



hp calculators

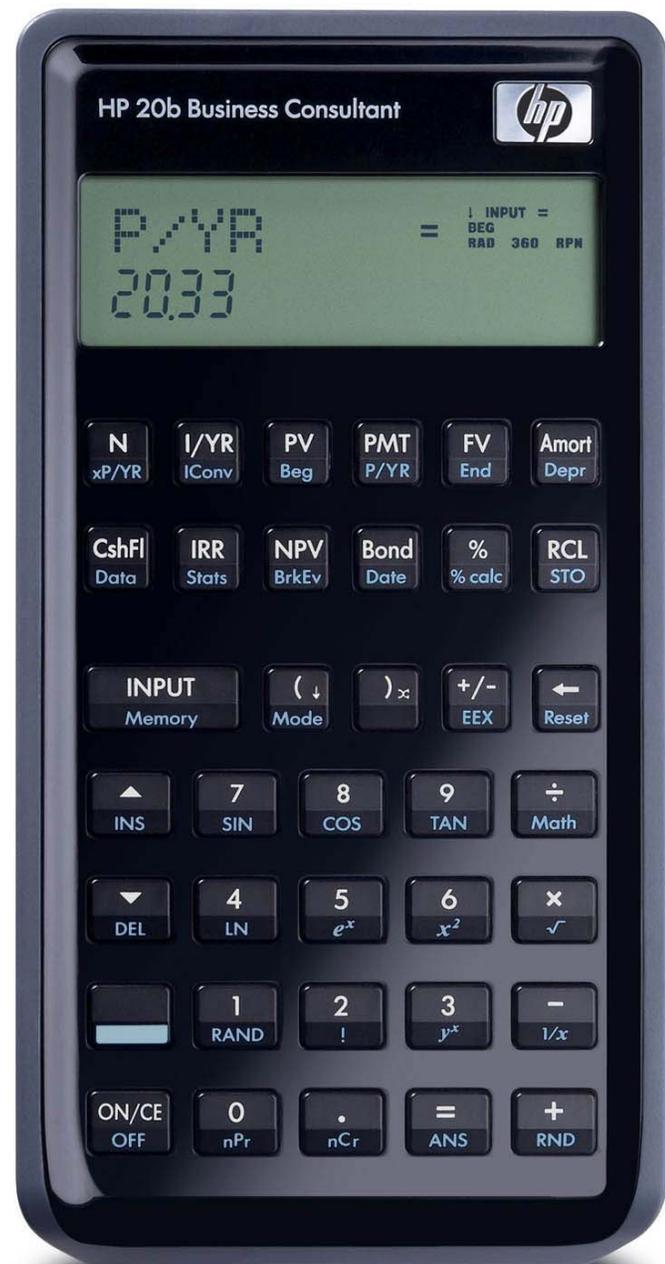
HP 20b Solving for lease payments

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The time value of money application

The time value of money application built into the HP 20b is used to solve compound interest problems and annuities that involve regular, uniform payments. Compound interest problems require the input of 3 of these 4 values:

\boxed{N} $\boxed{I/YR}$ \boxed{PV} \boxed{FV} . Annuity problems require the input of 4 of these 5 values: \boxed{N} $\boxed{I/YR}$ \boxed{PV} \boxed{PMT} \boxed{FV} . Once these values have been entered in any order, the unknown value can be computed by pressing the key for the unknown value. These keys and their shifted functions, are described in the table below.

The time value of money application operates on the convention that money invested is considered positive and money withdrawn is considered negative.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 \boxed{PV} , then a computed \boxed{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 \boxed{PV} and \boxed{PMT} are positive, then the \boxed{FV} will be negative. If the \boxed{PMT} and \boxed{FV} are both negative, then the \boxed{PV} must be positive, etc. An analysis of the monetary situation should indicate which values are being invested and which values are being withdrawn.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.

Table 1 The HP 20b Time Value of Money Keys

Keys	Description
\boxed{N}	Stores or calculates the number of payments or compounding periods N.
$\boxed{\text{■}}$ $\boxed{xP/YR}$	Multiplies a value by the number of payments per year and stores as N.
$\boxed{I/YR}$	Stores or calculates the nominal, annual interest rate.
\boxed{PV}	Stores or calculates the present value (PV). To a lender or borrower, PV is the amount of a loan; to an investor, PV is the initial investment. PV always occurs at the beginning of the first period.
\boxed{PMT}	Stores or calculates the amount of each periodic payment (PMT).
$\boxed{\text{■}}$ $\boxed{P/YR}$	Stores the number of payments or compounding periods per year.
\boxed{FV}	Stores or calculates the future value (FV), a final cash flow. FV always occurs at the end of the last compounding period.
$\boxed{\text{■}}$ $\boxed{\text{Beg}}$	Sets Begin mode (Beg). Payments occur at the beginning of each compounding period.
$\boxed{\text{■}}$ $\boxed{\text{End}}$	Sets End mode (End). Payments occur at the end of each compounding period.

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 \boxed{PV} , then a computed \boxed{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 \boxed{PV} and \boxed{PMT} are positive, then the \boxed{FV} will be negative. If the \boxed{PMT} and \boxed{FV} are both negative, then the \boxed{PV} must be positive, etc. 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 stated annual nominal interest rate is always entered into $\boxed{I/YR}$, as shown in the examples.

Special settings

Clearing the time value of money registers. The 5 storage registers that hold the time value of money values, **N** **I/YR** **PV** **PMT** **FV**, are cleared when **Reset** is pressed and then if TVM is shown in the display, by pressing **INPUT**. Note: If TVM is not displayed, use the **▼** or **▲** keys to scroll through the options until it is displayed. **NOTE:** Clearing the TVM registers this way resets the begin/end mode to END.

Begin/End Mode. A special mode setting relates to the solution of problems known as annuities. This mode tells the HP 20b to solve these problems assuming that payments are made either at the beginning of a period or at the end of a period, which is why this mode is called Begin / End mode. When the HP 20b is in Begin mode, the display will show the word BEG in the top right corner of the screen. There is no indication in the HP 20b display when the calculator is in End mode, other than by the absence of the word BEG.

This mode is changed using the shifted BEG and END functions. The begin mode is on the front of the **PV** key and you press **Shift** **Beg** to activate begin mode. The end mode is on the front of the **FV** key and you press **Shift** **End** to activate end mode. When in begin mode, the HP 20b display will show a small BEG annunciator in the top right corner of the screen.

Lease payments

A lease is an agreement for one company or individual to use an asset owned by another company or individual for a specified time. The payment required (often called the "rent") during this lease period depends upon the interest rate involved and the decline in value the asset with experience while being used. The projected value of the asset at the end of the period is often called the residual value. Lease payments are usually made in advance, which requires them to be treated as annuities due.

For the HP 20b to solve problems involving leases or annuities due, it must be in Begin mode, set as described in the section above.

If you receive an unexpected result when solving an annuity problem, make sure that the calculator is in the proper mode and try resolving the problem. Note that it may also be difficult to determine the actual interest rate involved in a lease. The examples below assume this interest rate is known.

Practice solving for the payment on a lease

Example 1: A company is considering leasing a machine that costs \$20,000 today. The lease would be for 5 years with a residual value of \$6,000 for the machine at the end of that period. The agreement calls for the use of an 8%, compounded monthly, interest rate. If monthly lease payments will be made, what is the size of the lease payment required?

Solution: To solve this leasing problem, the calculator will need to be in Begin mode. The solution below assumes the HP20b calculator is not already in this mode, which it WILL NOT BE if you reset the TVM registers. Therefore, the keystrokes **Shift** **Beg** are necessary if you clear the TVM registers as shown.

Shift **Reset** **INPUT** **Shift** **Beg** **1** **2** **Shift** **P/YR**
6 **0** **N**
8 **I/YR**
2 **0** **0** **0** **0** **PV**

HP 20b Solving for lease payments

6 0 0 0 +/- FV
PMT

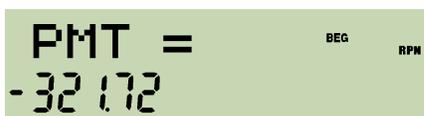


Figure 1

Answer: \$321.72

Example 2: An individual is considering leasing a car that costs \$26,995 today. The lease would be for 2 years with a residual value of \$14,000 for the vehicle at the end of that period. The agreement calls for the use of a 6%, compounded monthly, interest rate. If monthly lease payments will be made, what is the size of the lease payment required?

Solution: To solve this leasing problem, the calculator will need to be in Begin mode. The solution below assumes the HP20b calculator is not already in this mode, which it WILL NOT BE if you reset the TVM registers. Therefore, the keystrokes are necessary if you clear the TVM registers as shown.

1 2
2 4 N
6 I/YR
2 6 9 9 5 PV
1 4 0 0 0 +/- FV
PMT

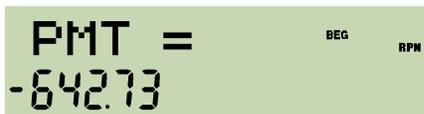


Figure 2

Answer: \$642.73

Example 3: A company is considering leasing a machine that costs \$24,505 today. The lease would be for 3 years with a residual value of \$11,000 for the machine at the end of that period. The agreement calls for the use of an 10%, compounded monthly, interest rate. If monthly lease payments will be made, what is the size of the lease payment required?

Solution: To solve this leasing problem, the calculator will need to be in Begin mode. The solution below assumes the HP20b calculator is not already in this mode, which it WILL NOT BE if you reset the TVM registers. Therefore, the keystrokes are necessary if you clear the TVM registers as shown.

1 2
3 6 N
1 0 I/YR
2 4 5 0 5 PV
1 1 0 0 0 +/- FV
PMT

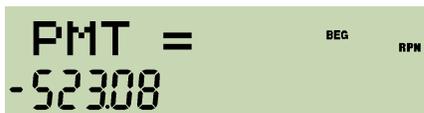


Figure 3

Answer: \$532.08