INTRODUZIONE

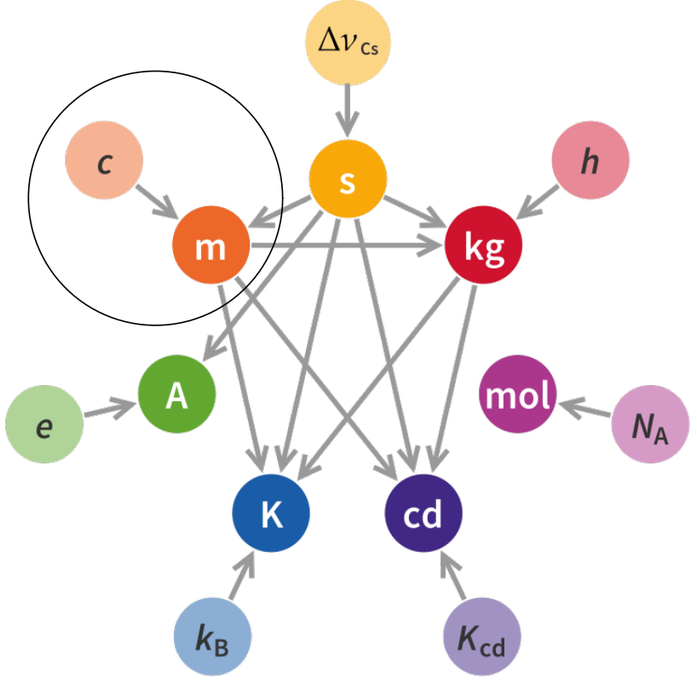
GRANDEZZE FISICHE

definizione operativa

GRANDEZZA —misura→ VALORI NUMERICI

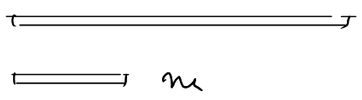
Caratteristica di un corpo o di un fenomeno naturale a cui si può associare in modo riproducibile uno o più valori numerici

Grandezza	Dimensione	Unità	
Lunghezza	L	m	} FONDAMENTALI
Tempo	T	s	
Massa	M	Kg	
Area	L^2	m^2	} DERIVATE
Volume	L^3	m^3	
Densità	M/L^3	kg/m^3	
...			



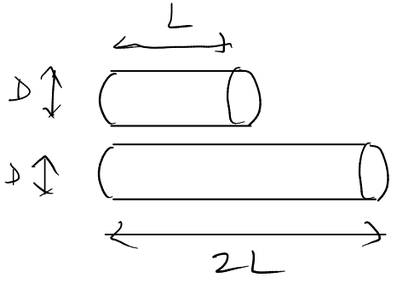
Sistema internazionale (SI): m, s, Kg

Misura diretta: confronto grandezza con campione (unità)



$\frac{L}{m} = 1,25 \qquad L = 1,25\ m$

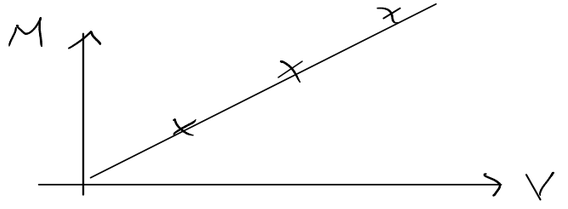
Misura indiretta: relazione matematica



Area: $A = \pi\left(\frac{D}{2}\right)^2$

Volume: $V = A \cdot L$

Densità: $\rho \equiv \frac{M}{V}$ ← def.



$M \sim V$

prop. diretta

Aria: $\rho \approx 1 \frac{Kg}{m^3}$ → gas

Acqua: $\rho \approx 1000 \frac{Kg}{m^3}$ → liquidi / solidi

Gesso: $\rho \approx 2300 \frac{Kg}{m^3}$

Ordini di grandezza

Notazione scientifica: $R = 6350000\ m = 6.35 \times 10^6\ m$ $\qquad 9.99 \times 10^6\ m$?

$6.35 \sim$

10^6 ↑ ordine grandezza ⚠

Multipli e sottomultipli:

	10^{-15}	10^{-12}	10^{-9}	10^{-6}	10^{-3}	10^{0}	10^{3}	10^{6}	10^{9}	10^{12}	10^{15}
prefisso	f	p	n	μ	m		k	M	G	T	P
	fermo	pico	nano	micro	milli		kilo	mega	giga	tera	peta
lunghezza	fm	pm	nm	μm	mm		km	Mm	Gm	Tm	Pm

- fm → protone
- pm → distanza tra nuclei in nana bianca
- nm → molecola glucosio $C_6H_{12}O_6$
- μm → macromolecola di grasso nel latte
- mm → punta matita
- km → passeggiata di 10 min
- Mm → raggio terrestre $R \approx 6 \times 10^3$ km
- Gm → terra-luna
- Tm → orbita terrestre 10^{11} m
- Pm → anno luce $\sim 10^{16}$ m

$10^{-10}\ m \equiv 1\ \text{Å}$

~ atomo

Conversione tra unità di misura

1) miglio anglosassone

$$60 \ \frac{mi}{h} = 60 \times 1.609 \ \frac{km}{h} = 96 \ \frac{km}{h}$$

$$\frac{mi}{km} = 1.609 \qquad 1 \ mi = 1.609 \ km$$

2) velocità del suono nell'aria

$$c = 330 \ \frac{m}{s} = 330 \times \frac{10^{-3} \ km}{\frac{1}{3600} \ h} = 330 \times 10^{-3} \times 3600 \ \frac{km}{h} = 330 \times 10^{-3} \times 3.6 \times 10^{3} \ \frac{km}{h}$$

$$\approx 1000 \ \frac{km}{h}$$

3) densità acqua

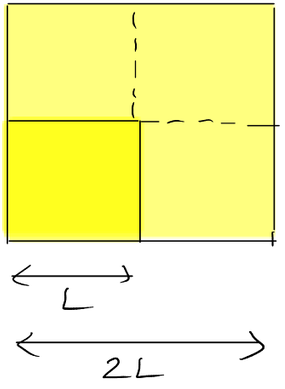
$$\rho = 10^3 \ \frac{kg}{m^3} = ? \ \frac{g}{cm^3} \quad (el)$$

LEGGI DI SCALA

Di quanto cambia una caratteristica di un corpo se cambio la "scala di lunghezza" del corpo stesso?

L

L'



$L \to L' = 2L$

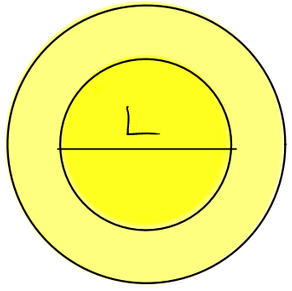
$A \to A' = 4A$

$A' = L'^2$

$= (2L)^2$

$= 4L^2$

$= 4A$



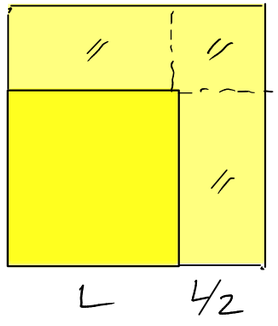
$L \to L' = \alpha L$

$A \to A' = \pi \left(\frac{L'}{2}\right)^2$

$= \pi \left(\frac{\alpha L}{2}\right)^2$

$= \alpha^2 \pi \left(\frac{L}{2}\right)^2$

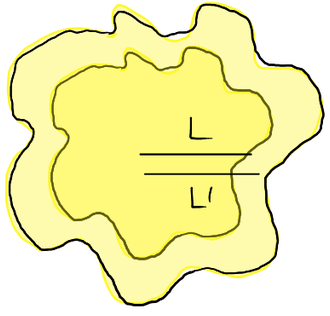
$= \alpha^2 A$



$L \to L' = \frac{3}{2} L$

$A \to A' = \frac{9}{4} L$

(es.)



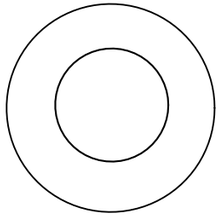
$L \to L' = \alpha L$

$A \to A' = \alpha^2 A$

$A \sim L^2$

Variazione assoluta: $\Delta A \equiv A' - A = 3A$

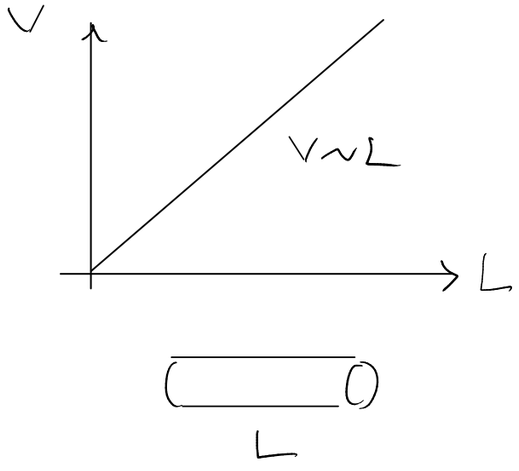
Variazione relativa: $\frac{\Delta A}{A} = 3 = 300\%$

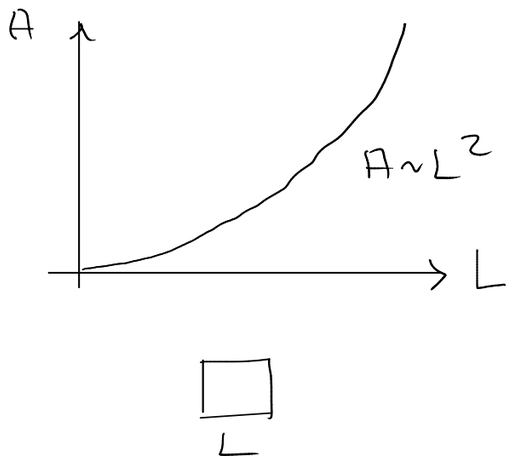


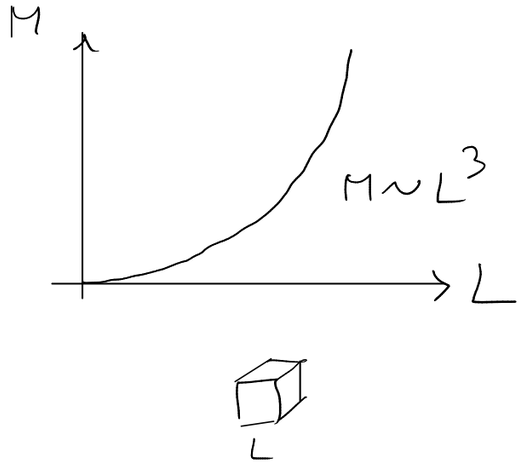
$$L \to L' = \frac{3}{2} L$$

$$N \to N' = c L'^2 = c \left(\frac{3}{2} L\right)^2 = \frac{9}{4} c L^2 = \frac{9}{4} N$$

$$\frac{\Delta N}{N} = \left(\frac{9}{4} - 1\right) N / N = \frac{5}{4} = 125\%$$







⚠ area di base cost

Legge di potenza

$$Y \sim X^a \qquad a \in \mathbb{R}$$

$$Y = c X^a \qquad Y = Y(X)$$

$$X_i \longrightarrow X_f$$

$$Y_i = Y(X_i) \to Y_f = Y(X_f)$$

$$\frac{Y_f}{Y_i} = \frac{c X_f^a}{c X_i^a} = \left(\frac{X_f}{X_i}\right)^a$$

□