hp calculators

HP 10BII Loan Amortizations

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Amortization

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The time value of money application

The time value of money application built into the HP 10BII is used to solve annuities that involve regular, uniform payments. Annuity problems require the input of 4 of these 5 values: N I/YR PV PMT FV . Once these values have been entered in any order, the unknown value can be computed by pressing the key for the unknown value.

The time value of money application operates on the convention that money invested is considered positive and money withdrawn is considered negative. In a compound interest problem, for example, if a positive value is input for the PV , then a computed FV will be displayed as a negative number. In an annuity problem, of the three monetary variables, at least one must be of a different sign than the other two. For example, if the PV and PMT are positive, then the FV will be negative. If the PV and FV are both negative, then the PMT must be positive. An analysis of the monetary situation should indicate which values are being invested and which values are being withdrawn. This will determine which are entered as positive values and which are entered as negative values.
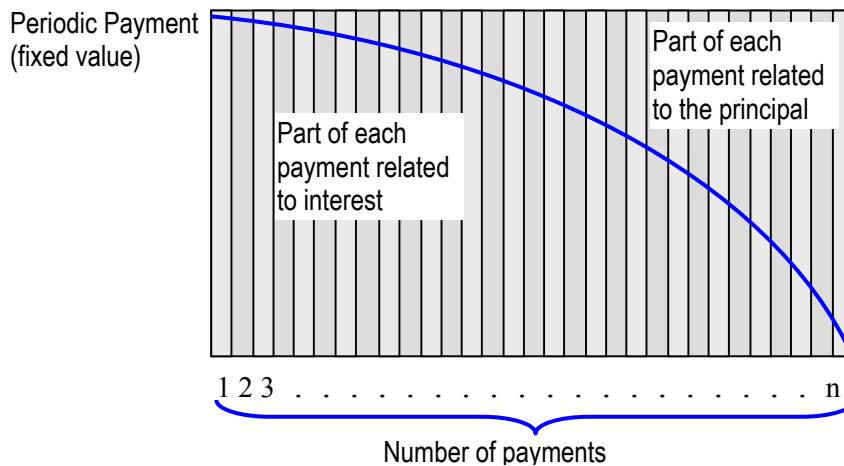
Interest rates are always entered as the number is written in front of the percent sign, i.e., 5% is entered as a 5 rather than as 0.05.

The number of periods per year is set using the yellow-shifted P/YR function. Problems involving annual compounding or annual payments should be solved with this value set to 1. Problems involving monthly compounding or monthly payments should be solved with this value set to 12. To set this value to 4 for quarterly payments / quarterly compounding, for example, you would press 4 ▬ P/YR .

Additional information can be found in the learning module covering time value of money basics.
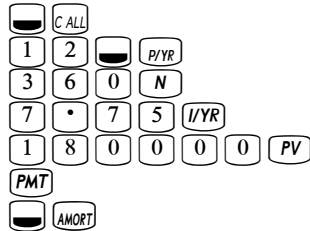
Amortization

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 deduced from each payment and the remaining amount is used to reduce the debt. The figure below illustrates this process.

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.

Solution: By default, the HP 10BII will amortize an entire year's worth of payments unless told otherwise by the user. If the number of periods per year is set to 12, then the amortization for the first 12 months will be computed. If the number of periods per year is set to 4, then the amortization for the first 4 quarters will be computed, etc. Later examples indicate how to set the parameters for other time periods, including individual payment amortization.

At this point, the HP 10BII enters a special amortization mode and the top left of the display will stay "AMORT" with "PER" right below it. The numbers in the display will indicate for which period(s) the amortization is being computed, in this case showing 1-12.

Press ⟨=⟩ to display the amount of principal repaid during these periods, which is $-1,579.82. Note that the display now shows "PRIN" under "AMORT" to indicate the principal paid is being displayed.

Press ⟨=⟩ again to display the amount of interest paid during these periods, which is $-13,894.66. Note that the display now shows "INT" under "AMORT" to indicate the interest paid is being displayed.

Press ⟨=⟩ again to display the remaining loan balance at the end of these periods, which is $178,420.18. Note that the display now shows "BAL" under "AMORT" to indicate the remaining balance is being displayed.

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: Simply press:

The numbers in the display change to indicate for which period(s) the amortization is being computed, in this case showing 13-24, or the second year.

Press ⟨=⟩ to display the amount of principal repaid during these periods, which is $-1,706.69. Note that the display now shows "PRIN" under "AMORT" to indicate the principal paid is being displayed.
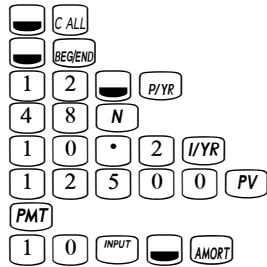
Press $=$ again to display the amount of interest paid during these periods, which is $-13,767.79. Note that the display now shows "INT" under "AMORT" to indicate the interest paid is being displayed.

Press $=$ again to display the remaining loan balance at the end of these periods, which is $176,713.49. Note that the display now shows "BAL" under "AMORT" to indicate the remaining balance is being displayed.

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:

[■] [C ALL]
[■] [BEG/END]
[1] [2] [■] [P/YR]
[4] [8] [N]
[1] [0] [·] [2] [I/YR]
[1] [2] [5] [0] [0] [PV]
[PMT]
[1] [0] [INPUT] [■] [AMORT]

The numbers in the display change to indicate for which period(s) the amortization is being computed, in this case showing 10-10, indicating that ONLY the 10th payment is being amortized.

Press $=$ to display the amount of principal repaid during this period, which is $-226.83. Note that the display now shows "PRIN" under "AMORT" to indicate the principal paid is being displayed.
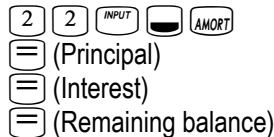
Press $=$ again to display the amount of interest paid during this period, which is $-88.72. Note that the display now shows "INT" under "AMORT" to indicate the interest paid is being displayed.

Press $=$ again to display the remaining loan balance at the end of this period, which is $10,210.45. Note that the display now shows "BAL" under "AMORT" to indicate the remaining balance is being displayed.

Answer: After ten payments, the remaining 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:

[2] [2] [INPUT] [■] [AMORT]
$=$ (Principal)
$=$ (Interest)
$=$ (Remaining balance)

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.