LOAN BALANCE IN SPREADSHEETS

Reducing Balance Loans

REDUCING BALANCE LOANS

A loan will accrue interest, usually with a compounding period more frequent than just annually.

Repayments are made at the end of each compounding period.

When repayments are larger than the interest accrued, the balance owed loan will get smaller over time – called a reducing balance loan.

MODELLING INTEREST AND REPAYMENTS IN A SPREADSHEET

Loan Amount	
Nominal Interest	
Compounding periods each year	
Payments	

Month	Opening Balance	Interest	Payment	Closing Balance
1				
2				
3				
4				
5				

EXAMPLE PROBLEM

John takes out a loan for $200 000 with a nominal interest rate of 4.20 % pa. Using a spreadsheet, compare the amount of money John would spend paying off the loan between:

- $500 payment made weekly (interest compounded weekly)
- $1000 payments made fortnightly (interest compounded fortnightly)

Fortnightly payments tally to $241 746.12
Weekly payments tally to $241 648.50
(Be careful of the value of the final payment)

LOAN BALANCE USING A RECURRENCE RELATION

Reducing Balance Loans

BREAKING IT DOWN

Loans accrue interest each compounding period. A compounding loan is modelled using a geometric recurrence relation.

Repayments reduce the balance of a loan by fixed amounts. Repayments are modelled as arithmetic recurrence relation.

When both interest and repayments are considered, the balance of a loan is modelled by a combination of geometric and arithmetic relations – a first order linear recurrence relation.

BUILDING THE RECURRENCE RELATION

Consider a loan taken out for $300 000 with 0.47 % interest applied each month. A $2000 repayments is made each month. What is equation of the recurrence relation for the balance of the loan at the end of each month?

EXAMPLE PROBLEM

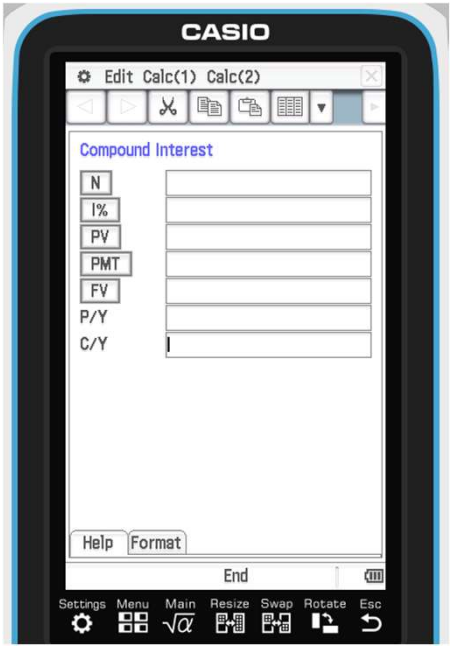
Consider a savings account that, starting from nothing, has regular weekly deposits of $100. The savings account earns 1.30 % pa, compounded weekly. Deduce a recurrence equation for the balance in the account.

LOAN BALANCE AND SAVINGS USING A CALCULATOR

Reducing Balance Loans

FINANCE APP IN CALCULATOR

Some problems or repeatable problems are best solved using a dedicated finance application.



- Number of payments, **total**
- Nominal interest rate
- Principal value*
- Payment amount (PMT = **P**ay**M**en**T**)*
- Final/Future value (after N payments)*
- Payments (P) and compoundings (C) per year (Y).

*positive if receiving money, negative if giving money to bank

EXAMPLE PROBLEM

Clarence takes out a $230 000 loan at 4.60 % pa. She wants to reduce the amount owed on the loan to less than $60 000 within 15 years. What is the size of her repayments if both the interest and payments are calculated at the end of each month?