B–20 Creating Repayment Schedules Using the TVM Solver

In this section, you will create a repayment schedule, by applying some of the financial functions from the Finance CALC menu.

Part 1: Introducing Other Finance CALC Menu Functions

You have used the **TVM Solver** to find, for example, future value and present value. The calculator can use the information that you have entered into the **TVM Solver** to perform other functions. Here are three other functions:

ΣInt(*A*, *B*, *roundvalue*)	calculates the sum of the interest paid from period *A* to period *B*
ΣPrn(*A*, *B*, *roundvalue*)	calculates the sum of the principal paid from period *A* to period *B*
bal(*x*, *roundvalue*)	calculates the balance owing after period *x*

The calculator rounds as it calculates. You will need to tell the calculator the value for rounding, *roundvalue*. The greater *roundvalue* is, the greater the accuracy of the calculations. In this section, the *roundvalue* is 6, which is also the value that banks use.

Part 2: Using the TVM Solver and Other Finance CALC Menu Functions

Press MODE and change the fixed decimal mode to 2, because most of the values in this section represent dollars and cents.

EXAMPLE 1

Eleanor finances the purchase of a new pickup truck by borrowing $18 000. She will repay the loan with monthly payments. The term of the loan is five years. The interest rate is 14%/a, compounded monthly.

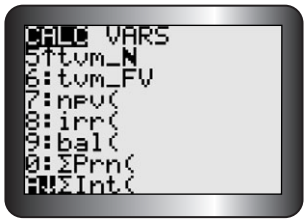
a) How much is the monthly payment?
b) How much will she pay in interest?
c) How much will she still owe on the loan after the 30th payment, that is, at the halfway point in repaying the loan?
d) What portion of the 30th payment reduces the principal?

Solution

a) Press APPS and select **1:Finance**. Then press ENTER to select **1:TVM Solver** from the Finance CALC menu. Enter **N** = 60, because 12 × 5 = 60. Enter **I%** = 14, **PV** = 18 000, **FV** = 0, **P/Y** = 12, and **C/Y** = 12. Notice that the present value, **PV**, is a positive number because Eleanor receives (a cash inflow) $18 000 from the bank.

Scroll to the line containing **PMT** and press ALPHA ENTER. The monthly payment is $418.83.

The payment appears as a negative value, because Eleanor pays this amount each month. The actual value is −418.828 515 3, which the calculator rounded to −418.83.

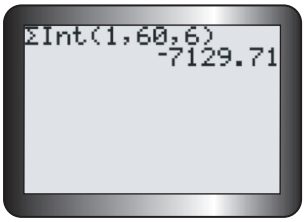


b) Use **ΣInt**(*A*, *B*, *roundvalue*) to calculate the total interest that Eleanor will pay.

Press [2nd] [MODE] to return to the home screen. Press [APPS] and select **1:Finance** from the Finance CALC menu. Select **ΣInt** by scrolling down or by pressing [ALPHA] [MATH].

Press [ENTER].

Press [1] [,] [6] [0] [,] [6] [)] [ENTER].



The sum of the interest paid from the first period to the 60th period is calculated.

By the end of the loan, Eleanor will have paid $7129.71 in total interest. Eleanor will have paid $7129.71 + $18 000 = $25 129.71 in interest and principal for the truck. Note that the product of the payment, $418.83, and the total number of payments, 60, is $25 129.80. The difference of $0.09 is due to rounding, because 418.828 515 3 was rounded to 418.83.

c) Find the balance on the loan after the 30th payment. *roundvalue* must be consistent, that is, 6.

From the Finance CALC menu, select **bal** by scrolling or by pressing [9].

Press [3] [0] [,] [6] [)] [ENTER].

Eleanor still owes $10 550.27 after the 30th payment. (Why is this amount not $9000?)

d) Find the portion of the 30th payment that reduces the principal by calculating the sum of the principal paid from the 30th payment to the 30th payment. In the words, you are calculating the sum of only one item, the 30th payment. *roundvalue* is again 6. From the Finance CALC menu,

select **ΣPrn** by scrolling down or by pressing [0]. Press [3] [0] [,] [3] [0] [,] [6] [)] [ENTER].

The portion of the 30th payment that reduces the principal is $292.33. The other portion of this payment, $126.50, is interest.

Part 3: Using the Finance Functions to Create Repayment Schedules

Use the functions described in parts 1 and 2 to create repayment schedules or amortization tables.

EXAMPLE 2

Recall that Eleanor borrows $18 000 to purchase a pickup truck. She will repay the loan with monthly payments. The term of the loan is five years. The interest rate is 14%/a compounded monthly.

a) What will be the monthly outstanding balance on the loan after each of the first seven months?

b) Create a repayment schedule for the first seven months of the loan.

c) Use the repayment schedule to verify that the loan is completely paid after five years or 60 payments.

Solution

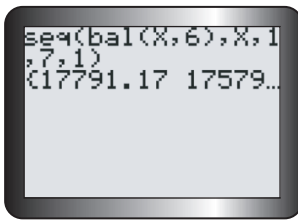
a) Find the outstanding balance after each payment for the first seven months. You will combine **sequence** (List OPS menu) and **bal**.

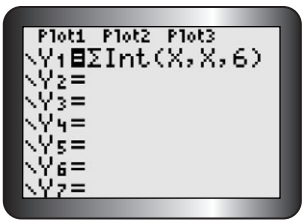
From the home screen, press [2nd] [STAT] [▶] [5] to select sequence.

Then press [APPS] [ENTER] [9] to select **bal**.

Press [X, T, Θ, n] [,] [6] [)] [,] [X, T, Θ, n] [,] [1] [,] [7] [,] [1] [)].

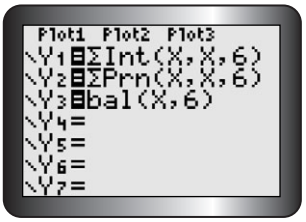
Press [ENTER] to calculate the sequence of balances, beginning with the first month, 1, and ending with the last month, 7. The increment for this sequence is 1, which is the last value entered. Recall that the increment is the change from payment number to payment number. Scroll right ([▶]) to see the other balances.





b) Create a repayment, or an amortization, schedule for the first seven months by comparing the interest, principal, and balance in a table.

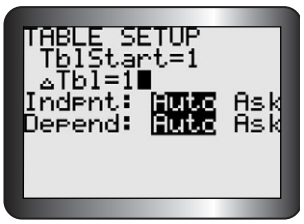
Begin by opening the equation editor. Press [Y=]. Clear **Y1** to **Y3**, if necessary. Store the interest portion of each payment in **Y1**. Move the cursor to the right of **Y1=**. Press [APPS] [ENTER] [ALPHA] [MATH] to select **ΣInt**. Press [X, T, Θ, *n*] [,] [X, T, Θ, *n*] [,] [6] [)] [ENTER].

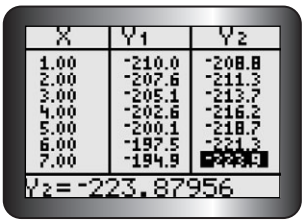


To store the principal portion of each payment in Y2, press [APPS] [ENTER] [0] to select **ΣPrn**. Press [X, T, Θ, *n*] [,] [X, T, Θ, *n*] [,] [6] [)] [ENTER].

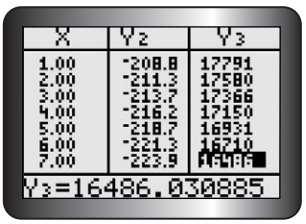
To store the outsanding balance after each payment in **Y3**, press [APPS] [ENTER] [9] to select **bal**. Press [X, T, Θ, *n*] [,] [6] [)] [ENTER].

Before viewing the table, press [2nd] [WINDOW]. Set **TblStart** to 1 and **ΔTbl** to 1. The table will start with payment 0 and the payment number will increase by 1 at each step.



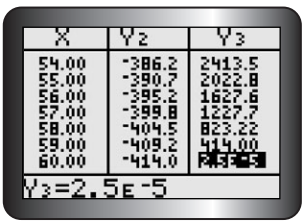


Press [2nd] [GRAPH] to see the amortization table. Notice that the interest portion and the principal portion of each payment appear as negative values. Each payment, which is a combination of interest and principal, is a cash outflow for Eleanor.



Scroll right to see the values for **Y3**, the outstanding balance.

The outstanding balance after seven payments is $16 486.03.



c) Scroll or reset the tables's start value to see other entries in the amortization table. Scroll up to the beginning of the table. Notice that a substantial portion of the $418.83 payment is interest. Scroll down the table. At the end of the amortization, none of the payment is applied to the principal. The final outstanding balance is **2.5E⁻5**. As a decimal, this value is $0.000 25. Therefore, the amortization period of 60 payments is correct. The loan will be paid completely after five years or 60 payments.