

# Exponential Notation and SI Prefixes

## Learning Intentions

To be able to:

- **Enter** values in exponential notation into a calculator
- **Convert** between exponential and normal notation
- Replace **SI Prefixes** using a table

## Exponential Notation

Exponential notation (also known as scientific notation) is a way of writing very big (like 10000000) and very small numbers (like 0.00000001) without having to write all the zeros. Its name comes from the fact the power of ten is called the 'exponent'.

Numbers in exponential notation are written as a number 1 or greater but less than 10, followed by  $\times 10^x$  where  $x$  is the number of times to multiply the number by 10 (or divide by 10 if  $x$  is negative).

Examples: 10000000 becomes  $1 \times 10^7$  (1 multiplied by 10 seven times).

0.0000001 becomes  $1 \times 10^{-7}$  (1 divided by 10 seven times).

The  $\times 10^x$  part is not counted in the number of significant figures (so the above examples are to 1 s.f.).

To enter exponential notation into a calculator, you don't need to type all of  $\times 10^x$  bit by bit, there is a shortcut function labelled **EE**. To use it, first enter the first part of the exponential number (before the  $\times$ ), then press **2<sup>ND</sup>** **,** then enter the index (power) of 10.

## Converting Between Exponential Notation and Normal Notation

Converting from normal numbers to exponential notation (example 324.01):

1. Jump the decimal place until there is exactly one non-zero digit to its left (example 3.2401)
2. Count the number of jumps; this gives you your exponent (in the example, 2 jumps)
3. If the jump was to the right, give the exponent a negative sign (not needed in this example)

Converting from exponential notation to normal numbers:

1. If the exponent is negative you'll need to jump the decimal place left, otherwise jump right
2. Move the decimal place the number of times indicated by the exponent.

A negative exponent means the number is less than 1, a positive exponent means it is greater than 1.

## SI Prefixes

Prefixes are a shortcut way of writing numbers to quickly recognise their size. The "SI" part means "Standard International", because they are used all around the world.

The prefix is always written before the unit, without a space between them.

Some common prefixes are listed below.

Name	Symbol	Meaning
nano	n	$\times 10^{-9}$
micro	$\mu$	$\times 10^{-6}$
milli	m	$\times 10^{-3}$
centi	c	$\times 10^{-2}$
kilo	k	$\times 10^3$
mega	M	$\times 10^6$
giga	G	$\times 10^9$

To use the table, replace the prefix symbol in a given value with the meaning ( $\times 10^x$ ).

Example: 1.2 km becomes  $1.2 \times 10^3$  m (because k =  $\times 10^3$ )