

Mathematics at St Mark's



Memory is
the
residue of
thought.

Daniel Willingham

...recall important
number and concept
facts

...be fluent in number,
choosing the most efficient
ways to solve problems

...take risks, be resilient
and be enthused by
challenge

...enjoy their Maths
lessons



...feel like they can
succeed and make
progress

...have a deep and
broad understanding of
the curriculum

...be able to apply their
knowledge in both
Maths and other areas
of the curriculum

...be able to reason
Mathematically by
explaining and proving

...be able to make connections
and links between different
areas of Maths

...have a secure
conceptual
understanding of ideas

**Our aims are for
children to...**

Our Curriculum

- The National Curriculum is a statutory document which states the objectives for Mathematics however a school can choose how these objectives are taught
- We use 'White Rose' planning as a start point for our planning which was devised by a group of leading Maths teachers from around the world. This planning fulfils our school aims and teaches a 'Mastery' approach
- In a Mastery approach, the idea is that children study a Mathematical concept in depth and 'master' it before moving on

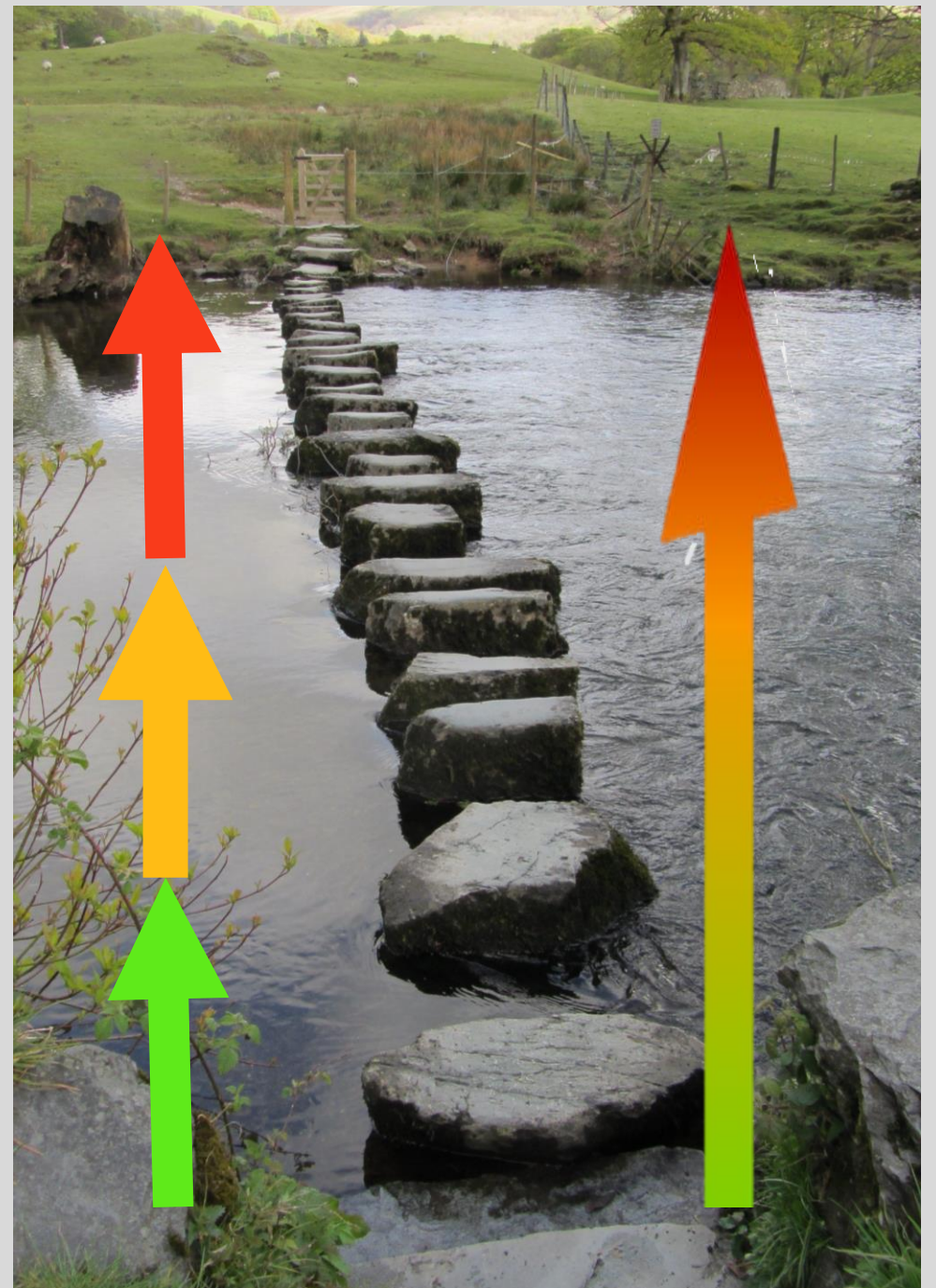


Long Units with Number at the Heart

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | Week 11 | Week 12 |
|--------|-------------------------------------|--------|--------|----------------------------------|------------|--------|-----------------------------------|--------|-------------------------------------|-------------------|---------|---------------|
| Autumn | Number: Place Value | | | Number: Addition and Subtraction | | | | | Number: Multiplication and Division | | | Consolidation |
| Spring | Number: Multiplication and Division | | | Measurement: Money | Statistics | | Measurement: Length and Perimeter | | | Number: Fractions | | Consolidation |
| Summer | Number: Fractions | | | Measurement: Time | | | Geometry: Properties of Shape | | Measurement: Mass and Capacity | | | Consolidation |

Lessons

- Whole class teaching
- When teaching something new, the children start at the same point in learning – no assumptions are made
- Learning is not capped
- Lesson tasks start in a more simple way, covering earlier foundations then move on to more complex problems, this limits gaps in learning
- The children have the same opportunities but will move through 'steps' at a different speed, with varying amounts of support
- Children who grasp concepts at a faster speed can move onto more complex problems quicker



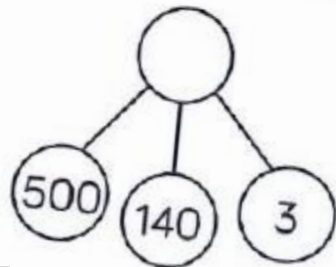
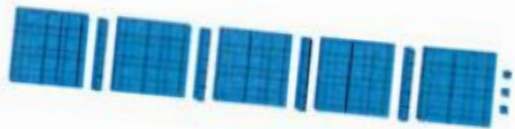
Using pictorials and visuals

We use concrete resources and visual aids where possible to help children build a conceptual understanding, particularly in place value

Which image is the odd one out?



| | | | | | |
|-----|-----|-----|-----|-----|-----|
| 539 | 540 | 541 | 542 | 543 | 544 |
|-----|-----|-----|-----|-----|-----|



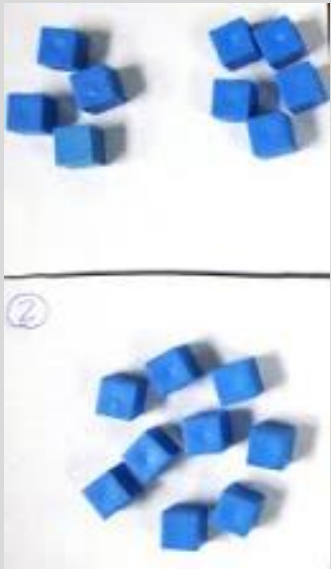
The part whole model

is the odd one out because it shows 643 and
all of the other images show 543. ✓










Using pictorials and visuals

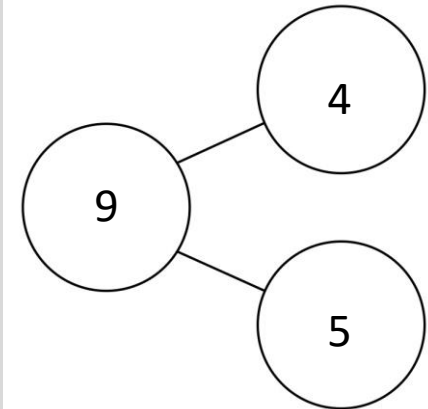
The CPA approach (concrete, pictorial/visual, abstract) is used from Year R throughout the school to give meaning to numbers and number sentences



There are 7 apples so the whole is 7.
4 apples are red so the red apples represent $\frac{4}{7}$.
3 apples are green so the red apples represent $\frac{3}{7}$.



| | | | | |
|---|---|---|--|--|
|  |  |  | | |
|  |  |  |  | |



I can use number sentences to draw arrays.

$$4 \times 3 = 12$$

$$3 \times 4 = 12$$

$$12 \div 4 = 3$$

$$12 \div 3 = 4$$

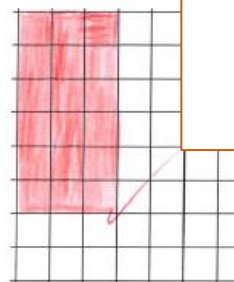


$$6 \times 3 = 18$$

$$3 \times 6 = 18$$

$$18 \div 6 = 3$$

$$18 \div 3 = 6$$

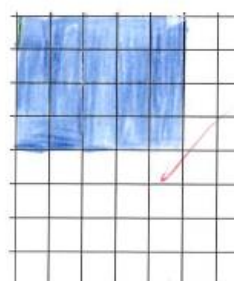


$$4 \times 5 = 20$$

$$5 \times 4 = 20$$

$$20 \div 4 = 5$$

$$20 \div 5 = 4$$



Visuals can help children to understand the 'why' behind a procedure

Having a secure conceptual understanding is more likely to result in sustained learning

A lorry is 4 times as big as a car. The car 10m long. How long is

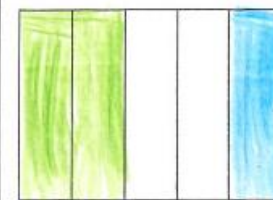
| | | | | |
|-------|------|------|------|------|
| Car | 10 m | | | |
| Lorry | 10 m | 10 m | 10 m | 10 m |

Number sentence- $10m \times 4 = 40m$

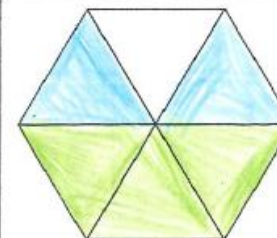
A T-Rex is 6 times as big as a pterodactyl. The pterodactyl is 12m long. How big is the dinosaur?

| | | | | | | |
|-------------|------|------|------|------|------|------|
| Pterodactyl | 12 m | | | | | |
| T-Rex | 12 m | 12 m | 12 m | 12 m | 12 m | 12 m |

Colour the windows to match the fractions listed.



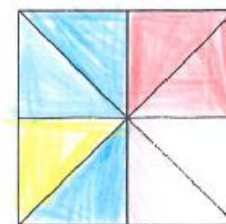
$\frac{2}{5}$: green ✓
 $\frac{1}{5}$: blue ✓



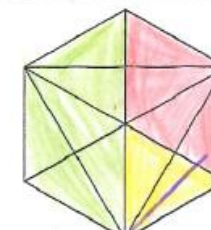
$\frac{1}{2}$: green ✓
 $\frac{2}{6}$: blue ✓



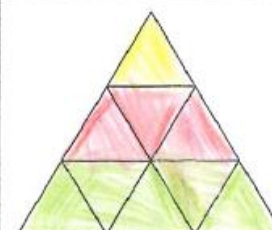
$\frac{2}{5}$: blue ✓
 $\frac{1}{5}$: yellow ✓
 $\frac{3}{10}$: green ✓



$\frac{3}{8}$: blue ✓
 $\frac{1}{4}$: red ✓
 $\frac{1}{8}$: yellow ✓

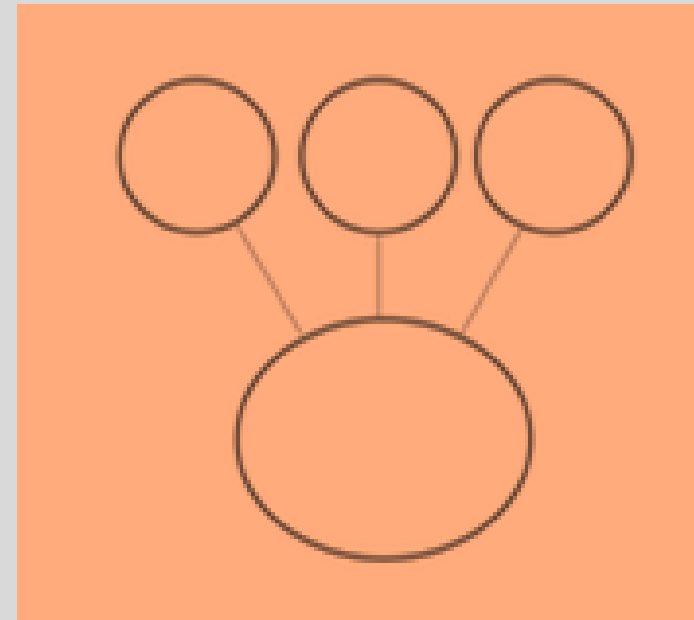
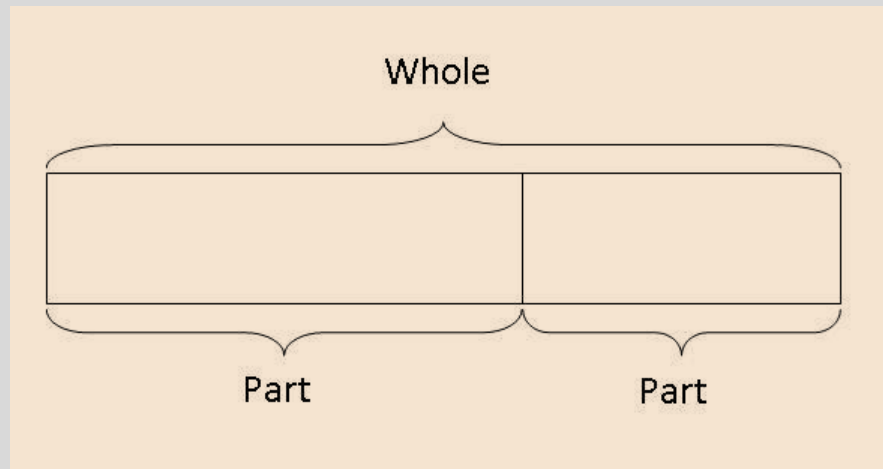
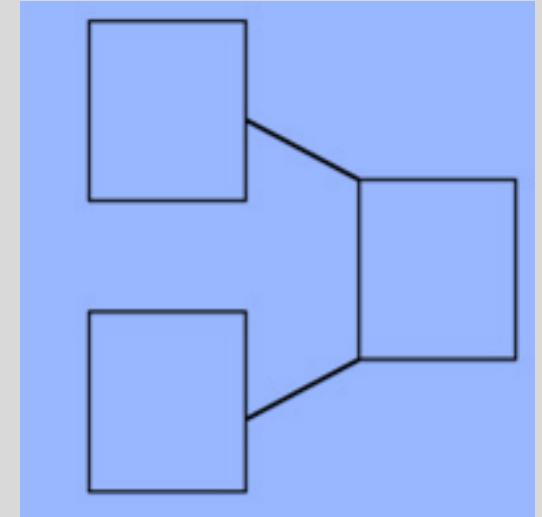
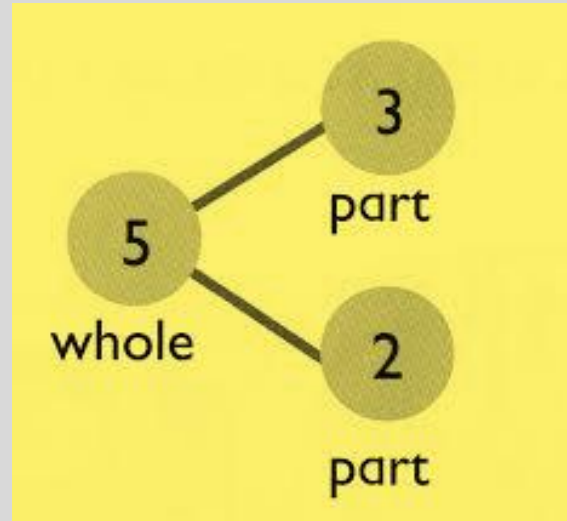
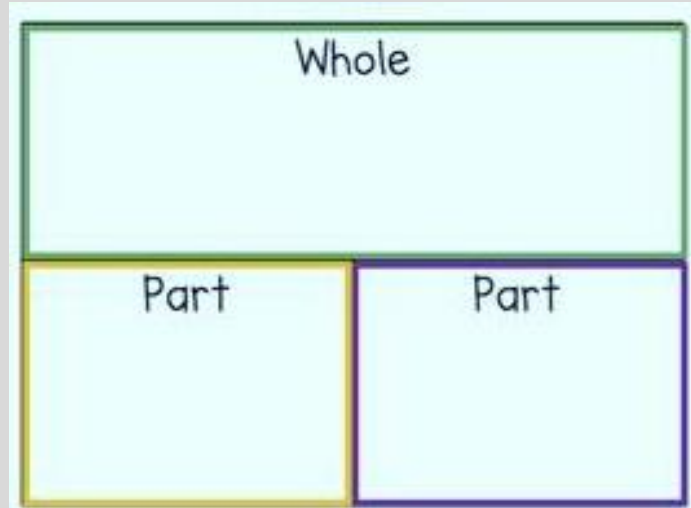


$\frac{1}{12}$: yellow ✓
 $\frac{1}{3}$: red ✓
 $\frac{1}{2}$: green ✓



$\frac{1}{3}$: yellow ✓
 $\frac{2}{9}$: green ✓
 $\frac{1}{3}$: red ✓

Diagrams can help children to understand the structures of number sentences



These diagrams and structures help children to understand what they need to do to solve a problem

Complete these number tracks – going up in 10s

| | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | 200 |
| 400 | 410 | 420 | 430 | 440 | 450 | 460 | 470 | 480 | 490 | 500 |

Fill in the missing numbers – going up in 10s

| | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| 200 | 210 | 220 | 230 | 240 | 250 | 260 | 270 |
| 600 | 610 | 620 | 630 | 640 | 650 | 660 | 670 |

Place the numbers in the correct boxes – going up in 1

| | | | |
|-----|-----|-----|-----|
| 100 | 120 | 180 | 120 |
| 500 | 510 | 550 | 590 |

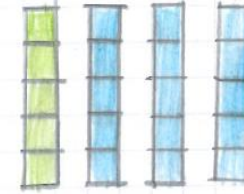
| Tens | Ones |
|------|------|
| | |
| | |
| | |
| | |

Draw it; solve it.

There are 5 green cubes in a box.

There are 3 times as many blue cubes than green cubes in the box.

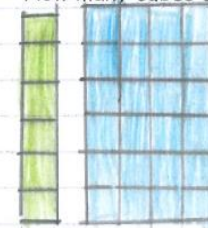
How many cubes are there altogether? he has 20 cubes



There are 6 green cubes in a box.

There are 4 times as many blue cubes than green cubes in the box.

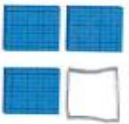


How many cubes are there altogether? he has 30 cubes



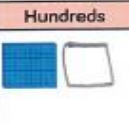


$$\begin{array}{r}
 T + O \\
 10 + 4 \\
 \times 4 \\
 \hline
 50 + 6 = 56 \\
 10 \\
 56 \text{ children}
 \end{array}$$

Procedural skills are practised in lessons before applying them to contextual problems

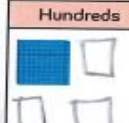


454

| Hundreds | Tens | Ones |
|---|---|---|
|  |  |  |



218

| Hundreds | Tens | Ones |
|---|---|---|
|  |  |  |

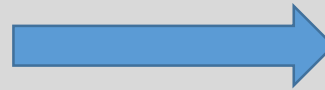
467

| Hundreds | Tens | Ones |
|--|--|--|
|  |  |  |


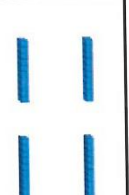

460

| Hundreds | Tens | Ones |
|---|---|------|
|  |  | |

Handwritten diagrams showing the decomposition of each number into its place value components (hundreds, tens, ones) using circles and arrows, with a checkmark indicating correctness.



Handwritten place value grid for 467:

| Hundreds | Tens | Ones |
|---|---|---|
|  |  |  |

Eva

The place value grid shows the number 467

Do you agree? Explain your reasoning.

What do you notice about the number shown?

I disagree because the place value grid shows 6 hundreds 4 tens and 7 ones so the number is 647.

I notice that 4 6 7 and 6 4 7 have the same digits but in a different order.

I

Deep Thinking – breadth and depth in learning

In order to embed skills and understanding, children will solve more complex problems which will deepen their understanding of a concept

2. Write the missing digits in the boxes.

$$\begin{array}{r} + \quad 4 \quad 9 \quad \square \\ 3 \quad \square \quad 3 \\ \hline 8 \quad 6 \quad 4 \end{array}$$

Explain how you found the number in the **bold** box:

$$\begin{array}{r} \square \\ + \square \\ \hline 8 \quad 6 \quad 6 \end{array}$$

What are all the possibilities?
List them systematically

Circle the mistake and
explain what their
misconception is

$$\begin{array}{r} 7 \quad 6 \quad 2 \\ + 6 \quad 3 \quad 8 \\ \hline 1 \quad 3 \quad 0 \quad 0 \\ \hline \end{array}$$

$$\begin{array}{r} \quad \quad b \quad b \\ + \quad \quad a \\ \hline a \quad c \quad c \end{array}$$

What are the
values of b, a
and c?

True or false

A 2-digit number add a 1-digit
number always totals a 2-digit
number

Reasoning and Explaining

Not all Maths is just wrong or right. In order to show a deep understanding about a concept, children need to be able to explain their thinking using Mathematical vocabulary

True or False?

Explain your answer.
If it is false, how could you correct it?

True or False?

Explain your answer.
If it is false, how could you correct it?

If it is true because there are 2 hundreds 1 ten and 2 ones which is greater than 2 hundreds and 0 ones 0 Tens.

False because 11 hundred 1 Ten and 10 ones is greater than 0 hundred 11 tens 0 and 0 ones - there should be + 2 tens in the far one.

Teddy has 420 in Base 10 but some are covered.

Work out the missing amount.
How many different ways can you make the missing amount using Base 10?

120 ones ✓
100 ones 1 Ten ✓
90 ones and 11 ✓
80 ones ✓
70 ones ✓
60 ones ✓
50 ones ✓

Stem Sentences

Stem sentences are a oral or written framework which is repeated. It helps children to identify patterns and remember key facts.

1 ten is equal to 1000

2 thousands are equal to 2000

3 thousands are equal to 3000

4 thousands are equal to ____

5 thousands are equal to ____






____ thousands are equal to ____

____ thousands are equal to ____



____ thousands are equal to ____

I can count in 100's

Complete the stem sentences using words.

| | |
|---|--|
|  | There are <u>6</u> tens. This is <u>60</u> ✓ |
|  | There are <u>7</u> tens. This is <u>70</u> ✓ |
|  | There are <u>8</u> tens. This is <u>80</u> ✓ |
|  | There are <u>9</u> tens. This is <u>90</u> ✓ |
|  | There are <u>10</u> tens. This is <u>100</u> ✓ |

There are 100 sweets in each jar. Write the numbers of sweets in numerals and words.

| Picture | Numeral | word |
|---|---------|----------------|
|  | 400 | four hundred ✓ |
|  | 500 | five hundred ✓ |

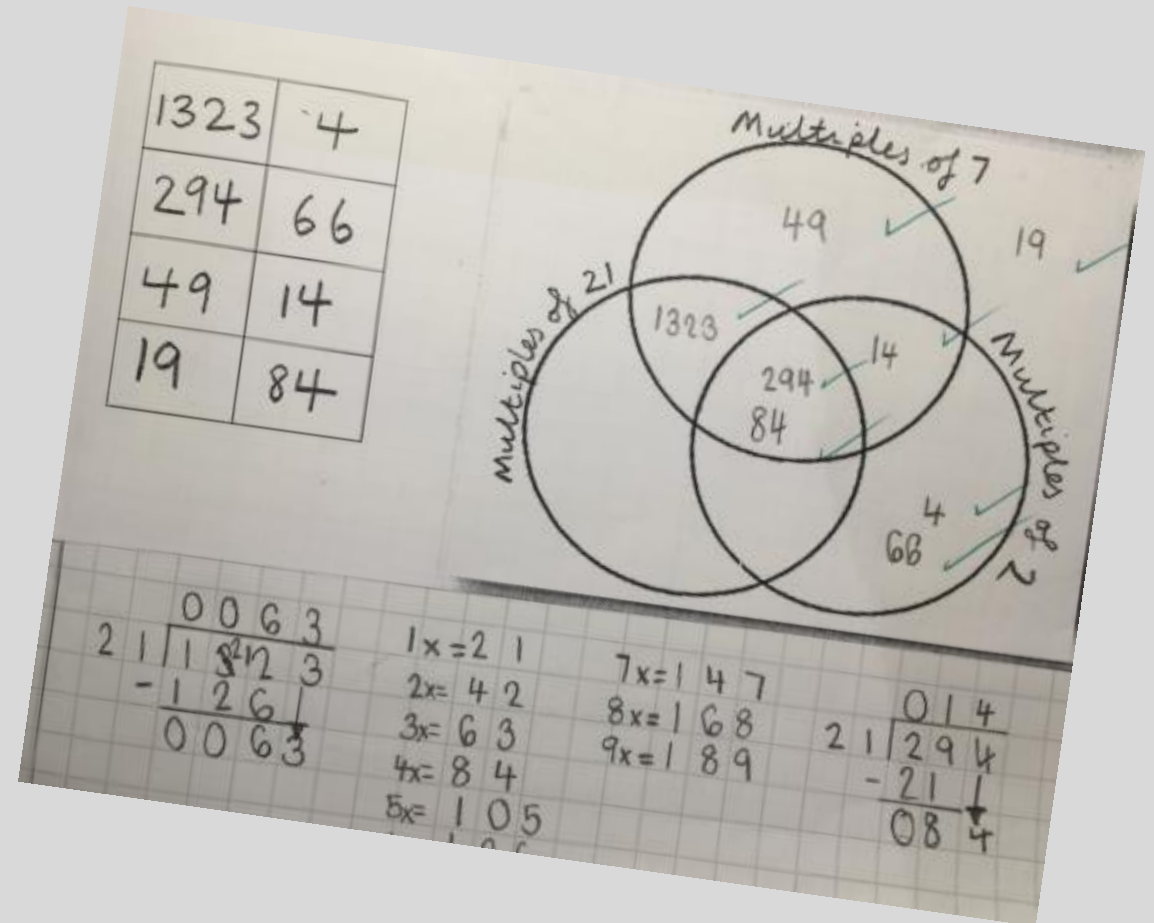
Re-visiting previous concepts and making connections

We aim to keep learning alive by revisiting concepts during Morning Maths Challenges or in future lessons. When children are able to make connections with other Mathematical concepts, then their learning becomes more purposeful

What you learned last month...

What you learned last week...

What you learned yesterday...



Number Fluency – Written Methods

Our calculation policy ensures steady progression from Year R – Year 6.

These posters are displayed in classrooms to aid children in their working.

Addition

Pictorial Representation

Structured Number Line
 $4 + 3$

Unstructured Number Line
 $23 + 14$

Formal Column Method
$$\begin{array}{r} 342 \\ + 475 \\ \hline 717 \end{array}$$

$$\begin{array}{r} 75685 \\ + 493 \\ \hline 76178 \end{array}$$

Expanded Column Method
$$\begin{array}{r} 23 + 52 \\ 20 + 3 \\ + 50 + 2 \\ \hline 70 + 5 = 75 \end{array}$$

$$\begin{array}{r} 132 + 289 \\ 100 + 20 + 2 \\ + 200 + 80 + 9 \\ \hline 400 + 20 + 1 = 421 \end{array}$$

Subtraction

Pictorial Representation

Structured Number Line
 $12 - 4$

Unstructured Number Line
 $45 - 23$

Formal Column Method
$$\begin{array}{r} 698 \\ - 422 \\ \hline 276 \end{array}$$

$$\begin{array}{r} 7568 \\ - 493 \\ \hline 7075 \end{array}$$

Expanded Column Method
$$\begin{array}{r} 89 - 23 \\ 80 + 9 \\ - 20 + 3 \\ \hline 60 + 6 = 66 \end{array}$$

$$\begin{array}{r} 636 - 218 \\ 600 + 30 + 16 \\ - 200 + 10 + 8 \\ \hline 400 + 10 + 8 = 418 \end{array}$$

Multiplication

Pictorial Grouping

Repeated Addition using Pictorial
 4×2
 $2 + 2 + 2 + 2$

Grouping with Arrays
 5×2
 3×6

Repeated Addition on a Number Line
 4×3

Long Method
$$\begin{array}{r} 372 \\ \times 43 \\ \hline 1116 \\ 14880 \\ \hline 15996 \end{array}$$

Short Method
$$\begin{array}{r} 241 \\ \times 7 \\ \hline 1687 \end{array}$$

$$\begin{array}{r} 8 \\ \times 416 \\ \hline 3328 \end{array}$$

Grid Method
$$\begin{array}{r} 23 \times 35 \\ 20 \times 30 = 600 \\ 20 \times 5 = 100 \\ 3 \times 30 = 90 \\ 3 \times 5 = 15 \\ \hline 600 + 100 + 90 + 15 = 805 \end{array}$$

Chunking on a Number Line
 24×5

Division

Grouping and Sharing Pictorially
 $6 \div 3$
 $16 \div 4$

Grouping and Sharing with Arrays
 $6 \div 3$
 $15 \div 5$

Repeated Addition on a Number Line
 $12 \div 4$
 $17 \div 8$

Long Method
$$\begin{array}{r} 12684 \div 35 \\ 003624 \\ 35 \overline{)126840} \\ \underline{105} \\ 218 \\ \underline{210} \\ 84 \\ \underline{70} \\ 140 \\ \underline{140} \\ 0 \end{array}$$

Short Method
$$\begin{array}{r} 249 \div 4 \\ 062r1 \\ 4 \overline{)249} \\ \underline{8} \\ 98 \\ \underline{80} \\ 96 \\ \underline{96} \\ 0 \end{array}$$

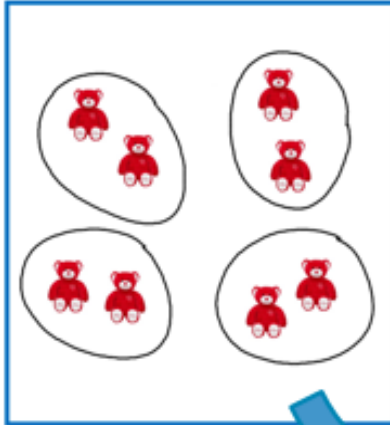
$$\begin{array}{r} 986 \div 8 \\ 1232r5 \\ 8 \overline{)98600} \\ \underline{80} \\ 186 \\ \underline{160} \\ 260 \\ \underline{240} \\ 200 \\ \underline{160} \\ 400 \\ \underline{400} \\ 0 \end{array}$$

Vertical Chunking
$$\begin{array}{r} 747 \div 23 \\ 23 \overline{)747} \\ \underline{46} \\ 287 \\ \underline{230} \\ 57 \\ \underline{46} \\ 110 \\ \underline{115} \\ 5 \end{array}$$

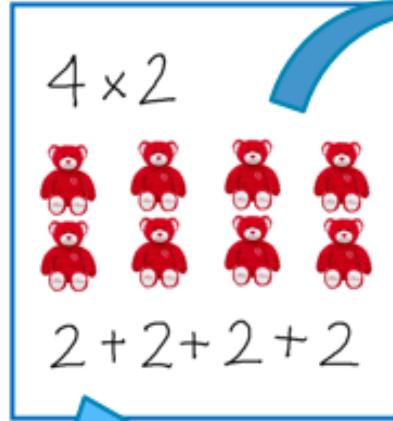
$$20 + 10 + 2 = 32$$

Chunking on a Number Line
 $65 \div 5$
 $67 \div 3$

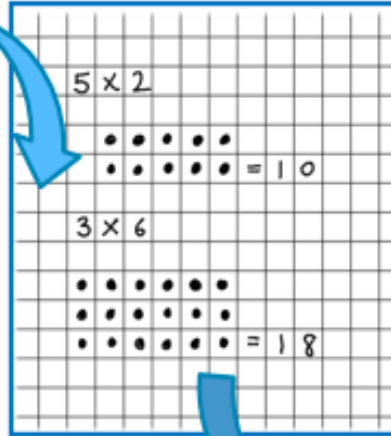
Pictorial Grouping



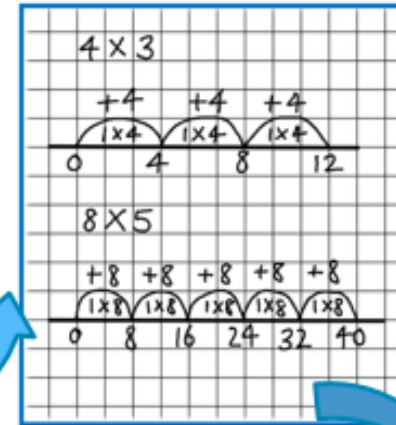
Repeated Addition using Pictorials



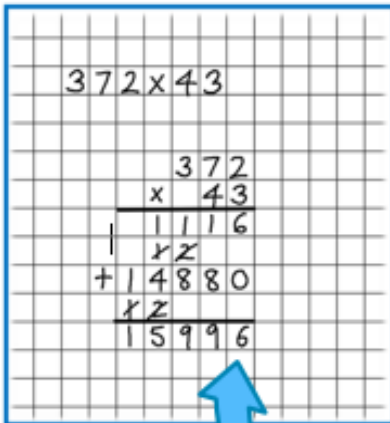
Grouping with Arrays



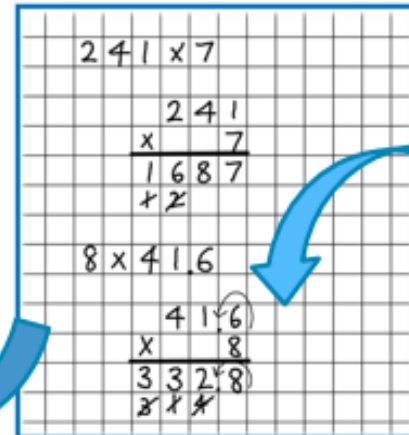
Repeated Addition on a Number Line



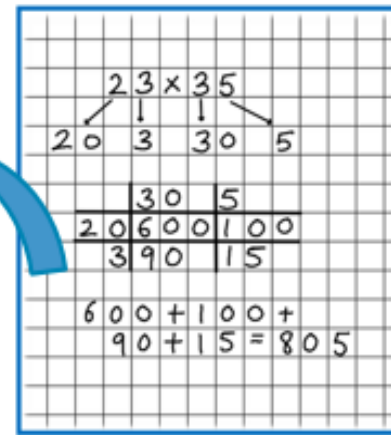
Long Method



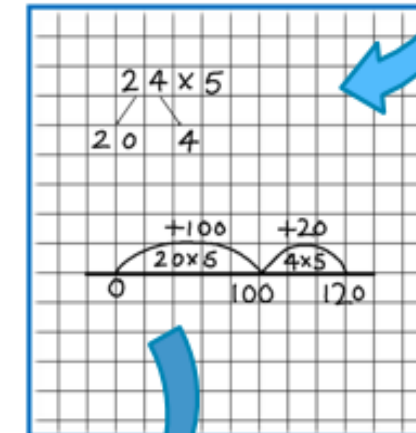
Short Method



Grid Method



Chunking on a Number Line



Multiplication

Variation and Making Small Steps

When a new concept is introduced, we provide questions that begin with just slight variations before moving onto more mixed practice

$$\begin{aligned}42 \times 5 &= \\43 \times 5 &= \\47 \times 5 &= \\47 \times 6 &= \\57 \times 6 &= \\67 \times 7 &= \\63 \times 8 &= \end{aligned}$$

| | | | |
|----|---------------|---|--|
| 11 | Nearest 10 | → | |
| 12 | Nearest 10 | → | |
| 13 | Nearest 10 | → | |
| 14 | Nearest 10 | → | |
| 15 | Nearest 10 | → | |
| 16 | Nearest 10 | → | |

Q2. Emma is thinking of a number.

- My number is odd.
- It is less than 15
- It is a multiple of 3.
- It can be divided by 4.

What number is Emma thinking of?

Q3. Sharon is thinking of a number.

- My number is odd.
- It is less than 10.
- It is a multiple of 3.
- It can be divided by 2.

What number is Sharon thinking of?

Q4. Jaden is thinking of a number.

- My number is odd.
- It is less than 30.
- It is a multiple of 3.
- It can be divided by 5.

What number is Jaden thinking of?

- a) 15 is one ten less than _____
- b) 45 is one ten less than _____
- c) 345 is one hundred less than _____
- d) 345 is two hundreds less than _____
- e) 345 is three hundreds less than _____
- f) 7,345 is one thousand less than _____
- g) 7,345 is two thousand less than _____
- h) 7,345 is four thousands less than _____

Number fluency

99 x 4

$$14.05 \div 10$$

7×5

$$800 \div 25$$

100 x 100

$1320 \div 12$

$404 \div 4$

$8120 \div 145$

When solving number problems, we need to equip our children with the ability to choose efficient methods drawing on their knowledge.

Alongside more formal methods, we teach children a range of mental maths skills and how to use jottings to support their thinking.

Daily Fluency Practice

| Week 12 - Day 1 | Week 12 - Day 2 | Week 12 - Day 3 | Week 12 - Day 4 | Week 12 - Day 5 |
|--------------------------|---------------------------------------|---------------------------------------|--|---|
| $180 \div 30 = 6$ ✓ | $180 \div 60 = 3$ ✓ | $150 \div 30 = 5$ ✓ | $120 \div 30 = 4$ ✓ | $120 \div 60 = 2$ ✓ |
| XXIX = 29 ✓ | XL = 40 ✓ | LIV = 54 ✓ | LIX = 59 ✓ | XC = 90 ✓ |
| $2/5 \times 2 = 4/5$ ✓ | $2/5 \times 3 = 6/5 = 1\frac{1}{5}$ ✓ | $2/3 \times 2 = 4/3 = 1\frac{1}{3}$ ✓ | $2/3 \times 5 = 10/3 = 3\frac{1}{3}$ ✓ | $4/5 \times 4 = 16/5 = 3\frac{1}{5}$ ✓ |
| $1.57 \times 3 = 4.71$ ✓ | $2.36 \times 3 = 7.08$ ✓ | $4.76 \times 5 = 23.8$ ✓ | $4.63 \times 7 = 32.41$ ✓ | $1.02 \times 8 = 8.16$ ✓ |
| $1/2 + 1/9 = 11/18$ ✓ | $3/4 \times 3/7 = 9/28$ ✓ | $4/5 - 1/2 = 8/10 - 5/10 = 3/10$ ✓ | $1/3 \div 5 = 1/15$ ✓ | $2/7 + 3/14 = 4/14 + 3/14 = 7/14 = 1/2$ ✓ |
| $943 \div 41 = 23$ ✓ | $14,104 \div 41 = 344$ ✓ | $1,435 \div 42 = 34$ ✓ | $18,942 \div 42 = 451$ ✓ | $14,663 \div 43 = 341$ ✓ |
| $0.8 + 0.3 = 1.1$ ✓ | $0.9 + 0.2 = 1.1$ ✓ | $0.9 + 0.5 = 1.4$ ✓ | $0.5 + 0.9 = 1.4$ ✓ | $0.3 + 1.1 = 1.4$ ✓ |

| | | | | |
|---|---|---|---|--|
| $\begin{array}{r} 2 \times 2 = 4 \\ 5 \quad 1 \quad 5 \end{array}$ $\begin{array}{r} 157 \\ \times 3 \\ \hline 471 \end{array}$ $\begin{array}{r} 023 \\ 4 \overline{) 9423} \end{array}$ $\begin{array}{r} 41 \\ 82 \\ 123 \\ 164 \end{array}$ | $\begin{array}{r} 2.36 \\ \times 3 \\ \hline 7.08 \end{array}$ $\begin{array}{r} 3 \times 3 = 9 \\ 4 \times 7 = 28 \end{array}$ $\begin{array}{r} 00370 \\ 4 \overline{) 114704} \end{array}$ $\begin{array}{r} 41 \\ 82 \\ 123 \\ 164 \end{array}$ | $\begin{array}{r} 00344 \\ 4 \overline{) 114704} \end{array}$ $\frac{2}{3} \times \frac{2}{1} = \frac{4}{3} = 1\frac{1}{3}$ $\begin{array}{r} 476 \\ \times 5 \\ \hline 2380 \end{array}$ $\begin{array}{r} 4 \\ 5 \overline{) 25} \\ \hline 5 \end{array}$ | $\frac{1}{3} \div \frac{5}{15} = \frac{1}{5}$ $\begin{array}{r} 00451 \\ 42 \overline{) 118942} \end{array}$ $\begin{array}{r} 004702 \\ 42 \overline{) 118942} \end{array}$ $\begin{array}{r} 189 \\ -168 \\ \hline 021 \end{array}$ | $\frac{4}{5} \times \frac{4}{1} = \frac{16}{5} = 3\frac{1}{5}$ $\begin{array}{r} 1.02 \\ \times 8 \\ \hline 8.16 \end{array}$ $\begin{array}{r} 00341 \\ 43 \overline{) 114643} \end{array}$ $\begin{array}{r} 1436 \\ -129 \\ \hline 017 \end{array}$ |
|---|---|---|---|--|

$\frac{2}{7} \div \frac{4}{14} = \frac{3}{14}$
 $\frac{0.9}{7} \div \frac{0.5}{14} = \frac{1.4}{14}$
 $\frac{1}{3} \div \frac{5}{15} = \frac{1}{5}$
 $\frac{4.63}{7} \div \frac{8.41}{5} = \frac{1.4}{5}$

Times Tables/ Multiplication Recall

Learning their times tables is fundamental for solving more complex number problems as this knowledge is required for most areas of Mathematics

National Curriculum - Statutory Guidance for multiplication and division tables

Year 2

Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables.

Year 3

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

Year 4

Recall multiplication and division facts for multiplication tables up to 12×12 .

| | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| 2x÷ | 3x÷ | 4x÷ | 5x÷ | 6x÷ | 7x÷ | 8x÷ | 9x÷ | 10x÷ | 11x÷ | 12x÷ |
|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|



Join us back in the classrooms

- Lesson about rounding:

I can round to the nearest 100.



- Children have been introduced to this concept
- They have been identifying the 100 before and the 100 after
- Use rounding rules they have then been rounding up or down
- Feel free to question their understanding – how do you know? Can you explain that to me?