National Curriculum Programme of Study:

- Perform mental calculations including with mixed operations and large numbers
- Use their knowledge of the order of operations to carry out calculations involving the four operations

Y6

MENTAL CALCULATION
Addition & Subtraction

FLUENCY

By the end of Year 6, pupils should fluently derive and recall:

- Number bonds to 1000, quickly and without difficulty
- Addition and subtraction facts for multiples of 10 to 1000 and decimal numbers with one decimal place, e.g. 650 + ☐ = 930, ☐ - 1.4 = 2.5
- What must be added to a decimal with ones, tenths and hundredths to make the next whole number, e.g. 7.26 + ☐ = 8

Consolidating from Year 5…

- Sums and differences of 1 or 2-digit multiples of 10, 100, 1000, 10 000, and 100 000, e.g. 8 000 + 17 000, 600 000 - 20 000
- Sums and differences of near multiples of 10, 100, 1000, 10 000 and 100 000 to other numbers, e.g. 82 472 + 30 004, 82 472 – 30 004
- Sums and differences of decimal numbers which are near multiples of 1 or 10, inc. money, e.g. 6.34 + 1.99, £34.59 - £19.95

PERFORM MENTAL CALCULATIONS INCLUDING WITH MIXED OPERATIONS AND LARGE NUMBERS

Teaching should focus on:

- Consolidation of key mental skills as outlined in Years 1-5
- Adding and subtracting negative numbers in a meaningful context such as temperature
- Adding and subtracting small and large numbers where the use of place value or number facts makes the calculation accessible mentally, e.g. 34 000 + 8 000
- Adding and subtracting multiples of powers of 10 and near multiples of the same, e.g. 6345 - 199
- Using number facts and place value to perform mental subtraction of large numbers or decimal numbers with up to 2 places, e.g. 467 900 – 3 005

Teachers should familiarise themselves with the earlier stages of mental calculation strategies from Years 1 to 5, to identify any gaps in understanding

Encourage pupils to use what should by now be well-developed reasoning skills to solve a range of questions and problems involving addition and subtraction;

Use five of the digits 1 to 9 to make this number sentence true…

☐☐.☐ + ☐☐ = 31.7

Can you find a different set of 5 digits that would also work?

What digits are missing?

14 781 - 6☐53 = 8528

23.12 + 22.☐ = 45.23

What's my number?
Two numbers have a difference of 2.38. What could the two numbers be if they add up to 6?
What if one of the numbers is three times as big as the other?

What's my number?
Two numbers have a difference of 2.3 They are both less than 10. What could they be?
If I round the two numbers to the nearest 10, they are both 10. What could the numbers be now?

USE THEIR KNOWLEDGE OF THE ORDER OF OPERATIONS TO CARRY OUT CALCULATIONS INVOLVING THE FOUR OPERATIONS

Teaching should focus on:

- Ensuring children understand the principles of ordering operations through practical examples
- Rehearsing the use of brackets when carrying out calculations with more than one step
- The use of the memory keys on a calculator to support the use of brackets
- Consolidating quick recall of multiplication and division facts for tables up to 12 x 12
- Encouraging pupils to decide on a calculation method; mentally, mentally with jottings, or whether they need to use a more formal written method

Provide children with a contextualised problem where decisions will need to be made, and a range of calculations carried out. E.g. decorating a room.

Show the children a picture of a recently decorated room and explain that this is the final look you are hoping to achieve in your bedroom/lounge. Provide them with prices for the various elements of the room such as;

1 rug
£8 each

3 rolls of wallpaper
£10/roll

1 blind
£12.50 each

2 tins of paint
£11.25 each

Show the children your calculation for the total cost as **2 x 11.25 + 12.50 + 3 x 10 + 8 = £388**
Do they agree? Why is it so expensive? Ask them to explain to me how I could estimate the total cost before calculating the exact amount. Is my final total near to the estimate? Why not? Ask them to find the correct answer.

Discuss the order of calculations and ask them to determine where the brackets would go in my calculation above.

(2 x 11.25) + 12.50 + (3 x 10) + 8 = £73

How many other answers can they reach if the items are added in a different order and the brackets are used in a different way (or not at all)?

Provide the children with a calculation and the correct answer and ask them to determine the position of the brackets, e.g.

10 x 8 + 5 + 17 + 10 x 5 = 165 (carried out in order, the answer is 560)

The correct answer should be;

(10 X (8 + 5)) + ((17 - 10) X 5)
10 X 13 + 7 X 5
130 + 35

Provide them with other challenges requiring them to make us of their understanding of all four operations. Ask them to consider which operations usually increase the size of a number (addition and multiplication). What are the exceptions to this rule? Is it possible to use division to make a number larger? How?

Provide a set of four numbers in a set order;

24 + 26 – 12 x 9

What answer do you think the calculator will give if the numbers are entered exactly as they appear here? Why?

The numbers must be kept in the same order as shown here, but you can add one set of brackets. What is the highest answer you can reach? The lowest?

Now add two sets of brackets – what difference does it make to your totals?

If you were allowed to change the order of the three operation signs (+, -, x), what difference could it make to your answers?

Choose operations to go in the empty boxes to make these number sentences true;

6 □ 3 □ 7 = 16
6 □ 3 □ 7 = 27
6 □ 3 □ 7 = 9

Can you reach any other answers using only the digits 6, 3 and 7?

Can you write a number sentence using the digits 2, 3, 5 and 8 before the equals sign, which has the same answer as another number sentence using the digits 2, 3, 5 and 8 but which is a different sentence?

Children in Year 6 can learn the acronym 'BODMAS', as a memory aid for the order of operations. They should learn that calculations in brackets (B) should always be calculated first, before those relating to division and/or multiplication (DM) and then those requiring addition and/or subtraction (AS)