Conversions and Unit Analysis

Conversions
(Using T-Charts and Metric Conversions)

- Convert 45.0 cm/min to m/s.

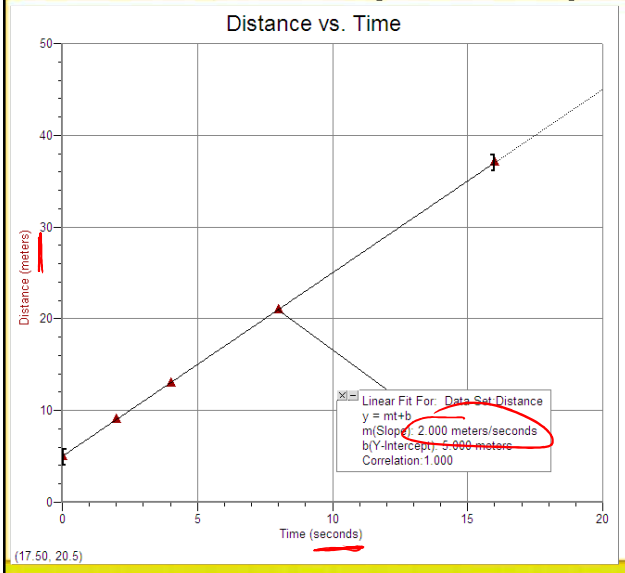
$$\frac{45.0\ \text{cm}}{1\ \text{min}} \left| \frac{1\ \text{m}}{100\ \text{cm}} \right| \frac{1\ \text{min}}{60\ \text{s}} = .0075\ \text{m/s}$$

- Convert 32 km/hr to m/s.

$$\frac{32\ \text{km}}{1\ \text{hr}} \left| \frac{1000\ \text{m}}{1\ \text{km}} \right| \frac{1\ \text{hr}}{60\ \text{min}} \left| \frac{1\ \text{min}}{60\ \text{s}} \right. = 8.9\ \text{m/s}$$

1 m = 100 cm
1 m = 1000 mm
1 km = 1000 m
1 mile = 1609 m
1 kg = 1000 g
1 min = 60 s
1 hour = 60 min
1 day = 24 hour
1 years = 365.25 days

Unit Analysis to Find Physical Quantity of Slope



- Slope

$\frac{\text{Rise}}{\text{Run}} \Rightarrow \frac{\Delta Y}{\Delta x} = \frac{Y_2 - Y_1}{X_2 - X_1}$

$\frac{\Delta Y}{\Delta x} = \frac{m}{s}$

Slope => Velocity

Quantity	Units
Force	N or kg m/s^2
Acceleration	m/s^2
Mass	kg
Velocity	m/s
Distance	m
Time	s
Energy	J or kg m^2/s^2

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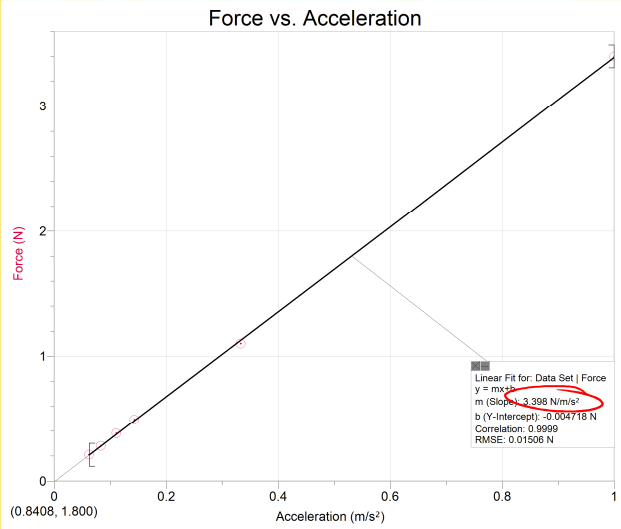
Unit Analysis to Find Physical Quantity of Slope



- Slope

$\frac{\Delta Y}{\Delta x} = \frac{N}{m/s^2}$

$\frac{\Delta Y}{\Delta x} = \frac{kg \cdot m/s^2}{m/s^2}$

$\frac{\Delta Y}{\Delta x} = kg \Rightarrow$ Mass

Quantity	Units
Force	N or kg m/s^2
Acceleration	m/s^2
Mass	kg
Velocity	m/s
Distance	m
Time	s
Energy	J or kg m^2/s^2

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Unit Analysis to Find a Possible Equation.

- $v = v_0 + at^3$

$\frac{M}{S} = \frac{M}{S} + \left[\left(\frac{M}{S^2}\right)\left(S^3\right)\right]$

$\frac{M}{S} = \frac{M}{S} + MS$ Not Valid

- $x = v_0 t + \frac{1}{2}at^2$

$M = \left[\left(\frac{M}{S}\right)(S)\right] + \left[\left(\frac{M}{S^2}\right)\left(S^2\right)\right]$

$M = M + M$ Valid

- $U_g = mgh$

Pot. Energy = m (kg) × Acc of Grav. × Height

$J = (Kg)\left(\frac{M}{S^2}\right)(M)$ Valid

$= Kg\left(\frac{M^2}{S^2}\right)$

Quantity	Units
Force	N or kg m/s^2
Acceleration	m/s^2
Mass	kg
Velocity	m/s
Distance	m
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Energy	J or kg m^2/s^2