Addition

Pupils should be taught to:

- Add numbers mentally, including:
  - A three-digit number and ones (175 + 8)
  - A three-digit number and tens (249 + 50)
  - A three-digit number and hundreds (381 + 400)
- Add numbers with up to three digits, using formal written methods of columnar addition
- Estimate the answer to a calculation and use inverse operations to check answers
- Solve problems, including missing number problems, using number facts, place value, and more complex addition

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Add the 7 in two jumps: jump to 80 (+ 4),
then to 83 (+ 3).
Encourage pupils to use this strategy rather than counting on their fingers.

+ 10   + 10   + 10   + 4   + 3

46   56   66   76   80   83
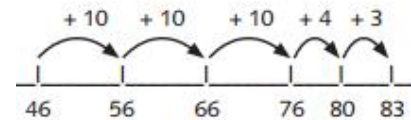
Introduce the expanded column addition method:
In order to carry out this method of addition:
Children need to recognise the value of the hundreds, tens and ones without recording the partitioning.
Pupils need to be able to add in columns.

$$
\begin{array}{r}
236 \\
+ 73 \\
\hline
9 \\
100 \\
200 \\
\hline
309 \\
\end{array}
$$

> Add the ones first, in preparation for

Partitioning for larger numbers:
This is **not** adding in columns and they will still need to add the total mentally or using other methods.

487+546=
500 + 40 + 6
+ 400 + 80 + 7
900 + 120 + 13 = 1033

Move to the compact column addition method:
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.

> Add ones first

> Carry numbers underneath the bottom line

> Remind pupils the actual value is „three tens add seven tens, not three add seven", which

$$
\begin{array}{r}
236 \\
+ 73 \\
\hline
309 \\
1 \\
\end{array}
$$

Bar modelling

a) Sally has 86 football cards in her collection folder. The whole folder holds 155 football cards in total. How many more football cards does Sally need to complete her collection?

155 cards to fill folder

155	
86	69
Sally's cards	cards needed

Mastery in addition – see

NCETM website for more examples

What do you notice?
Is there a relationship between the calculations?

500 + 400 =	523 + 400 =	523 + 28 =
400 + 500 =	423 + 500 =	423 + 28 =
300 + 600 =	323 + 600 =	323 + 28 =
200 + 700 =	223 + 700 =	223 + 28 =
100 + 800 =	123 + 800 =	123 + 48 =

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

Subtraction

Pupils should be taught to:
- Subtract numbers mentally including:
  - A three-digit number and ones
  - A three-digit number and tens
  - A three-digit number and hundreds
- Subtract numbers with up to three digits, using formal written methods of column subtraction
- Estimate the answer to a calculation and use the inverse operation to check answers
- Solve problems, including missing number problems, using number facts, place value, and more complex subtraction

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

$$89 - 35 = \underline{54}$$
$$
\begin{array}{r}
80 + 9 \\
- 30 + 5 \\
\hline
50 + 4
\end{array}
$$

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

72 - 47

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

$$
\begin{array}{r}
^{60}\!\!\!\not{70} + {}^{1}2 \\
- 40 + 7 \\
\hline
20 + 5
\end{array}
$$

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 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:

Subtracting Money: Partition into e.g. £1 + 30p + 8p

$$
\begin{array}{r}
2\ 3\ 8 - 1\ 4\ 6 = 9\ 2 \\
{}^{1}{}^{0}{}^{0} \\
\not{2}\not{0}\not{0} + {}^{1}3\ 0 + 8 \\
- \quad 1\ 0\ 0 + 4\ 0 + 6 \\
\hline
0 + 9\ 0 + 2
\end{array}
$$

Bar modelling

Sally had 100 sweets and gave 50 to Rose, how many
Did she have left?

100	
50	?
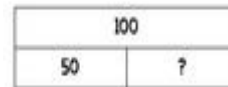
100-50=

Mastery in subtraction – see

NCETM website for more examples

Flo and Jim are answering a problem:
Danny has read 62 pages of the class book, Jack has read 43. How many more pages has Danny read than Jack?
Flo does the calculation 62 + 43. Jim does the calculation 62–43.
Who is correct?

Explain how you know.

Pupils might demonstrate using a bar model to explain their reasoning.

Key vocabulary: equal to, take, takeaway, less, minus, subtract, leaves, distance between, how many more, how many fewer/less than, most, least, countback, how many left, how much less is? difference, count on, strategy, partition, tens, ones, exchange, decrease, hundreds, value, digit

Multiplication

Pupils should be taught to:

- Recall and use multiplication facts for the 3, 4 and 8 times tables
- Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
- Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 times tables, and multiply multiples of 10.
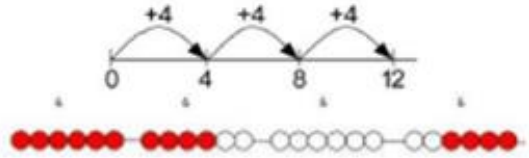
Multiply 2-digits by a single digit number (Grid method)

Continue to use repeated addition on number lines as above (where needed) to reinforce how to calculate multiplication facts.

Example

$43 \times 5 \rightarrow 40 \times 5 = 200$

×	40	3	
5	200	15	= 215

Use the expanded written method to calculate TO × O

Explain that in this method we work vertically instead of horizontally and we begin with the ones column.

```
  H T O
    6 3
  ×   8
    2 4   ( 3 × 8)
  4 8 0   (60 × 8)
  5 0 4
    1
```

Bar modelling

Jack is weighs twice as much as Chris. Chris weighs 42 kilograms. How much does Jack weigh?

Chris [   ]
Jack [   ]

$2 \times 42 = 84$

Jack weighs 84 kilograms.

Mastery in multiplication – see NCETM website for more examples

Roger is laying tiles. He has 84 tiles altogether. How many complete rows of tiles can he make?

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

Division

Pupils should be taught to:

- Recall and use division facts for the 3, 4 and 8 times tables
- Write and calculate mathematical statements for division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.
- Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Using an empty number line to count forwards...
$24 \div 3 = 8$
How many threes in 24?

...also jump back from 24 to make the link with repeated subtraction.

'How many groups of three in 24?'

Division using partitioning
What is 60 divided by 3? (20)
How many are left? (9)
Can 9 be divided by 3?
What is 9 divided by 3? (3)
Add 20 and 3

$69 \div 3 = (60 + 9) \div 3$
$= 20 + 3$
$= 23$

Division using the expanded written method
Is it possible to make 10 groups of four? (yes, $4 \times 10 = 40$)
Is it possible to make 20 groups of 4? (yes)
Is it possible to make 30 groups of 4? (no)
We started with 92, we subtract the 20 groups of four, which makes 80.
How many are left? (12)
How many times can 4 be divided into 12? (3)
We subtract 12 from 12. Ask: How many are left? (0)

$92 \div 4.$

```
        2   3
   4 | 9   2
        8   0   20 × 4
        1   2
        1   2   3 × 4
            0
```

Division using the formal written method
How many threes in 72?
The answer must be a multiple of 10. (20 threes equals 60 with 10 remaining)
We write the answer 20 above in the tens column.
We write the remaining 10 as one ten (1) in the ones column to make a total of 12 ones remaining.
How many threes in 12? (4) We write the answer 4 above in the ones column.

```
      T   O
      2   4
   3 | 7  ¹2
```

Mastery in division – see

NCETM website for more examples

The following problems can be solved by using the calculation $8 \div 2$. True or false?
- There are 2 bags of bread rolls that have 8 rolls in each bag. How many rolls are there altogether?
- A boat holds 2 people. How many boats are needed for 8 people?
- I have 8 pencils and give 2 pencils to each person. How many people receive pencils?
- I have 8 pencils and give 2 away. How many do I have left?

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