Finance with the TVM Solver

Introduction

The biggest financial commitment for most Australians will be purchasing a residence in which to live. For most people their mortgage (loan) will tie up a significant proportion of their income for at least 20 to 30 years. It therefore makes perfect sense to understand what is happening with the money and potentially how to save some along the way. This introductory activity illustrates how to use the Time – Value – Money (TVM) solver on the TI-Nspire CX calculator. Accounting for all the variations regarding the number of payments per year, compounding periods per year and the total number of repayments can be very challenging task by-hand. The TVM solver wizard does most of the hard work for you, leaving you to focus on understanding what can make a difference to the total amount of money you will really spend on your number one financial commitment.

Problem Statement

Imagine you just purchased an apartment for $400 000. You pay a 30% deposit, and mortgage the balance. You amortise your debt with monthly repayments for 30 years.
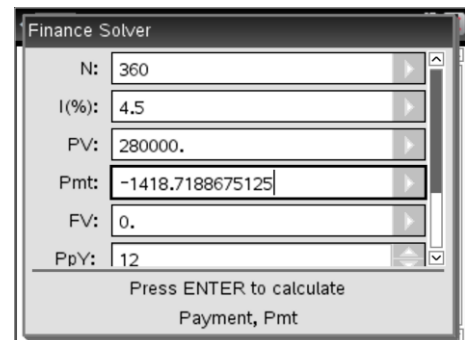
a.   What is your monthly payment if your interest rate for the loan is 4.5% compounded monthly?

Teacher Notes:

Students should use the TAB key to navigate through this dialogue box. The ENTER key computes answers, so pressing ENTER after an entry forces a calculation.

Answer:

$1418.72 (Repayment amount per month)

b.   Create an amortisation table for the first 2 years of this scenario.

Teacher Notes:

With the TVM solver used in the previous question, tvm.pmt variable holds the most recently computed Payment amount for the previous scenario. This is a quick way to recall this amount.

Answer:

Amortisation Table (As shown)

Authors: Brown & Fox

TEXAS INSTRUMENTS

c. Use the amortisation table to see what percentage of your total repayments have contributed to the repayment of your actual debt for the first two years.

Teacher Notes:

Students may be surprised at how little money has been paid back on the original debt. As the loan continues this percentage grows.

Answer:

Total Payments to date: 24 x $1,418.72 = $34049.25
Amount paid off original debt: $280,000 - $270758.9 = $9241.61

Only 27% of the repayment amounts have contributed toward reducing the principal debt.

16	-1028.71	-390.01	273931.62
17	-1027.24	-391.48	273540.14
18	-1025.78	-392.94	273147.2
19	-1024.3	-394.42	272752.78
20	-1022.82	-395.9	272356.88
21	-1021.34	-397.38	271959.5
22	-1019.85	-398.87	271560.63
23	-1018.35	-400.37	271160.26
24	-1016.85	-401.87	270758.39

◀ortTbl(24,360,4.5,280000,**tvm.pmt**,0,12,12)

Instructions – Part A

Open a new TI-Nspire Document and insert a **Calculator Application**.

Select **Finance Solver** from the **Finance menu**.

[Menu] > Finance > Finance Solver …

In this problem the loan runs for 30 years with 12 payments each year:

N = 30 x 12

The interest rate is set at 4.5%:

I(%) = 4.5

The Principal Value is the amount of money being borrowed:

PV = 0.7 x 400000

The Payment amount is to be determined and is therefore left blank (0)

PMT = 0

The Future Value will be zero, that is, complete repayment of the loan.

FV = 0

The Payments Per Year (PPY) and Compounding Periods per Year (CPY) are both 12, representing monthly inputs.

Note: All computed values will now be accessible from the variable menu. (VAR)

Finance Solver

N:	360
I(%):	4.5
PV:	280000.
Pmt:	0
FV:	0.
PpY:	12

Press ENTER to calculate
Payment, Pmt
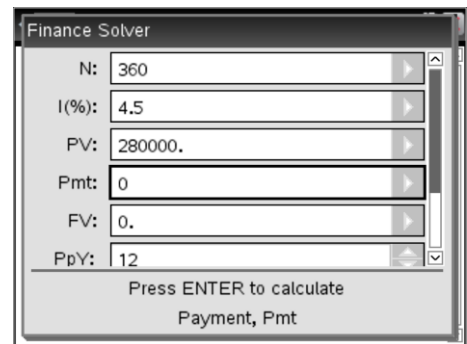
Press [Enter] in the corresponding entry line to compute the amount.
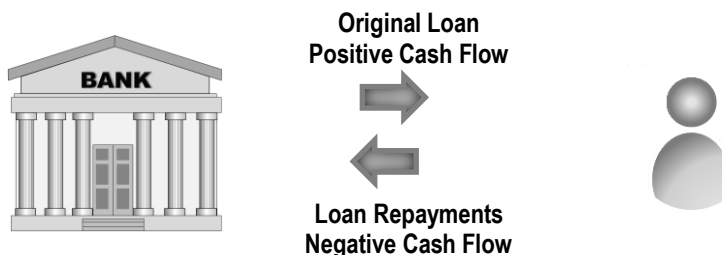
Calculator Tip!

The computed Payment (PMT) amount is for this scenario is negative. The negative sign indicates the cash flow is in the opposite direction to the original loan.

Original Loan: Cash flow is from the bank to you.

Repayment: Cash flow is from you to the bank.

BANK

**Original Loan
Positive Cash Flow**

**Loan Repayments
Negative Cash Flow**

Authors: Brown & Fox

TEXAS INSTRUMENTS

Instructions – Part b

In the **Calculator Application**.

Create an Amortisation Table:

[Menu] > Finance > Amortisation > Amortisation Table

The syntax for this command is quite large (Available from catalogue):

amortTbl(NPmt,N,I,PV,[PMT],[FV],[PpY],[CpY],[PmtAt],[roundVale])

NPmt = Number of payments to be included in the table

N = Total number of payments in loan

I = Interest Rate

PV = Principal Value

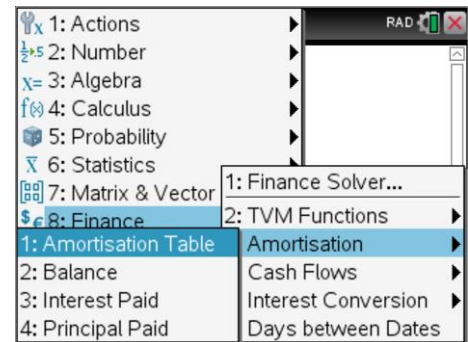PMT = Payment amount [Optional] (default = 0)

FV = Future Value [Optional] (default = 0)

PpY = Payments per Year [Optional] (default = 1)

CpY = Compounding periods per Year [Optional] (default = 1)

PmtAt = Payments at start or end of month [Optional] (default = 0[1])

RoundValue = Number of decimal places to include in table

To accept the default values for optional items leave a blank entry between the corresponding commas.

An amortisation table shows the relationship between interest and principal paid at each payment cycle. Line 24 for this amortisation table scenario reads:

| 24 | −1016.85 | −401.87 | 270758.39 |

The first figure (24) represents the 24th month of the mortgage. The amount in the second column -$1016.85 represents the amount of the monthly repayment (-$1418.72) that is contributing towards interest repayments only. The amount in the third column (-$401.87) represents the amount from each monthly repayment that is contributing towards paying down the original loan amount. The last column ($270758.39) represents the current loan balance.

Explore what happens over a period of five years if the monthly repayment is increased above the computed repayment amount. Try values that may be achievable for a new home buyer such as $1600.00.

Teacher Notes:

Students can see the difference a small increase in loan repayments can make even at this early stage in the loan. This prompt builds on Question C where student computed that only 27% of the payments for the first two years paid down the original loan debt. Additional payments however work directly on the Principal and can therefore reduce the duration of the loan significantly.

Students can explore scenarios such as paying $1600 per month instead of the computed $1418.72 for just the first 5 years then revert back to the original computed value. How much money will be saved over the course of the loan?

This reduces the total amount that would be paid back by: $35,751.74

The additional contributions amount to: $10,876.87

This represents a saving of: $24,874.87

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[1] PmtAt: Refers to when a payment is made, at the Start (1) or End (0) of the month.

Authors: Brown & Fox