Working with Proportioning Technique

Jupiter

	T	R	
x 3.947	7.6×10^6	5.8×10^{10}	x 2.586
	30×10^6	15×10^{10}	

$$2.586^x = 3.947$$

$$\log 2.586^x = \log 3.947$$

$$x \log 2.586 = \log 3.947$$

$$x = \frac{\log 3.947}{\log 2.586}$$

$$x = 1.45 \approx 1.5 = \frac{3}{2}$$

$$T \propto R^{\frac{3}{2}}$$

$$T^2 \propto R^3$$

§1-8 Using Proporting Techniques in Physics

Equations from Proportions

The intensity (I) of light varies inversely with the square of the distance (d). If I = 10 lx and d = 3.0 cm, determine the equation relating the two variables.

proportionality statement $I \propto \frac{1}{d^2}$

general equation $I = \frac{k}{d^2}$

solve for k

$k = Id^2$

$k = (10\,lx)(3.0\,cm)^2$

$k = 90\,lx \cdot cm^2$

specific equation $I = \frac{(90\,lx \cdot cm^2)}{d^2}$

Finding the Proportionality from an Equation

Consider the equation: $a_c = \frac{4\pi^2 R}{T^2}$

$a_c \propto R$

$a_c \propto \frac{1}{T^2}$

Solving Problems Using Proportioning Techniques

SP1 $F \propto v^2$ What happens to F when v is tripled.

$F = kv^2$

new F: $F' = k(3v)^2$

$F' = k(9v^2)$

$F' = 9kv^2$

$F' = 9F$

The new force will be 9 times the original.

2. $V = 1.0 \times 10^5 L$ what will be the new volume if all dimensions are doubled?

$V = \pi r^2 h$

new V: $V' = \pi(2r)^2(2h)$

$V' = \pi(4r^2)(2h)$

$V' = 8\pi r^2 h$

$2^3 = 8$

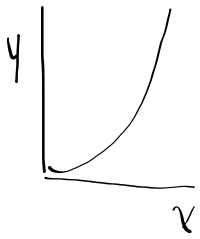
$V' = 8V$

$V' = 8(1.0 \times 10^5 L)$

$V' = 8.0 \times 10^5 L$

↑ new volume

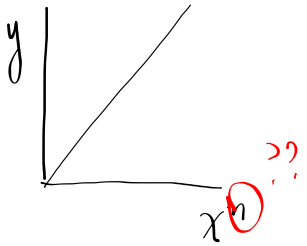
Using Logs to find a proportionality



Power Curve

$y \propto x^n$

$y = kx^n$

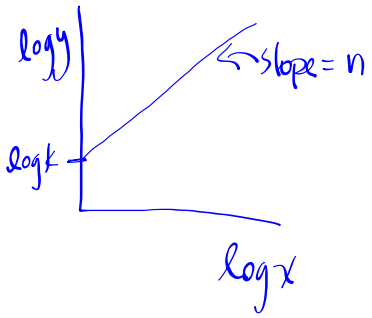


$\log y = \log kx^n$

$\log y = \log k + \log x^n$

$\log y = \log k + n \log x$

$(y = b + mx)$



A graph of Log y vs log x will be linear with a slope of n and a y-intercept of log k.

$\log_{10} k = b$

$10^b = k$

TO DO

① FOP|PP|30

② Assignment (due Tues) → FOP|p38|28-34

ADV 35+36

③ Quiz (wed)

- like PP|23 and p38|26+27.