The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.
At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.
By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages.
Pupils should read, spell and pronounce mathematical vocabulary correctly.

Children at Raeburn Primary will be exposed to a mastery curriculum and within this will have many opportunities to develop and deepen their understanding of mathematical procedures and concepts. They will be exposed to a range of concrete, pictorial and abstract representations as well as intelligent practice to embed their learning. We want our children to be fluent mathematicians and to be able to recognise patterns and sequences within number so that they are prepared for the future. We contextualise our mathematics and include as many real world examples as possible to allow all children to access the curriculum.

Concrete resources we use include: rekenrek, tens frame, red and yellow counters, numicon, number lines, dienes, place value counters
Pictorial representations we use include: bar model, number line, part-part-whole model, place value chart, gattegno chart

Year 5 Objectives	Year 6 Objectives
• 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. • identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers • know and use the vocabulary of prime numbers, prime factors and composite (nonprime) numbers	• multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication • divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context • divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context • perform mental calculations, including with mixed operations and large numbers • identify common factors, common multiples and prime numbers • use their knowledge of the order of operations to carry out

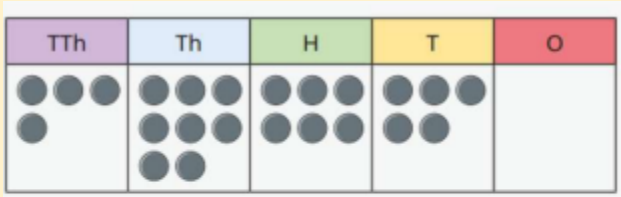
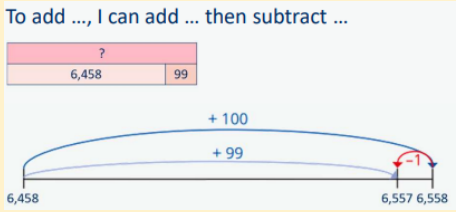
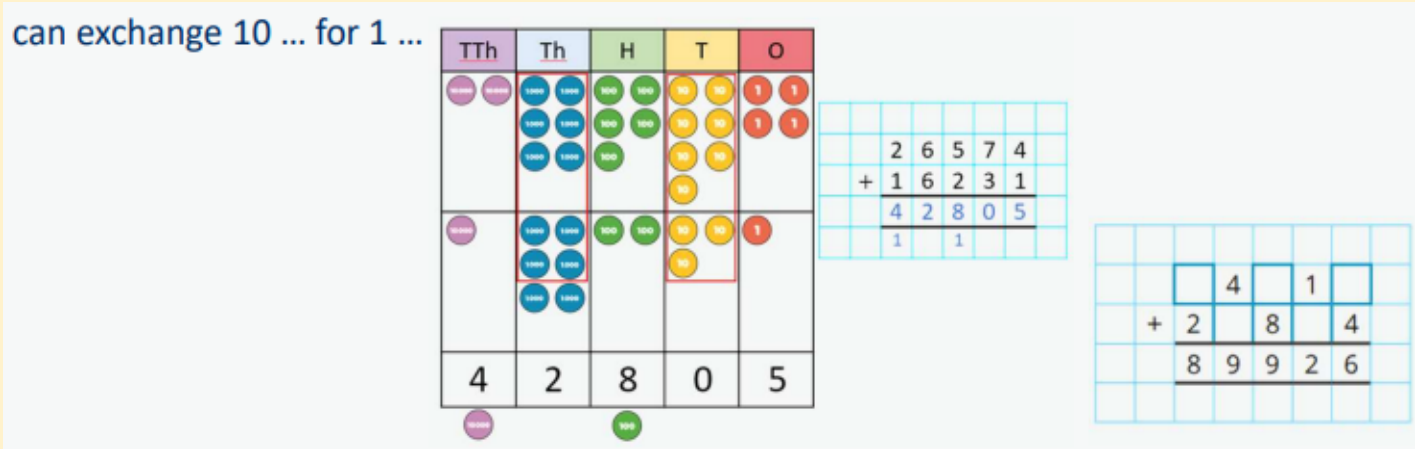
● establish whether a number up to 100 is prime and recall prime numbers up to 19 ● multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers ● multiply and divide numbers mentally drawing upon known facts ● divide 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 ● multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 ● recognise and use square numbers and cube numbers, and the notation for squared (²) and cubed (³) ● solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes ● solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign ● solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.	calculations involving the four operations ● solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why ● solve problems involving addition, subtraction, multiplication and division ● use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Year 5 small steps				**Year 6 small steps**			
Addition	**Subtraction**	**Multiplication**	**Division**	**Addition**	**Subtraction**	**Multiplication**	**Division**
5	**5**	**9**	**4**	**5**	**5**	**7**	**11**

Addition

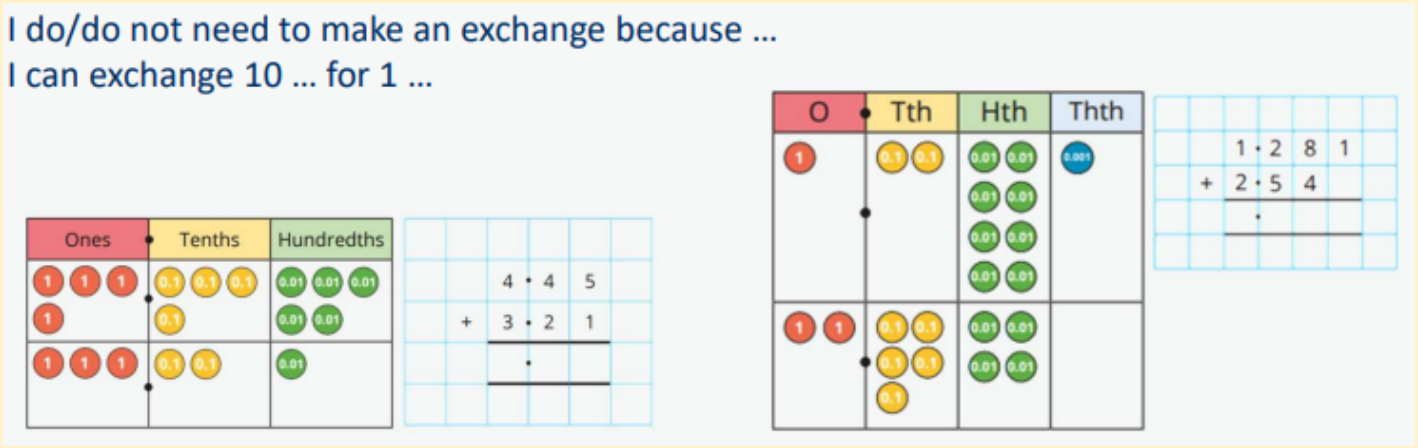
Key language:
whole, part, ones, ten, tens, number bond, add, addition, plus, total, altogether, subtract, subtraction, find the difference, take away, minus, less, more, group, equal, equals, is equal to, equal groups, addend, sum, commutative

Addend plus addend equals the sum
addend + addend = sum

Progression of skills	Key representations		
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**
Add using mental strategies - Add 1s, 10s, 100s, etc. to any number. - Use number bonds and related facts.	 48,650 + 300 = 48,650 + 30,000 = 48,650 + 30 =		
Add whole numbers with more than 4 digits - Encourage children to estimate and use inverse operations to check answers to calculations.			

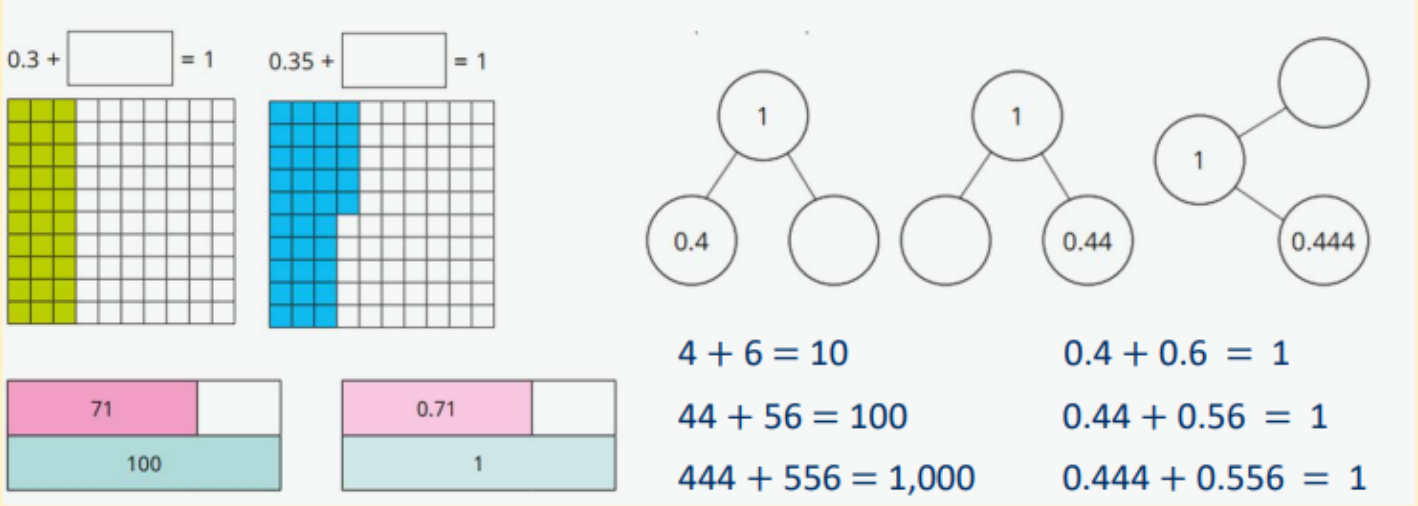
Add decimals with up to 2 decimal places

- Progress from the same number of decimal places to a different number of decimal places, and from no exchange to exchange.



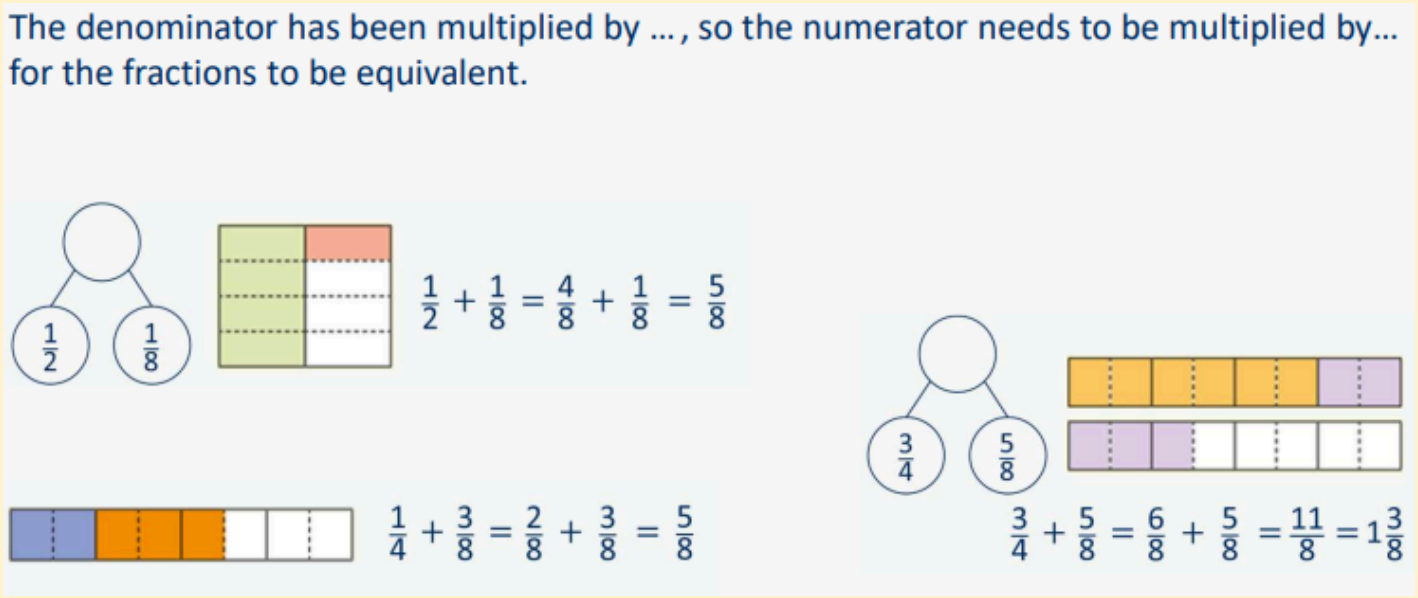
Complements to 1

- Pairs of numbers with up to 3 decimal places which total 1
- Encourage children to make links with bonds to 10 and complements to 100 and 1,000



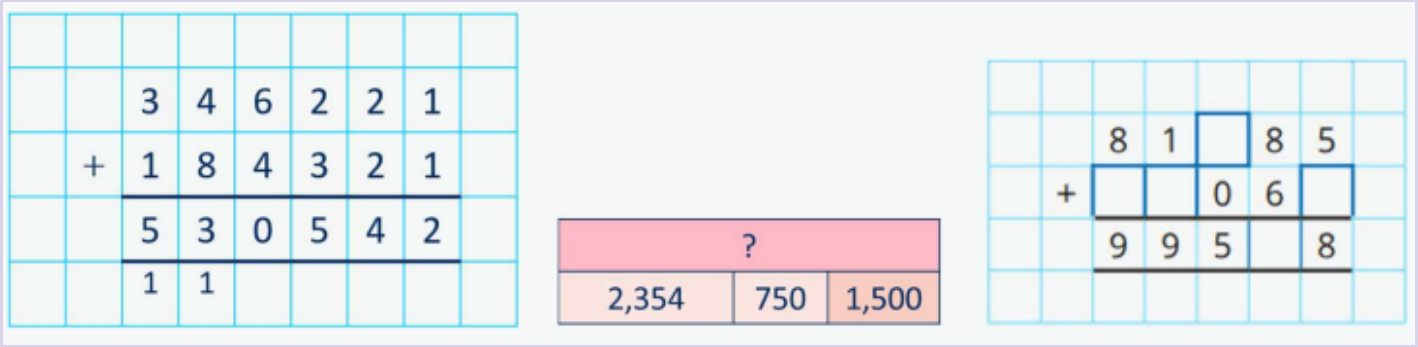
Add fractions with denominators that are a multiple of one another

- Encourage children to convert fractions to the same denominator before adding.
- Progress from adding fractions within 1 whole to adding fractions beyond 1 whole



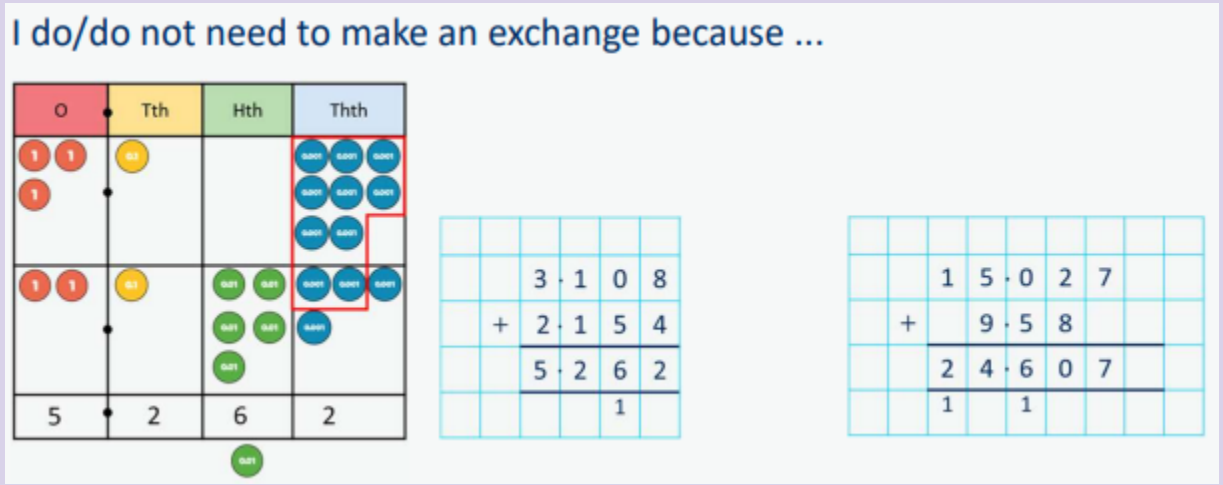
Add integers up to 10 million

- Encourage children to estimate and use inverse operations to check answers to calculations



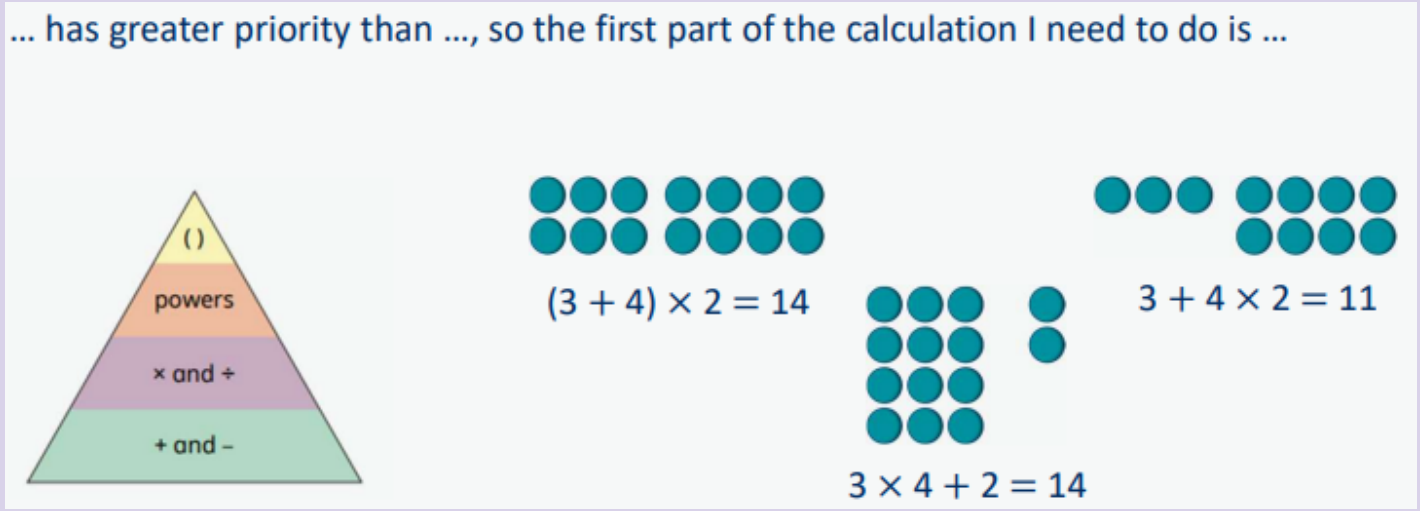
Add decimals with up to 3 decimal places

- Progress to numbers with digits in different place value columns.
- Encourage children to check that they have lined up the columns correctly



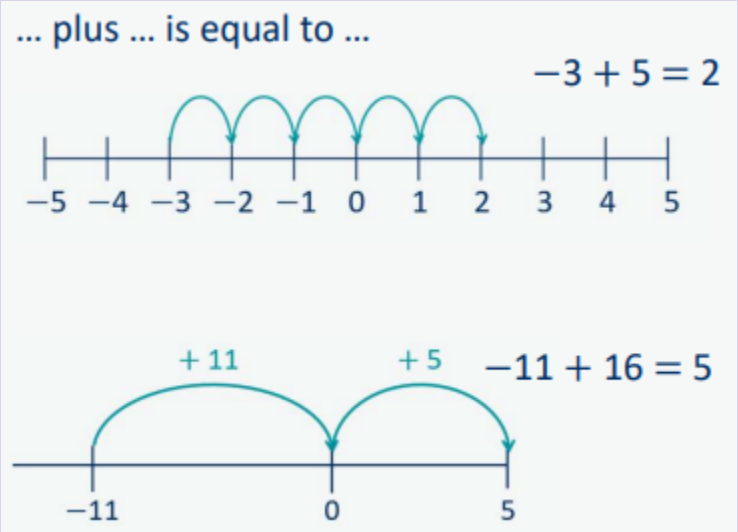
Order of operations

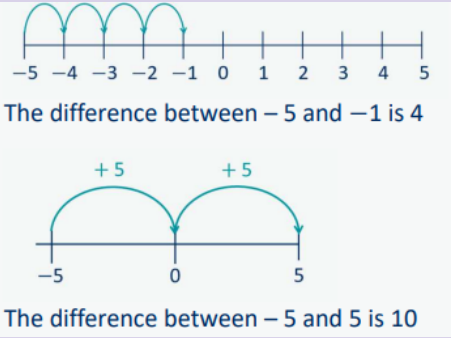
- Calculations in brackets should be done first. Multiplication and division should be performed before addition and subtraction.
- When no brackets are shown and the operations have the same priority, work left to right.



Negative numbers

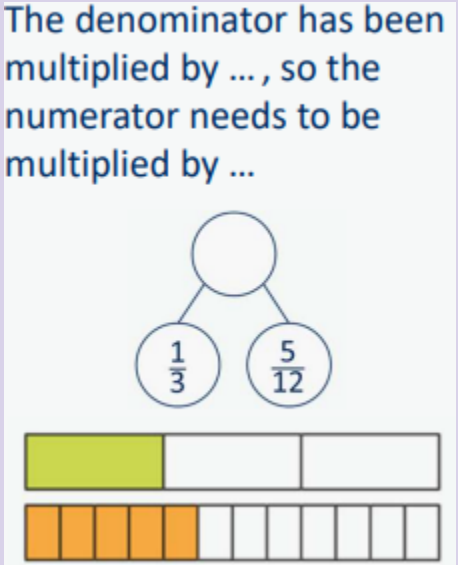
- Children add to negative numbers and carry out calculations which cross 0

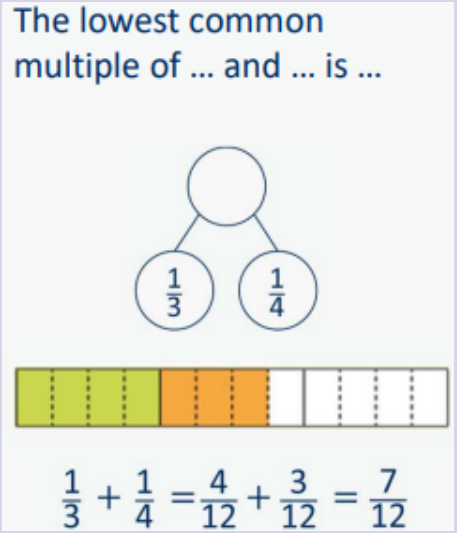


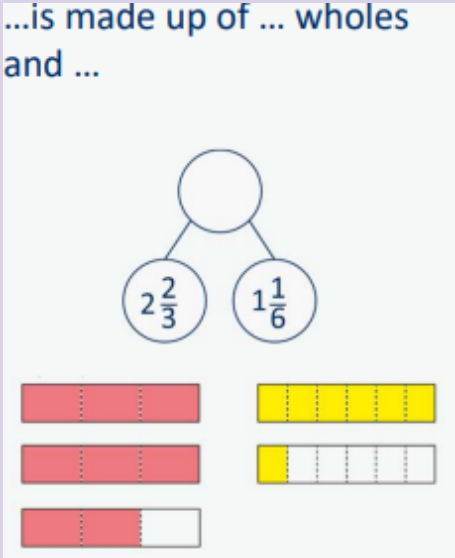


Add fractions

- Convert fractions to the same denominator before adding.
- Progress from fractions where one denominator is a multiple of the other, to any fractions and then to mixed numbers.



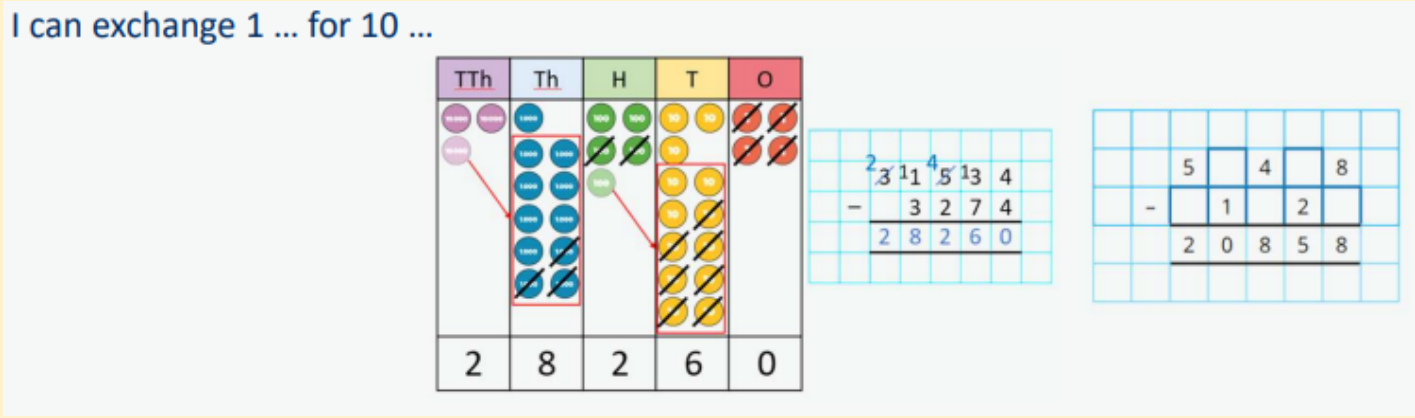
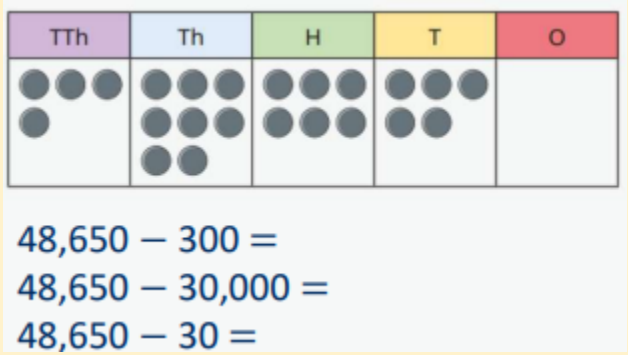
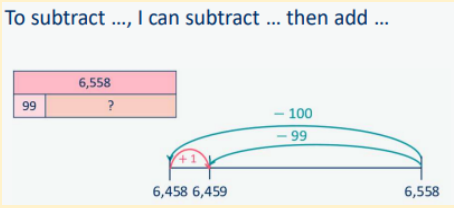


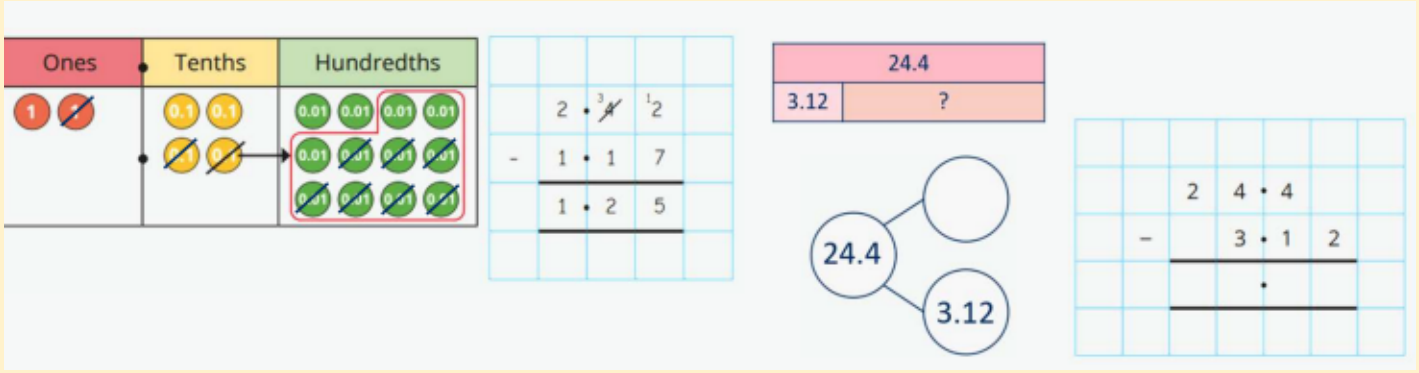
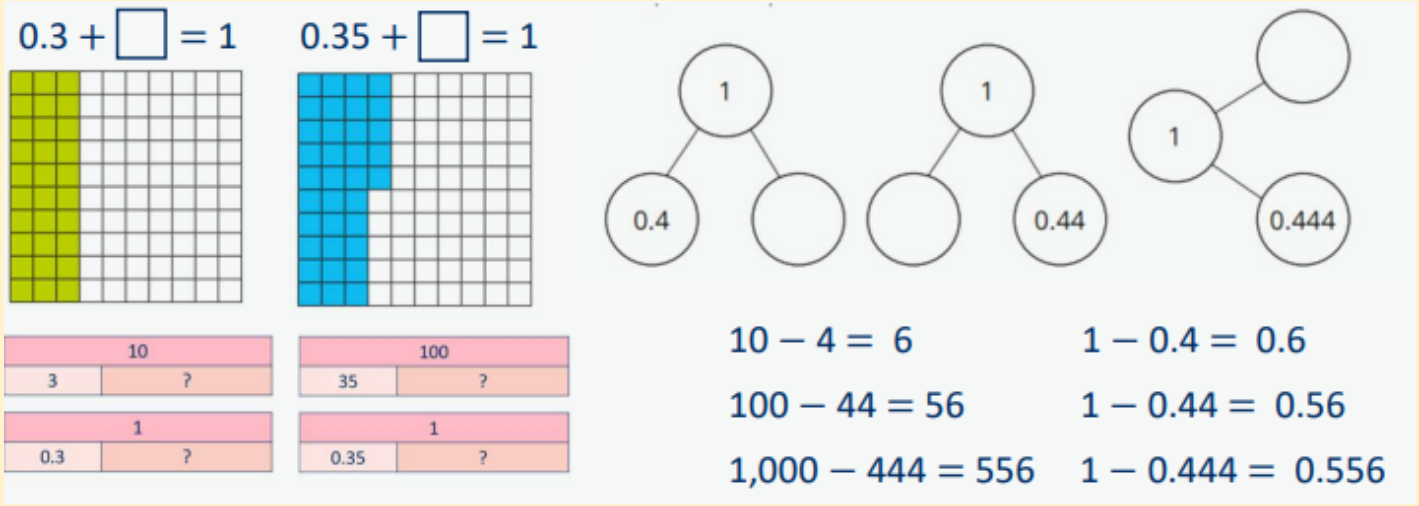


Subtraction

Key language:
whole, part, ones, ten, tens, number bond, add, addition, plus, total, altogether, subtract, subtraction, find the difference, take away, minus, less, more, group, equal, equals, is equal to, equal groups, addend, sum, subtrahend, minuend

Minuend minus subtrahend equals the difference.
minuend - subtrahend = the difference

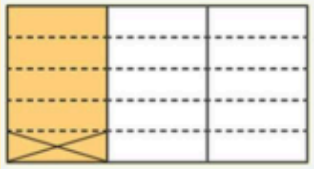
Progression of skills	Key representations		
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**
Subtract whole numbers with more than 4 digits - Encourage children to estimate and use inverse operations to check answers to calculations.			
Subtract using mental strategies - Subtract 1s, 10s, 100s etc from any number. Use number bonds and related facts.			

Subtract decimals with up to 2 decimal places - Progress from the same number of decimal places to a different number of decimal places and from no exchange to exchange.	
Complements to 1 - Encourage children to make links with bonds to 10 and complements to 100 and 1,000 when finding a missing part or subtracting from 1	

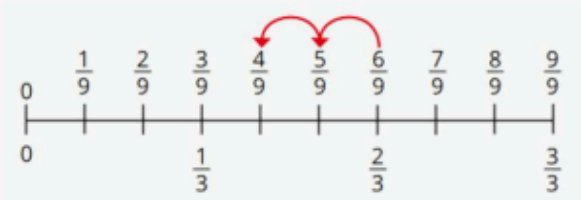
Subtract fractions with denominators that are a multiple of one another

- Convert fractions to the same denominator before subtracting.
- Progress from subtracting fractions within 1 whole to subtracting from a mixed number.

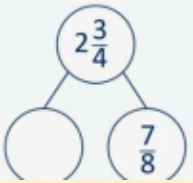
The denominator has been multiplied by … , so the numerator needs to be multiplied by… for the fractions to be equivalent.

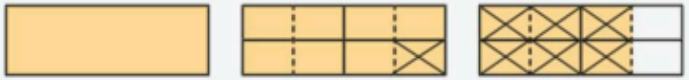


$\frac{1}{3} - \frac{1}{15} = \frac{5}{15} - \frac{1}{15} = \frac{4}{15}$



$\frac{2}{3} - \frac{2}{9} = \frac{6}{9} - \frac{2}{9} = \frac{4}{9}$





Subtract integers up to 10 million

- Encourage children to estimate and use inverse operations to check answers to calculations.

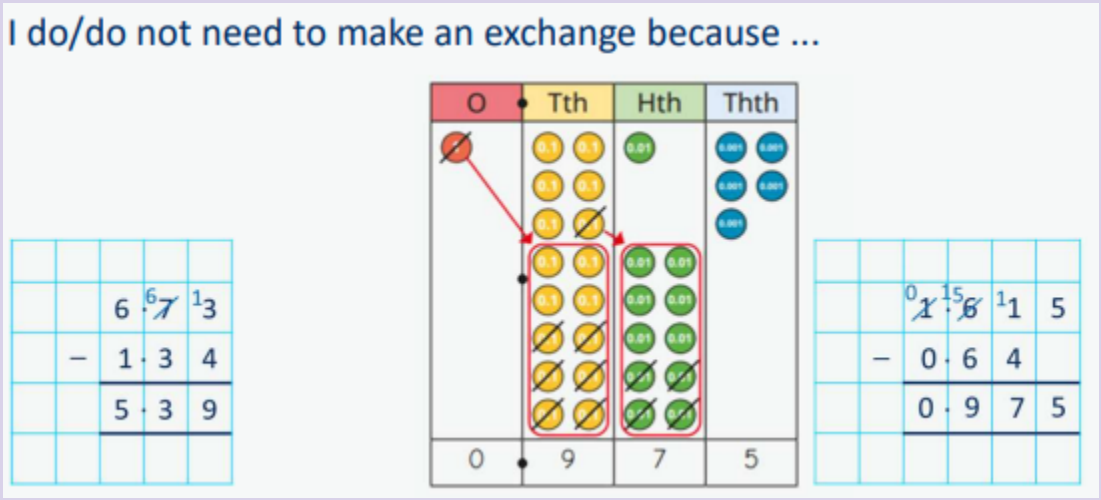
		2 3	1 4	5 6	1 2	2	1
	−	1	8	4	3	2	1
		1	6	1	9	0	0

4,604		
2,354	750	?

	8		4	8	5	
−	3	6				4
		5	5	5	5	5

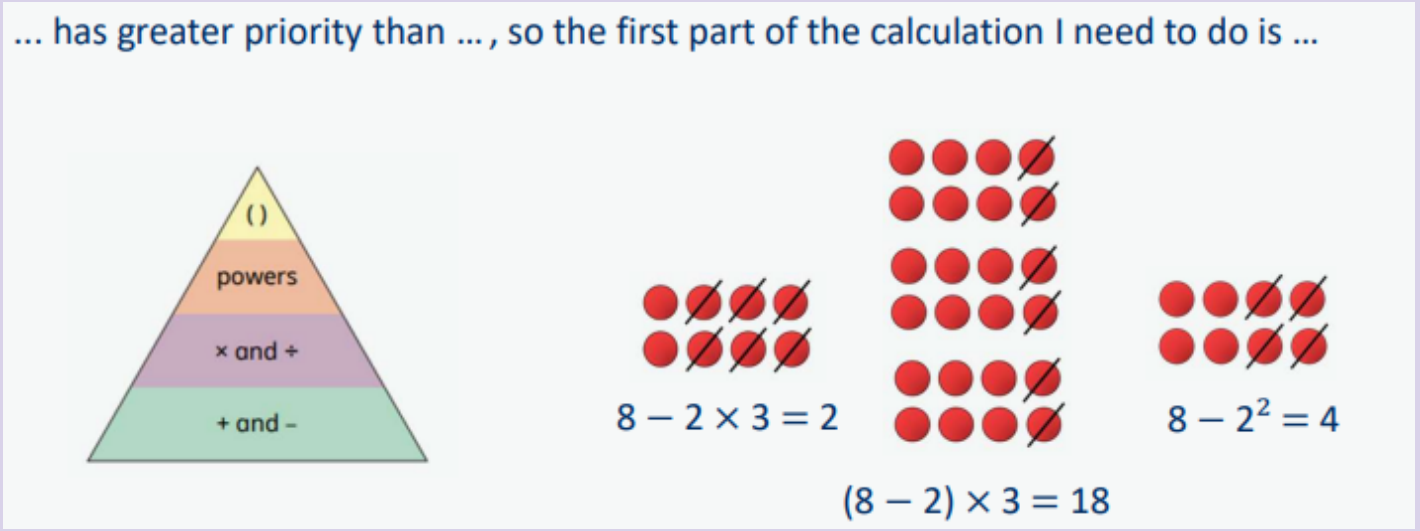
Subtract decimals with up to 3 decimal places

- Progress from the same number of decimal and whole number places to a different number of decimal and whole number places



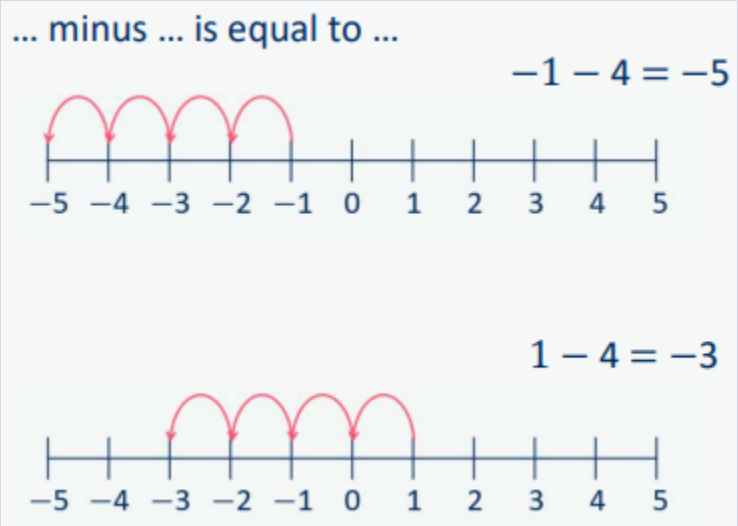
Order of operations

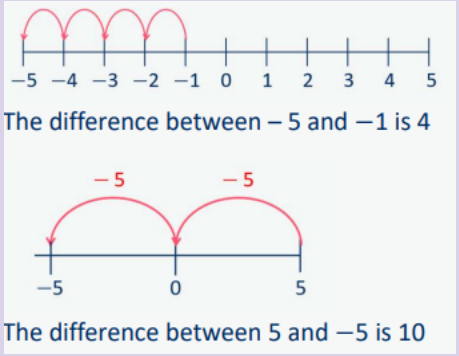
- Children learn the order of priority for operations in a calculation.
- Calculations in brackets should be done first.
- Multiplication and division should be performed before addition and subtraction.



Negative numbers

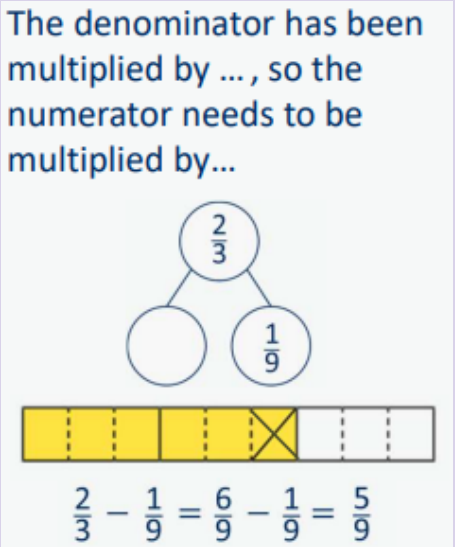
- Children subtract from positive and negative numbers and calculate intervals across 0

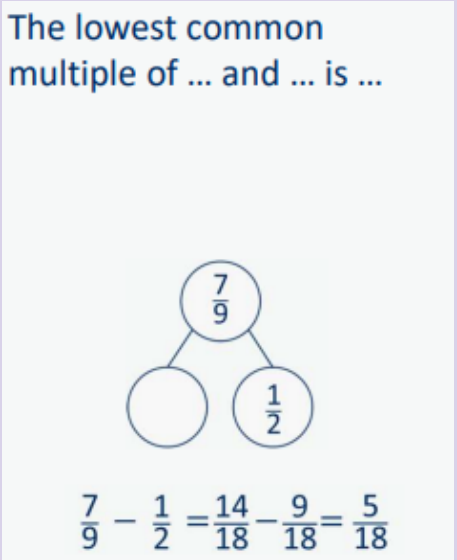


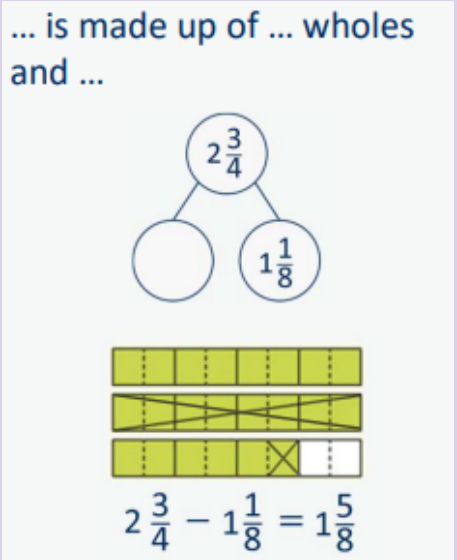


Subtract fractions

- Convert fractions to the same denominator before subtracting.
- Progress from fractions where one denominator is a multiple of the other, to any fractions and then subtracting from a mixed number.



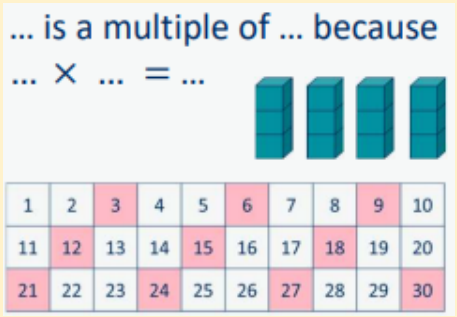
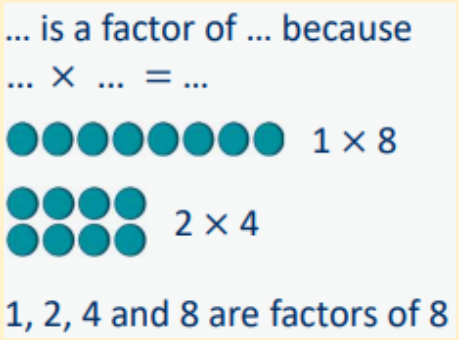
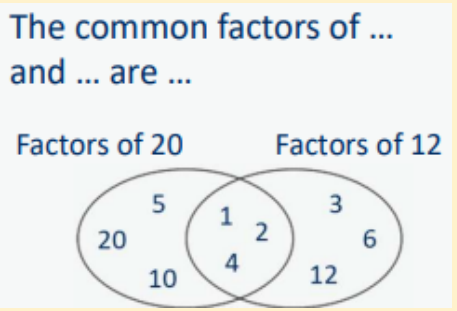
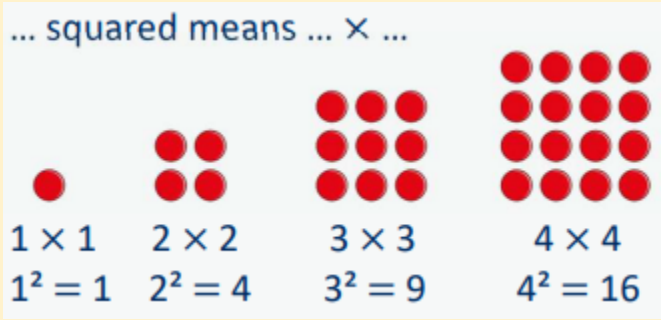
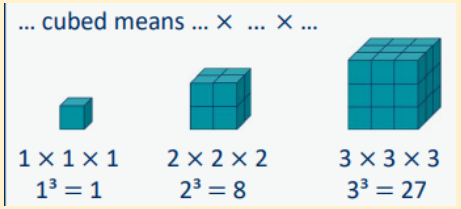




Multiplication

Key language:
Factor, multiply, times by, group, repeated addition, multiplicative, equal, multiple, times table, commutative, equal groups, altogether, odd, even, column, row, scale

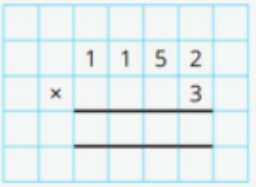
Factor multiplied by factor equals the product
Factor x factor = product

Progression of skills	Key representations		
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**
Multiples and factors - Encourage children to notice patterns and make links with known facts.			
Square and cube numbers			

Multiply numbers up to 4 digits by a 1-digit number

- This builds on the short multiplication method introduced in Y4

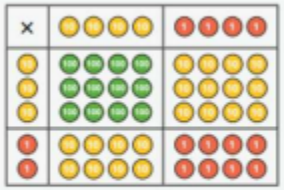
To multiply a 4-digit number by … , I multiply the ones by … , the tens by … , the hundreds by … and the thousands by …



Multiply numbers up to 4 digits by a 2-digit number

- Numbers are first partitioned using an area model then long multiplication is introduced for the first time.

I can partition … into … and …

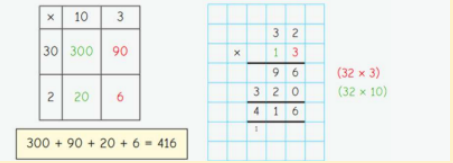


×	40	4
30	1,200	120
2	80	8

$32 \times 44 = 1{,}200 + 80 + 120 + 8$

$32 \times 44 = 1{,}408$

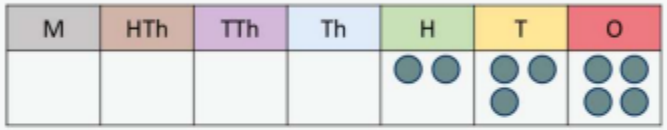
First, I multiply by the … Then I multiply by the …

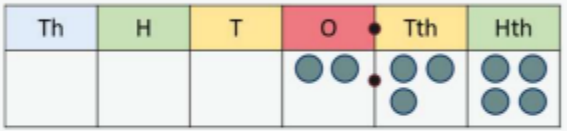


Multiply by 10, 100 and 1,000

- Some children may overgeneralise that multiplying by a power of 10 always results in adding zeros.
- This will cause issues later when multiplying decimals.

To multiply by 10/100/1,000, I move all the digits … places to the left.
… is 10/100/1,000 times the size of …





$234 \times 10 = 2{,}340$

$234 \times 100 = 23{,}400$

$234 \times 1{,}000 = 234{,}000$

$2.34 \times 10 = 23.4$

$2.34 \times 100 = 234$

$2.34 \times 1{,}000 = 2{,}340$

Mental strategies

- Children continue to use efficient mental strategies such as partitioning and knowledge of factor pairs and related facts to multiply.

The most efficient strategy to calculate … × … is …
To calculate … × 12, I can do … × … × …

For example: 121 × 12
I could calculate 100 × 12 plus 20 × 12 plus 1 × 12
I could calculate 121 × 10 plus 121 × 2
I could calculate 121 × 6 × 2
I could calculate 121 × 4 × 3

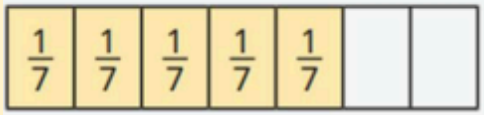
Multiply fractions by a whole number

- Make links with repeated addition.

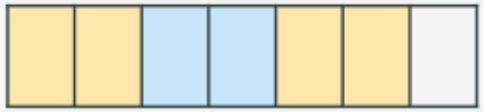
E.g. $\frac{1}{5} \times 4 = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$

-

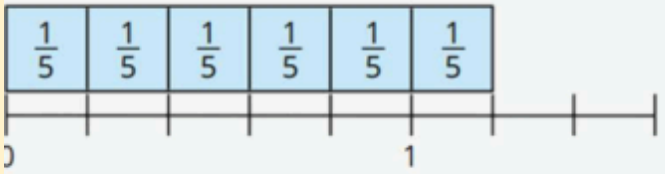
To multiply a fraction by an integer, I multiply the numerator by the integer and the denominator remains the same.



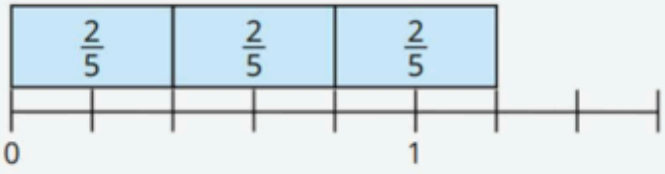
$\frac{1}{7} \times 5 = \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{5}{7}$



$\frac{2}{7} \times 3 = \frac{2}{7} + \frac{2}{7} + \frac{2}{7} = \frac{6}{7}$

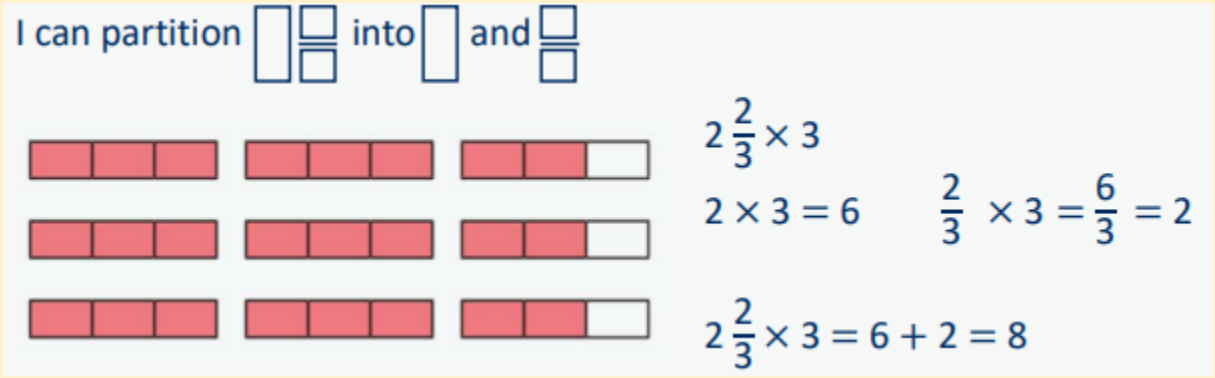


$\frac{1}{5} \times 6 = \frac{6}{5} = 1\frac{1}{5}$



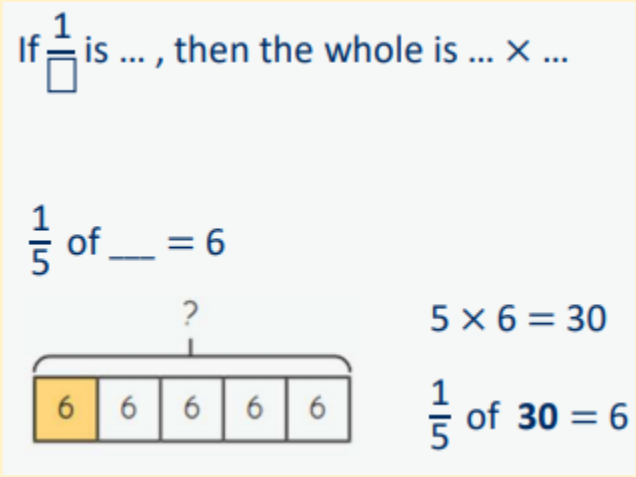
$\frac{2}{5} \times 3 = \frac{6}{5} = 1\frac{1}{5}$

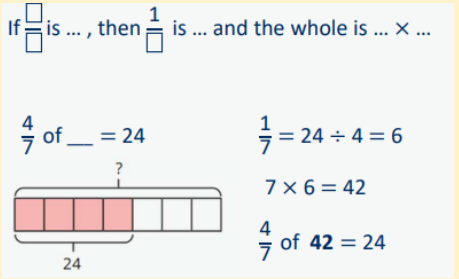
Multiply mixed numbers by a whole number



Find the whole

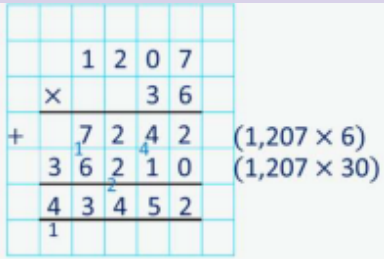
- Children multiply to find the whole from a given part.





Multiply numbers up to 4 digits by a 2-digit number

To multiply by a 2-digit number, first multiply by the ones, then multiply by the tens and then find the total.

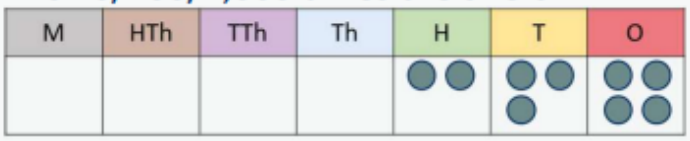


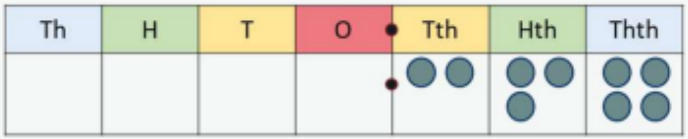
Multiply by 10, 100 and 1,000

- Some children may overgeneralise that multiplying by a power of 10 always results in adding zeroes.

To multiply by 10/100/1,000, I move all the digits … places to the left.

… is 10/100/1,000 times the size of …





$234 \times 10 = 2{,}340$

$234 \times 100 = 23{,}400$

$234 \times 1{,}000 = 234{,}000$

$0.234 \times 10 = 2.34$

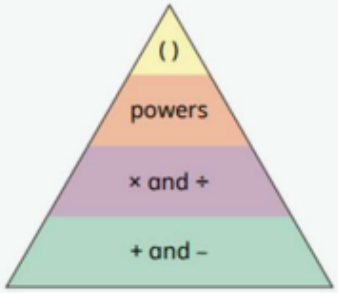
$0.234 \times 100 = 23.4$

$0.234 \times 1{,}000 = 234$

Order of operations

- Calculations in brackets should be done first.
- Multiplication and division should be performed before addition and subtraction.

… has greater priority than …, so the first part of the calculation I need to do is …



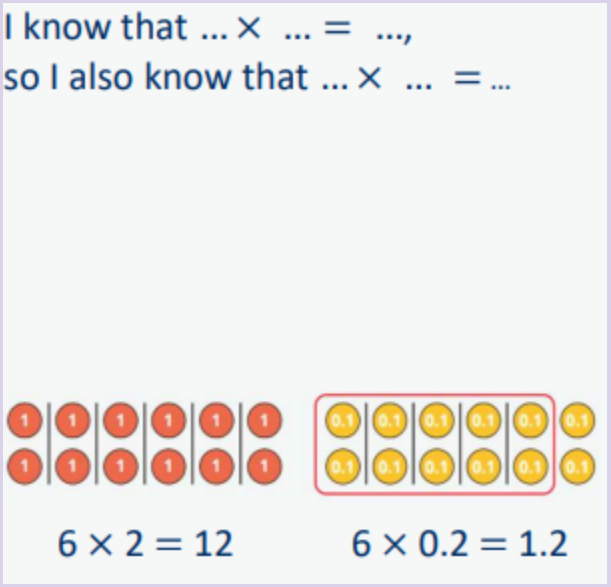
$(3 + 4) \times 2 = 14$

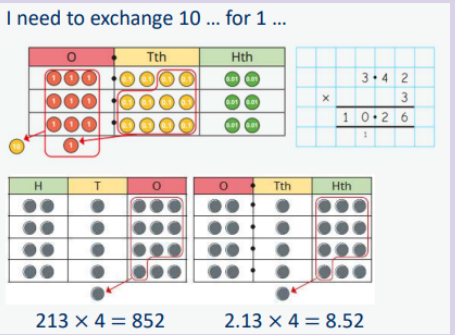
$3 + 4^2 = 19$

$3 + 4 \times 2 = 11$

Multiply decimals by integers

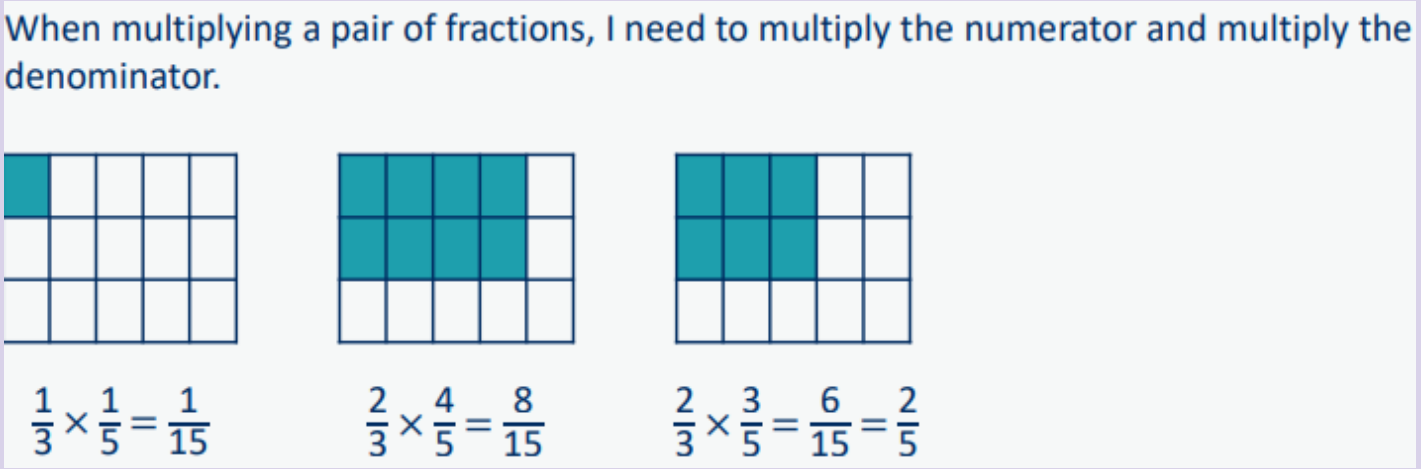
- This is the first time children multiply decimals by numbers other than 10, 100 or 1,000
- Encourage them to make links with known facts and whole number multiplication.





Multiply fractions by fractions

- Encourage children to give answers in their simplest form. (but not essential)

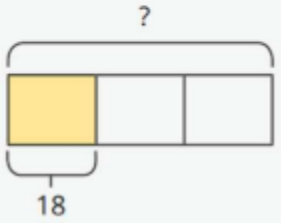


Find the whole

- Children multiply to find the whole from a given part.

If $\frac{1}{\square}$ is … , then the whole is … × …

$\frac{1}{3}$ of ___ = 18

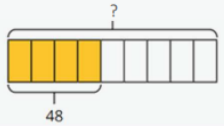


18 × 3 = 54

$\frac{1}{3}$ of **54** = 18

If $\frac{\square}{\square}$ is … , then $\frac{1}{\square}$ is … and the whole is … × …

$\frac{4}{9}$ of ___ = 48



$\frac{1}{9}$ = 48 ÷ 4 = 12

9 × 12 = 108

$\frac{4}{9}$ of **108** = 48

Calculate percentages

- Children first learn how to find 1%, 10%, 20%, 25% and 50% before using multiples of these amounts to find any percentage.

There are … lots of … % in 100%
To find … %, I need to divide by …

100%			
50%		50%	
25%	25%	25%	25%

50% of … = …÷ 2
25% of … = …÷ 4

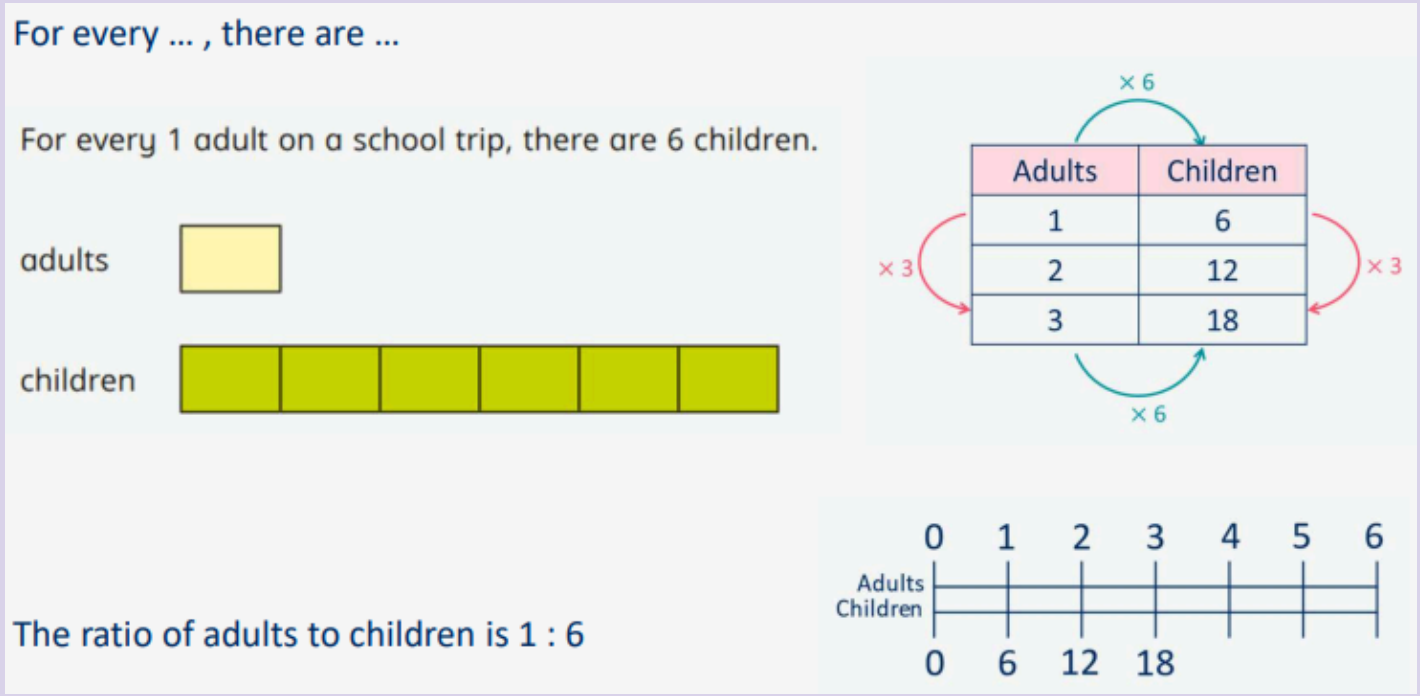
… % is made up of … %, and … %

100%									
10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

To find 30%, I can find 10% and then multiply it by 3
To find 23%, I can use 10% × 2 and 1% × 3
To find 99%, I can find 1%, then subtract from 100%

Calculations involving ratio

- Encourage children to see the multiplicative relationship between ratios.
- They will need to multiply or divide each value by the same number to keep the ratio equivalent.
- Double number lines and ratio tables help children to see both horizontal and vertical multiplicative relationships.

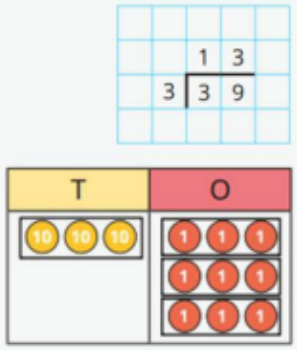


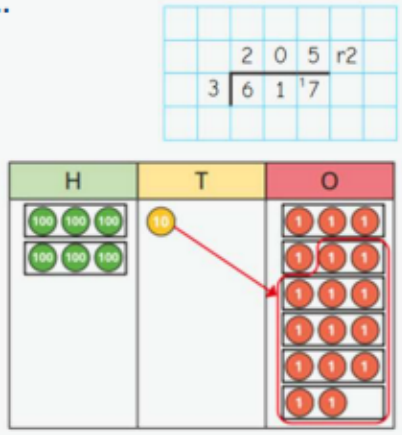
Division

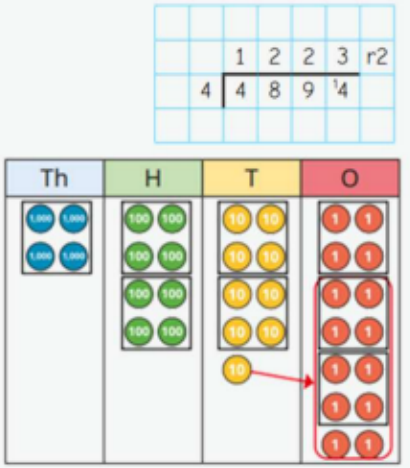
Key language:
Factor, multiply, times by, group, repeated addition, multiplicative, equal, multiple, times table, commutative, equal groups, altogether, odd, even, column, row, divide, share, share equally, dividend, divisor, quotient, unit fraction, non-unit fraction, double, half, quarter, third

Dividend divided by divisor equals the quotient
Dividend ÷ Divisor = quotient

Progression of skills	Key representations		
Objective and strategy	**Concrete**	**Pictorial**	**Abstract**
Mental strategies	I can partition … into … and … to help me to divide more easily. 436 ÷ 4 400 ÷ 4 36 ÷ 4	I can show groups of … on a number line. 100 × 4 9 × 4 0 400 436	To divide by …, I can divide by … and then divide the result by … 436 ÷ 4 = 436 ÷ 2 ÷ 2 436 ÷ 2 = 218 218 ÷ 2 = 109
Divide numbers up to 4 digits by a 1-digit number - The short division method is introduced for the first time. - Bus stop	There are … groups of … hundreds/tens/ones/ in … I can exchange 1 … for 10 …		

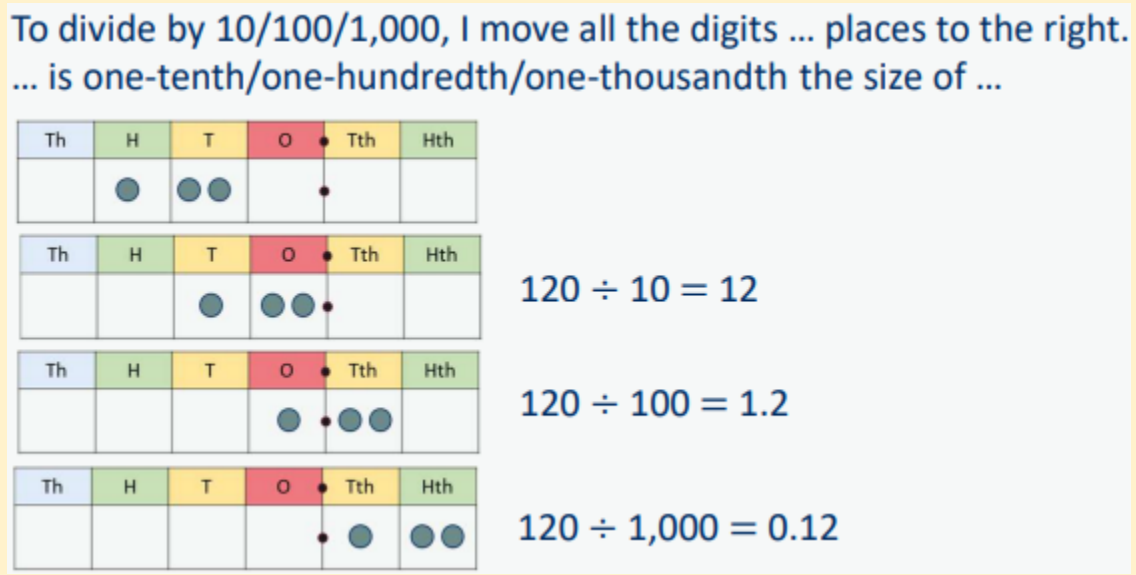






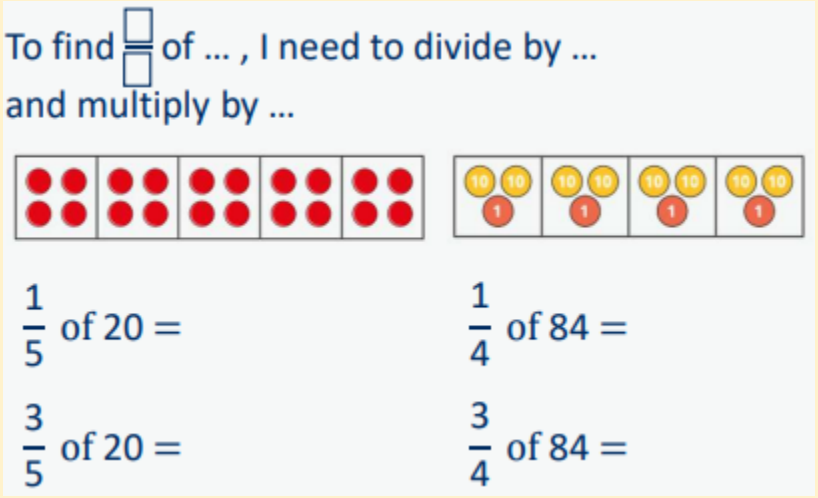
Divide by 10, 100 and 1,000

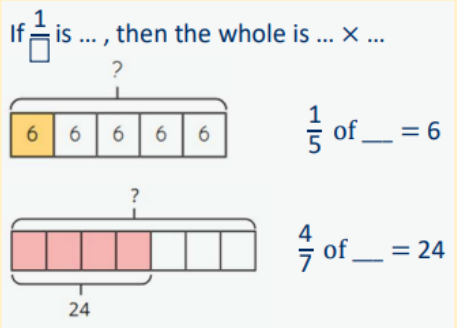
- Encourage children to notice that dividing by 100 is the same as dividing by 10 twice, and that dividing by 1,000 is the same as dividing by 10 three times.



Fraction of an amount

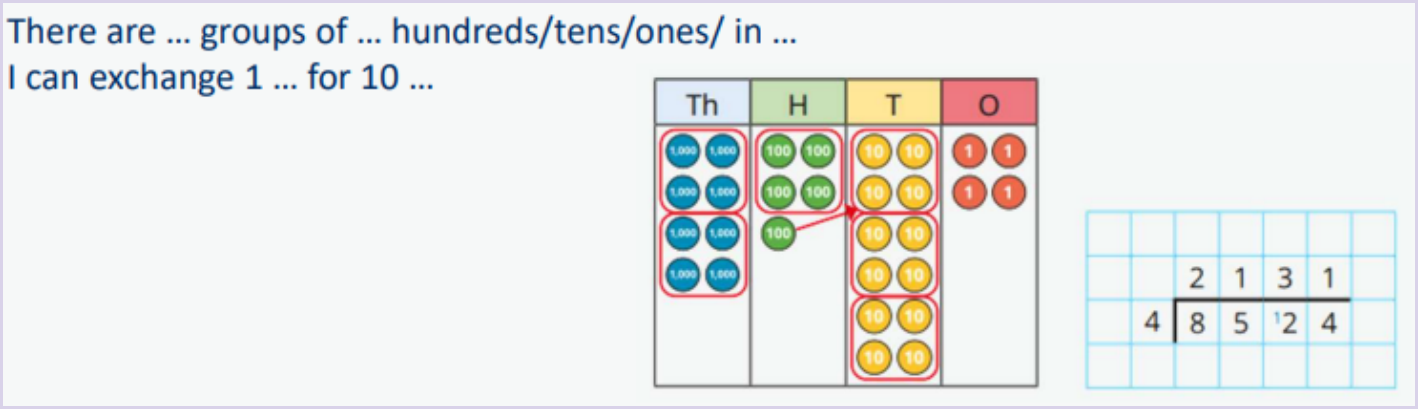
- Bar models support children to understand that to find a fraction of an amount, we divide by the denominator and multiply by the numerator.





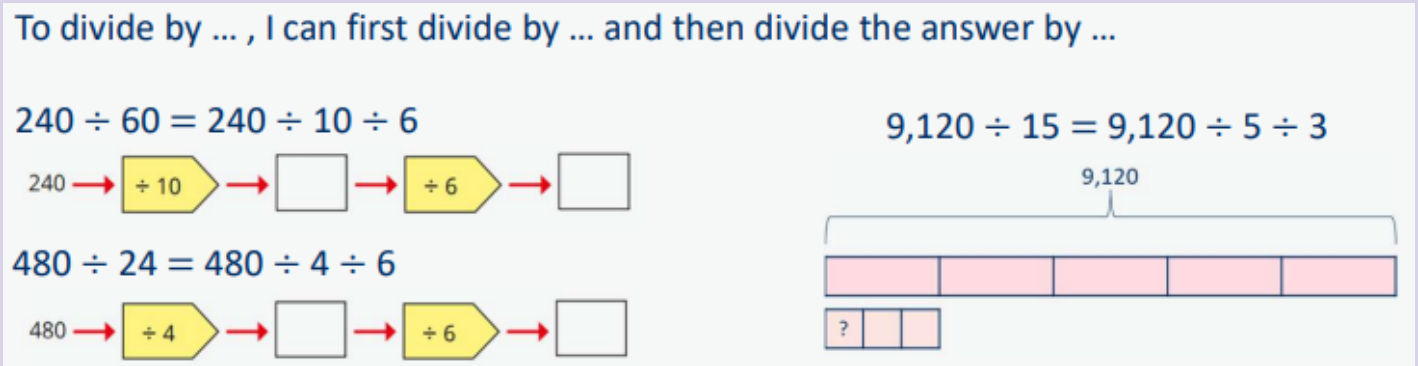
Short division

- Encourage children to interpret remainders in context, for example knowing that “4 remainder 1” could mean 4 complete boxes with 1 left over so 5 boxes will be needed.



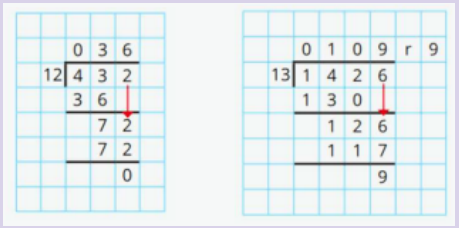
Mental strategies

- Include partitioning and number line strategies outlined in Y5 as well as division using factors.



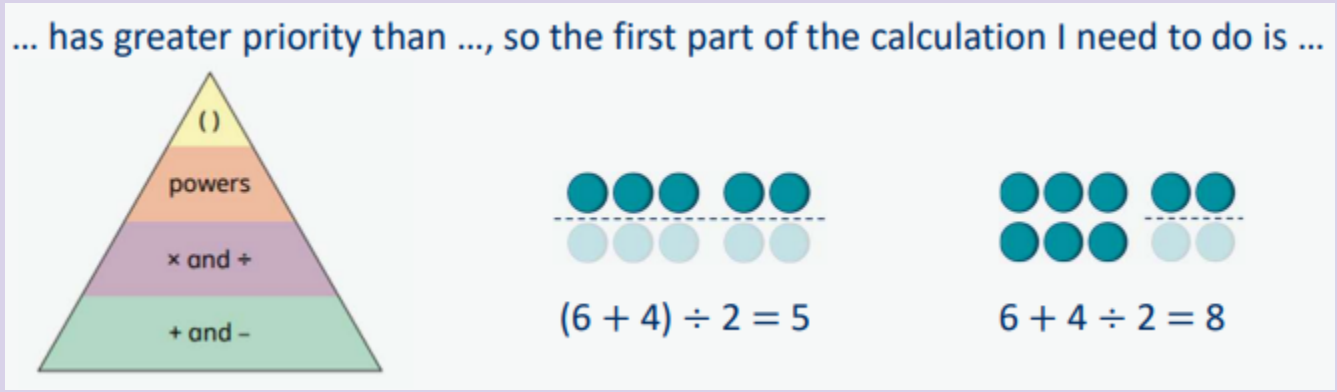
Long division

- The long division method is introduced for the first time.



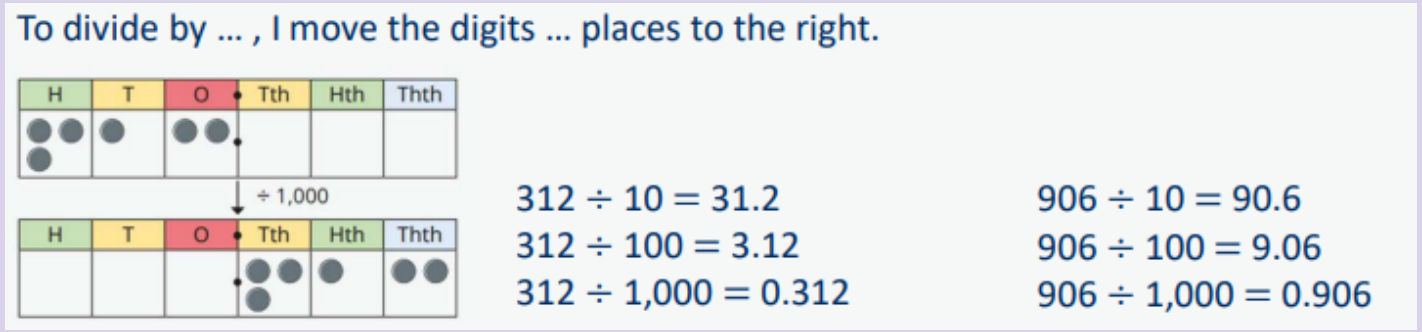
Order of operations

- Calculations in brackets should be done first, then powers.
- Multiplication and division should be performed before addition and subtraction.



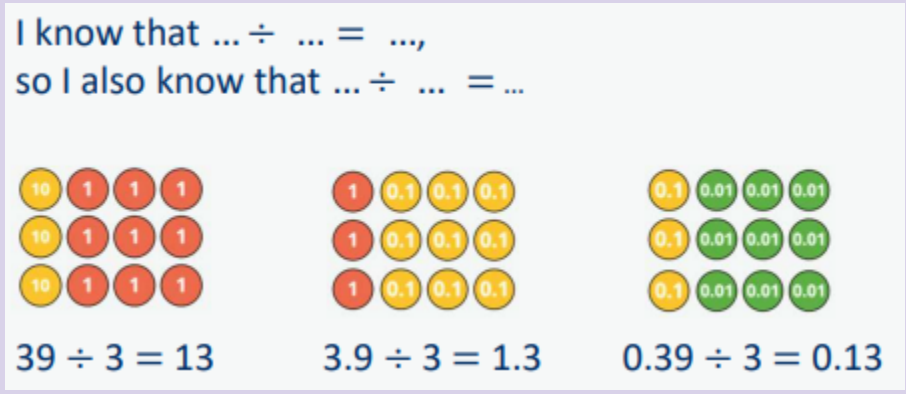
Divide by 10, 100 and 1,000

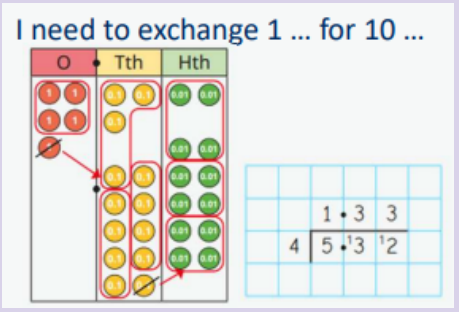
- Encourage children to notice that dividing by 100 is the same as dividing by 10 twice, and that dividing by 1,000 is the same as dividing by 10 three times.



Divide decimals by integers

- This is the first time children divide decimals by numbers other than 10, 100 or 1,000



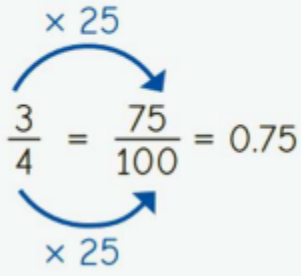


Decimal and fraction equivalents

The fraction … is equivalent to the decimal …

$\frac{1}{5} = 0.2$ $\frac{2}{5} = 0.4$ $\frac{3}{5} = 0.6$

$\frac{\square}{\square}$ is equal to $\frac{\square}{100}$



Divide a fraction by an integer

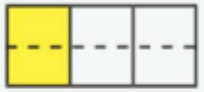
- This is the first time children divide fractions by an integer

… ones divided by 2 is … ones so … sevenths divided by 2 is … sevenths.

$\frac{4}{7} \div 4 = \frac{1}{7}$

$\frac{4}{7} \div 2 = \frac{2}{7}$

I am dividing by … , so I can split each part into … equal parts.



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

… is equivalent to …
so … ÷ … = … ÷ …

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

so $\frac{2}{3} \div 4 = \frac{4}{6} \div 4 = \frac{1}{6}$

Fraction of an amount

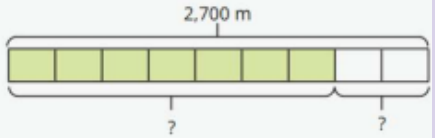
- Children divide and multiply to find fractions of an amount.
- Bar models can still be used to support understanding where needed.

To find $\frac{1}{\square}$ I divide by …

$\frac{1}{2}$ of $36 = 36 \div 2$

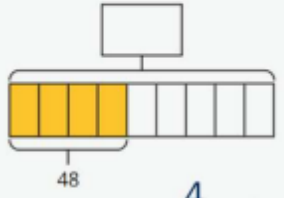
$\frac{1}{12}$ of $36 = 36 \div 12$

If $\frac{1}{\square}$ is equal to …, then $\frac{\square}{\square}$ are equal to …



$\frac{7}{9}$ of $2{,}700 = \frac{1}{9}$ of $2{,}700 \times 7$

If $\frac{\square}{\square}$ is equal to …, then the whole is equal to …



$\frac{4}{9}$ of ___ $= 48$

Calculate percentages

- Children first learn how to find 1%, 10%, 20%, 25% and 50% before using multiples of these amounts to find any percentage.

There are … lots of … % in 100%
To find … %, I need to divide by …

100%			
50%		50%	
25%	25%	25%	25%

50% of … = …÷ 2
25% of … = …÷ 4

… % is made up of … %, and … %

100%									
10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

To find 30%, I can find 10% and then multiply it by 3
To find 23%, I can use 10% × 2 and 1% × 3
To find 99%, I can find 1%, then subtract from 100%

Calculations involving ratio

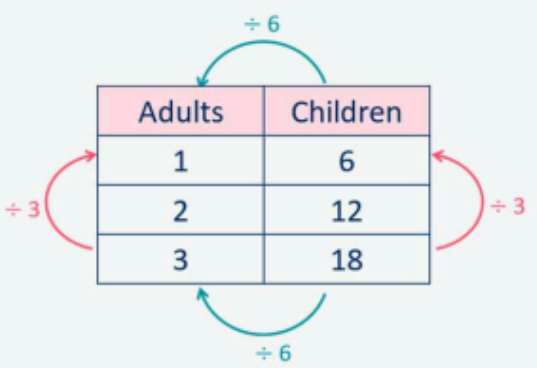
- Encourage children to see the multiplicative relationship between ratios.
- They will need to multiply or divide each value by the same number to keep the ratio equivalent.
- Double number lines and ratio tables help children to see both horizontal and vertical multiplicative relationships.

For every … , there are …

For every 6 children on a school trip, there is 1 adult.

adults

children



The ratio of children to adults is 6 : 1