

Written Methods of Calculation in Mathematics at Key Stage 2



A guide for parents and carers

Addition

Children working on the *Year 3* objectives will use informal pencil and paper methods (jottings) to support, record or explain their calculations. These methods build upon existing mental strategies.

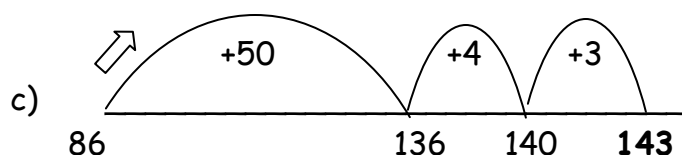
Most children will set sums out horizontally, like this

$$86 + 57 =$$

and work them out using methods such as;

$$\begin{aligned} \text{a) } 86 + 57 &= 86 + 50 + 7 \\ &= 136 + 7 = 143 \end{aligned}$$

$$\begin{aligned} \text{b) } 86 + 57 &= (80 + 50) + (6 + 7) \\ &= 130 + 13 \\ &= 143 \end{aligned}$$



These are preparation for efficient, standard methods where calculations are set out in columns; units line up under units, tens under tens and so on.

$$\begin{array}{r} 46 \\ + 27 \\ \hline 60 \quad (40 + 20, \text{ adding tens first}) \\ + 13 \quad (6 + 7, \text{ then adding units}) \\ \hline 73 \end{array}$$

$$\begin{array}{r} \text{or } 46 \\ + 27 \\ \hline 13 \quad (\text{adding units first}) \\ + 60 \quad (\text{then adding tens}) \\ \hline 73 \end{array}$$

$$\begin{array}{r} 256 \\ + 85 \\ \hline 11 \quad (\text{units}) \\ + 130 \quad (\text{tens}) \\ \hline 200 \quad (\text{hundreds}) \\ 341 \end{array}$$

Addition

Children working on the *Year 4, 5 and 6* objectives will use pencil and paper methods to support, record or explain their calculations, achieving consistent accuracy.

When setting sums out vertically the children will continue to line up tens under tens, units under units and so on.

Standard written methods, adding the least significant digits first, using "carrying"

Year 4 objectives

$\begin{array}{r} 358 \\ + 73 \\ \hline 11 \text{ (units)} \quad (\text{leading to}) \\ + 120 \text{ (tens)} \\ \hline 300 \text{ (hundreds)} \\ \hline 431 \end{array}$	$\begin{array}{r} 358 \\ + 73 \\ \hline 431 \\ 1 \end{array}$
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Year 5 objectives

$\begin{array}{r} 587 \\ + 475 \\ \hline 1062 \\ 11 \end{array}$
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Year 6 objectives

$\begin{array}{r} 7648 \\ + 1486 \\ \hline 9134 \\ 111 \end{array}$	$\begin{array}{r} 6584 \\ + 5848 \\ \hline 12432 \\ 111 \end{array}$
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d) **extend to decimals**, using similar methods to those above, ensuring that the decimal points line up with each other.



Subtraction

Children working on the **Year 3** objectives will be introduced to the expanded written method, **decomposition**, recording calculations in preparation for an efficient standard method. Children working on the **Year 3** objectives will use informal pencil and paper methods (jottings) to support, record or explain partial mental methods, building on existing strategies.

Most children will set calculations out horizontally, like this, $84 - 56$ and work them out using methods such as:

a) **counting up** from the smaller to the larger number (**complimentary addition**)

1) $84 - 56$ becomes $56 + 4 + 20 + 4 = 84$ or

$4 + 20 + 4 = 28$

2) $783 - 356$

$$\begin{array}{r} 4 \\ + 40 \\ 300 \\ \underline{83} \\ 427 \end{array}$$

$$\begin{array}{r} 81 \\ - \underline{57} \end{array} = \begin{array}{r} 80 + 1 \\ - \underline{50 + 7} \end{array} = \begin{array}{r} 70 + 11 \\ - \underline{50 + 7} \end{array} \quad (\text{adjust from T to U})$$

$$20 + 4 = 24$$

working on the objectives for **Year 4** and.....

Year 5

and **Year 6**.

$\begin{array}{r} 754 \\ - \underline{86} \end{array} = \begin{array}{r} 700 + 50 + 4 \\ - \underline{86 + 6} \end{array}$	leading to	leading to (Yr 5)
$= \begin{array}{r} 700 + 40 + 14 \text{ (adjust from T to U)} \\ - \underline{80 + 6} \end{array}$	$\begin{array}{r} 4 \ 1 \\ 7 \ 5 \ 4 \\ - \underline{8 \ 6} \end{array}$	
$= \begin{array}{r} 600 + 140 + 14 \text{ (adjust from H to T)} \\ \underline{80 + 6} \\ 600 + 60 + 8 = 668 \end{array}$	$\begin{array}{r} 4 \ 1 \\ 7 \ 5 \ 4 \\ - \underline{8 \ 6} \end{array}$	$\begin{array}{r} 6 \ 14 \ 14 \\ 7 \ 5 \ 4 \\ - \underline{8 \ 6} \\ 6 \ 6 \ 8 \end{array}$

$\begin{array}{r} 5 \ 3 \ 1 \\ 6 \ 4 \ 6 \ 7 \\ - \underline{2 \ 6 \ 8 \ 4} \\ \underline{3 \ 7 \ 8 \ 3} \end{array}$

d) **extend to decimals**, ensuring that the decimal points line up with each other.

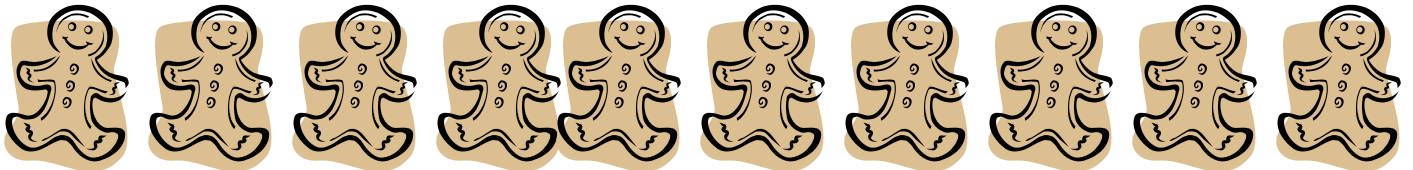


Multiplication and Division

Multiplication

Children working on the **Year 3** objectives will use informal pencil and paper methods (jottings) to support, record or explain their calculations. These methods build upon existing mental strategies.

They will be working on such problems as "If there are 10 gingerbread men in 1 packet, how many will there be in 3 packets?"



$$38 \times 7 = (30 \times 7) + (8 \times 7)$$

$$\begin{array}{r} \times \quad 30 \quad 8 \\ \hline 7 \quad 210 \quad 56 = 266 \end{array}$$

Example: TU \times TU 56×27

Estimate: $60 \times 30 = 1,800$

$56 \times 27 = (50 + 6) \times (20 + 7)$

$$\begin{array}{r|l} \times & 50 \quad 6 \\ 20 & 1000 \quad 120 = 1120 \\ 7 & 350 \quad 42 = \underline{392} \\ & 1512 \end{array}$$

Children working on the **Year 4, 5 and 6** objectives will use pencil and paper methods to support, record or explain their calculations, achieving consistent accuracy. They will discuss, explain and compare methods.

Standard written methods

<p>Short multiplication ; HTU x U Example: 346×9 Estimate $350 \times 10 = 3500$</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: left;"> $\begin{array}{r} 346 \\ \times 9 \\ \hline 54 \text{ (} 6 \times 9 \text{)} \\ 360 \text{ (} 40 \times 9 \text{)} \\ + 2700 \text{ (} 300 \times 9 \text{)} \\ \hline 3114 \end{array}$ </div> <div style="text-align: left;"> <p>leading to</p> $\begin{array}{r} 346 \\ \times 9 \\ \hline 3114 \\ \hline 4 \ 5 \end{array}$ </div> </div>	<p>Long multiplication: TU x TU Example: 72×38 Estimate: $70 \times 40 = 2800$</p> $\begin{array}{r} 72 \\ \times 38 \\ \hline 576 \text{ (} 8 \times 72 \text{)} \\ 2160 \text{ (} 30 \times 72 \text{)} \\ \hline 2736 \end{array}$
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Standard written methods

<p>Short multiplication: Th H T U x U Example: 4346×8 Estimate: $4500 \times 10 = 45000$</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: left;"> $\begin{array}{r} 4346 \\ \times 8 \\ \hline 48 \text{ (} 6 \times 8 \text{)} \\ 320 \text{ (} 40 \times 8 \text{)} \\ 2400 \text{ (} 300 \times 8 \text{)} \\ \hline 34768 \end{array}$ </div> <div style="text-align: left;"> <p>leading to</p> $\begin{array}{r} 4346 \\ \times 8 \\ \hline 34768 \\ \hline 2 \ 3 \ 4 \end{array}$ </div> </div>	
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<p>Long multiplication: HTU x TU Example: 352×27 Estimate: $350 \times 30 = 10500$</p> $\begin{array}{r} 352 \\ \times 27 \\ \hline 2464 \text{ (} 352 \times 7 \text{)} \\ + 7040 \text{ (} 352 \times 20 \text{)} \\ \hline 9504 \\ 1 \end{array}$	
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Multiply by a single digit, estimating first. Decimal points should line up under each other.

Example: 4.92×3

Estimate: $5 \times 3 = 15$

$$\begin{array}{r} 4.92 \\ \times 3 \\ \hline 14.76 \end{array}$$

Begin to extend to multiplying by two-digit numbers

Example: 4.92×73

Estimate: $5 \times 70 = 35$

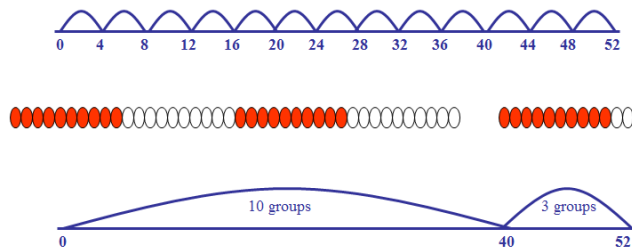
$$\begin{array}{r} 4.92 \\ \times 73 \\ \hline 14.76 \quad (4.92 \times 3) \\ 344.40 \quad (4.92 \times 70) \\ \hline 359.16 \end{array}$$

Division

Year 3

The knowledge of multiplication tables is necessary for the objectives relating to division, along with a knowledge of doubles and halves. The children will be working on such problems as "How many lots of 3 go into 9?" and "What is 80 divided by 10?".

They will need to recognise the \div sign and use the vocabulary related to division, such as "share".



$52 \div 4 = 13$ Children find chunks to jump on the number line.

Children working on the **Year 4, 5 and 6** objectives will use pencil and paper methods to support, record or explain their calculations, achieving consistent accuracy. They will discuss, explain and compare methods.

Standard written methods: short division HTU ÷ U

Example $336 \div 6$

Estimate $300 \div 6 = 50$

$$\begin{array}{r} 056 \\ \underline{6)33\ 36} \\ \text{Answer } 56 \end{array}$$

Example: $196 \div 6$

Estimate: $200 \div 5 = 40$

$$\begin{array}{r} 032\ \text{r.4} \\ \underline{6)19\ 16} \end{array}$$

Answer 32 r 4 extending to $32 \frac{4}{6}$ or $32 \frac{2}{3}$ or 32.666.

Standard written method: long division

Example: $432 \div 15 =$

Estimate: $400 \div 20 = 20$

$$\begin{array}{r} 28\ \text{r.12} \\ \underline{15)432} \\ -300 \quad 15 \times 20 \\ \underline{132} \\ -120 \quad 8 \times 20 \\ \underline{12} \end{array}$$

Answer 28 r.12 extending to $28 \frac{12}{15}$ or $28 \frac{4}{5}$ or 28.8



c) extend to decimals with up to two decimal places

Example: $87.5 \div 7$ Estimate: $80 \div 8 = 10$

$$\begin{array}{r} \underline{7)87.5} \\ -70.0 \quad (10 \times 7) \\ \underline{17.5} \\ -14.0 \quad (2 \times 7) \\ \underline{3.5} \\ -3.5 \quad (0.5 \times 7) \\ \underline{0.0} \quad \mathbf{12.5} \quad \text{answer } 12.5 \end{array}$$