Relations and Scaling : Review Problems

1. Using the table below:
   a. Determine the proportionality statement between A and B.
   b. Determine the equation relating A to B (i.e. put your equation in the form B=...).
   c. Find the value for B when A = 213 (a whole number answer is fine).

A	B
50	16
75	54
125	250
175	686

$A^3 \propto B$

$B = 1.28\times10^{-4}A^3$

$A = 213,\ B = 1237$

2. Find the equation relating the data in the chart below. Express your answer in two ways (i.e. P=??? and d =??). In both cases show your units on your constant of proportionality (k).

P (W)	D (cm)
3.5	90
10.5	52
25	34
42	26
75	19.4

$P \propto \frac{1}{D^2}$

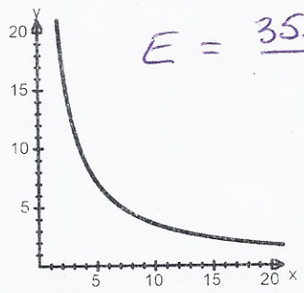
$P = \frac{28227\ W\cdot cm^2}{D^2}$

$D = \frac{168\sqrt{W}\ cm}{\sqrt{P}}$

varies depending on what points for P & D are picked.

3. An experiment produced the set of values shown below for separation (d) and energy (E). A graph was also drawn of E versus d. Determine an equation relating E and d.

Separation d (cm)A	Energy E (J)
2.2	16.2
4.4	8.2
6.1	5.4
11.1	3.3



$E = \frac{35.6\ cm\cdot J}{d}$

4. When a mass is placed on the free end of a board, the end is deflected downwards. The following table shows the downward deflection (d) corresponding to various lengths of board, as measured in each experiment. Each deflection was produced by the same mass.

Length of board (L) (m)	Downward Deflection (d) (cm)
1.0	0.4
2.0	3.2
3.0	10.8
4.0	25.6
5.0	50.0

a. Determine the proportionality relationship between d and L.
b. Determine an equation relating d and L.
c. Predict the deflection when the board is 2.5m and 6.0 m long.

a. $d \propto L^3$

b. $d = (0.4\ cm/m^3)L^3$

c. 6.5 cm
86.4 cm

5. If $V^2 \alpha F^3$. Which of the following statements is true?

a. $V \alpha F$ T / (F)
b. $V^4 \alpha F^6$ (T) / F
c. $V \alpha \sqrt{F^3}$ (T) / F
d. $F \alpha V^2$ T / (F)
e. $F \alpha V^3$ T / (F)
f. $F \alpha V^{2/3}$ (T) / F

6. If can be shown that the kinetic energy (E_k) of a moving car is proportional to the square of its velocity, i.e. $E_k \alpha v^2$. At 90km/h, a certain car's E_k is measured as 400 units.
a. What is the car's E_k at 270 km/h? 3600
b. What is the car's E_k at 45 km/h? 100
c. What is the car's velocity when it's E_k is 16 units? 18 km/hr