



# Repeated Proportional Change



## Percentage Multipliers

To increase by a percentage add the increase percentage to 100%, convert to the decimal equivalent and multiply.

For example:

Increase £50 by 12%

$$50 \times 112\%$$

$$= 50 \times 1.12$$

$$= \text{£}56 \quad (\text{don't forget units})$$

In this example 1.12 is the multiplier

To decrease by a percentage subtract the decrease percentage from 100%, convert to the decimal equivalent and multiply.

For example:

Decrease 85 kg by 4%

$$85 \times 96\%$$

$$= 85 \times 0.96$$

$$= 81.6 \text{ kg} \quad (\text{don't forget units})$$

In this example 0.96 is the multiplier

If a value is being increased or decreased by the same percentage over regular intervals we can use the following formula.

$$\text{Final amount} = \text{Principal amount} \times (\% \text{ multiplier})^n$$

Where n is the number of years/months/days etc

This formula works for increases and decreases.

## Worked Examples

Tom invests £3000 for 5 years with a fixed compound interest rate of 3.5%. How much does Tom have after 5 years?

$$3000 \times 1.035^5 = \text{£}3563.06$$

Principal amount

Multiplier

Number of regular intervals

The population in a village is decreasing at a rate of 1% every 6 months. If the population is presently 2200, what will it be in 4 years?

$$2200 \times 0.99^8 = 2030.03\dots$$

Principal amount

Multiplier

Number of 6 month intervals in 4 years

It may not always be the same percentage – in this case you cannot use the above formula but you can still work it out using just one calculation.

For example:

An investment of £4350 earns 5% interest in the first year, 4% in the second year and 3% in the following 2 years. What is the investment worth after these 4 years?

$$4350 \times 1.05 \times 1.04 \times 1.03^2 = \text{£}5039.49$$