

Hillcrest Mathematics Knowledge Organiser



58 - Standard Form

- A number is converted into **standard form** when the number is very large or very small, this mainly used in science and astronomy.
- The format of a number in standard form consists of a number between 1 and 10 but **cannot be 10**, multiplied by a power of 10.

$$(1 \leq x < 10) \times 10^n$$

- Converting a **very small number into standard form**: Size of a bacteria is 0.00000037
 $0.00000037 = 3.7 \times 10^{-7}$
- Converting a **very large number into standard form**: Distance from Earth to the sun is 147100 million metres

$$147\,100\,000\,000 = 1.471 \times 10^{11}$$

- Converting into a **small ordinary number**
 $2.4 \times 10^{-6} = 0.0000024$
- Converting into a **large ordinary number**
 $5.67 \times 10^9 = 5\,670\,000\,000$

Common mistakes:

- When not in standard form but in the same format as the number is not between $1 \leq x < 10$
 (too big) $76.18 \times 10^6 = 7.618 \times 10^7$ and (too small) $0.12 \times 10^{-6} = 1.2 \times 10^{-7}$
 When the **number is getting smaller the power gets bigger**, and when the **number gets bigger the power gets smaller**.

- When **adding or subtracting** numbers in standard form the numbers must be converted into the ordinary numbers

$$(2.3 \times 10^4) + (6.4 \times 10^3) = \\ 23000 + 6400 = \\ 29400 = 2.94 \times 10^4$$

- When **multiplying** numbers in standard form the format stays the same. We can use **index laws** to help us.

$$(1.5 \times 10^3) \times (3 \times 10^5) = \\ 4.5 \times 10^{3+5} = \\ 4.5 \times 10^8$$

- Multiply the numbers together e.g. $1.5 \times 3 = 4.5$
- Multiply the powers of ten together e.g. $10^3 \times 10^5 = 10^8$






- When **dividing** numbers in standard form the format stays the same. We can use **index laws** to help us.

- Dividing the numbers e.g. $2.5 \div 5 = 0.5$
- Dividing the powers of ten e.g. $10^{11} \div 10^{13} = 10^{-2}$

$$(2.5 \times 10^{11}) \div (5 \times 10^{13}) = \\ 0.5 \times 10^{-2} = \\ 5 \times 10^{-3}$$

This is not complete standard form, we multiply 0.5 by 10^1 and therefore the power reduces by 1.

Using a calculator

When inputting a very large or small ordinary number in the calculator, it will automatically convert to standard form. When inputting the number as standard form it will generally leave as standard form. You can use the button  or you can use    .

Linked Prior Topics

- Indices
- Inequalities
- Rounding and Accuracy
- Adding, subtracting, multiplying, dividing
- Negative numbers
- Index Laws

Vocabulary

- Standard form
- Ordinary number
- Power
- Index Laws

- Convert
- Ordinary number
- Adding, subtracting
- Multiplying, dividing

Linked Future Topics

- Speed, distance and time
- Mass, density, volume
- Accuracy in answers