JOINT VARIATION

In this variation, not only two variables or quantities are involved, instead it's three or more quantities or variables that are involved in the relationship. It could be that the variables vary directly or inversely or both ways. For instance: when price (p) is high demand (d) decreases; mathematically, the statement is expressed thus:

$$p \propto \frac{1}{d}$$

And when supply (s) is high, demand increases as price increases as price decreases:

$$p \propto \frac{1}{s}; s \propto d$$

$$p \propto \frac{1}{sd}$$

Therefore, price, *p* is jointly varied as supply, *s* and demand, *d*.

Example: the mass, M of a body varies jointly as its specific gravity, s and the cube of its diameter, d. When the diameter is 6cm and the specific gravity is 7.5, the mass is 850g. Find the mass of the body if its specific gravity is 10.5 and diameter is 8cm.

Solving

$M \propto sd^3 \rightarrow M = ksd^3 \rightarrow k = \frac{M}{sd^3}$

$d = 6cm; s = 7.5; M = 850g; k = ?$

$k = \frac{850}{7.5 \times 6^3} = \frac{850}{7.5 \times 36 \times 6} = \frac{850}{1620} = \frac{85}{162}$

Finding the mass of the body, if its specific gravity is 10.5 and diameter is 8cm.

$M = ? ; d = 8cm; s = 10.5; k = \frac{85}{162}$

$M = ksd^3 = \frac{85}{162} \times 10.5 \times 8^3$

$M = \frac{85}{162} \times 10.5 \times 512 = \frac{85}{162} \times 5376 = \mathbf{2820.74g}$