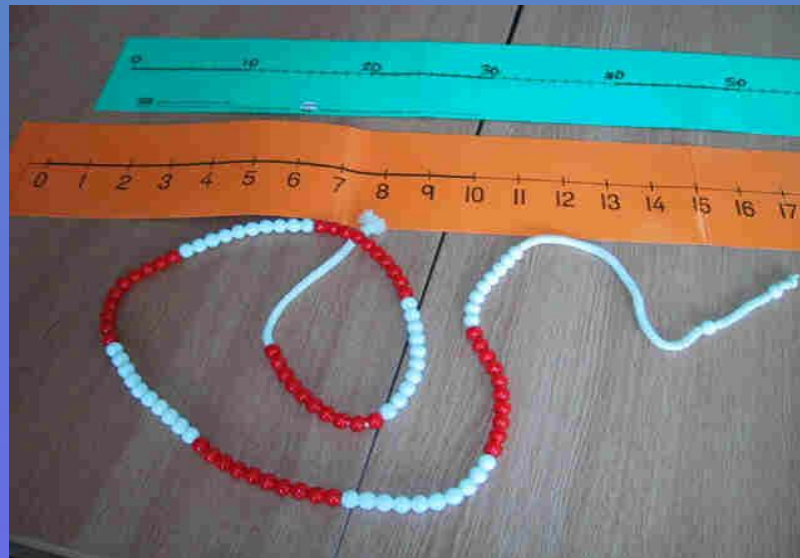


Welcome to our KS2 Parents Maths Workshop

Primary School



29th April 2024

Primary School Parents Meeting on: Progression through Calculations



We all use maths all day everyday!



- We look at the clock to tell the time before we get out of bed.



- We estimate how far it is to the floor!

- We know how many degrees to turn the tap so that we get enough water without getting soaked!



- We measure the cornflakes in our bowl so they don't spill over!



Aims

- To look at the ways in which the teaching of mathematics has changed;
- To look at how children calculate;
- Try activities to develop calculation strategies;
- To look at ways in which parents can help their children

How has mathematics changed?

- Daily mathematics lesson;
- Emphasis on mental/arithmetical calculations;
- Interactive whole class and group teaching;
- Enjoyable practical approaches;
- Mathematics with understanding

Calculations

The aim is that children will always be able to recognise when calculations can be done 'in their heads' and choose effective and efficient strategies to work out the answers.



Mental calculations

Children are encouraged to count in different ways and to calculate mentally.

*Number lines - Bead bar / number stick / individual number lines /
Number ladders*



Skills of mental calculation/arithmetic

- Remembering number facts and recalling them without hesitation.
- Using facts that are known by heart to figure out new facts.
- Applying understanding of place value and ability to partition numbers into parts
- Understanding and using the laws of arithmetic and relationships between the four operations to find answers and check results
- Having a repertoire of mental strategies to do calculations with some thinking time
- Solving word problems

Calculations


Ways to help children to remember...

- Practice with just one fact a day, or try a 'fact of the week'
- Practice 'fact families', e.g. $6+8=14$, $8+6=14$, $14-6=8$, $14-8=6$
- Work from answers back to facts - how many facts do you know with an answer of 12?
- Make an addition or multiplication table and cross out all those facts you already know. Now focus on those you need to learn.
- Encourage children to work out their own ways to remember facts
- Draw pictures to accompany particular facts.
- Repeat it and repeat it!

How can we give children the best foundations for success with written calculations?

- We need to encourage children to use mental calculation strategies for smaller/ simpler numbers.
- We need to encourage children to ask the question "Can I do it in my head?" or "Can I do it in my head with jottings/ a number line?"

Laying the foundations for addition and subtraction

- Partitioning
 - Rounding
 - Compensating
 - Counting on
 - Bridging through 10s, 100s, 1000s boundaries
 - Addition and subtraction facts
- 

Overview

Up to Year 3 the emphasis is on:

- working mentally,
- calculations recorded in horizontal number sentences
- some jottings for more challenging numbers
- Models and Images

In Year 3-6 children will be gradually taught more formal written methods of calculation but they will still use mental methods and jottings where appropriate.

Addition- Progression

- Mental calculation
- Expanded method using partitioning
- Compact 'carrying' method

- Stage 1: Mental method using partitioning:

$$47 + 76 = (40 + 70) + (7 + 6) = 110 + 13 = 123$$

- Continue to use partitioning

- $364 + 34$

$$= 300 + 60 + 4 + 30 + 4$$

$$= 300 + 90 + 8$$

- Then we recombine it all, to be left with the answer, 398.

Stage 2/3: Use an expanded layout

Beginning to use column addition, step 1.....

- Continue to use partitioning.
- $364 + 54 = 364$
- $\underline{+ 54}$
- 300
- 110
- $\underline{\quad 8}$
- 418

Column addition...

- The final step, when the children have a sound grasp of place value & of the whole process...

- 364

$$\begin{array}{r} + 54 \\ \hline \end{array}$$

$$\begin{array}{r} 418 \\ \hline \end{array}$$

$$1$$

Common calculation errors!

$$\begin{array}{r} 99 \\ + \underline{101} \\ \hline \underline{1901} \end{array}$$

$$\begin{array}{r} 158 \\ + \underline{184} \\ \hline \underline{612} \\ 4 \quad 1 \end{array}$$

$$\begin{array}{r} 945 \\ - \underline{237} \\ \hline \underline{712} \end{array}$$

$$\begin{array}{r} 1 \quad 1 \quad 1 \\ 2000 \\ - \underline{108} \\ \hline \underline{902} \end{array}$$

Adding sums

1. T U 2
 4 2
+ 2 3

 6 5 ✓

3. T U
 3 3
+ 3 3

 6 6 ✓

3. T U
 5 2
+ 2 3

 7 5 → ✓

4. T U
 2 4
+ 3 4

 5 8
 ⑦ ⑥

5. T U
 3 2
+ 4 5

 7 7
 ⑤ ⑨

6. T U
 5 6
+ 4 2

 9 8
 1 1 ⑥

7. T U
 4 4
+ 4 4

 8 8 → ✓

8. T U
 6 6
+ 3 3

 9 9
 1 2 ⑥

9. T U
 4 1
+ 4 0

 8 1
 5 4

10. T U
 5 2
 2 4

 7 6

Very neat.

Vocabulary.

- Add
- Plus
- Altogether
- Addition
- Total
- Count on

Subtraction - Progression

- Mental calculations
- Expanded decomposition using partitioning
- Compact decomposition

How do you
work out...

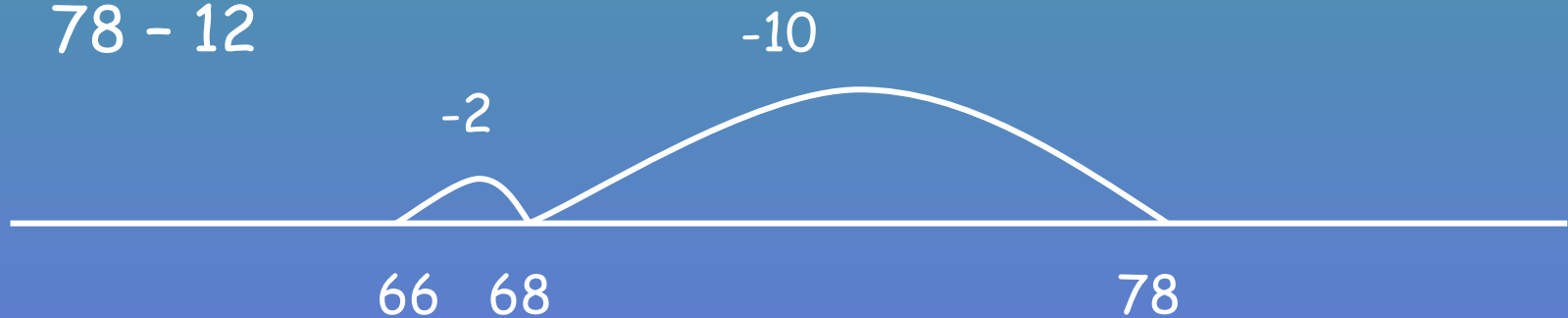
 $78 - 12?$

 $74 - 57?$

Using a Number line for Subtraction

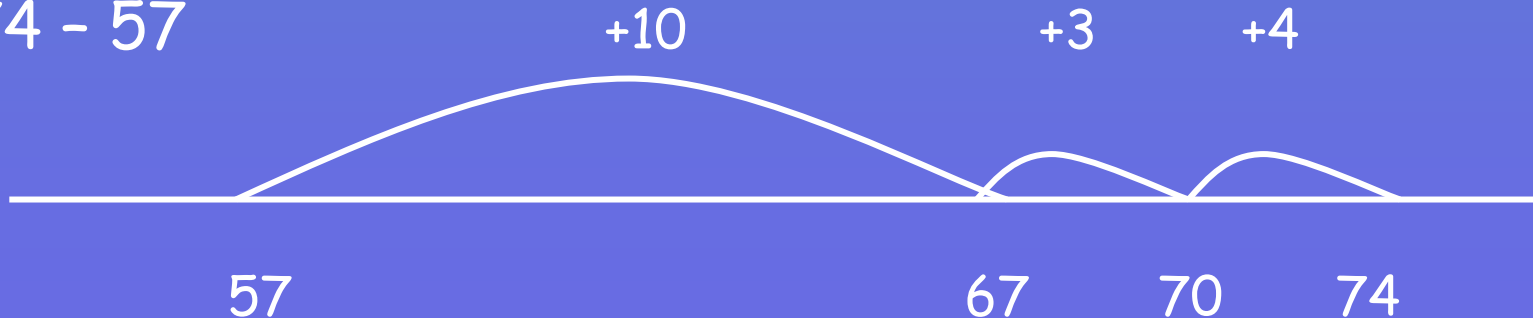
- Counting Back

$$78 - 12$$



- Counting on to find the Difference

$$74 - 57$$



Stage 1: Mental method using partitioning.

$$76 - 32 = (70 - 30) + (6 - 2) = 44$$

Ongoing methods:
mental methods and subtraction using a number line

•Stage 2: Expanded vertical layout

•Stage 3: Compact decomposition



• Stage 2: Expanded vertical layout

$$\begin{array}{r} 89 \\ - 57 \\ \hline \end{array} = \begin{array}{r} 80 \\ + 9 \\ \hline 50 \\ + 7 \\ \hline 30 \\ + 2 \\ \hline \end{array} = 32$$

• Stage 3: Compact decomposition

$$\begin{array}{r} 5131 \\ \cancel{6467} \\ - \underline{2684} \\ 3783 \end{array}$$

Subtraction Vocabulary

How many are left?

Take (away)

How many have gone?

Difference between

1 less

How many fewer is ... than ...

Leave

10 less

How many are left over?

Multiply

- 'Show me' -

1. The **product** of a multiplication

2. A **multiple** of 2, 3, 5, 10, 4, etc

3. A number that is exactly **divisible** by 3, 5, 2, 10, 4, etc

4. A **common multiple** of 2 and 3, 3 and 5, 3 and 10

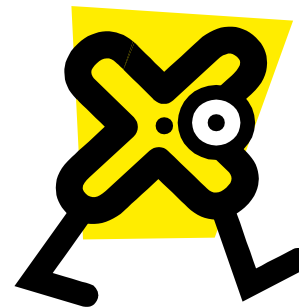
Knowing our Tables

Year 2 2 times table
 5 times table
 10 times table

Year 3 2 times table
 3 times table
 4 times table
 5 times table
 6 times table
 10 times table

Year 4 Derive and recall division facts for all tables up to 10×10

Year 5 & 6 Derive and recall quickly division facts for all tables up to 10×10



Multiplication - Progression

- Mental calculation
- Understanding of multiplication as:
 - an array
 - repeated addition
 - scaling
- Grid method

Laying the foundations for multiplication and division

- Doubling/ Halving
- Grouping/ equal groups/ equal jumps
- Repeated addition/ subtraction
- Arrays
- Multiplication and division facts

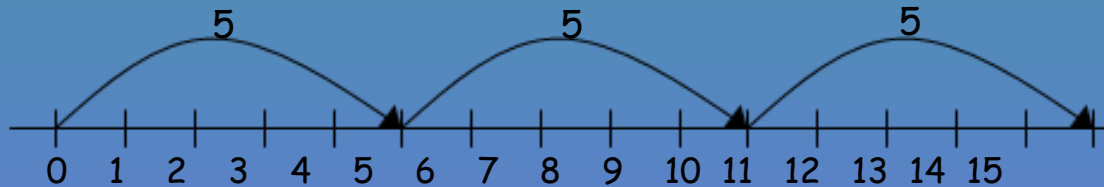
Children will develop their understanding of multiplication and use jottings to support calculation:

ü **Repeated addition**

3 times 5 is $5 + 5 + 5 = 15$ or 3 lots of 5 or 5×3

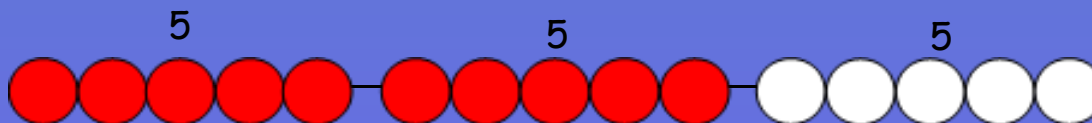
Repeated addition can be shown easily on a number line:

$$5 \times 3 = 5 + 5 + 5$$



and on a bead bar:

$$5 \times 3 = 5 + 5 + 5$$

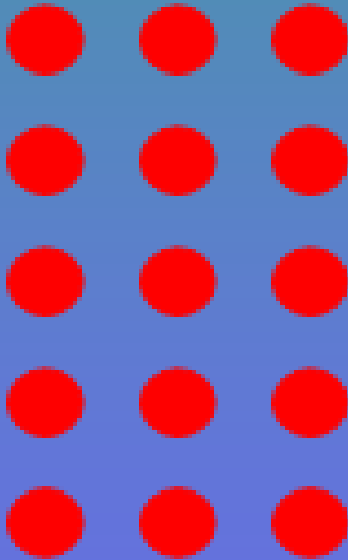




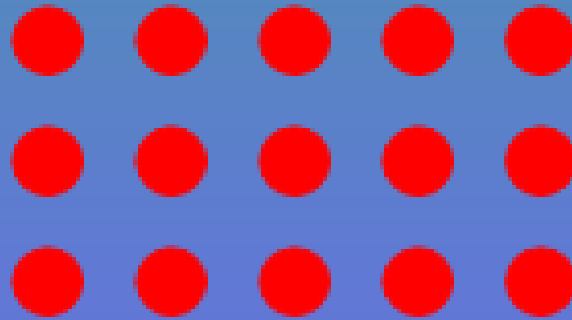
Arrays

Children should be able to model a multiplication calculation using an array.
This knowledge will support with the development of the grid method.

$$3 \times 5$$



$$5 \times 3$$



Grid method

TU × U

(Short multiplication - multiplication by a single digit)

$$23 \times 8$$

X		

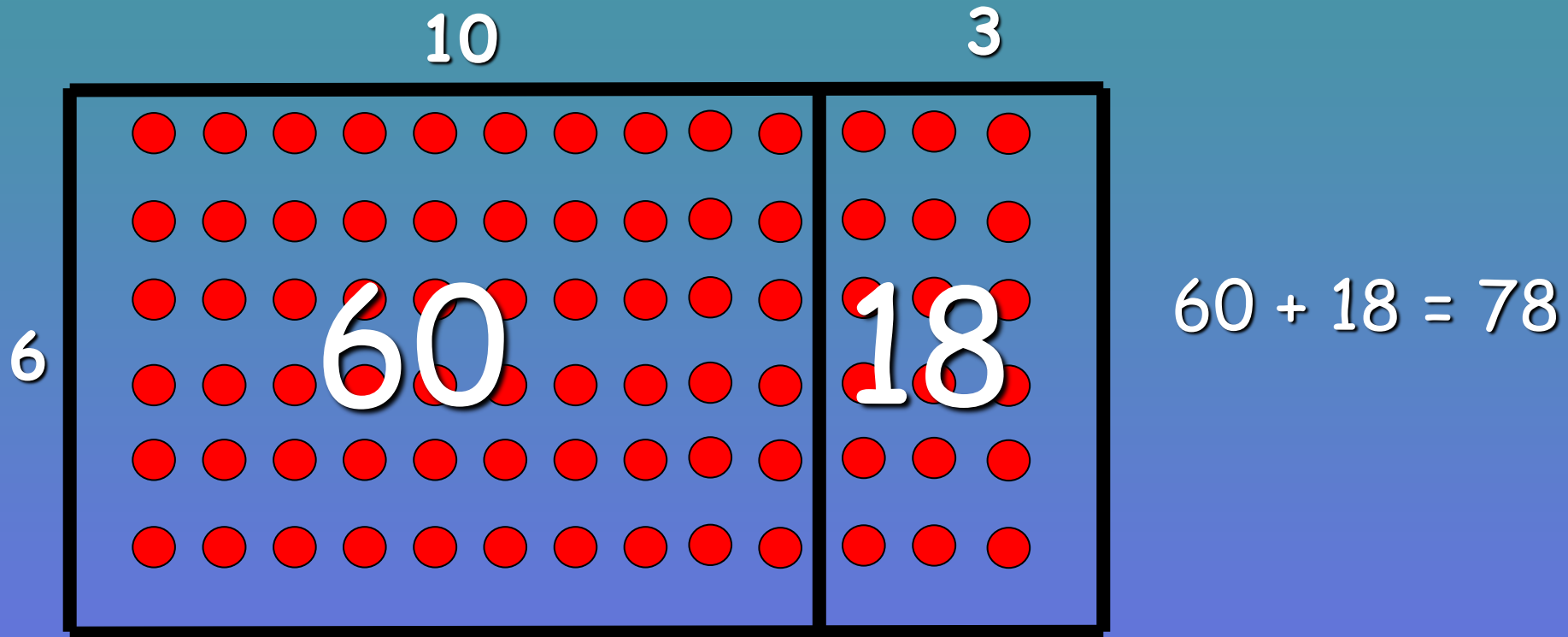
HTU × U

(Short multiplication - multiplication by a single digit)

$$346 \times 9$$

X			

Grid method of multiplication



so $6 \times 13 = 78$

TU x TU

(Short multiplication - multiplication by more than a single digit)

72×38

X	70	2
30	2100	60
8	560	16

$$\begin{array}{r} 2100 \\ + 560 \\ + 60 \\ + 16 \\ \hline 2736 \end{array}$$

HTU x TU

(Short multiplication - multiplication by more than a single digit)

372×24

X	300	70	2
20	6000	1400	40
4	1200	280	8

$$\begin{array}{r} 6000 \\ + 1400 \\ + 1200 \\ + 280 \\ + 40 \\ + 8 \\ \hline 8928 \end{array}$$

HTU × TU
(Standard Method for long multiplication)

$$372 \times 24$$

$$\begin{array}{r} 372 \\ 24 \\ \hline 1488 \\ 7440 \\ \hline \underline{8928} \end{array}$$

Multiplying by 10 or 100

Knowing that the effect of multiplying by 10 is a shift in the digits one place to the left.

Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

Dividing by 10 or 100

Knowing that the effect of dividing by 10 is a shift in the digits one place to the right.

Knowing that the effect of dividing by 100 is a shift in the digits two places to the right.

Th	H	T	U	•	$\frac{1}{10}$	$\frac{1}{100}$
	1	4	7			

Division - Progression

- Mental calculations supported by:
 - Jottings
 - Number lines
 - Modelling of method by teacher
- Understanding division as sharing and grouping.
- Visualising division using:
 - arrays
 - repeated subtraction



Sharing equally

6 sweets are shared between 2 people.
How many do they each receive?



Three!

6 sweets shared between two people equals 3



Write the answer.

$$45 \div 5 = \boxed{9}$$



This child has used a strategy of grouping tallies to find the answer.

Write the answer.

$$45 \div 5 = \boxed{9}$$

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

This child has used a strategy of counting equal groups to find the answer.

Then, move on to.....

Chunking

Division - Progression

Chunking

Step 1:

Demonstrate practically by repeatedly subtracting groups of objects and keeping count

Step 2:

Model on a number line

Step 3:

Model vertical method

•Stage 1: Short division. i.e. $TU \div U$, $HTU \div U$
Known as the 'chunking' method.

$$\begin{array}{r} 6 \overline{) 72} \\ - 60 \quad \times 10 \\ \hline 12 \\ - 6 \quad \times 1 \\ \hline 6 \\ - 6 \quad \times 1 \\ \hline 0 \end{array}$$

Answer = 12

$$\begin{array}{r} 9 \overline{) 97} \\ - 90 \quad \times 10 \\ \hline 7 \end{array}$$

Answer = 10 r 7

•Stage 3 Long division (HTU ÷ TU)

$$\begin{array}{r} 15 \overline{) 432} \\ - \underline{150} \quad \times 10 \\ 282 \\ - \underline{150} \quad \times 10 \\ 132 \\ - \underline{60} \quad \times 4 \\ 72 \\ - \underline{60} \quad \times 4 \\ 12 \end{array}$$

$$\begin{array}{r} 15 \overline{) 432} \\ - \underline{300} \quad \times 20 \\ 132 \\ - \underline{120} \quad \times 8 \\ 12 \end{array}$$

Answer = 28 r 12

Answer = 28 r 12

And finally....

By the end of year 6, children will have a range of calculation methods, mental and written.

Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

- 1) they are not ready.
- 2) they are not confident.

Children should be encouraged to approximate their answers before calculating.

Children should be encouraged to check their answers after calculation using an appropriate strategy.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods

How to help your child with mathematics!



How can parents help?

- Count with their child
- Play number games
- Involve children in shopping activities
- Involve children when taking measurements or weighing items
- Take note of numbers in real life eg telephone numbers, bus numbers, lottery numbers etc
- Give children opportunities to use money to shop, check change etc
- Talking about the mathematics in football eg. How many points does your favourite team need to catch the next team in the division?
- When helping their children calculate use the method that they have been taught.