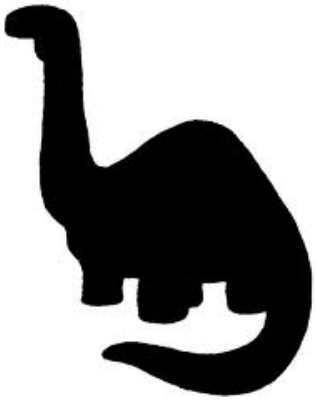
Estimate the following to the nearest order of magnitude

$10^5 \cdot 10^4 \cdot 10^{-4} \div 10^6$ 10^{-1} (0.0 50936 ...)

① $47816 \times (4293 \times 10^{-4}) / 403000$

② $\sqrt{\frac{2\pi}{4.6 \times 10^{-5}}}$ 10^1 10^{-4} } $\sqrt{10^5}$ $(10^5)^{1/2}$ $10^{5/2}$ 10^3 316



Estimate the mass of the dinosaur in kg to the nearest order of magnitude. State any assumptions that you have made.

10^3 (gc)

10^3 (TF)

10^3 (ME)

10^5 (NH)

10^3 (SY)

~~10^1~~

~~10^{10}~~

1 THE SEVEN BASE UNITS IN THE INTERNATIONAL SYSTEM OF UNITS (SI)

Quantity	Name of base SI Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Amount of substance	mole	mol
Luminous intensity	candela	cd

all of these except the kg can be measured in the lab.

Derived units

volume	m^3	
speed	$m\,s^{-1}$	
force	N (newton)	$kg\,m\,s^{-2}$ (space, space)
frequency	Hz	s^{-1}

You need to be able to convert units (factor labelling)

How many seconds in a week?

last year:

$$1\ week \left(\frac{7\ day}{1\ week}\right)\left(\frac{24\ h}{1\ day}\right)\left(\frac{3600\ s}{1\ h}\right)$$

this year:

$$1\ \cancel{week}\left(7\ \cancel{days}\ \cancel{week^{-1}}\right)\left(24\ \cancel{h}\ \cancel{day^{-1}}\right)\left(3600\ s\ \cancel{h^{-1}}\right)$$

$$= 604800\ s$$

Example

How many joules of energy are there in one kilowatt-hour

$$\text{Power} = \frac{\text{work}}{\text{time}}$$

$$\text{Work} = \text{power} \times \text{time}$$

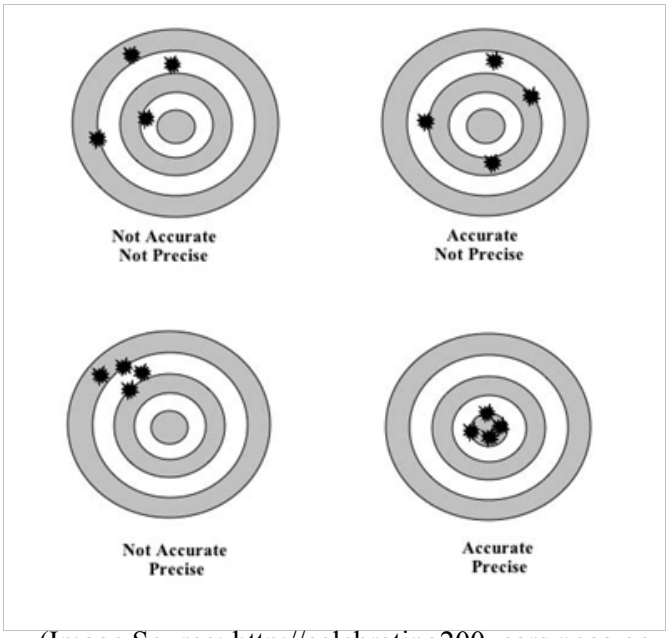
$1\,W = 1\,J\,s^{-1}$

$= 1\,kW \cdot 1\,h$

$= 1000\,J\,s^{-1} \times 3600\,s$

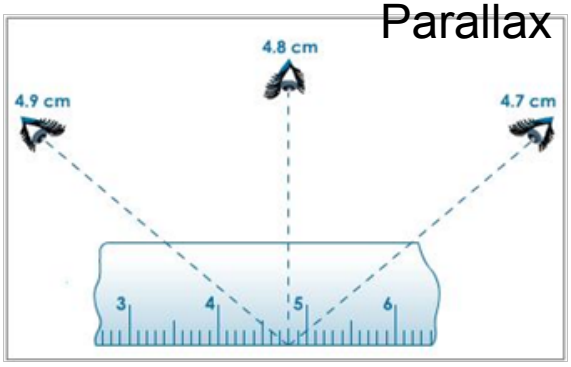
$= 3.6 \times 10^6\,J \quad (3.6\,MJ)$

Conversion factor: $1\,kWh = 3.6 \times 10^6\,J$

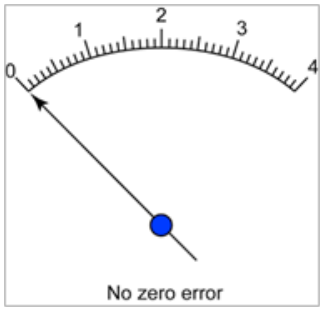


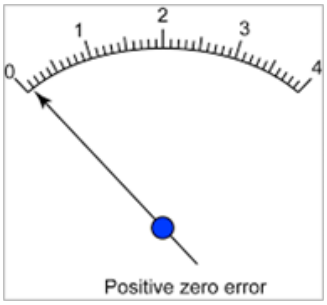
(Image Source: http://celebrating200years.noaa.gov/magazine/tct/accuracy_vs_precision.html

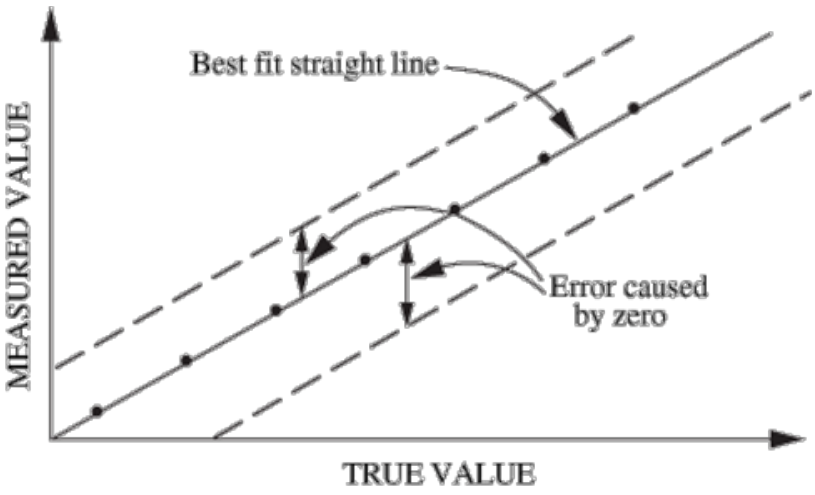
Parallax



(Image Source: http://www.tutorvista.com/content/physics/physics-i/measurement-and-experimentation/measurement-length.php)


0
1
2
3
4
No zero error


0
1
2
3
4
Positive zero error


Best fit straight line
MEASURED VALUE
Error caused by zero
TRUE VALUE