STANDARD FORM

Used to express very small or very large numbers

$7,000,000 \Rightarrow 7 \times 10^6$

$0.000072 \Rightarrow 7.2 \times 10^{-5}$

where $10^6 = 1,000,000$

where $10^{-5} = 0.00001$

Standard form is always written as $a \times 10^b$

where **a is between 1 & 10** and **b is a positive or negative integer**

Multiplying with Standard Form

$(2.1 \times 10^5) \times (3.0 \times 10^4)$

the numbers are seperated from the standard form & done seperately

$2.1 \times 3.0 = 6.3$

$10^5 \times 10^4 = 10^9$ (+)

don't forget the powers r when multiplied

$\Rightarrow 6.3 \times 10^9$

The same happens with dividing

$(8.4 \times 10^{10}) \div (2.0 \times 10^3)$

powers - to give 10^7

$8.4 \div 2 = 4.2$

$10^{10} \div 10^3 = 10^7$

$\Rightarrow 4.2 \times 10^7$

Adding & Subtracting with Standard Form

$(3.6 \times 10^3) + (2.4 \times 10^2)$

Because of the powers being different we can't just add the numbers we have to get them to the same powers first

2.4×10^2

$\div 10$ to increase power

$\Rightarrow 0.24 \times 10^3$

$3.6 \times 10^3 + 0.24 \times 10^3 \Rightarrow \begin{array}{r} 3.6 \\ +\ 0.24 \\ \hline 3.84 \end{array}$

$\Rightarrow 3.84 \times 10^3$

$5.8 \times 10^9 - 1.2 \times 10^8 \Rightarrow 5.8 \times 10^9 - 0.12 \times 10^9$

$\Rightarrow 5.68 \times 10^9$

ESTIMATING

It can be useful to estimate an answer without the use of a calculator

Firstly approximate your numbers to a certain number of decimal places or significant figures

$24.9 \times 3.12 \approx 25 \times 3 = 75$

$321.5 \div 74 \approx 320 \div 30 = 4$

Estimating with standard form

Can be useful to convert your number first to standard form

$0.07824 \times 49760 \approx 0.08 \times 50000$ (1 sf)

$\approx 8 \times 10^{-2} \times 5 \times 10^{4}$

$\approx 40 \times 10^{2}$

BOUNDS

When numbers are rounded we lose a certain level of accuracy

Knowing the degree of accuracy helps us find the

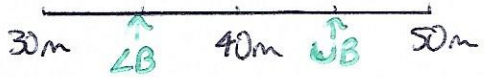
highest possible value - UPPER BOUND

OR lowest possible value - LOWER BOUND

eg A measurement of 40 m has been rounded to the nearest 10m

The exact measurement will be between 35m & 45m

Can be written as 40 ± 5m



Calculating with Bounds

First calculate the necessary U or L Bound of the numbers before doing the actual calculation

eg A field measures 150m square to the nearest 10m

Find the greatest & smallest area of the field

GREATEST

UB of side length = 155m

so Area = 155×155

$= 24,025\text{m}^2$

SMALLEST

LB of side length = 145m

so Area = 145×145

$= 21,025\text{m}^2$

$21,025 \leq A < 24,025 \text{ m}^2$