MORLEY VICTORIA

Encouragement ★ Enjoyment ★ Success ★ Effort ★

Morley Victoria Calculation Policy

Aspire
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INVESTORS IN PUPILS

Leeds Inclusion Chartermark

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Addition

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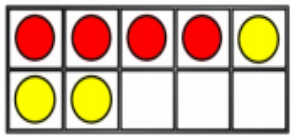
Progression in addition

Add 1-digit numbers within 10

Concrete



Derive +1 facts by placing Numicon on the baseboard with the matching whole piece.

E.g. 5 + 1 = 6

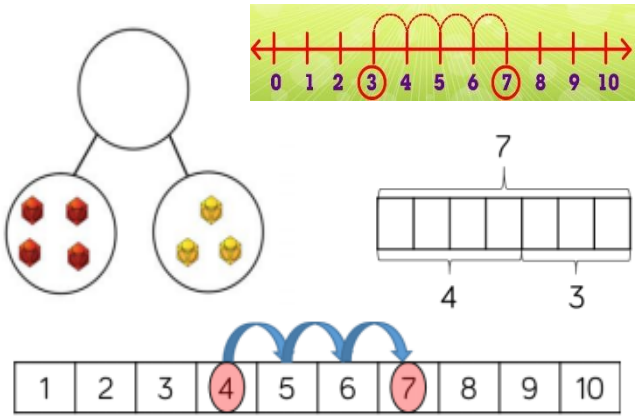
Adding together two numbers by placing Numicon on the baseboard with the matching whole piece.

E.g. 4 + 3 = 7

Placing counters on a tens frame to add two numbers together.

E.g. 4 + 3 = 7

Pictorial



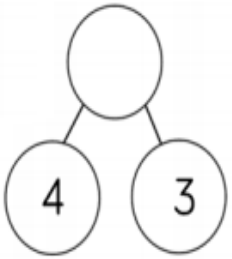
Children to use part-whole models, number tracks, bar models, and number lines to perform addition pictorially.

Placing counters on a tens frame to add two numbers together.

Abstract

$4 + 3 = 7$

$7 = 4 + 3$



Children to complete addition only using the abstract (numbers).

E.g. 4 + 3 = 7

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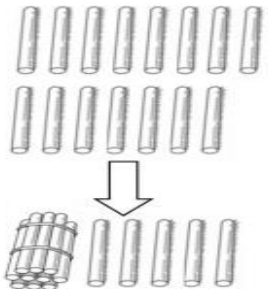
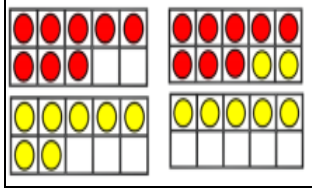
Progression in addition

Add 1-digit and 2-digit numbers to 20

Concrete



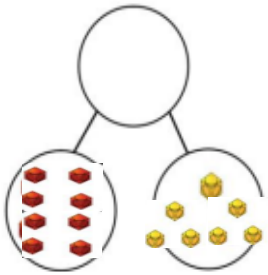


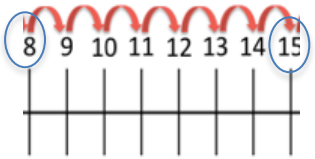
Adding together two numbers by finding the corresponding Numicon pieces and adding them together to find the answer.

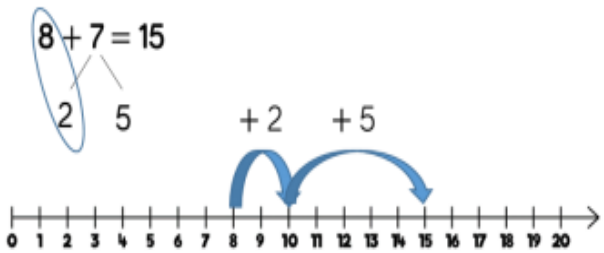
Crossing 10 can be achieved by 'exchange'. Children can group together '10 ones' and make '1 ten', add the remainder to find the answer. E.g. 8 + 7 =

Placing counters on a tens frame to add two numbers (to 20). Children make 10 before adding the remainder.

Pictorial



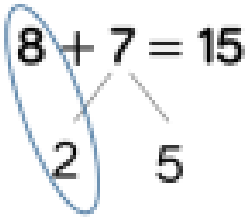


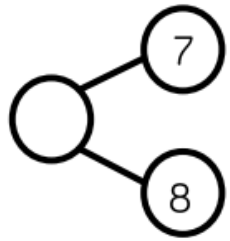


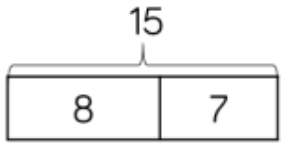
Children to use part-whole models, number tracks, bar models, and number lines to perform addition pictorially.

Abstract

$$8 + 7 = 15$$







Children to complete addition (to 20) only using the abstract (numbers).

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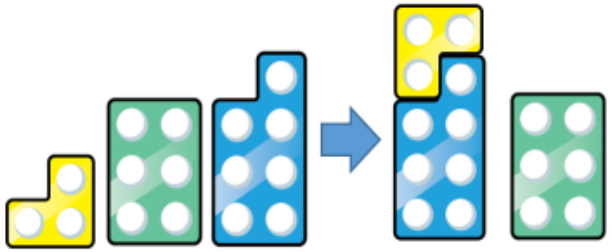
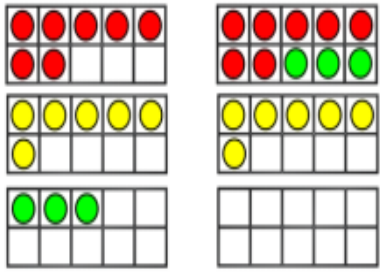
Progression in addition

Add three 1-digit numbers

Concrete

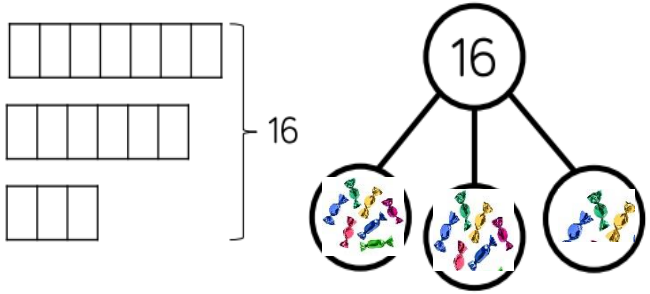


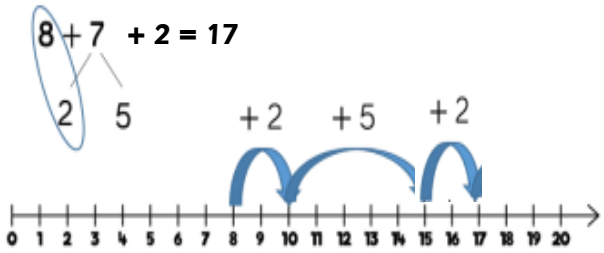
When adding three 1-digit numbers, children should be encouraged to find number bonds to 10 or doubles to add the numbers more efficiently.



Children to use counters and tens frames to add three 1-digit numbers by finding bonds to 10.

Pictorial

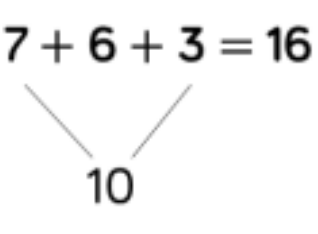


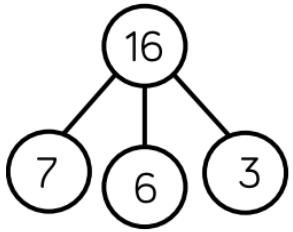


Children to use part-whole models, number tracks, bar models, and number lines to perform addition pictorially. Children to find common number bonds to 10 to help them calculate the answer.

Abstract

$$7 + 6 + 3 = 16$$





Children to complete addition of three 1-digit numbers using the abstract (numbers). Children again are encouraged to find bonds to 10 to help them calculate the answer.

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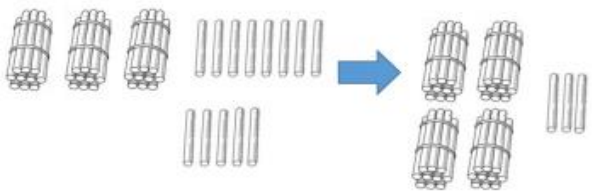
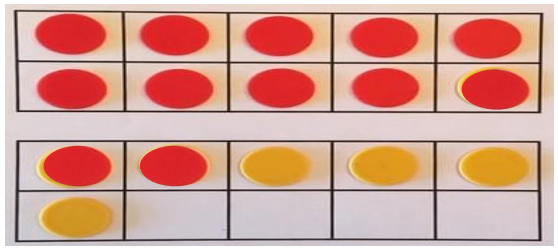
Progression in addition

Add 1-digit and 2-digit numbers to 100

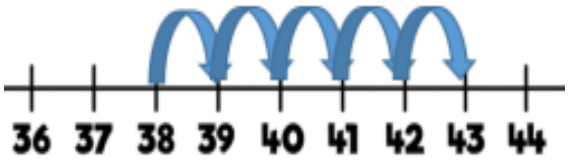
Concrete

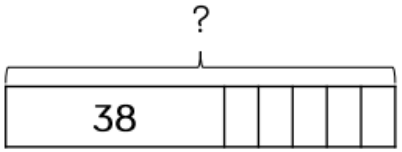




When adding single digits to two-digit numbers, children should be encouraged to count on from the larger number.

Pictorial



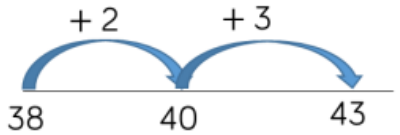


1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Children to use part-whole models, number tracks, bar models, and number lines to perform addition pictorially. Children to be encouraged to count on from the larger number.

Abstract

$$38 + 5 = 43$$



Children to complete addition of 1-digit and 2-digit numbers using the abstract (numbers). Children again are encouraged to count on from the larger number.

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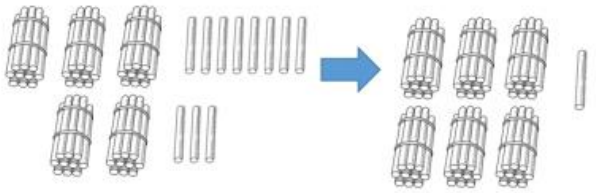
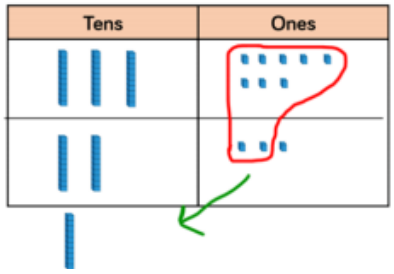
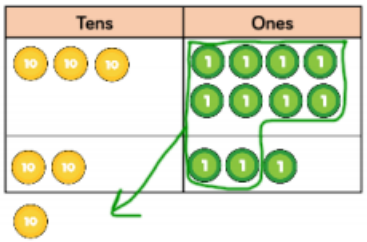
Progression in addition

Add 2-digit numbers to 100

Concrete

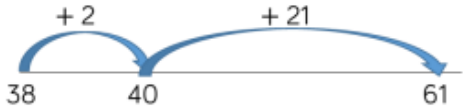


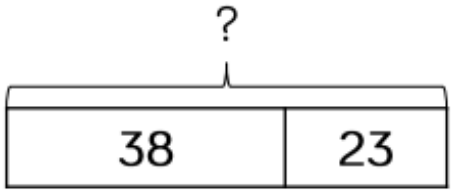




Children to use the formal column method when calculating alongside straws, Base10 and place value counters.

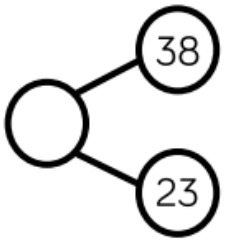
Pictorial





Children to use part-whole models, number tracks, bar models, and number lines to perform addition pictorially. Children to be encouraged to count on from the larger number.

Abstract



$$\begin{array}{r} 38 \\ +\ 23 \\ \hline 61 \\ \hline 1 \end{array}$$

Children to complete addition of 1-digit and 2-digit numbers using the abstract (numbers). Children again are encouraged to count on from the larger number.

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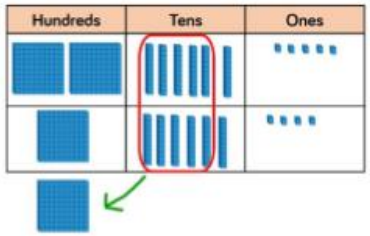
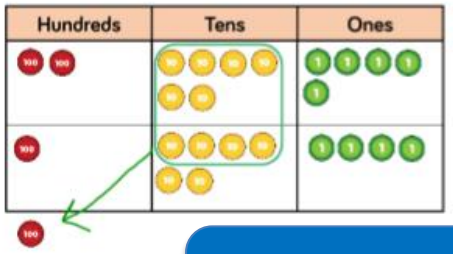
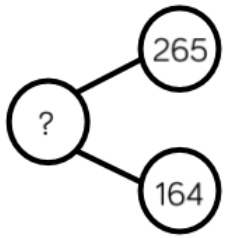
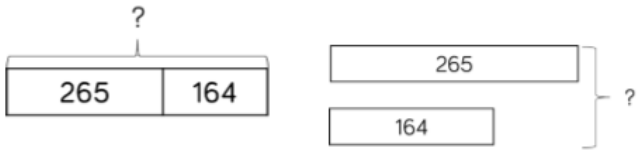
Progression in addition

Adding digits with more than 4 digits

Concrete	Pictorial	Abstract
 	 	265 + 164 429 1
Use the manipulatives to explore the power of 10 and concept of exchange.		Begin with base 10 (visual impact) or PV counters. As the numbers increase, PV counters and grids are the most effective manipulative. Ensure children write out the calculation alongside any concrete resources so they can see the link between them.

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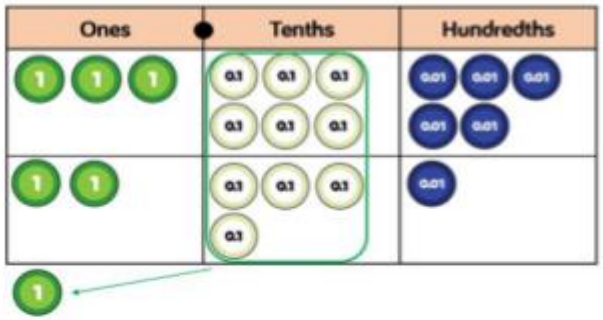
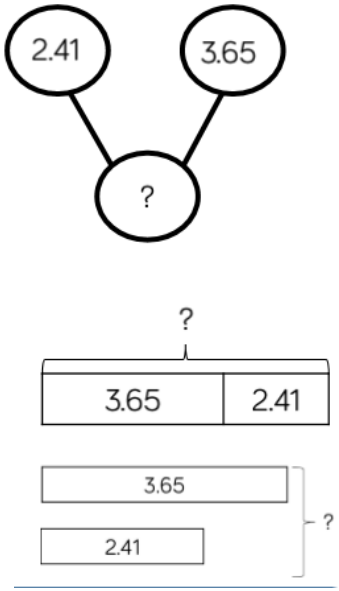
Progression in addition

Adding numbers with up to three decimal places.

Concrete	Pictorial	Abstract
		$\begin{array}{r} 3.65 \\ +\ 2.41 \\ \hline 6.06 \\ \hline 1 \end{array}$
Use the manipulatives to help children understand the concept of decimal exchange.		**Ensure children have experience of adding decimal places. This includes putting it into context when adding money and measures.**

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Subtraction

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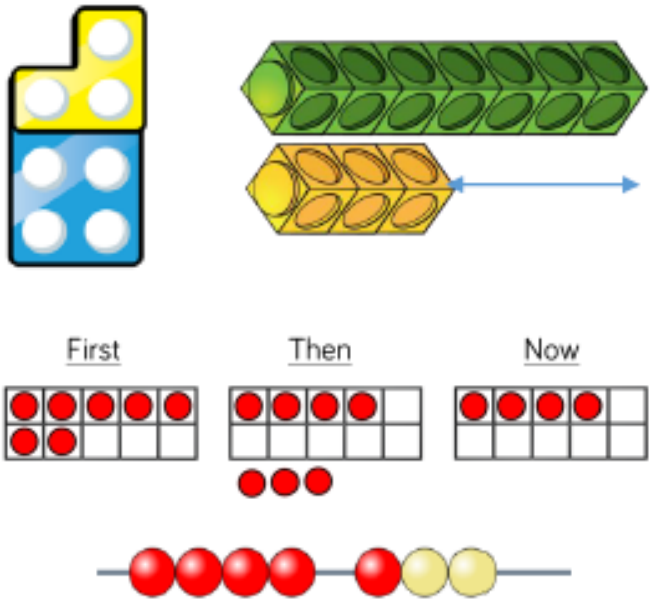
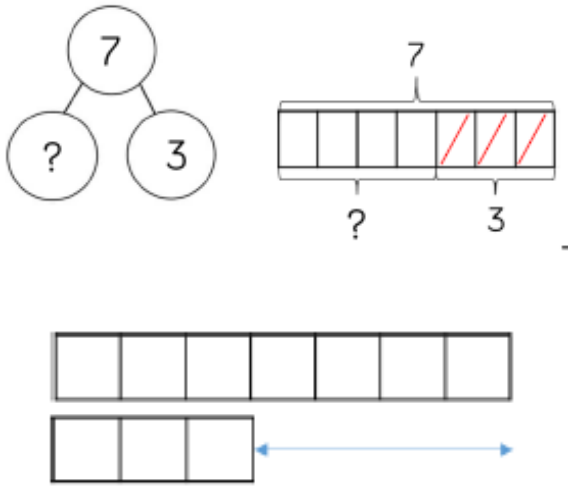
Progression in subtraction

Subtracting 1-digit numbers within 10

Concrete	Pictorial	Abstract
		$7 - 3 = 4$

Use the manipulatives, such as Numicon & Base 10 to explore subtraction before exploring pictorially.

Begin with cubes and Numicon (visual impact). As the numbers increase, PV counters and grids are the most effective manipulative. Ensure children write out the calculation alongside any concrete resources so they can see the link between them.

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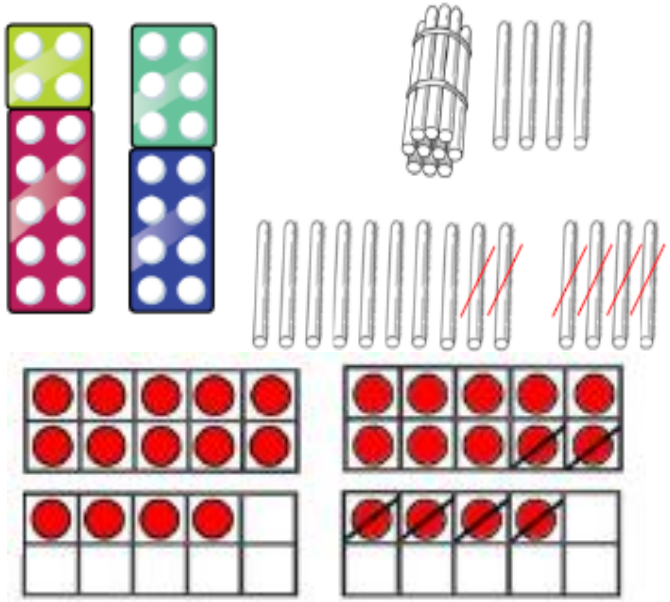
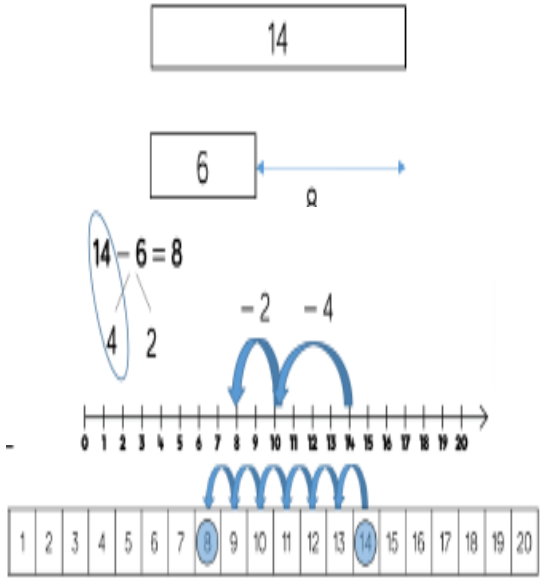
Progression in subtraction

Subtracting 1-digit and 2-digit numbers to 20.

Concrete	Pictorial	Abstract
		$14 - 6 = 8$

Use the manipulatives, such as Numicon & Base 10 to explore subtraction before exploring pictorially. Highlight importance of 10 ones = 1 ten.

Begin with Base10, straws and Numicon (visual impact). As the numbers increase, PV counters and grids are the most effective manipulative. Ensure children write out the calculation alongside any concrete resources so they can see the link between them.

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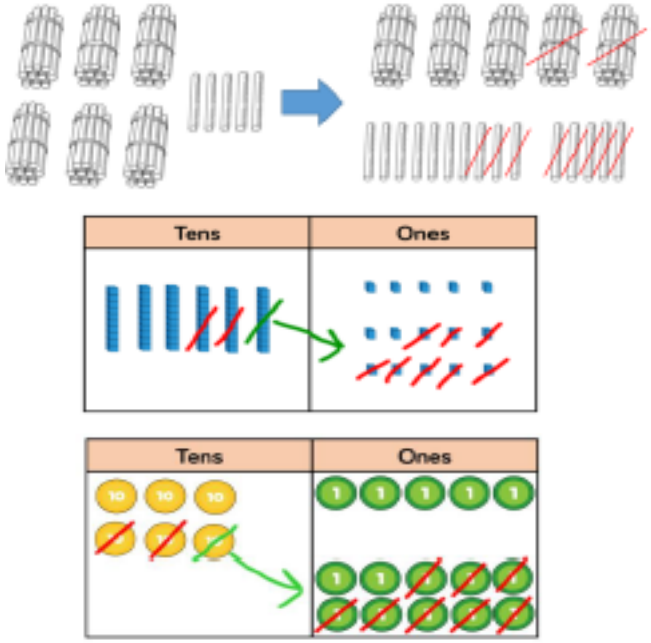
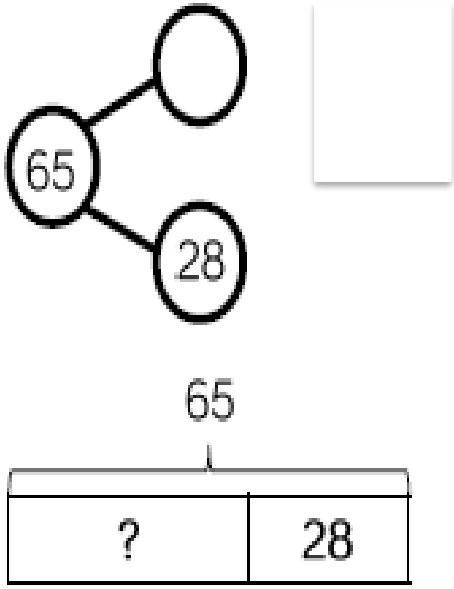
Progression in subtraction

Subtracting 1-digit and 2-digit numbers to 100.

Concrete	Pictorial	Abstract
		$65 - 28 = 37$

Encourage children to use the manipulatives, such as straws and PV counters to explore subtraction before progressing this knowledge within part-whole models and bar models.

Children to write out the calculation but to have previous concrete and pictorial resources next to them to aid understanding and so the children can see the link between manipulatives and pictorials with the abstract.

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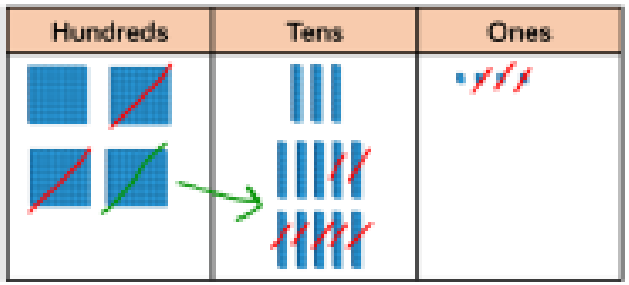
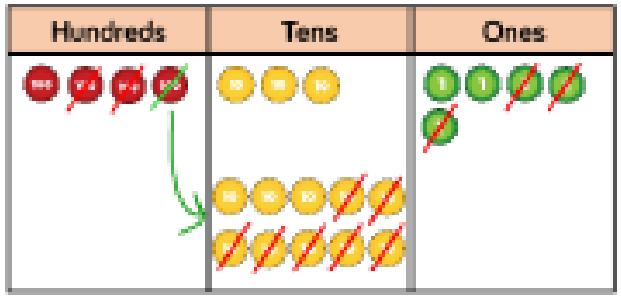
Progression in subtraction

Subtracting numbers with up to 3-digits.

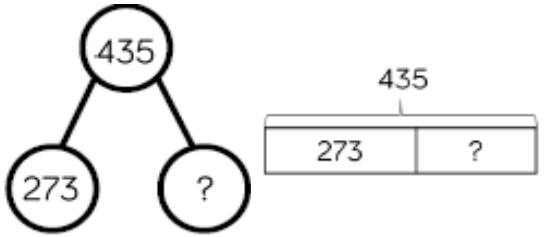
Concrete

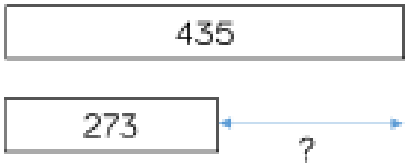




Base 10 and PV counters are the most effective concrete resources when subtracting numbers with up to 3-digits.

Pictorial





Abstract

$$435 - 273 = 262$$

Begin with base 10 (visual impact) or PV counters. As the numbers increase, PV counters and grids are the most effective manipulative. Ensure children write out the calculation alongside any concrete resources so they can see the link between them.

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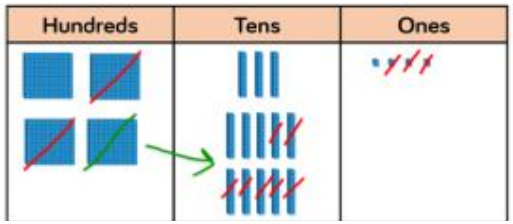
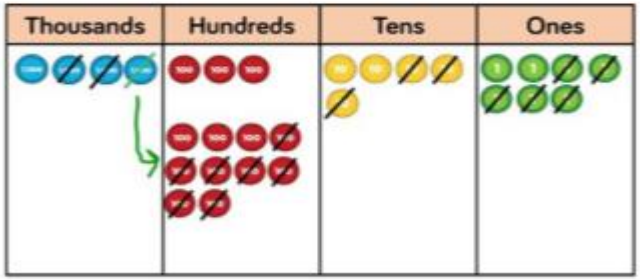
Progression in subtraction

Subtracting digits with more than 4 digits

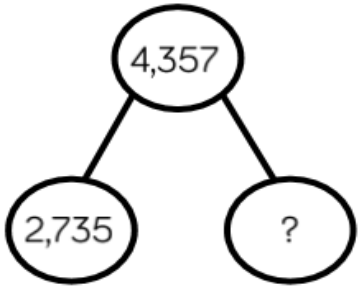
Concrete

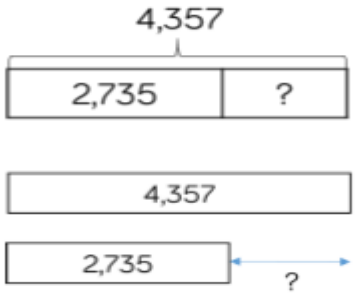




Use the manipulatives to explore taking from the next column.

Pictorial





Abstract

$$\begin{array}{r} {}^{3}\not{4}\,{}^{1}357 \\ -\ 2735 \\ \hline 1622 \end{array}$$

Begin with base 10 (visual impact) or PV counters. As the numbers increase, PV counters and grids are the most effective manipulative. Ensure children write out the calculation alongside any concrete resources so they can see the link between them.

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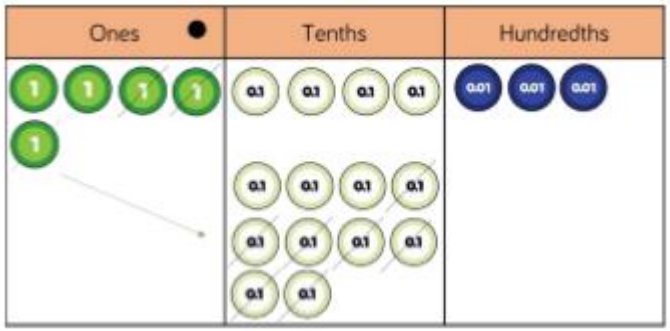
Progression in subtraction

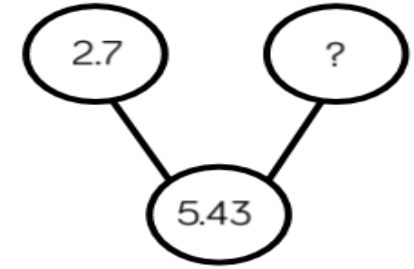
Subtracting digits with more than 4 digits

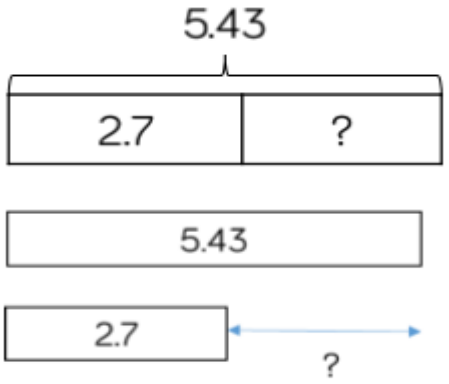
Concrete



Use the manipulatives to explore decimal place value.

Pictorial





Abstract

$$\begin{array}{r} {}^{4}\cancel{5}^{1}.43 \\ -\ 2.7 \\ \hline 2.73 \end{array}$$

Ensure children have experience of adding decimal places. This includes putting it into context when adding money and measures.

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Multiplication

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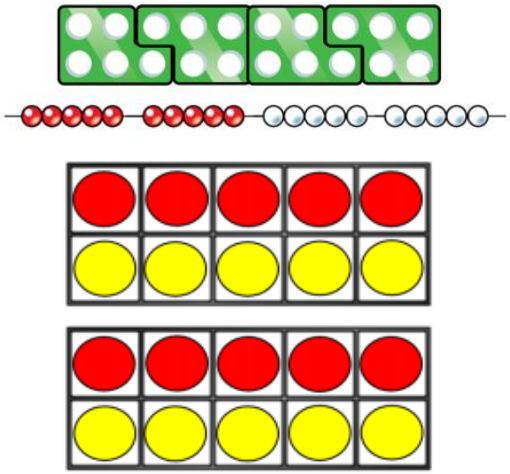
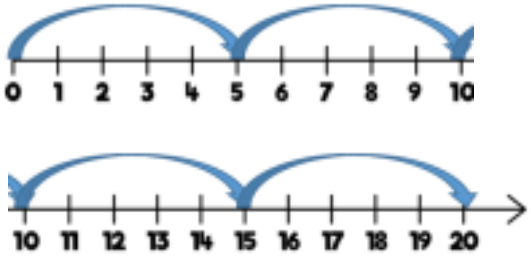
Progression in multiplication

Solve 1-step problems using multiplication

Concrete	Pictorial	Abstract
		$5 + 5 + 5 + 5 = 20$ $4 \times 5 = 20$ $5 \times 4 = 20$

Children first explore multiplication through concrete resources such as Numicon and counters (tens frames). Children then complete pictorially (number line method).

Once children are secure in concrete and pictorial concepts, children then move into the abstract and are introduced to the multiplication symbol.

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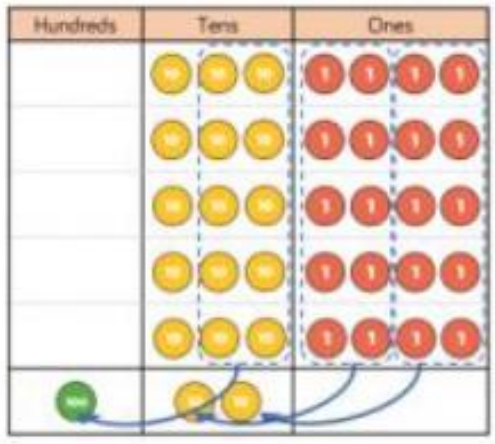
Progression in multiplication

Multiply 2-digit numbers by 1-digit numbers

Concrete

Pictorial



Abstract

$34 \times 5 = 170$

	H	T	O		
		3	4		
×			5		
		2	0	(5 × 4)	
+	1	5	0	(5 × 30)	
	1	7	0		

	H	T	O	
		3	4	
×			5	
	1	7	0	
	1	2		

Children to begin exploring concept through concrete resources but then move into pictorial representation once numbers become greater. Concrete resources used to support times table knowledge rather than used as a method.

Children to look at the expanded column method before moving on to the short multiplication method.

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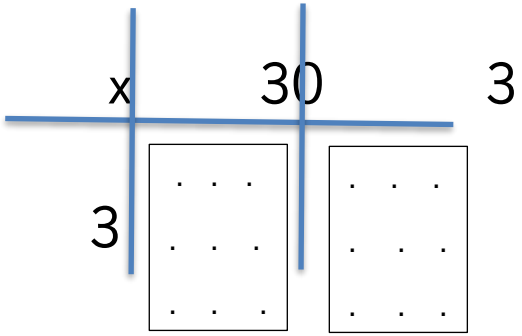
Progression in multiplication

Multiplication grid method

Concrete

Use the manipulatives to reinforce the concept of the power of 10 and exchange. Arrays can be used to support children in their calculations.

Pictorial



Abstract

x	30	3
3	90	9

Dienes equipment provides a great visual when starting to multiply a 2 digit by 1 digit number. Children need to write out their calculation alongside their equipment to see how the concrete and written representations match.

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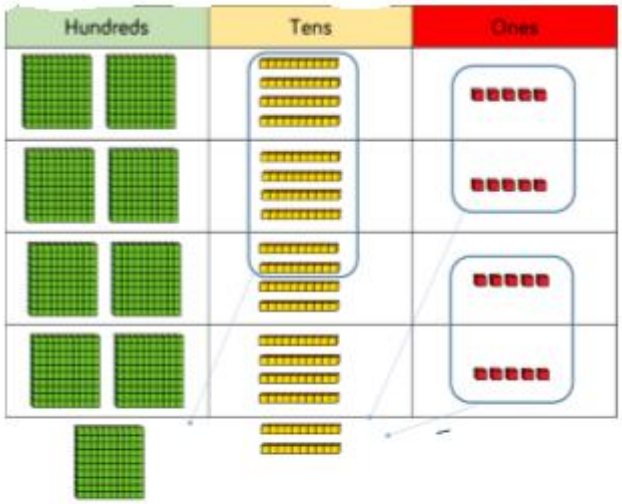
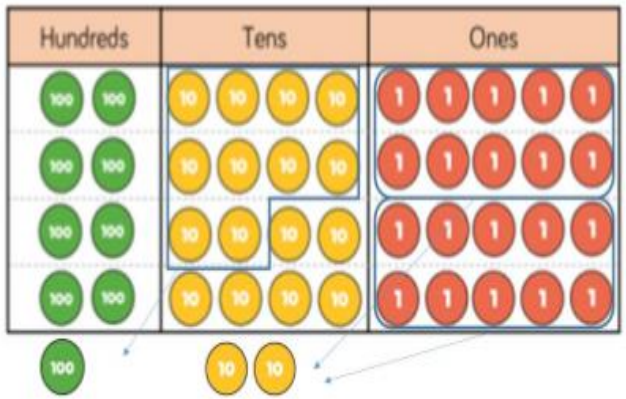
Progression in multiplication

Multiply multiple digits by 1-digit column multiplication

Concrete





When using concrete resources, limit the number of exchanges and move children away from concrete when using larger numbers.

Abstract

	H	T	O
	2	4	5
×			4
	9	8	0
	1	2	

Base 10 and PV counters can continue to help children understand the concept of the formal written method.

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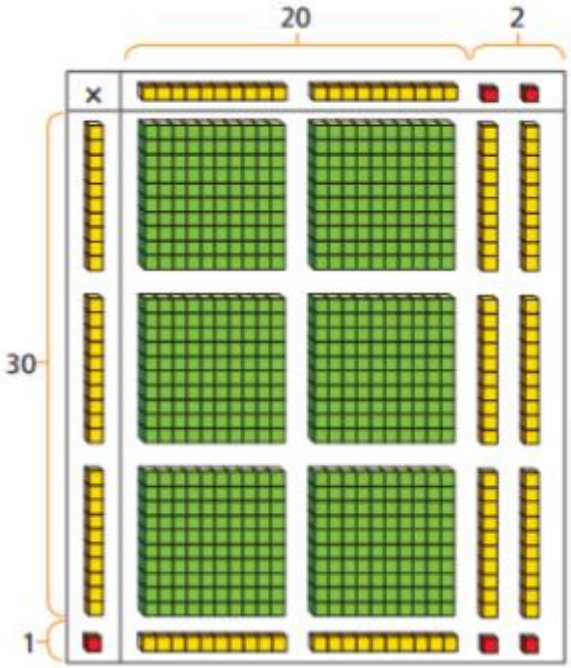
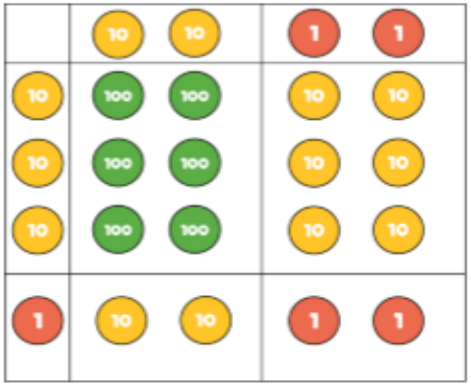
Progression in multiplication

Multiply multiple digits by multiple digits column multiplication

Concrete





When multiplying a multi-digit number by 2-digits, use the area model to help children understand the size of the numbers they are using. The grid method can be used initially as a written method as it matches the model. Children then move on to the formal method. Children should be encouraged to use a written method at this point.

Abstract

×	20	2
30	600	60
1	20	2

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

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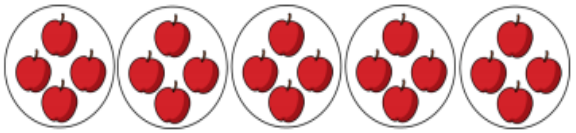
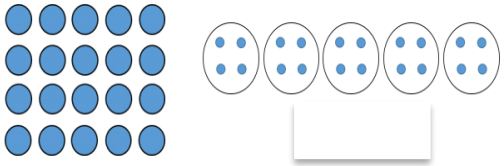
Progression in division

Solve 1-step problems using division (sharing)

Concrete

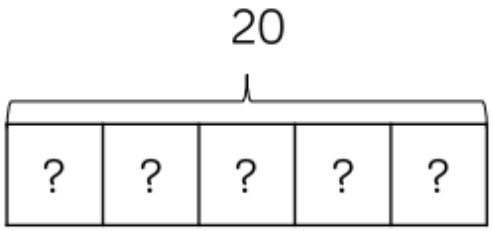


There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?



Children solve problems by sharing into equal groups. Children begin by exploring division through concrete and pictorial representations.

Pictorial



Abstract

$$20 \div 5 = 4$$

Once children are secure in the understanding of division through concrete and pictorial representation, children are introduced to the division symbol.

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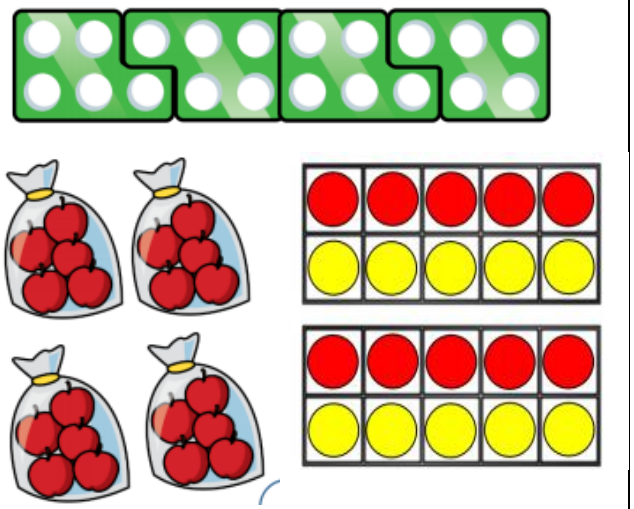
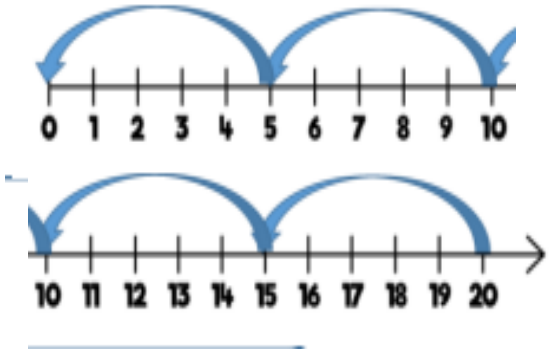
Progression in division

Solve 1-step problems using division (grouping)

Concrete	Pictorial	Abstract
		$20 \div 5 = 4$

Children to use concrete resources in fixed groups which represent the links between multiplication and division. Children to then complete calculations pictorially with the aid of concrete resources (e.g. on a number line).

Once children are secure in the understanding of division through concrete and pictorial representation, children move into the abstract.

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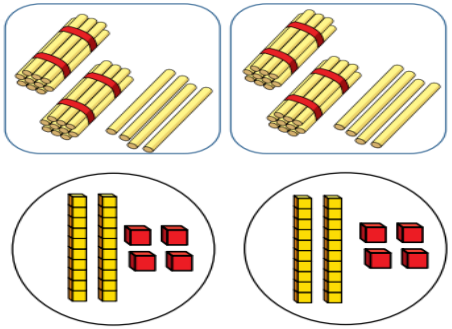
Progression in division

Divide 2-digit by 1-digit (sharing with no exchange)

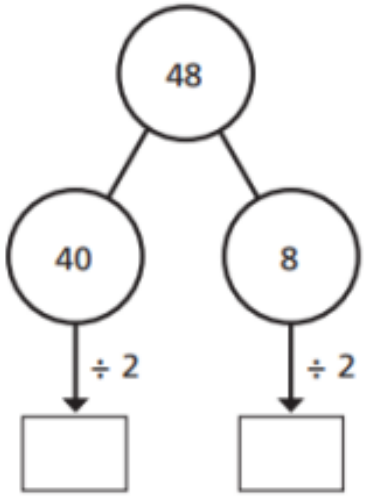
Concrete



Tens	Ones
10 10	1 1 1 1
10 10	1 1 1 1

When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, Base10 and place value counters can be used to share numbers into equal groups.

Pictorial



Part-whole models can provide children with a clear written method that matches the concrete representation.

Abstract

$$48 \div 2 = 24$$

Children to move into the abstract once they are secure in concrete and pictorial representations.

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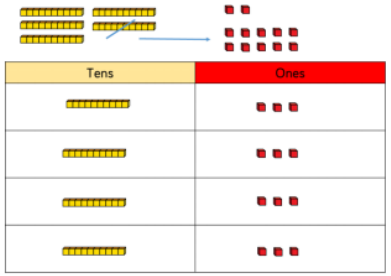
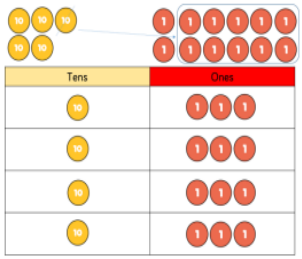
Progression in division

Divide 2-digit by 1-digit (sharing with exchange)

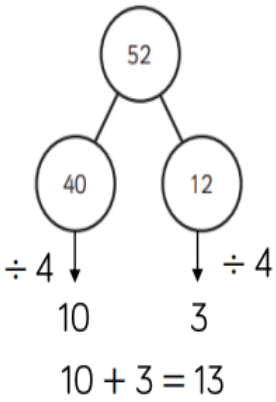
Concrete

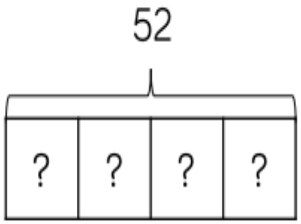




When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones. Straws, Base10 and place value counters can be used to share numbers into equal groups.

Pictorial





Part-whole models can provide children with a clear written method that matches the concrete representation.

Abstract

$$52 \div 4 = 13$$

Children to move into the abstract once they are secure in concrete and pictorial representations.

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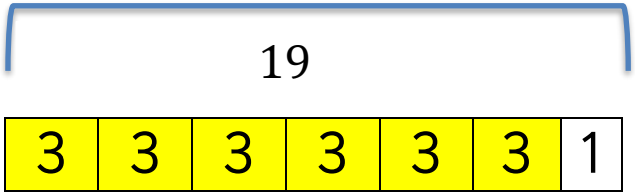
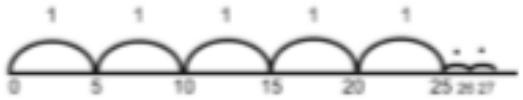
Progression in division

Dividing 2 digits by 1 digit involving remainders

Concrete	Pictorial	Abstract
		
Use the number tracks to introduce the concept of remainders. Use the same numbers and ensure these are numbers the children are confident in.	Children can keep track of how many blocks they have used and how many remainders with the help of a pre prepared bar model.	Use of a number line can help children with their calculations and to introduce dividing by a range of numbers.

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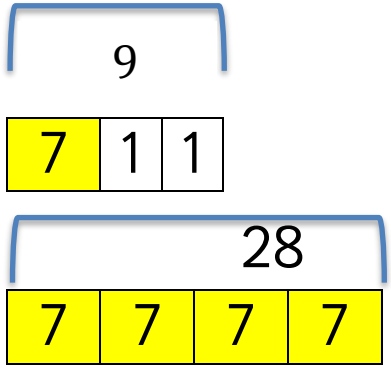
Progression in division

Dividing 2 digits by 1 digit involving remainders bus shelter

Concrete

The number tracks can support the concept of remainders in bus shelter method. Begin with numbers that don't leave remainders.

Pictorial



Children can keep track of how many blocks they have used and how many remainders with the help of a pre prepared bar model.

Abstract

Recorded in bus shellter

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7\overline{)98} \\ 2 \end{array}$$

Children begin to record using the bus shelter method. They record this alongside the manipulatives. Let children divide by the same number initially.

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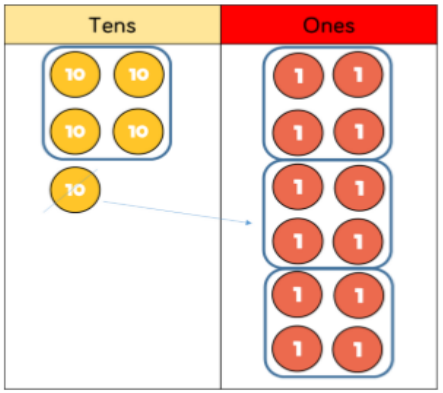
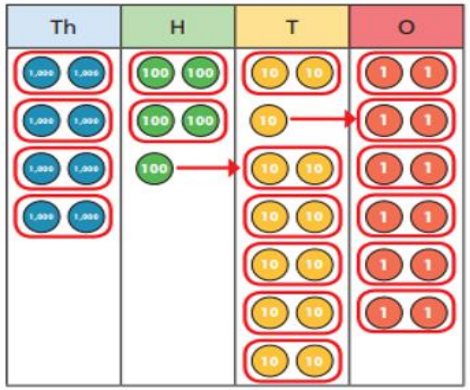
Progression in division

Dividing multi-digits by 1 digit (grouping)

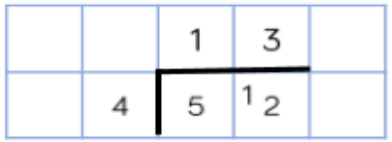
Concrete

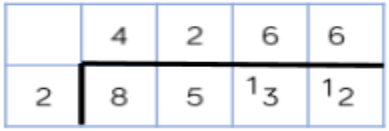




When using the short division written method, children use grouping. Starting with the largest place value, they group by the divisor. Grouping can be used to divide by 3 or 4 digit numbers.

Abstract





Children should record their work alongside the manipulatives. Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

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Progression in division

Dividing two digits by multi- digits (long division)

Pictorial

43	
86	r11 →
129	r 25 →
172	
215	
258	
291	

54
111

When children begin to divide up to 4 digits by 2 digits then, written methods become the most accurate. Counting ladders can help children organise their multiples. Arrows can help with understanding where the remainder has been derived from. Children need a variety of counting strategies to help with unknown multiples e.g. add 40 add 3, or add 30 -1 for multiples of 29.

Abstract

```
    0  1  2  6
   ----------
   5  11 25
43 | 5  4  1  8
```

Make links to the previous use of bus shelter method and use the counting ladder to help with the multiples and remainders.

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Fractions, Decimals and Percentages

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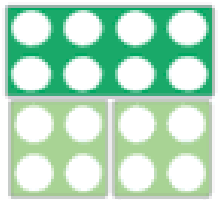
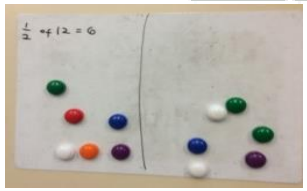
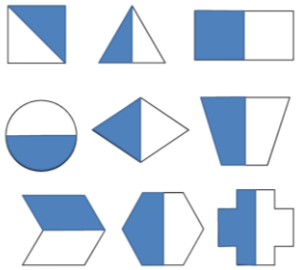
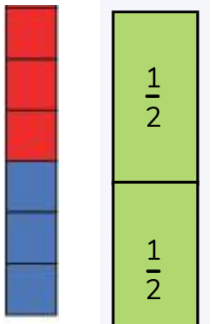
Progression in fractions, decimals, and percentages.

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

Concrete	Pictorial	Abstract
  	 	Half of 8 = 4 $\frac{1}{2}$ of 16 = 8
Use concrete objects to introduce the concept 'whole' and 'half'. Children to then use manipulatives (such as Numicon and counters) to explore finding half.	**Different pictorial representations can be used to represent 'half'.**	**Move on to the abstract and introduce representing half of a quantity in a number sentence.**

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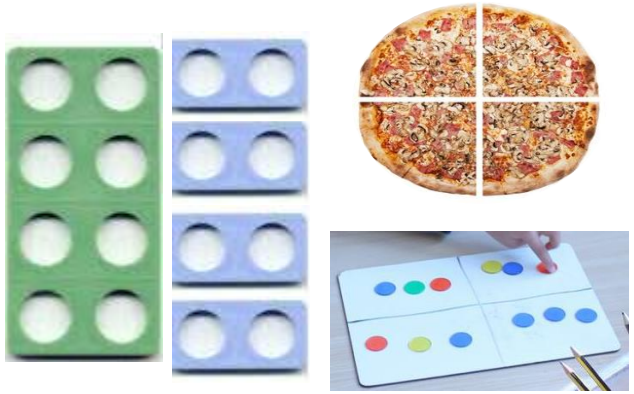
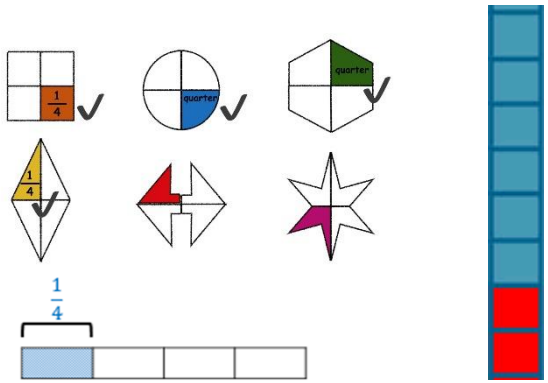
Progression in fractions, decimals, and percentages.

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

Concrete	Pictorial	Abstract
		One quarter of 8 = 2 $\frac{1}{4}$ of 16 = 4
Use concrete objects to introduce the concept 'quarter'. Children to then use manipulatives (such as Numicon and counters) to explore finding quarter.	**Different pictorial representations can be used to represent 'quarter'.**	**Move on to the abstract and introduce representing quarter of a quantity in a number sentence.**

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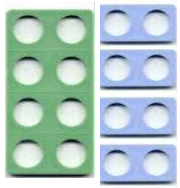
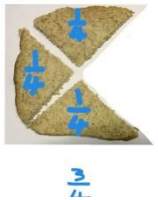
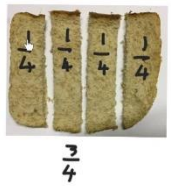
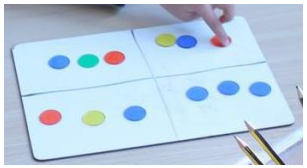
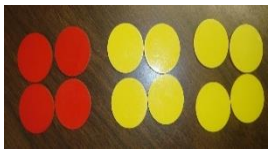
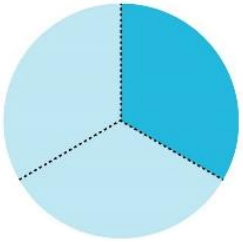
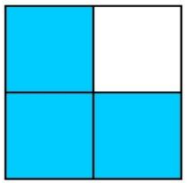
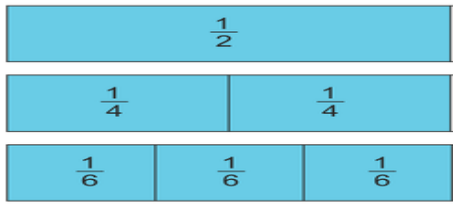
Progression in fractions, decimals, and percentages.

Recognise, find, name and write fractions one third, one quarter, two quarters, and three quarters of a length, shape, set of objects or quantity.

Concrete	Pictorial	Abstract
     Use concrete objects to recognise each corresponding fraction. Children to then use manipulatives (such as Numicon and counters) to explore finding each fraction.	    **Different pictorial representations can be used to represent each corresponding fraction.**	One third of 6 = 2 $\frac{3}{4}$ of 16 = 12 **Move on to the abstract and introduce representing quarter of a quantity in a number sentence.**

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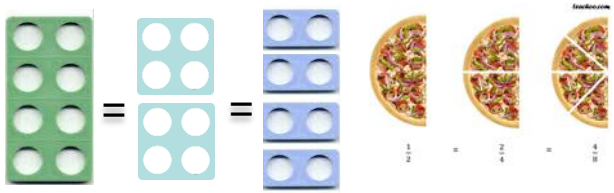
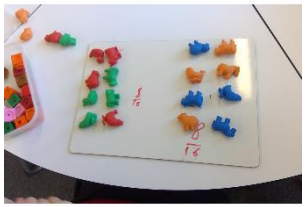
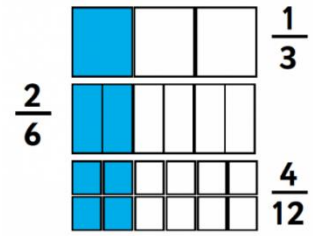
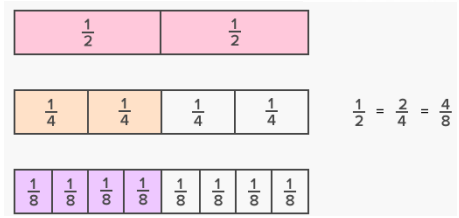
Progression in fractions, decimals, and percentages.

Write simple fractions (such as one third/three quarters) and to be able to recognise the equivalent.

Concrete	Pictorial	Abstract
 	 	$\frac{1}{2} = \frac{2}{4} = \frac{8}{16}$
Use concrete objects to recognise each corresponding fraction. Children to then use manipulatives (such as Numicon and counters) to explore and identify equivalent fractions.	**Different pictorial representations can be used to represent equivalent fractions.**	**Move on to the abstract and represent equivalent fraction and introduce equivalent fraction problems.**

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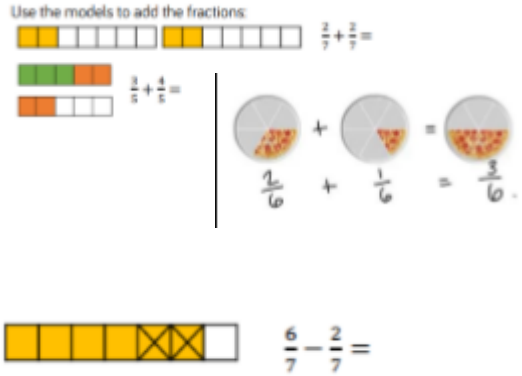
Progression in fractions, decimals, and percentages.

Add and subtract fractions with the same denominator within one whole.

Concrete

Use fraction cubes to add and subtract different unit fractions. When using numicon, the base piece represents the denominator and the top pieces represent the numerator. Cubes or pegs could also be used to represent the numerators.

Pictorial



$\frac{6}{7} - \frac{2}{7} =$

Different pictorial representations can be used for adding and subtracting different fractions.

Abstract

Complete the additions.

a) $\frac{3}{8} + \frac{4}{8}$

b) $\frac{3}{9} + \frac{4}{9}$

c) $\frac{3}{29} + \frac{4}{29}$

d) $\frac{3}{103} + \frac{4}{103}$

e) $\frac{5}{31} + \frac{9}{31}$

f) $\frac{17}{111} + \frac{33}{111}$

Move on to the abstract and introduce missing fraction problems.

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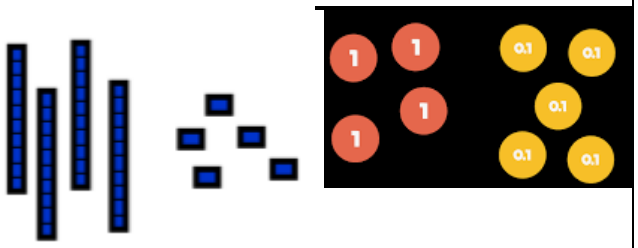
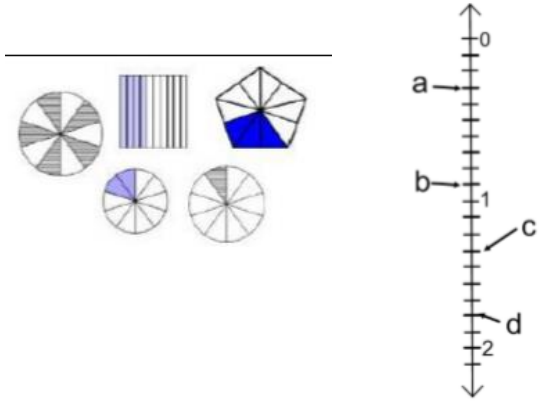
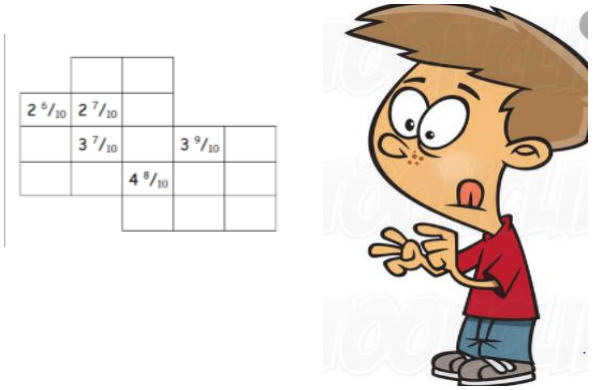
Progression in fractions, decimals, and percentages.

Counting up and down in tenths

Concrete	Pictorial	Abstract
		
To start with, use the tenths cubes to embed the idea that 10 tenths = 1 whole. Children can then exchange their ten tenths for a 1 whole stick. Start at different points to rehearse counting forwards and backwards. Use counters to start to count on and backwards from whole numbers keeping the concept of exchange.	**Support with different pictorial representations to embed the concept of ten tenths = 1 whole. Use number lines to count backwards and forwards from.**	**Lots or retrieval and rehearsal practice at different opportunities. Complete missing number squares when counting.**

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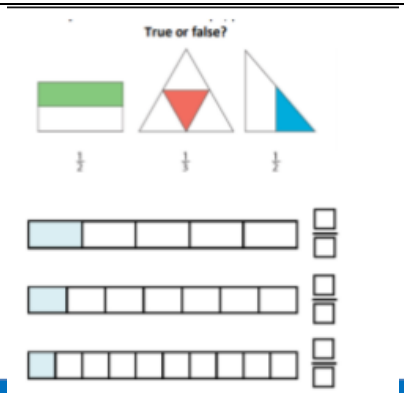
Progression in fractions, decimals, and percentages.

Recognise, find and write fractions of a discreet set of objects: unit fractions and non-unit fractions with small denominators.

Concrete	Pictorial	Abstract
		Continue the pattern. What do you notice? What about $^{1}/_{10}$ of 20? Use this to work out $^{2}/_{10}$ of 20, etc. True or false? $^{2}/_{10}$ of 20cm = 2cm $^{4}/_{10}$ of 40cm = 4cm $^{3}/_{5}$ of 20cm = 12cm
Use a range of concrete resources and objects then get children to make their own.	**Move on to pictorial representations asking children to explain their answers.**	**Look at pattern spotting.**

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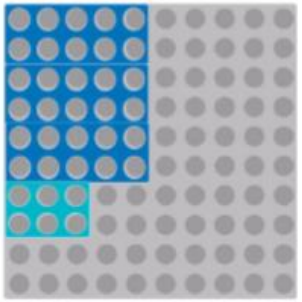
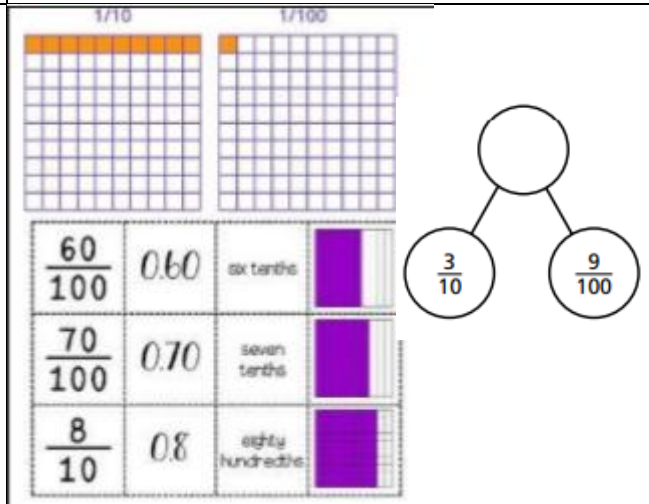
Progression in fractions, decimals, and percentages.

Recognise and write decimal equivalents of any number of tenths or hundredths

Concrete	Pictorial	Abstract
 		Complete the sentences. a) 4 tenths is equivalent to ☐ hundredths. b) 70 hundredths is equivalent to ☐ tenths. c) 5 tenths is equivalent to ☐ hundredths or 1 _____
Use peg board and numicon to work in hundredths and tenths. Children explore finding any number of tenths or hundredths using money - 10p and 1p to pounds and write as the decimal equivalent.	**Move on to pictorial representations linked to the peg boards. Consolidate understanding through part-whole models.**	Practise verbally through sentence stems before moving on to abstract.

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Progression in fractions, decimals, and percentages.

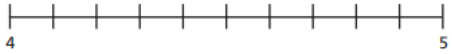
Round decimals with one decimal place to the nearest whole number

Concrete

Use the hundredths counters/numicon to embed the concept of exchange and practice exchanging ten tenths for a one. Remind children of previous rounding rules and how these still apply.

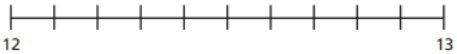
Pictorial

a) Label 4.3 on the number line.



Is it closer to 4 or 5? ☐

b) Label 12.8 on the number line.



Is it closer to 12 or 13? ☐

Use number lines to help children understand the rounding rules and that ten tenths make a whole.

Abstract

Round each decimal to the nearest whole number.

a) 1.8	☐	e) 13.7	☐
b) 4.2	☐	f) 20.1	☐
c) 0.9	☐	g) 0.4	☐
d) 1.5	☐	h) 99.8	☐

Tommy is thinking of a number that has one decimal place.

When he rounds his number to the nearest whole, the answer is 32

What number could Tommy be thinking of? ☐

Are there any other answers?

Use varied fluency, reasoning and problem solving on rounding to extend and consolidate children's understanding.

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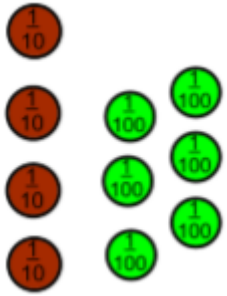
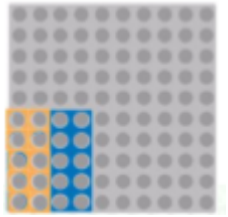
Progression in fractions, decimals, and percentages.

Recognise that hundredths arise when dividing and object by hundred and dividing tenths by ten.

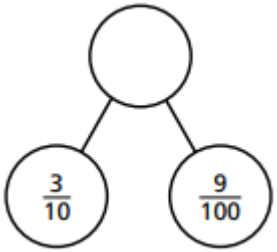
Concrete

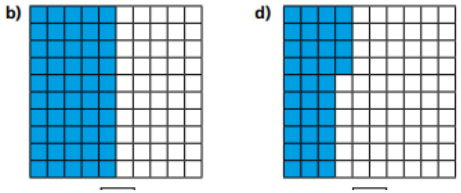




Divide the numicon grid by using the ten pieces to show this, then divide the ten pieces to demonstrate this concept. Can use pounds, ten pence and pennies and also counters to embed the concept of exchange.

Pictorial





Use hundred squares and part-whole models. Use units of measurement to make the links too e.g mm, cm and m.

Abstract

Partition the following numbers

1. 2.35
2. 6.36

Can you partition these numbers in different ways?

1. 9.23
2. 3.64

What do you notice?

What about $^{1}/_{10}$ of 20? Use this to work out $^{2}/_{10}$ of 20, etc.

$^{1}/_{10}$ of 100 = 10

$^{1}/_{100}$ of 100 = 1

$^{2}/_{10}$ of 100 = 20

$^{2}/_{100}$ of 100 = 2

How can you use this to work out $^{6}/_{10}$ of 200? $^{6}/_{100}$ of 200?

Explore the abstract through partitioning, place value of a digit, dividing by 10 etc

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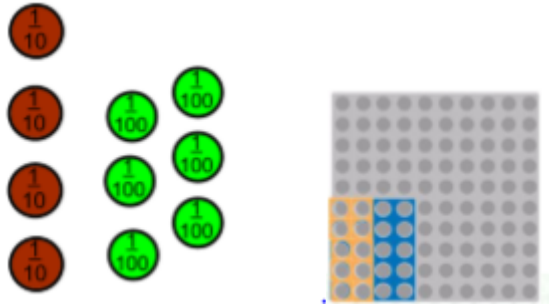
Progression in fractions, decimals, and percentages.

Count up and down in hundredths

Concrete	Pictorial	Abstract
	Decimal Number Chart 0.01-1 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18 0.19 0.2 0.21 0.22 0.23 0.24 0.25 0.26 0.27 0.28 0.29 0.3 0.31 0.32 0.33 0.34 0.35 0.36 0.37 0.38 0.39 0.4 0.41 0.42 0.43 0.44 0.45 0.46 0.47 0.48 0.49 0.5 0.51 0.52 0.53 0.54 0.55 0.56 0.57 0.58 0.59 0.6 0.61 0.62 0.63 0.64 0.65 0.66 0.67 0.68 0.69 0.7 0.71 0.72 0.73 0.74 0.75 0.76 0.77 0.78 0.79 0.8 0.81 0.82 0.83 0.84 0.85 0.86 0.87 0.88 0.89 0.9 0.91 0.92 0.93 0.94 0.95 0.96 0.97 0.98 0.99 1	
Use the hundredths counters/numicon to embed the concept of exchange. Children can exchange their ten hundredths for a tenth. Start counting at any point backwards and forwards.	**Use a decimal number chart and pick a random place to start counting up and down in.**	**Regular opportunities to count on and back in hundredths.**

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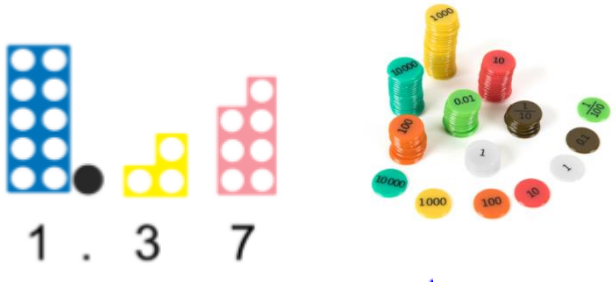
Encouragement

Progression in fractions, decimals, and percentages.

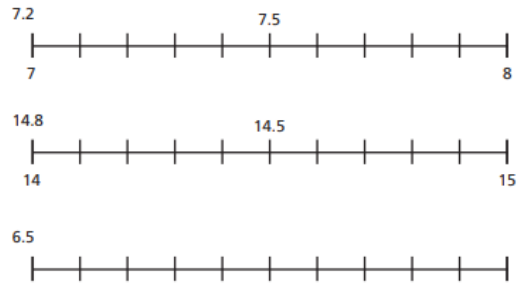
Round decimals with two decimal places to the nearest whole number and to one decimal place

Concrete



Use concrete resources such as Numicon to demonstrate the concept. Refer back to the rounding rules they have learnt previously and the concept of exchange. Use pennies, ten pence pieces and pounds to support understanding of the decimal point and rounding.

Pictorial



Move onto using number lines as a visual representation for rounding decimals to the nearest whole number.

Abstract

a) When rounding to the nearest tenth, how many digits will there be after the decimal point?

b) Round each number to one decimal place.

1.33	4.03
1.34	4.04
1.35	4.05
1.36	4.06
1.37	4.07

a) 4.21
b) 8.09
c) 4.84
d) 11.86
e) 5.67
f) 0.15

Make explicit links to children's previous learning around decimal place value, exchange and rounding rules to support children.

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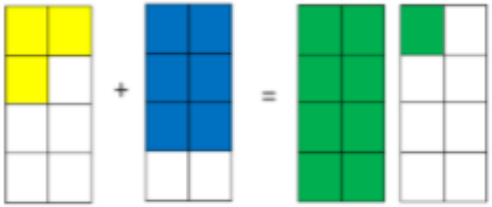
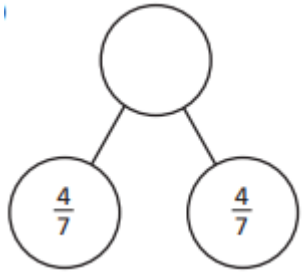
Progression in fractions, decimals, and percentages.

Add and subtract fractions with the same denominator including bridging over whole numbers e.g. $7/9 + 4/9 = 11/9$ or $1\ 2/9$

Concrete	Pictorial	Abstract
	 	$\frac{8}{5} + \frac{6}{5} = \square = \square$ h) $\frac{3}{7} + \frac{3}{7} + \frac{8}{7} = \square = \square$ Complete the number sentences. a) $\frac{3}{8} + \frac{\square}{8} = \frac{7}{8}$ e) $\frac{4}{9} + \frac{\square}{9} = \frac{13}{9} = 1\frac{\square}{9}$
Use equivalence towers to demonstrate what happens when they go above the whole number.	**Either give children blank grids to colour in or partially completed grids to calculate from. Demonstarte understanding further through the use of part-whole models.**	**Move on to the abstract and introduce missing numbers. Recap on what children have covered previously about the rules for addition and subtraction and their relationship.**

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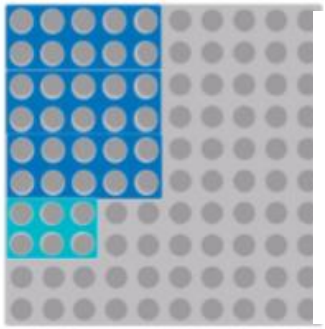
Progression in fractions, decimals, and percentages.

Read and write decimal numbers as fractions

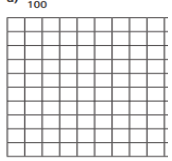
Concrete



Use Numicon board to represent tenths and ones e.g. 0.36 = 36/100. Use double sided PV counters to support.

Pictorial

a) $\frac{7}{100}$

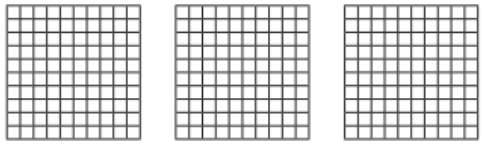


What fractions and decimals do the counters represent?

a) 

fraction = ☐ decimal = ☐

a) Represent 2.15



Move onto pictorial representation and begin to explore further children's understanding of wholes and decimals.

Abstract

Decimal	Decimal (expanded form)	Fraction	Fraction (expanded form)	In words
2.13	2 + 0.1 + 0.03	$2\frac{13}{100}$	$2+\frac{1}{10}+\frac{3}{100}$	2 ones, 1 tenth and 3 hundredths
4.37		$4\frac{\square}{100}$		

Fifths	Tenths	Decimals
$\frac{1}{5}$	$\frac{\square}{10}$	0.2
$\frac{\square}{5}$	$\frac{4}{10}$	

Get children to apply to the abstract including whole numbers and decimals.

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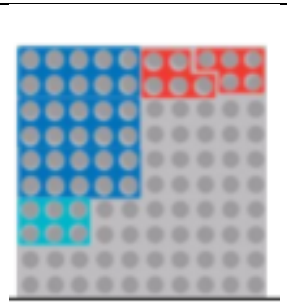
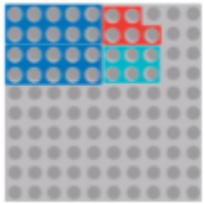
Progression in fractions, decimals, and percentages.

Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per 100', and write and write percentages as a fraction with denominator 100, and as a decimal fraction.

Concrete

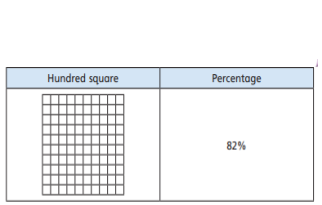


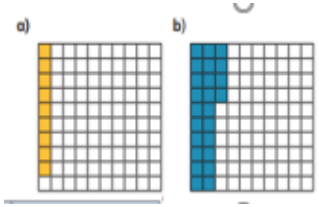
31% = 31/100 =0.31



Explain how the Numicon board represents 100. Cover the Numicon board with different colours and ask children to calculate %. Red = 10%, Dark blue 30% and light blue 6%. Give children certain percentages of colours and ask them to fill the board with these. Convert these to a fraction then decimal fraction. 10% = 10/100 = 0.10, 36$ = 36/100 = 0.36 etc

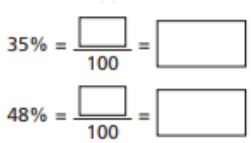
Pictorial





Move onto pictorial representation and begin to explore further children's understanding of per cent being 'number of parts of a hundred' by using representations other than a hundred square.

Abstract



Write the values in order from smallest to greatest.

a) 33% $\frac{30}{100}$ 3% $\frac{13}{100}$

29/50 = %

10/25 = %

Children complete varied fluency activities recognizing and converting between %, denominator over a 100 and as decimal fractions. Begin to look at fractions over 50, 25 etc to convert into %

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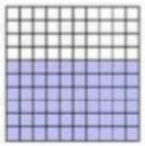
Progression in fractions, decimals, and percentages.

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

Concrete

x

0.6
six tenths

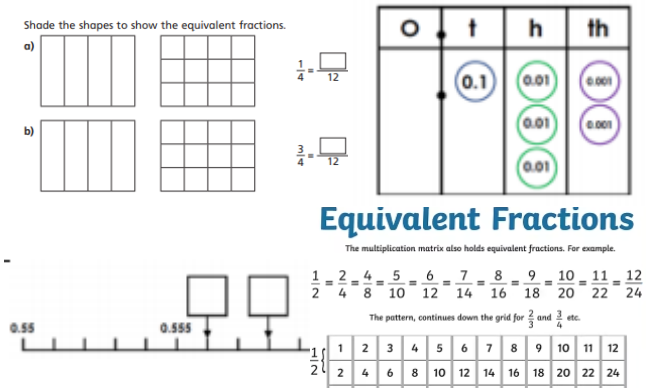


0.60
sixty hundredths

60/100 6/10 3/5

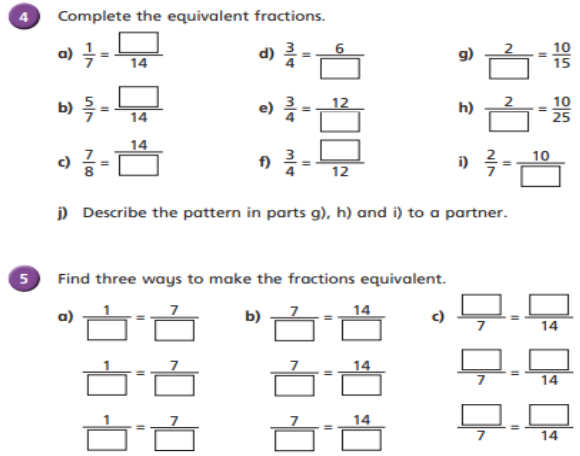
Use concrete resources such as equivalence towers with decimals equivalents to compare. Use place value counters with decimals and fractions and use Numicon peg boards to show relationship between fractions, tenths and hundredths.

Pictorial



Use pictures and diagrams to recognise equivalence and then convert to decimals. Use place value counters and grids to represent decimal numbers up to 3DP. Use a number line to represent visually. Explore patterns linked to multiples.

Abstract



Make clear links to existing tables, division facts, factors, even numbers and prime numbers. Reiterate that the operations need to be completed for the numerator and the denominator.

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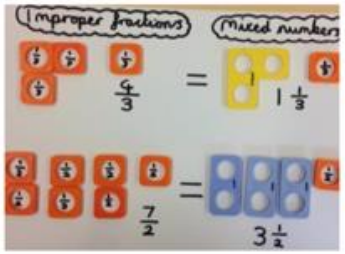
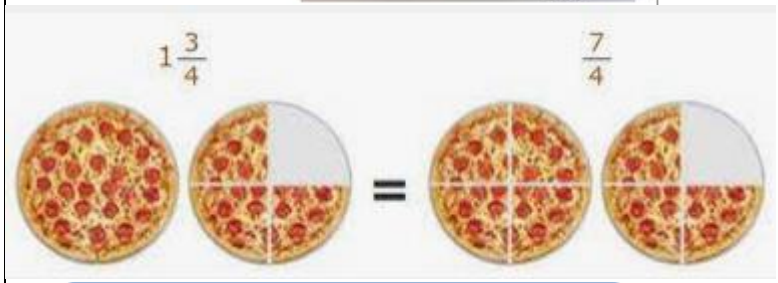
Progression in fractions, decimals, and percentages.

Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number [for example, 2/5 + 4/5 = 6/5 = 1 1/5]

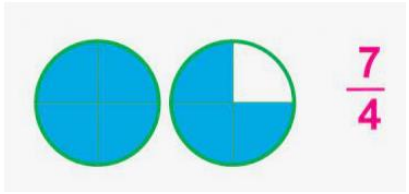
Concrete

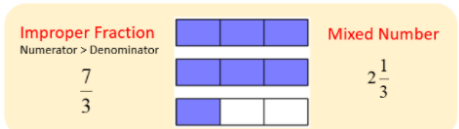




Use Numiucon to demonstrate the concept of what improper and mixed fractions look like. Use pizza fractions to demonstrate the concept in real life.

Pictorial





Here are 4 whole pizzas and $\frac{3}{5}$ of a pizza.

Use shapes, bar models, diagrams, pizzas etc to model understand the concept and how to convert between the two.

Abstract

Convert the mixed numbers to improper fractions.
Write the next conversion in each part.

a) $2\frac{1}{7}$ b) $3\frac{1}{5}$ c) $5\frac{1}{2}$

$2\frac{2}{7}$ $4\frac{1}{5}$ $5\frac{1}{4}$

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

Talk to a partner about any patterns you spot.

Convert the improper fractions to mixed numbers.

a) $\frac{7}{3}$ b) $\frac{8}{3}$ c) $\frac{9}{4}$ d) $\frac{11}{4}$

Encourage children to visualise and identify patterns to aid with processes of converting. Relate to factors, times table facts etc for efficiency and to check calculations.

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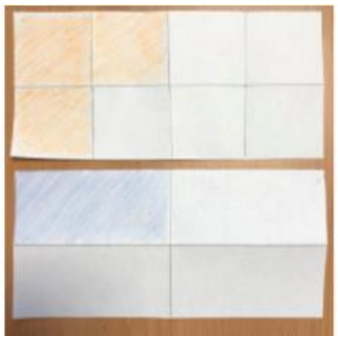
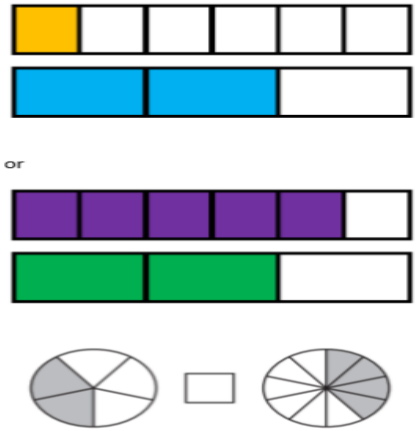
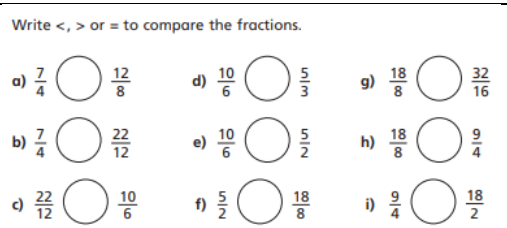
Progression in fractions, decimals, and percentages.

Compare and order fractions whose denominators are all multiples of the same number

Concrete	Pictorial	Abstract
  		
Fraction tiles, equivalence towers and paper strips can be used to compare and order fractions with the same denominator.	**Use of pictures and diagrams. Link to multiples and factors so children begin to make links to existing facts.**	**Make links to multiples and factors so that a common denominator can be found before ordering and comparing the fractions. Ensure children understand <, > and = symbols, descending, ascending etc**

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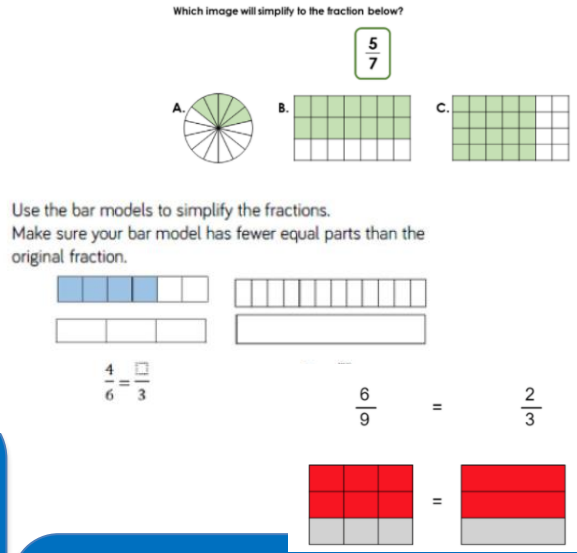
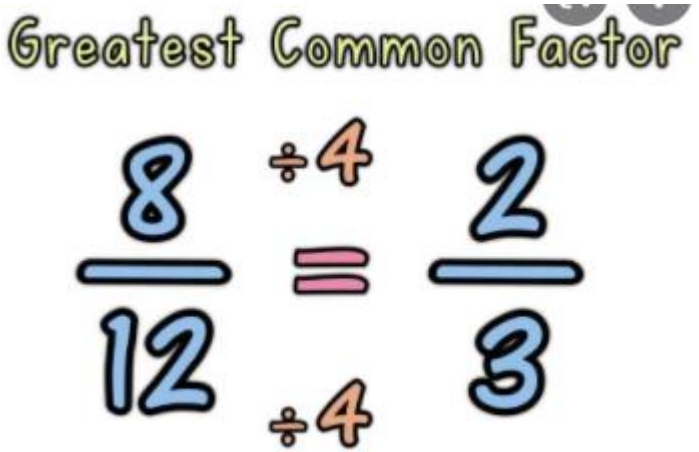
Progression in fractions, decimals, and percentages.

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

Concrete	Pictorial	Abstract
		
Use concrete resources such as equivalence towers to explore how to simplify and express in the same denominator.	**Use diagrams, models and pictures to explore how to simplify and express fractions in the same denominator.**	**Make clear links to existing tables, division facts, factors, even numbers and prime numbers. Reiterate that the operations need to be completed for the numerator and the denominator.**

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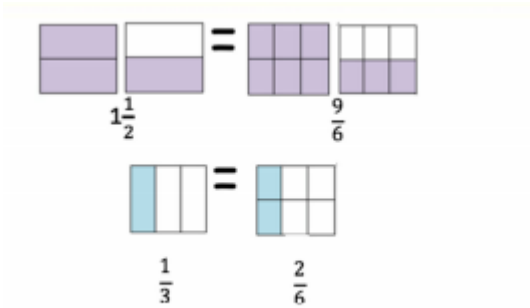
Progression in fractions, decimals, and percentages.

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

Concrete	Pictorial	Abstract
		$1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$ because $1\frac{1}{2} = \frac{3}{2}$ $\frac{3}{2} = \frac{9}{6}$ and $\frac{1}{3} = \frac{2}{6}$ so $\frac{9}{6} + \frac{2}{6} = \frac{11}{6} = 1\frac{5}{6}$
Use equivalence towers to help understand the concept of a common denominator to add/subtract with.	Children to use diagrams to help understand the concept of finding a common denominator to add fractions with.	**Explore the commutative and associative laws for addition but remind children that this won't apply to subtraction therefore it is important to follow each step in the process.**

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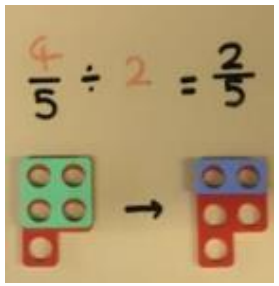
Progression in fractions, decimals, and percentages.

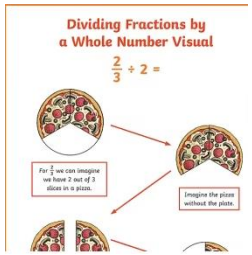
Divide proper fractions by whole number e.g. 1/3 ÷ 2 = 1/6

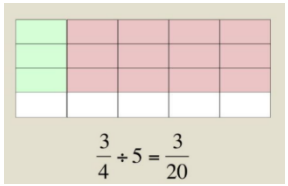
Concrete

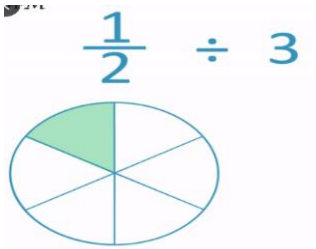


Use concrete resources such as numicon and pizza fractions to demonstrate the concept of dividing fractions. Begin to look at patterns and relationships between the numerator and the denominator.

Pictorial







Support with pictorial representations such as diagrams, and physically divide the fractions to show the answer. Continue to look at patterns and relationships between the numerator and the denominator.

Abstract

c) $7 \div \frac{2}{3} =$

d) $5 \div \frac{2}{5} =$

e) $\frac{3}{4} \div 15 =$

f) $\frac{6}{7} \div 12 =$

g) $\frac{5}{6} \div 5 =$

h) $4 \div \frac{2}{5} =$

i) $\frac{2}{7} \div 7 =$

j) $10 \div \frac{3}{4} =$

Model questions to the children and the process to find the answers. What rules do we need to follow to divide fractions. Can children explain why this is?

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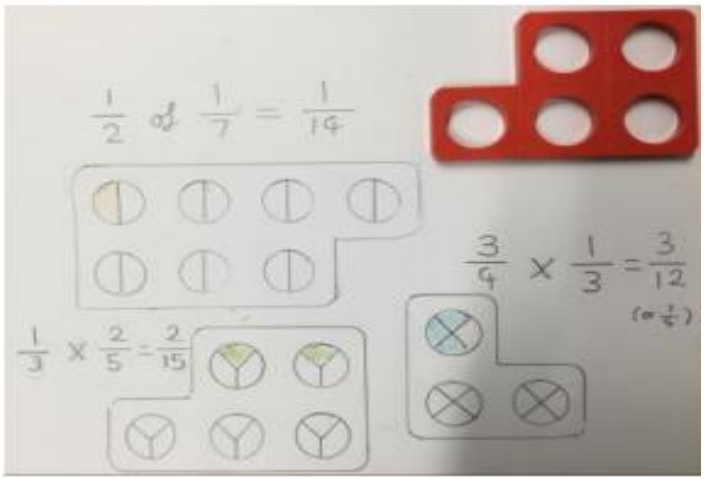
MORLEY VICTORIA

Encouragement ★ Enjoyment ★ Success ★ Effort

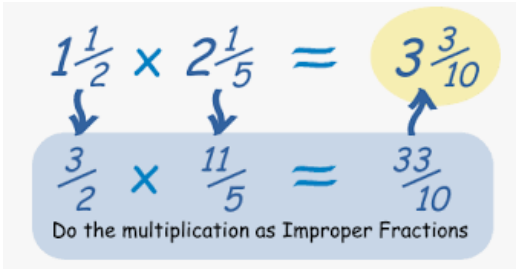
Progression in fractions, decimals, and percentages.

Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, ¼ x ½ = 1/8

Concrete	Pictorial	Abstract



Support with Numicon pieces and diagrams to explore the concepts, patterns and rules which occur when multiplying a fraction by a fraction.



$\frac{2}{5} \times \frac{6}{7} = \frac{2 \times 6}{5 \times 7} = \frac{12}{35}$

$\frac{1}{4} \times \frac{2}{3} = \frac{1 \times 2}{4 \times 3} = \frac{2}{12} =$ reduces to $\frac{1}{6}$

Model questions to the children and the process to find the answers. What are the steps to multiply fractions by fractions? Remind children and makes lonks throughout about how to simplify fractions and convert between mixed and improper fractions.

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Appendix 1

Adding and subtracting fractions

Method 1

Method 1 keeps the whole numbers and fraction parts separate largely, which is often conceptually easier for children. However, the exchange of one whole for an equivalent fraction when bridging is required in subtraction can prove difficult.

Adding Fractions Method 1

1. **Add whole number parts.**
2. **Make sure the denominators are the same if they are not already.**
3. **Add the numerators.**
4. **Simplify if possible.**
5. **Add up the whole number part and the fraction part if we need to.**

Example 1: 2/5 + 4/5

1. No whole numbers to include.
2. Denominators are already the same.
3. Add the numerators. 2/5 + 4/5 = 6/5.
4. 6/5 simplifies to 1 1/5.
5. No whole number parts to add up, so **1 1/5** is our answer.

Example 2: 9 2/3 + 6 4/5

1. Add up the whole numbers: 9 + 6 = 15 (keep that for later).
2. Make the denominators the same. Thirds and fifths can both be converted to fifteenths. 2/3 = 10/15 (multiplying numerator and denominator by 5 to keep the fraction equivalent). 4/5 = 12/15 (multiplying numerator and denominator by 3 to keep the fraction equivalent).
3. Add the numerators. 10/15 + 12/15 = 22/15
4. There are 15/15 in one whole, so we can simplify this to 1 7/15.

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5. Add the two parts together: 15 + 1 7/15 = **16 7/15**

Example 3: 3 3/4 + 7/5

1. 7/5 is an improper fraction; we convert it to 1 2/5. Add up the whole numbers: 3 + 1= 4 (keep that for later).
2. Make the denominators the same. Quarters and fifths can both be converted to twentieths. 3/4 = 15/20 (multiplying numerator and denominator by 5 to keep the fraction equivalent). 2/5 = 8/20 (multiplying numerator and denominator by 4 to keep the fraction equivalent).
3. Add the numerators. 15/20 + 8/20 = 23/20
4. There are 20/20 in one whole, so we can simplify this to 1 3/20.
5. Add the two parts together: 4 + 1 3/20 = **5 3/20**

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Subtracting Fractions Method 1a

1. **Subtract whole number parts.**
2. **Make sure the denominators are the same if they are not already.**
3. **If the left-side fraction part is smaller than the right-side fraction part, we need to exchange one whole from our whole number part to make the right-side fraction part big enough.**
4. **Subtract the numerators.**
5. **Simplify if possible.**
6. **Add up the whole number part and the fraction part if we need to.**

Example 1: 7/8 - 1/4

1. No whole number parts to subtract.
2. Make the denominators the same. Quarters can be converted to eighths. 1/4 = 2/8 (multiplying numerator and denominator by 2 to keep the fraction equivalent). We now have 7/8 – 2/8.
3. The left-side fraction is big enough.
4. Subtract the numerators. 7/8 – 2/8 = 5/8.
5. 5/8 does not simplify.
6. There is no whole number part here. Our answer is **5/8**.

Example 2: 11 3/4 – 7 5/6

1. Subtract whole number parts. 11 – 7 = 4 (keep that for later).
2. Make the denominators the same. Quarters and sixths can be converted to twelfths. 3/4 = 9/12 (multiplying numerator and denominator by 3 to keep the fraction equivalent). 5/6 = 10/12 (multiplying numerator and denominator by 2 to keep the fraction equivalent). We now have 9/12 – 10/12.
3. The left-side fraction is smaller than the right-side fraction, so we need to make it bigger. We do this by exchanging one from our whole number part for 12/12. Our whole number part is now 3. By adding 12/12 to 9/12, our fraction calculation is now 21/12 – 10/12.
4. Subtract the numerators. 21/12 – 10/12 = 11/12.
5. 11/12 does not simplify.
6. Add together the whole number and fraction parts. 3 + 11/12 = **3 11/12**.

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Subtracting Fractions Method 1b

1. **Make sure the denominators are the same if they are not already.**
2. **If the left-side fraction part is smaller than the right-side fraction part, we need to exchange one whole from our whole number part to make the right-side fraction part big enough.**
3. **Subtract whole number parts.**
4. **Subtract the numerators.**
5. **Simplify if possible.**
6. **Add up the whole number part and the fraction part if we need to.**

Example 1: 7/8 - 1/4

1. Make the denominators the same. Quarters can be converted to eighths. 1/4 = 2/8 (multiplying numerator and denominator by 2 to keep the fraction equivalent). We now have 7/8 – 2/8.
2. The left-side fraction is big enough.
3. There are no whole number parts to subtract.
4. Subtract the numerators. 7/8 – 2/8 = 5/8.
5. 5/8 does not simplify.
6. There is no whole number part here. Our answer is **5/8**.

Example 2: 11 3/4 – 7 5/6

1. Make the denominators the same. Quarters and sixths can be converted to twelfths. 3/4 = 9/12 (multiplying numerator and denominator by 3 to keep the fraction equivalent). 5/6 = 10/12 (multiplying numerator and denominator by 2 to keep the fraction equivalent). We now have 9/12 – 10/12.
2. The left-side fraction is smaller than the right-side fraction, so we need to make it bigger. We do this by exchanging one from our whole number part for 12/12. Our whole number part on the left is 11, so that now becomes 10. By adding 12/12 to 9/12, our fraction calculation is now 21/12 – 10/12.
3. This makes our new calculation **10 21/12 – 7 10/12.** Subtract whole number parts. 10 – 7 = 3.
4. Subtract the numerators. 21/12 – 10/12 = 11/12.
5. 11/12 does not simplify.
6. Add together the whole number and fraction parts. 3 + 11/12 = **3 11/12**.

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Method 2

Method 2 converts mixed numbers to improper fractions. This simplifies trickier calculations involving bridging. However, arithmetic errors are more likely to occur using this method, and this risk grows in proportion with the value of the numbers involved.

Adding Fractions Method 2

1. **Make sure the denominators are the same if they are not already.**
2. **If they are mixed numbers, convert them to improper fractions.**
3. **Add the numerators.**
4. **Convert any improper fractions back to mixed numbers if required.**
5. **Simplify if possible.**

Example 1: 2/5 + 4/5

1. Denominators are already the same.
2. Proper fractions with no whole numbers, so no need to convert.
3. Add the numerators. 2/5 + 4/5 = 6/5.
4. 6/5 converts to 1 1/5.
5. Nothing to simplify. Answer is **1 1/15**.

Example 2: 9 2/3 + 6 4/5

1. Make the denominators the same. Thirds and fifths can both be converted to fifteenths. 2/3 = 10/15 (multiplying numerator and denominator by 5 to keep the fraction equivalent). 4/5 = 12/15 (multiplying numerator and denominator by 3 to keep the fraction equivalent).
2. They are mixed numbers. Convert 9 10/15 to 145/15 and 6 12/15 to 102/15.
3. Add the numerators. 145/15 + 102/15 = 247/15.
4. 247/15 converts to 16 7/15.
5. Nothing to simplify. Answer is **16 7/15**.

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Subtracting Fractions Method 2

1. Make sure the denominators are the same if they are not already.
2. If they are mixed numbers, convert them to improper fractions.
3. Do left numerators subtract right numerator.
4. Convert any improper fractions back to mixed numbers if required.
5. Simplify if possible.

Example 1: 7/8 - 1/4

1. Make the denominators the same. Quarters can be turned into eighths. 1/4 = 2/8 (multiplying numerator and denominator by 2 to keep the fraction equivalent).
2. Proper fractions with no whole numbers, so no need to convert.
3. Subtract the numerators. 7/8 - 2/8 = 5/8.
4. 5/8 is a proper fraction, so nothing to convert.
5. Nothing to simplify. Answer is **5/8**.

Example 2: 11 3/4 – 7 5/6

1. Make the denominators the same. Quarters and sixths can both be converted to twelfths. 3/4 = 9/12 (multiplying numerator and denominator by 3 to keep the fraction equivalent). 5/6 = 10/12 (multiplying numerator and denominator by 2 to keep the fraction equivalent).
2. They are mixed numbers. Convert 11 9/12 to 141/12 and 7 10/12 to 94/12.
3. Subtract the numerators. 141/12 - 94/12= 147/12.
4. 147/12 converts to 12 3/12.
5. 3/12 simplifies to 1/4 (dividing numerator and denominator by 3 to keep the fraction equivalent). Answer is **12 1/4**.

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