



Alexandra Park Primary School

Care. Aspire. Achieve

At Alexandra Park Primary School, we aim for every child to become a life-long learner with maths playing a central role. Maths is much more than a school subject and delivers children vital problem-solving, reasoning and logic skills. Each and every child should leave Alexandra Park Primary School with a thirst for knowledge and a desire to learn at every corner, having being inspired through maths.

To achieve this, we have focused on embedding a mastery approach to teaching maths with our core values of Care, Aspire, Achieve at the centre of this. White Rose is based on extensive research and years of classroom practice. White Rose use a concrete-pictorial-abstract approach to support children to understand the maths they are learning and to be able to use it elsewhere, thus fitting with our aims for maths to be bigger than just a school subject. The "small step" approach means nothing is left to chance - all curriculum objectives are broken down into accessible parts that build on each other so the learning journey is complete, therefore giving every child the opportunity to Aspire and Achieve.

After a challenging couple of years, it is even more important that our maths curriculum is organised in a logical and progressive manner through which essential knowledge and skills are taught. With that in mind, the White Rose is organised to follow the national curriculum in said organised manner, deliver the mentioned skills and knowledge and highlights areas indicated in the *Ready To Progress* materials, ensuring nothing seen as absolutely crucial is missed.

Calculation Policy

The policy goes through:

- Addition
- Subtraction
- Multiplication
- Division

Each operation is broken down into skills for the year group and shows recommended models and visuals to support the teaching of the corresponding concepts alongside.

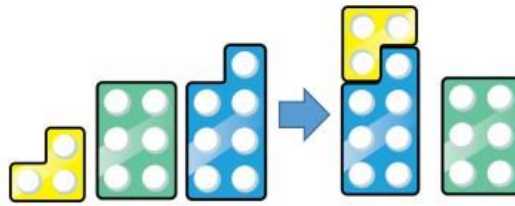
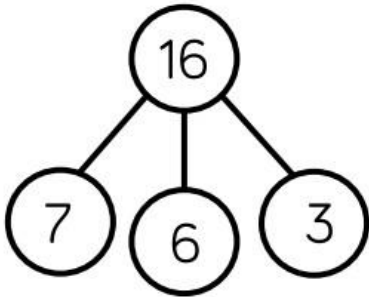
Addition

Skill: Add 1-digit numbers within 10	Year: 1
<p style="text-align: center;">$4 + 3 = 7$</p>	<p>When adding numbers to 10, children can explore both aggregation and augmentation.</p> <p>The part-whole model, discrete and continuous bar model, number shapes and ten frame support aggregation.</p> <p>The combination bar model, ten frame, rekenrek and number track all support augmentation.</p>

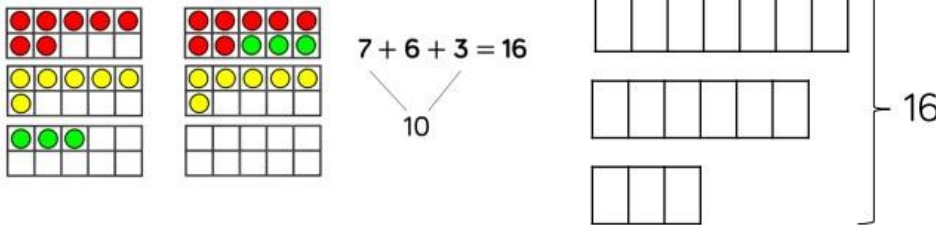
Skill: Add 1 and 2-digit numbers to 20	Year: 1/2
<p style="text-align: center;">$8 + 7 = 15$</p>	<p>When adding one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.</p> <p>Different manipulatives can be used to represent this exchange. Use concrete resources alongside number lines to support children in understanding how to partition their jumps.</p>

Skill: Add three 1-digit numbers

Year: 2



$7 + 6 + 3 = 16$



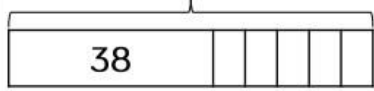
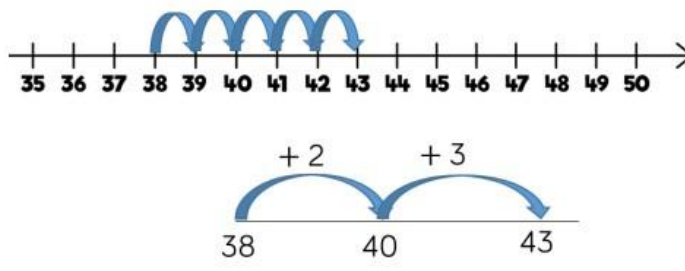
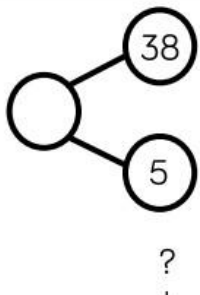
When adding three 1-digit numbers, children should be encouraged to look for number bonds to 10 or doubles to add the numbers more efficiently.

This supports children in their understanding of commutativity.

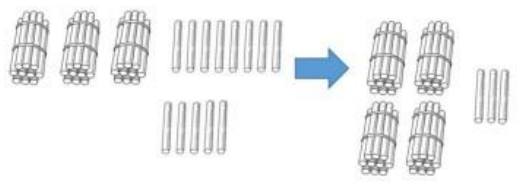
Manipulatives that highlight number bonds to 10 are effective when adding three 1-digit numbers.

Skill: Add 1-digit and 2-digit numbers to 100

Year: 2/3



$38 + 5 = 43$



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

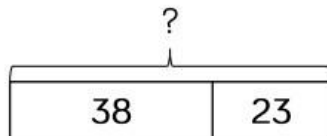
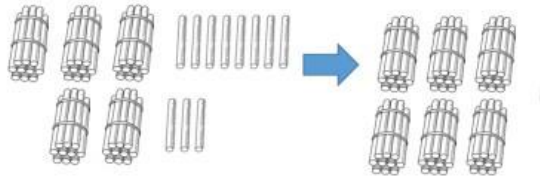
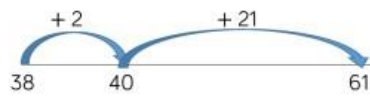
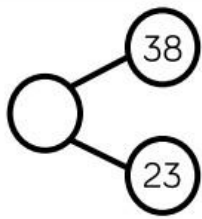
When adding single digits to a two-digit number, children should be encouraged to count on from the larger number.

They should also apply their knowledge of number bonds to add more efficiently e.g. $8 + 5 = 13$ so $38 + 5 = 43$.

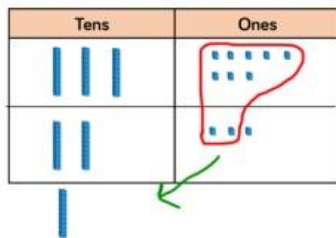
Hundred squares and straws can support children to find the number bond to 10.

Skill: Add two 2-digit numbers to 100

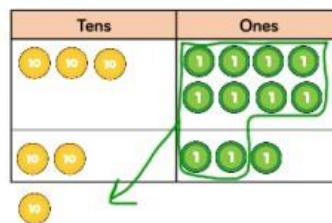
Year: 2/3



$$38 + 23 = 61$$



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



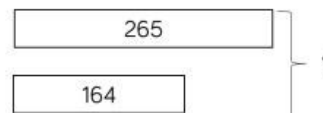
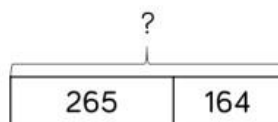
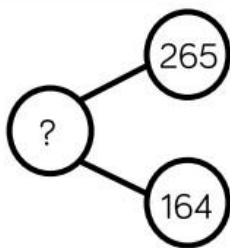
At this stage, in Year 3, encourage children to use the formal column method when calculating alongside straws, base 10 or place value counters. As numbers become larger, straws become less efficient.

Year 2...

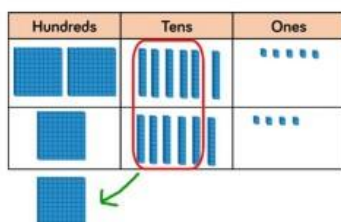
Children should be able to count on to find a total. Encourage them to jump to multiples of 10 to become more efficient.

Skill: Add numbers with up to 3 digits

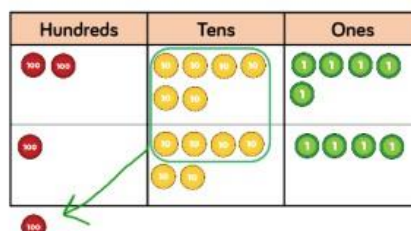
Year: 3



$$265 + 164 = 429$$



$$\begin{array}{r} 265 \\ + 164 \\ \hline 429 \\ 1 \end{array}$$




Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 3 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Skill: Add numbers with up to 4 digits

Year: 4



?

2,138	1,378
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2,138

1,378

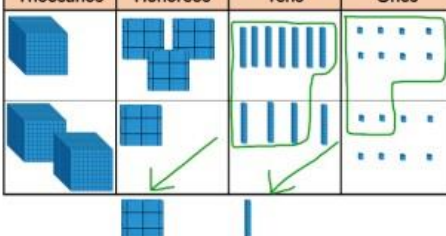
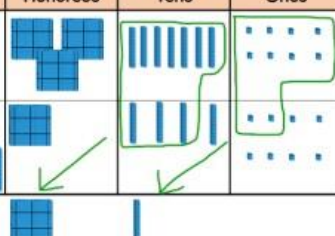
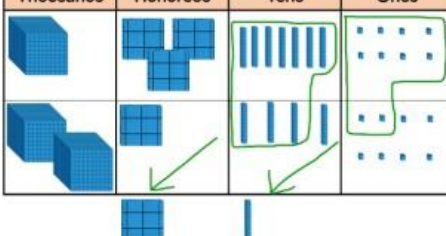
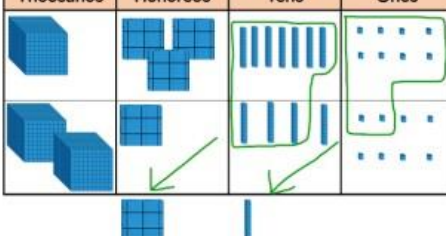
1	3	7	8
+	2	1	4
3	5	2	6
	1	1	

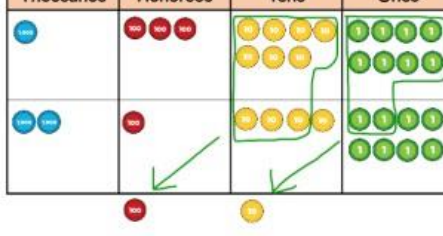
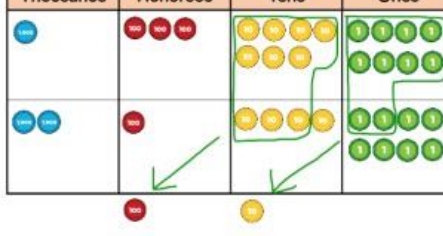
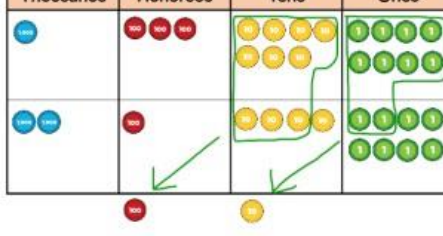
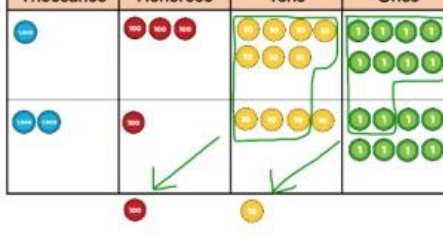
1,378 + 2,148 = 3,526

is recommended along with tens frames.

Base 10 and place value counters are the most effective manipulatives when adding numbers with up to 4 digits. The above is recommended along with tens frames. Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Thousands	Hundreds	Tens	Ones
			

Thousands	Hundreds	Tens	Ones
			

Skill: Add numbers with more than 4 digits

Year: 5/6

?

104,328

61,731

?

104,328	61,731
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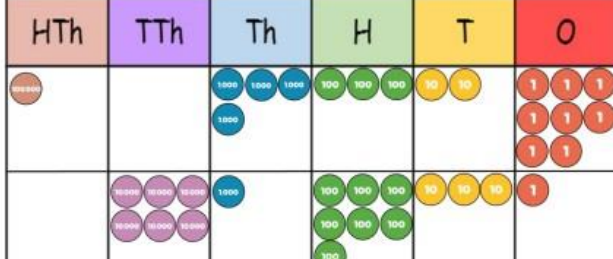
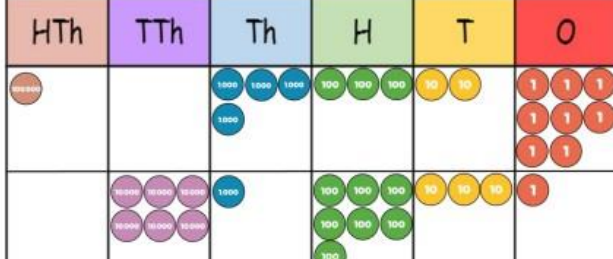
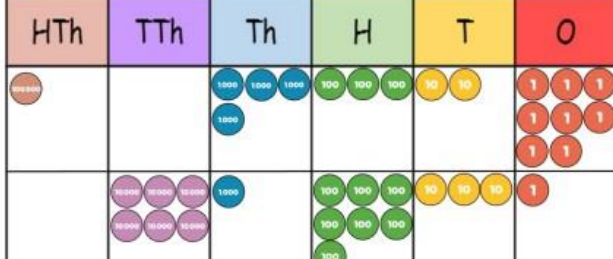
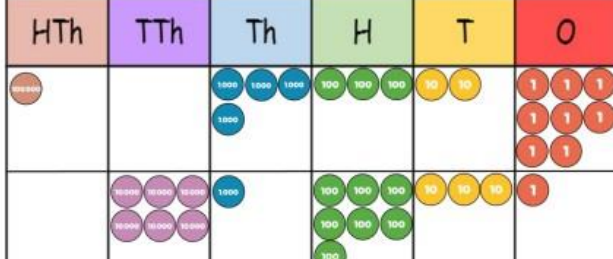
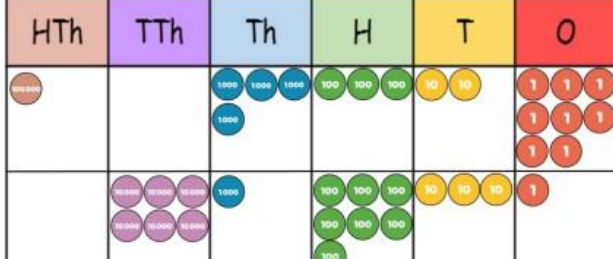
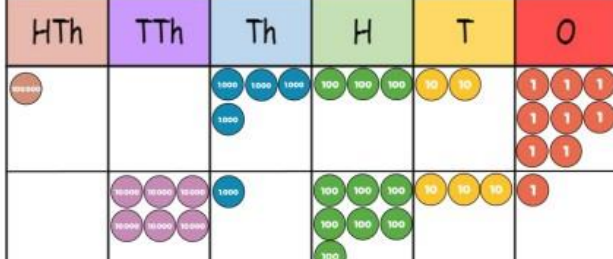
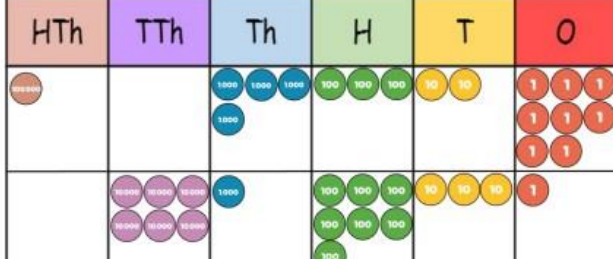
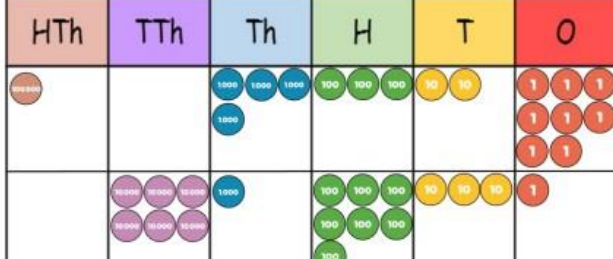
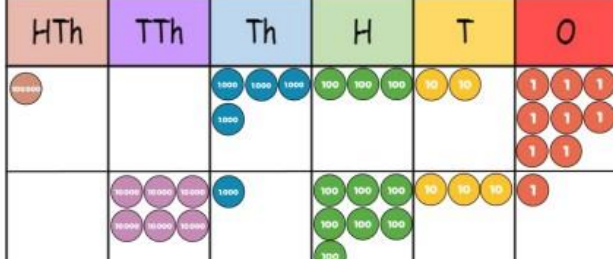
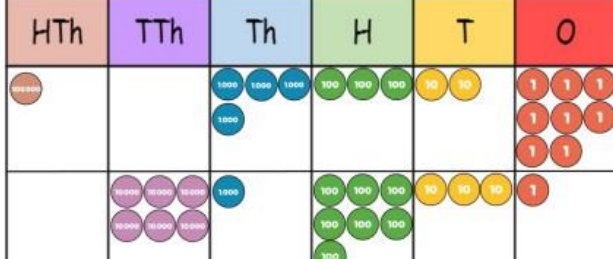
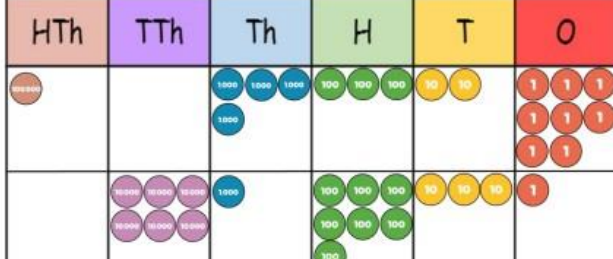
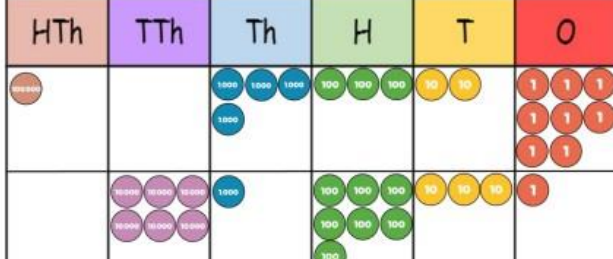
104,328

61,731

104,328 + 61,731 = 166,059

Place value counters or plain counters on a place value grid are the most effective concrete resources when adding numbers with more than 4 digits.

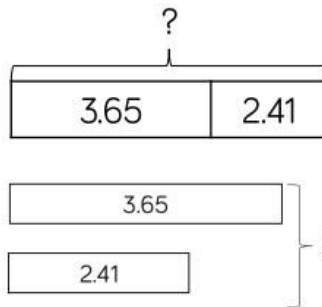
At this stage, children should be encouraged to work in the abstract, using the column method to add larger numbers efficiently.

HTh	TTh	Th	H	T	O
					
					

1	0	4	3	2	8
+	6	1	7	3	1
1	6	6	0	5	9
			1		

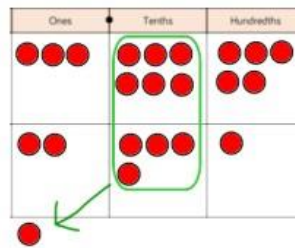
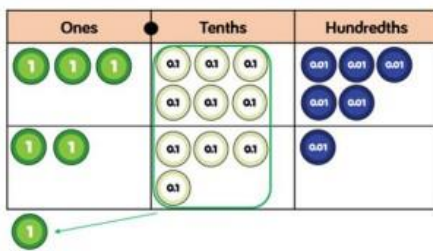
Skill: Add with up to 3 decimal places

Year: 5



$$\begin{array}{r}
 3.65 \\
 + 2.41 \\
 \hline
 6.06 \\
 1
 \end{array}$$

$3.65 + 2.41 = 6.06$



Place value counters and plain counters on a place value grid are the most effective manipulatives when adding decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of adding decimals with a variety of decimal places. This includes putting this into context when adding money and other measures.

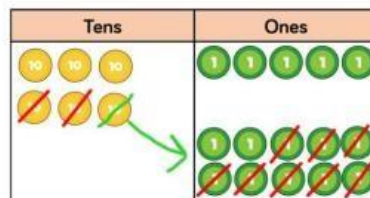
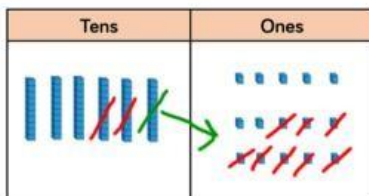
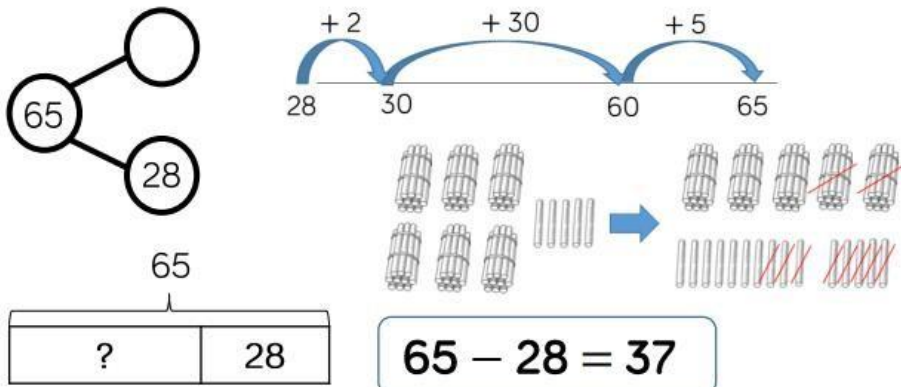
Subtraction

Skill: Subtract 1-digit numbers within 10	Year: 1
<p>$7 - 3 = 4$</p>	<p>Part-whole models, bar models, ten frames and number shapes support partitioning.</p> <p>Ten frames, number tracks, single bar models and rekenreks support reduction.</p> <p>Cubes and bar models with two bars can support finding the difference.</p>

Skill: Subtract 1 and 2-digit numbers to 20	Year: 1/2
<p>$14 - 6 = 8$</p>	<p>When subtracting one-digit numbers that cross 10, it is important to highlight the importance of ten ones equalling one ten.</p> <p>Children should be encouraged to find the number bond to 10 when partitioning the subtracted number. Ten frames, numicon s and number lines are particularly useful for this.</p>

Skill: Subtract 1 and 2-digit numbers to 100

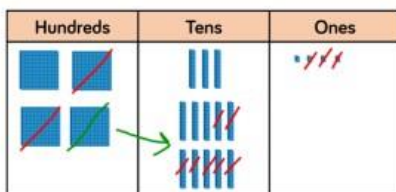
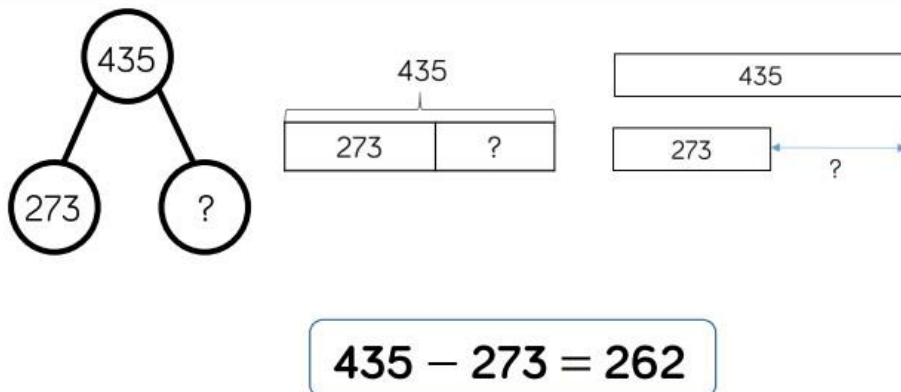
Year: 2



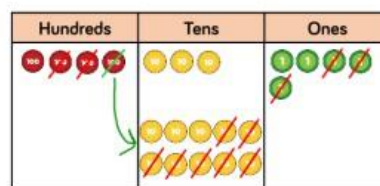
Children can also use a blank number line to count on to find the difference. Encourage them to jump to multiples of 10 to become more efficient.

Skill: Subtract numbers with up to 3 digits

Year: 3



$$\begin{array}{r} 3 \quad 1 \\ 435 \\ - 273 \\ \hline 262 \end{array}$$



Base 10 and place value counters are the most effective manipulative when subtracting numbers with up to 3 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Formal written method introduced in Year 3.

Skill: Subtract numbers with up to 4 digits

Year: 4

4,357

2,735	?
-------	---

4,357

2,735	?
-------	---

$$\begin{array}{r} 3 \ 1 \\ 4357 \\ - 2735 \\ \hline 1622 \end{array}$$

$4,357 - 2,735 = 1,622$

Thousands	Hundreds	Tens	Ones

Base 10 and place value counters are the most effective manipulatives when subtracting numbers with up to 4 digits.

Ensure children write out their calculation alongside any concrete resources so they can see the links to the written column method.

Plain counters on a place value grid can also be used to support learning.

Skill: Subtract numbers with more than 4 digits

Year: 5/6

294,382

182,501	?
---------	---

294,382

182,501	?
---------	---

$294,382 - 182,501 = 111,881$

HTh	TTh	Th	H	T	O

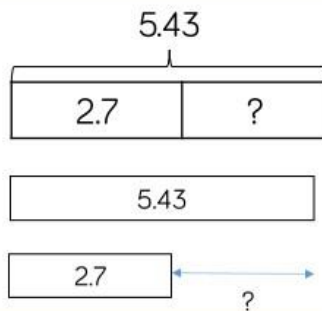
	2	9	3	1 3	8	2
-	1	8	2	5	0	1
	1	1	1	8	8	1

Place value counters or plain counters on a place value grid are the most effective concrete resource when subtracting numbers with more than 4 digits.

At this stage, children should be encouraged to work in the abstract, using column method to subtract larger numbers efficiently.

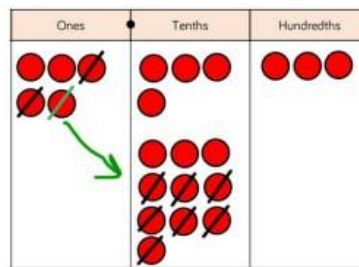
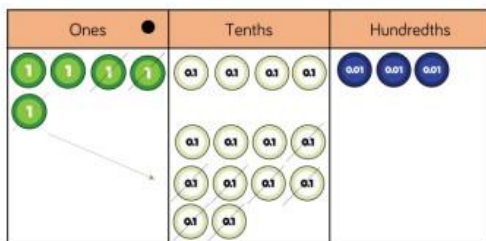
Skill: Subtract with up to 3 decimal places

Year: 5



$$\begin{array}{r} 4 \quad 1 \\ 5.43 \\ - 2.7 \\ \hline 2.73 \end{array}$$

$$5.43 - 2.7 = 2.73$$



Place value counters and plain counters on a place value grid are the most effective manipulative when subtracting decimals with 1, 2 and then 3 decimal places.

Ensure children have experience of subtracting decimals with a variety of decimal places. This includes putting this into context when subtracting money and other measures.

Multiplication

Our calculation policy for multiplication starts with a breakdown of times tables; what should be taught when and what that teaching should look like.

During the Summer Term, the children in Year 4 sit the Multiplication Tables Check in line with the Government's assessment framework.

Times tables continue to be recalled and tested throughout Years 5 and 6.

IDL's new multiplication strand should be used to aid in catch-up across KS2.

TT Rockstars forms part of children's homework diet.

Skill	Year	Representations and models
Recall and use multiplication and division facts for the 2-times table	2	Bar model Number shapes Counters Money Ten frames Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 5-times table	2	Bar model Number shapes Counters Money Ten frames Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 10-times table	2	Hundred square Number shapes Counters Money Ten frames Bead strings Number lines Base 10

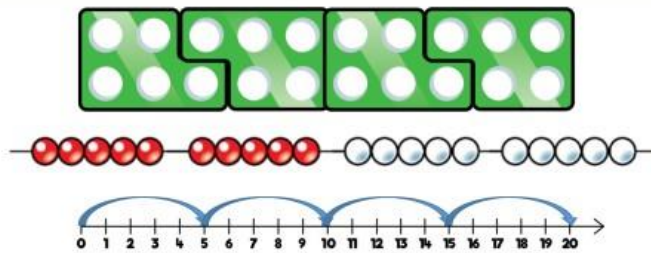
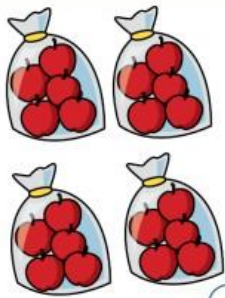
Skill	Year	Representations and models	
Recall and use multiplication and division facts for the 3-times table	3	Hundred square Number shapes Counters	Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 4-times table	3	Hundred square Number shapes Counters	Bead strings Number lines Everyday objects
Recall and use multiplication and division facts for the 8-times table	3	Hundred square Number shapes	Bead strings Number tracks Everyday objects
Recall and use multiplication and division facts for the 6-times table	3	Hundred square Number shapes	Bead strings Number tracks Everyday objects

This has been moved to be done alongside the 6s like the 4s and 8s.

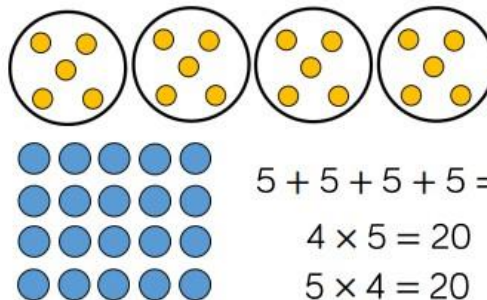
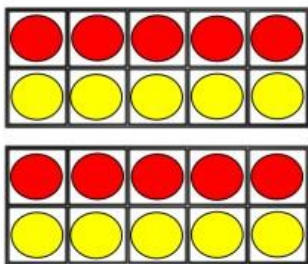
Skill	Year	Representations and models	
Recall and use multiplication and division facts for the 7-times table	4	Hundred square Number shapes	Bead strings Number lines
Recall and use multiplication and division facts for the 9-times table	4	Hundred square Number shapes	Bead strings Number lines
Recall and use multiplication and division facts for the 11-times table	4	Hundred square Base 10	Place value counters Number lines
Recall and use multiplication and division facts for the 12-times table	4	Hundred square Base 10	Place value counters Number lines

Skill: Solve 1-step problems using multiplication

Year: 1/2



One bag holds 5 apples.
How many apples do 4 bags hold?



$$5 + 5 + 5 + 5 = 20$$

$$4 \times 5 = 20$$

$$5 \times 4 = 20$$

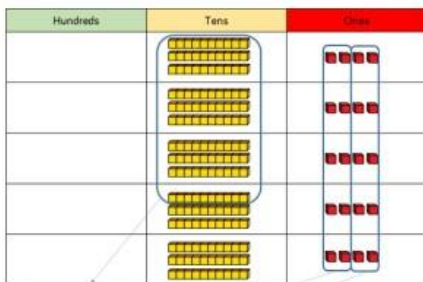
Children represent multiplication as repeated addition in many different ways.

In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record multiplication formally.

In Year 2, children are introduced to the multiplication symbol.

Skill: Multiply 2-digit numbers by 1-digit numbers

Year: 3/4

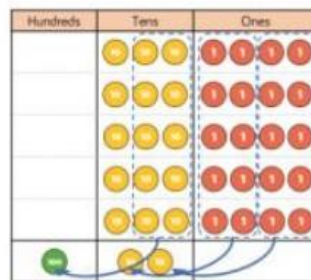


	H	T	O	
		3	4	
x			5	
		2	0	(5 x 4)
+	1	5	0	(5 x 30)
	1	7	0	



$34 \times 5 = 170$

	H	T	O
		3	4
x			5
	1	7	0
	1	2	

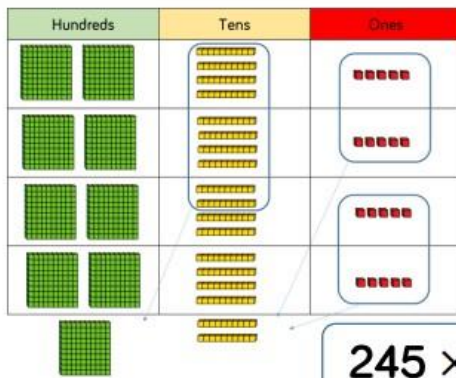


Teachers may decide to first look at the expanded column method before moving on to the short multiplication method.

The place value counters should be used to support the understanding of the method rather than supporting the multiplication, as children should use times table knowledge.

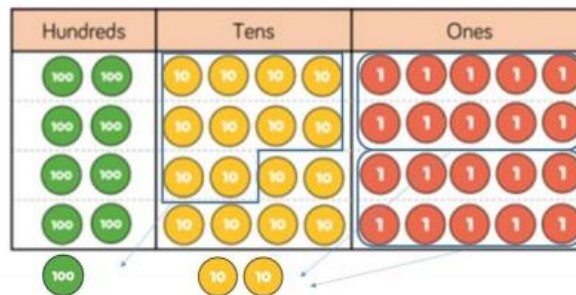
Skill: Multiply 3-digit numbers by 1-digit numbers

Year: 3/4



	H	T	O
	2	4	5
x			4
	9	8	0
	1	2	

$$245 \times 4 = 980$$

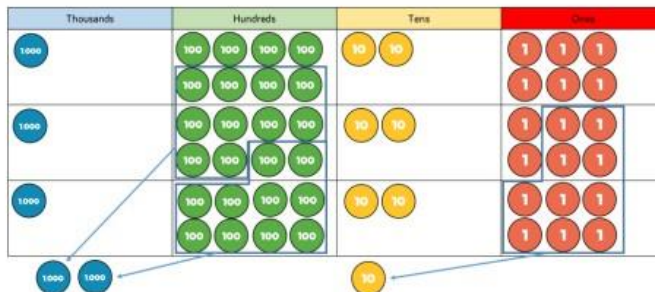


When moving to 3-digit by 1-digit multiplication, encourage children to move towards the short, formal written method.

Base 10 and place value counters continue to support the understanding of the written method. Limit the number of exchanges needed in the questions and move children away from resources when multiplying larger numbers.

Skill: Multiply 4-digit numbers by 1-digit numbers

Year: 5



$$1,826 \times 3 = 5,478$$

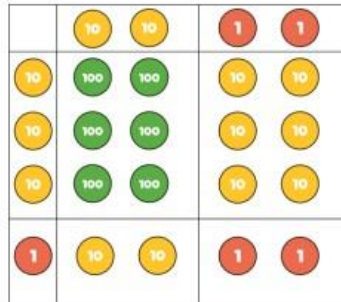
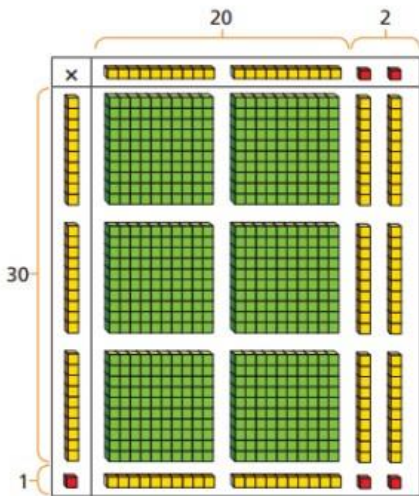
	Th	H	T	O
	1	8	2	6
x				3
	5	4	7	8
	2	1		

When multiplying 4-digit numbers, place value counters are the best manipulative to use to support children in their understanding of the formal written method.

If children are multiplying larger numbers and struggling with their times tables, encourage the use of multiplication grids so children can focus on the use of the written method.

Skill: Multiply 2-digit numbers by 2-digit numbers

Year: 5



×	20	2
30	600	60
1	20	2

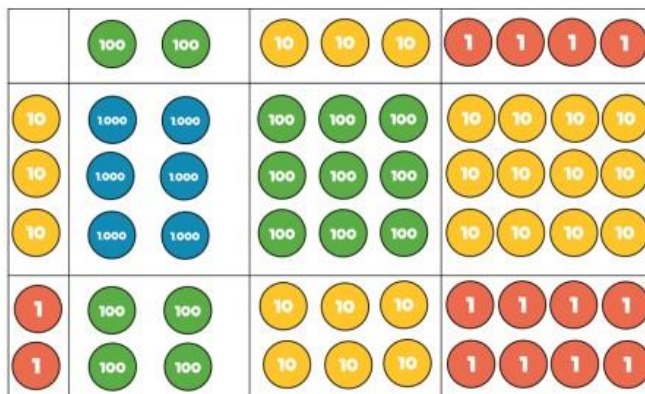
	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

$$22 \times 31 = 682$$

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. This links to finding the area of a rectangle by finding the space covered by the Base 10. The grid method matches the area model as an initial written method before moving on to the formal written multiplication method.

Skill: Multiply 3-digit numbers by 2-digit numbers

Year: 5



	Th	H	T	O
		2	3	4
×			3	2
		4	6	8
17	10	2	0	
7	4	8	8	

$$234 \times 32 = 7,488$$

×	200	30	4
30	6,000	900	120
2	400	60	8

Children can continue to use the area model when multiplying 3-digits by 2-digits. Place value counters become more efficient to use but Base 10 can be used to highlight the size of numbers.

Encourage children to move towards the formal written method, seeing the links with the grid method.

Skill: Multiply 4-digit numbers by 2-digit numbers

Year: 5/6

	TTh	Th	H	T	O
		2	7	3	9
×				2	8
2	1	9	1	2	
₂	₅	₃	₇		
5	4	7	8	0	
₁		₁			
7	6	6	9	2	

2,739 × 28 = 76,692

When multiplying 4-digits by 2-digits, children should be confident in the written method.

If they are still struggling with times tables, provide multiplication grids to support when they are focusing on the use of the method.

Consider where exchanged digits are placed and make sure this is consistent.

Name _____

Date _____

MULTIPLICATION CHART TO 12X12

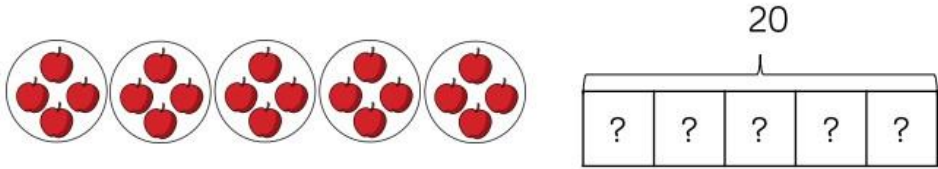
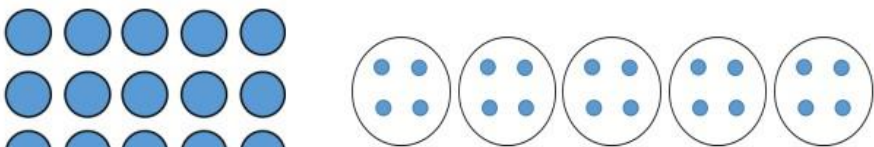


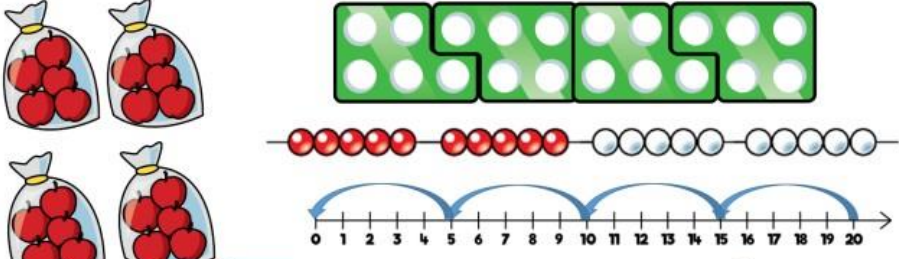
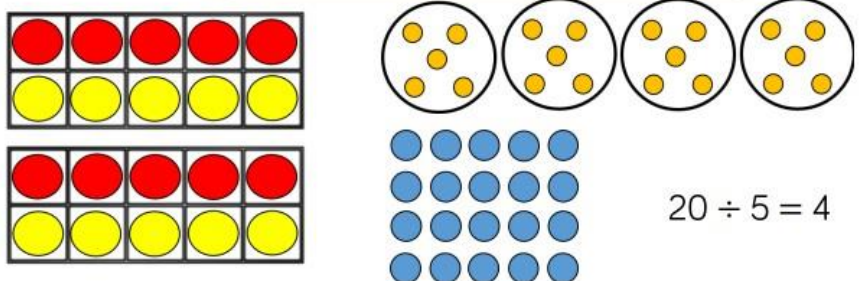
×	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Factors in yellow and multiples in white.

Children to be told this to encourage the language and understanding.

Division

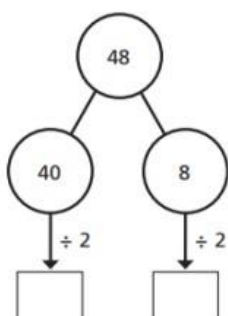
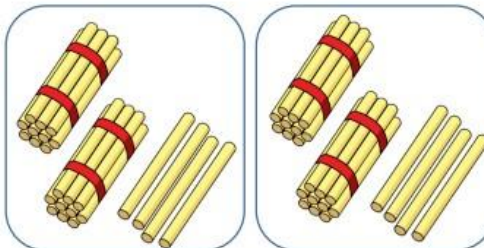
Skill: Solve 1-step problems using multiplication (sharing)	Year: 1/2
 <p data-bbox="383 672 965 817">There are 20 apples altogether. They are shared equally between 5 bags. How many apples are in each bag?</p>  <p data-bbox="758 996 933 1041">$20 \div 5 = 4$</p>	<p data-bbox="1149 414 1412 571">Children solve problems by sharing amounts into equal groups.</p> <p data-bbox="1149 604 1428 862">In Year 1, children use concrete and pictorial representations to solve problems. They are not expected to record division formally.</p> <p data-bbox="1149 907 1428 1019">In Year 2, children are introduced to the division symbol.</p>

Skill: Solve 1-step problems using division (grouping)	Year: 1/2
 <p data-bbox="391 1579 941 1702">There are 20 apples altogether. They are put in bags of 5. How many bags are there?</p>  <p data-bbox="845 1892 1021 1937">$20 \div 5 = 4$</p>	<p data-bbox="1141 1310 1412 1982">Children solve problems by grouping and counting the number of groups. Grouping encourages children to count in multiples and links to repeated subtraction on a number line. They can use concrete representations in fixed groups such as number shapes which helps to show the link between multiplication and division.</p>

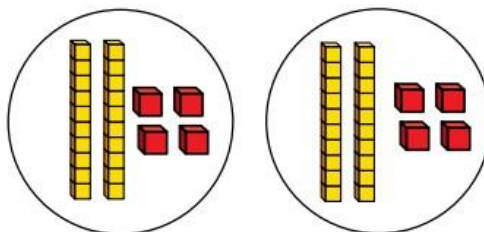
Skill: Divide 2-digits by 1-digit (sharing with no exchange)

Year: 1/2

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



$$48 \div 2 = 24$$



When dividing larger numbers, children can use manipulatives that allow them to partition into tens and ones.

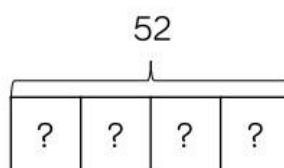
Straws, Base 10 and place value counters can all be used to share numbers into equal groups.

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

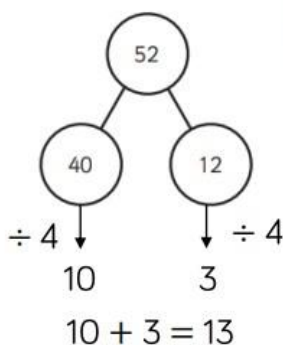
Skill: Divide 2-digits by 1-digit (sharing with exchange)

Year: 3/4

Tens	Ones
10	2
10	2
10	2
10	2



$$52 \div 4 = 13$$



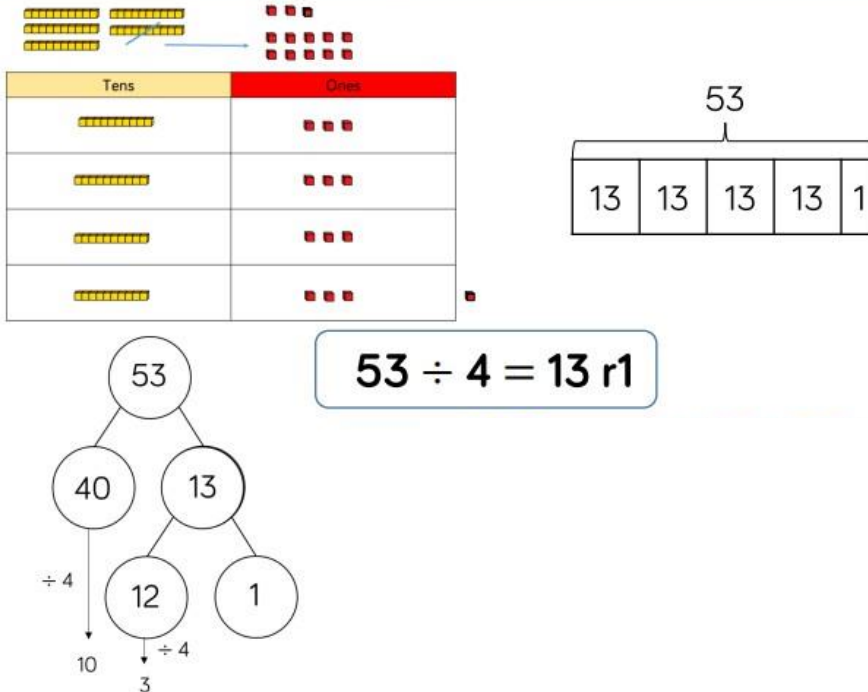
Tens	Ones
10	2
10	2
10	2
10	2

When dividing numbers involving an exchange, children can use Base 10 and place value counters to exchange one ten for ten ones. Children should start with the equipment outside the place value grid before sharing the tens and ones equally between the rows.

Flexible partitioning in a part-whole model supports this method.

Skill: Divide 2-digits by 1-digit (sharing with remainders)

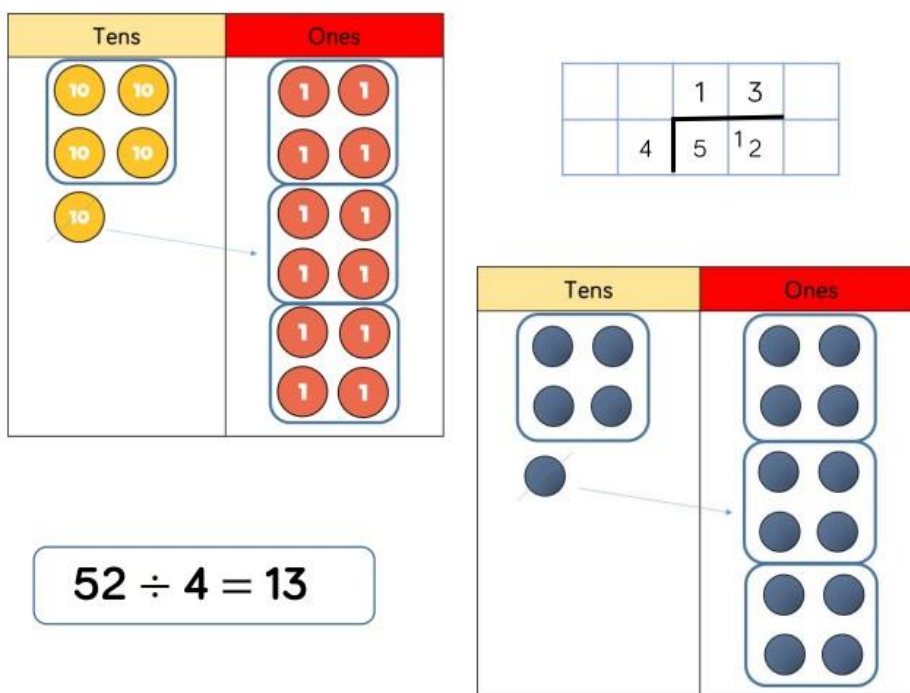
Year: 3/4



When dividing numbers with remainders, children can use Base 10 and place value counters to exchange one ten for ten ones. Starting with the equipment outside the place value grid will highlight remainders, as they will be left outside the grid once the equal groups have been made. Flexible partitioning in a part-whole model supports this method.

Skill: Divide 2-digits by 1-digit (grouping)

Year: 4/5



When using the short division method, children use grouping. Starting with the largest place value, they group by the divisor.

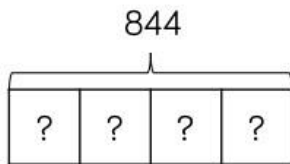
Language is important here. Children should consider 'How many groups of 4 tens can we make?' and 'How many groups of 4 ones can we make?'

Remainders can also be seen as they are left ungrouped.

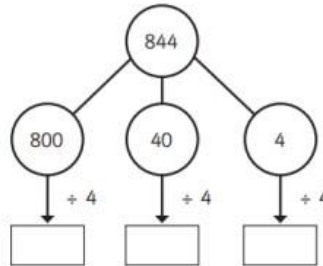
Skill: Divide 3-digits by 1-digit (sharing)

Year: 4

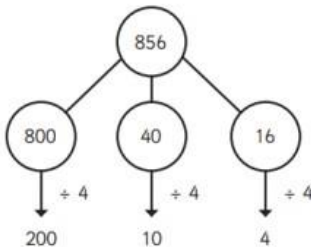
$$844 \div 4 = 211$$



H	T	O
100 100	10	1
100 100	10	1
100 100	10	1
100 100	10	1



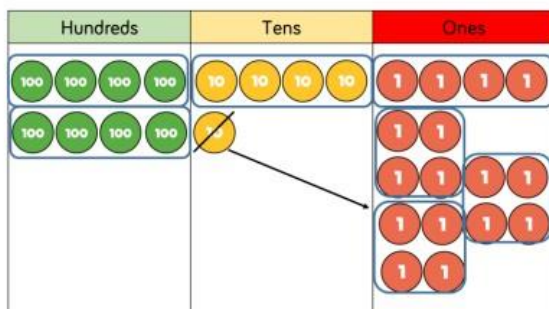
$$844 \div 4 = 211$$



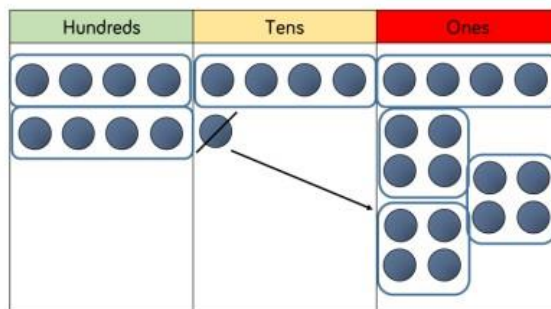
Flexible partitioning in a part-whole model supports this method.

Skill: Divide 3-digits by 1-digit (grouping)

Year: 5



		2	1	4
	4	8	5	16



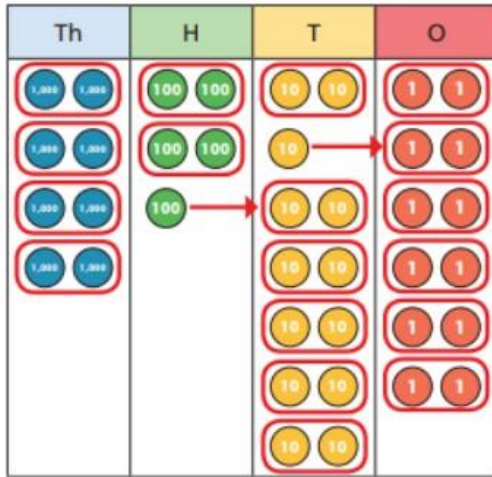
$$856 \div 4 = 214$$

Children can continue to use grouping to support their understanding of short division when dividing a 3-digit number by a 1-digit number.

Place value counters or plain counters can be used on a place value grid to support this understanding. Children can also draw their own counters and group them through a more pictorial method.

Skill: Divide 4-digits by 1-digit (grouping)

Year: 5



	4	2	6	6
2	8	5	¹ 3	¹ 2

8,532 ÷ 2 = 4,266

Place value counters or plain counters can be used on a place value grid to support children to divide 4-digits by 1-digit. Children can also draw their own counters and group them through a more pictorial method.

Children should be encouraged to move away from the concrete and pictorial when dividing numbers with multiple exchanges.

Skill: Divide multi digits by 2-digits (short division)

Year: 6

		0	3	6
	12	4	⁴ 3	⁷ 2

432 ÷ 12 = 36

7,335 ÷ 15 = 489

	0	4	8	9
15	7	⁷ 3	¹³ 3	¹³ 5

15	30	45	60	75	90	105	120	135	150
----	----	----	----	----	----	-----	-----	-----	-----

When children begin to divide up to 4-digits by 2-digits, written methods become the most accurate as concrete and pictorial representations become less effective. Children can write out multiples to support their calculations with larger remainders. Children will also solve problems with remainders where the quotient can be rounded as appropriate.

Skill: Divide multi-digits by 2-digits

Year: 6


Children taught to make decisions as to whether they should use decimal division or remainder.

If they are dealing with a physical object, they should use division with remainders. If they are dividing things that can be broken into fractions (legitimately), they should use decimal division.

Part-whole models can be used to support remainders and exchanges.

Who is correct? Why?

Frankie owns a shop that sells goldfish. He has 45 new goldfish to put into tanks. He has 6 tanks. He wants to add the fish equally. How many fish can he put in each tank?



Marvin: He should put 7.5 fish into each tank because

$$\begin{array}{r} 07.50 \\ 6 \overline{) 45.00} \\ \underline{42} \\ 30 \\ \underline{30} \\ 00 \\ 00 \\ \hline \end{array}$$

Dale: He should put 7 fish into each tank but would have 3 left over because

$$\begin{array}{r} 07 \text{ r}3 \\ 6 \overline{) 45} \\ \underline{42} \\ 30 \\ \underline{30} \\ 00 \\ \hline \end{array}$$

$$9,680 \div 16 =$$

1	2	3	4	5	6	7	8	9	10
16	32	48	64	80	96	112	128	144	160

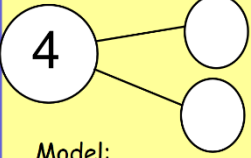
$$16 \overline{) 9680} \begin{array}{l} 0605 \\ \underline{96} \\ 80 \\ \underline{80} \\ 00 \\ \hline \end{array}$$

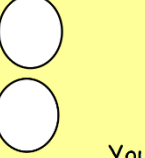
Short division method is to be used entirely and supported by ratio tables.

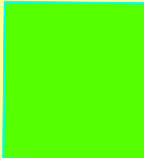
Children can write out multiples to support their calculations with larger remainders.

Children will also solve problems with remainders where the quotient can be rounded as appropriate.

4



Model:  You

$$3 \overline{) 429}$$


$$13,668 \div 34 =$$


1	2	3	4	5	6	7	8	9	10
34	68	102	136	170	204	238	272	306	340

$$34 \overline{) 13668} \begin{array}{l} 00402 \\ \underline{136} \\ 66 \\ \underline{68} \\ 00 \\ \hline \end{array}$$

M

$32 \times 0 = 0$

$$\begin{array}{r} 015 \\ 32 \overline{) 4480} \\ \underline{32} \\ 128 \\ \underline{128} \\ 00 \\ \hline \end{array}$$

$$\begin{array}{r} 48 \\ - 32 \\ \hline 16 \end{array}$$


1	2	3	4	5	6	7	8	9	10
32	64	96	128	160	192	224	256	288	320