

# fs4u

## Numbers of Any Size

### ‘How To’ Booklet 36

# Numbers of Any Size Converting Numbers to Standard Form

## Example

Write the following in standard form

- a      34,560,000                      b)      0.000000045

## Solution

- a**      First express as a number between 1 and 10

34,560,000    becomes    3.456

Note how the decimal point comes immediately after the first whole number. It has been moved 7 places to the left.

Then balance this by multiplying the new number by  $10^7$   
( $10^7 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10$ )

So 34,560,000 is  **$3.456 \times 10^7$**  in standard form

- b**      First express as a number between 1 and 10

0.000000045    becomes 4.5

The decimal point has been moved 8 places to the right. Balance this by multiplying the new number by  $10^{-8}$

So 0.000000045 in standard form is  **$4.5 \times 10^{-8}$**

(note  $10^{-8} = \frac{1}{10^8}$ )

### Activity 1

Express the following in standard form:-

a	23000
b	876,000,000
c	0.000123
d	0.0082
e	0.35
f	2660000
g	43518
h	0.502
i	6500
j	101 million
k	1 thousand
l	292.65

## Converting Ordinary Numbers to Standard Form

### Example

Express the following in ordinary numbers:-

- a)  $3.4 \times 10^5$                       b)  $8.5 \times 10^{-2}$

### Solution

- a) the POSITIVE power of 10 indicates that the decimal point must be moved 5 places to the RIGHT>

$3.4 \times 10^5$                       becomes              340000

- b) the NEGATIVE power of 10 indicates that the decimal point must be moved 2 places to the LEFT.

$8.5 \times 10^{-2}$                       becomes 0.085

### Activity 2

Write the following as ordinary numbers:-

a	$2.38 \times 10^5$
b	$3.0 \times 10^8$
c	$9.3 \times 10^{-1}$
d	$1.609 \times 10^{-4}$
e	$4.4 \times 10^0$
f	$1.01 \times 10^{-5}$

# Calculators

When a number contains too many digits to fit onto the screen of a scientific calculator, the calculator will display the number in standard form.

e.g. 3500000000000 will be displayed as

3.5      12	or	3.5 <b>12</b>	or	3.5   E <b>12</b>
-------------	----	---------------	----	-------------------

and should be read as  $3.5 \times 10^{12}$

(NB the E in the last examples stands for exponent. This is another word for index or power)

EG 0.00000000018 will be displayed as

1.8      -10	or	1.8 <b>-10</b>	or	1.8   E <b>-10</b>
--------------	----	----------------	----	--------------------

and should be read as  $1.8 \times 10^{-10}$