

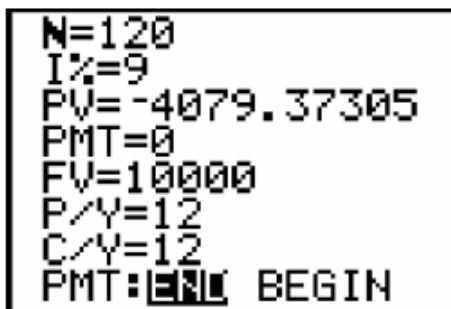
9.3 Paying Back Loans & Amortization Period

Determining the Cost of a Loan Using Technology

There are many online applications that enable people to determine the cost of various loans. These apps enable the user to manipulate different variables such as interest rates, payment periods and compounding frequency as well as observe what impact these variables will have on interest paid and the time taken to pay off a loan. Such apps can be found at various bank web sites such as CIBC, Scotia Bank, TD, and BMO.

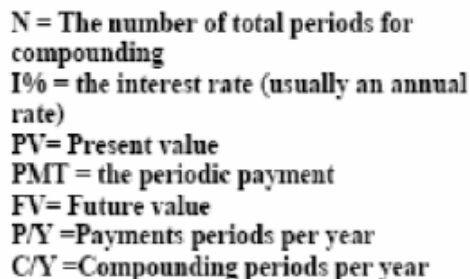
There is an app on the TI83 Plus graphing calculator that also enables us to do these things. It is called "Finance". Below are instructions for getting into this app.

Press [APPS], then FINANCE, choose TVM Solver. Press [ENTER]



```
N=120
I%=9
PV=-4079.37305
PMT=0
FV=10000
P/Y=12
C/Y=12
PMT: [ ] [ ] [ ] BEGIN
```

Screen shot - sample values used.



N = The number of total periods for compounding
I% = the interest rate (usually an annual rate)
PV = Present value
PMT = the periodic payment
FV = Future value
P/Y = Payments periods per year
C/Y = Compounding periods per year

Explanation of what each variable represents.

Notes:

- if a variable is not being used in a question, or it is being solved for, put in zero for its value.
- For our purposes we will always leave PMT at END

To solve for a variable:

- Make sure you put in 0 for its' value.
- Hit "Apps" then "Finance".
- Scroll down to the variable you want to solve for and hit "Enter".

Example 1:

When you were born your grandparents deposited \$5,000 in a special account for your 21st birthday. The interest was compounded monthly at 5%. How much will it be worth on your 21st birthday?

(A) Enter the values that you would type in on the TI83 Plus.

N= 252
I%= 5
PV= 5000
PMT= 0
FV= 0
P/Y= 12
C/Y= 12
PMT: END BEGIN

When we enter these values and run the app, the calculator returns the following value:

FV = 14257.12055

$$N = 21 \times 12 = 252$$

(B) How much is the investment worth on your 21st birthday?

\$14,257.12

(C) Show how the data entered into the calculator would change if your grandparents not only paid a lump sum of money into an investment, but also added an extra \$10 every month.

N= 252
I%= 5
PV= 5000
PMT= 10
FV= 0
P/Y= 12
C/Y= 12
PMT: END BEGIN

$$FV = -18700.54$$

* Drop the negative

(D) What would the investment now be worth on your 21st birthday?

\$ 18700.54

Example 2:

Suppose you find a car for \$12,500. You are going to put \$3000 down and take a loan for the rest for 4 years? The rate offered to you is 8.3%. What is your car payment each month?

Complete the following and use a TI83 Plus to solve for the monthly payment.

N= 48
I%= 8.3
PV= 9500
PMT= 0
FV= 0
P/Y= 12
C/Y= 12
PMT: END
BEGIN

$$N = 4 \times 12 = 48$$

$$PV = 12500 - 3000 = 9500$$

$$PMT = -233.26$$

$$\text{Monthly Payment: } \$233.26$$

Example 3:

Brittany takes out a loan for \$100 000 at 3.25% interest, compounded monthly. She takes 20 years to repay the loan. Ask students to answer to following:

- (A) Use a financial application to determine the amount of each monthly payment.
- (B) How much interest will she have paid at the end of the 20 years?

N= 240
I%= 3.25
PV= 100 000
PMT= 0
FV= 0
P/Y= 12
C/Y= 12
PMT: END
BEGIN

$$N = 20 \times 12 = 240$$

$$(A) \text{ PMT} = -567.20$$

$$\text{Monthly payment: } \$567.20$$

$$(B) \begin{aligned} & 240 \times \$567.20 \\ & = \$136128.00 \end{aligned}$$

$$\begin{array}{r} \$136128.00 \\ - \quad 100000.00 \\ \hline \$36128.00 \end{array}$$

Amortization Period

This refers to the total amount of time that it takes to pay off a loan. For example, if you take out a five year payment for a new vehicle, then the amortization period for the loan is five years.

If you take on a short amortization period, this will do two things:

- Increase your regular payments (ie. larger monthly payments)
- Decrease the total interest paid.

Thus, it is often to a customer's benefit to decrease an amortization period, provided the larger payments are manageable for the customer.

Example 4:

Compare the monthly payments on a mortgage of \$300,000 at an interest rate of 3.5% compounded monthly, with no down payment, for amortization periods of (A) 25 years and (B) 20 years.

$N = 25 \times 12 = 300$

(A)

N= 300
I%= 3.5
PV= 300 000
PMT= 0
FV= 0
P/Y= 12
C/Y= 12
PMT: END
BEGIN

$PMT: -1501.87$

$N = 20 \times 12 = 240$

(B)

N= 240
I%= 3.5
PV= 300 000
PMT= 0
FV= 0
P/Y= 12
C/Y= 12
PMT: END
BEGIN

$PMT: -1739.88$

(C) How much will you pay overall for each option?

$300 \times \$1501.87$
 $= \$450 561.00$

$240 \times \$1739.88$
 $= \$417 571.20$

(D) How much interest gets paid in each case?

$$25 \text{ yr: } \$450\,561.00 - \$300\,000 \\ = \$150\,561.00$$

$$20 \text{ yr: } \$417\,571.20 - \$300\,000 \\ = \$117\,571.20$$

(E) What are the monthly payments for each option?

$$25 \text{ yr: } \$1501.87$$

$$20 \text{ yr: } \$1739.88$$