

NUMBER

Written calculation methods

Pupils should learn to:	As outcomes, Year 7 pupils should, for example:
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Use efficient written methods for addition and subtraction of whole numbers, and extend to decimals

Continue to use and refine efficient methods for column addition and subtraction, while maintaining accuracy and understanding. Extend to decimals with up to two decimal places, including:

- sums and differences with different numbers of digits;
- totals of more than two numbers.

For example:

- | | |
|-------------------|--------------------------|
| • $671.7 - 60.2$ | • $543.65 + 45.8$ |
| • $45.89 + 653.7$ | • $1040.6 - 89.09$ |
| • $764.78 - 56.4$ | • $76.56 + 312.2 + 5.07$ |

Refine written methods of multiplication and division of whole numbers to ensure efficiency, and extend to decimals

Multiplication

Use written methods to support, record or explain multiplication of:

- a three-digit number by a two-digit number;
- a decimal with one or two decimal places by a single digit.
- 6.24×8 is approximately $6 \times 8 = 48$.

	×	6	0.2	0.04	Answer
		8	48	1.6	49.92

Progress from the 'grid' method (see Year 6) to using a standard procedure efficiently and accurately, with understanding.

- 673×24 is approximately $700 \times 20 = 14\ 000$.

$$\begin{array}{r}
 673 \\
 \times \quad 24 \\
 \hline
 673 \times 20 \quad 13460 \\
 673 \times 4 \quad \underline{2692} \\
 \hline
 16152 \\
 \small{11}
 \end{array}$$

- 6.24×8 is approximately $6 \times 8 = 48$ and is equivalent to $624 \times 8 \div 100$.

$$\begin{array}{r}
 624 \\
 \times \quad 8 \\
 \hline
 4992 \\
 \small{13}
 \end{array}
 \quad 4992 \div 100 = \underline{49.92}$$

- 642.7×3 is approximately $600 \times 3 = 1800$ and is equivalent to $6427 \times 3 \div 10$.

$$\begin{array}{r}
 6427 \\
 \times \quad 3 \\
 \hline
 19281 \\
 \small{12}
 \end{array}
 \quad 19281 \div 10 = \underline{1928.1}$$

[Link to estimating calculations \(pages 102–3, 110–11\), and multiplying by powers of 10 \(pages 38 to 4-39\).](#)

NUMBER

Written calculation methods

As outcomes, Year 8 pupils should, for example:

Consolidate the methods learned and used in previous years, and extend to harder examples of sums and differences with different numbers of digits.

For example:

- $44.8 + 172.9 + 87.36$
- $5.05 + 3.9 + 8 + 0.97$
- $14 - 3.98 - 2.9$
- $32.7 + 57.3 - 45.17$
- $18.97 + 2.9 - 17.36 - 28.4 + 5.04$

Multiplication

Use written methods to multiply by decimals with up to two decimal places. Consider the approximate size of the answer in order to check the magnitude of the result. For example:

- 23.4×4.5 is approximately $23 \times 5 = 115$.

×	20	3	0.4	Check
4	80	12	1.6	93.6
0.5	10	1.5	0.2	+ 11.7
	90	13.5	1.8	105.3

Use a standard procedure to improve efficiency, maintaining accuracy and understanding.

- 1.89×23 is approximately $2 \times 20 = 40$, and is equivalent to $1.89 \times 100 \times 23 \div 100$, or $189 \times 23 \div 100$.

		189
	×	<u>23</u>
189×20		3780
189×3		<u>567</u>
		<u>4347</u>
		<small>11</small>

Answer: $4347 \div 100 = \underline{43.47}$

- 23.4×4.5 is approximately $23 \times 5 = 115$, and is equivalent to $23.4 \times 10 \times 4.5 \times 10 \div 100$, or $234 \times 45 \div 100$.

		234
	×	<u>45</u>
234×40		9360
234×5		<u>1170</u>
		<u>10530</u>
		<small>1</small>

Answer: $10530 \div 100 = \underline{105.3}$

[Link to estimating calculations \(pages 102–3, 110–11\), and multiplying by powers of 10 \(pages 38–9\).](#)

As outcomes, Year 9 pupils should, for example:

Use a standard column procedure for addition and subtraction of numbers of any size, including a mixture of large and small numbers with differing numbers of decimal places.

For example:

- $6543 + 590.005 + 0.0045$
- $5678.98 - 45.7 - 0.6$

Multiplication

Use a standard column procedure for multiplications equivalent to three digits by two digits. Understand where to put the decimal point for the answer. Consider the approximate size of the answer in order to check the magnitude of the result. For example:

- $64.2 \times 0.43 \approx 60 \times 0.5 = 30$, and is equivalent to $642 \times 43 \div 1000$.

	642
×	<u>43</u>
	25680
	<u>1926</u>
	<u>27606</u>
	<small>11</small>

Answer: $27606 \div 1000 = \underline{27.606}$

Where appropriate, round the answer to a suitable number of decimal places *or significant figures*.

For example:

- $0.0721 \times 0.036 \approx 0.07 \times 0.04 = 0.0028$, and is equivalent to $721 \times 36 \div 10\,000\,000$, or 0.0025956 , or 0.0026 correct to 4 d.p.
- $5.16 \times 3.14 \approx 5 \times 3 = 15$, and is equivalent to $516 \times 314 \div 10\,000$, or 16.2024 , or 16.2 correct to 3 s.f.

[Link to estimating calculations \(pages 102–3, 110–11\), and multiplying by powers of 10 \(pages 38–9\).](#)

NUMBER

Written calculation methods

Pupils should learn to:	As outcomes, Year 7 pupils should, for example:
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Refine written methods of multiplication and division of whole numbers to ensure efficiency, and extend to decimals with two places (continued)

Division

Use written methods to support, record or explain division of:

- a three-digit number by a two-digit number;
- a decimal with one or two decimal places by a single digit.

Progress from informal methods to using a standard algorithm efficiently and accurately, and with understanding.

For example:

- $3199 \div 7$ is approximately $2800 \div 7 = 400$.

$$\begin{array}{r}
 7) 3199 \\
 - \underline{2800} \quad 7 \times 400 \\
 \quad 399 \\
 - \underline{350} \quad 7 \times 50 \\
 \quad \quad 49 \\
 - \underline{49} \quad 7 \times 7 \\
 \quad \quad \quad 0 \\
 \text{Answer: } \underline{457}
 \end{array}$$

Refine methods to improve efficiency while maintaining accuracy and understanding.

- $109.6 \div 8$ is approximately $110 \div 10 = 11$.

$$\begin{array}{r}
 8) 109.6 \\
 - \underline{80.0} \quad 8 \times 10 \\
 \quad 29.6 \\
 - \underline{24.0} \quad 8 \times 3 \\
 \quad \quad 5.6 \\
 - \underline{5.6} \quad 8 \times 0.7 \\
 \quad \quad \quad 0.0 \\
 \text{Answer: } \underline{13.7}
 \end{array}$$

- $239.22 \div 6$ is approximately $200 \div 5 = 40$.

$$\begin{array}{r}
 6) 239.22 \\
 - \underline{180.00} \quad 6 \times 30 \\
 \quad 59.22 \\
 - \underline{54.00} \quad 6 \times 9 \\
 \quad \quad 5.22 \\
 - \underline{4.80} \quad 6 \times 0.8 \\
 \quad \quad \quad 0.42 \\
 - \underline{0.42} \quad 6 \times 0.07 \\
 \quad \quad \quad \quad 0.00 \\
 \text{Answer: } \underline{39.87}
 \end{array}$$

[Link to estimating calculations \(pages 102–3\), and multiplying and dividing by powers of 10 \(pages 38–9\).](#)

NUMBER

Written calculation methods

As outcomes, Year 8 pupils should, for example:

As outcomes, Year 9 pupils should, for example:

Division

Use a standard procedure for divisions equivalent to three digits by two digits, by transforming to an equivalent calculation with a non-decimal divisor. Consider the approximate size of the answer in order to check the magnitude of the result.

For example:

- $91.8 \div 17$ is approximately $100 \div 20 = 5$.

$$\begin{array}{r} 17 \overline{) 91.8} \\ - 85.0 \quad 17 \times 5 \\ \hline 6.8 \\ - 6.8 \quad 17 \times 0.4 \\ \hline 0.0 \end{array}$$

Answer: 5.4

- $87.5 \div 16$ is approximately $90 \div 15 = 6$.

$$\begin{array}{r} 16 \overline{) 87.50} \\ - 80.00 \quad 16 \times 5 \\ \hline 7.50 \\ - 6.40 \quad 16 \times 0.4 \\ \hline 1.10 \\ - 0.96 \quad 16 \times 0.06 \\ \hline 0.14 \end{array}$$

Answer: 5.46 R 0.14
5.5 to 1 d.p.

- $428 \div 3.4$ is approximately $400 \div 4 = 100$ and is equivalent to $4280 \div 34$.

$$\begin{array}{r} 34 \overline{) 4280} \\ - 3400 \quad 34 \times 100 \\ \hline 880 \\ - 680 \quad 34 \times 20 \\ \hline 200 \\ - 170 \quad 34 \times 5 \\ \hline 30.0 \\ - 27.2 \quad 34 \times 0.8 \\ \hline 2.80 \\ - 2.72 \quad 34 \times 0.08 \\ \hline 0.08 \end{array}$$

Answer: 125.88 R 0.08
125.9 to 1 d.p.

[Link to estimating calculations \(pages 102–3\), and multiplying and dividing by powers of 10 \(pages 38–9\).](#)

Division

Use a standard procedure for divisions involving decimals by transforming to an equivalent calculation with a non-decimal divisor. Consider the approximate size of the answer in order to check the magnitude of the result.

For example:

- $361.6 \div 0.8$ is equivalent to $3616 \div 8$.
- $547.4 \div 0.07$ is equivalent to $54\,740 \div 7$.
- $0.048 \div 0.0035$ is equivalent to $480 \div 35$.
- $0.593 \div 6.3$ is equivalent to $5.93 \div 63$.

Where appropriate, round the answer to a suitable number of decimal places *or significant figures*.

For example:

- $0.0821 \div 0.78 \approx 0.08 \div 0.8 = 0.1$
and is equivalent to
 $(821 \div 10\,000) \div (78 \div 100)$
or
 $(821 \div 78) \div 100$
or
0.105 correct to 3 s.f.

[Link to estimating calculations \(pages 102–3\), and multiplying and dividing by powers of 10 \(pages 38–9\)](#)