Using Financial
And Business Calculators

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Using Financial and Business Calculators

Most business and financial calculators offer a multitude of powerful functions. The purpose of this guide is to provide students with an easy and quick reference for some of the most commonly used financial functions. More detailed operational descriptions can be obtained from the owners' manuals that accompany the calculators.

This calculator guide discusses the basic functions of five business and financial calculators: the Texas Instruments (TI) BA-35 SOLAR, the Texas Instruments (TI) BA II PLUS, The Hewlett-Packard (HP) 12C, The Hewlett-Packard (HP) 17BII, and the Hewlett-Packard (HP) 19BII. The sections for each calculator present step-by-step instructions for using general and financial functions offered by each calculator. The calculations for each type of financial operation have been explained using sample problems. The display on the calculator's screen at the completion of each step has also been included to allow you to confirm your calculations as you proceed.

I. Texas Instruments (TI) BA-35 SOLAR

The TI BA-35 SOLAR can operate in three different modes: statistical (STAT), financial (FIN), and profit margin. No indicator is displayed for the profit margin mode. To set the calculator to a particular mode, press MODE repeatedly until the appropriate indicator is displayed. Changing to a new mode clears the contents of the mode registers. Arithmetic, mathematical, and percentage operations can be executed in any of the three modes.

The second function (2nd) invokes the "second" functions that are marked above some of the keys. To perform a second function, press 2nd and then the appropriate function key. If you accidentally press the 2nd key, simply press it again to cancel its affect.

A. Clearing the calculator display and memory, and setting the decimal points:

	Keystrokes			Display	Description
1.		AC/ON		0	Switch the calculator on. This will also clear the calculator completely, including the display, all pending operations, and the memory and mode operations. It also sets the calculator to floating-decimal mode and financial mode.
2.		CE/E		0	Clears incorrect entries, error conditions, the display, or pending operations. It does not affect the memory, the mode registers, or the display format.
3.	2nd	CMR		0	Clears ay values that have been stored in the mode registers. Changing to a new mode also clears the contents of the mode registers.
4.	2nd	Fix	2	0.00	Sets the number of decimals to two.
5.	2nd	Fix	.	0	Sets decimals back to floating.

B. Calculating the present value of a lump sum amount:

Example: Liz anticipates it will cost her $65,000 to buy a house in eighteen months. How much should she invest today, at an annual interest rate of 15% (interest is compounded monthly), to be able to afford the house in one and a half years?

	Keystrokes	Display	Description
	Clear all memory.		
1.	AC/ON	0	Clears Time-Value-of-Money worksheet.
2.	65000 FV	65,000	Records the future cash flow of $65,000.
3.	18 N	18	Calculates the number of time periods as 18.
4.	15 ÷ 12 = %i	1.25	Records the periodic interest rate of 1.25% per month for 18 months.
5.	CPT PV	51,975.99	Calculates the present value of $65000 in 1.5 years discounted at a monthly rate of 1.25%.

C . Calculating the future value of a lump sum amount:

Example: If John invests $1,850 today in an asset earning a 10% rate of return (compounded annually), how much will he have after two years?

	Keystrokes	Display	Description
	Clear all memory.		
1.	AC/ON	0	Clears Time-Value-of-Money worksheet.
2.	1850 PV	1,850	Records the present cash outflow of $1,850.

3.	10	%i	10	Stores annual rate of interest as 10%.
4.	2	N	2	Records number of time periods as 2.
5.	CPT	FV	2,238.50	Calculates the future value of $1,850 after 2 years at 10%.

D. Calculating the present value of an annuity:

Example: How much should you invest now so that, starting one year from today, your daughter can receive $6,000 per year for the next five years? Assume the discount rate is 15%.

Keystrokes		Display	Description
Clear all memory.			
1.	AC/ON	0	Clears Time-Value-of-Money worksheet.
2. 6000	PMT	6,000	Records the amount of the periodic payments or annuity.
3. 15	%i	15	Records annual rate of interest as 15%.
4. 5	N	5	Records number of time periods as 5.
5. CPT	PV	PV = 20,112.93	Calculates the PV of the annuity.

E. Calculating the present value of an annuity due:

Example: In this case, instead of receiving payments at the end of each year, your daughter will receive the payments at the beginning of each year**.** Therefore, her first payment will be received immediately.

Thereare two methods to calculate the present value of an annuity due:

1. You can calculate the present value of an annuity, as shown in section D, and multiply it by (1 + k). In that case the additional step would be:

Keystrokes		Display	Description
Follow steps 1-5 from section D.			
6. x	1.15 =	23,129.87	Calculates the PV of the annuity due.

2. The TI BA-35 SOLAR allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below:

Keystrokes		Display	Description
Clear all memory.			
1.	AC/ON	0	Clears Time-Value-of-Money worksheet.
2. 2nd	BGN	Begin	Sets the payment mode to beginning of the period.
3. 6000	PMT	6,000	Records the amount of the periodic payments.
4. 15	%i	15	Records annual rate of interest as 15%.
5. 5	N	5	Records number of time periods as 5.
6. CPT	PV	23,129.87	Calculates the PV of the annuity due.
7.	AC/ON	0	Clears Time-Value-of-Money worksheet and sets payments to the default “end of the period” position.

F. Calculating the future value of an annuity:

Example: You have recently won a lottery for $10,000. Your winnings will come in five annual payments of $2,000 each, starting one year from now. If the annual compound rate is 11.4%, how much is the lottery worth at the end of five years?

	Keystrokes		Display	Description
Clear all memory.				
1.		AC/ON	0	Clears Time-Value-of-Money worksheet.
2.	2000	PMT	2,000	Records the amount of periodic payments.
3.	11.4	%i	11.4	Records the annual compound rate as 11.4%.
4.	5	N	5	Records the number of time periods as 5.
5.	CPT	FV	-12,555.07	Calculates FV of the annuity.

G. Calculating the future value of an annuity due:

Example: In this case, your winnings will be paid at the beginning, instead of at the end, of each year for five years. So, you are going to get the first payment of your $10,000 lottery, i.e. $2,000, immediately! Thereare two methods to calculate the future value of an annuity due:

1. *You can calculate the future value of an annuity, as shown in section F, and multiply it by (1 + k). In that case the additional step would be:*

	Keystrokes			Display	Description
Follow steps 1-5 from section F. (i)					
6.	x	1.114	=	-13,986.35	Calculates the FV of the annuity due.

2. The TI BA-35 SOLAR allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below.

	Keystrokes		Display	Description
Clear all memory.				
1.		AC/ON	0	Clears Time-Value-of-Money worksheet.
2.	2nd	BGN	Begin	Sets the payment mode to beginning of the period.
3.	2000	PMT	2,000	Records the amount of the periodic payments.
4.	11.4	%i	11.4	Records annual rate of interest as 11.4%.
5.	5	N	5	Records number of time periods as 5.
6.	CPT	FV	-13,986.35	Calculates the FV of the annuity due.
7.		AC/ON	0	Clears Time-Value-of-Money worksheet and sets payments to the default “end of the period” position.

H. Calculating the net present value of an annuity:

Example: Jane thinks if she invests $80,000 by buying property today, she can get $15,000 in rent from it for each of the next twenty years (the rent will be paid quarterly). If she wants a rate of return of 12% (with quarterly discounting) on her investment, what is the net present value of this project?

1. The annual rate of return will be divided by four, i.e., the quarterly rate of return will be 3%.
2. The number of time periods will be multiplied by four, i.e., 80.
3. The amount of annual rent will be divided by four, i.e., $3,750.

Keystrokes	Display	Description
Clear all memory.		
1. AC/ON	0	Clears Time-Value-of-Money worksheet.
2. 15000 ÷ 4 = PMT	3,750	Records the amount of the quarterly periodic payments.
3. 12 ÷ 4 = %i	3	Records quarterly rate of interest as 3%.
4. 20 x 4 = N	80	Records number of quarterly time periods as 80.
5. CPT PV	113,252.86	Calculates the PV of the annuity.
6. - 80000 =	33,252.86	Computes the Net Present Value.

I. Calculating the internal rate of return of an annuity:

Example: ABC Inc. is planning to spend $35,000 to buy a warehouse. Under the contract, they will receive an annual after-tax cash flow of $6,000 (paid semiannually) from the property for the next eight years. What is the internal rate of return for the investment?

Keystrokes	Display	Description
Clear all memory.		
1. AC/ON	0	Clears Time-Value-of-Money worksheet.
2. 6000 ÷ 2 = PMT	3,000	Records the amount of the semiannual periodic payments.
3. 35000 PV	35,000	Records the cost of the warehouse.
4. 8 x 2 = N	16	Records number of quarterly time periods as 80.

5.	CPT	%i		3.98	Calculates semiannual IRR.
6.	x	2	=	7.97	Computes the IRR.

J. Bond valuation with interest compounded annually:

Example: How much would you be willing to pay for a bond today if it pays $100 in interest annually for 20 years (starting next year), and has a principal payment of $1,000? The yield to maturity is 15%.

This question can be interpreted as that of finding the NPV of an uneven cash flow series, with the initial cash outflow equal to zero. Hence, we will follow the steps used for calculating NPV to compute the current price of the bond.

	Keystrokes		Display	Description
Clear all memory.				
1.		AC/ON	0	Clears Time-Value-of-Money worksheet.
2.	100	PMT	100	Records the amount of the periodic annual coupon payments.
3.	15	%i	15	Records annual yield-to-maturity as15%.
4.	20	N	20	Records number of time periods as 20.
5.	1000	FV	1000	Records the future face or par value of the bond.
6.	CPT	PV	687.03	Calculates the bond’s current market price.

K. Bond valuation with interest compounded semiannually:

Since most bonds pay interest semiannually, we will show the conversion required to calculate the current value of such bonds.

Example: If the bond described in section J pays interest semiannually, the calculations will be:

I_t=\$50, $P_{n=}$\$1000, i=7.5%, n=40.

	Keystrokes					Display	Description
Clear all memory.							
1.		AC/ON				0	Clears Time-Value-of-Money worksheet.
2.	100	÷	2	=	PMT	50	Records the amount of the periodic semiannual coupon payments.
3.	15	÷	2	=	%i	7.5	Records semiannual yield-to-maturity as7.5%.
4.	20	x	2	=	N	40	Records number of time periods as 40.
5.	1000	FV				1000	Records the future face or par value of the bond.
6.	CPT	PV				685.13	Calculates the bond's current market price.

II. Texas Instruments (TI) BAII PLUS

The TI BAII PLUS can perform two basic sets of financial functions. The first set of functions is invoked simply by pressing the relevant keys. The second set is invoked first by pressing the gray colored "2nd " function key, which is located at the far left on the second row from the top, and then selecting the appropriate gray colored function written above the calculator keys.

This 2nd key will be represented by "2nd" in this appendix.

The BA II PLUS has a continuous memory. Turning off the calculator does not affect the contents stored in the memory, though the display is reset to zero. Therefore, it is extremely important to *clear the calculator memory after each calculation*. The BAII PLUS automatically turns itself off when not used for more than approximately ten minutes.

A. Clearing the calculator display and memory, and setting the decimal points:

	Keystrokes				Display	Description
1.	ON/OFF				0.00	Switch the calculator on.
2.	2nd	QUIT			0.00	Resets the calculator to the standard mode, clears the screen.
3.	2nd	MEM	2nd	CLRWork	MO=0.00	Clears all the memory locations simultaneously.
4.	2nd	Format	9	ENTER	DEC=9	Allows the number of decimal places on the calculator to "float."
5.	2nd	QUIT			0.00	Brings the calculator to the standard mode.

To clear each memory location individually, use the following key sequence.

	Keystrokes			Display	Description
1.	2nd	MEM		MO=0	Clears the memory location 1.
2.	↑	0	ENTER	M9=0	Clears the next memory location.

A worksheet for this calculator is a framework of formulae, such as the Time-Value-of-Money worksheet. The term "worksheet" has been used extensively in the owners' manual and, hence, is being used in this appendix.

Note:
1. We will be using two decimal places for all the calculations in this appendix. To reset the TI BA II PLUS to two decimal places, press <2nd><Format>><2><Enter>
2. Even though it displays two decimal digits, the TI BAII PLUS uses 13 digits in all calculations.
3. To erase a part of the entered display, use CE/C key.
4. The CE/C key can be used to clear any error displays.

B. Using the memory capability:

Example: Before leaving on a sales call one morning, Alfred stored the price of a fax machine ($1,200) and a printer ($1,000) in his calculator. Later that day, he sold three fax machines and four printers to a customer. He used his calculator to get the total amount due from this customer in the following way:

Keystrokes	Display	Description
Clear all memory.		
1. 1200 STO 1	1,200.00	Stores the price of the fax machine in memory location 1.
2. 1000 STO 2	1,000.00	Stores the price of the printer in memory location 2.
3. ON/OFF		Turns the calculator off.
Later that day:		
4. ON/OFF	0.00	After the sale, Alfred turns the calculator on.
5. RCL 1	1,200.00	Recalls the cost of the fax to the display.
6. x 3 =	3,600.00	Multiplies 1,200 by 3 to calculate the cost of the three fax machines.
7. STO 3	3,600.00	Stores the number in the memory location 3.

8.	RCL	2			1,000.00	Recalls the cost of the printer.
9.	x	4	=		4,000.00	Calculates cost of four printers.
10.	+	RCL	3	=	7,600.00	Recalls the cost of fax machines to calculate the total amount for the sale.

C. Calculating the present value of a lump sum amount:

Example: Liz anticipates it will cost her $65,000 to buy a house in eighteen months. How much should she invest today, at an annual interest rate of 15% (interest is compounded monthly), to be able to afford the house in one and a half years?

	Keystrokes				Display	Description
Clear all memory.						
1.	2nd	CLRTVM			0.00	Clears Time-Value-of-Money worksheet.
2.	2nd	P/Y	12	ENTER	P/Y=12.00	Sets number of payments per year to 12.
3.	2nd	QUIT			0.00	Brings the calculator to the standard mode.
4.	65000	FV			FV=65,000.00	Records the future cash flow of $65,000.
5.	15	I/Y			I/Y=15.00	Records the periodic rate of interest as 15%.
6.	1.5	2nd	xP/Y		18.00	Calculates the number of time periods as 18.
7.	N				N=18.00	Stores the number of time periods.
8.	CPT	PV			PV=-51,975.99	Calculates the present value of $65000 in 1.5 years discounted at a monthly rate of 1.25%.

Note: The display in step 8 has a negative sign because it represents a cash outflow (investment) today.

D . Calculating the future value of a lump sum amount:

Example: If John invests $1,850 today in an asset earning a 10% rate of return (compounded annually), how much will he have after two years?

	Keystrokes				Display	Description
Clear all memory.						
1.	2nd	CLRTVM			0.00	Clears Time-Value-of-Money worksheet.
2.	2nd	P/Y	1	ENTER	P/Y=1.00	Sets number of payments per year to 1.
3.	2nd	QUIT			0.00	Brings the calculator to the standard mode.
4.	1850	+/–	PV		PV=–1,850.00	Records the present cash outflow of $1,850.
5.	10	I/Y			I/Y=10.00	Stores annual rate of interest as 10%.
6.	2	N			N=2.00	Records number of time periods as 2.
7.	CPT	FV			FV=2,238.50	Calculates the future value of $1,850 after 2 years at 10%.

E. Calculating the present value of an annuity:

Example: How much should you invest now so that, starting one year from today, your daughter can receive $6,000 per year for the next five years? Assume the discount rate is 15%.

	Keystrokes				Display	Description
Clear all memory.						
1.	2nd	CLRTVM			0.00	Clears Time-Value-of-Money worksheet.
2.	2nd	P/Y	1	ENTER	P/Y=1.00	Sets number of payments per year to 1.
3.	2nd	QUIT			0.00	Brings the calculator to the standard mode.
4.	6000	PMT			PMT=6,000.00	Records the amount of the periodic payments.
5.	15	I/Y			I/Y=15.00	Records annual rate of interest as 15%.
6.	5	N			N=5.00	Records number of time periods as 5.
7.	CPT	PV			PV=–20,112.93	Calculates the PV of the annuity.

F. Calculating the present value of an annuity due:

Example: In this case, instead of receiving payments at the end of each year, your daughter will receive the payments at the beginning of each year**.** Therefore, her first payment will be received immediately.

Thereare two methods to calculate the present value of an annuity due:

1. You can calculate the present value of an annuity, as shown in section E, and multiply it by (1 + k). In that case the additional step would be:

	Keystrokes				Display	Description
Follow steps 1-7 from section E.						
8.	x	1.15	=		-23,129.87	Calculates the PV of the annuity due.

2. The TI BAII PLUS allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below:

	Keystrokes				Display	Description
Clear all memory.						
1.	2nd	CLRTVM			0.00	Clears Time-Value-of-Money worksheet.
2.	2nd	P/Y	1	ENTER	P/Y=1.00	Sets number of payments per year to 1.
3.	2nd	BGN			END	Shows the default setting for the payment mode.
4.	2nd	SET			BGN	Sets the payment mode to beginning of the period.
5.	2nd	QUIT			0.00	Brings the calculator to the standard mode.
6.	6000	PMT			PMT=6,000.00	Records the amount of the periodic payments.
7.	15	I/Y			I/Y=15.00	Records annual rate of interest as 15%.
8.	5	N			N=5.00	Records number of time periods as 5.
9.	CPT	PV			PV=–23,129.87	Calculates the PV of the annuity due.
10.	2nd	BGN			BGN	Invokes the payment mode.
11.	2nd	SET			END	Sets the payment mode to the end of the period.
12.	2nd	QUIT			0.00	Brings the calculator to the standard mode.

G. Calculating the future value of an annuity:

Example: You have recently won a lottery for $10,000. Your winnings will come in five annual payments of $2,000 each, starting one year from now. If the annual compound rate is 11.4%, how much is the lottery worth at the end of five years?

Keystrokes				Display	Description
Clear all memory.					
1. 2nd CLRTVM				0.00	Clears Time-Value-of-Money worksheet.
2. 2nd P/Y	1	ENTER		P/Y=1.00	Sets number of payments per year to 1.
3. 2nd QUIT				0.00	Brings the calculator to the standard mode.
4. 2000 PMT				PMT=2,000.00	Records the amount of periodic payments.
5. 11.4 I/Y				I/Y=11.40	Records the annual compound rate as 11.4%.
6. 5 N				N=5.00	Records the number of time periods as 5.
7. CPT FV	+/-			12,555.07	Calculates FV of the annuity.

H. Calculating the future value of an annuity due:

Example: In this case, your winnings will be paid at the beginning, instead of at the end, of each year for five years. So, you are going to get the first payment of your $10,000 lottery, i.e. $2,000, immediately! Thereare two methods to calculate the future value of an annuity due:

1. *You can calculate the future value of an annuity, as shown in section G, and multiply it by (1 + k). In that case the additional step would be:*

Keystrokes				Display	Description
Follow steps 1-7 from section G.					
8. x	1.114	=		13,986.35	Calculates the FV of the annuity due.

2. The TI BAII PLUS allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below.

	Keystrokes				Display	Description
Clear all memory.						
1.	2nd	CLRTVM			0.00	Clears Time-Value-of-Money worksheet.
2.	2nd	P/Y	1	ENTER	P/Y=1.00	Sets number of payments per year to 1.
3.	2nd	BGN			END	Shows the default setting for the payment mode.
4.	2nd	SET			BGN	Sets the payment mode to beginning of the period.
5.	2nd	QUIT			0.00	Brings the calculator to the standard mode.
6.	2000	PMT			PMT=2,000.00	Records the amount of the periodic payment.
7.	11.4	I/Y			I/Y=11.40	Records annual rate of interest as 11.4%.
8.	5	N			N=5.00	Records number of time periods as 5.
9.	CPT	FV	+/-		13,986.35	Calculates the FV of an annuity due.
10.	2nd	BGN			BGN	Invokes the payment mode.
11.	2nd	SET			END	Sets the payment mode to the end of the period.
12.	2nd	QUIT			0.00	Brings the calculator to the standard mode.

I. Calculating the net present value of an annuity:

Example: Jane thinks if she invests $80,000 by buying property today, she can get $15,000 in rent from it for each of the next twenty years (the rent will be paid quarterly). If she wants a rate of return of 12% (with quarterly discounting) on her investment, what is the net present value of this project?

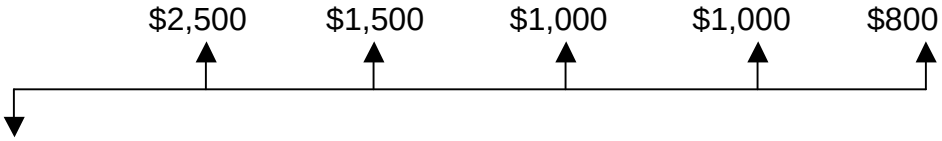
1. The annual rate of return will be divided by four, i.e., the quarterly rate of return will be 3%.
2. The number of time periods will be multiplied by four, i.e., 80.
3. The amount of annual rent will be divided by four, i.e., $3,750.

	Keystrokes	Display	Description
	Clear all memory.		
1.	2nd CLRWork	0.00	Clears the Cash Flow worksheet.
2.	2nd Reset ENTER	RST 0.00	Resets all variables to zero.
3.	CF 80000 +/–	CF_0 -80,000	Inputs initial cash outflow.
4.	ENTER	CF_0=-80,000.00	Stores initial cash outflow.
5.	↓ 15000 ÷	C01 15,000.00	Calculates periodic cash inflows.
6.	4 ENTER	C01=3,750.00	Stores quarterly cash inflow amount.
7.	↓ 20 x 4 ENTER	F01=80.00	Stores the number of times the quarterly cash inflow occurs.
8.	NPV 12 ÷ 4 ENTER	I=3.00	Stores the quarterly interest rate as 3%.
9.	↓ CPT	NPV=33,252.86	Calculates the net present value of the investment.

J. Calculating the net present value of a series of uneven cash flows:

The TI BAII PLUS can store 24 cash flow groups, besides the initial cash investment. A cash flow group comprises the cash flow amount and the number of times it repeats consecutively in the cash flow series. Each cash flow group can have up to 9,999 cash flows i.e., the maximum value of Fnn (the frequency of consecutive cash flows in one group) can be 9,999.

Example: Beth is planning to buy a Pentium based PC for rental purposes. She has calculated that her expected cash flows from the investment for the next five years would be as shown below.



CF_0 = -$4,000

If she has to pay an annual interest rate of 9.75%, should she buy the computer?

	Keystrokes	Display	Description
Clear all memory.			
1.	2nd CLRWork	0.00	Clears the Cash Flow worksheet.
2.	2nd Reset ENTER	RST 0.00	Resets all variables to zero.
3.	CF 4000 +/–	CF_0 -4,000	Inputs initial cash outflow.
4.	ENTER	CF_0=–4,000.00	Stores initial cash outflow.
5.	↓ 2500 ENTER	C01=2,500.00	Stores the first cash inflow.
6.	↓	F01=1.00	Records that cash inflow of $2,500 occurs once.
7.	↓ 1500 ENTER	C02=1,500.00	Stores the second cash inflow.
8.	↓	F02=1.00	Records that cash inflow of $1,500 occurs once.
9.	↓ 1000 ENTER	C03=1,000.00	Stores the third cash inflow.

10.	↓	2	ENTER	F03=2.00	Stores the number of times that cash inflow of $1,000 repeats.
11.	↓	800	ENTER	C04=800.00	Stores the fifth cash inflow.
12.	NPV	9.75	ENTER	I=9.75	Stores the annual interest rate as 9.75%.
13.	↓	CPT		NPV=1,471.37	Calculates the net present value of the investment.

K. Calculating the internal rate of return of an annuity:

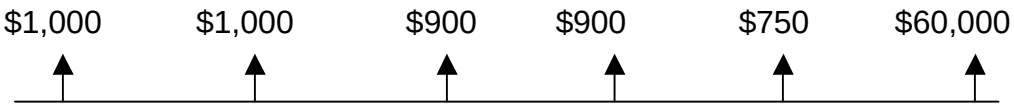
Example: ABC Inc. is planning to spend $35,000 to buy a warehouse. Under the contract, they will receive an after-tax cash flow of $6,000 (paid semiannually) from the property for the next eight years. What is the internal rate of return for the investment?

Keystrokes				Display	Description
Clear all memory.					
1.	2nd	CLRWork		0.00	Clears the Cash Flow worksheet.
2.	2nd	Reset	ENTER	RST 0.00	Resets all variables to zero.
3.	CF	35000	+/–	C_0 -35,000.00	Change sign to show cash outflow.
4.	ENTER			CF_0=-35,000.00	Stores initial cash investment.
5.	↓	6000	÷	C01 6,000.00	Computes semi-annual cash inflow.
6.	2	ENTER		C01=3,000.00	Stores semi-annual cash inflow.
7.	↓	8	x	F01 8.00	Calculate the total number of time periods.
8.	2	ENTER		F01=16.00	Store total number of time periods.

9.	IRR	CPT		IRR=3.98	Calculates semi-annual IRR of this investment.
10.	x	2	=	IRR 7.97	Calculates annual IRR of this investment.

L. Calculating the internal rate of return of a series of uneven cash flows:

Example: Healthtime has the opportunity to make an investment that requires an initial cash outflow of $6,500.. The estimated cash inflows from the project for the next 6 years are shown below. What is the IRR on this investment?



CF_0 = -$6,500

Keystrokes			Display	Description
Clear all memory.				
1. 2nd	CLRWork		0.00	Clears the Cash Flow worksheet.
2. 2nd	Reset	ENTER	RST 0.00	Resets all variables to zero.
3. CF	6500	+/–	CF_0 -6,500.00	Change sign to show cash outflow.
4. ENTER			CF_0=-6,500.00	Stores initial cash investment.
5. ↓	1000	ENTER	C01=1, 000.00	Stores first cash inflow.
6. ↓	2	ENTER	F01=2.00	Records that cash inflow of $1,000 occurs twice
7. ↓	900	ENTER	C02=900.00	Stores second cash flow amount.
8. ↓	2	ENTER	F02=2.00	Records that cash inflow of $900 occurs twice.
9. ↓	750	ENTER	C03=750.00	Stores third cash flow amount.

10.	↓			F03=1.00	Shows that cash flow of $750,000 occurs once.
11.	↓	60000	ENTER	C04=60,000.00	Stores final cash inflow of $60,000.
12.	IRR	CPT		IRR=51.88	Calculates IRR of this investment.

M. Bond valuation with interest compounded annually:

Example: How much would you be willing to pay for a bond today if it pays $100 in interest annually for 20 years (starting next year), and has a principal payment of $1,000? The yield to maturity is 15%.

This question can be interpreted as that of finding the NPV of an uneven cash flow series, with the initial cash outflow equal to zero. Hence, we will follow the steps used for calculating NPV to compute the current price of the bond.

	Keystrokes			Display	Description
Clear all memory.					
1.	2nd	CLRWork		0.00	Clears the Cash Flow worksheet.
2.	2nd	Reset	ENTER	RST 0.00	Resets all variables to zero.
3.	CF	0	ENTER	$CF_{0=}$0.00	Inputs initial cash outflow as zero.
4.	↓	100	ENTER	C01=100.00	Stores the first cash inflow.
5.	↓	19	ENTER	F01=19.00	Records that cash inflow of $100 occurs 19 times.
6.	↓	1100	ENTER	C02=1,100.00	Stores the final cash inflow.
7.	NPV	15	ENTER	I=15.00	Stores the annual discount rate as 15%.
8.	CPT			NPV=687.03	Calculates the initial price of the bond.

N. Bond valuation with interest compounded semiannually:

Since most bonds pay interest semiannually, we will show the conversion required to calculate the current value of such bonds.

Example: If the bond described in section K pays interest semiannually, the calculations will be:

I_t=\$50, $P_{n=}$\$1000, i=7.5%, n=40.

	Keystrokes				Display	Description
Clear all memory.						
1.	2nd CLRWork				0.00	Clears the Cash Flow worksheet.
2.	2nd	Reset	ENTER		RST 0.00	Resets all variables to zero.
3.	CF	0	ENTER		CF_o=0.00	Inputs initial cash outflow as zero.
4.	↓	100	÷		C01 100-00	Calculates the semiannual interest payment.
5.	2	ENTER			C01=50.00	Stores the semiannual interest payment as \$50.
6.	↓	20	x		F01 20.00	Calculates the number of periods when cash inflow of \$50 will occur.
7.	2	-	1	ENTER	F01=39.00	Stores the number of interest periods.
8.	↓	1050	ENTER		C02=1,050.00	Stores the final cash inflow.
9.	NPV	15	÷		I 15.00	Calculates semiannual discount rate.
10.	2	ENTER			I=7.50	Stores semiannual discount rate as 7.5%.
11.	↓	CPT			NPV=685.14	Calculates the initial price of the bond.

III. Hewlett Packard (HP) 12C

The HP 12C is color-coded. The gold "f" key refers to the function coded in gold above the keys on the calculator. Similarly, the blue "g" key refers to the functions coded in blue on the lower portion of the keys themselves.

The HP 12C has continuous memory. Therefore, turning of the calculator does not affect the information you have previously stored in the calculator. If not turned off manually, the calculator will turn off automatically approximately 8 to 17 minutes after last use.

A. Clearing the calculator display and memory, and setting the decimal points:

	Keystrokes				Display	Description
1.	ON	CLX	f	REG	0.00000	Clears screen and storage registers.
2.	f	FIN			0.00000	Clears the financial registers.
3.	f	2			0.00	Sets the number of decimal places equal to 2. Note: the HP12C will perform calculations to 10 decimals even though only two decimals are displayed.

B. Using the memory capability:

Example: Before leaving on a sales call one morning, Alfred stored the price of a fax machine ($1,200) and a printer ($1,000) in his calculator. Later that day, he sold three fax machines and four printers to a customer. He used his calculator to get the total amount due from this customer in the following way:

	Keystrokes			Display	Description
Clear all memory and financial registers.					
1.	1200	STO	1	1,200.00	Stores the price of the fax machine in memory location 1.
2.	1000	STO	2	1,000.00	Stores the price of the printer in memory location 2.

3.	ON			Turns the calculator off.

Later that day:

4.	ON		1,000.00	After the sale, Alfred turns the calculator on.
5.	RCL	1	1,200.00	Recalls the cost of the fax to the display.
6.	3	x	3,600.00	Multiplies 1,200 by 3 to calculate the cost of the three fax machines.
7.	RCL	2	1,000.00	Recalls the cost of the printer.
8.	4	x	4,000.00	Calculates cost of four printers.
9.	+		7,600.00	Totals the amount for this sale.

C. Calculating the present value of a lump sum amount:

Example: Liz anticipates it will cost her $65,000 to buy a house in eighteen months. How much should she invest today, at an annual interest rate of 15% (interest is compounded monthly), to be able to afford the house in one and a half years?

	Keystrokes			Display	Description
Clear the memory and financial registers.					
1.	65000	FV		65,000.00	Record's the future cash flow of $65,000.
2.	15	g	12÷	1.25	Records the monthly interest rate of 1.25%.
3.	1.5	g	12 x	18.00	Records the number of time periods as 18.

4.	PV		-51,975.99	Calculates the present value of $65000 in 1.5 years discounted at a monthly rate of 1.25%.

Note: The display in step 8 has a negative sign because it represents a cash outflow (investment) today.

D . Calculating the future value of a lump sum amount:

Example: If John invests $1,850 today in an asset earning a 10% rate of return (compounded annually), how much will he have after two years?

	Keystrokes		Display	Description
Clear the memory and financial registers.				
1.	1850 CHS	PV	-1,850.00	Records the present cash outflow of $1,850.00.
2.	10	i	10.00	Records the annual interest rate of 10%.
3.	2	n	2.00	Records the number of time periods as 2.
4.	FV		2,238.50	Calculates the future value of $1,850 after 2 years at 10%.

E. Calculating the present value of an annuity:

Example: How much should you invest now so that, starting one year from today, your daughter can receive $6,000 per year for the next five years? Assume the discount rate is 15%.

	Keystrokes		Display	Description
Clear the memory and financial registers.				
1.	6000	PMT	6,000.00	Records the amount of the periodic payments.

2.	15	i	15.00	Records the annual interest rate of 15%.
3.	5	n	5.00	Records the number of time periods as 5.
4.	PV		-20,112.93.00	Calculates the present value of the annuity.

F. Calculating the present value of an annuity due:

Example: In this case, instead of receiving payments at the end of each year, your daughter will receive the payments at the beginning of each year**.** Therefore, her first payment will be received immediately.

Thereare two methods to calculate the present value of an annuity due:

1. You can calculate the present value of an annuity, as shown in section E, and multiply it by (1 + k). In that case the additional step would be:

Keystrokes	Display	Description

Follow steps 1-4 from section E.

5.	1.15	1.15	Records the second term (1+k) in the formula for an annuity due.
6.	x	-23,129.87	Calculates the PV of the annuity due.

2. The HP 12C allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below:

Keystrokes	Display	Description

Clear the memory and financial registers.

1.	g BEG	BEGIN	Displays BEGIN at the bottom of the screen to indicate that payment is made at the beginning of the period.

2.	6000	PMT	6,000.00	Records the amount of the periodic payments.
3.	15	i	15.00	Records the annual interest rate of 15%.
4.	5	n	5.00	Records the number of time periods as 5.
5.	g	END		Toggles to the default setting of end-of-the-period payments.

G. Calculating the future value of an annuity:

Example: You have recently won a lottery for $10,000. Your winnings will come in five annual payments of $2,000 each, starting one year from now. If the annual compound rate is 11.4%, how much is the lottery worth at the end of five years?

	Keystrokes		Display	Description
Clear the memory and financial registers.				
1.	2000	PMT	2,000.00	Records the amount of periodic payments.
2.	11.4	i	11.4	Records the annual rate of interest of 11.4%.
3.	5	n	5.00	Records the number of time periods as 5.
4.	FV	CHS	12,555.07	Calculates the FV of an annuity.

H. Calculating the future value of an annuity due:

Example: In this case, your winnings will be paid at the beginning, instead of at the end, of each year for five years. So, you are going to get the first payment of your $10,000 lottery, i.e. $2,000, immediately! Thereare two methods to calculate the future value of an annuity due:

1. *You can calculate the future value of an annuity, as shown in section G, and multiply it by (1 + k). In that case the additional step would be:*

	Keystrokes		Display	Description
Follow steps 1-4 from section G.				
5.	1.114		1.114	Records the second (1+k) term in the formula for an annuity due.
6.	x		13,986.35	Calculates the FV of the annuity due.

2. The HP 12C allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below.

	Keystrokes		Display	Description
Clear the memory and financial registers.				
1.	g	BEG	BEGIN	Displays the BEGIN at the bottom of the screen to indicate that payment is made at the beginning of the period.
2.	2000	PMT	2,000.00	Records the amount of periodic payments.
3.	11.4	i	11.40	Records the annual rate of interest of 11.4%.
4.	5	n	5.00	Records the number of time periods as 5.
5.	FV	CHS	13,986.35	Calculates the FV of an annuity due.
6.	g	END		Toggles to the default setting of end-of-the-period payments.

I. Calculating the net present value of an annuity:

Example: Jane thinks if she invests $80,000 by buying property today, she can get $15,000 in rent from it for each of the next twenty years (the rent will be paid quarterly). If she wants a rate of return of 12% (with quarterly discounting) on her investment, what is the net present value of this project?

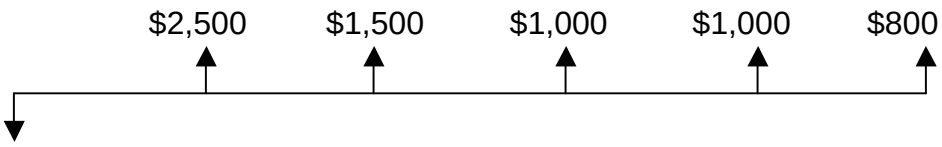
1. The annual rate of return will be divided by four, i.e., the quarterly rate of return will be 3%.
2. The number of time periods will be multiplied by four, i.e., 80.
3. The amount of annual rent will be divided by four, i.e., $3,750.

	Keystrokes	Display	Description
	Clear the memory and financial registers.		
1.	80000 CHS	-80,000	Record the initial cash outflow of $80,000.
2.	g CF0	-80,000.00	Stores the initial investment in the financial register.
3.	3750 g CFj	3,750.00	Stores cash inflow amount.
4.	80 g Nj	80.00	Records the number of time periods as 80.
5.	3 i	3.00	Records the quarterly interest rate of 3%.
6.	f NPV	33,252.86	Calculates the net present value of the investment.

J. Calculating the net present value of a series of uneven cash flows:

The HP 12C can store 24 cash flow groups, besides the initial cash investment. A cash flow group comprises the cash flow amount and the number of times it repeats consecutively in the cash flow series. Each cash flow group can have up to 9,999 cash flows i.e., the maximum value of Fnn (the frequency of consecutive cash flows in one group) can be 9,999.

Example: Beth is planning to buy a Pentium based PC for rental purposes. She has calculated that her expected cash flows from the investment for the next five years would be as shown below.



CF_0 = -$4,000

If she has to pay an annual interest rate of 9.75%, should she buy the computer?

	Keystrokes			Display	Description
	Clear the memory and financial registers.				
1.	4000	CHS		-4,000.00	Enter the initial investment of $4,000.
2.	g	CF0		-4,000.00	Stores the initial investment in the financial register.
3.	2500	g	CFj	2,500.00	Stores the first cash inflow amount.
4.	1500	g	CFj	1,500.00	Stores the second cash inflow amount.
5.	1000	g	CFj	1,000.00	Stores the third cash inflow amount.
6.	2	g	Nj	2.00	Records that $1,000 occurs twice for both the third and fourth time periods.
7.	800	g	CFj	800.00	Stores the fifth cash inflow amount.
8.	9.75	I		9.75	Records the annual interest rate of 9.75%.
9.	f	NPV		1,471.57	Calculates the net present value of the investment.

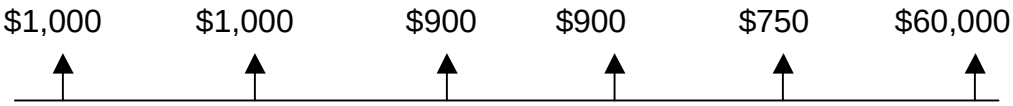
K. Calculating the internal rate of return of an annuity:

Example: ABC Inc. is planning to spend $35,000 to buy a warehouse. Under the contract, they will receive an after-tax cash flow of $6,000 (paid semiannually) from the property for the next eight years. What is the internal rate of return for the investment?

Keystrokes	Display	Description
Clear the memory and financial registers.		
1. 35000 CHS	-35,000	Enter the initial investment of $35,000.
2. g CF0	-35,000.00	Stores the initial investment in the financial register.
3. 3000 g CFj	3,000.00	Stores the semi-annual cash inflow amount.
4. 16 g Nj	16.00	Stores the total number of time periods as 16.
5. f IRR	3.98	Calculates the semi-annual IRR.
6. 2 x	7.97	Calculates the IRR of the investment.

L. Calculating the internal rate of return of a series of uneven cash flows:

Example: Healthtime has the opportunity to make an investment that requires an initial cash outflow of $6,500.. The estimated cash inflows from the project for the next 6 years are shown below. What is the IRR on this investment?



CF_0 = -$6,500

Keystrokes	Display	Description
Clear the memory and financial registers.		
1. 6500 CHS	-6,500	Enter the initial investment of $6,500.
2. g CF0	-6,500.00	Stores the initial investment in the financial register.

3.	1,000	g	CFj	1,000.00	Stores the first cash inflow amount
4.	2	g	Nj	2.00	Stores $1,000 as the cash inflow amount for both the first and second periods.
5.	900	g	CFj	900.00	Stores the amount of the third cash inflow.
6.	2	g	Nj	2.00	Records that $900 occurs twice for the third an fourth periods.
7.	750	g	CFj	750.00	Stores the fifth cash inflow amount.
8.	60,000	g	CFj	60,000.00	Stores the sixth cash inflow amount.
9.	f	IRR		51.88	Calculates the internal rate of return for the cash flow series.

M. Bond valuation with interest compounded annually:

Example: How much would you be willing to pay for a bond today if it pays $100 in interest annually for 20 years (starting next year), and has a principal payment of $1,000? The yield to maturity is 15%.

This question can be interpreted as that of finding the NPV of an uneven cash flow series, with the initial cash outflow equal to zero. Hence, we will follow the steps used for calculating NPV to compute the current price of the bond.

	Keystrokes			Display	Description
Clear the memory and financial registers.					
1.	0	g	CF0	0.00	Stores the initial investment as zero in the financial register.
2.	100	g	CFj	100.00	Stores the first cash inflow amount.

3.	19	g	Nj	19.00	Records that interest payments of $100 occur 19 times.
4.	1100	g	CFj	1100.00	Stores the amount of the last cash inflow (interest + principal).
5.	15	i		15.00	Records the yield-to-maturity as 15%.
6.	f	NPV		687.03	Computes the current bond price.

N. Bond valuation with interest compounded semiannually:

Since most bonds pay interest semiannually, we will show the conversion required to calculate the current value of such bonds.

Example: If the bond described in section K pays interest semiannually, the calculations will be: I_t=$50, $P_{n=}$$1000, i=7.5%, n=40.

Keystrokes			Display	Description
Clear the memory and financial registers.				
1. 0	g	CF0	0.00	Stores the initial investment as zero in the financial register.
2. 50	g	CFj	500.00	Stores the first cash inflow amount.
3. 39	g	Nj	39.00	Records that interest payments of $50 occur 39 times.
4. 1050	g	CFj	1050.00	Stores the amount of the last cash inflow (interest + principal payment).
5. 7.5	i		7.50	Records the semi-annual YTM as 7.5%.
6. f	NPV		685.14	Calculates the current bond value.

III. Hewlett Packard (HP) 17BII

The HP 17BII contains a two-line display space for messages, prompts, and labels. Menus and messages show you options and guide you through problems. Some keys and functions are activated by pressing the "SHIFT" key, which is the amber colored key located at the far left on the second line of keys from the bottom. The "CLR" (clear key) clears the calculator display line. Pressing "SHIFT" "CLEAR DATA" will clear all information in the current work area such as a time value of money worksheet.

It is also important to note that most financial calculations are accomplished by accessing the appropriate variable as displayed on the display panel. In order to select a particular variable, it is necessary to depress the up arrow symbol "^" located directly beneath the variable along the row of keys just beneath the display panel. For the sake of brevity in this guide, only the actual variable name will be indicated even though the up arrow symbol beneath the variable is actually depressed. To return to the main display line menu, simply press "SHIFT" "MAIN". To back out of a particular menu without going all the way back to the main menu, simply press EXIT.

The HP 17BII has continuous memory. Therefore, turning of the calculator does not affect the information you have previously stored in the calculator. If not turned off manually, the calculator will turn off automatically approximately 10 minutes after last use.

A. Clearing the calculator display and memory, and setting the decimal points:

	Keystrokes	Display	Description
1.	SHIFT CLEAR DATA	0.00	Clears screen and storage registers.
2.	DSP FIX ^ 2	0.00	Sets the number of decimal places equal to 2.

B. Using the memory capability:

Example: Before leaving on a sales call one morning, Alfred stored the price of a fax machine ($1,200) and a printer ($1,000) in his calculator. Later that day, he sold three fax machines and four printers to a customer. He used his calculator to get the total amount due from this customer in the following way:

Keystrokes					Display	Description
Clear all memory and financial registers.						
1.	1200	STO	1		1,200.00	Stores the price of the fax machine in memory location 1.
2.	1000	STO	2		1,000.00	Stores the price of the printer in memory location 2.
3.	SHIFT	OFF				Turns the calculator off.
Later that day:						
4.	ON				1,000.00	After the sale, Alfred turns the calculator on.
5.	RCL	1			1,200.00	Recalls the cost of the fax to the display.
6.	x	3	=		3,600.00	Multiplies 1,200 by 3 to calculate the cost of the three fax machines.
7.	STO	3			3,600.00	Stores the cost of the three fax machine.
7.	RCL	2			1,000.00	Recalls the cost of the printer.
8.	x	4	=		4,000.00	Calculates cost of four printers.
9.	+	RCL	3	=	7,600.00	Totals the amount for this sale.

C. Navigating Menus

The main menu is obtained by turning the calculator ON. The main Menu appears as follows:

0.00
FIN BUS SUM TIME SOLVE

For most calculations finance students will undertake, it will be necessary to next select the finance menu by selecting FIN, and then TVM for time value of money. The TVM menu appears as follows:

```
12 P/YR                    END     MODE
N    I%Y    PV    PMT    FV    OTHER
```

The HP 17BII is programmed with the assumption that interest is compounded 12 times each year (monthly compounding). This manual will reset the number of compounding periods to once per year and adjust the interest rate as needed in the calculations. The number of compounding periods and interest can be set to annual compounding as follows:

Keystrokes	Display	Description
1. Select the TVM Menu		
2. OTHER 1 P/YR	1 P/YR END MODE	Sets the calculator for annual compounding (one compounding period per year).

Note: To back out of menus, simply depress the EXIT key.

D. Calculating the present value of a lump sum amount:

Example: Liz anticipates it will cost her $65,000 to buy a house in eighteen months. How much should she invest today, at an annual interest rate of 15% (interest is compounded monthly), to be able to afford the house in one and a half years?

Keystrokes	Display	Description
1. SHIFTCLEAR DATA	0.00	Clears previously stored data.
2. FIN TVM	1 P/YR END MODE	Accesses the TVM Menu
3. 65000 FV	FV=65,000.00	Records the FV amount of $65,000.
4. 15 ÷ 12 = I%YR	I%YR=1.25	records the monthly interest rate of 1.25%
5. 18 N	N=18	records the number of monthly periods as 18.

6.	PV	PV = -51,975.99	Calculates the present value.

Note: The display in step 8 has a negative sign because it represents a cash outflow (investment) today.

E . Calculating the future value of a lump sum amount:

Example: If John invests $1,850 today in an asset earning a 10% rate of return (compounded annually), how much will he have after two years?

Keystrokes			Display	Description
Clear the data and select the TVM Menu				
1. 1850	+/-	PV	PV = -1,850.00	Records the present cash outflow of $1,850.00.
2. 10	I%YR		I%YR = 10.00	Records the annual interest rate of 10%.
3. 2	N		N = 2.00	Records the number of time periods as 2.
4. FV			FV = 2,238.50	Calculates the future value of $1,850 after 2 years at 10%.

F. Calculating the present value of an annuity:

Example: How much should you invest now so that, starting one year from today, your daughter can receive $6,000 per year for the next five years? Assume the discount rate is 15%.

Keystrokes		Display	Description
Clear the data and select the TVM Menu			
1. 6000	PMT	PMT = 6,000.00	Records the amount of the periodic payments.
2. 15	I%YR	I%YR = 15.00	Records the annual interest rate of 15%.

3.	5	N	N = 5.00	Records the number of time periods as 5.
4.	PV		PV = -20,112.93	Calculates the present value of the annuity.

G. Calculating the present value of an annuity due:

Example: In this case, instead of receiving payments at the end of each year, your daughter will receive the payments at the beginning of each year**.** Therefore, her first payment will be received immediately.

Thereare two methods to calculate the present value of an annuity due:

1. You can calculate the present value of an annuity, as shown in section F, and multiply it by (1 + k). In that case the additional step would be:

Keystrokes		Display	Description
Follow steps 1-4 from section F.			
5. x	1.15 =	-23,129.87	Records the second term (1+k) in the formula for an annuity due.

2. The HP 17BII allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below:

Keystrokes		Display	Description
Clear the data and select the TVM Menu			
1. OTHER	BEG	1 P/YR BEGIN MODE	Sets the calculator to beginning of the period payments.
2. EXIT	6000 PMT	PMT = 6,000.00	Records the amount of the periodic payments.
3.	15 I%YR	I%YR = 15.00	Records the annual interest rate of 15%.

4.	5	N	N = 5.00	Records the number of time periods as 5.
5.	PV		PV = - 23,129.87	Calculates the PV of the annuity due.

H. Calculating the future value of an annuity:

Example: You have recently won a lottery for $10,000. Your winnings will come in five annual payments of $2,000 each, starting one year from now. If the annual compound rate is 11.4%, how much is the lottery worth at the end of five years?

Keystrokes		Display	Description
Clear the data and select the TVM Menu			
1. 2000	PMT	PMT = 2,000.00	Records the amount of periodic payments.
2. 11.4	I%Y	I%YR = 11.4	Records the annual rate of interest of 11.4%.
3. 5	N	N = 5.00	Records the number of time periods as 5.
4. FV	+/-	FV = 12,555.07	Calculates the FV of an annuity.

I. Calculating the future value of an annuity due:

Example: In this case, your winnings will be paid at the beginning, instead of at the end, of each year for five years. So, you are going to get the first payment of your $10,000 lottery, i.e. $2,000, immediately! Thereare two methods to calculate the future value of an annuity due:

1. *You can calculate the future value of an annuity, as shown in section H, and multiply it by (1 + k). In that case the additional step would be:*

Keystrokes				Display	Description
Follow steps 1-4 from section H.					
5.	x	1.114	=	13,986.35	Calculates the FV of the annuity due.

2. *The HP 17BII allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below.*

Keystrokes	Display	Description
Clear the data and select the TVM Menu		
1. OTHER BEG	1 P/YR BEGIN MODE	Sets the calculator to beginning of the period payments.
2. EXIT 2000 PMT	PMT = 2,000.00	Records the amount of the periodic payments.
3. 11.4 I%YR	I%YR = 11.40	Records the annual interest rate of 11.4%.
4. 5 N	N = 5.00	Records the number of time periods as 5.
5. FV	FV = -13,986.35	Calculates the FV of the annuity due.

J. Calculating the net present value of an annuity:

Example: Jane thinks if she invests $80,000 by buying property today, she can get $15,000 in rent from it for each of the next twenty years (the rent will be paid quarterly). If she wants a rate of return of 12% (with quarterly discounting) on her investment, what is the net present value of this project?

3. The annual rate of return will be divided by four, i.e., the quarterly rate of return will be 3%.

4. The number of time periods will be multiplied by four, i.e., 80.

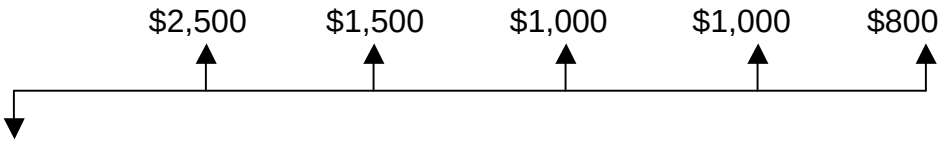
3. The amount of annual rent will be divided by four, i.e., $3,750.

Keystrokes	Display	Description
1. On SHIFT CLEAR DATA	0.00	Turn on and clear the calculator

2.	FIN	CFLO			FLOW (0) = ?	Select the cash flow data input register.
3.	80000	+/-	INPUT		FLOW (1) = ? -80,000.00	Stores the initial investment in the financial register.
4.	3750	INPUT			TIMES (1) = 1	Enters the quarterly annuity cash inflow and prompts the user to enter the number of periods.
5.	80	INPUT	EXIT	CALC	NPV, NUS, NFV = I%	Enters the number of periods and prompts the user for the interest rate.
6.	3	I%	NPV		NPV = 33,252.86	Enters the quarterly interest rate and calculates the net present value of the investment.

K. Calculating the net present value of a series of uneven cash flows:

Example: Beth is planning to buy a Pentium based PC for rental purposes. She has calculated that her expected cash flows from the investment for the next five years would be as shown below.



CF_0 = -$4,000

If she has to pay an annual interest rate of 9.75%, should she buy the computer?

	Keystrokes			Display	Description
1.	On	SHIFT CLEAR DATA		0.00	Turn on and clear the calculator
2.	FIN	CFLO		FLOW (0) = ?	Select the cash flow data input register.
3.	4000	+/-	INPUT	FLOW (1) = ? -4,000.00	Stores the initial investment in the financial register.

4.	2500	INPUT	INPUT		FLOW (2) = ? 1.00	Stores the second cash inflow amount.
5.	1500	INPUT	INPUT		FLOW (3) = ? 1.00	Stores the third cash inflow amount.
5.	1000	INPUT	2	INPUT	FLOW (4) = ? 2.00	Stores the third and fourth cash inflow.
6.	800	INPUT	INPUT		2.00	Stores the fifth cash inflow amount.
7.	EXIT	CALC	9.75	I%	I% = 9.75	Enters the discount rate.
8.	NPV				1,471.57	Calculates the net present value of the investment.

L. Calculating the internal rate of return of an annuity:

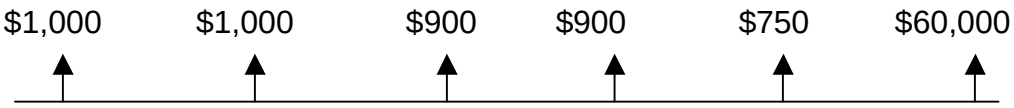
Example: ABC Inc. is planning to spend $35,000 to buy a warehouse. Under the contract, they will receive an after-tax cash flow of $6,000 (paid semiannually) from the property for the next eight years. What is the internal rate of return for the investment?

	Keystrokes				Display	Description
1.	On	SHIFT	CLEAR	DATA	0.00	Turn on and clear the calculator
2.	FIN	CFLO			FLOW (0) = ?	Select the cash flow data input register.
3.	35000	+/-	INPUT		FLOW (1) = ? -35,000.00	Stores the initial investment in the financial register.
4.	3000	INPUT			TIMES (1) = 1	Enters the semiannual annuity cash inflow and prompts the user to enter the number of periods.
5.	16	INPUT	EXIT	CALC	NPV, NUS, NFV = I%	Enter the number of semiannual time periods.

6.	IRR			IRR% = 3.98	Results in the se present value of the investment.
7.	x	2	=	7.97	Compute the IRR

M. Calculating the internal rate of return of a series of uneven cash flows:

Example: Healthtime has the opportunity to make an investment that requires an initial cash outflow of $6,500.. The estimated cash inflows from the project for the next 6 years are shown below. What is the IRR on this investment?



CF_0 = -$6,500

Keystrokes				Display	Description
1. On	SHIFT CLEAR DATA			0.00	Turn on and clear the calculator
2. FIN	CFLO			FLOW (0) = ?	Select the cash flow data input register.
3. 6500	+/-	INPUT		FLOW (1) = ? -6,500.00	Stores the initial investment in the financial register.
4. 1000	INPUT	2	INPUT	FLOW (2) = ? 2.00	Stores the first and second cash inflow amounts.
5. 900	INPUT	2	INPUT	FLOW (3) = ? 2.00	Stores the third and fourth cash inflow amounts.
6. 750	INPUT	INPUT		FLOW (4) = ? 1.00	Stores the fifth cash inflow amount.
7. 60000	INPUT	INPUT		FLOW (5) = ? 1.00	Stores the sixth cash inflow amount.
8. EXIT	CALC	IRR		IRR% = 51.88	Calculates the IRR.

N. Bond valuation with interest compounded annually:

The HP 17BII has a an extremely sophisticated bond calculator menu that is often used by practicing bond professionals. However, most finance students using the HP 17BII will be given bond data in a simplified format. As a result, it is more simple and convenient to use the time value of money (TVM) menu. This manual will therefore illustrate bond valuation principles using the TVM menu.

Example: How much would you be willing to pay for a bond today if it pays $100 in interest annually for 20 years (starting next year), and has a principal payment of $1,000? The yield to maturity is 15%.

This question can be interpreted as that of finding the NPV of an uneven cash flow series, with the initial cash outflow equal to zero. Hence, we will follow the steps used for calculating NPV to compute the current price of the bond.

	Keystrokes	Display	Description
Clear the data and select the TVM Menu			
1.	100 PMT	PMT = 100.00	Records the amount of the annual coupon payments.
2.	15 I%YR	I%YR = 15.00	Records the yield-to-maturity of 15%.
3.	20 N	N = 20.00	Records the number of time periods as 20.
4.	1000 FV	FV = 1,000.00	Records the future or face value of the bond.
4.	PV	PV = -687.03	Calculates the present value of the Bond

O. Bond valuation with interest compounded semiannually:

Since most bonds pay interest semiannually, we will show the conversion required to calculate the current value of such bonds.

Example: If the bond described in section K pays interest semiannually, the calculations will be:

I_t=$50, $P_{n=}$$1000, i=7.5%, n=40.

	Keystrokes		Display	Description
Clear the data and select the TVM Menu				
1.	50	PMT	PMT = 50.00	Records the amount of the semiannual coupon payments.
2.	7.5	I%YR	I%YR = 7.50	Records the semiannual yield-to-maturity of 7.5%.
3.	40	N	N = 40.00	Records the number of time periods as 40.
4.	1000	FV	FV = 1,000.00	Records the future or face value of the bond.
4.	PV		PV = -685.14	Calculates the present value of the Bond

I. Hewlett Packard (HP) 19BII

The HP 19BII is extremely sophisticated and contains a multi-line display space for messages, prompts, and labels. This manual will discuss only a small fraction of the 19BII's capabilities focusing primarily on its time value of money functions. Menus and messages show you options and guide you through problems. Some keys and functions are activated by pressing the "SHIFT" key, which is the amber colored key located at the far left on the second line of keys from the top. The "SHIFT" "CLR" key combination clears the calculator display line. Pressing "SHIFT" "CLEAR DATA" will clear all information in the current work area such as a time value of money worksheet.

It is also important to note that most financial calculations are accomplished by accessing the appropriate variable as displayed on the display panel. In order to select a particular variable, it is necessary to depress the GRAY key located directly beneath the variable along the row of keys just beneath the display panel. For the sake of brevity in this guide, only the actual variable name will be indicated even though the up arrow symbol beneath the variable is actually depressed. To return to the main display line menu, simply press "SHIFT" "MAIN". To back out of a particular menu without going all the way back to the main menu, simply press EXIT.

The HP 19BII has continuous memory. Therefore, turning of the calculator does not affect the information you have previously stored in the calculator. If not turned off manually, the calculator will turn off automatically approximately 10 minutes after last use.

A. Clearing the calculator display and memory, and setting the decimal points:

	Keystrokes	Display	Description
1.	SHIFT CLEAR DATA	0.00	Clears screen and storage registers.
2.	DSP FIX 2 INPUT	0.00	Sets the number of decimal places equal to 2.

B. Using the memory capability:

Example: Before leaving on a sales call one morning, Alfred stored the price of a fax machine ($1,200) and a printer ($1,000) in his calculator. Later that day, he sold three fax machines and four printers to a customer. He used his calculator to get the total amount due from this customer in the following way:

Keystrokes	Display	Description
Clear all memory and financial registers.		
1. 1200 STO 1	1,200.00	Stores the price of the fax machine in memory location 1.
2. 1000 STO 2	1,200.00 1,000.00	Stores the price of the printer in memory location 2.
3. ON		Turns the calculator off.
Later that day:		
4. ON	1,200.00 1,000.00	After the sale, Alfred turns the calculator on.
5. RCL 1	1,200.00 1,000.00 1,200.00	Recalls the cost of the fax to the display.
6. x 3 =	1,200.00 1,000.00 3,600.00	Multiplies 1,200 by 3 to calculate the cost of the three fax machines.
7. STO 3	1,200.00 1,000.00 3,600.00	Stores the cost of the three fax machine.
7. RCL 2	1,000.00 3,600.00 1,000.00	Recalls the cost of the printer.
8. x 4 =	1,000.00 3,600.00 4,000.00	Calculates cost of four printers.

9.	+	RCL	3	=	1,000.00 3,600.00 7,600.00	Totals the amount for this sale.

C. Navigating Menus

The main menu is obtained by turning the calculator ON. The main Menu appears as follows:

0.00
FIN BUS SUM TIME SOLVE TEXT

For most calculations finance students will undertake, it will be necessary to next select the finance menu by selecting FIN, and then TVM for time value of money. The TVM menu appears as follows:

12 P/YR END MODE

0.00
N I%Y PV PMT FV OTHER

The HP 19BII is programmed with the assumption that interest is compounded 12 times each year (monthly compounding). This manual will reset the number of compounding periods to once per year and adjust the interest rate as needed in the calculations. The number of compounding periods and interest can be set to annual compounding as follows:

Keystrokes			Display	Description
1. Select the TVM Menu				
2. OTHER	1	P/YR	1 P/YR END MODE	Sets the calculator for annual compounding (one compounding period per year).

Note: To back out of menus, simply depress the EXIT key.

D. Calculating the present value of a lump sum amount:

Example: Liz anticipates it will cost her $65,000 to buy a house in eighteen months. How much should she invest today, at an annual interest rate of 15% (interest is compounded monthly), to be able to afford the house in one and a half years?

Keystrokes	Display	Description
1. SHIFTCLEAR DATA	0.00	Clears previously stored data.
2. FIN TVM	1 PMTS/YR: END MODE 0.00	Accesses the TVM Menu
3. 65000 FV	FV=65,000.00	Records the FV amount of $65,000.
4. 15 ÷ 12 = I%YR	I%YR=1.25	records the monthly interest rate of 1.25%
5. 18 N	N=18	records the number of monthly periods as 18.
6. PV	PV = -51,975.99	Calculates the present value.

Note: The display in step 8 has a negative sign because it represents a cash outflow (investment) today.

E . Calculating the future value of a lump sum amount:

Example: If John invests $1,850 today in an asset earning a 10% rate of return (compounded annually), how much will he have after two years?

Keystrokes	Display	Description
Clear the data and select the TVM Menu		
1. 1850 +/- PV	PV = -1,850.00	Records the present cash outflow of $1,850.00.
2. 10 I%YR	I%YR = 10.00	Records the annual interest rate of 10%.

3.	2	N	N = 2.00	Records the number of time periods as 2.
4.	FV		FV = 2,238.50	Calculates the future value of $1,850 after 2 years at 10%.

F. Calculating the present value of an annuity:

Example: How much should you invest now so that, starting one year from today, your daughter can receive $6,000 per year for the next five years? Assume the discount rate is 15%.

	Keystrokes		Display	Description
Clear the data and select the TVM Menu				
1.	6000	PMT	PMT = 6,000.00	Records the amount of the periodic payments.
2.	15	I%YR	I%YR = 15.00	Records the annual interest rate of 15%.
3.	5	N	N = 5.00	Records the number of time periods as 5.
4.	PV		PV = -20,112.93	Calculates the present value of the annuity.

G. Calculating the present value of an annuity due:

Example: In this case, instead of receiving payments at the end of each year, your daughter will receive the payments at the beginning of each year**.** Therefore, her first payment will be received immediately.

Thereare two methods to calculate the present value of an annuity due:

1. You can calculate the present value of an annuity, as shown in section F, and multiply it by (1 + k). In that case the additional step would be:

	Keystrokes		Display	Description
Follow steps 1-4 from section F.				
5.	x	1.15 =	-23,129.87	Records the second term (1+k) in the formula for an annuity due.

2. The HP 19BII allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below:

Keystrokes	Display	Description
Clear the data and select the TVM Menu		
1. OTHER BEG	1 P/YR: BEGIN MODE	
	0.00	Sets the calculator to beginning of the period payments.
2. EXIT 6000 PMT	PMT = 6,000.00	Records the amount of the periodic payments.
3. 15 I%YR	I%YR = 15.00	Records the annual interest rate of 15%.
4. 5 N	N = 5.00	Records the number of time periods as 5.
5. PV	PV = - 23,129.87	Calculates the PV of the annuity due.

H. Calculating the future value of an annuity:

Example: You have recently won a lottery for $10,000. Your winnings will come in five annual payments of $2,000 each, starting one year from now. If the annual compound rate is 11.4%, how much is the lottery worth at the end of five years?

Keystrokes	Display	Description
Clear the data and select the TVM Menu		
1. 2000 PMT	PMT = 2,000.00	Records the amount of periodic payments.
2. 11.4 I%Y	I%YR = 11.4	Records the annual rate of interest of 11.4%.

3.	5	N	N = 5.00	Records the number of time periods as 5.
4.	FV	+/-	12,555.07	Calculates the FV of an annuity.

I. Calculating the future value of an annuity due:

Example: In this case, your winnings will be paid at the beginning, instead of at the end, of each year for five years. So, you are going to get the first payment of your $10,000 lottery, i.e. $2,000, immediately! Thereare two methods to calculate the future value of an annuity due:

1. *You can calculate the future value of an annuity, as shown in section H, and multiply it by (1 + k). In that case the additional step would be:*

Keystrokes			Display	Description
Follow steps 1-4 from section H.				
5.	x	1.114 =	13,986.35	Calculates the FV of the annuity due.

2. *The HP 19BII allows you to set the timing of the payment. You have to set the payment mode at "BEGIN" and start from the first step. This method is shown below.*

Keystrokes			Display	Description
Clear the data and select the TVM Menu				
1. OTHER	BEG		1 P/YR: BEGIN MODE 0.00	Sets the calculator to beginning of the period payments.
2. EXIT	2000	PMT	PMT = 2,000.00	Records the amount of the periodic payments.
3.	11.4	I%YR	I%YR = 11.40	Records the annual interest rate of 11.4%.

4.	5	N	N = 5.00	Records the number of time periods as 5.
5.	FV		FV = -13,986.35	Calculates the FV of the annuity due.

J. Calculating the net present value of an annuity:

Example: Jane thinks if she invests $80,000 by buying property today, she can get $15,000 in rent from it for each of the next twenty years (the rent will be paid quarterly). If she wants a rate of return of 12% (with quarterly discounting) on her investment, what is the net present value of this project?

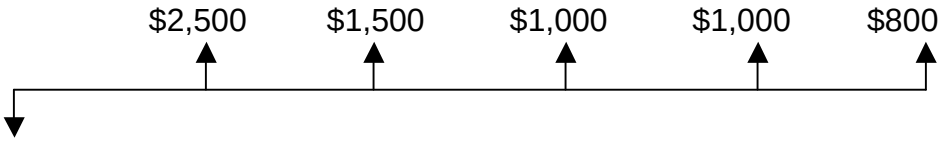
5. The annual rate of return will be divided by four, i.e., the quarterly rate of return will be 3%.
6. The number of time periods will be multiplied by four, i.e., 80.
3. The amount of annual rent will be divided by four, i.e., $3,750.

	Keystrokes		Display	Description
1.	On	SHIFT CLEAR DATA	0.00	Turn on and clear the calculator
2.	FIN	CFLO	INITIAL FLOW INIT = 0.00	Select the cash flow data input register.
3.	80000	+/- INPUT	FLOW (1) = #TIMES = -80,000.00	Stores the initial investment in the financial register.
4.	3750	INPUT	FLOW (1) = 3,750.00 #TIMES (1) = 1 1.00	Enters the quarterly annuity cash inflow and prompts the user to enter the number of periods.

5.	80	INPUT	CALC	I% NEEDED TO CALCULATE NPV, NUS, AND NFV 80.00	Enters the number of periods and prompts the user for the interest rate.
6.	3	I%	NPV	I% = 3.00 NPV = 33,252.86	Enters the quarterly interest rate and calculates the net present value of the investment.

K. Calculating the net present value of a series of uneven cash flows:

Example: Beth is planning to buy a Pentium based PC for rental purposes. She has calculated that her expected cash flows from the investment for the next five years would be as shown below.



CF_0 = -$4,000

If she has to pay an annual interest rate of 9.75%, should she buy the computer?

	Keystrokes			Display	Description
1.	On	SHIFT	CLEAR DATA	0.00	Turn on and clear the calculator
2.	FIN	CFLO		INITIAL FLOW INIT = 0.00	Select the cash flow data input register.
3.	4000	+/-	INPUT	FLOW (1) = #TIMES = -4,000.00	Stores the initial investment in the financial register.
4.	2500	INPUT	INPUT	FLOW (2) = #TIMES 1.00	Enters the first annual cash inflow and selects one period

						for the number of occurrences of this cash flow.
5.	1500	INPUT	INPUT		FLOW (3) = #TIMES (1) = 1.00	Enters the second annual cash inflow and selects one period for the number of occurrences of this cash flow.
6.	1000	INPUT	2	INPUT	FLOW (4) = #TIMES (1) = 2.00	Enters the third annual cash inflow and selects one period for the number of occurrences of this cash flow.
7.	800	INPUT	INPUT		FLOW (5) = #TIMES (1) = 1.00	Enters the last annual cash inflow and selects one period for the number of occurrences of this cash flow.
8.	CALC	9.75	I%	NPV	I% = 9.75 NPV = 1,471.37	Enters the annual interest rate and calculates the net present value of the investment.

L. Calculating the internal rate of return of an annuity:

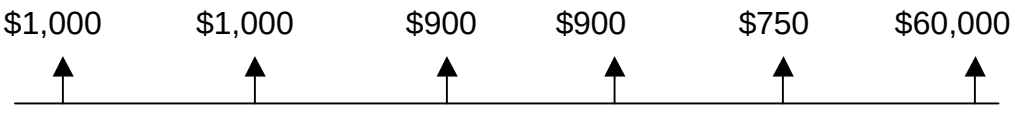
Example: ABC Inc. is planning to spend $35,000 to buy a warehouse. Under the contract, they will receive an after-tax cash flow of $6,000 (paid semiannually) from the property for the next eight years. What is the internal rate of return for the investment?

	Keystrokes	Display	Description
1.	On SHIFT CLEAR DATA	0.00	Turn on and clear the calculator

2.	FIN	CFLO		INITIAL FLOW INIT = 0.00	Select the cash flow data input register.
3.	35000	+/-	INPUT	FLOW (1) = #TIMES = -35,000.00	Stores the initial investment in the financial register.
4.	3000	INPUT		FLOW (1) = 3,000.00 #TIMES (1) = 1 1.00	Enters the semiannual annuity cash inflow and prompts the user to enter the number of periods.
5.	16	INPUT	CALC	I% NEEDED TO CALCULATE NPV, NUS, AND NFV 16.00	Enters the number of semiannual time periods.
6.	IRR	x	2 =	7.97	Calculates the semiannual IRR, which must then be converted to an annual IRR.

M. Calculating the internal rate of return of a series of uneven cash flows:

Example: Healthtime has the opportunity to make an investment that requires an initial cash outflow of $6,500.. The estimated cash inflows from the project for the next 6 years are shown below. What is the IRR on this investment?



CF_0 = -$6,500

	Keystrokes	Display	Description
1.	On SHIFT CLEAR DATA	0.00	Turn on and clear the calculator
2.	FIN CFLO	INITIAL FLOW INIT = 0.00	Select the cash flow data input register.
3.	6500 +/- INPUT	FLOW (1) = #TIMES = -6,500.00	Stores the initial investment in the financial register.
4.	1000 INPUT 2 INPUT	FLOW (2) = #TIMES 2.00	Enters the first annual cash inflow and selects two periods for the number of occurrences of this cash flow.
5.	900 INPUT 2 INPUT	FLOW (3) = #TIMES (1) = 2.00	Enters the second annual cash inflow and selects two periods for the number of occurrences of this cash flow.
6.	750 INPUT INPUT	FLOW (4) = #TIMES (1) = 1.00	Enters the third annual cash inflow and selects one period for the number of occurrences of this cash flow.
7.	60000 INPUT INPUT	FLOW (5) = #TIMES (1) = 1.00	Enters the last annual cash inflow and selects one period for the number of occurrences of this cash flow.

8. CALC IRR		IRR% = 51.88	Enters the annual interest rate and calculates the net present value of the investment.

N. Bond valuation with interest compounded annually:

The HP 19BII has an extremely sophisticated bond calculator menu that is often used by practicing bond professionals. However, most finance students using the HP 19BII will be given bond data in a simplified format. As a result, it is more simple and convenient to use the time value of money (TVM) menu. This manual will therefore illustrate bond valuation principles using the TVM menu.

Example: How much would you be willing to pay for a bond today if it pays $100 in interest annually for 20 years (starting next year), and has a principal payment of $1,000? The yield to maturity is 15%.

This question can be interpreted as that of finding the NPV of an uneven cash flow series, with the initial cash outflow equal to zero. Hence, we will follow the steps used for calculating NPV to compute the current price of the bond.

Keystrokes		Display	Description
Clear the data and select the TVM Menu			
1. 100	PMT	PMT = 100.00	Records the amount of the annual coupon payments.
2. 15	I%YR	I%YR = 15.00	Records the yield-to-maturity of 15%.
3. 20	N	N = 20.00	Records the number of time periods as 20.
4. 1000	FV	FV = 1,000.00	Records the future or face value of the bond.
4. PV		PV = -687.03	Calculates the present value of the Bond

O. Bond valuation with interest compounded semiannually:

Since most bonds pay interest semiannually, we will show the conversion required to calculate the current value of such bonds.

Example: If the bond described in section K pays interest semiannually, the calculations will be:

I_t=$50, $P_{n=}$$1000, i=7.5%, n=40.

Keystrokes		Display	Description
Clear the data and select the TVM Menu			
1. 50	PMT	PMT = 50.00	Records the amount of the semiannual coupon payments.
2. 7.5	I%YR	I%YR = 7.50	Records the semiannual yield-to-maturity of 7.5%.
3. 40	N	N = 40.00	Records the number of time periods as 40.
4. 1000	FV	FV = 1,000.00	Records the future or face value of the bond.
4. PV		PV = -685.14	Calculates the present value of the Bond