

NUMBER

Place value, ordering and rounding

As outcomes, Year 8 pupils should, for example: | **As outcomes, Year 9 pupils should, for example:**

Use vocabulary from previous year and extend to: *billion, power, index...*

Use vocabulary from previous years and extend to: *standard (index) form... exponent...*

Read and write positive integer powers of 10.

Extend knowledge of integer powers of 10.

Know that:

Know that:

- 1 hundred is $10 \times 10 = 10^2$
- 1 thousand is $10 \times 10 \times 10 = 10^3$
- 10 thousand is $10 \times 10 \times 10 \times 10 = 10^4$, etc.
- 1 million is 10^6
- 1 billion is 10^9 , one thousand millions
(In the past, 1 billion was 10^{12} , one million millions, in the UK.)

- $10^0 = 1$
- $10^1 = 10$
- $10^{-1} = 1/10^1 = 1/10$
- $10^{-2} = 1/10^2 = 1/100$

Recognise that successive powers of 10 (i.e. $10, 10^2, 10^3, \dots$) underpin decimal (base 10) notation.

Know the pre-*fixes* associated with powers of 10. Relate to commonly used units. For example:

- 10^9 giga
- 10^6 mega
- 10^3 kilo
- 10^{-2} centi
- 10^{-3} milli
- 10^{-6} micro
- 10^{-9} nano
- 10^{-12} pico

Read numbers in standard form, e.g. read 7.2×10^3 as 'seven point two times ten to the power three'.

Know the term *standard (index) form* and read numbers such as 7.2×10^{-3} .

Link to using index notation (pages 56–9).

Link to using index notation (pages 56 to 4-59) and writing numbers in standard form (pages 38 to 4-39).

Know that commonly used units in science, other subjects and everyday life are:

kilogram (kg) – SI unit		metre (m) – SI unit
gram (g)	kilometre (km)	litre (l)
milligram (mg)	millimetre (mm)	millilitre (ml)

Add or subtract 0.001 to or from any number.

Answer questions such as:

- What is 0.001 more than 3.009?
What is 0.001 more than 3.299?
What is 0.002 less than 5?
What is 0.005 less than 10?
- What needs to be added or subtracted to change:
4.257 to 4.277? 6.132 to 6.139?
5.084 to 5.053? 4.378 to 4.111?

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Pupils should learn to:	As outcomes, Year 7 pupils should, for example:												
<p>Understand and use decimal notation and place value; multiply and divide integers and decimals by powers of 10 (continued)</p>	<p>Multiply and divide numbers by 10, 100 and 1000.</p> <p>Investigate, describe the effects of, and explain multiplying and dividing a number by 10, 100, 1000, e.g. using a place value board, calculator or spreadsheet.</p> <p>In particular, recognise that:</p> <ul style="list-style-type: none"> • Multiplying a positive number by 10, 100, 1000... has the effect of increasing the value of that number. • Dividing a positive number by 10, 100, 1000... has the effect of decreasing the value of that number. • When a number is multiplied by 10, the digits move one place to the left: $\begin{array}{r} 34.12 \\ \times 10 \\ \hline 341.2 \end{array}$ 34.12 multiplied by 10 = 341.2 • When a number is divided by 10, the digits move one place to the right: $\begin{array}{r} 34.1 \\ \div 10 \\ \hline 3.41 \end{array}$ 34.1 divided by 10 = 3.41 <p>Complete statements such as:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">$4 \times 10 = \square$</td> <td style="width: 50%;">$4 \times \square = 400$</td> </tr> <tr> <td>$4 \div 10 = \square$</td> <td>$4 \div \square = 0.04$</td> </tr> <tr> <td>$0.4 \times 10 = \square$</td> <td>$0.4 \times \square = 400$</td> </tr> <tr> <td>$0.4 \div 10 = \square$</td> <td>$0.4 \div \square = 0.004$</td> </tr> <tr> <td>$\square \div 100 = 0.04$</td> <td>$\square \div 10 = 40$</td> </tr> <tr> <td>$\square \times 1000 = 40\,000$</td> <td>$\square \times 10 = 400$</td> </tr> </table> <p>Link to converting mm to cm and m, cm to m, m to km... (pages 228–9).</p>	$4 \times 10 = \square$	$4 \times \square = 400$	$4 \div 10 = \square$	$4 \div \square = 0.04$	$0.4 \times 10 = \square$	$0.4 \times \square = 400$	$0.4 \div 10 = \square$	$0.4 \div \square = 0.004$	$\square \div 100 = 0.04$	$\square \div 10 = 40$	$\square \times 1000 = 40\,000$	$\square \times 10 = 400$
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$\square \times 1000 = 40\,000$	$\square \times 10 = 400$												

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As outcomes, Year 8 pupils should, for example:

As outcomes, Year 9 pupils should, for example:

Multiply and divide numbers by 0.1 and 0.01.

Investigate, describe the effects of, and explain multiplying and dividing a number by 0.1 and 0.01, e.g. using a **calculator** or **spreadsheet**.

In particular, recognise how numbers are increased or decreased by these operations.

0.1 is equivalent to $\frac{1}{10}$ and 0.01 is equivalent to $\frac{1}{100}$, so:

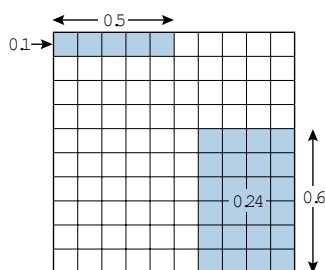
- **Multiplying by 0.1** has the same effect as multiplying by $\frac{1}{10}$ or dividing by 10. For example, 3×0.1 has the same value as $3 \times \frac{1}{10}$, which has the same value as $3 \div 10 = 0.3$, and 0.3×0.1 has the same value as $\frac{3}{10} \times \frac{1}{10} = \frac{3}{100} = 0.03$.
- **Multiplying by 0.01** has the same effect as multiplying by $\frac{1}{100}$ or dividing by 100. For example, 3×0.01 has the same value as $3 \times \frac{1}{100}$, which has the same value as $3 \div 100 = 0.03$, and 0.3×0.01 has the same value as $\frac{3}{10} \times \frac{1}{100} = \frac{3}{1000} = 0.003$.
- **Dividing by 0.1** has the same effect as dividing by $\frac{1}{10}$ or multiplying by 10. For example, $3 \div 0.1$ has the same value as $3 \div \frac{1}{10}$.
(How many tenths in three? $3 \times 10 = 30$)
 $0.3 \div 0.1$ has the same value as $\frac{3}{10} \div \frac{1}{10}$.
(How many tenths in three tenths? $0.3 \times 10 = 3$)
- **Dividing by 0.01** has the same effect as dividing by $\frac{1}{100}$ or multiplying by 100. For example, $3 \div 0.01$ has the same value as $3 \div \frac{1}{100}$.
(How many hundredths in three? $3 \times 100 = 300$)
 $0.3 \div 0.01$ has the same value as $\frac{3}{10} \div \frac{1}{100}$.
(How many hundredths in three tenths?
 $0.3 \times 100 = 30$)

Complete statements such as:

$0.5 \times 0.1 = \square$
 $0.7 \div 0.1 = \square$

$0.8 \times \square = 0.08$
 $0.6 \div \square = 6$

Understand a diagrammatic explanation to show, for example, that $0.1 \times 0.5 = 0.05$, or $0.24 \div 0.6 = 0.4$.



Discuss the effects of multiplying and dividing by a number less than 1.

- Does division always make a number smaller?
- Does multiplication always make a number larger?

Multiply and divide by any integer power of 10.

For example:

- Calculate:

7.34×100	$37.4 \div 100$
46×1000	$3.7 \div 1000$
$8042 \times 10\,000$	$4982 \div 10\,000$
9.3×0.1	$0.27 \div 0.1$
0.63×0.01	$5.96 \div 0.01$

[Link to converting mm² to cm², cm² to m², mm³ to cm³ and cm³ to m³ \(pages 228–9\).](#)