

Calculation Policy for Year 5: Calshot Primary School

ADDITION

Informal methods to support mental calculations

- Add numbers mentally with increasingly large numbers, e.g. $12,462 + 2300 = 14,762$
- Add 10, 100 and 1000 onto five-digit numbers
- Mentally add tenths and one-digit numbers and tenths
- Use rounding to check answers to calculations to determine, in the context of a problem, levels of accuracy.
- Add decimals, including a mix of whole numbers and decimals, numbers with different amounts of decimal places using complements/bonds to 1 (e.g. $0.83 + 0.17 = 1$)

Common mental calculation strategies:

Partitioning and recombining
Doubles and near doubles
Use number pairs to 10 and 100
Adding near multiples of ten and adjusting
Using patterns of similar calculations
Using known number facts
Bridging through ten, hundred
Complementary addition

SUBTRACTION

Informal methods to support mental calculations

- Subtract numbers mentally with increasingly large numbers. E.g. $12,462 - 2300 = 10,162$.
- Use rounding to check answers to calculations to determine, in the context of a problem, levels of accuracy.
- Pupils practise subtracting decimals, including a mix of whole numbers and decimals, numbers with different amounts of decimal places using complements/bonds to 1 (for example, $1 - 0.17 = 0.83$.)
- Pupils mentally subtract tenths and one-digit whole numbers and tenths.
- Pupils subtract using number lines to count on

Mental Strategies for Subtraction:

- ❖ Find differences by counting on
- ❖ Partitioning numbers in a variety of ways
- ❖ Applying known facts
- ❖ Bridging through multiples of 10
- ❖ Subtracting 9, 11 etc by compensating

Children use, or visualise, representation of choice. Refer back to physical representations as required.

Written calculations

- Add whole numbers with more than four digits, using formal written (columnar) methods.
- Include decimal addition for money.

$$\begin{array}{r} \pounds 563.14 \\ + \pounds 207.88 \\ \hline \pounds 771.02 \\ \hline 111 \end{array}$$

Revert to expanded methods if children find formal calculation method difficult

Written calculations

- Subtract whole numbers with more than four digits, using formal written methods (columnar subtraction.)
- Pupils practise subtracting decimals.

As in Year 4, compare physical and / or pictorial representations and expanded algorithms alongside columnar methods. Ask: *What is the same? What's different?*

Compare and discuss the suitability of different methods, (mental or written), in context.

Revert to expanded methods whenever difficulties arise

£17.34 - £12.16

$$\begin{array}{r} 1000+700+20+14\text{p} \\ - 1000+200+10+6\text{p} \\ \hline 500+10+8\text{p} \end{array}$$

$$\begin{array}{r} 1734\text{p} \\ - 1216\text{p} \\ \hline 518\text{p} \end{array}$$

$$\begin{array}{r} \pounds 17.34 \\ - 12.16 \\ \hline 5.18 \end{array}$$

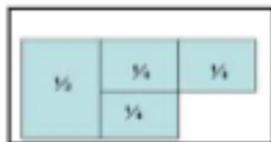
What is the same about these models?
What's different?

Relate place value of decimals with that of whole numbers using representations. See below.

Fractions (if needed)

- Add fractions with the same denominator and denominators that are multiples of the same number (to become fluent through a variety of increasingly complex problems and add fractions that exceed 1 as a mixed number.)

$$\frac{1}{2} + \frac{3}{4} = \frac{2}{4} + \frac{3}{4} = \frac{5}{4}$$



Fractions (if needed)

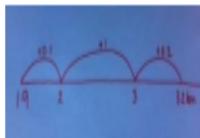
- Subtract fractions with the same denominator and denominators that are multiples of the same number. (Include fractions exceeding 1 as a mixed number.)
- Solve problems involving numbers up to three decimal places.
- Pupils mentally subtract tenths and one-digit whole numbers and tenths.

Concrete and pictorial representations, including:

Use physical/pictorial representations alongside columnar methods where needed.

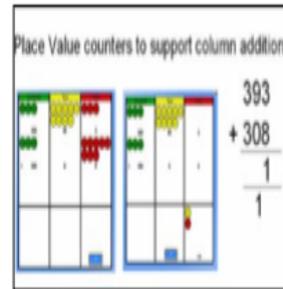
$$\begin{aligned} &12\,462 + 2300 \\ &= 12\,462 + 2000 + 300 \\ &= 14\,462 + 300 \\ &= 14\,762 \end{aligned}$$

Partitioning and recombining

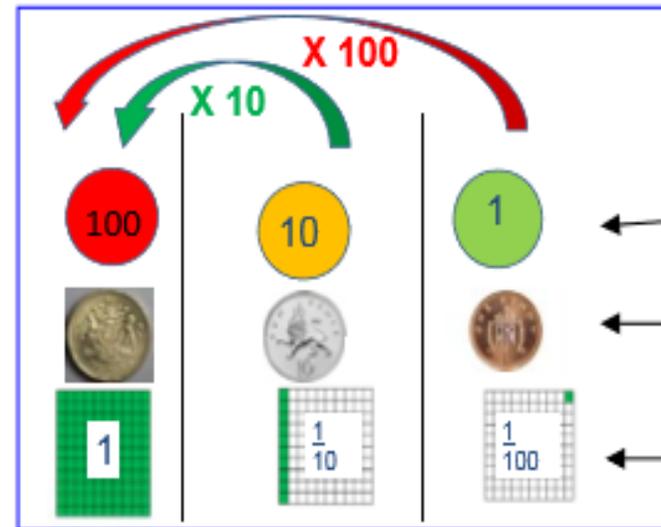


Jottings to support mental calculation

Ask what is the same and what is different about all these methods?



Concrete and pictorial representations, including:



Integers

Money

Decimals

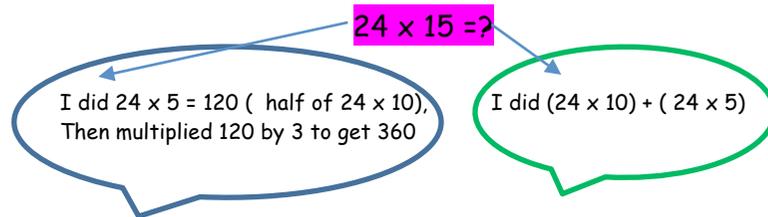
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MULTIPLICATION

Informal methods to support mental calculations

- Recall multiplication and division facts for multiplication tables up to 12×12
- Multiply and divide mentally drawing upon known facts
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- Recognise and use square and cube numbers (& notation)
- Establish whether a number up to 100 is prime and recall prime numbers up to 19

Pupils should be taught throughout that percentages, decimals and fractions are different ways of expressing proportions.



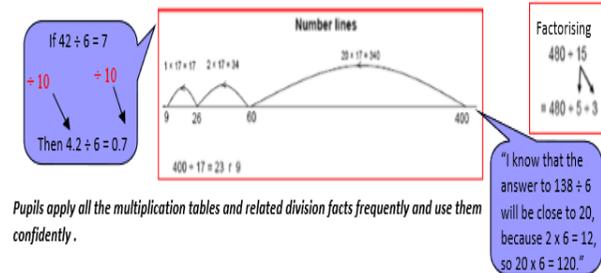
DIVISION

Informal methods to support mental calculations

The relationship between multiplication and division must be continually reinforced.

Pupils should be taught to:

- Recall multiplication and division facts for multiplication tables up to 12×12
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000
- Use a range of divisibility rules (2,3,4,5,9 and 10)
- Divide numbers mentally drawing upon known facts
- Identify multiples and factors, including all factor pairs of a number and common factors of two numbers.



Written calculations

- Multiply numbers up to four-digits by a one or two-digit number using a formal written method

Written calculations

Pupils practise the use of the formal written methods of short division.

- Divide numbers up to four-digits by a one-digit number

- Pupils introduced to expanded column multiplication followed by short column multiplication for multiplying by a one-digit number, then long column multiplication for two-digit numbers

$$\begin{array}{r}
 67 \\
 \times 54 \\
 \hline
 280 \\
 350 \\
 +3000 \\
 \hline
 3618
 \end{array}
 \rightarrow
 \begin{array}{r}
 67 \\
 \times 54 \\
 \hline
 240 \\
 350 \\
 +3000 \\
 \hline
 3618
 \end{array}
 \rightarrow
 \begin{array}{r}
 67 \\
 \times 54 \\
 \hline
 240 \\
 350 \\
 +3000 \\
 \hline
 3618
 \end{array}
 \rightarrow
 \begin{array}{r}
 67 \\
 \times 54 \\
 \hline
 28 \\
 350 \\
 +3000 \\
 \hline
 3618
 \end{array}$$

$$\begin{array}{r}
 237 \\
 \times 4 \\
 \hline
 948 \\
 \begin{array}{cc}
 1 & 2
 \end{array}
 \end{array}$$

Compact methods for multiplication are efficient but often do not make the value of each digit explicit. When introducing multiplication of decimals, it is sensible to take children back to an expanded form such as the grid method where the value of each digit is clear, to ensure that children understand the process.

Revert to expanded methods if children find formal calculation method difficult

Fractions (if needed)

- Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams
- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and

98 ÷ 7 becomes

$$\begin{array}{r}
 14 \\
 7 \overline{) 98} \\
 \underline{7} \\
 28 \\
 \underline{28} \\
 0
 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r}
 86 \text{ r}2 \\
 5 \overline{) 432} \\
 \underline{40} \\
 32 \\
 \underline{30} \\
 2
 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r}
 45 \text{ r}1 \\
 11 \overline{) 496} \\
 \underline{44} \\
 56 \\
 \underline{55} \\
 1
 \end{array}$$

Answer: $45\frac{1}{11}$

using the formal written method of short division and interpret remainders appropriately for the context.

- Divide a three-digit number by a 2-digit number using long division (chunking by repeatedly subtracting).

$$\begin{array}{r}
 23 \text{ r}4 \\
 24 \overline{) 556} \\
 \underline{-480} \\
 76 \\
 \underline{-72} \\
 4
 \end{array}
 \begin{array}{l}
 24 \times 20 \\
 24 \times 3
 \end{array}$$

- Pupils interpret non-integer answers to division by expressing results in different ways according to the context, including with remainders, as fractions, as decimals or by rounding. (See representations below.)

Revert to expanded methods if children find formal calculation method difficult

Fractions (if needed)

- Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number.
- Pupils connect equivalent fractions >1 that simplify to

hundredths

- Pupils connect multiplication by a fraction to using fractions as operators (fractions of) and to division, building on work from previous years. This relates to scaling by simple

$\frac{3}{4} \times \frac{1}{2}$
Scaling by $\frac{1}{2}$
"finding a half of a quarter"

$\frac{1}{2} \times \frac{1}{4}$
"1/4 of a 1/2": find a 1/2, then divide it by 4.

Encourage children to draw diagrams to represent situations or problems involving fractions. Model how to do this, for example:
2/5 of a number is 20. What is the number? $\frac{10}{10} \frac{10}{10} \frac{10}{10} \frac{10}{10} \frac{10}{10}$ Whole = 50
20

fractions, including fractions > 1.

integers with division and other fractions > 1 to division with remainders.

- Pupils connect multiplication by a fraction to using fractions as operators (fractions of) and to division.
- Pupils should make connections between percentages, fractions and decimals.

Concrete and pictorial representations, including:

	3000	500	60	7		
20	60000	10000	1200	140	71340	3567
4	12000	2000	240	28	14268	x24
					Total 85608	14268
						71340
						85608

To start multiplying using the least significant digit for the grid method will support children with implementation of the written procedure

Build on children's understanding: demonstrate multiplication of a decimal number alongside its whole number equivalent

326	3.26
x 8	x 8
2400	24.00
160	1.60
48	0.48
2608	26.08

What is the same and what is different about these two methods?

Concrete and pictorial representations, including

Can we divide this token into 6 equal groups?, then we must exchange it for ten tokens. Can we divide into 6 groups now?

Short division with exchange.

Practical experience with manipulatives is vital for children to talk through the language of division e.g. exchange, remainder; and to embed conceptual understanding.

Understanding remainders.

2 out of a whole group of 4 = $\frac{2}{4} = \frac{1}{2} = 0.5$

$98 \div 4 = \frac{98}{4} = 24 \text{ r } 2 = 24\frac{1}{2} = 24.5$

What is the same? What's different about the ways that these remainders are expressed?