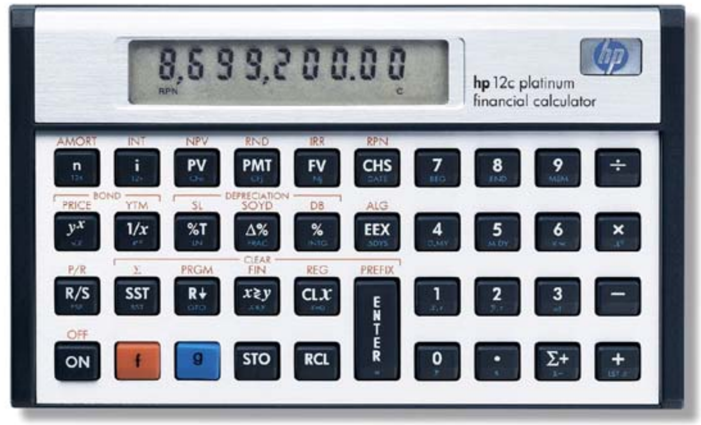
hp calculators



HP 12C Platinum
Saving for retirement

TVM calculations

Cash flow diagrams and sign conventions

Saving for retirement

Practice solving problems involving saving for retirement

TVM calculations

A set of mathematical tools has been developed with the purpose of evaluating the time value of money (TVM), and the concepts of present value of money (*PV*), future value of money (*FV*), periodic payments (*PMT*), interest rates (*i*), and the number of compounding periods (*n*). The standard HP12C Platinum features designed to solve for unknown annuity or compound interest variables with the five TVM keys [n], [i], [PV], [PMT] and [FV] allow problems related to savings variables to be solved easily.

Cash flow diagrams and sign conventions

The regular use of cash flow diagrams leads to a faster approach to the solution in most TVM-related problems. The key is keeping the same viewpoint through each complete calculation. The sign conventions for cash flow in the HP12C Platinum follow the simple rule: money received is positive (arrow pointing up), money paid out is negative (arrow pointing down). The cash flow diagram below represents the borrower viewpoint of the most common savings calculations and their relation with the TVM variables.

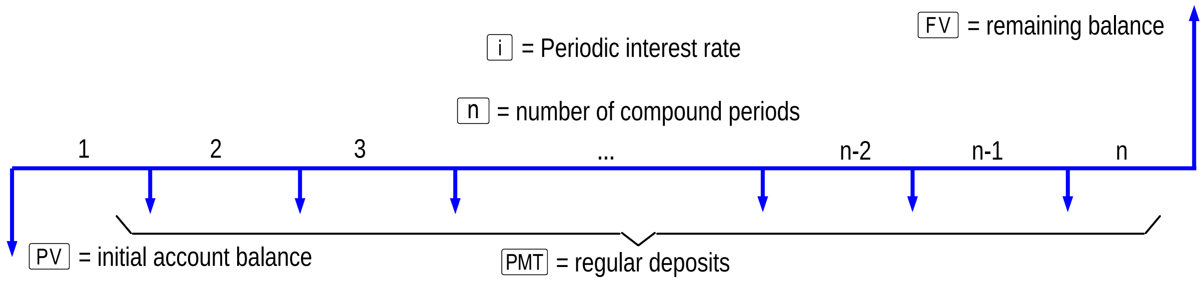


Figure 1

There are also two functions meant to be an aid when entering or retrieving annual values for [n] and [i] : [12x] and [12÷]. Pressing [g][12x] is the same as pressing [ENTER][1][2] [x] [n] in RPN mode or [x][1][2][=][n] in algebraic mode, meaning the number of years can be keyed in and stored as number of months automatically. Pressing [g][12÷] is the same as pressing [ENTER][1][2] [÷] [i] in RPN mode or [÷] [1][2][=][i] in algebraic mode, meaning the yearly interest rate can be keyed in and stored as monthly interest rate automatically. It is also possible to retrieve the yearly-related values by pressing [RCL][g][12x] (number of years) and/or [RCL][g][12÷] (yearly interest rate) whenever necessary.

Saving for retirement

A savings account is a type of account where a current, positive balance earns periodic interest. Nearly everyone is interested in saving for retirement, and this almost always involves making regular deposits into an account. When those deposits are of equal size and spaced apart equally, the problem becomes an annuity. These types of problems may involve solving for a payment required in order to reach an already stated goal or a known, regular deposit but an unknown future amount available at retirement.

Practice calculating problems involving saving for retirement

<u>Example 1:</u> If you want to retire 40 years from now with $1,000,000 in your account, how much must you deposit beginning next month and continuing for 40 years into the account to achieve this goal? Assume the account earns 6%, compounded monthly.

<u>Solution:</u> The following keystroke sequence can be used to calculate the amount to be deposited:

[4] [0] [g] [12x] [6] [g] [12÷] [0] [PV] [1] [0] [0] [0] [0] [0] [0] [CHS] [FV] [PMT]

Figure 2

<u>Answer:</u> $502.14 per month. The value at the end of the 40-year period would be a withdrawal and is therefore entered as a negative value.

<u>Example 2:</u> Johnny can save $50 per month. If he is 30 years old today and begins saving next month, how much is in an account paying 8%, compounded monthly, if he continues to save for 35 years?

<u>Solution:</u> The following keystroke sequence can be used to calculate the amount to be deposited:

[3] [5] [g] [12x] [8] [g] [12÷] [0] [PV] [5] [0] [PMT] [FV]

Figure 3

<u>Answer:</u> $-114,694.12. Since the $50 is a deposit, it is entered as a positive number.

<u>Example 3:</u> Billy can save $50 per month. If he is 20 years old today and begins saving next month, how much is in an account paying 8%, compounded monthly, if he continues to save for 45 years?

<u>Solution:</u> The following keystroke sequence can be used to calculate the amount to be deposited:

[4] [5] [g] [12x] [8] [g] [12÷] [0] [PV] [5] [0] [PMT] [FV]

Figure 4

<u>Answer:</u> $-263,726.99. Since the $50 is a deposit, it is entered as a positive number.

<u>Example 4</u>: Cindy saved $250 per quarter for 10 years and then quit making deposits. How much is in her account 20 years later, if the account earns 8%, compounded quarterly?

<u>Solution:</u> First we need to calculated the balance after ten years; note that each year corresponds to four periods, and ¼ of the annual interest rate applies to each period:

In RPN mode: [2] [5] [0] [PMT] [8] [ENTER] [4] [÷] [i] [1] [0] [ENTER] [4] [x] [n] [0] [PV] [FV]
In algebraic mode: [2] [5] [0] [PMT] [8] [÷] [4] [=] [i] [1] [0] [x] [4] [=] [n] [0] [PV] [FV]

Figure 5

This is the starting balance to calculate the remaining 20 years (80 periods):

In RPN mode: CHS PV 0 PMT 2 0 ENTER 4 x n FV
In algebraic mode: CHS PV 0 PMT 2 0 x 4 = n FV

Figure 6

Answer: The final balance after 30 years will be $73,621.55.

Example 5: What interest rate would an account need to earn so that monthly deposits of $200 over the next 40 years would grow to become $800,000? Assume the account has $5,000 in it today.

Solution: The following keystroke sequence can be used to calculate the amount to be deposited:

4 0 g 12x 2 0 0 PMT 5 0 0 0 PV 8 0 0 0 0 0 CHS FV i RCL g 12÷

Figure 7

Answer: 7.92%. The initial deposit and the monthly deposit are both entered as positive values, since they are in fact deposits into the account.