

WASPS

**Methods of Calculating
with the Four Operations**

(+ - \times \div)

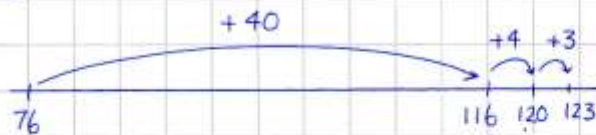
Upper KS2

Progression from mental to written strategies - KS2
Addition (Years 5 and 6)

Mental methods using partitioning:

eg $76 + 47 = (70 + 40) + (6 + 7)$
 $= 110 + 13$
 $= 123$

Using a blank number line:



Vertical layout ("ones/units" first):

eg
$$\begin{array}{r} 76 \\ + 47 \\ \hline 13 \\ \hline 110 \\ \hline 123 \end{array}$$
 "six add seven"
 "seventy add forty"

Compact written method:

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

With decimals:

$$\begin{array}{r} 76.50 \\ + 32.45 \\ \hline 108.95 \\ * \end{array}$$
 use to keep column discipline

Progression from mental to written strategies - KS2
Division continued

Compact method for dividing by a single digit:

$$\begin{array}{r} 12 \\ 6 \overline{) 72} \end{array}$$

With a remainder:

$$\begin{array}{r} 15 \text{ r}3 \\ 5 \overline{) 78} \end{array}$$

With a decimal answer:

$$\begin{array}{r} 15.6 \\ 5 \overline{) 78.30} \end{array}$$

With a decimal in original sum:

$$\begin{array}{r} 14.5 \\ 5 \overline{) 72.5} \end{array}$$

Dividing by 2-digit divisor, using chunking:

$$\begin{array}{r} 22 \text{ r}12 \\ 13 \overline{) 298} \\ -130 \\ \hline 168 \\ -130 \\ \hline 38 \\ -26 \\ \hline 12 \end{array}$$

10×13
 10×13
 2×13

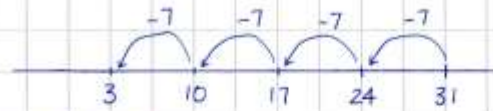
↑
 22 rem. 12

(12) →

Progression from mental to written strategies - KS2
Division

Division as repeated subtraction, on the number line:

$$31 \div 7$$



$$= 4 \text{ r. } 3$$

Repeated subtraction (chunking)

$$31 \div 7 = \begin{array}{r} 31 \\ - 7 \quad \downarrow \times 7 \\ \hline 24 \\ - 7 \quad \downarrow \times 7 \\ \hline 17 \\ - 7 \quad \downarrow \times 7 \\ \hline 10 \\ - 7 \quad \downarrow \times 7 \\ \hline 3 \end{array}$$

Repeated subtraction ("under the arch")

$$\begin{array}{r} 4 \text{ r } 3 \\ 7 \overline{) 31} \\ \underline{- 7} \quad \downarrow \times 7 \\ 24 \\ \underline{- 7} \quad \downarrow \times 7 \\ 17 \\ \underline{- 7} \quad \downarrow \times 7 \\ 10 \\ \underline{- 7} \quad \downarrow \times 7 \\ 3 \end{array}$$

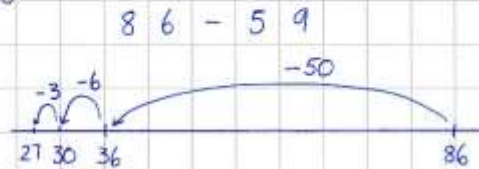
(3) \uparrow
4 remainder 3

continued...

Progression from mental to written strategies - KS2
Subtraction

Subtraction as "taking away" using the number line:

eg



Subtraction using compact written method:

eg

$$\begin{array}{r} 78 \\ \cancel{8} 6 \\ - 59 \\ \hline 27 \end{array}$$

With decimals:

$$\begin{array}{r} 1 \overset{5}{8} \overset{8}{8} \\ - 1 \overset{4}{4} \overset{9}{9} \\ \hline 1 \cdot 0 \overset{9}{9} \end{array}$$

Progression from mental to written strategies - KS2
Multiplication

Multiplication as repeated addition:

eg $7 + 7 + 7 = 3 \times 7$ (or 7×3)

Vertical method:

eg

38	
x 7	
56	(7 x 8)
210	(7 x 30)
266	

2-digit x 2-digit:

45	
x 23	
15	(3 x 5)
120	(3 x 40)
100	(20 x 5)
800	(20 x 40)
1035	

Compact written method:

38	45
x 7	x 23
266	135
x 8	900
	1035

Progression from mental to written strategies - KS2
Multiplication continued: Decimals

6.2×3.9

① Estimate: $6 \times 4 = 24$

② "do a similar sum" with no decimal points:

62	
x 39	
18	(9 x 2)
540	(9 x 60)
60	(30 x 2)
1800	(30 x 60)
2418	

③ Count the decimal places in both numbers in the original sum:

6.2×3.9 two, in this example

④ Put same number of decimal places in the answer: 24.18 two in answer

⑤ Check against estimate:

24.18 is close to 24
so $6.2 \times 3.9 = 24.18$