



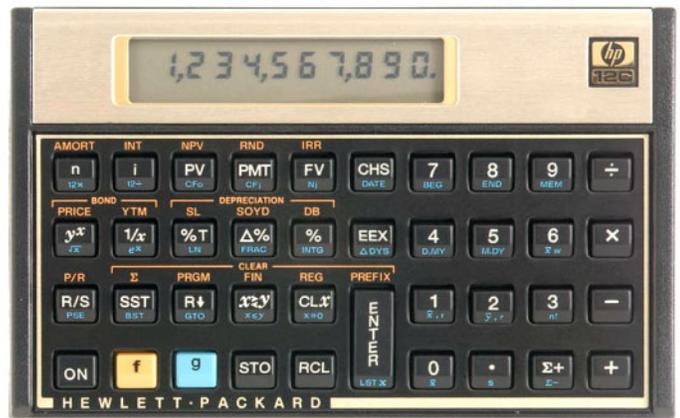
hp calculators

HP 12C Loan Amortizations

Amortization

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Amortization

The word 'amortization' comes from a Latin word meaning "about to die". When a loan earning interest has regular, fixed payments, it is said that the loan is being paid off or amortized. Although the debt is reduced by the same periodic payments, different parts of each payment are applied against the principal and against the interest. The interest is deducted from each payment and the remaining amount is used to reduce the debt. Figure 1 illustrates this process.

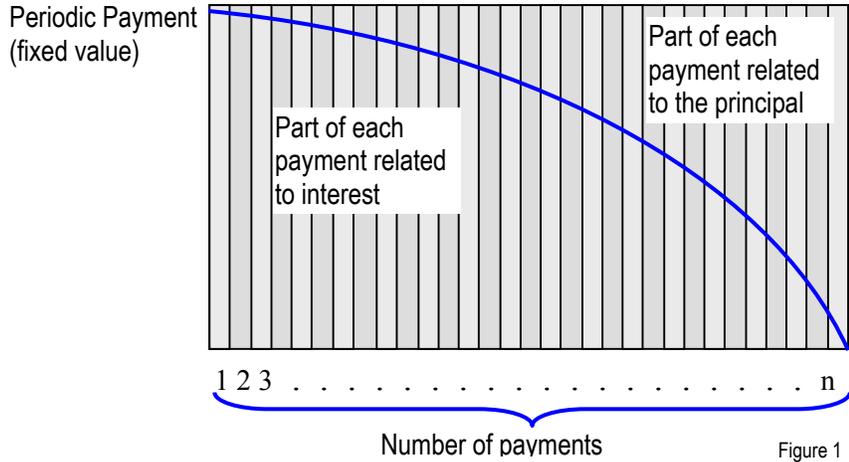


Figure 1

The HP12C amortization approach

In the HP12C, amortization uses the contents of the following Time Value of Money (TVM) registers:

- \boxed{n} - used as a reference and contains the number of payments amortized
- \boxed{i} - periodic interest rate
- \boxed{PMT} - periodic payment
- \boxed{PV} - remaining balance

The display must contain the number of payments to be amortized before executing $\boxed{f} \boxed{AMORT}$. It is important to keep in mind that on the HP12C, amortization is a sequenced calculation. This means that once a number of payments is amortized, all subsequent balances refer to the next amortized payments. If it is necessary to go back and review previous balance, some values must be restored to their default values. This is because every time $\boxed{f} \boxed{AMORT}$ is pressed, the following registers have their contents updated:

- \boxed{PV} - contents updated to remaining balance
- \boxed{n} - contents updated to current number of payments amortized

The following examples illustrate the HP12C amortization approach.

Practice amortizing loans

Example 1: Calculate the first year of the annual amortization schedule for a 30-year, \$180,000 mortgage at 7.75%, compounded monthly.

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Solution: Clear the TVM registers contents to zero and set END mode:

f FIN g END

Set the relevant TVM values and calculate the PMT:

7 . 7 5 g 12 ÷ 3 0 g 12 x 1 8 0 0 0 0 PV 0 FV PMT



Figure 2

To calculate the first year it is necessary to set n to zero and amortize twelve payments:

0 n 1 2 f AMORT



Figure 3

This is the total interest paid after one year. To see the part of the principal that is paid, press:

X \rceil Y



Figure 4

To check the loan balance after one year:

RCL PV



Figure 5

Answer: After one year, the loan balance is \$178,420.18. The amount of principal paid so far is \$1,579.82 and \$13,894.66 interest has been paid.

Example 2: With all data from the previous example still available in the calculator's memory, calculate the second year of the annual amortization of the same mortgage.

Solution: Just to make sure the calculator is at the proper point in the loan, recall the contents of n to the display:

RCL n



Figure 6

Now it is necessary to input the number of payments to be amortized. In this example, twelve more payments must be amortized to calculate the second year:

1 2 f AMORT

- 13,767.79

Figure 7

This is the total interest paid after two years. To see the part of the principal that is paid, press:

x>y

- 1,706.69

Figure 8

To check the loan balance after one year, press:

RCL PV

176,713.49

Figure 9

Answer: After two years, the loan balance is \$176,713.49. The amount of principal repaid is \$1,706.69 and the amount of interest paid is \$13,767.79.

Example 3: Amortize the 10th payment of a 4-year car loan. The loan amount is \$12,500 and the interest rate is 10.2%, compounded monthly. Assume monthly payments starting immediately.

Solution: Clear the TVM registers contents to zero and set BEGIN mode:

f FIN g BEG

Set the relevant TVM values and calculate PMT:

1 0 . 2 9 12÷ 4 9 12x 1 2 5 0 0 PV 0 FV PMT

- 315.55
BEGIN

Figure 10

To amortize the 10th payment it is necessary to amortize the first nine payments and then amortize the 10th separately:

0 n 9 f AMORT 1 f AMORT



Figure 11

This is the interest paid with the 10th payment. To see the part of the principal that is paid:

$\boxed{\times \div y}$



Figure 12

To check the loan balance after ten payments:

$\boxed{\text{RCL}} \boxed{\text{PV}}$



Figure 13

Answer: After ten payments, the loan balance is \$10,210.45. With the 10th payment, the amount of principal that has been paid is \$226.83 and \$88.72 interest has been paid.

Example 4: With all data from the previous example still available in the calculator memory, amortize the 22nd payment.

Solution: Just to verify the calculator is still in the proper state, recall the contents of n to the display:

$\boxed{\text{RCL}} \boxed{\text{n}}$



Figure 14

To amortize the 22nd payment it is necessary to amortize the next eleven payments and then amortize the 22nd separately:

$\boxed{1} \boxed{1} \boxed{\text{f}} \boxed{\text{AMORT}} \boxed{1} \boxed{\text{f}} \boxed{\text{AMORT}}$



Figure 15

This is the interest paid with the 22nd payment. To see the part of the principal that is paid:

$\boxed{\times \div y}$



Figure 16

To check the loan balance after ten payments, press:

RCL PV



Figure 17

Answer: After twenty-two payments, the loan balance is \$7,333.27. With the 22nd payment, the amount paid toward principal is \$251.08 and \$64.47 interest has been paid.