Variations

1. Direct Variations ↑↑

- "As the number of carrots goes up… the cost of carrots goes up." However the ratio of the cost to the number of carrots is always the same
- This relationship is known as **direct variation** or **direct proportion**

$$general\ form \rightarrow y\ \text{OC}\ kx$$

e.g.1	$If\ y\ is\ directly\ proportional\ to\ x\ and\ y = 6\ when\ x = 2$ $i) express\ y\ in\ terms\ of\ x$ $given\ y\ \text{OC}\ x \rightarrow y = kx$ $given\ when\ x = 2, \quad y = 6$ $\rightarrow 2k = 6 \rightarrow k = 3$ $y = 3x$ $ii)\ Find\ the\ value\ of\ x\ when\ y = 12$ $12 = 3x$ $x = 4$
e.g.2	$Given\ that\ the\ mass\ m\ grams\ of\ a\ sphercial\ globe\ varies\ directly\ as\ the\ cube\ of\ its\ radius,$ $rcm\ and\ that\ m = 675g\ when\ r = 30cm, find\ the\ mass\ when\ r = 40cm$ $given\ that\ m\ direct\ pro.\ r^3$ $\rightarrow m = kr^3$ $675 = k30^3$ $k = \frac{675}{2700}$ $k = 0.025$ $\therefore m = 0.025r^3$ $m = 0.025(40)^3 \rightarrow m = 1600g$

2. Inverse Variations ↑↓

- "More workers mean less time required and vice versa".
- This relationship is known as **inversely proportional**

$$general\ form \rightarrow y\ \text{OC}\ \frac{k}{x}$$

e.g.1	$If\ y\ is\ varies\ inversely\ as\ x^2 and\ y = 8\ when\ x = \frac{3}{2}.$ $find\ the\ equation\ connecting\ x\ and\ y.\ Find\ also\ the\ value\ of\ y\ when\ x = 3$ $given\ y = \frac{k}{x^2}$ $8 = \frac{k}{\left(\frac{3}{2}\right)^2} \rightarrow k = 18$ $when\ x = 3 \rightarrow y = \frac{18}{(3)^2} \rightarrow y = 2$
e.g.2	$Given\ that\ the\ mass\ m\ grams\ of\ a\ sphercial\ globe\ varies\ directly\ as\ the\ cube\ of\ its\ radius,$ $rcm\ and\ that\ m = 675g\ when\ r = 30cm, find\ the\ mass\ when\ r = 40cm$ $given\ that\ m\ direct\ pro.\ r^3$ $\rightarrow m = kr^3$

	$675 = k30^3$ $k = \frac{675}{2700}$ $k = 0.025$ $\therefore m = 0.025r^3$ $m = 0.025(40)^3 \rightarrow m = 1600g$