Air Balloon Calculation Policy: Multiplication

At Air Balloon, we follow the CPA approach– concrete materials; followed by pictorials and models; then abstract. One or more of these stages will be shown concurrently in a lesson. The examples shown start from KS1 and move on to KS2. However, teachers are encouraged to refer back to previous Key Stages' calculation strands to consolidate and reinforce fluency when calculating multiplication and division problems. Objects, base 10 and place value counters are key resources which are used to reinforce calculations. Missing number problems should be included in lessons regularly, to check understanding with connections to multiplication.
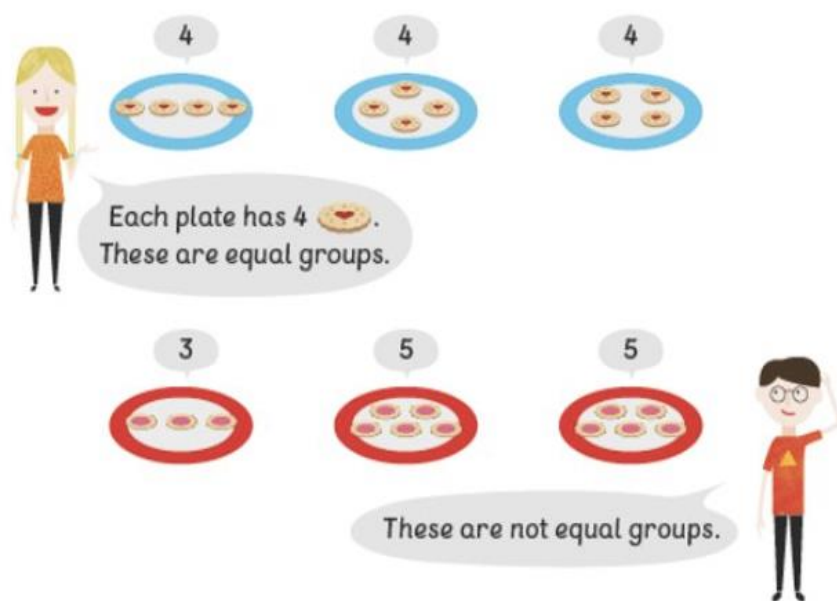
Calculating in KS2 has been shown as mental and written methods. This is to promote efficiency and fluency. To promote reasoning skills, children should be encouraged to discuss their methods and why using a mental or written method is the most efficient with the calculations they have been given.

Multiplication: KS1

Year 1	Year 2
Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher. *Pupils express multiplication through making equal groups.*	Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.

Year 1 images:

4   4   4

Each plate has 4 🍪.
These are equal groups.

3   5   5

These are not equal groups.

Year 2:

Concrete:

☐ + ☐ + ☐ = ☐

☐ groups of ☐ = ☐

☐ x ☐ = ☐

Pictoral:

How many dots are there?
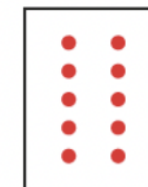
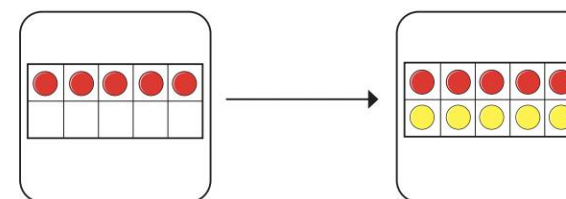2 x 5 = 10   5 x 2 = 10

2 × 5 is equal to 5 × 2.

Double ☐ is ☐

Abstract:

Amira has 7 pies.
She cuts each pie into 10 slices.
How many slices of pie are there in all?

$4 \times \boxed{} = 40$

A wall has **5** bricks in each row.

How many bricks are there in **6** rows?

☐ bricks

Multiplication: KS2

Skill	LKS2	UKS2
Multiplying whole numbers and decimal numbers by 10, 100 and 1000	3. Children continue to calculate mathematical statements when multiplying by 10 within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.	5. Multiply whole numbers and those involving decimals by 10, 100 and 1000.

In the LKS2 column:

$5 × 10 = 50$
$10 × 5 = 50$
They are equal.

Amira has 7 pies.
She cuts each pie into 10 slices.
How many slices of pie are there in all?

4. Use place value, known and derived facts to multiply mentally including: multiplying by 0, 10 and 100.

Use a place value grid and counters to calculate:

| $7 × 10$ | $63 × 10$ | $80 × 10$ |
| $7 × 100$ | $63 × 100$ | $80 × 100$ |

In the UKS2 column:

$12 × 10$	$12 × 100$	$12 × 1000$
10 10 10 10 10 10 10 10 10 10 10 10	100 100 100 100 100 100 100 100 100 100 100 100	1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000 1000
$12 × 10 = 12 × 1$ ten $= 12$ tens	$12 × 100 = 12 × 1$ hundred $= 12$ hundreds	$12 × 1000 = 12 × 1$ thousand $= 12$ thousands

Multiplying a whole number by a 1-digit number	**Mental Methods:**	**Mental Methods:**

Mental Methods:

3. Multiply 2-digit numbers by 1-digit numbers using mental methods.

Mental methods of partitioning should be used for 2-digit multiplicands/ multipliers that are just beyond the children's times tables knowledge (ie ×12, ×14, ×15 etc).

$13 \times 3 =$

13
10   3
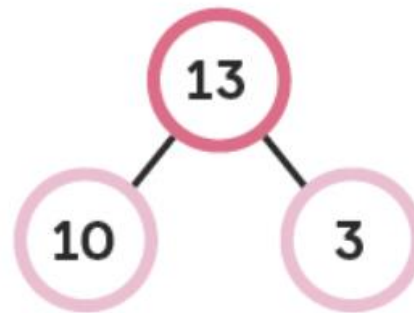
4. Recognise and use factor pairs and commutativity in mental calculations.
Pupils write statements about the equality of expressions (for example, use the distributive law).

$14 \times 8 =$

10 1 1 1 1

$10 \times 8 =$

$4 \times 8 =$

$14 \times 8 =$

Mental Methods:

5. Multiply and divide numbers mentally drawing upon known facts

If renaming doesn't occur, pupils should be encouraged to solve methods mentally.

$1022 \times 4 =$

$$1000 \times 4 = 4000$$
$$20 \times 4 = 80$$
$$2 \times 4 = 8$$
$$1022 \times 4 = 4088$$

Written Methods:

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

Expanded method (including with regrouping) moving onto compact method. Digits should be renamed inside or below answer box to support written multiplication in UKS2 with 2 digit numbers.

```
      t   o
      2   3
  ×       4
  _____
      1   2
  +   8   0
  _____
      9   2
```

```
      h   t   o
          4   7
  ×           4
  _____
      1   ²8   8
```

Written Methods:

5. Multiply numbers up to 4 digits by a one-digit number using a formal written method, including long multiplication for two-digit numbers.

Expanded method with 3 and 4 digits moving onto compoact method up to 4 diigts. Digits should be renamed inside or below answer box.

```
      7   2   4
  ×           9
  _____
          3   6
      1   8   0
  6   3   0   0
  _____
  6   5   1   6
```

2741×6 becomes

```
      2   7   4   1
  ×               6
  _____
  1   6   4   4   6
          4   2
```

Answer: 16 446

4. Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.

Written methods using expanded multiplication leading to short method including renaming.

$$342 \times 7 \text{ becomes}$$

$$
\begin{array}{rr}
 & 2 \quad 3 \\
\times & 6 \\
\hline
 & 1 \quad 8 \\
+ \; 1 & 2 \quad 0 \\
\hline
 & 1 \quad 3 \quad 8 \\
\hline
\end{array}
$$

$$
\begin{array}{rrrr}
 & 3 & 4 & 2 \\
\times & & & 7 \\
\hline
2 & 3 & 9 & 4 \\
\hline
 & & 2 & 1 \\
\end{array}
$$

Answer: 2394

| Multiplying whole numbers and decimals by multiples of 10	3. Pupils develop efficient mental methods using associativity	5. Pupil explore mental methods through partitioning when multiplying 1-digit numbers by larger multiples of 10.

Multiplying whole numbers and decimals by multiples of 10

3. Pupils develop efficient mental methods using associativity

20 x 4 is solved using their understanding of 2 x 4
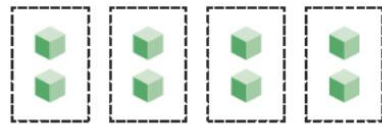
Multiply 2 ones by 4
$2 × 4 = 8$
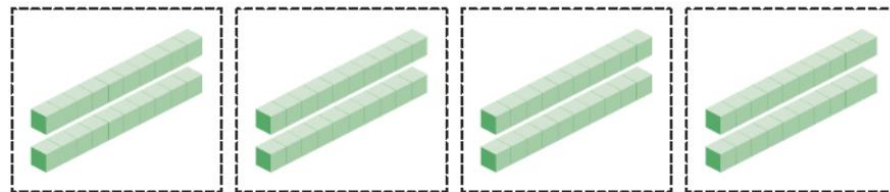
Multiply 2 tens by 4
$20 × 4 = 80$

4. Pupils explore efficient methods when multiplying by multiples of 10.

$3 × 40 = 3 × 4$ tens

$\quad = \boxed{}$ tens

$\quad = \boxed{}$

$3 × 40 = 3 × 4 × 10$

$\quad = \boxed{} × 10$

$\quad = \boxed{}$

5. Pupil explore mental methods through partitioning when multiplying 1-digit numbers by larger multiples of 10.

$100 × 4 = \boxed{}$

$20 × 4 = \boxed{}$

$120 × 4 = \boxed{}$

5. Pupils explore mental methods through partitioning when multiplying larger numbers by multiples of 10.

Method 1
$1414 × 20 = 20\ 000 + 8280$
$\qquad = 28\ 280$

Method 2
$1414 × 10 = 14\ 140$
$1414 × 20 = 14\ 140 × 2$
$\qquad = 28\ 280$

Method 3
$1414 × 20 = 1414 × 2 × 10$
$\qquad = 2828 × 10$
$\qquad = 28\ 280$

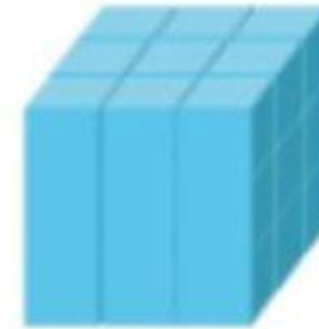|		
Multiplying 3 1-digit numbers	**4.** Use place value, known and derived facts to multiply mentally including multiplying together three numbers. $2 \times 5 \times 6 = 10 \times 6 = 60$	**6.** Perform mental calculations, including with mixed operations. wrote this expression: $2 \times 3 \times 6 \div 4 - 5 - 1$ $2 \times 3 \times 6 \div 4 - 5 - 1$ $= 6 \times 6 \div 4 - 5 - 1$ $= 36 \div 4 - 5 - 1$ $= 9 - 5 - 1$ $= 3$
Multiplying whole numbers by 2-digit numbers	n/a	**5.** Multiply numbers up to 4 digits by a two-digit number using a formal written method, including long multiplication for two-digit numbers
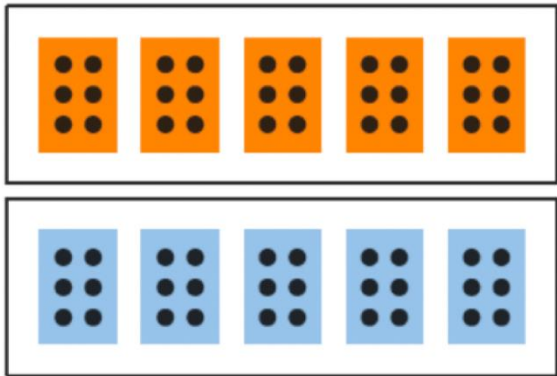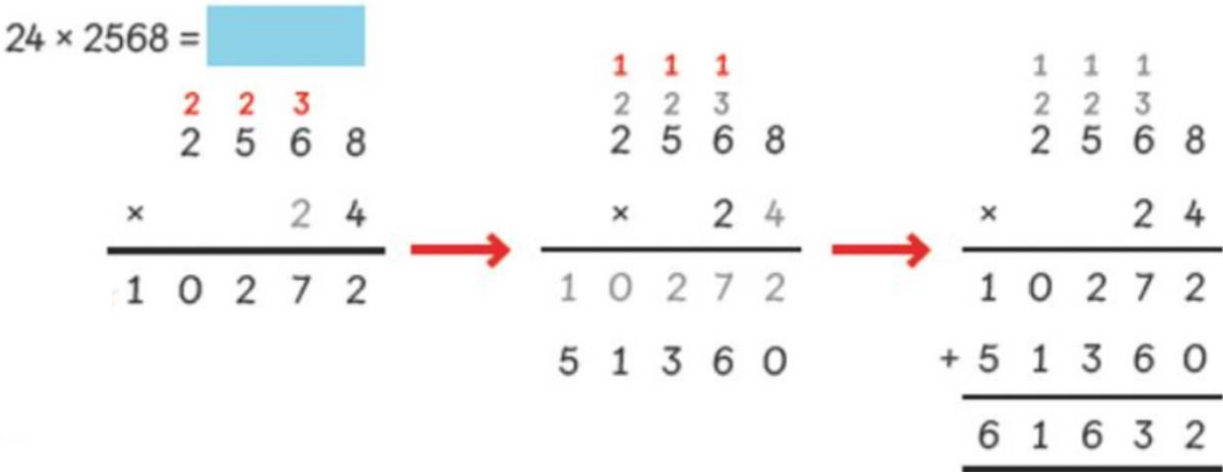
Finding squared and cubed numbers	n/a	5. Recognise and use square numbers and cube numbers.
		$27 = 3 \times 3 \times 3 = 3^3$
		27 is a **cube**.
		6. Perform mental calculations, including with mixed operations.