Arithmetic Methods

In Year 6 children are expected to work with numbers up to 10 million.
The arithmetic test may contain questions involving seven-digit numbers.

<u>Addition</u>
<u>Mental strategies:</u>

Using number bonds:

Look for pairs of units or tens that make 10 or 100

4<u>3</u> + 2<u>7</u>   43 + 7 = 50 (3 + 7 known fact)
                  50 + 20 = 70

1<u>32</u> + 2<u>75</u>   132 + 70 = 202 (30 + 70 known fact)
                  202 + 200 = 402
                  402 + 5 = 407 (2 + 5 known fact)

Using known facts to bridge over 10:

38 + 7   38 + 2 + 5 = 45

156 + 8   156 + 4 + 4 = 164

Compensating:
Look for numbers 9 or 11 and add these to the total by adding 10 and then adjusting by 1

89 + 11   89 + 10 = 99
                      99 + 1 = 100

Doubling:

Look for near doubles.

25 + 24   double 25 – 1
                or
Look for doubles.   double 24 + 1

25 + 25   double 25   49 + 49   double 50 - 2

<u>Written strategies:</u>

Columnar addition is used with larger numbers eg:

12 786 + 2568 = ▊

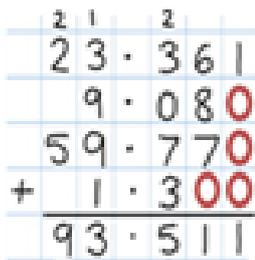Remind your children of the value of each digit in the calculation

eg ⟍ This is 80 + 60 **not** 8 + 6

$$12\ 786$$
$$+\ \ 2\ 568$$
$$\overline{15\ 354}$$
$$1\ 1\ 1$$

← Because 80 + 60 = 150, the 5 is recorded in the tens column and the 1 carried over to the hundreds column.

Children must also be able to add decimal numbers with different numbers of digits eg

$$
\begin{array}{r}
23 \cdot 361 \\
9 \cdot 080 \\
59 \cdot 770 \\
+\ \ 1 \cdot 300 \\
\hline
93 \cdot 511
\end{array}
$$

Adding place holders to help.

Adding fractions:

When adding fractions, add the numerators if the denominators are the same, eg:

$$\frac{2}{8} + \frac{4}{8} = \frac{6}{8} +$$

If the denominators are different you must find a common multiple of each denominator and convert all fractions so that they denominators are the same, eg:

$$\frac{6}{8} - \frac{1}{4} =$$

8 is a factor of 4 so we can convert $\frac{6}{8}$ into quarters.

To do this we must divide 6 and 8 by 2 because 8 ÷ 4 = 2

Therefore $\frac{6}{8} = \frac{3}{4}$ so $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$ this can also be written as $\frac{1}{2}$

<u>Subtraction</u>

<u>Mental strategies:</u>

Children need to recognise that subtraction is the inverse of addition.

If it is known that:

6 + 4 = 10 it is also known that 10 – 4 = 6

20 + 20 = 40 it is also known that 40 – 20 = 20
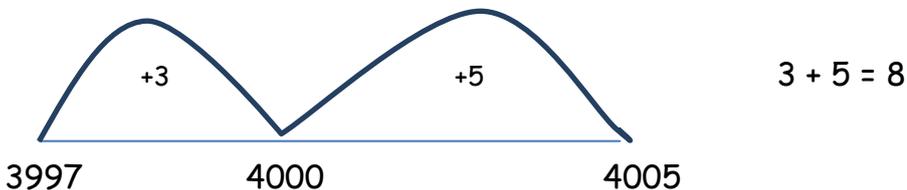
Compensating:

Take too much away and then add back

47 – 19	47 – 20 = 27
	27 + 1 = 28
256 – 98	256 – 100 = 156
	156 + 2 = 158

Finding a small difference by counting on:

4005 – 3997 = 8

Start from 3997 and count on to 4005 either mentally or using a number line and jottings to help eg

+3   +5   3 + 5 = 8

3997   4000   4005

<u>Written strategies:</u>

Columnar subtraction is used with larger integers and decimal numbers (up to 10,000,000) eg:

12, 462 – 8556   12.4 -3.56

Estimate:
4000 = 12 500 – 8 500

1¹2¹4 5 6¹2
-   8 5 5 6
    3 9 0 6

1¹2¹³4⁰
-   3. 5 6
    8. 8 4

and

Subtracting fractions:

Follow the guidance for adding fractions

<u>Multiplication</u>
<u>Mental strategies:</u>

Children must be able to recall all multiplication and related division facts to 12 x 12 eg
If 4 x 5 = 20 then 20 ÷ 4 =5 and 20 ÷ 5 =4 etc.
Good questions to ask your child include:
 3 times what is 12?
How many 7s are there in 49?
How many multiples of 4 give you 24?

Children also need practice **multiplying by 10, 100 and other powers of 10**.

They will struggle to be able to use written methods for multiplication and division if they can't recall their times tables.

Partitioning:
23 x 7
3 x 7 = 21
20 x 7 = 140
So 140 + 21 = 161

<u>Written strategies:</u>
Long multiplication eg:

$$
\begin{array}{r}
469 \\
\times\ 32 \\
\hline
1938 \\
14070 \\
\hline
15008
\end{array}
$$

Multiplying with fractions

Examples:

$\frac{1}{2} \times \frac{2}{5}$

Multiply the numerator 1 x 2 = 2

Multiply the denominator 2 x 5 = 10 so the answer is $\frac{2}{10}$ which can be simplified to $\frac{1}{5}$

Or

$\frac{2}{3} \times 5$

Make 5 into $\frac{5}{1}$

Then follow the rule, multiplying the numerators then the denominators

$$\frac{2 \times 5}{3 \times 1} = \frac{10}{3}$$

Division

Mental strategies:

Recalling facts related to multiplication facts:

As mentioned before, children need to be able to recall division facts related to their times tables to be able to confidently divide.

Children must also be able to **divide mentally by powers of 10** eg 34 ÷ 10 = 3.4

Partitioning:

Partition 93 into 90 and 3

93 ÷ 3

90 ÷ 3 = 30   3 ÷ 3 = 1   30 + 1 = 31

Written strategies:

Short division

```
  0 4 5
8 3 ³6 ⁴0
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Long division

```
   2191
4 8764
  8
  07
   4
   36
   36
    04
     4
     0
```

Dividing fractions

$$\frac{1}{2} \div \frac{1}{6}$$

Turn the second fraction upside down ($\frac{1}{6}$ becomes $\frac{6}{1}$)

Multiply the two fractions together $\frac{1}{2}$ x $\frac{6}{1}$ = $\frac{6}{2}$ which can be simplified to 3.

or

$$\frac{2}{3} \div 5$$

Make 5 into $\frac{5}{1}$:

$$\frac{2}{3} \div \frac{5}{1}$$

Then continue as before.

$\frac{5}{1}$ becomes $\frac{1}{5}$

$$\frac{2}{3} \times \frac{1}{5} = \frac{2 \times 1}{3 \times 5} = \frac{2}{15}$$