Addition

Year 3 Add numbers with up to 3-digits

Introduce the **expanded column addition** method:

```
  236
+  73
  ---
    9
  100
  200
  ---
  309
```

Add the **units** first, in preparation for the compact method.

In order to carry out this method of addition:

- Children need to recognise the value of the hundreds, tens and units without recording the partitioning.
- Pupils need to be able to add in columns.

Move to the compact **column addition** method, with „carrying":

```
 236
+ 73
 ---
 309
  1
```

Add **units** first.

„Carry" numbers **underneath** the bottom line.

Children who are very secure and confident with 3-digit expanded column addition should be moved onto the **compact column addition** method, being introduced to „carrying" for the first time. Compare the expanded method to the compact column method to develop an understanding of the process and the reduced number of steps involved.

Remind pupils the actual value is **„thirty add seventy'**, but we say **„three add seven'** because it is already in the tens column.

Key vocabulary: *add, more, plus, and, make, altogether, total, equal to, equals, double, most, count on, number line, sum, tens, units, partition, plus, addition, column, tens boundary,* ***hundreds boundary, increase, vertical, _carry', expanded, compact***

Key skills for addition at Y3:

- Read and write numbers to 1000 in numerals and words.
- Add 2-digit numbers mentally, incl. those exceeding 100.
- **Add a three-digit number and ones mentally (175 + 8)**
- **Add a three-digit number and tens mentally (249 + 50)**
- **Add a three-digit number and hundreds mentally (381 + 400)**
- Estimate answers to calculations, using inverse to check answers.
- Solve problems, including missing number problems, using
- number facts, place value, and more complex addition.
- Recognise place value of each digit in 3-digit numbers (hundreds, tens, ones.)
- Continue to practise a wide range of mental addition strategies, ie. number bonds, adding the nearest multiple of 10, 100, 1000 and adjusting, using near doubles, partitioning and recombining.

Video clip: Demonstration of expanded 3-digit column addition

Subtraction

Year 3 Subtracting with 2 and 3-digit numbers.

Introduce **partitioned column subtraction** method.

STEP 1: introduce this method with examples where no exchanging is required.

$$89 - 35 = \underline{54}$$

$$80 + 9$$
$$- 30 + 5$$
$$50 + 4$$

When learning to „exchange", explore „partitioning in different ways" so that pupils understand that when you exchange, the **VALUE** is the same ie **72** = 70+2 = 60+12 = 50+22 etc. Emphasise that the **value hasn't changed**, we have just partitioned it in a different way.

STEP 2: introduce „exchanging" through practical subtraction. Make the larger number with Base 10, then subtract 47 from it.

72 - 47

$$\begin{array}{r} {}^{60}\not{7}0 + {}^{1}2 \\ -\ 40 + 7 \\ \hline 20 + 5 = \underline{25} \end{array}$$

Before subtracting '7' from the 72 blocks, they will need to exchange a row of 10 for ten units. Then subtract 7, and subtract 4 tens.

STEP 3: Once pupils are secure with the understanding of "exchanging", they can use the partitioned column method to subtract any 2 and 3-digit numbers.

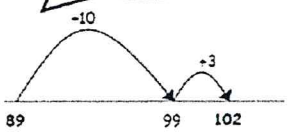
$$238 - 146 = 92$$

$$\begin{array}{r} {}^{100}\not{2}\not{0}\not{0} + {}^{1}30 + 8 \\ -\ 100 + 40 + 6 \\ \hline 0 + 90 + 2 \end{array}$$

Subtracting money: partition into e.g. £1 + 30p + 8p

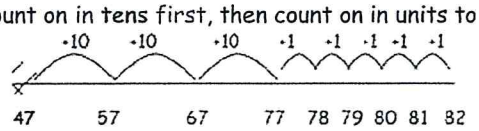
Counting on as a mental strategy for subtraction:

Because counting on in tens is the way we use a 100 square.



Continue to reinforce counting <u>on</u> as a strategy for **close-together numbers** (e.g. 121—118), and also for numbers that are "nearly" multiples of 10, 100, 1000 or £s, which make it easier to count on (e.g. 102-89, 131—79, or calculating change from £1 etc.).

- Start at the smaller number and count on in tens first, then count on in units to find the rest of the difference:



<u>Key vocabulary</u>: *equal to, take, take away, less, minus, subtract, leaves, distance between, how many more, how many fewer / less than, most, least, count back , how many left, how much less is_? difference, count on, strategy, partition, tens, units* ***exchange, decrease, hundreds, value, digit***

Key skills for subtraction at Y3:

- Subtract mentally a: **3-digit number and ones, 3-digit number and tens, 3-digit number and hundreds .**
- Estimate answers and use inverse operations to check.
- Solve problems, including missing number problems.
- Find 10 or 100 more or less than a given number.
- Recognise the place value of each digit in a 3-digit number .
- Counting up differences as a mental strategy when numbers are close together or near multiples of 10 (see examples above)
- Read and write numbers up to 1000 in numerals and words.
- Practise mental subtraction strategies, such as subtracting near multiples of 10 and adjusting (e.g. subtracting 19 or 21), and select most appropriate methods to subtract, explaining why.

Approximate,
Calculate,
Check it mate!

Video clips: 1—<u>Subtraction—teaching children to consider the most appropriate methods before calculating</u>
2—<u>Introducing partitioned column subtraction method, from practical to written</u>

Multiplication

Year 3 Multiply 2-digits by a single digit number

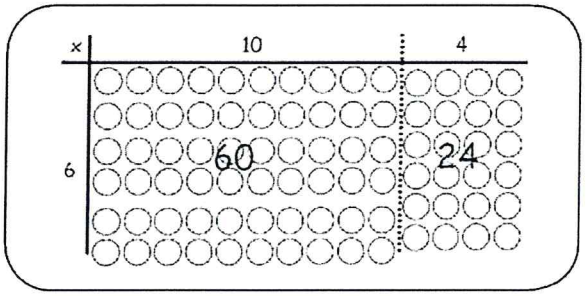
Introduce the grid method for multiplying 2-digit by single-digits:

Eg. 23 x 8 = 184

X	20	3
8	160	24

160 + 24 = 184

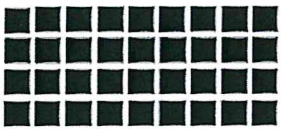
Link the layout of the grid to an array initially:



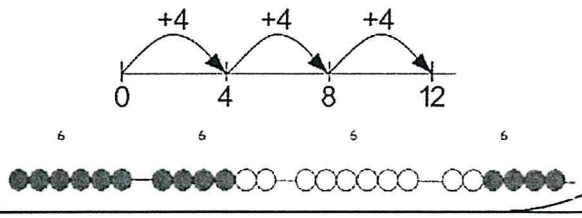
Introduce the grid method with children physically making an array to represent the calculation (e.g. make 8 lots of 23 with 10s and 1s place value counters), then translate this to grid method format (see video clip).

To do this, children must be able to:

- Partition numbers into tens and units
- Multiply multiples of ten by a single digit (e.g. 20 x 4) using their knowledge of multiplication facts and place value
- Recall and work out multiplication facts in the **2, 3, 4, 5, 8 and 10** times tables.
- Work out multiplication facts not known by repeated addition or other taught mental strategies (e.g. by commutative law, working out near multiples and adjust-ing, using doubling etc.) Strategies to support this are repeated addition using a number line, bead bars and arrays:



9 x 4 = 36



Key vocabulary: *groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times, _times as big as, once, twice, three times..., **partition, grid method, multiple, product, tens, units, value***

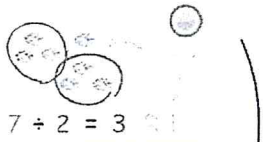
Key skills for multiplication:

- Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including **2-digit x single digit**, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240)
- Solve simple problems in contexts, deciding which operations and methods to use.
- Develop efficient mental methods to solve a range of problems e.g using commutativity (**4 × 12 × 5** = 4 × 5 × 12 = **20 × 12** = 240) and for missing number problems _ x 5 = 20, 3 x _ = 18, _ x _ = 32

Video clips: **Teaching the grid method as an interim step** (partitioning and counters to introduce grid)

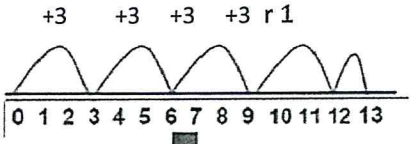
Division

Year 3 Divide 2-digit numbers by a single digit (where there is no remainder in the final answer)



Grouping on a number line:

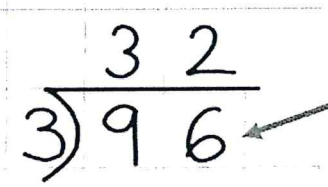
13 ÷ 3 = 4 r 1



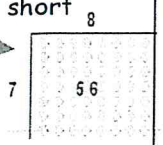
STEP 1: **Children continue to work out unknown division facts by grouping on a number line from zero.** They are also now taught the concept of **remainders**, as in the example. This should be introduced practically and with arrays, as well as being translated to a number line. Children should work towards calculating some basic division facts with remainders mentally for the 2s, 3s, 4s, 5s, 8s and 10s, ready for „carrying" remainders across within the short division method.

Short division: Limit numbers to

NO remainders in the answer OR carried (each digit must be a multiple of the divisor).



STEP 2: Once children are secure with division as grouping and demonstrate this using number lines, arrays etc., **short division** for larger 2-digit numbers should be introduced, initially with carefully selected examples requiring no calculating of remainders at all. Start by introducing the layout of short division by comparing it to an array.

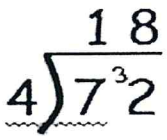


Remind children of correct place value, that 96 is equal to 90 and 6, but in short division, pose:

- *How many 3"s in 9? = 3, and record it above the **9 tens**.*
- *How many 3"s in 6? = 2, and record it above the **6 units**.*

Short division: Limit numbers to

NO remainders in the final answer, but with remainders occurring within the



STEP 3: Once children demonstrate a full understanding of remainders, and also the short division method taught, they can be taught how to use the method when remainders occur within the calculation (e.g. 96†4), and be taught to „carry" the remainder onto the next digit. If needed, children should use the number line to work out individual division facts that occur which they are not yet able to recall mentally.

Step 3 Only taught when pupils can calculate „remainders".

Real life contexts need to be used routinely to help pupils gain a full understanding, and the ability to recognise the place of division and how to apply it to problems.

Key Vocabulary: *share, share equally, one each, two each..., group, equal groups of, lots of, array, divide, divided by, divided into, division, grouping, number line, left, left over,* ***inverse, short division, „carry", remainder, multiple***

Key number skills needed for division at Y3:

- Recall and use multiplication and division facts for the 2, 3, 4, 5, 8 and 10 multiplication tables (through dou-bling, connect the 2, 4 and 8s).
- 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 for-mal written methods.
- Solve problems, in contexts, and including missing number problems, involving multiplication and division.
- Pupils develop efficient mental methods, for example, using multiplication and division facts (e.g. using 3 × 2 = 6, 6 ÷ 3 = 2 and 2 = 6 ÷ 3) to derive related facts (30 × 2 = 60, so 60 ÷ 3 = 20 and 20 = 60 ÷ 3).
- Pupils develop reliable written methods for division, starting with calculations of 2-digit numbers by 1-digit numbers and progressing to the formal written method of short division.