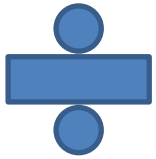
Teaching calculation

Add

subtract

multiply

divide



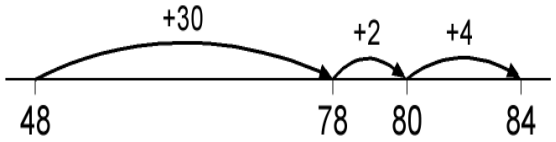
Addition

To add successfully, children need to be able to mentally:

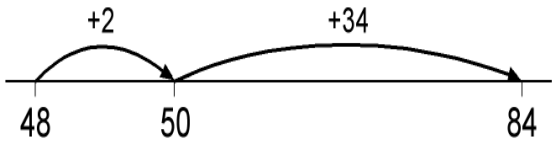
- know all addition pairs to 9 + 9 as well as □ + 3 = 15 or 6 + □ = 14
- add mentally a series of one-digit numbers eg 5 + 4 + 3
- add one digit to any number eg 34+8
- add multiples of 10 eg 60 + 40 or of 100 eg 600 + 400 using the related addition fact 6 + 4 and their knowledge of place value
- Add a tens number to any number eg 45+20
- find doubles and near doubles
- partition (split) two-digit and three-digit numbers in different ways eg 362 = 300+60+2 or 300+30+32
- Understand and use addition and subtraction as inverse operations

1. Using an empty number line

48 + 36 = 84



or:



2. Using partitioning (splitting)

47 + 76

76 + 40 = 116

116 + 7 = 123

or

6 + 7 = 13

70 + 40 = 110

110 + 13 = 123

3. Column addition – adding units first, expanded method

$$
\begin{array}{r}
47 \\
+\ 76 \\
\hline
13 \\
110 \\
\hline
123
\end{array}
$$

4. Column addition – adding units first compact method

$$
\begin{array}{r}
47 \\
+\ 76 \\
\hline
123 \\
1
\end{array}
$$

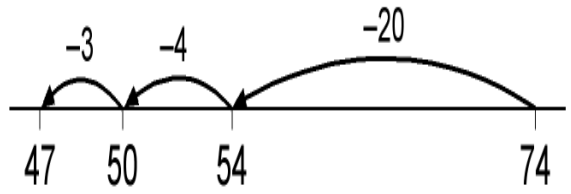
Subtraction

To subtract successfully, children need to be able to mentally:

- to know all addition and subtraction facts to 20 as well as 19 - □ = 13 or □ - 11 = 5
- subtract one digit from any number eg 36-5
- subtract multiples of 10 eg 160 – 70 or of 100 eg 1600 - 700 using the related subtraction fact of 16 – 7 and their knowledge of place value
- subtract a tens number to any number eg 78-40
- partition (split) two-digit and three-digit numbers in different ways eg 362 = 300+60+2 or 300+30+32
- Understand and use subtraction and addition as inverse operations

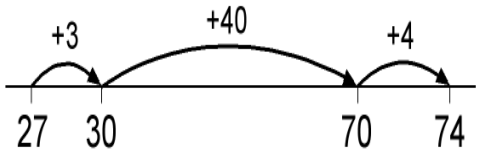
1. Using an empty number line and counting back

74 - 27 = 47 worked by counting back:



1. Using an empty number line and counting on

74 - 27 =



Counting on or back – which is best?

With practice, children will need to record less information and decide whether to count back or forward. It is useful to ask children whether counting up or back is the more efficient for calculations such as 57 – 12, 86 – 77 or 43 – 28.

2. Partitioning

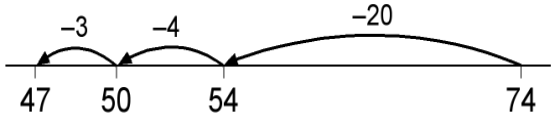
Subtraction can be recorded using partitioning:

74 – 27

74 – 20 = 54

54 – 7 = 47

This requires children to subtract a single-digit number or a multiple of 10 from a two-digit number mentally. The method of recording links to counting back on the number line.

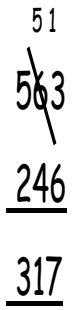


3. Expanded method, using columns with decomposition

Example: 563 – 246, adjustment from the tens to the units

			50		13	
	500	+	~~60~~	+	~~3~~	
-	200	+	40	+	6	
	300	+	10	+	7	= 317

4. Compact method, using columns with decomposition



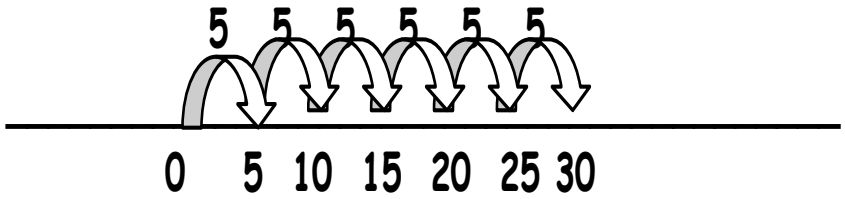
Multiplication

To multiply successfully, children need to be able to mentally:

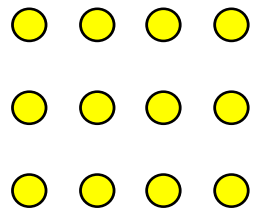
- know all multiplication facts to 12 × 12
- Find doubles and halves
- partition numbers into hundreds, tens and ones in different ways
- work out products such as 70 × 5, 70 × 50, 700 × 5 or 700 × 50 using the related fact 7 × 5 and their knowledge of place value
- add two or more single-digit numbers mentally
- add multiples of 10 (such as 60 + 70) or of 100 (such as 600 + 700) using the related addition fact, 6 + 7, and their knowledge of place value
- add combinations of whole numbers using the column method
- understand and use multiplication and division as inverse operations

1. Number lines

6 X 5 =

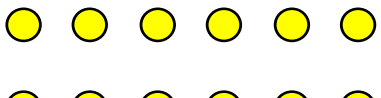


1. Arrays



3 lots of 4

3 X 4



2 lots of 6

2 X 6

6 lots of 2

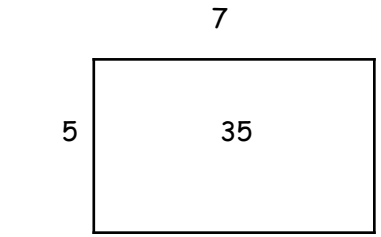
6 X 2

4 lots of 3

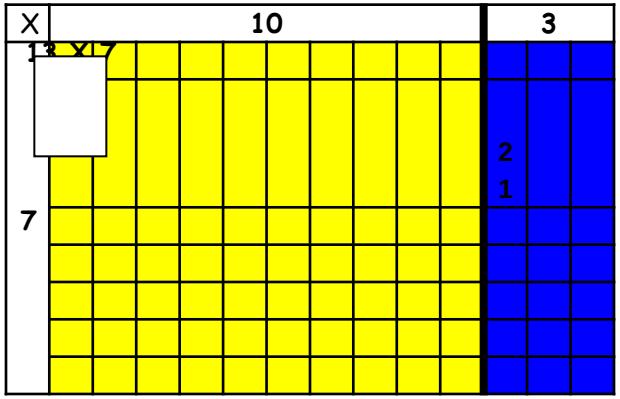
4 X 3

1. Rectangular arrays

7 X 5 = 35

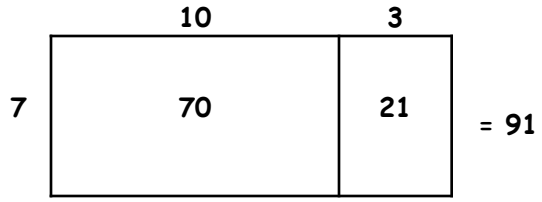


2. Mental multiplication using arrays and partitioning to multiply



3. Two-digit by one-digit products using the grid method

13 X 7



4. Column method (linking to grid method)

38 X 7 is approximately 40 X 7 = 280

30 + 8

x 7

210 30 X 7

56 8 X 7

266

38

× 7

210

56

266

4. Short column method

38 X 7 is approximately 40 X 7 = 280

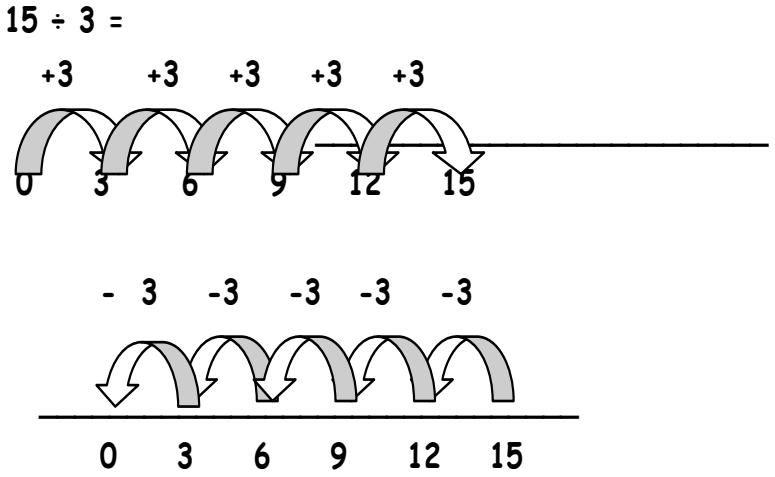
$$\begin{array}{r} 38 \\ \times\ 7 \\ \hline 266 \\ {\scriptstyle 5} \end{array}$$

Division

To divide successfully children need to mentally:

- partition numbers into multiples of 100, 10 and 1 in different ways
- know multiplication and division facts to 10 × 10/100 ÷ 10 and divide multiples of 10 or 100 by a single-digit number eg 400 ÷ 5= 80 using their knowledge of division facts 40 ÷ 5 = 8 and place value
- Subtract combinations of TU/HTU numbers
- know how to find a remainder working mentally – for example, find the remainder when 48 is divided by 5
- understand and use multiplication and division as inverse operations

1. Number lines



2. Counting back by chunking

100 ÷ 7 =

4X7=28 **10X7=70**

Answer 14 remainder 2

3. Expanded method for TU divided by U, in columns

96	
60	10 X 6
36	
30	5 X 6
6	
6	1 X 6
0	16
Answer 16	

4. Long division

$$
\begin{array}{rrl}
 & 24\,\overline{\smash{)}\,560} & \\
20 & -\underline{480} & \quad 24 \times 20 \\
 & 80 & \\
3 & \underline{72} & \quad 24 \times 3 \\
 & 8 &
\end{array}
$$

Answer: 23 R 8