Lower Key Stage 2 Maths Workshop 2023
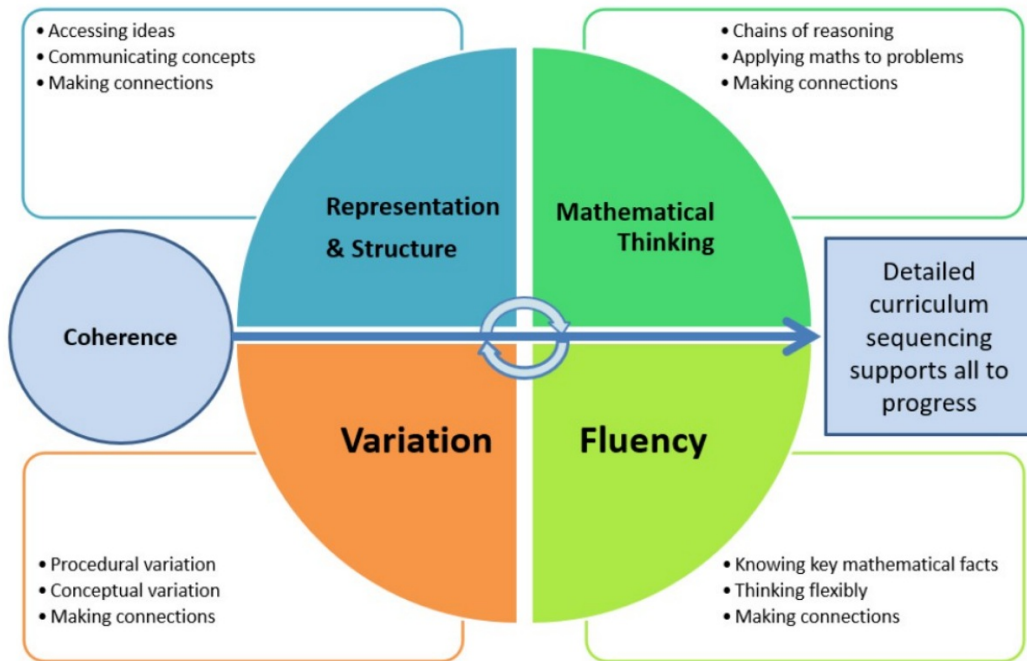
Will Beadon and Jade Huxley

Barnes Primary School

Teaching for Mastery

- Accessing ideas
- Communicating concepts
- Making connections

- Chains of reasoning
- Applying maths to problems
- Making connections

Representation & Structure

Mathematical Thinking

Coherence

Variation

Fluency

Detailed curriculum sequencing supports all to progress

- Procedural variation
- Conceptual variation
- Making connections

- Knowing key mathematical facts
- Thinking flexibly
- Making connections

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Representation and Structure
Teachers carefully select representations of mathematics to expose mathematical structure. The intention is to support pupils in 'seeing' the mathematics, rather than using the representation as a tool to 'do' the mathematics. These representations become mental images that students can use to think about mathematics, supporting them to achieve a deep understanding of mathematical structures and connections.

Mathematical Thinking
Mathematical thinking is central to how pupils learn mathematics and includes looking for patterns and relationships, making connections, conjecturing, reasoning, and generalising. Pupils should actively engage in mathematical thinking in all lessons, communicating their ideas using precise mathematical language

Coherence
Teaching is designed to enable a coherent learning progression through the curriculum, providing access for all pupils to develop a deep and connected understanding of mathematics that they can apply in a range of contexts.

The purpose of variation is to draw closer attention to a key feature of a mathematical concept or structure through varying some elements while keeping others constant. Conceptual variation involves varying how a concept is represented to draw attention to critical features. Often more than one representation is required to look at the concept from different perspectives and gain comprehensive knowledge. Procedural variation considers how the student will 'proceed' through a learning sequence. Purposeful changes are made in order that pupils' attention is drawn to key features of the mathematics, scaffolding students' thinking to enable them to reason logically and make connections.

Fluency
Efficient, accurate recall of key number facts and procedures is essential for fluency, freeing pupils' minds to think deeply about concepts and problems, but fluency demands more than this. It requires pupils to have the flexibility to move between different contexts and representations of mathematics, to recognise relationships and make connections, and to choose appropriate methods and strategies to solve problems.

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Y3 Number and Place Value
National Curriculum

Number - number and place value

Pupils should be taught to:

- count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number
- recognise the place value of each digit in a 3-digit number (100s, 10s, 1s)
- compare and order numbers up to 1,000
- identify, represent and estimate numbers using different representations
- read and write numbers up to 1,000 in numerals and in words
- solve number problems and practical problems involving these ideas

Notes and guidance (non-statutory)

Pupils now use multiples of 2, 3, 4, 5, 8, 10, 50 and 100.

They use larger numbers to at least 1,000, applying partitioning related to place value using varied and increasingly complex problems, building on work in year 2 (for example, 146 = 100 + 40 + 6, 146 = 130 +16).

Using a variety of representations, including those related to measure, pupils continue to count in 1s, 10s and 100s, so that they become fluent in the order and place value of numbers to 1,000.

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Addition and subtraction

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

0-0	1-0	2-0	3-0	4-0	5-0	6-0	7-0	8-0	9-0	10-0
1-1	2-1	3-1	4-1	5-1	6-1	7-1	8-1	9-1	10-1	11-1
2-2	3-2	4-2	5-2	6-2	7-2	8-2	9-2	10-2	11-2	12-2
3-3	4-3	5-3	6-3	7-3	8-3	9-3	10-3	11-3	12-3	13-3
4-4	5-4	6-4	7-4	8-4	9-4	10-4	11-4	12-4	13-4	14-4
5-5	6-5	7-5	8-5	9-5	10-5	11-5	12-5	13-5	14-5	15-5
6-6	7-6	8-6	9-6	10-6	11-6	12-6	13-6	14-6	15-6	16-6
7-7	8-7	9-7	10-7	11-7	12-7	13-7	14-7	15-7	16-7	17-7
8-8	9-8	10-8	11-8	12-8	13-8	14-8	15-8	16-8	17-8	18-8
9-9	10-9	11-9	12-9	13-9	14-9	15-9	16-9	17-9	18-9	19-9
10-10	11-10	12-10	13-10	14-10	15-10	16-10	17-10	18-10	19-10	20-10

Y3 Addition and Subtraction
National Curriculum

Number - addition and subtraction

Pupils should be taught to:

- add and subtract numbers mentally, including:
  - a three-digit number and 1s
  - a three-digit number and 10s
  - a three-digit number and 100s
- add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction
- estimate the answer to a calculation and use inverse operations to check answers
- solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

Notes and guidance (non-statutory)

Pupils practise solving varied addition and subtraction questions. For mental calculations with two-digit numbers, the answers could exceed 100.

Pupils use their understanding of place value and partitioning, and practise using columnar addition and subtraction with increasingly large numbers up to 3 digits to become fluent (see Mathematics appendix 1 (PDF, 248KB)).

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Addition in Y3

Column addition
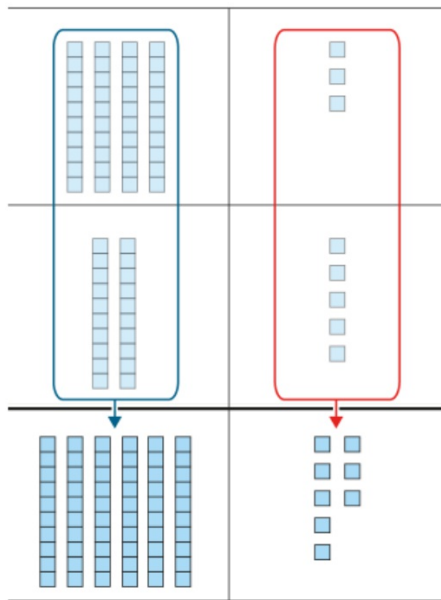

```
    4  3
+   2  5
-------
    6  8
```

Column addition

```
   1  2  4         6  4  4         3  6  6
+  2  3  3      +  1  7  2      +  2  7  7
_____      _____      _____

_____      _____      _____


   5  7  9         7  9  1         5  6  7
+  2  2  1      +  1  6  3      +  2  3  3
_____      _____      _____

_____      _____      _____
```

Key vocabulary

ones, tens, hundreds, part, whole, addend, sum, column, regroup

<u>Partitioning</u>

87 + 56 =
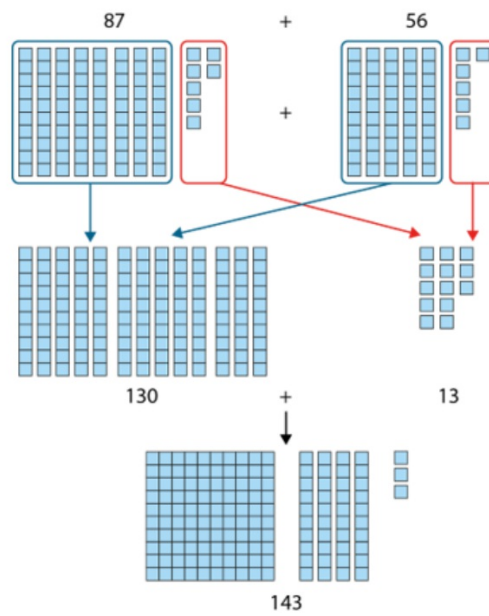
87 + 56

87 + 56

87   +   56

130   +   13

143

Jottings:

87   +   56   =   130   +   13   =   143
/\   /\
80   7   50   6

$$52 + 29 =$$

+ 30

− 1

52

81 82

$$52 + 29 = 52 + 30 - 1$$
$$= 82 - 1$$
$$= 81$$

$$45 + 29 =$$

45 + 29 = 74

74

44 + 30 = 74

74
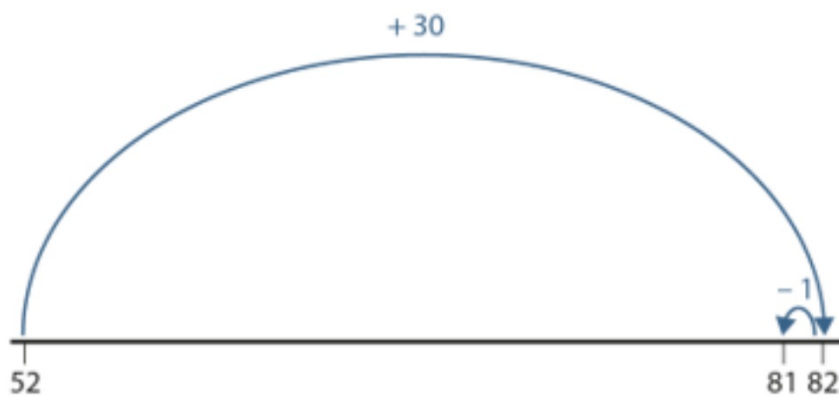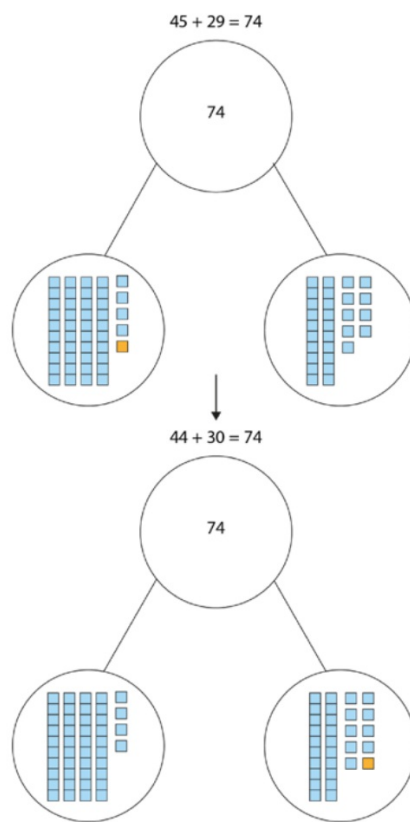
Subtraction in Y3

Column subtraction

child A

child B
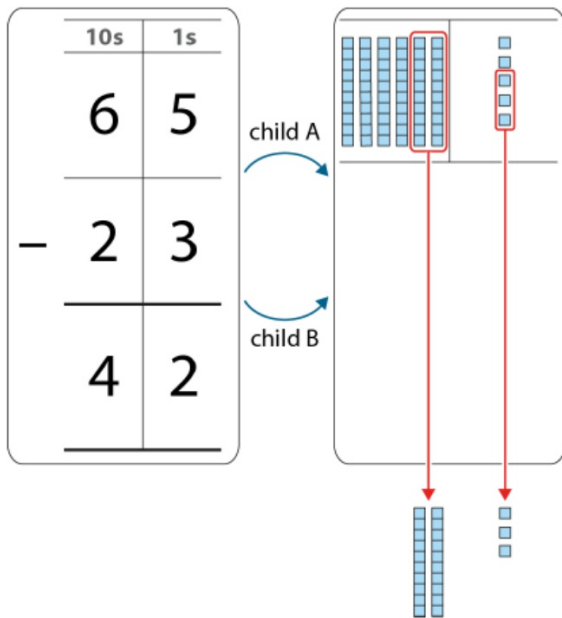
$$
\begin{array}{r}
5\ 7 \\
-\ 3\ 2 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
4\ 6\ 2 \\
-\ 2\ 5\ 1 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
3\ 7\ 5 \\
-\ \ \ 4\ 2 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
8\ 7 \\
-\ 2\ 4 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
4\ 3\ 6 \\
-\ 2\ 0\ 4 \\
\hline
\end{array}
$$

$$
\begin{array}{r}
3\ 9\ 5 \\
-\ \ \ 4\ 0 \\
\hline
\end{array}
$$

Column subtraction

94 − 6

10s	1s
9	4
−	6

10s	1s
9⁸	¹4
−	6

10s	1s
9⁸	¹4
−	6
8	8

```
   5  6  3          4  8  2          8  2  4
 − 2  1  3        − 1  9  7        − 3  1  9
 ─────────        ─────────        ─────────


   4  0  5          3  1  6          9  0  3
 − 1  2  3        − 1  0  3        − 1  2  4
 ─────────        ─────────        ─────────
```

Column subtraction

```
    5  6  3        4  8  2        8  2  4
 -  2  1  3     -  1  9  7     -  3  1  9
   ─────────       ─────────       ─────────

   ─────────       ─────────       ─────────

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

   ─────────       ─────────       ─────────
```

Key vocabulary

ones, tens, hundreds, part, whole, minuend, subtrahend, difference, exchange

Partitioning the subtrahend (no bridging)

78 − 24


```
        − 4              − 20

      54    58                    78
```

178 − 24


```
        − 4              − 20

      154   158                   178
```
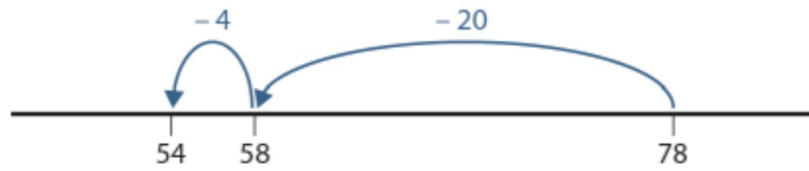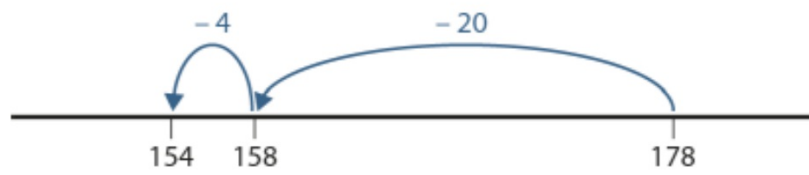
780 − 240


```
        − 40             − 200

      540   580                   780
```
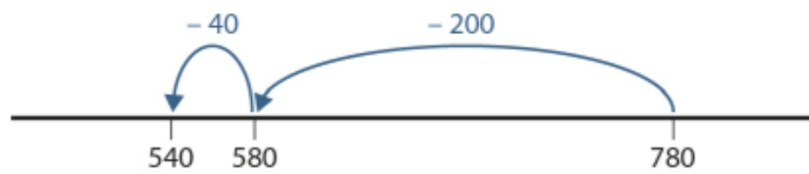
Partitioning the subtrahend (bridging)

44 – 16

| −2 | −4 | −10 |

28 30   34   44

544 – 16

| −2 | −4 | −10 |

528 530   534   544

440 – 160

| −20 | −40 | −100 |
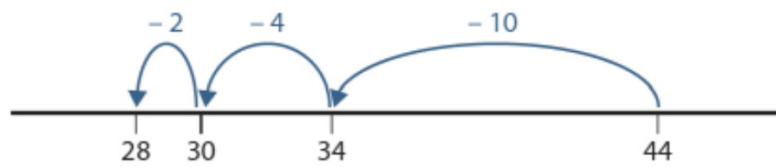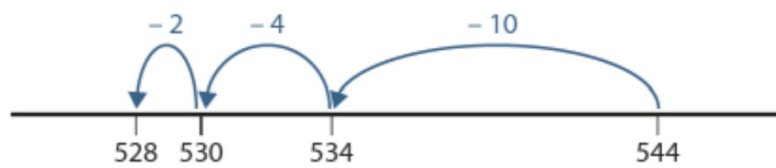
280 300   340   440
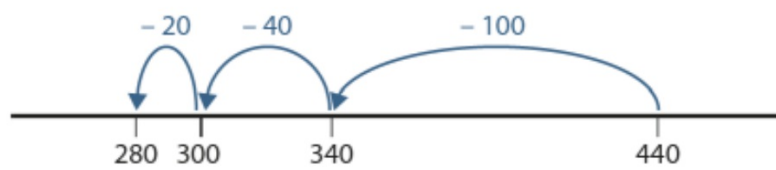
Y3 Multiplication and division National Curriculum

Number - multiplication and division

Pupils should be taught to:

- recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables
- write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods
- solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects

Notes and guidance (non-statutory)

Pupils continue to practise their mental recall of multiplication tables when they are calculating mathematical statements in order to improve fluency. Through doubling, they connect the 2, 4 and 8 multiplication tables.

Pupils develop efficient mental methods, for example, using commutativity and associativity (for example, $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and multiplication and division facts (for example, using $3 \times 2 = 6$, $6 \div 3 = 2$ and $2 = 6 \div 3$) to derive related facts ($30 \times 2 = 60$, $60 \div 3 = 20$ and $20 = 60 \div 3$).

Pupils develop reliable written methods for multiplication and division, starting with calculations of two-digit numbers by one-digit numbers and progressing to the formal written methods of short multiplication and division.

Pupils solve simple problems in contexts, deciding which of the 4 operations to use and why. These include measuring and scaling contexts, (for example 4 times as high, 8 times as long etc) and correspondence problems in which m objects are connected to n objects (for example, 3 hats and 4 coats, how many different outfits?; 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children).

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Multiplication and division in Y3

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1 x 4 = 4

2 x 4 = 8

3 x 4 = 12

4 x 4 = 16

What do you notice?
What is the same?
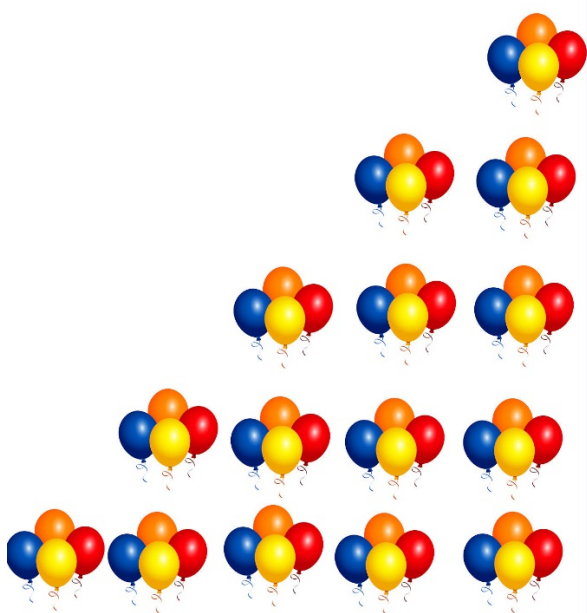What is different?

1 x 4 = 4
2 x 4 = 8
3 x 4 = 12
4 x 4 = 16

What do you notice?
What is the same?
What is different?

X	÷
$4 \times 1 = 4$	$4 \div 4 = 1$
$4 \times 2 = 8$	$8 \div 4 = 2$
$4 \times 3 = 12$	$12 \div 4 = 3$
$4 \times 4 = 16$	$16 \div 4 = 4$
$4 \times 5 = 20$	$20 \div 4 = 5$

Teaching for Mastery

- Accessing ideas
- Communicating concepts
- Making connections

Representation & Structure

Mathematical Thinking
- Chains of reasoning
- Applying maths to problems
- Making connections

Coherence

Variation
- Procedural variation
- Conceptual variation
- Making connections

Fluency
- Knowing key mathematical facts
- Thinking flexibly
- Making connections

Detailed curriculum sequencing supports all to progress

$3 \times 4 = 12$

Can they show you a drawing or tell a story to match the claculation?

Times Tables Rock Stars

Y3 expectations

10
5
2
3
4
8
6
9

Y2 expectations

10
5
2
3

GOV.UK   Multiplication Tables Check

Remaining time: 5

$11 \times 2 =$

1	2	3
4	5	6
7	8	9
⌫	0	Enter

Y3 parents
What to focus on

Quick recall of addition and subtraction facts

Posters
Hit the button
TTR
Chanting
Walking to school

Multiplication
Check

Information for parents:

2023 multiplication tables check

Multiplication tables check

Do you have a child in year 4 at primary school?

If so, your child will be participating in the multiplication tables check in June.

The purpose of the check is to determine whether your child can fluently recall their times tables up to 12, which is essential for future success in mathematics. It will also help your child's school to identify if your child may need additional support.

What is the multiplication tables check?

It is an on-screen check consisting of 25 times table questions. Your child will be able to answer 3 practice questions before taking the actual check. They will then have 6 seconds to answer each question. On average, the check should take no longer than 5 minutes to complete.

What if my child cannot access the check?

There are several access arrangements available for the check, which can be used to support pupils with specific needs. Your child's teacher will ensure that the access arrangements are appropriate for your child before they take the check in June.

The check has been designed so that it is inclusive and accessible to as many children as possible, including those with special educational needs or disability (SEND) or English as an additional language (EAL). However, there may be some circumstances in which it will not be appropriate for a pupil to take the check, even when using suitable access arrangements. If you have any concerns about your child accessing the check, you should discuss this with your child's headteacher.
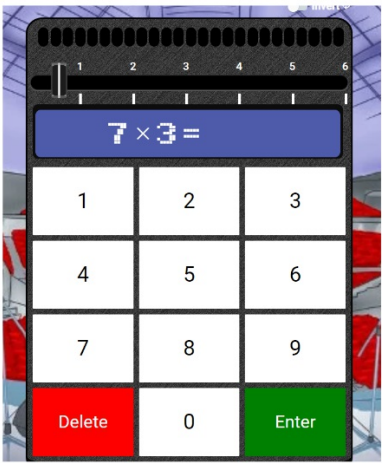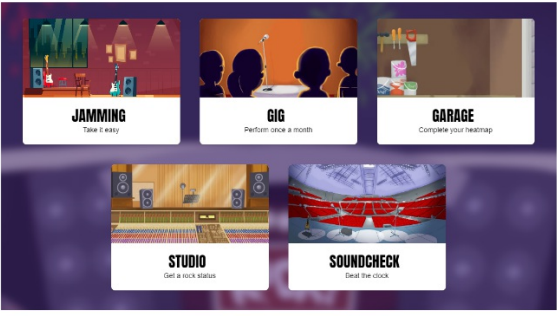
Do I need to do anything to prepare my child for the check?

No, you do not need to do anything additional to prepare your child for the check. As part of usual practice, teachers may ask you to practise times tables with your child.
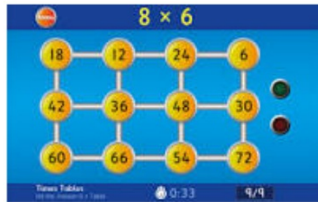
Remaining time: 5

$11 \times 2 =$

1	2	3
4	5	6
7	8	9
⌫	0	Enter

JAMMING	GIG	GARAGE
Take it easy	Perform once a month	Complete your heatmap

STUDIO	SOUNDCHECK
Get a rock status	Beat the clock

$7 \times 3 =$

1	2	3
4	5	6
7	8	9
Delete	0	Enter

Chanting times tables

Chanting in different ways

3 x 6 =

6 x 3 =

18 divided by 6 =

18 divided by 3 =

Copying out the times table facts
with division

1 x 6 = 6   6 ÷ 6 = 1

2 x 6 = 12   12 ÷ 6 = 2

We can describe pictures using multiplication and division number sentences.

Look at these vases. There are 5 flowers in each vase.

The same 3 numbers are used and connected.

3, 5 and 15

3 and 5 are factors or 15

We can describe this using 4 different number sentences.

a 3 x 5 = ...

3 groups of 5 are equal to ....

b 5 x 3 = ...

5, three times, is equal to ....

c 15 ÷ 5 = ... Grouping

15 flowers, 5 in each vase. How many vases? ....

d 15 ÷ 3 = ... Sharing

15 flowers shared between 3 vases.

How many flowers in each vase? ....

THIRD SPAC

3 groups of 5

5 three times

3 x table step 1   Time: Date: Score:

Standard	Mixed	Answer first (mixed)
1 x 3 = 3	4 x 3 = 12	6 = 2 x 3
2 x 3 = 6	1 x 3 = 3	36 = 12 x 3
3 x 3 = 9	0 x 3 = 0	27 = 9 x 3
4 x 3 = 12	3 x 3 = 9	21 = 7 x 3
5 x 3 = 15	11 x 3 = 33	12 = 4 x 3
6 x 3 = 18	12 x 3 = 36	18 = 6 x 3
7 x 3 = 21	2 x 3 = 6	33 = 11 x 3
8 x 3 = 24	7 x 3 = 21	3 = 1 x 3
9 x 3 = 27	8 x 3 = 24	15 = 5 x 3
10 x 3 = 30	6 x 3 = 18	24 = 8 x 3
11 x 3 = 33	9 x 3 = 27	9 = 3 x 3
12 x 3 = 36	5 x 3 = 15	30 = 10 x 3

3 x table step 2   Time: Date: Score:

Mixed missing number	Division facts	Everything Everything
4 x __ = 12	6 ÷ 3 =	__ x 3 = 30
__ x 3 = 3	24 ÷ 3 =	7 x 3 =
__ x 3 = 30	21 ÷ 3 =	12 x __ = 36
3 x __ = 9	33 ÷ 3 =	33 ÷ __ = 11
11 x 3 = __	12 ÷ 3 =	__ x 3 = 6
12 x __ = 36	30 ÷ 3 =	__ ÷ 3 = 5
__ x 3 = 6	18 ÷ 3 =	36 ÷ 3 =
7 x 3 = __	36 ÷ 3 =	9 x 3 =
__ x 3 = 24	15 ÷ 3 =	__ = 6 x 3
6 x 3 = __	3 ÷ 3 =	__ x 3 = 24
9 x __ = 27	9 ÷ 3 =	33 ÷ __ = 3
__ x 3 = 15	27 ÷ 3 =	__ x 3 = 27

Year 4 expectations

Autumn 1

3 step 1

3 step 2

6 step 1

6 step 2

Autumn 2

9 step 1

9 step 2

3, 6, 9 mixed

4 and 8 step 1

4 and 8 step 2

7 step 1

7 step 2

Spring 1

11 step 1

11 step 2

12 step 1

12 step 2

Spring 2

Mixed 5, 10, 11

Mixed 2, 4, 8, 12

Mixed 3, 6, 9, 7
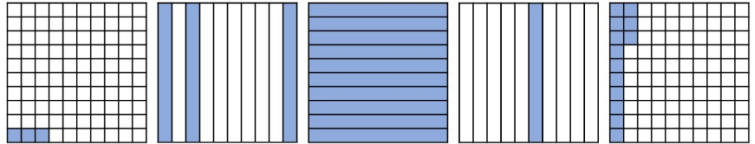
Mixed all - challenges

Decimals

$\frac{13}{100}$

0.1 + 0.03

0.13
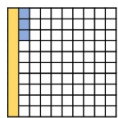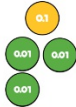
Match the representations to the numbers.

$\frac{10}{100}$ $\frac{3}{10}$ 1 $\frac{3}{100}$ $\frac{13}{100}$

Let's try another

0.45

0.4   0.05

0.59

0.74

0.98
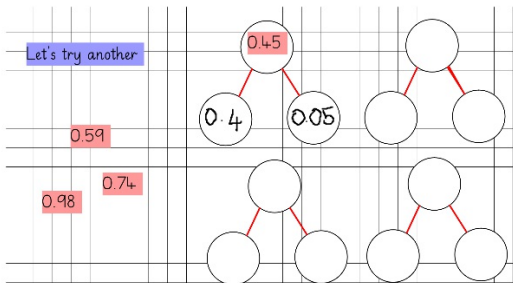
Alex says the number on the place value chart is 3.4

Ones		Tenths	Hundredths
●●●	•		●●●●
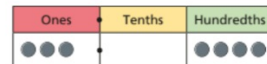
Do you agree with Alex? _____
Explain your answer.

Addition and Subtraction

Formal Strategies

When starting an addition or subtraction use the language 'begin from the lowest place value column' (rather than 'ones column').

T	h	t	o
4	8	0	3
+ 1	4	5	8
6	2	6	1

This is to prepare children for adding and subtracting decimals where we are not 'starting with the ones'.

Th	H	T	O
1.000 1.000 1.000 1.000	100 100 100 100 100 100 100 100		1 1 1
1.000	100 100 100 100	10 10 10 10 10	1 1 1 1 1 1 1 1 1 1

$$
\begin{array}{r}
4\ 8\ 0\ 3 \\
+\ 1\ 4\ 5\ 8 \\
\hline
6\ 2\ 6\ 1 \\
\end{array}
$$

regrouping

$$4,065 - 2,128 =$$

Th	H	T	O
1000 1000 1000 1000	100 100 100 100 100 100 100 100 100 100	10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1	9	3	7

exchanging

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

→ 15 − 8
5 3

There are not enough _____ , so I need to
exchange 1 _____ for 10 _____

Multiplication and Division

Formal Strategies

$$
\begin{array}{r}
3\ 6\ 7 \\
\times \quad\quad 4 \\
\hline
1\ 4\ 6\ 8 \\
2\ 2
\end{array}
$$

Eighty-four sticks are shared equally between four children. How many sticks does each child get?

10s   1s

$$\begin{array}{r} 2 \quad 1 \\ 4\overline{)\ 8 \quad 4} \end{array}$$
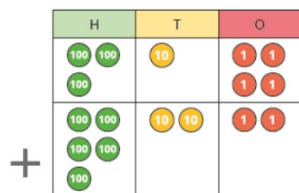
2   1

$$4\overline{)}$$
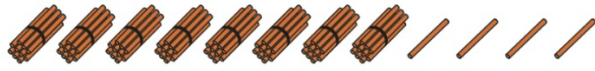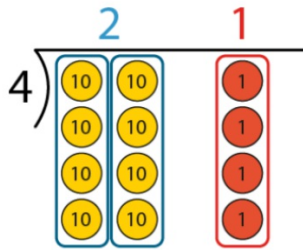
Reasoning

There is challenge in everything we do!

I can add up to two 4 digit numbers _____

1. Calculate 314 + 522

Use the place value chart to help you.

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

+

314 + 522 = ☐

2. Complete the calculations.

a) 4,122 + 2,605 = ☐

b) 3,709 + 4,160 = ☐

c) 247 + 1,032 = ☐

d) 3,007 + 560 = ☐

3. The distance from Scotland to France is 1,550 km.

The distance from France to Spain is 1,002 km.

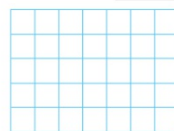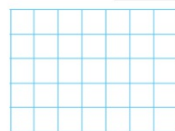Teddy is travelling from Scotland to France and then France to Spain.

How far will he travel in total?

☐

4. **a)** Complete the calculations.

2,415 + 5,142 = ☐   3,051 + 1,503 = ☐

b) What do you notice about the numbers in each question? How does this affect the answers?
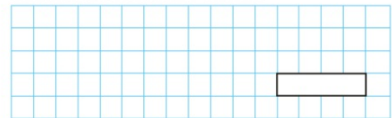
_____

_____

5. The mass of a box of fruit is 1,241 g.

Another three pieces of fruit are placed in the box.

Each piece of fruit has a mass of 102 g.
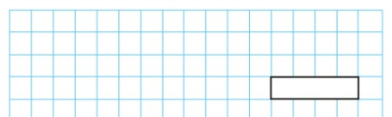
What is the mass of the box of fruit now?

☐

6. Whitney and Jack are playing a game.

Whitney has 1,323 points.

Jack has 230 points more than Whitney.

How many points do they have altogether?

☐

7. Fill in the missing digits.

a)

	Th	H	T	O
	3	2		
+		4		6
	8	7	9	6

b)

	Th	H	T	O
				0
+	5	0		7
	8	9	0	8

Further challenges

Further Challenge

1. Dani and Aisha are raising money for charity.

   Dani raises £2,304 and Aisha raises £1,695

   How much money have they raised altogether?

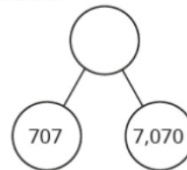   Scott and Tom are also raising money for charity.

   So far, Scott has raised £1,423 and Tom has raised £121 more than Scott.

   How much have Scott and Tom raised altogether?

   Scott [_____] 121

   Tom [_____]

2. Fill in the missing numbers.

   ( )
   707   7,070

1,052	5,945

3,194	405

   | | |

3. Work out the missing numbers.

	Th	H	T	O
	4		6	
+	2	5		1
		7	8	9

Multi-step Problems

5. The mass of a box of fruit is 1,241 g.

Another three pieces of fruit are placed in the box. ←

Each piece of fruit has a mass of 102 g.

What is the mass of the box of fruit now?

× 1,241g + 102g ←×

Step 1 ✓ 102g × 3 =

Step 2 ✓ 1,241g + 306g

_____ g ← units!

Children often rush
and don't do the
first/second step.

6. Whitney and Jack are playing a game.

Whitney has 1,323 points.

Jack has 230 points more than Whitney.

How many points do they have altogether? ⌐

Step 1   1,323 + 230 = 1,553

Step 2   1,553 + 1,323 =   2,876

General tips when supporting at home

- Focus on the process of solving problems, not just the answer – encourage your child to explain their thinking
- Be positive and encourage a growth mindset – praise effort not outcome
- Use everyday situations to tecah maths concepts – where is the maths in everyday life
- Encourage your child to ask questions to guide thinking/ and ask them questions – is this the most efficient strategy?
- Find fun interactive maths games – apps or boardgames – make maths as fun as possible!
- Find efficient strategies that work for them.