Lesson 4

Proportionality : GCSE

4.1 The proportionality symbol

Proportion questions often get asked in an abbreviated form.
Part of the abbreviation involves the symbol $\propto$ which means *proportional to*.

Example 1

If $C \propto \frac{1}{R}$ and $C = 12$ when $R = 4$ write a formula connecting C and R.

Translation

(i) Write down the equation described by,

$$C \text{ is inversely proportional to } R$$

$$\text{The constant of the proportionality is } k$$

(ii) Use $C = 12$ when R is 4, to work out the value of k.

(iii) Rewrite your part **(i)** answer with k replaced with its constant fixed value.

So, to answer this example, answer the translation !

Example 2

If $T \propto AX$ and $T = 30$ when $A = 2$ and $X = 3$ write a formula connecting T, A and X.

4.2 Exercise

Question 1

If $Q \propto t$ and $Q = 20$ when $t = 4$ write a formula connecting Q and t.

Question 2

If $y \propto \frac{1}{x}$ and $y = 6$ when $x = 2$ write a formula connecting y and x.

Question 3

If $w \propto z^2$ and $w = 45$ when $z = 3$ write a formula connecting w and z.

Question 4

If $F \propto \sqrt{G}$ and $F = 18$ when $G = 81$ write a formula connecting F and G.

Question 5

If $R \propto \frac{1}{P^2}$ and $R = 4$ when $P = 4$ write a formula connecting R and P.

Question 6

If $L \propto \frac{1}{\sqrt{M}}$ and $L = 12$ when $M = 25$ write a formula connecting L and M.

Question 7

If $C \propto D^3$ and $C = 81$ when $D = 3$ write a formula connecting C and D.

Question 8

*This question tries to confuse by using the letter K as one of the variables. *CARE**

If $H \propto KC$ and $H = 75$ when $K = 3$ and $C = 5$ write a formula connecting H, K and C.

Question 9

If $I \propto \frac{J}{Q}$ and $I = 18$ when $J = 24$ and $Q = 8$ write a formula connecting I, J and Q.

Question 10

$T \propto \frac{1}{W A}$ and $T = 60$ when $W = 4$ and $A = 3$. Write a formula connecting T, W and A.

Question 11

$E \propto \sqrt{F G}$ and $E = 18$ when $F = 3$ and $G = 12$. Write a formula relating E, F and G.

Question 12

$s \propto \frac{t^2}{c}$ and $s = 10$ when $t = 8$ and $c = 32$. Write a formula connecting s, t and c.

Question 13

$X \propto \frac{R\sqrt{A}}{Y}$ and $X = 200$ when $R = 8$, $A = 25$ and $Y = 4$.

Write a formula connecting X, R, A and Y.

Question 14

T is inversely proportional to m.

$T = 6$ when $m = 2$.

Write a formula of the form $T = \frac{k}{m}$ in which is placed the appropriate k value.

Question 15

$$R \propto \frac{1}{Q}$$

If $R = 32$ when $Q = 4$ determine, k, the constant of the proportionality.

Hence write out a formula in terms of R, Q, and the numerical value of k.

Question 16

W is inversely proportional to x.

$W = 5$ when $x = 12$.

Write a formula of the form $W = \frac{k}{x}$ in which is placed the appropriate k value.

Use your formula to fill in the empty entries in the following table;

W	5			10	
x	12	24	1		3

Question 17

While doing underwater tests in one part of an ocean, a team of scientists noticed that the temperature, t, in °C was inversely proportional to the depth, d, in kilometres.

When the temperature was 3°C the depth was 1.5 km.

Plot a graph showing how how temperature varies with depth.

* Put depth on the x-axis and have $0 \leqslant d \leqslant 10$
* Put temperature on the y-axis and have $0 \leqslant t \leqslant 5$