Type 1 – Finding the Percentage Change

1) This is the formula for giving a change in value as a percentage:

$$\text{Percentage 'Change'} = \frac{\text{'Change'}}{\text{Original}} \times 100$$

2) You end up with a percentage rather than an amount.
3) Typical questions will ask 'Find the percentage increase / profit / error' or 'Calculate the percentage decrease / loss / discount', etc.

Type 2 – Finding the Original Value

Example: A house increase in value by 10.5% to £132,600. Find what it was worth before the rise.

1) An increase of 10.5% means £132,600 represents 110.5% of the original value.
2) Divide by 110.5 to find 1% of the original value.
1) Then multiply by 100.

÷110.5: £132 600 = 110.5%
×100: £1200 = 1%
£120 000 = 100%
So the original value was £120 000

If it was a decrease of 10.5%, then you'd put '£132 600 = 89.5%' and divide by 89.5 instead of 110.5.

Simple Interest

Simple interest means a certain percentage of the original amount only is paid at regular intervals (usually once a year). So the amount of interest is the same every time it's paid.

EXAMPLE: Regina invests £380 in an account which pays 3% simple interest each year. How much interest will she earn in 4 years?

1) Work out the amount of interest earned in one year: 3% = 3 ÷ 100 = 0.03; 3% of £380 = 0.03 × £380 = £11.40
2) Multiply by 4 to get the total interest for 4 years: 4 × £11.40 = £45.60

Compound Growth and Decay

This topic is simple if you LEARN THIS FORMULA. If you don't, it's pretty well impossible:

$$N = N_0 \times (\text{multiplier})^n$$

- N: Amount after n days/hours/years
- N_0: Initial amount
- multiplier: Percentage change multiplier. E.g. 5% increase is 1.05 (= 1 + 0.05); 26% decrease is 0.74 (= 1 – 0.26)
- n: Number of days/hours/years

Proportion

Algebraic proportion questions normally involve two variables (often x and y) which are linked in some way.

Types of Proportion

∝ means 'is proportional to'.

1) The simple proportions are 'y is proportional to x' ($y \propto x$) and 'y is inversely proportional to x' ($y \propto \frac{1}{x}$).
2) You can always turn a proportion statement into an equation by replacing '∝' with '= k' like this:

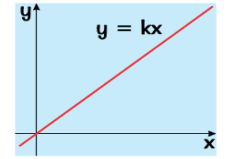
	Proportionality	Equation
'y is proportional to x'	$y \propto x$	$y = kx$
'y is inversely proportional to x'	$y \propto \frac{1}{x}$	$y = \frac{k}{x}$

k is just some constant (unknown number)

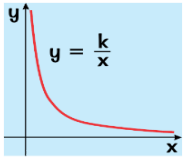
3) Trickier proportions involve y varying proportionally or inversely to some function of x, e.g. x^2, x^3, $\sqrt{x}$ etc.

	Proportionality	Equation
'y is proportional to the square of x'	$y \propto x^2$	$y = kx^2$
't is proportional to the square root of h'	$t \propto \sqrt{h}$	$t = k\sqrt{h}$
'V is inversely proportional to r cubed'	$V \propto \frac{1}{r^3}$	$V = \frac{k}{r^3}$

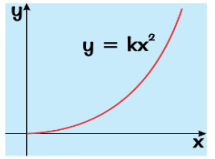
4) Once you've written the proportion statement as an equation you can easily graph it.



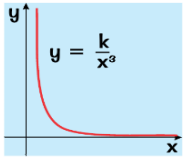
y is proportional to x



y is inversely proportional to x



y is proportional to x^2



y is inversely proportional to x^3

Key Steps:

1) Write the sentence as a proportionality and replace '∝' with '= k' to make an equation (as above).
2) Find a pair of values (x and y) somewhere in the question — substitute them into the equation to find k.
3) Put the value of k into the equation and it's now ready to use, e.g. $y = 3x^2$.
4) Inevitably, they'll ask you to find y, having given you a value for x (or vice versa).

EXAMPLE: G is inversely proportional to the square root of H. When G = 2, H = 16. Find an equation for G in terms of H, and use it to work out the value of G when H = 36.

1) Convert to a proportionality and replace ∝ with '= k' to form an equation. $G \propto \frac{1}{\sqrt{H}}$ $G = \frac{k}{\sqrt{H}}$
2) Use the values of G and H (2 and 16) to find k. $2 = \frac{k}{\sqrt{16}} = \frac{k}{4} \Rightarrow k = 8$
3) Put the value of k back into the equation. $G = \frac{8}{\sqrt{H}}$ ← This is the equation for G in terms of H.
4) Use your equation to find the value of G. When H = 36, $G = \frac{8}{\sqrt{36}} = \frac{8}{6} = \frac{4}{3}$

Key Words

Percentage change; Simple interest; Compound interest; Growth/Decay

Linked Topics

Percentage increase/decrease; Express a number as a percentage of another