INDIRECT (OR INVERSE) VARIATION

If when one quantity *y* increases, while the other quantity *x* decreases and vice versa in the same ratio then we say that the two quantities *x* and *y* vary indirectly or inversely or that *y* varies inversely as *x*; or *y* is inversely proportional to *x*. It is written like this:

$$y \propto \frac{1}{x} \rightarrow y = \frac{k}{x}$$

Example: if $y \propto \frac{1}{x}$ and $y = 7\frac{1}{2}$, when $x = 4$ find the equation relating y and x. Find y when x = 12 and x when y = 20.

Solving

a. $y \propto \frac{1}{x} \rightarrow y = \frac{k}{x} \rightarrow k = xy$

$y = 7\frac{1}{2} = \frac{15}{2}; x = 4$

$k = \frac{15}{2} \times 4 = 30$

$\boldsymbol{k = 30}$

The equation of the relationship between *x* and *y* is therefore,

$$\boldsymbol{y = \frac{30}{x}}$$

b. $y = ?, x = 12, k = 30$

$y = \frac{k}{x} = \frac{30}{12} = \mathbf{2\frac{1}{2}}$

$\therefore when\ x = 12; y = 2\frac{1}{2}$

c. $x = \frac{k}{y}; k = 30; y = 20$

$x = \frac{30}{20} = \frac{3}{2} = \mathbf{1\frac{1}{2}}$

$\therefore when\ y = 20, x = 1\frac{1}{2}$