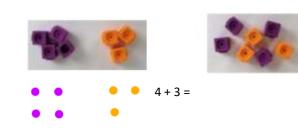
Addition

Counting objects- Aggregation (how many altogether?)

I have 4 purple flowers and 3 orange flowers. How many flowers do I have altogether?



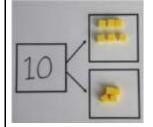
Using a number line to count on-Augmentation



Mental strategies

Adding (orally/mentally) by 'putting the big number in your head and counting on' Eg. 6 + 3 Start by putting 6 in your head, then count on three fingers, saying '7,8,9'

Part-part-whole

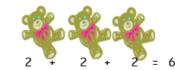


This method can be particularly useful for visualising missing number problems and can be used in conjunction with other methods. This also leads onto fact family triangles.

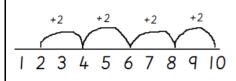
Multiplication

Repeated addition

How many legs will 3 teddies have?

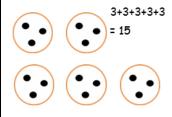


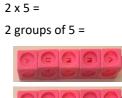
Number line



Grouping

There are 3 sweets in one bag. How many sweets are in 5 bags altogether?





Arrays

Arithmetic Methods Year 1

Subtraction Take away (opposite of aggregation): I had five balloons. Two burst. How many did I have left? Æ

E C 5 - 2 = (Abstract)

How many more/counting on:

Sajid has 7p, how many more does he need to get to 10p?

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

Difference/comparison:

Sarah has 9p and John has 13p. How much more does John have?



Children should be able to use these strategies to solve missing number problems.

(Pictorial)

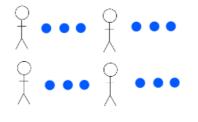
Reduction (opposite of augmentation):

8m reduced by 2m. How many metres are there now? Use counting back techniques to support this.

Division

Division can be split into sharing and grouping:

Sharing happens where we know the number being divided and the number of groups but we don't know the size of each group e.g. I had 12 sweets and I share them between four people, how many sweets do they each get?



Grouping happens where we know the number being divided and the size of each group but we don't know how many groups e.g. I have 15 marbles and I split them into groups of 3, how many groups will I have?



Addition

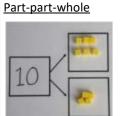
Using a number line to count on:

Sam had 35 coins and Zaydan had 27, how many did they have in total? Children can make jumps in

+20 +5 +2 35 60 62 55

Mental strategies

Adding (orally/mentally) by 'putting the big number in your head and counting on' Eg. 6 + 3 Start by putting 6 in your head, then count on three fingers, saying '7,8,9'



Fact family triangles

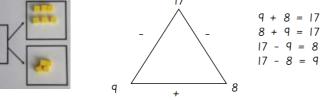
a range of ways depending

on their understanding of

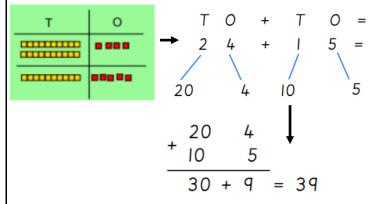
number. Throughout the

making larger jumps.

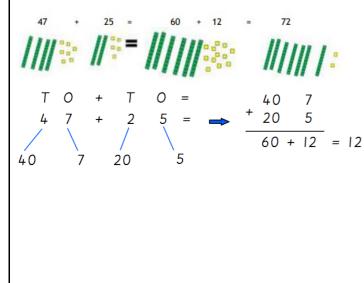
year, they should progress to



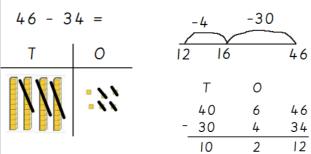
Written method (no regrouping)



Written method (regrouping)



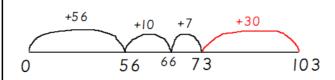
Subtraction Take away/ counting back:



Arithmetic Methods Year 2

How many more/counting on:

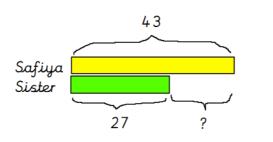
It takes 103 miles to travel to London. The Patel family travel 56 miles and take a break, then they travel another 17 miles before filling up with petrol. How many more miles do they need to travel?



Difference/comparison:

es?

Safiya is 43 and her sister is 27. What is the difference in their ag-

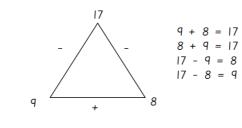


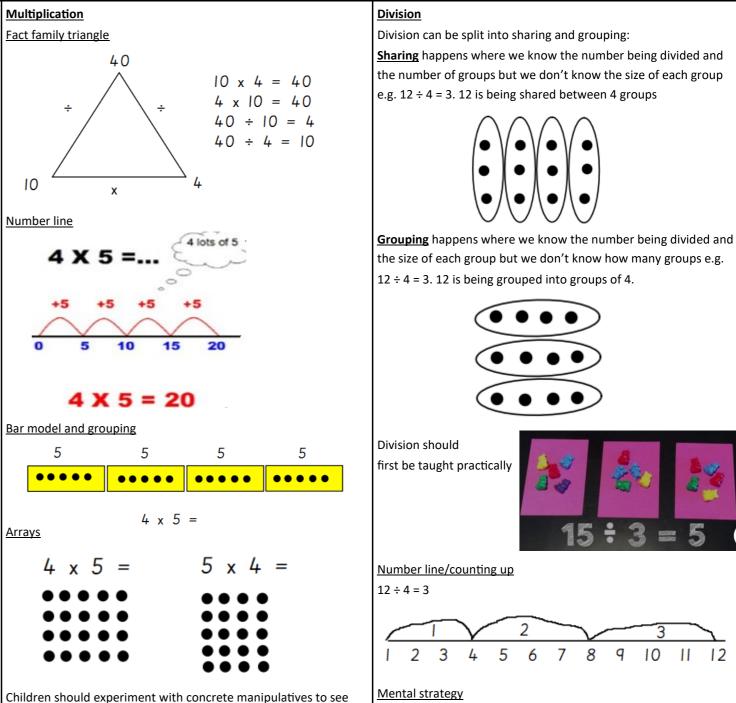
Children should be able to use this strategy to solve missing number problems.

Reduction:

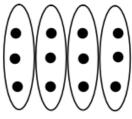
8m reduced by 2m. How many metres are there now? Use counting back techniques to support this.

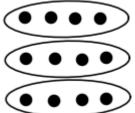
Fact family triangles





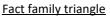
that multiplication is commutative. Children should understand that the calculation 4 x 5 means 4 groups of 5, with each group being drawn horizontally.

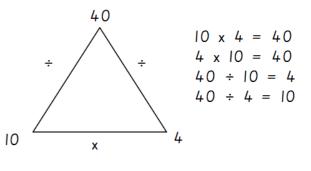




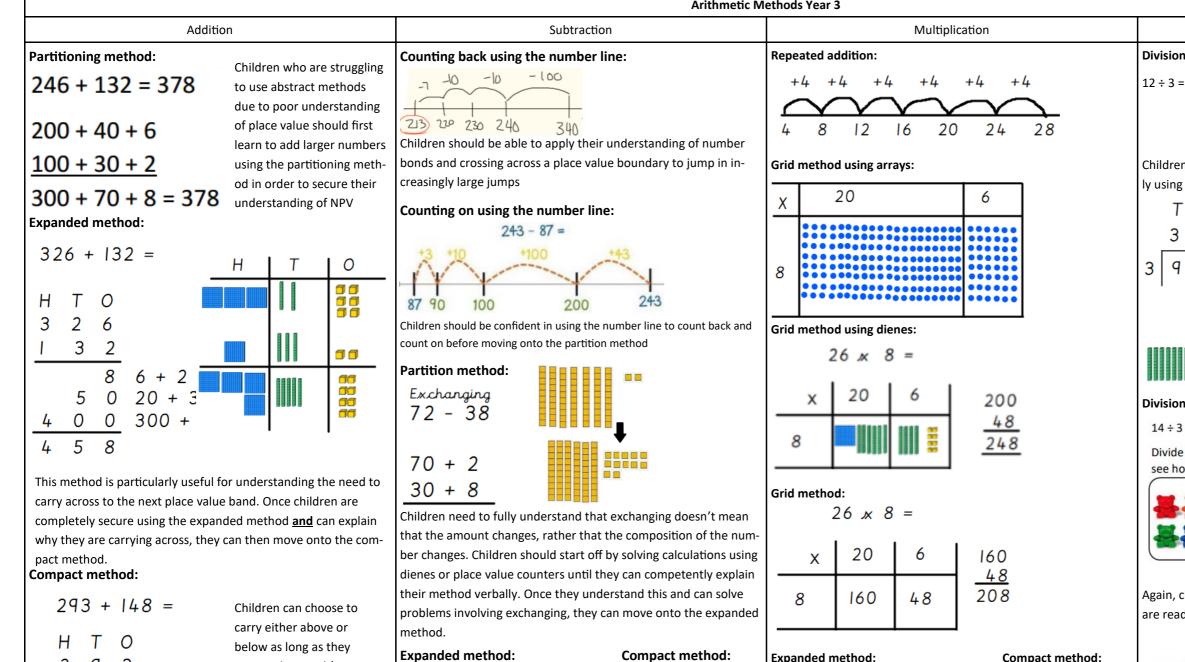


 $12 \div 4 = 3$. Count up in 4s until you get to 12











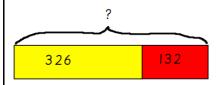
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Remember that word problems are still fluency questions and are merely in a different format. Questions should use a range of vocabulary such as altogether, sum, in total, add, more, added on etc

Bar Model:



3

8

Part-whole bar models can be used to express word problems visually that link to the fact family triangles.

are consistent with their method.

Exchanging

72 - 38

4

3 0

3 4

Bar Model:

132

326

?

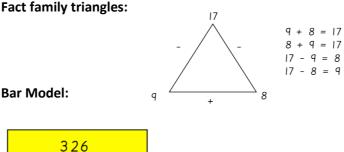
12 - 8

60 - 30

ТО

°**1** '2

3 8



The comparison bar model can be used to find the difference.

Exchanging

72 - 38

0 Т

2

8

- 4

°7

3

3

Expanded method: **Compact method:** 26 x 8 = $26 \times 8 =$ 0 Н Т Т 0 Н 2 6 8 6 8 8 4 6 x 8 6 0 20 x 8 0 8 2 0 8

Children need to be fully secure on each stage before moving on to ensure full understanding of multiplication methods especially in terms of place value and carrying across a place value barrier.

Bar Model:



Division

Division without remainders:



Children will progress to doing this method pictorially before finally using an abstract method (shown below)



Children must understand that the 9 isn't 9, it is actually 9 tens, so although we say 'how many 3s are there in 9', we actually mean how many 3s are there in 9 tens? Use dienes or place value counter to help with this understanding. Children will initially do this method with no carrying and



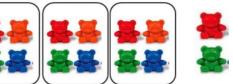
no remainders. They will then progress to doing short division with remainders.

Division with remainders:

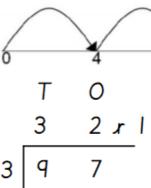
```
14 \div 3 =
```

3

Divide objects between groups and see how much is left over



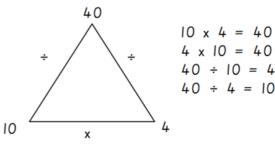
Again, children can progress onto doing this pictorially until they are ready to progress onto the number line or the abstract form.

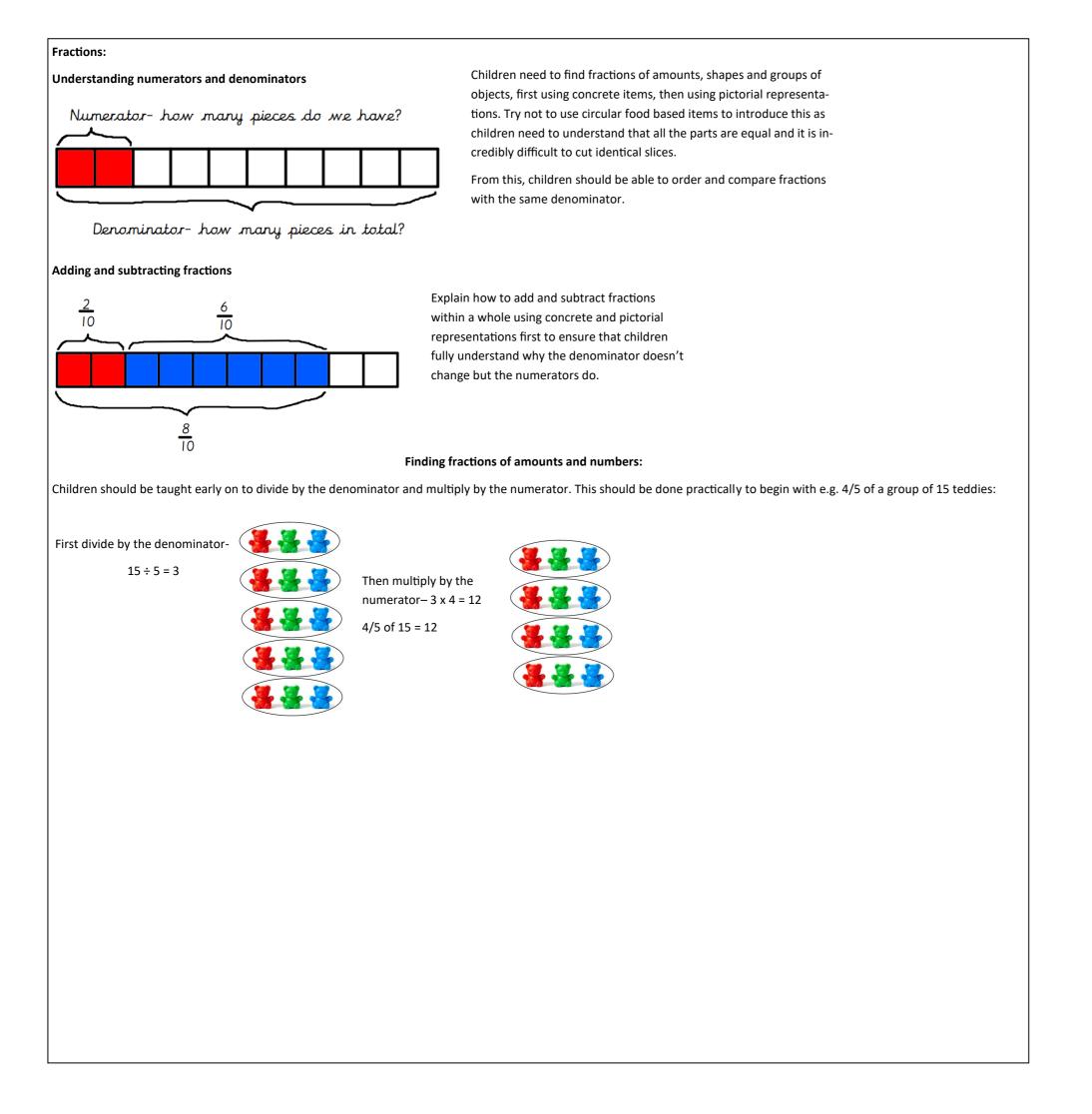


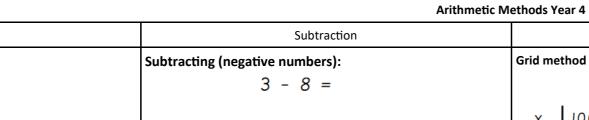
It is important to go back to dienes or place value counters when starting the bus stop method of short division.

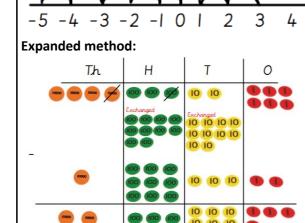
2 13

Fact family triangles:





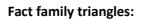




10 10 10 10 10 Th H T 0 The use of place ¹²X 2 6 value counters is 193 2 particularly im-6 - 2 4 portant when add-120 - 30 q 0 ing or subtracting 3 0 0 1200 - 900 tenths. 2 0 0 0 3000 - 1000

Children need to fully understand that exchanging doesn't mean that the amount changes, rather that the composition of the number changes. Children should start off by solving calculations using dienes or place value counters until they can competently explain their method verbally. Once they understand this and can solve problems involving exchanging, they can move onto the expanded method.

Compact method:



The comparison bar

find the difference.

model can be used to

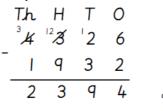
9 + 8 = 17

8 + 9 = 17

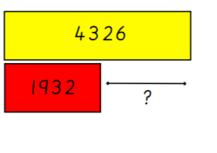
17 - 9 = 8

17 - 8 = 9

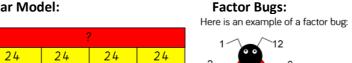
Bar Model:

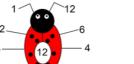


Bar Model:



			N	Iultipl	ication					
Grid metho	d using	g dien	es:							Divis
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8					90 90 90		16	0		
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Grid metho	d:		21		-					
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		, I	2	0		Т				4
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8	80	0	16	n	48			4	8	
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Expanded r	nethod	:				_				
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100	8									
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Children need to understand that factors are the times tables that the number are in e.g. 3 and 4 are factors of 12

Children can choose to carry either above or below as long as they are consistent with their method.

Addition

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Th H

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Adding (negative numbers):

- 3

Expanded method:

Compact method:

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0

3

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Th.

4

Th

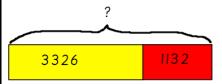
-2

Once children understand how to carry using the expanded method, they can progress to the compact method. Children using the compact method that are not successfully carrying must return to the expanded method to secure their understanding.

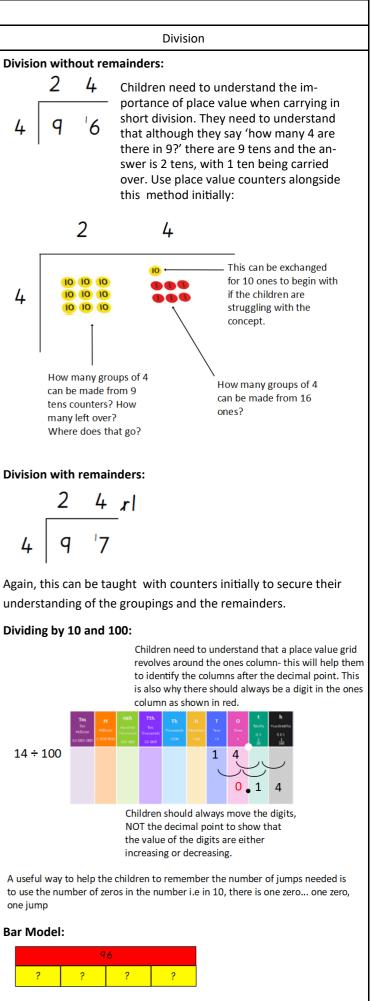
Word problems:

Remember that word problems are still fluency questions and are merely in a different format. Questions should use a range of vocabulary such as altogether, sum, in total, add, more, added on etc



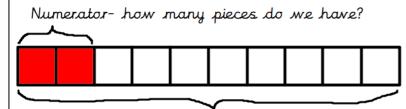


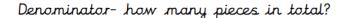
one jump



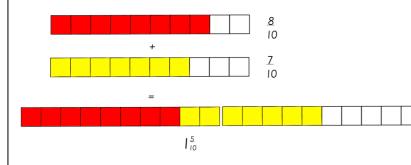
Fractions:

Understanding numerators and denominators





Adding and subtracting fractions that exceed 1:

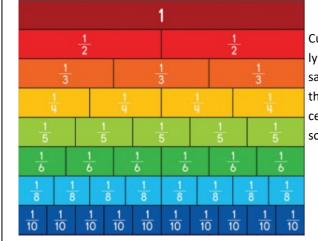


Children need to find fractions of amounts, shapes and groups of objects, first using concrete items, then using pictorial representations. Try not to use circular food based items to introduce this as children need to understand that all the parts are equal and it is incredibly difficult to cut identical slices.

From this, children should be able to order and compare fractions with the same denominator.

Explain how to add and subtract fractions within a whole using concrete and pictorial representations first to ensure that children fully understand why the denominator doesn't change but the numerators do.

Equivalent fractions:



Cuisenaire rods should be used to explore equivalent fractions practically. Children should understand that the size of a whole remains the same, which is shown clearly using an equivalent fraction wall alongside the Cuisenaire rods. Equivalent fractions should be one of the last concepts to be taught and should only be taught when the children have a solid understanding of numerators and denominators.

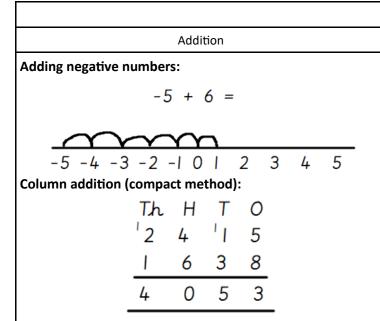
1<u>4</u>.(2) Underline the number that may change

Circle the number that decides whether the underlined number should change

Rhyme to remember: 5 or more, let it soar 4 or less, let it rest. Rounding decimals:

Try not use use the term 'round down' as that implies that the number decreases.





Children will be expected to add numbers of increasing length, however the method remains the same.

Adding decimals:

	TTh	Th	Н	Т	0.th
	4	5	2	0	8.17
+		3	1	9	4.7 <mark>0</mark>
	4	8	4	0	2.87
			I.	I.	

Children need to understand that the decimal points must always line up and place holders must be used if there are not an equal number of decimal places in each number (shown in red).

Children can carry either above or below (shown in varying ways above) however must be consistent.

Word problems:

Remember that word problems are still fluency questions and are merely in a different format. Questions should use a range of vocabulary such as altogether, sum, in total, add, more, added on etc.

Bar Model:



Part-whole bar models can be used to express word problems visually that link to the fact family triangles.

		Subtra	action			
Subtracting (negative	ve nu	mber	s):			
:	3 -	8 =	=			
		\sim	\sim			
-5 -4 -3 -2	-1	0 1	2	3	4	5
Column subtraction	n (con	npact	meth	nod):		
	Th	Н	Т	0		
	³ ႓	12	2	6		
-	1	q	3	2		
	2	3	q	4		

Children will be expected to subtract numbers of increasing length, however the method remains the same.

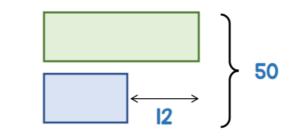
Subtracting decimals:

	TTh	Th	Н	Т	_0.th
	4	5	\varkappa	'0	0. t. h 8. 17
-		3	T	q	4.7 <mark>0</mark>
	4	2	0	I	3.47

Children need to understand that the decimal points must always line up and place holders must be used if there are not an equal number of decimal places in each number (shown in red).

Bar Model:

Children will need to be familiar with the bar model as they will need to use it to solve increasingly hard problems, particularly with the comparison model, and should be able to adapt the part-part-whole model to calculate missing values e.g. The sum of two numbers is 50 and the difference between the numbers is 12. What is the smallest number?

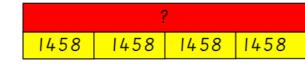




		-					
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	10			= 260	260 + <u>208</u>		5
	8			= 208	468		
Grid	d meth	od:					
	1	18 🛪 26	8 =				
_	x	20	6				
_	10	200	60	= 260	260 + <u>208</u>		Division
_	8	160	48	= 208	468		
Exp	anded	methoo		18 =	H T O 2 6 1 8 4 8 1 6 0 2 0 0 4 6 8	6 x 8 20 x 8 6 x 10 20 x 10	The sam od e.g. r to the 4 Multiply
Con	npact r	nethod:		18 =	H T O ⁴ 2 6 1 8 2 0 8 2 6 0 4 6 8	-	14 ÷

Ensure that children fully understand how to complete calculations using the expanded method before moving onto the compact method. Children must be able to explain the need to add in a place holder as well as the order in which the calculation is completed. If children cannot do this, it shows a lack of understanding of the method.

Bar Model:

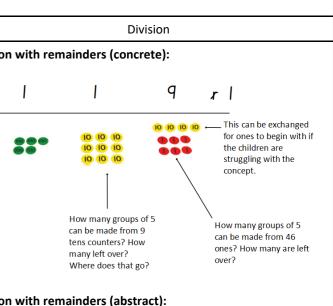


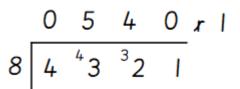
Factors and Multiples:

Children need to understand the link between their times tables and factors and multiples. They also need to understand the relationship between factors and multiples. This is a useful way to do this:

Factor x Factor = Multiple

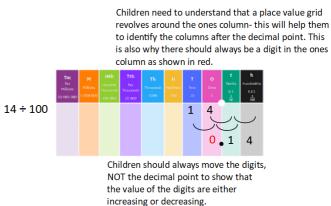
E.g. 3 x 4 = 12, so 3 and 4 are the factors and 12 is the multiple





me questions should be asked alongside the abstract meth-. how many groups of 8 can be made from 4, what happens 4 now?

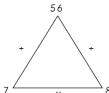
olying and dividing by 10, 100 and 1000:



A useful way to help the children to remember the number of jumps needed is to use the number of zeros in the number i.e in 10, there is one zero... one zero, one jump

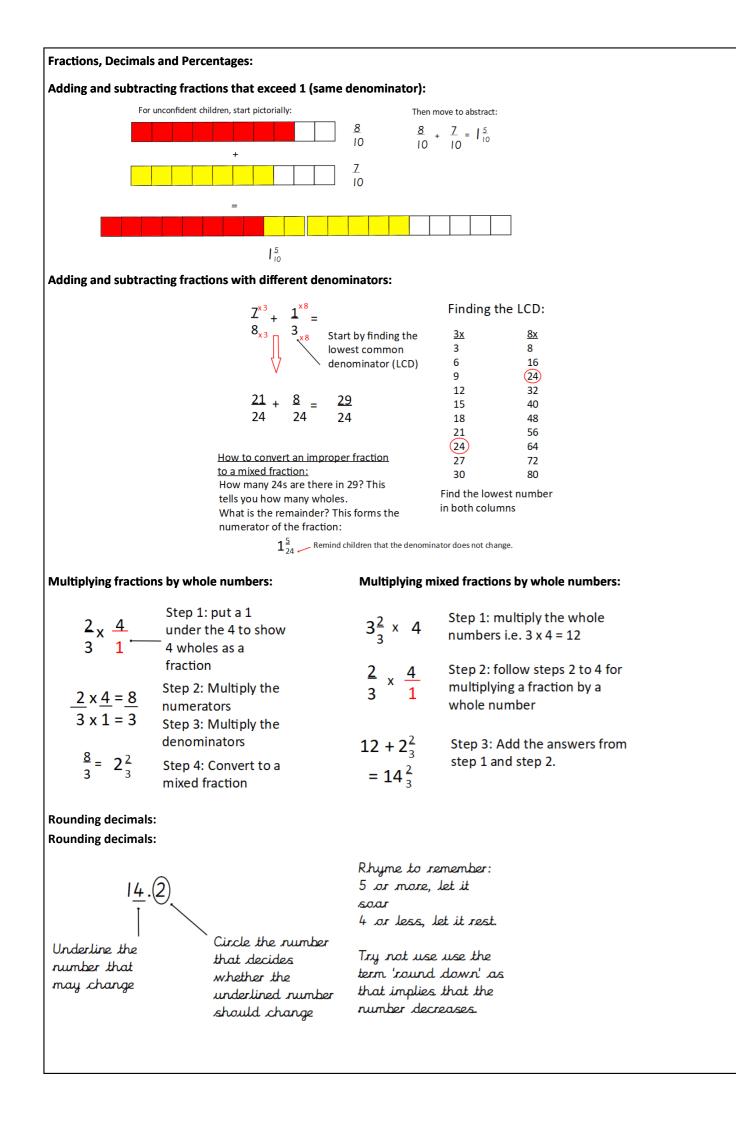
Fact families:





Bar Model:





Addition Adding negative numbers: -5 + 6 =-5 -4 -3 -2 -1 0 1 2 3 Column addition (compact method): Th. H T O 2 5

Children will be expected to be able to add together more than two numbers of increasing length but the method remains the same.

Adding decimals:

	TTh	Th	Н	Т	0.th
	4	5	2	0	8.17
+		3	T	q	4.7 <mark>0</mark>
	4	8	4	0	2.87

3

5

6

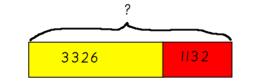
Children need to understand that the decimal points must always line up and place holders must be used if there are not an equal number of decimal places in each number (shown in red). Children will be expected to add together more than two numbers of increasing lengths but the method remains the same. Encourage the children to write the place value titles about their calculation in order to help correctly organise their calculations.

Children can carry either above or below (shown in varying ways above) however must be consistent.

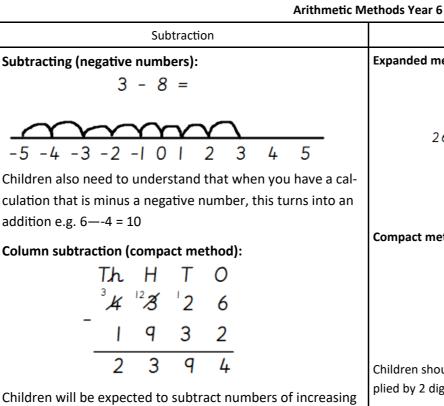
Word problems:

Remember that word problems are still fluency questions and are merely in a different format. Questions should use a range of vocabulary such as altogether, sum, in total, add, more, added on etc





Part-whole bar models can be used to express word problems visually that link to the fact family triangles. Fact family triangles should be used when teaching algebra to make the link between missing number problems and the use of letters to represent numbers.



length, however the method remains the same.

Subtracting decimals:

	TTh 4	Th 5	Н 'Х	T '0	0.th 78.17	
-		3	T	q	4.7 <mark>0</mark>	
	4	2	0	1	3.47	

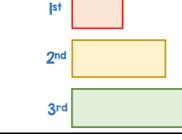
Children need to understand that the decimal points must always line up and place holders must be used if there are not an equal number of decimal places in each number (shown in red).

Children will be expected to subtract numbers of increasing length, however the method remains the same.

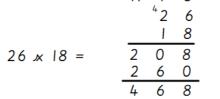
Bar Model:

Children will need to be familiar with the bar model as they will need to use it to solve increasingly hard problems, particularly with the comparison model

E.g. A sequence increases by the same amount each time. The difference between the first and third term in the sequence is 18 and the sum of all three terms is 60. What is the 3rd term in the sequence?

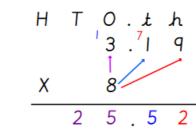


ethods Year 6		
	Multiplication	
Expanded method for child	dren who are not confident:	Divis
26 x 18 =	H T O 2 6 1 8 4 8 6 x 8 1 6 0 20 x 8 6 0 6 x 10 2 0 0 20 x 10 4 6 8	5
Compact method:	H T O ⁴ 2 6	Divis



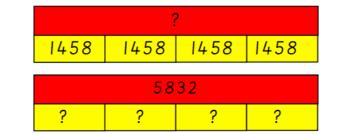
Children should be able to use this method for up to 4 digits multiplied by 2 digits.

Compact method (multiplying decimals):



Children should understand that although the whole number is in the ones column, that they still multiply this with the smallest place value first i.e. ones x hundredths, then ones x tenths, then ones x ones.

Bar Model (for multiplication and division):

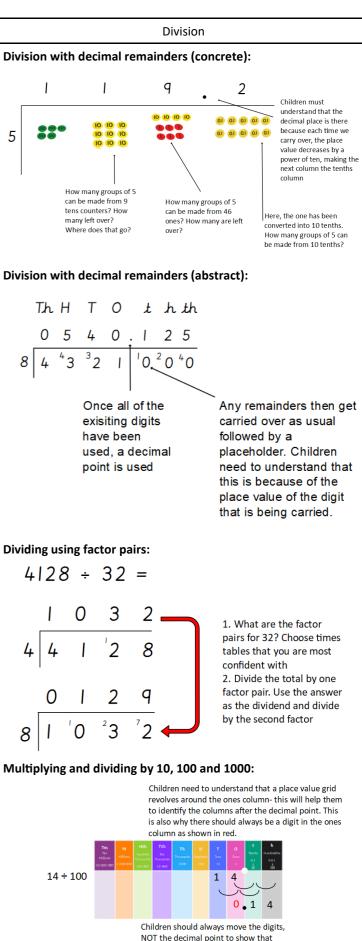


Factors and Multiples:

Children need to understand the link between their times tables and factors and multiples. They also need to understand the relationship between factors and multiples. This is a useful way to do this:



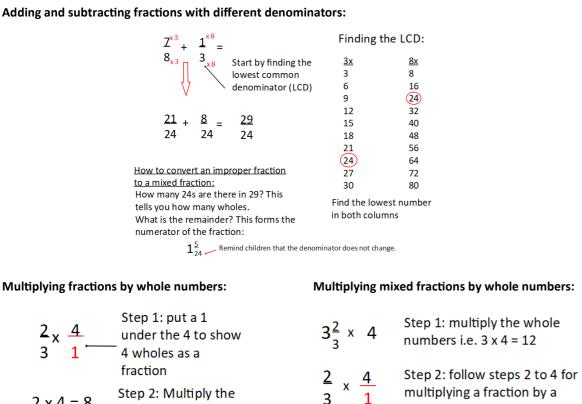
E.g. $3 \times 4 = 12$, so 3 and 4 are the factors and 12 is the multiple.



A useful way to help the children to remember the number of jumps needed is to use the number of zeros in the number i.e in 10. there is one zero... one zero. one iump

the value of the digits are either increasing or decreasing.

Fractions and decimals:



2 x <u>4</u> = 8 numerators $3 \times 1 = 3$ Step 3: Multiply the denominators $\frac{8}{2} = 2\frac{2}{3}$ Step 4: Convert to a 3 mixed fraction

 $12 + 2_3^2$

 $= 14^{\frac{2}{3}}$

whole number

step 1 and step 2.

Step 3: Add the answers from

Step 1: put a 1

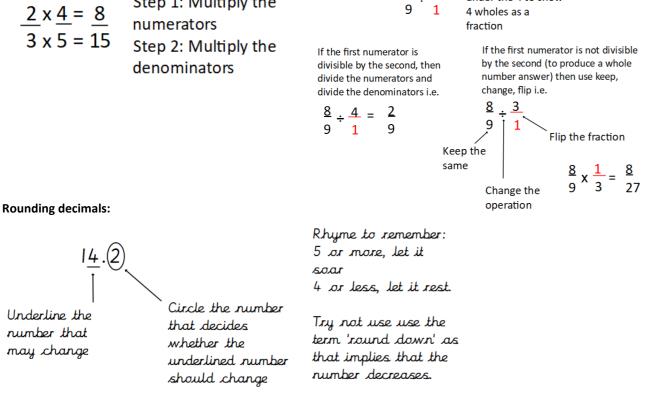
under the 4 to show

Multiplying fractions:

Step 1: Multiply the numerators

Dividing fractions by whole numbers:

<u>8</u> <u>+</u> 4



Percentages:

Children need to understand how they can use their existing multiplication and division facts to find the percentage of any amount e.g.	37% of 420 10% of 420 = 42
	30% = 42 x 3 = 126
When children are more confident with this, they can divide by 100 and multiply by the percentage	1% = 42 ÷ 10 = 4.2 7% = 4.2 x 7 = 29.4
	126 + 29.4 = 155.4

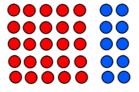
Ratio:

Children should understand that ratios relate to proportions. For a ratio of 5:2, this would mean that for every 5 of something, there is 2 of something else. Represent that pictorially first of all e.g.

In a bag of red and blue balls, there are 5 red balls for every 2 blue balls.

how many would be red?

From here, we can incorporate guantities i.e. if there were 35 balls in total,



Once they understand this pictorially, they can move into abstract

First we need to add together 5 and 2 together because there are 7 parts to our ratio. We then divide our total by the number of parts we have. Next we must multiply our answer by each number in our ratio. So red = 5 x 5 and blue = 2 x 5.

Step 1: Start off by finding 10% Step 2: Multiply the 10% by 3 to find 30% Step 3: Find 7% by dividing by 10 again and then multiplying by 7. Step 4: Add the amounts together.

If working out 5%, children should halve 10%