

BERKSWELL CE PRIMARY SCHOOL

Calculation Policy 2022 – Key Stage 2

Our Calculation Policy shows the progression of maths teaching from year to year, for the four operations: addition, subtraction, multiplication and division. It enables both teachers and parents a clear understanding of how the operations are taught sequentially through the year groups. Included in this policy are illustrations of how the teaching of calculations are modelled by teachers and how concepts are taught through a process of concrete demonstration and pictorial representations, before moving on to the abstract calculation.

This policy has been adapted from the White Rose Maths Hub Calculation Policy with further material added. It is a working document and will be revised and amended as necessary.

Progression within each area of calculation is in line with the programme of study in the 2014 National Curriculum.

ADDITION – Year 3

Skills and Objectives

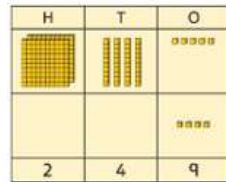
Add numbers mentally, including:

- a three-digit number and 1s
- a three-digit number and 10s
- a three-digit number and 100s

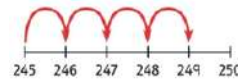
Add numbers with up to 3 digits, using formal written methods of columnar addition

Strategies and Methods

Mental methods may include the following:



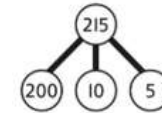
place value –base ten



number lines



hundred squares



$$215 = 200 + 10 + 5$$

part-part-whole

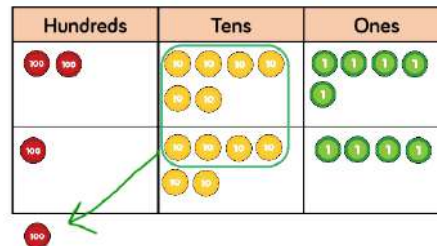
$$753 + 40$$

I know that $5 + 4 = 9$

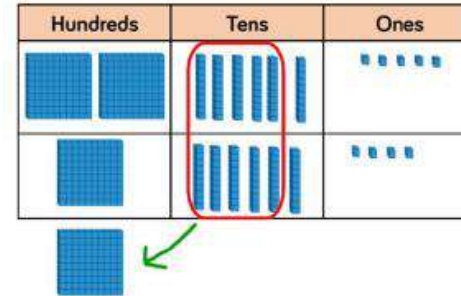
$$\text{So, } 50 + 40 = 90$$

$$753 + 40 = 793$$

using known facts



Place value grid



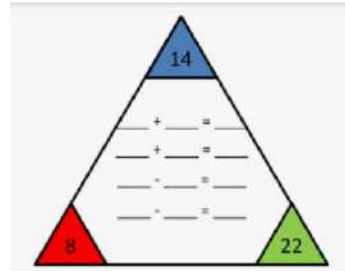
Base 10

			T	T	U	
	5	6	5	0	6	
+	2	1	2	0	1	
			7	0	+ 7 = 77	

Expanded column addition

H	H	H		T	T	U	
4	0	0		5	0	6	
2	0	0		7	0	3	
6	0	0	+	12	0	+	9 = 729

Estimate the answer to a calculation and use inverse operations to check answers



$$14+8= 22$$

$$8+14= 22$$

$$22- 14 = 8$$

$$22- 8 = 14$$

SUBTRACTION – Year 3

Skills and Objectives

Subtract numbers mentally, including:

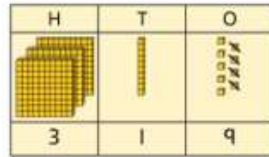
- a three-digit number and 1s
- a three-digit number and 10s
- a three-digit number and 100s

Subtract numbers with up to 3 digits, using formal written methods of columnar subtraction

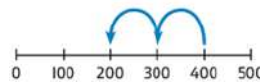
Estimate the answer to a calculation and use inverse operations to check answers

Strategies and Methods

Mental methods may include the following:



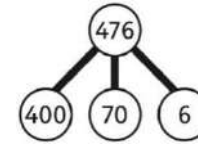
place value –base ten



number lines



hundred squares



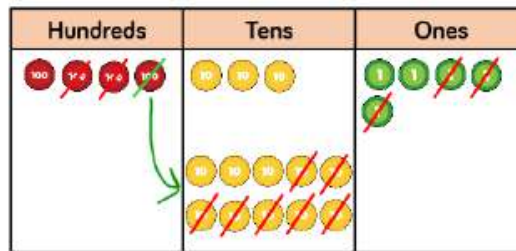
part-part-whole

$$372 - 50 = ?$$

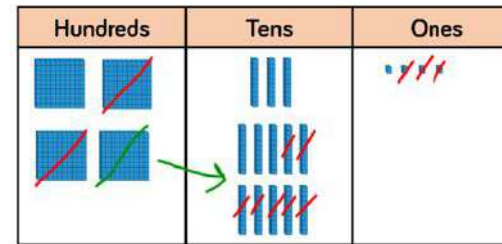
$$70 - 50 = 20$$

$$\text{So, } 372 - 50 = 322$$

using known facts



Place value grid



Base 10

				T	T		U		
	5	6		5	0		6		
-	2	2		2	0		2		
				3	0	+	4	=	3 4

Expanded method- No Exchange

				T	T		U		
	9	4		8	0		14		
-	2	6		2	0		6		
				6	0	+	8	=	6 8

Expanded method- With Exchange

H	H	H		T	T		U		
4	0	0		5	0		6		
1	0	0		2	0		2		
3	0	0		3	0	+	4	=	334

Expanded method-No exchange

<https://www.youtube.com/watch?v=7qtNfofyFyw>

<https://www.youtube.com/watch?v=I3JyOstFgyw>

H	H	H		T	T		U		
4	0	0		5	0		6		
2	0	0		7	0		3		
1	0	0		8	0	+	3	=	183

Expanded method- With exchange

MULTIPLICATION – Year 3

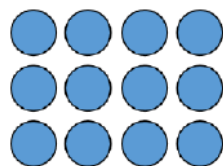
Skills and Objectives

Recall and use multiplication facts for the 3, 4 and 8 multiplication tables

Write and calculate mathematical statements for multiplication using the multiplication tables that they know (2, 5, 10, 3, 4 and 8) including for two-digit numbers times one-digit numbers. (Using mental and progressing to formal written methods)

Strategies and Methods

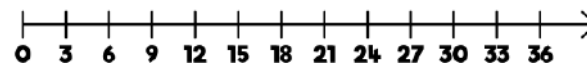
Mental methods may include the following



arrays

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

hundred square

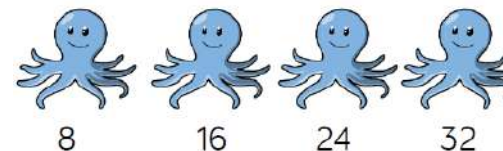


number lines



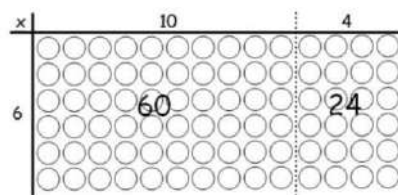
4 8 12 16

picture representations



8 16 24 32

Formal written methods



$$17 \times 3 =$$

6	10	4	60
	60	24	+24
			4
			80
			84

Grid method

<https://www.youtube.com/watch?v=7Hj1wAYamfE>

<https://www.youtube.com/watch?v=62Qm4mGK7xl>

DIVISION – Year 3

Skills and Objectives

Recall and use division facts for the 3, 4 and 8 tables

Write and calculate mathematical statements for division using mental and progressing to formal written methods

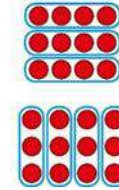
Strategies and Methods



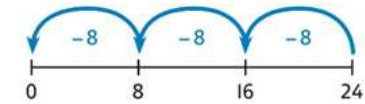
24 divided into groups of 8.
There are 3 groups of 8.

sharing/grouping

This is 3 groups of 4.
This is 4 groups of 3.



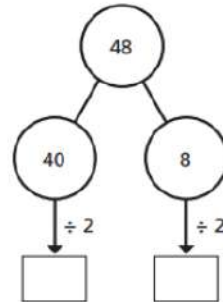
arrays



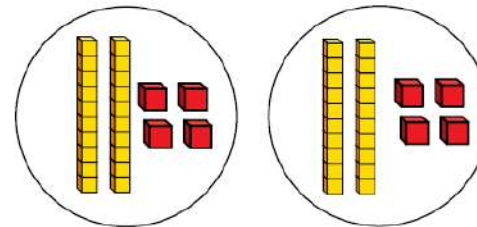
$$24 \div 8 = 3$$

number lines

Mental methods may include the following:



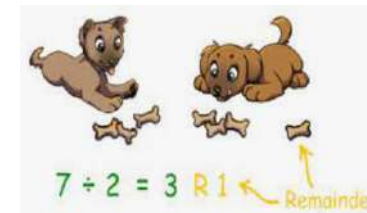
$$48 \div 2 = 24$$



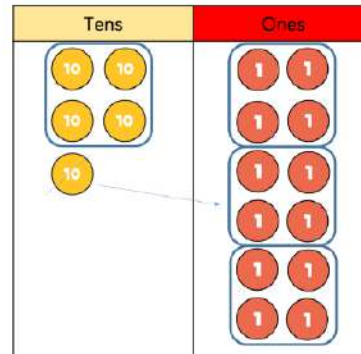
Moving on to remainders

Tens	Ones
40	8
30	8
20	8
10	8

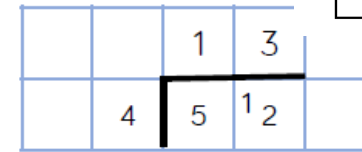
1



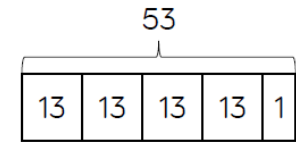
Written methods



$$52 \div 4 = 13$$



Bus stop method



<https://www.youtube.com/watch?v=5TTnUyW-ICk>

ADDITION – Year 4

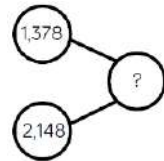
Skills and Objectives

Choose and use mental methods of addition where appropriate.

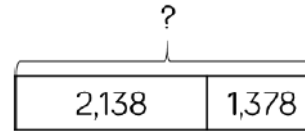
Add numbers with up to 4 digits using formal written methods of columnar addition where appropriate (including exchanging)

Use checking strategies e.g. estimating, rounding or using the inverse.

Strategies and Methods



part-part-whole diagrams



bar modelling



1112+2102=
partitioning to add

Start at the ones, add each column in turn.

No exchange

$$\begin{array}{r} 5162 \\ +3427 \\ \hline 8589 \end{array}$$

One exchange

$$\begin{array}{r} 5162 \\ +3497 \\ \hline 8659 \\ 1 \end{array}$$

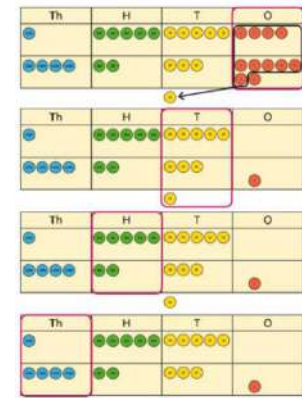
Multiple exchanges

$$\begin{array}{r} 5864 \\ +3497 \\ \hline 9361 \\ 111 \end{array}$$

The concept of exchanging may be introduced using place values counters and pictorial representations before moving to the formal method.

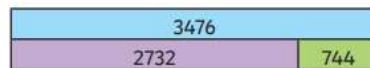
<https://www.youtube.com/watch?v=u-1Rku6ma6M>

<https://www.youtube.com/watch?v=mKxRdvagPLU>

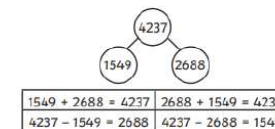


Use rounding and estimating on a number line to check the reasonableness of an addition.
 $912 + 6,149 = ?$
 I used rounding to work out that the answer should be approximately $1,000 + 6,000 = 7,000$.

Use inverse



$2,732 + 744 = 3,476$ can be checked using $3,476 - 744$ or $3,476 - 2,732$



This part-part-whole diagram shows the inverse calculations using 4237, 1549 and 2688

SUBTRACTION – Year 4

Skills and Objectives

Choose and use mental methods of subtraction where appropriate.

Subtract numbers with up to 4 digits using formal written methods of columnar subtraction where appropriate (with exchanging).

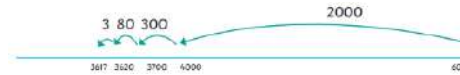
Use checking strategies e.g. estimating, rounding or using the inverse.

Strategies and Methods



$$7,646 - 40 = 7,606$$

place value



$$6,000 - 2,383 = 3,617$$

number lines



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

part-part-whole and bar models

Start at the ones, subtract each column in turn.

$$\begin{array}{r} 5789 \\ - 3421 \\ \hline 2368 \end{array}$$

No exchange

$$\begin{array}{r} 61 \\ 5749 \\ - 3471 \\ \hline 2278 \end{array}$$

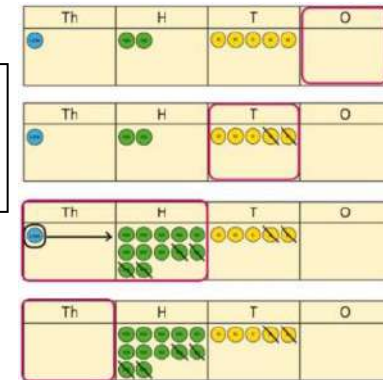
One exchange

$$\begin{array}{r} 6131 \\ 5742 \\ - 3476 \\ \hline 2266 \end{array}$$

Multiple exchanges

The concept of exchanging may be introduced using place values counters and pictorial representations before moving to the formal method.

- <https://www.youtube.com/watch?v=4kXqc7sqzN0>
- <https://www.youtube.com/watch?v=idqXm3gk8sY>
- <https://www.youtube.com/watch?v=06btnQA82a0>
- <https://www.youtube.com/watch?v=Miyell9CCs>



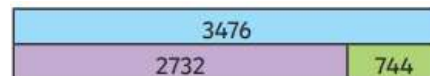
$$1250 - 420 = 830$$

Use rounding and estimating on a number line to check the reasonableness of a subtraction.

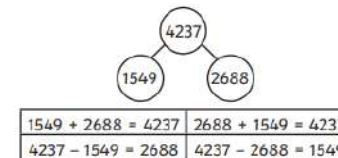
$$9,362 - 5,729$$

I used rounding to work out that that the answer should be approximately $9,000 - 6,000 = 3,000$

Use inverse



$$3,476 - 2,732 \text{ can be checked using } 2,732 + 744$$



This part-part-whole diagram shows the inverse calculations using 4,237, 1,549 and 2,688

MULTIPLICATION – Year 4

Skills and Objectives

Mental Multiplication
Count in multiples of 6, 7, 9, 25 and 1000.

Multiplying by multiples of 10 and 100.

Recall multiplication (and division) facts up to 12x12.

Use place value and known, derived facts to multiply and divide mentally, including multiplying by 1 and 0.

Multiply 3 small numbers together.

Recognise and use factor pairs and commutativity in mental calculations.

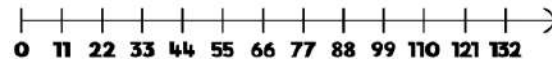
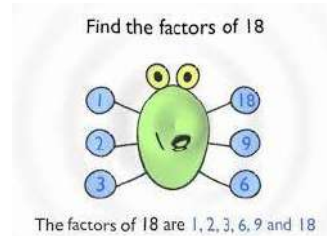
Strategies and Methods



6	12	18	24	30
36	42	48	54	60
66	72	78	84	90

Use of a multiplication grid

Visual hooks such as number lines and factor bugs.



Represent situations by multiplying three numbers together.



Each sheet has 2×5 stickers.
There are 3 sheets.

There are $5 \times 2 \times 3$ stickers in total.

$$5 \times 2 \times 3 = 30$$

$$\underbrace{\hspace{2cm}}_{10} \times 3 = 30$$

Understand that commutativity can be used to multiply in different orders.



$$2 \times 6 \times 10 = 120$$

$$12 \times 10 = 120$$

$$10 \times 6 \times 2 = 120$$

$$60 \times 2 = 120$$

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

Looking for patterns



Use of resources such as cubes, base 10 and place value counters.

Related facts



$$4 \times 7 = 28$$

$$4 \times 70 = 280$$

$$40 \times 7 = 280$$

$$4 \times 700 = 2,800$$

$$400 \times 7 = 2,800$$

Use knowledge of factors to simplify some multiplications.

$$24 \times 5 = 12 \times 2 \times 5$$

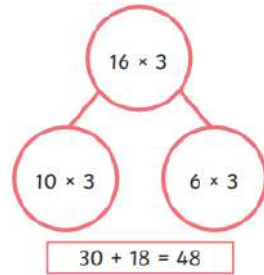
$$12 \times 2 \times 5 =$$

$$\underbrace{\hspace{2cm}}_{12} \times 10 = 120$$

$$\text{So, } 24 \times 5 = 120$$

Written Multiplication

Multiply 2 digit and 3 digit numbers by a 1 digit number using a formal written layout.



part-part-whole diagrams

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

Base 10 and place value counters may be used to support understanding of this formal method.

<https://www.youtube.com/watch?v=eUUrV5onhyo>

<https://www.youtube.com/watch?v=ntXkdMO-7aY>



$$\begin{array}{r} 312 \\ \times \quad 3 \\ \hline 936 \end{array}$$

×	20	6	
5	100	30	= 130

grid method for multiplying 2 or 3 digit numbers by a 1 digit number

<https://www.youtube.com/watch?v=nGvPVYjrg8>

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

DIVISION – Year 4

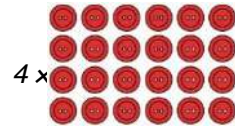
Skills and Objectives

Understand the relationship between multiplication and division including times tables.

Dividing by multiples of 10 and 100 by a single digit.

Divide 2 digit and 3 digit numbers by a 1 digit number by partitioning into 100s, 10s and 1s.

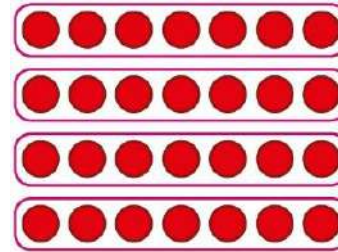
Strategies and Methods



4 ×

24 is 6 groups of 4.
24 is 4 groups of 6.

24 divided by 6 is 4.
24 divided by 4 is 6.



$28 \div 7 = 4$

Use objects to explore families of multiplication and division facts.

Pictorial representations of division.

I know that $5 \times 7 = 35$

so I know all these facts:

$5 \times 7 = 35$
 $7 \times 5 = 35$
 $35 = 5 \times 7$
 $35 = 7 \times 5$
 $35 \div 5 = 7$
 $35 \div 7 = 5$
 $7 = 35 \div 5$
 $5 = 35 \div 7$

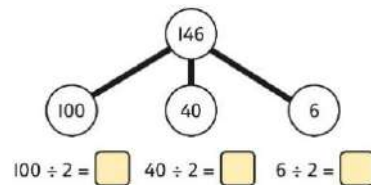
$15 \div 3 = 5$

$150 \div 3 = 50$

$1500 \div 3 = 500$

Using known or related facts.

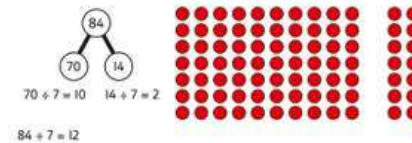
$146 \div 2 = ?$



Use of partitioning.

$84 \div 7 = ?$

I will partition into 70 and 14 because I am dividing by 7.



$84 \div 7 = 12$

Partitioning in different ways to support chunking method.



Use of base 10 or counters.

Understand remainders.

$$186 \div 6 =$$
$$\begin{array}{r} 031 \\ 6 \overline{) 186} \\ \underline{6} \\ 18 \\ \underline{18} \\ 0 \end{array}$$

no groups of 6
can be made

$3 \times 6 = 18$

$1 \times 6 = 6$

$$4 \overline{) 132} r1$$

Further development of a short, formal method to include remainders.

<https://www.youtube.com/watch?v=5TTnUyW-ICk>
<https://www.youtube.com/watch?v=gNUnk-4z6KU>

$$70 \div 5 = 14$$

$$\begin{array}{r} 14 \\ 5 \overline{) 70} \\ \underline{50} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

(10 x 5)

(4 x 5)

Early use of an expanded method to include chunking.

https://www.youtube.com/watch?v=bV_ZxHguF3Q

ADDITION – Year 5

Skills and Objectives

Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods.

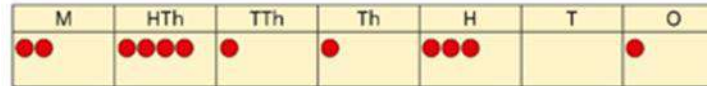
Use the column method to add larger numbers efficiently.

(Children may be taught to use zero as a place holder.)

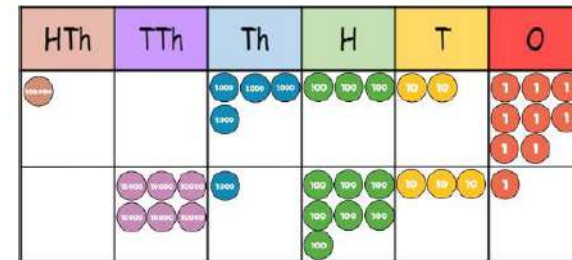
Add two or more decimal fractions with up to three decimal places.

Strategies and Methods

2, 411, 301 =



$104,328 + 61,731 = 166,059$



[Addition - YouTube](#)

$$\begin{array}{r}
 3587 \\
 + 675 \\
 \hline
 4262 \\
 \hline
 4111
 \end{array}$$

[Addition Decimals - YouTube](#)

$$\begin{array}{r}
 65.84 \\
 + 58.48 \\
 \hline
 124.32 \\
 \hline
 111
 \end{array}$$

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

SUBTRACTION – Year 5

Skills and Objectives

Represent 6 and 7-digit numbers on a place value grid, and use this to support thinking and mental methods.

Use the column method to subtract larger numbers efficiently.

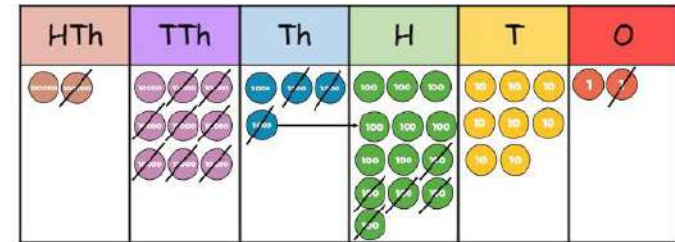
(Children may be taught to use zero as a place holder.)

Subtract two or more decimal fractions with up to three decimal places.

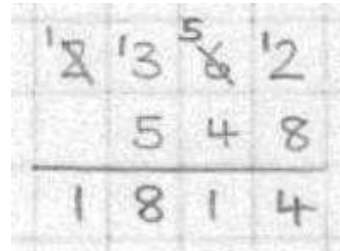
Children will be taught to use zero as a place holder in decimal examples such as this.

Strategies and Methods

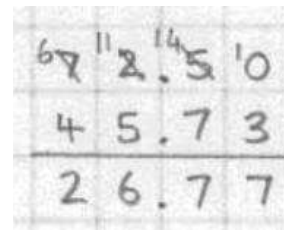
$$294,382 - 182,501 = 111,881$$



[Subtraction - YouTube](#)



	2	9	3	13	8	2
-	1	8	2	5	0	1
	1	1	1	8	8	1



MULTIPLICATION – Year 5

Skills and Objectives

Strategies and Methods

Multiply up to a 4-digit number by a single digit number.
(Short multiplication)

[Short Multiplication - YouTube](#)

$$\begin{array}{r} 242 \\ \times \quad 5 \\ \hline 1210 \\ 21 \end{array}$$

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

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

Multiply up to a 4-digit number by a 2-digit number.
(Long multiplication)

[Long Multiplication 2 - YouTube](#)

1.

$$\begin{array}{r} 56 \\ \times 27 \\ \hline 42 \\ 350 \\ 120 \\ \hline 1000 \\ 1512 \\ \hline 1 \end{array}$$

$$\begin{array}{l} 6 \times 7 = 42 \\ 50 \times 7 = 350 \\ 6 \times 20 = 120 \\ 50 \times 20 = 1000 \end{array}$$



2.

			5	6
		×	2	7
			3	9
			2	
	1	1	2	0
	1	5	1	2
			1	

This process is then used to extend children's learning to include 3 digit x 2 digit numbers (See Year 6).

DIVISION – Year 5

Skills and Objectives

Divide up to a 4-digit number by a single digit number. (Short Division)

When there is a remainder, children will be taught when to leave it as a remainder and when it might need converting to a fraction or a decimal depending on the context of the question.

Children will build on their understand of chunking from Year 4 and begin to use this when dividing by 2 digit numbers.

Strategies and Methods

$$139 \div 5 = 27 \text{ r}4$$

$$\begin{array}{r}
 27 \text{ r}4 \\
 5 \overline{) 139} \\
 \underline{100} \quad (20 \times 5) \\
 39 \\
 \underline{35} \quad (7 \times 5) \\
 4
 \end{array}
 \longrightarrow
 \begin{array}{r}
 27 \text{ r}4 \\
 5 \overline{) 139}
 \end{array}$$

$8,532 \div 2 = 4,266$

	4	2	6	6
2	8	5	13	12

Some children may continue to use the expanded method using larger numbers.

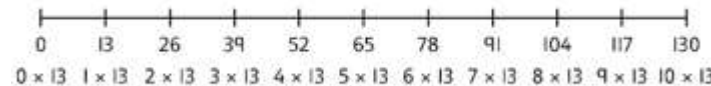
[Short Division with remainders - YouTube](#)

$$8 \overline{) 18279} \quad 234 \text{ r}7$$

Remainder as a fraction or as a decimal.
e.g; $\frac{7}{8}$ or 0.875

[Chunking Method - YouTube](#)

$$377 \div 13 = 29$$



$$\begin{array}{r}
 13 \overline{) 377} \\
 - 130 \quad (10 \times 13) \\
 \hline
 247 \\
 - 130 \quad (10 \times 13) \\
 \hline
 117 \\
 - 117 \quad (9 \times 13) \\
 \hline
 0
 \end{array}$$

ADDITION – Year 6

Skills and Objectives

Represent 7-digit numbers on a place value grid, and use this to support thinking and mental methods.

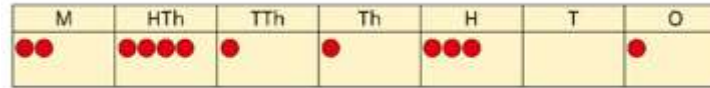
Use the column method to add larger numbers efficiently.

(Children may be taught to use zero as a place holder.)

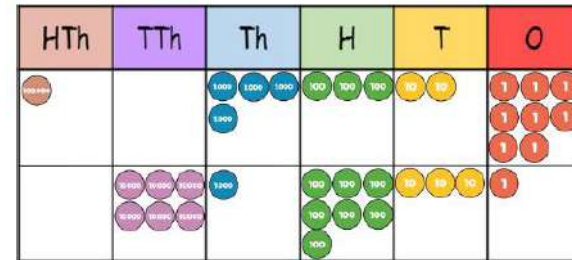
Add two or more decimal fractions with up to three decimal places.

Strategies and Methods

2, 411, 301 =



$104,328 + 61,731 = 166,059$



[Addition - YouTube](#)

$$\begin{array}{r}
 3587 \\
 + 675 \\
 \hline
 4262 \\
 \hline
 411
 \end{array}$$

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

1

[Addition Decimals - YouTube](#)

$$\begin{array}{r}
 65.84 \\
 + 58.48 \\
 \hline
 124.32 \\
 \hline
 111
 \end{array}$$

SUBTRACTION – Year 6

Skills and Objectives

Represent 6 and 7-digit numbers on a place value grid, and use this to support thinking and mental methods.

Use the column method to subtract larger numbers efficiently.

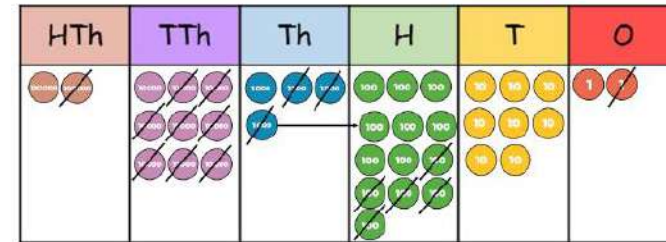
(Children may be taught to use zero as a place holder.)

Subtract two or more decimal fractions with up to three decimal places.

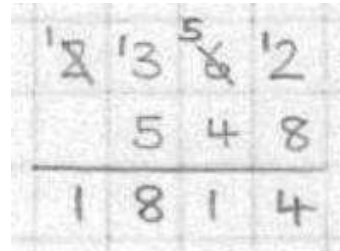
Children will be taught to use zero as a place holder in decimal examples such as this.

Strategies and Methods

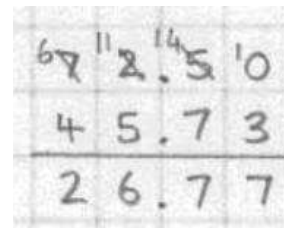
$$294,382 - 182,501 = 111,881$$



[Subtraction - YouTube](#)



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



		2	9	9	1	5
-	0	4	6	6		
	2	5	3	9		

MULTIPLICATION – Year 6

Skills and Objectives

Strategies and Methods

Multiply up to a 4-digit number by a single digit number.
(Short multiplication)

$$\begin{array}{r} 242 \\ \times 5 \\ \hline 1210 \\ 21 \end{array}$$

[Short Multiplication - YouTube](#)

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

$$\begin{array}{r} 5.742 \\ \times 9 \\ \hline 51678 \\ \hline 631 \end{array}$$

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

Multiply up to a 4-digit number by a 2-digit number.
(Long multiplication)

[Long Multiplication 1 - YouTube](#)

[Long Multiplication 2 - YouTube](#)

[Long Multiplication 3 - YouTube](#)

1.

$$\begin{array}{r} 56 \\ \times 27 \\ \hline 392 \\ 1120 \\ \hline 1512 \end{array}$$

2.

$$\begin{array}{r} 286 \\ \times 29 \\ \hline 2574 \\ 5720 \\ \hline 8294 \end{array}$$

3.

$$\begin{array}{r} 4392 \\ \times 63 \\ \hline 13176 \\ 263520 \\ \hline 276696 \end{array}$$

DIVISION – Year 6

Skills and Objectives

Strategies and Methods

Divide up to a 4-digit number by a single digit number.

(Short Division)

Divide decimals up to two decimal places.

(Short Division)

Divide multi-digit numbers by a 2-digit number.

(Short Division)

$$8,532 \div 2 = 4,266$$

	4	2	6	6
2	8	5	13	12

$$8 \overline{) 4.24}$$

0.

$$8 \overline{) 4.24}$$

0.5

$$8 \overline{) 4.24}$$

0.53

$$8 \overline{) 4.24}$$

[Short Division with remainders - YouTube](#)

$$8 \overline{) 182739} \begin{matrix} 234r7 \end{matrix}$$

Remainder as a fraction or as a decimal.
e.g; $\frac{7}{8}$ or 0.875

		0	3	6
	12	4	43	72

$$432 \div 12 = 36$$

$$7,335 \div 15 = 489$$

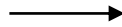
	0	4	8	9
15	7	73	133	135

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

Divide multi-digit numbers by a 2-digit number. (Long Division)

[Long Division - YouTube](#)

$$\begin{array}{r}
 24 \overline{) 6272} \\
 \underline{2400} \quad (100 \times 24) \\
 3872 \\
 \underline{2400} \quad (100 \times 24) \\
 1472 \\
 \underline{960} \quad (40 \times 24) \\
 512 \\
 \underline{480} \quad (20 \times 24) \\
 32 \\
 \underline{24} \\
 8 \quad (1 \times 24)
 \end{array}$$



$$\begin{array}{r}
 24 \overline{) 6272} \\
 \underline{4800} \quad (200 \times 24) \\
 1472 \\
 \underline{1340} \quad (60 \times 24) \\
 32 \\
 \underline{24} \quad (1 \times 24) \\
 8
 \end{array}$$



			2	6	1	r8
2	4	5	1 2	7	2	
		4	8	↓		
		1	4	7		
		1	4	4	↓	
				2 12		
				2	4	
				0	8	

When there is a remainder, children will be taught when to leave it as a remainder and when it might need converting to a fraction or a decimal depending on the context of the question.

Answers may also need rounding according to the context.

$$372 \div 15 = 24 \text{ r}12$$

			2	4	r	1	2
1	5	3	7	2			
-		3	0	0			
			7	2			
-			6	0			
			1	2			

$$372 \div 15 = 24.8$$

			2	4	$\frac{4}{5}$
1	5	3	7	2	
-		3	0	0	
			7	2	
-			6	0	
			1	2	

$$372 \div 15 = 24 \frac{4}{5}$$