



Using a Financial Calculator to Make Financial Decisions¹

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Do you know how much your credit accounts cost you each month? Can you achieve your financial goals even if you don't work on Wall Street?

Have you ever wanted to compare savings or investment plans offering different rates of return? Have you wondered how long it would take you to save for the down payment on a house or to buy a car for cash?

Have you longed to be able to compare the cost of loans with different rates, different amounts, and different time periods? Or, have you wished that you could compare the monthly payments for different loan proposals?

Do you know how long it will take you to accumulate enough money to send the children to college? Have you wondered about the amount of money you would have available to finance your retirement if you saved \$2,000 a year? Or, would you like to know how long your savings will last if you withdraw \$1,000 per month? Have you wondered what impact inflation will have on your retirement "nest egg?"

Such problems can be solved quickly and easily using a financial calculator.* although calculations involving compound interest, periodic payments, and declining or increasing balances are complex, a financial calculator* makes them simple. Regardless of your mathematical skills and training, you can make such calculations quickly and easily. This publication shows you how.

Topics covered include:

- The Financial Calculator
- The Magic of Compounding
- Inflation
- Future Value of a Present Sum
- Present Value of a Future Sum
- Computing Retirement Payments
- Withdrawals from Investments –
 - Time money will last
 - Amount of money to withdraw
- How Much Money do You Need?

The Math Keys

The math function (operation) keys are located on the right of your calculator. Press the keys in order of math function desired. Think through the process and then press the appropriate keys.

Practice each math function until you feel comfortable with the pressure that must be applied to the keys to have the number appear on the display screen.

* A number of good financial calculators are on the market. This publication uses Texas Instruments (TI) calculator BA II Plus and HP 10B II.

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Table 1

The Financial Keys for the Hewlett Packard 10B II and/or Texas Instrument BA II Plus.	
Value Keys	Command Keys
[N][%][PMT][PV][FV]	[2 nd][CPT][+/-]
Key	Function of Key
[N]	=Number of periods [often 1 year but could be 1 day, week or month]
[1/y] or [1/yr]	= Interest per period
[PV]	= Present Value
[FV]	= Future value
[+/-]	= This key is used to change the sign of the number in the window
[2 nd]	= On the TI BAII Plus this key changes the function of keys from the function written in white on the key to the function written in orange above the key.
[CPT]	= On the TI BAII Plus this key is pressed to ask the calculator to solve for {compute} whichever "value" key is pressed next and for end of the month payments. (Press the [CPT] key and then the "value" key for the unknown value).

All five value keys may not be needed for a given problem. If you know three values, you can solve for a fourth. If you know four you can solve for the fifth. For most problems the order in which the problem is entered into the calculator will not make any difference. The only requirement is that the known values be entered before you press the [CPT] key to solve for the unknown value.

The Magic of Compounding - Future Value

The value of money changes over time. A dollar received today is worth more than a dollar received a year from now. This is the opportunity cost of postponing the use of that dollar for one year.

Compounding interest is important because it forms the basis of many financial calculations. Perhaps you are familiar with the terms "compounded annually, quarterly, or daily." These expressions mean that interest is figured on principal as frequently as the period mentioned. This interest is then added to the previous principal before the next calculation is made. Annual compounding means that this calculation is made once each year. The new interest is added to the

principal before performing the next year's calculation.

Directions: Use your Financial Calculator Texas Instruments BAII Plus or Hewlett Packard 10B II to compute the following financial problems. Check answer section to see if your answers are correct.

The first example under each section provides the procedure used to solve that type of financial problem. But before we start; set your calculator. Clear memory, set decimal places, and set compounding periods to annual unless instructed otherwise. **[Clear memory after each problem]**

Table 2

	HP 10B II	TI BAII Plus
Set calculator		
Clear memory	[■][clear all]	[2 nd][MEM] [Enter][2 nd][Quit] [2 nd][CLR work] [2 nd][quit] [2 nd][CLR TVM]
Set decimal place 4 is used in this example	[■][DISP]4	[2 nd][Format]4[Enter] [2 nd][quit]
Set floating decimal point	[■][DISP].	[2 nd][Format]9[Enter] [2 nd][quit]
Set compounding periods Annually	1[■][P/YR]	[2 nd][P/Y]1[Enter] [2 nd][quit]
Monthly	12[■][P/YR]	[2 nd][P/Y]12[enter] [2 nd][quit]

*[■] is orange button

Future Value of Your Savings (1-5)

- Over the past 100 years stock prices have appreciated on average 7% per year. If your great grandfather had left you \$1,000 in stock in 1903, what would be the value of your account today?

Table 3

	HP 10B II	TI BAII Plus
Present value	1,000 [+/-][PV]	1000 [+/-][PV]
Time period	100 [N]	100 [N]
Interest rate	7 [I/YR]	7 [I/Y]
Results	[FV] 867,716	[CPT][FV] 867,716

- Paul inherited \$20,000 from his mother. He is using this to begin his retirement fund. If he invests his inheritance at 6% annually, what will be the value in 27 years when he is ready to retire?

3. Betty, 40, has \$15,000 in her IRA. If the annual interest rate averages 4%, how much will she have by age 62?
4. Betty's sister, Sarah, has \$50,000 in US Savings bonds. She plans to use this for her retirement. Sarah is currently 45. If she receives 6% annually on the bonds, how much will she have by age 60?
5. Ryan has \$38,000 in a Roth IRA. He plans to retire in 12 years. How much will his IRA be worth if he receives 4% annual interest?

Inflation problems (6-8)

6. JoAnn currently lives on \$1,500 per month. This is adequate for her today. If the annual inflation rate is 4.2% how much money will JoAnn need in 15 years to maintain her current life style?

Table 4

	HP 10B II	TI BAII Plus
Present value	1500[+/-][PV]	1500[+/-][PV]
Time	15[N]	15[N]
Inflation rate	4.2[I/YR]	4.2[I/Y]
Results	[FV]2,780	[CPT][FV]2,780

7. James thinks that he can live on \$1,200 per month if he retired today. If the inflation rate is 5%, how much will James need in 25 years to maintain today's purchasing power of \$1,200 per month?
8. A monthly retirement goal for Jim is \$2,000. If the inflation rate averages 3% per year, how much will Jim need to equal the buying power of \$2,000 in 20 years?

Future Value of Regular Savings (9-11) (annual deposits)

9. Cathy, 35, is saving \$3,000 each year in an IRA with an interest rate of 5% annually. What will the balance of the account be when she retires in 30 years.

Table 5

	HP 10B II	TI BAII Plus
Payment	3,000[+/-][PMT]	3,000[+/-][PMT]
Time period	30[N]	30[N]
Interest rate	5[I/YR]	5[I/Y]
Future value	[FV]199,317	[CPT][FV]199,317

10. Ann plans to save \$1,000 per year and put it in her IRA earning 4% annually. Ann is now 25. If she follows her plan how much money will she have at age 65?
11. Fred is five years away from retirement. He has started saving \$3,000 each year. If he earns 4% annually, how much money will he have accumulated when he retires?

Future Value of Savings (a lump sum and yearly additions) (12-14)

12. George and Margean are planning to retire in 15 years. Their children are on their own and their house is paid for. Their assets include: \$15,000 in certificates of deposit, \$12,000 cash value in life insurance, and \$23,000 in IRAs. Their plan is to deposit \$5,000 annually in their retirement funds. These accounts are averaging an annual interest rate of 5%. What will be the value of these assets in 15 years?

Table 6

	HP 10B II	TI BAII Plus
Present value	50,000[+/-][PV]	15,000[+]12,000[+]23,000[+] [+/-][PV]
Payment	5,000[+/-][PMT]	5,000[+/-][PMT]
Time period	15[N]	15[N]
Interest rate	5[I/YR]	5[I/Y]
Future value	[FV]211,839	[CPT][FV]211,839

13. The balance of Nancy's tax-deferred annuity is \$30,000. If she adds \$4,000 per year for 15 years what will be the value of her account at a 4% interest rate.
14. Betsy, age 35, has \$15,000 in her ROTH IRA. If she adds \$2,000 per year for 25 years, how much will she have if the account earns 5% annually?
15. What would Betsy have if she deposited \$3,000 per year (new limits) instead of \$2,000?

Future value of savings when you make monthly deposits (16-19)

16. Ralph is 20 years from retirement. He plans to make monthly payments of \$350 to fund his retirement. If he can get an interest rate of 6%, what will be the value of his account when he retires?

Table 7

	HP 10B II	BAIL Plus
Payment	350[+/-][PMT]	350[+/-][PMT]
Time period	20[X] 12[=]240[N]	20[X]12[=]240[N]
Interest rate	6[] 12[=].5[I/YR]	6[] 12[=].5[I/Y]
Future value	[FV]161,714	[CPT][FV]161,714

17. If Bill age 42, has savings that earn an annual interest rate of 6%, how much will he have by age 60, if he saves \$400 each month?

18. Fred saves \$325 monthly; he earns 4% annually. How much will he have in 5 years?

Future Value of Monthly Savings when Added to a Lump Sum.

19. Ben has \$65,000 in his retirement fund. He will retire in 8 years. If he saves \$660 per month and adds it to his lump sum, how much will he have if he earns 5.4% annually?

Table 8

	HP 10B II	TI BAIL Plus
Present value	65,000[+/-][PV]	65,000[+/-][PV]
Payment	660[+/-][PMT]	660[+/-][PMT]
Time period	8X12=[N]	8X12=[N]
Interest rate	5.4) 12=[I/YR]	5.4) 12=[I/Y]
Future value	[FV]179,055	[CPT][FV]179,055

20. James and Pam have paid for their house. They plan to add the \$750 monthly they paid on the house to their \$35,000 retirement account. If they can get 6% on all these funds, how much money will they have in 5 years?

21. Joan, 40, has saved \$30,000 in an IRA. She plans to retire at age 65. She currently adds \$200 per month to the account. How much will she have when she retires if she averages a 6% rate of return?

How long will a retirement fund last: start with a lump sum and make monthly withdrawals (22-27)

22. Delbert, age 65, has investment assets, in a deferred compensation plan, of \$100,000. If he starts taking \$950 per month from the fund to supplement his Social Security payments, how long will his fund last? Assume he has an annual interest rate of 6.25%. [Reminder clear calculator.]

Table 9

	HP 10B II	TI BAIL Plus
Present value	100,000[PV]	100,000[PV]
Payments	950[+/-][PMT]	950[+/-][PMT]
Interest rate	6.25) 12=[I/YR]	6.25) 12=[I/Y]
Payments will last	[N]152.96 months) 12=12.75 years	[CPT][N]152.96 months) 12[=]12.75 years

23. Patricia, 62, has \$53,000 invested. If she makes monthly withdrawals of \$800, how long will the fund last if she averages 6.2% rate of interest?

24. Tim has a retirement fund of \$103,000. If he withdraws \$1200 per month, how long will the fund last assuming an annual interest rate of 4%?

25. Cheryl's retirement fund has a current balance of \$65,000. She needs \$550 per month from this fund to supplement her Social Security. If she gets 5.5% how long will the fund last?

26. Sam age 70 has an IRA balance of \$45,000. If he decides to take \$995 monthly, how long will the fund last, assuming a 4% annual growth rate?

How much money can you take out each month from your nest egg? (27-30)

27. David wants to use his \$96,000 IRA to supplement his pension. How much can he take out monthly if he wants the money to last 20 years and he is getting 6% annual return?

Table 10

	HP 10B II	TI BAIL Plus
Present value	96,000[+/-][PV]	96,000[+/-][PV]
Interest rate	6[] 12[=][I/YR]	6[] 12[=][I/YR]
Time	20[X]12=[N]	20[X]12=[N]
Payment amount	[PMT] 688	[CPT][PMT] =688

28. Bob has \$90,000 in his retirement fund. He averages 4% annual interest rate. His life expectancy is 12.1 years. How much money can he withdraw per month if his money is to last

29. Ruth has \$150,000 in a tax-deferred account. She wants it to last 25 years. Assume an annual interest rate of 6%. (a) How much can she withdraw monthly? (b) If she decides to withdraw \$2,000 monthly, how long will the fund last? (Hint: \$2,000 is the payment)

How much money do you need to retire on? (Lump sum needed to provide a monthly income) (30-33)

30. Joe would like to withdraw \$1,250 per month for 20 years from his retirement fund. If he gets 4% annual rate of return on his money how much money will he need?

31. How much will Brenda need in her retirement fund if she plans to withdraw \$600 per month for 15 years if the account earns 5% annually?
32. How much money will Taylor need if she plans to withdraw \$800 per month for 25 years? Assume that she will get an average annual return of 4.5%.
33. Jimmy would like to have his retirement fund provide a monthly income of \$1,800 for his life expectancy of 15 years. How much does he need in his retirement fund if the interest rate is only 3.6%?

Note: the following pages contain answers to problems in this publication.

Table 11

	HP 10B II	TI BAII Plus
Time	20[X] 12=[N]	20[X]12 = [N]
Interest	4[)] 12=[I/YR]	4[)] 12=[I/Y]
Payment	1250[+/-][PMT]	1250[+/-][PMT]
	[PV] 206,277	[CPT][PV]206,277

	Answers (rounded)	
	HP 10B II	TI TI BALL Plus
2-		
Present value	20,000[+/-][PV]	20,000[+/-][PV]
Time period	27[N]	27[N]
Interest rate	6 [I/YR]	6 [I/Y]
Results	[FV] 96,447	[CPT][FV] 96,447
3-		
Present value	15,000[+/-][PV]	15,000[+/-][PV]
Time period	62[-]40 [=]22[N]	62[-]40[=] 22[N]
Interest rate	4 [I/YR]	4 [I/Y]
Results	[FV] 35,549	[CPT][FV] 35,549
4-		
Present value	50,000[+/-][PV]	50,000[+/-][PV]
Time	60[-]45[=] 15[N]	60[-]45[=]15[N]
Interest rate	6 [I/YR]	6 [I/Y]
Results	[FV] 119,828	[CPT][FV] 119,828
5-		
Present value	38,000[+/-][PV]	38,000[+/-][PV]
Time period	12[N]	12[N]
Interest rate	4 [I/YR]	4 [I/Y]
Results	[FV]60,839	[CPT][FV] 60,839
7-		
Present value	1,200[+/-][PV]	1,200[+/-][PV]
Time period	25[N]	25[N]
Interest rate	5 [I/YR]	5 [I/Y]
Results	[FV]4,064	[CPT][FV]4,064
8-		
Present value	2,000[+/-][PV]	2,000[+/-][PV]
Time period	20[N]	20[N]
Interest rate	3 [I/YR]	3 [I/Y]
Results	[FV] 3,612	[CPT][FV]3,612
10-		
Payment	1,000[+/-][PMT]	1,000[+/-][PMT]
Time period	40[N]	40[N]
Interest rate	4 [I/YR]	4 [I/Y]
Future value	[FV]95,026	[CPT][FV]95,026
11-		
Payment	3,000[+/-][PMT]	3,000[+/-][PMT]
Time period	5[N]	5[N]
Interest rate	4 [I/YR]	4 [I/Y]
Future value	[FV]16,249	[CPT][FV]16,249
13-		
Present value	30,000 [+/-][PV]	30,000[+/-][PV]
Payment	4,000[+/-][PMT]	4,000[+/-][PMT]
Time period	15[N]	15[N]
Interest rate	4 [I/YR]	4 [I/Y]
Future value	[FV]134,123	[CPT][FV] 134,123
14-		
Present value	15,000 [+/-][PV]	15,000[+/-][PV]
Payment	2,000[+/-][PMT]	2,000[+/-][PMT]
Time period	25[N]	25[N]
Interest rate	5 [I/YR]	5 [I/Y]
Future value	[FV]146,250	[CPT][FV] 146,250

	Answers (rounded)	
	HP 10B II	TI BALL II Plus
15-		
Present value	15,000 [+/-][PV]	15,000[+/-][PV]
Payment	3,000[+/-][PMT]	3,000[+/-][PMT]
Time period	25[N]	25[N]
Interest rate	5 [I/YR]	5 [I/Y]
Future value	[FV]193,977	[CPT][FV] 193,977
17-		
Payment	400[+/-][PMT]	400[+/-][PMT]
Time period	60-42=18X12[N]	[60-42=18 X 12=[N]
Interest rate	6) 12 = [I/YR]	6) 12 = [I/Y]
Future value	[FV] 154,941	[CPT][FV] 154,941
18-		
Payment	325[+/-][PMT]	325[+/-][PMT]
Time period	5X12=[N]	5X12=[N]
Interest rate	4) 12 =[I/YR]	4) 12 =[I/Y]
Future value	[FV] 21,547	[CPT][FV] 21,547
20-		
Present value	35,000 [+/-][PV]	35,000[+/-][PV]
Payment	750 [+/-][PMT]	750[+/-][PMT]
Time period	5X12 =[N]	5X12 =[N]
Interest rate	6) 12= [I/YR]	6) 12= [I/Y]
Future value	[FV] 99,537	[CPT][FV] 99,537
21-		
Present value	30,000 [+/-][PV]	30,000[+/-][PV]
Payment	200[+/-][PMT]	200[+/-][PMT]
Time period	65- 40[=]X12=N	65-40[=]X12=[N]
Interest rate	6) 12 = [I/YR]	6) 12 = [I/Y]
Future value	[FV] 272,548	[CPT][FV] 272,548
23-		
Present value	53,000 [PV]	53,000[PV]
Payment	800[+/-][PMT]	800[+/-][PMT]
Interest rate	6.2) 12 = [I/YR]	6.2) 12 = [I/Y]
Time period	[N]81.3) 12=[6.78 years]	[CPT][N]=81.3 mos. = 6.78 years
24-		
Present value	103,000 [PV]	103,000[PV]
Payment	1200[+/-][PMT]	1200[+/-][PMT]
Interest rate	4) 12 = [I/YR]	4) 12 = [I/Y]
Time period	[N]8.4 years [101.28 months]	[CPT][N]= 101.28 mos. or 8.44 years
25-		
Present value	65,000 [PV]	65,000[PV]
Payment	550[+/-][PMT]	550[+/-][PMT]
Interest rate	5.5) 12 = [I/YR]	5.5) 12 = [I/Y]
Time period	[N]170.61 months 14.22 years	[CPT][N]=170.61 mos. or 14.22 years
26-		
Present value	45,000 [PV]	45,000[PV]
Payment	995[+/-][PMT]	995[+/-][PMT]
Interest rate	4) 12 = [I/YR]	4) 12 = [I/Y]
Time period	[N] 49.1 mos. s 4.09 years	[CPT][N]=49.1 mos. or 4.09 years

28	HP 10B II	TI BALL II Plus	31	HP 10B II	TI BALL II Plus
Present value	90,000 [+/-] [PV]	90,000 [+/-][PV]	Time	15 X 12 = [N]	15 X 12 =[N]
Interest rate	4) 12 = [I/YR]	4) 12 = [I/Y]	Interest	5) 12 = [I/YR]	5) 12= [I/Y]
Years	12.1 X 12=[N]	12.1 X 12=[N]	Payment	600 [+/-][PMT]	600 [+/-][PMT]
[PMT]	783	[CPT][PMT]783		[PV] 75,873	[CPT][PV]= 75,873
29a			32		
Present value	150,000 [+/-] [PV]	150,000[+/-][PV]	Time	25 X 12 = [N]	25 X 12 =[N]
Time	25 X 12 = [N]	25 X 12 =[N]	Interest	4.5) 12 = [I/YR]	4.5) 12= [I/Y]
Interest	6) 12 = [I/YR]	6) 12= [I/Y]	Payment	800 [+/-][PMT]	800 [+/-][PMT]
[PMT]	966.45	[CPT][PMT] =966.45		[PV] 143,928	[CPT][PV] 143,928
29b			33		
Present value	150,000 [+/-] [PV]	150,000[+/-][PV]	Time	15 X 12 = [N]	15 X 12 =[N]
Interest rate	6) 12 = [I/YR]	6) 12= [I/Y]	Interest	3.6) 12 = [I/YR]	3.6) 12= [I/Y]
Payment	2000 [PMT]	2000 [PMT]	Payment	1800 [+/-] [PMT]	1800 [+/-][PMT]
Time period	[N] 94.2 months or 7.85 years	[CPT][N] 94.2 mos. or 7.85 years	Present value	[PV] 250,068	[CPT][PV] 250,068