

FINANCIAL MATHEMATICS

25 FEBRUARY 2013

Lesson Description

In this lesson we:

- Look at investments, loan repayments and compound interest.
- The type of questions we will look at are:
 - How long will it take R100, invested at 5% compound interest, to grow to R1 000?
 - How much money do you need to save each month if you want to have enough money to buy a car in 2 years time?
 - What is a sinking fund?
 - How are home loan repayments calculated?

Key Concepts

Example A

- A **sinking fund** is just an example of a future value annuity in which we invest cash so that we have a particular amount of money available when we need it. For example, managers in a business know that they will need to replace a certain piece of machinery in 5 years time. So what do they do?
- Machinery is purchased at a cost of R250 000 and is expected to rise in cost at 15%p.a.compound interest, and depreciate in value at a rate of 8% p.a. compounded annually.
- A sinking fund is started to make provision for replacing the old machine. The sinking fund pays 16% p.a. compounded monthly, and you make payments into this ordinary annuity for 5 years.

Determine:

- a.) The replacement cost of the new machine 5 years from now.
- b.) The scrap value of the machine in 5 years time.
- c.) The monthly payment into the sinking fund that will make provision for the replacement of the new machine.

Example B

Loan Repayments

- Often, when we take a loan we have to pay back a certain amount each month until the loan is paid off.
- The amount we pay back each month is also called an annuity. It is called a PRESENT VALUE annuity.
- When the principal and the interest are paid by means of an annuity, we say that the debt is **amortised**.

Formula: Present Value Annuity: Loan Repayment

$$P_v = x \left[\frac{1 - (1 + i)^{-n}}{i} \right]$$

Example C

Tumi plans to buy a R1 million house on a 20 year mortgage. A bank is offering mortgage bonds at 16,25% p.a. compounded monthly. Calculate the monthly repayments that Tumi will have to make in order to amortise the loan.

Question**Question 1**

(Adapted from Grade 12 Department of Education Nov 2009)

A car that costs R130 000 is advertised in the following way: "No deposit necessary and first payment due three months after date of purchase"

The interest rate quoted is 18% p.a. compounded monthly.

- a.) Calculate the amount owing two months after the purchase date.
- b.) John bought this car on 1 March 2009 and made his first payment on 1 June 2009. Thereafter he made another 53 equal payments on the first day of each month.
 - i.) Calculate his monthly repayments
 - ii.) Calculate the total of all John's payments
- c.) Paul also bought a car for R130 000. He also took out a loan for R130 000, at an interest rate of 18% p.a. compounded monthly. He also made 54 equal payments. However, he started payments one month after the purchase of the car.
 - i.) Calculate the total of all Paul's repayments.
 - ii.) Calculate the difference between John and Paul's total repayments.