Standard Form

Examples

$$326 = 3.26 \times 10^2$$

$$4{,}810{,}234 = 4.810234 \times 10^6$$

$$0.0000714 = 7.14 \times 10^{-5}$$

In standard form a number is written as a number between 1 and 10 multiplied by a power of 10

Non-calculator Arithmetic

$$(6 \times 10^8) \times (4 \times 10^{19}) = 24 \times 10^{27}$$
$$= 2.4 \times 10^{28}$$

$$(8 \times 10^{25}) \div (2 \times 10^6) = 4 \times 10^{19}$$

$$(4 \times 10^{22}) \div (8 \times 10^{14}) = 0.5 \times 10^8$$
$$= 5 \times 10^7$$

$$(3.2 \times 10^7) + (4.5 \times 10^6)$$

$$= \begin{array}{r} 32\,000\,000 \\ 4\,500\,000 + \\ \hline 36\,500\,000 \end{array} \qquad 3.65 \times 10^7$$

$$(3.2 \times 10^7) - (4.5 \times 10^6)$$

$$\begin{array}{r} 2\cancel{8}\,\cancel{2}\,000\,000 \\ 4\,500\,000 - \\ \hline 27\,500\,000 \end{array} \qquad = 2.75 \times 10^7$$

Calculator Arithmetic

Ex1 $\left(3.6 \times 10^{14}\right) \times \left(2.7 \times 10^{24}\right)$

CASIO

$\boxed{3}\ \boxed{.}\ \boxed{6}\ \boxed{\times 10^{x}}\ \boxed{1}\ \boxed{4}\ \boxed{\times}\ \boxed{2}\ \boxed{.}\ \boxed{7}\ \boxed{\times 10^{x}}\ \boxed{2}\ \boxed{4}\ \boxed{=}$

SHARP $\boxed{\text{Exp}}$ $\boxed{\text{Exp}}$

$= 9.72E38$ or 9.72×10^{38}

<u>Both mean 9.72×10^{38}</u>

Upper and Lower Bounds

Let $x = 23$ cm to nearest cm

$y = 5.3$ cm to nearest mm

$22.5 \leq x < 23.5$ cm

$5.25 \leq y < 5.35$ cm

Find upper and lower bounds for

1) $2x + y$

lower $2 \times 22.5 + 5.25 = 50.25$

upper $2 \times 23.5 + 5.35 = 52.35$

$\frac{y}{x}$

lower $\frac{5.25}{23.5} = 0.2234$

upper $\frac{5.35}{22.5} = 0.2378$

$$\frac{y+x}{x} = \frac{y}{x} + 1$$

so upper 1.2378

lower 1.2234

Degrees of accuracy

Suppose lower = 23.671

upper = 23.713

suitable answer = 23.7 to 3 s.f.

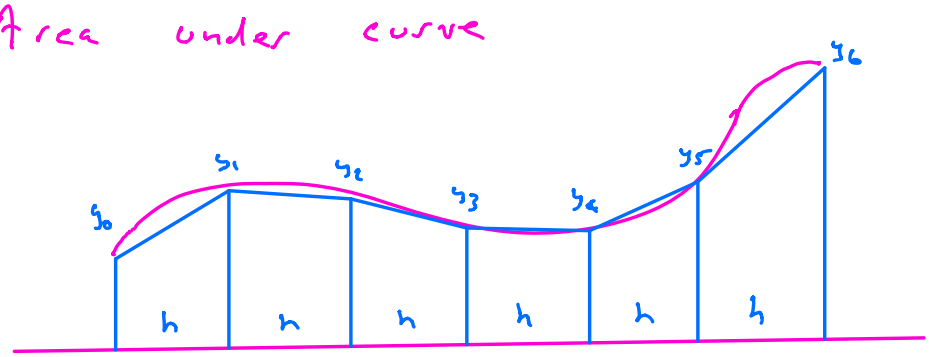
Suppose lower 19.72

upper 19.83

suitable answer 20 to 2 s.f.

can only quote to 2 s.f here because the upper and lower bounds only agree to 2 s.f.

Area under curve



$$\text{Area} \approx \frac{h}{2}\left[y_0 + 2(y_1 + y_2 + y_3 + y_4 + y_5) + y_6\right]$$