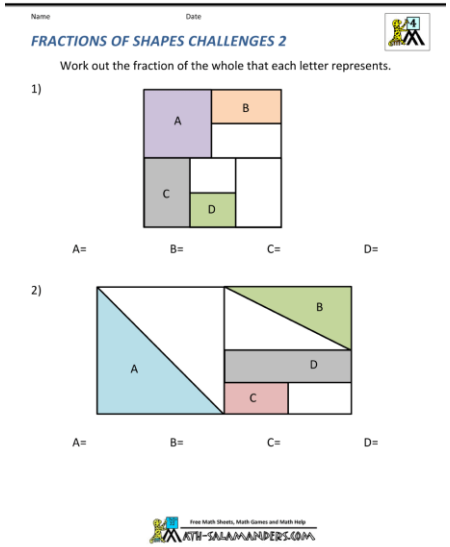
To solve problems that involve fractions of measures:

1. A 1km length of road has lamp posts every ¼ km. How many metres is it from the start of the road to the ¾ km post?
2. One-quarter of me is 10 metres. What am I?

To solve simple money problems involving decimals to two places (using mental methods and all four written methods):

1. A blue jacket costs £58.39. A green jacket costs £17.36 more than the blue. How much does the green jacket cost?
2. Theatre tickets cost £35. Children pay half price. What is the cost of tickets for two adults and three children?

Problems in the form of puzzles:



Name Date

FRACTIONS OF SHAPES CHALLENGES 2

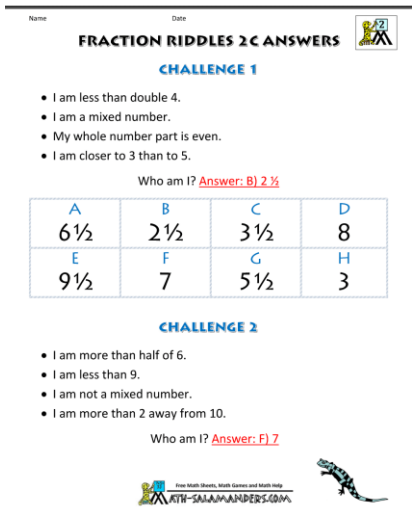
Work out the fraction of the whole that each letter represents.

1)

A= B= C= D=

2)

A= B= C= D=



Name Date

FRACTION RIDDLES 2C ANSWERS

CHALLENGE 1

- I am less than double 4.
- I am a mixed number.
- My whole number part is even.
- I am closer to 3 than to 5.

Who am I? Answer: B) 2 ½

A	B	C	D
6½	2½	3½	8
E	F	G	H
9½	7	5½	3

CHALLENGE 2

- I am more than half of 6.
- I am less than 9.
- I am not a mixed number.
- I am more than 2 away from 10.

Who am I? Answer: F) 7

Yr 5 and 6 Fractions

National Curriculum Program of Study Statement

Year 5

- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.
- Compare and order fractions whose denominators are all multiples of the same number
- Recognise mixed numbers and improper fractions. Convert from one form to the other and write mathematical statements >1 as a mixed number.
- Add and subtract fractions with the same denominators and denominators that are multiples of the same numbers.
- Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.
- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.
- Recognise % symbol and understand the meaning: write % as a fraction, decimal and percentage.

Year 6

- Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
- Compare and order fractions, including fractions > 1.
- Use factors to simplify fractions; use common multiples to express fractions in the same denominator.
- Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, 1 /4 × 1 /2 = 1 8]; divide proper fractions by whole numbers [for example, 1/ 3 ÷ 2 = 1 /6]
- Divide proper fractions by whole numbers.
- Recall and use equivalences between simple fractions, decimals and percentages including in different contexts.
- Associate fractions with division and calculate decimal fraction equivalents.

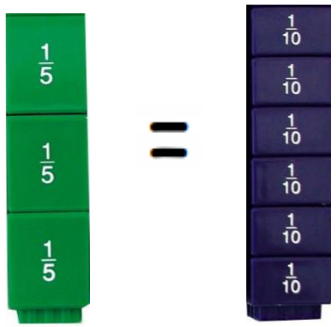
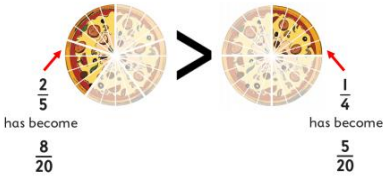
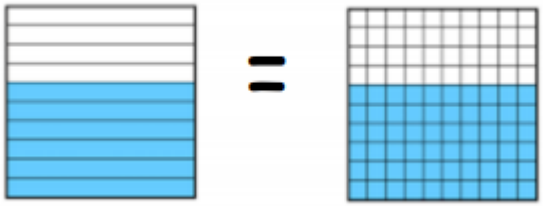
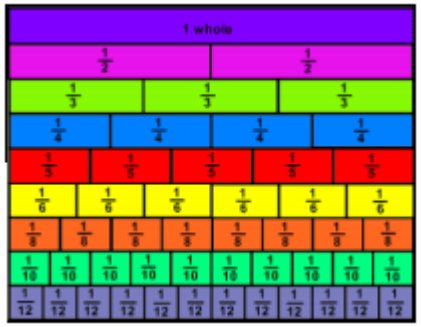
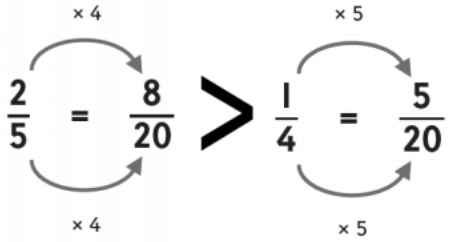
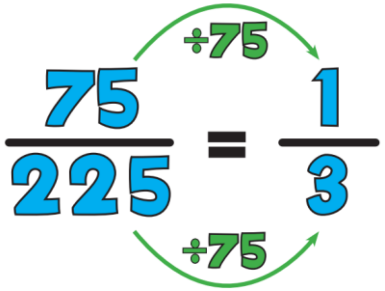
Big Ideas

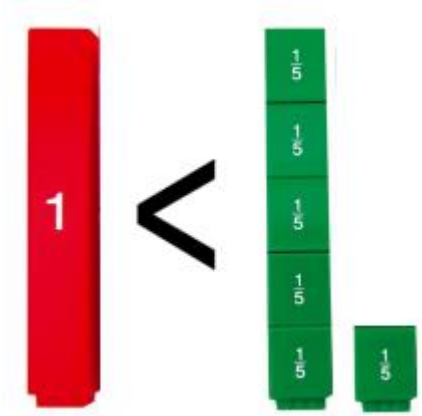
Representations that may appear different sometimes have similar underlying ideas. For example 1/ 4 , 0·25 and 25% are used in different contexts but are all connected to the same idea. Pupils should understand that percentages, decimals and fractions are different ways of expressing proportions.

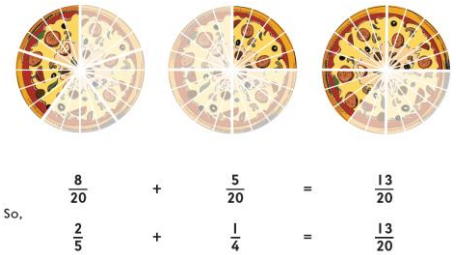
Fractions express a relationship between a whole and equal parts of a whole. Pupils should recognise this and speak in full sentences when answering a question involving fractions. For example, in response to the question 'What fraction of the journey has Tom travelled?' the pupil might respond, 'Tom has travelled two thirds of the whole journey.' Equivalent fractions are connected to the idea of ratio: keeping the numerator and denominator of a fraction in the same proportion creates an equivalent fraction. Putting fractions in place on the number lines helps understand fractions as numbers in their own right.

Adding and subtracting fractions should become fluent through solving a variety of increasingly complex problems. Understanding is extended to understand adding and subtracting fractions in calculations that exceed 1 as a mixed number

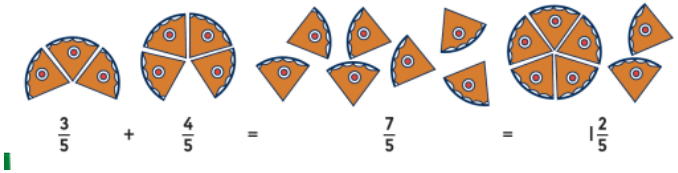
Connections should be made between division and converting improper fractions to mixed numbers eg 6/2 as a mixed number is 6 ÷ 2 = 3. Connections should also be made between division and multiplying by a fraction eg x 1/3 = ÷ by 3.

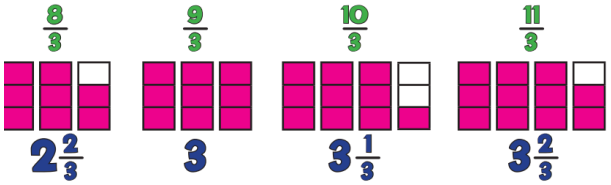
Language	Concrete	Pictorial	Abstract
Part Simplify Equivalent Whole Equivalence Simplest form Equal parts Numerator Denominator Mixed number Improper fraction Unit fraction Non-unit fraction Common	**Year 5**   	• **Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.**  • **Compare and order fractions whose denominators are all multiples of the same number**  	$\frac{3}{5} = \frac{6}{10} = \frac{60}{100}$ $\frac{3}{4} = \frac{75}{100}$ $\frac{1}{5} = \frac{2}{10} = \frac{20}{100}$  





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

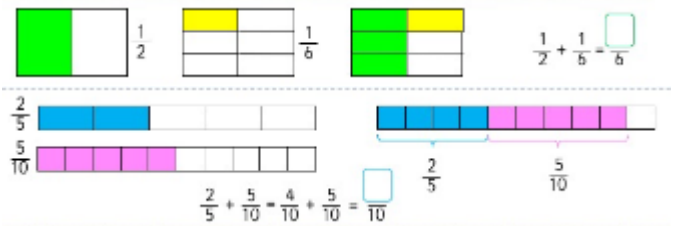




- **Add and subtract fractions with the same denominators and denominators that are multiples of the same numbers.**

Same denominators

Denominators that are multiples of the same number



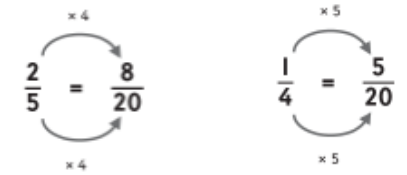
$$\frac{7}{2} = 3\frac{1}{2}$$

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

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

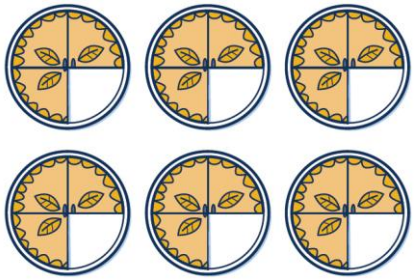


So,

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

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

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

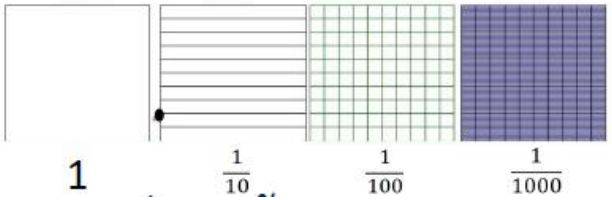


- **Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.**

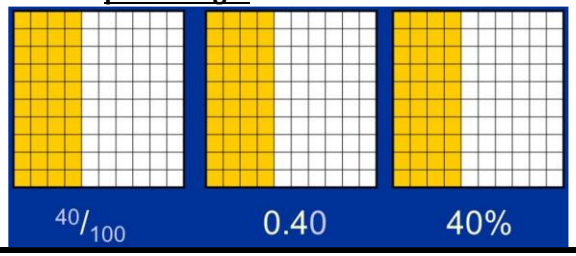
$4\frac{2}{4}$ altogether

Or use bar models

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



- **Recognise % symbol and understand the meaning: write % as a fraction, decimal and percentage.**



Multiply a proper fraction by a whole number:

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

Change to a mixed number:

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

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

67.153

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

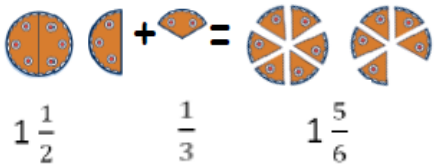
$\frac{4}{10} = 40\% = 0.4$

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

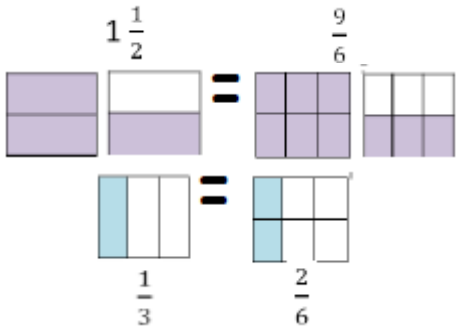
$\frac{75}{100} = 75\% = 0.75$

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

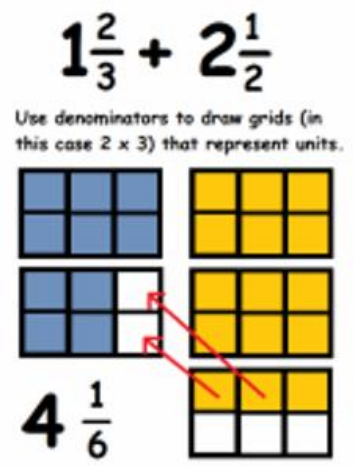
Year 6



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



OR

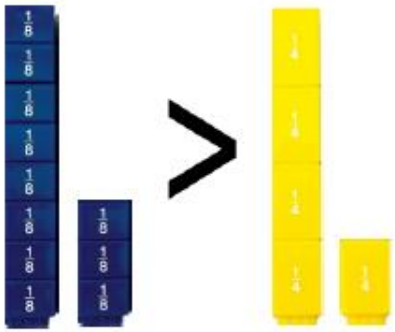


$$1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$$

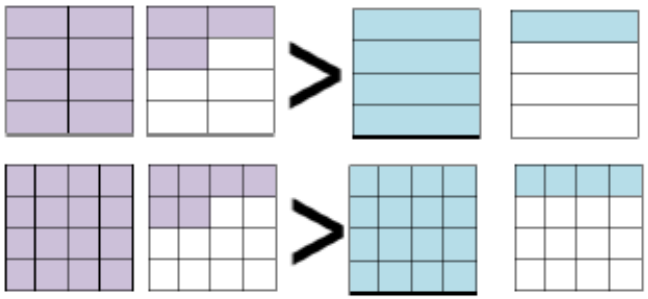
because $1\frac{1}{2} = \frac{3}{2}$

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

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

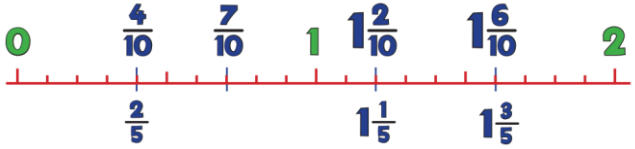


- **Compare and order fractions including fractions >1.**



$$\frac{7}{8} > \frac{3}{4} > \frac{5}{8} > \frac{1}{2} > \frac{1}{4}$$

$$0.875 > 0.75 > 0.625 > 0.5 > 0.25$$



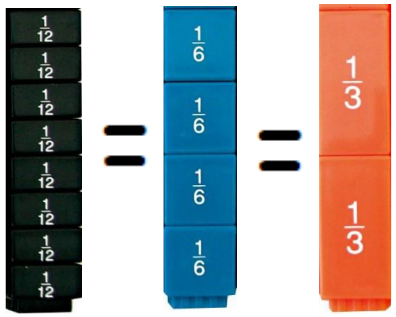
Which is greater?

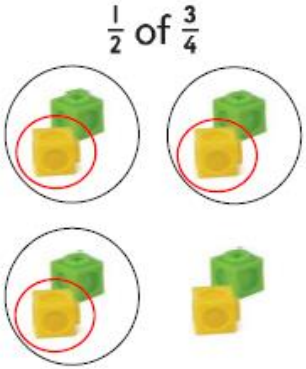
$$\frac{2}{8} < \frac{6}{16}$$

Ordering from smallest to largest by using equivalent fractions:

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

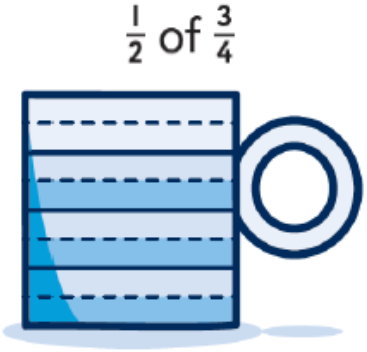
$$\frac{5}{12}, \frac{8}{12}, \frac{10}{12}$$



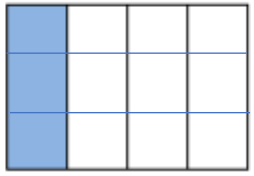


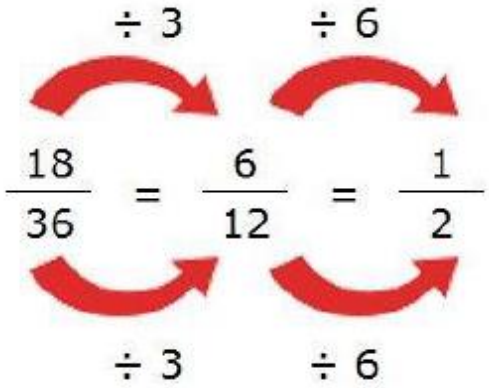
- **Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.**

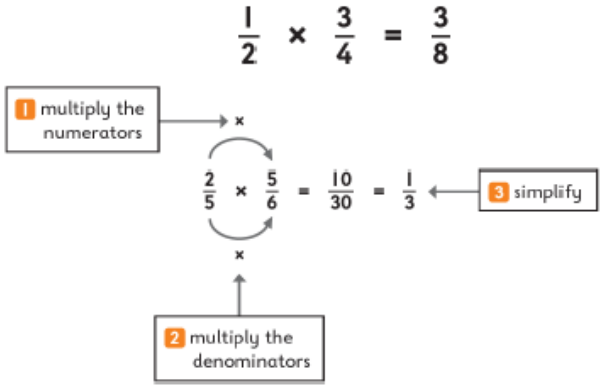
- **Multiply simple pairs of proper fractions, writing the answer in its simplest form.**

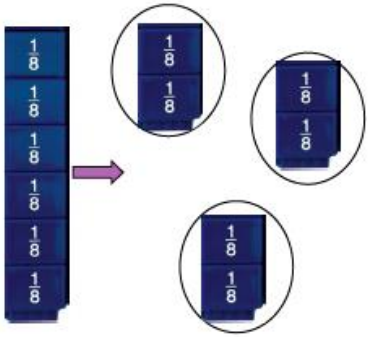


Use the diagram below to work out $\frac{1}{3} \times \frac{1}{4}$





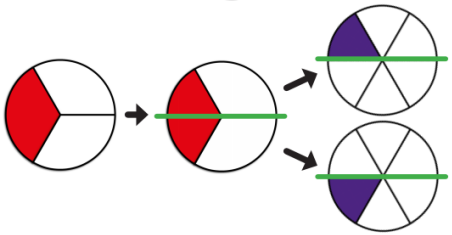




- **Divide proper fractions by whole numbers.**

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

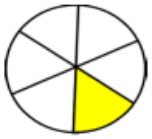
$\frac{1}{3} \div 2 = \frac{1}{6}$



Use the diagrams to help you calculate:

$\frac{3}{4} \div 3$

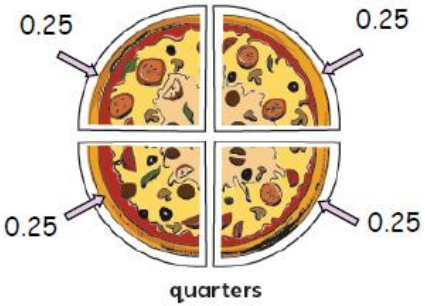
$\frac{1}{6} \div 3$



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

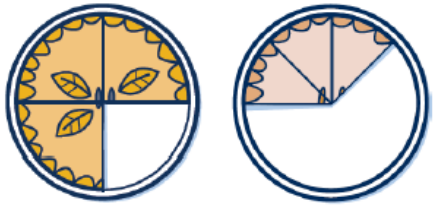
Keep it, change it, flip it!

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



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

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

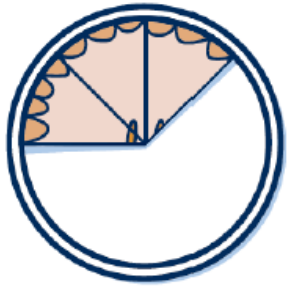


75%

$\frac{3}{8}$

- **Associate fractions with division and calculate decimal fraction equivalents.**

3 slices of pie 'out of' 8



$\frac{3}{8}$

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?

= 0.25m

$\frac{3}{8}$

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

3 ÷ 8 = 0·375

So $\frac{3}{8}$ = 0·375