STANDARD FORM

This is a more convenient way of writing numbers which are very large or very small.
To write a number in standard form we try to get it in the following format.

$$A \times 10^B$$

Where A is a number between 1 and 10 and B is either a positive or negative whole number.

Examples:

Convert the following into standard form

a) 15700
   $= 1.57 \times 10^4$

b) 200
   $= 2.00 \times 10^2$

c) 0.00729
   $= 7.29 \times 10^{-3}$

d) 0.000059
   $= 5.9 \times 10^{-5}$

HINT

For large numbers count the number of digits after the first one.
e.g. 5600 – there are three digits after the 5.
The standard for is 5.6×10^3. This is because $10^3 = 10 \times 10 \times 10$

For small numbers count the number of zeros after the decimal place and the first non-zero number. e.g. 0.0025, this would be 3
The standard form is 2.5×10^{-3}. This is because $10^{-3} = 1/10 \times 1/10 \times 1/10$

Questions: Express the following numbers in standard form (from Mathematics for Caribbean Schools)

1) 9 000 000
2) 600
3) 89 000

4) 55
5) 0.245
6) 0.00098

Your teacher will help you use your calculator to work out standard form but there are two simple rules that can help.

(1) $y^a \times y^b = y^{(a+b)}$

Example: $2a^2 \times 3a^3 = 6a^{(2+3)} = 6a^5$ (You can use this rule for standard form)

$2 \times 10^3 \times 6 \times 10^4 = (6 \times 2) \times 10^{(3+4)} = 12 \times 10^7$

(2) $y^a \div y^b = y^{(a-b)}$

Example: $\qquad$ $2a^6 \div 4a^2 = 8a^{(6-2)} = 8a^4$
Questions: $\quad$ Use your calculator or the method above to work out the following,

1. $(1.8 \times 10^4) \times (1.2 \times 10^5)$

2. $(9.6 \times 10^2) \div (3 \times 10^{-3})$

3. $(5 \times 10^2) \times (8 \times 10^5)$

4. $(4.8 \times 10^7) \div (8 \times 10^3)$

If you have to add two standard numbers you can change them both to ordinary form, add them and convert them back to standard form.

Example

$3 \times 10^4 + 5 \times 10^2$
$= 30\ 000 + 500 = 30\ 500 = 3.05 \times 10^4$

Questions: $\quad$ Calculate the following using your calculator or the method above.

1) $(7.5 \times 10^3) + (1.4 \times 10^5)$

2) $3.4 \times 10^3 + 6.2 \times 10^3$

3) $9.37 \times 10^4 - 6.51 \times 10^4$