Pupils should be taught to:	As outcomes, Year 7 pupils should, for example:
Understand and use decimal notation and place value; multiply and divide integers and decimals by powers of 10 (continued)	**Multiply and divide numbers by 10, 100 and 1000.**

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**.

In particular, recognise that:

- 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:

```
   3  4  .  1  2        34.12 multiplied by 10 = 341.2
3  4  1  .  2
```

- When a number is divided by 10, the digits move one place to the right:

```
3  4  .  1           34.1 divided by 10 = 3.41
   3  .  4  1
```

Complete statements such as:

4 × 10 = □	4 × □ = 400
4 ÷ 10 = □	4 ÷ □ = 0.04
0.4 × 10 = □	0.4 × □ = 400
0.4 ÷ 10 = □	0.4 ÷ □ = 0.004
□ ÷ 100 = 0.04	□ ÷ 10 = 40
□ × 1000 = 40 000	□ × 10 = 400

See Y456 examples (pages 6–7).

Link to converting mm to cm and m, cm to m, m to km… (pages 228–9).

As outcomes, Year 8 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 $\frac{3}{10} \times \frac{1}{100} = \frac{3}{1000} = 0.003$.

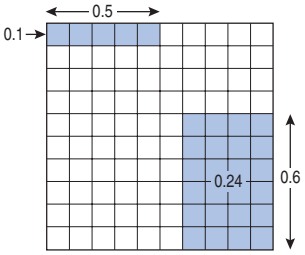
- Dividing by 0.1 has the same effect as dividing by $\frac{1}{10}$ or multiplying by 10. For example, $3 \div 0.1$ has the same value as $3 \div \frac{1}{10}$.
  (How many tenths in three? $3 \times 10 = 30$)
  $0.3 \div 0.1$ has the same value as $\frac{3}{10} \div \frac{1}{10}$.
  (How many tenths 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:

$0.5 \times 0.1 = \square$ $\quad$ $0.8 \times \square = 0.08$
$0.7 \div 0.1 = \square$ $\quad$ $0.6 \div \square = 6$

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?

As outcomes, Year 9 pupils should, for example:

Multiply and divide by any integer power of 10.

For example:

- Calculate:

7.34×100	$37.4 \div 100$
46×1000	$3.7 \div 1000$
$8042 \times 10\,000$	$4982 \div 10000$
9.3×0.1	$0.27 \div 0.1$
0.63×0.01	$5.96 \div 0.01$

Link to converting mm^2 to cm^2, cm^2 to m^2, mm^3 to cm^3 and cm^3 to m^3 (pages 228–9).

Begin to write numbers in standard form, expressing them as
$A \times 10^n$ where $1 \leq A < 10$, and n is an integer.

For example:
$734.6 = 7.346 \times 10^2$
$0.0063 = 6.3 \times 10^{-3}$

Know how to use the 'EXP' key on a **calculator** to convert from index form.

Answer questions such as:

- Complete these. The first is done for you.
  $3 \times 10^n = 300 \times 10^{n-2}$
  $0.3 \times 10^n = 30\,000 \times \square$
  $0.3 \times 10^n = 0.0003 \times \square$
  $3 \div 10^n = 0.003 \times \square$
  $0.3 \div 10^n = 300 \times \square$
  $0.003 \div 10^n = 3 \times \square$

- Put these numbers in ascending order:
  2×10^{-2}, 3×10^{-1}, 2.5×10^{-3}, 2.9×10^{-2}, 3.2×10^{-1}

- Write these numbers in standard form:
  a. The population of the UK is 57 million.
  b. The dwarf pigmy goby fish weighs 0.000 14oz.
  c. The shortest millipede in the world measures 0.082 inches.
  d. After the Sun, the nearest star is 24800000000000 miles away.

- The probability of dying before the age of 40 is 1 in 850, or 0.00118, or 1.8×10^{-3}.

  These are the risks of dying from particular causes:

smoking 10 cigarettes a day	1 in 200
road accident	1 in 8000
accident at home	1 in 260 000
railway accident	1 in 500000

  Write each of these as a probability in standard form.

Link to writing numbers in standard form in science and geography.