



hp calculators

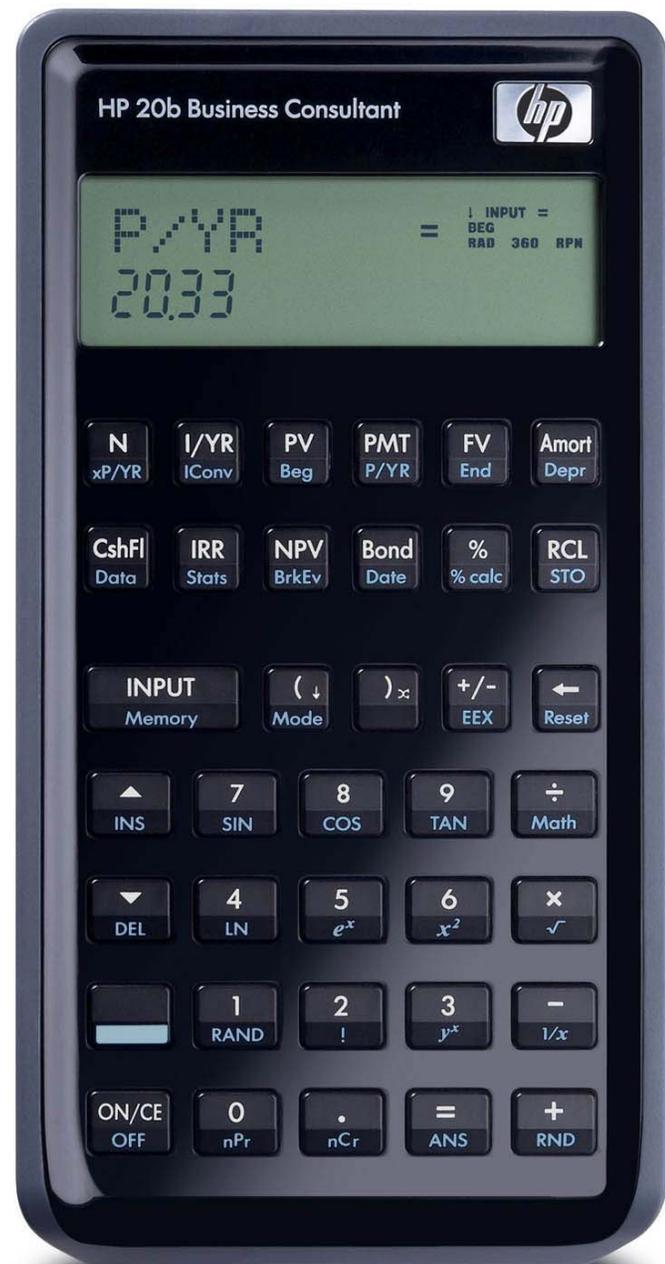
HP 20b Solving for a required down payment

The time value of money application

Loan down payments

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Practice solving loan down payment problems



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.

The time value of money application operates on the convention that money invested is considered positive and money withdrawn is considered negative.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 An analysis of the monetary situation should indicate which values are being invested and which values are being withdrawn.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.

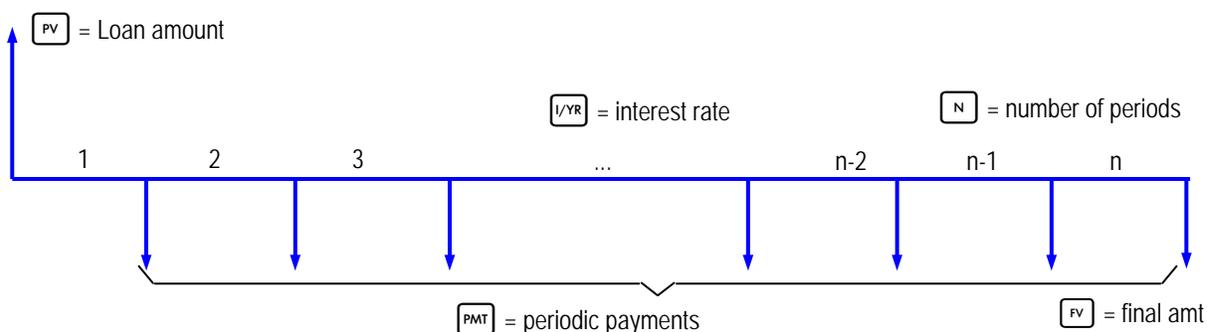
Additional information can be found in the learning module covering time value of money basics.

Loan Down Payments

Down payments are often made on loans to lower the required periodic payment. Down payments are also required to ensure an investment in the property has been made by the loan applicant, thereby reducing the risk to the lender that the loan will be abandoned. The process to be used is to input the payment the applicant can afford and determine the equivalent Present Value (PV). The difference between this PV and the actual loan amount will indicate the down payment necessary to achieve the required payment.

Cash flow diagrams and sign conventions

The sign conventions for cash flows in the HP 20b follow this simple rule: money received is positive (arrow pointing up), money paid out is negative (arrow pointing down). The key is keeping the same viewpoint through each complete calculation. The regular use of cash flow diagrams allows a faster approach to solve most TVM-related problems. The cash flow diagram below represents the most common borrower viewpoint and their relationship to the TVM variables.



Practice solving loan down payment problems

Example 1: Tommy wants to buy a car and can afford a payment of \$400 a month. If the car costs \$25,000 and Tommy can get a 72 month loan at 6.9%, compounded monthly, how much must Tommy give as a down payment to lower his payment to \$400 a month?

Solution:

| | | | | |
|-------|-------|---|------|------|
| Reset | INPUT | 1 | 2 | P/YR |
| 7 | 2 | N | | |
| 6 | . | 9 | I/YR | |
| 4 | 0 | 0 | +/- | PMT |
| PV | | | | |

At this point, the display shows 23,527.99. Now press these keys in chain or algebraic modes:

| | | | | | | |
|---|---|---|---|---|---|---|
| - | 2 | 5 | 0 | 0 | 0 | = |
|---|---|---|---|---|---|---|

In RPN mode, press:

| | | | | | |
|---|---|---|---|---|---|
| 2 | 5 | 0 | 0 | 0 | - |
|---|---|---|---|---|---|

Answer: To lower his monthly payment to \$400, Tommy needs to make a \$1,472.01 down payment.

Example 2: Jane is looking to buy a house and can afford a payment of \$1,400 a month. If the house costs \$270,000 and Jane can get a 30 year loan at 5.4%, compounded monthly, how much must Jane give as a down payment to lower her payment to \$1,400 a month?

Solution:

| | | | | |
|-------|-------|---|------|------|
| Reset | INPUT | 1 | 2 | P/YR |
| 3 | 6 | 0 | N | |
| 5 | . | 4 | I/YR | |
| 1 | 4 | 0 | 0 | +/- |
| PV | | | | |

At this point, the display shows 249,318.47. Now press these keys in chain or algebraic modes:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | 2 | 7 | 0 | 0 | 0 | 0 | = |
|---|---|---|---|---|---|---|---|

In RPN mode, press:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2 | 7 | 0 | 0 | 0 | 0 | - |
|---|---|---|---|---|---|---|

Answer: To lower her monthly payment to \$1,400, Jane needs to make a \$20,681.53 down payment.

Example 3: Kevin wants to buy a boat and can afford \$250 a month for this purchase. The boat costs \$15,600 and Kevin can get a 72-month loan at 8.9%, compounded monthly. How much must Kevin pay as a down payment to lower his monthly payment to \$250 a month?

Solution:

| | | | | |
|-------|-------|---|------|------|
| Reset | INPUT | 1 | 2 | P/YR |
| 7 | 2 | N | | |
| 8 | . | 9 | I/YR | |
| 2 | 5 | 0 | +/- | PMT |
| PV | | | | |

HP 20b Solving for a required down payment

At this point, the display shows 13,907.47. Now press these keys in chain or algebraic modes:

$\boxed{-} \boxed{1} \boxed{5} \boxed{6} \boxed{0} \boxed{0} \boxed{=}$

In RPN mode, press:

$\boxed{1} \boxed{5} \boxed{6} \boxed{0} \boxed{0} \boxed{-}$

Answer: To lower his monthly payment to \$250, Kevin needs to make a \$1,692.53 down payment.

Example 4: Namir wants to buy a small plane and can afford \$1,250 a month for this purchase. The plane costs \$95,600 and Namir can get a 96-month loan at 7.9%, compounded monthly. How much must Namir pay as a down payment to lower his monthly payment to \$1,250 a month?

Solution:

$\boxed{\text{Reset}} \boxed{\text{INPUT}} \boxed{1} \boxed{2} \boxed{\text{P/YR}}$
 $\boxed{9} \boxed{6} \boxed{\text{N}}$
 $\boxed{7} \boxed{\cdot} \boxed{9} \boxed{\text{I/YR}}$
 $\boxed{9} \boxed{5} \boxed{6} \boxed{0} \boxed{0} \boxed{\text{PV}}$
 $\boxed{\text{PMT}}$

The computed monthly payment is \$1,346.61, so a down payment will be needed.

$\boxed{1} \boxed{2} \boxed{5} \boxed{0} \boxed{+/-} \boxed{\text{PMT}}$
 $\boxed{\text{PV}}$

At this point, the display shows 88,741.19, the present value of the monthly payments Namir can afford. Now press these keys in chain or algebraic modes:

$\boxed{-} \boxed{9} \boxed{5} \boxed{6} \boxed{0} \boxed{0} \boxed{=}$

In RPN mode, press:

$\boxed{9} \boxed{5} \boxed{6} \boxed{0} \boxed{0} \boxed{-}$

Answer: To lower his monthly payment to \$250, Namir needs to make a \$6,858.81 down payment.