Compound interest

Compound interest means that not only is interest paid on the principal amount but interest is paid on the interest. It is compounded (or added to).

This sounds complicated but the example below will make it clear.

A builder is going to build six houses on a plot of land in Spain. He borrows 500 000 euro at 10% and will pay off the loan in full after three years.

At the end of the first year he will owe €500 000 + 10% of €500 000 i.e. 550 000 euro
At the end of the second year he will owe €550 000 + 10% of €550 000
i.e. €550 000 + €55 000 = 605 000 euro
At the end of the third year he will owe €605 000 + 10% of €605 000
i.e. €605 000 + €60.5 000 = 665 500 euro
His interest will be 665 500 - 500 000 euro i.e. 165 500 euro

The simple interest is 50 000 euro a year
i.e. 150 000 euro in total

The extra 155 000 euro was the compound interest.

The time taken for a debt to grow at compound interest can be calculated as shown in the example below.

How long will it take for a debt to double at a compound interest of 27%?

After 1 year the debt D will be D(1 + 27%) or 1.27D.
After 2 years the debt D will be (1.27 × 1.27)D or 1.61D.
After 3 years the debt D will be (1.27 × 1.27 × 1.27)D or 2.05D.
i.e. the debt will be more than doubled after 3 years.

Exercise

1. A shipping company borrows £70 million at 5% compound interest to build a new cruise ship. If it repays the debt after three years, how much interest will the company pay?

2. A woman borrows 100 000 euro to improve her house. She borrows the money at 15% interest and repays it in full after three years. What interest will she pay?

3. A man owes £5000 on his credit cards. The annual percentage rate APR is 20%. If he lets the debt grow, how much will he owe in four years?

4. A school increases its intake by 10% each year. If it starts with 1000 students, how many will it have at the beginning of the fourth year of expansion?

5. 8 million tonnes of fish were caught in the North Sea in 2005. If the catch is reduced by 20% each year for four years, what amount can be caught at the end of this time?

6. How many years will it take for a debt to double at 42% compound interest?

7. How many years will it take for a debt to double at 15% compound interest?

8. A car loses value at 27% compound interest. How many years will it take for its value to have halved?