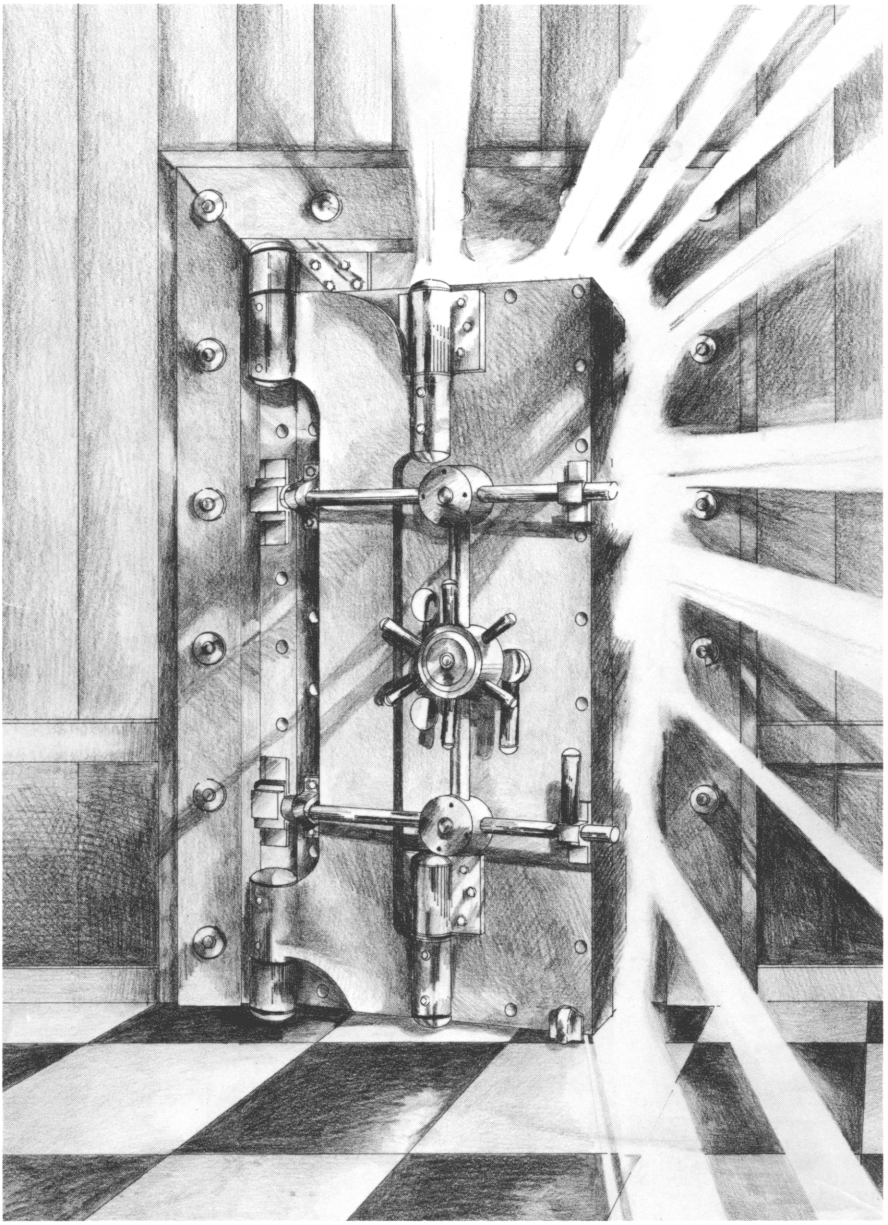
FINANCIAL SOLUTIONS

"POWER PAC"



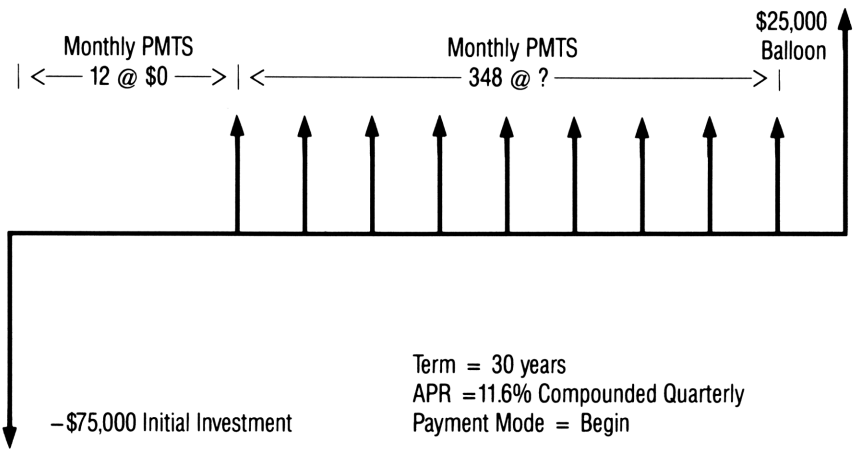
For the HP-12C Advanced Financial Calculator

Unlock the secrets of solving problems in Real Estate, Banking, and other finance related professions by learning what the experts know. Knowledge is ***power*** and the most essential element in the attainment of financial and professional success. The Financial Solutions **"POWER PAC"** defines the seventeen basic solution methods used individually or in a collective series for the solution of finance problems. Given the uniqueness and infinite possible variations from one problem to that of the next, it would take more than a lifetime of experiences to equal the knowledge received from the **"POWER PAC".** The 26 cards that make up the **"POWER PAC"** are like the 26 letters of the alphabet. Every word in the English language can be spelled out by some combination of the 26 basic letters. The Financial Solutions **"POWER PAC"** is the financial alphabet capable of solving a seemingly endless variety of finance problems.

The versatility of the **"POWER PAC"** is incredible. It can directly solve problems as simple as calculating the payment necessary to fully amortize a loan or provide the solution framework necessary to solve more complex problems as depicted in the following cash flow diagram.

THE CASH FLOW DIAGRAM: (Lenders Perspective)

A General Annuity Due Problem



THE SOLUTION: Case 15, Case 6, Case 15, **Case 14 = $818.56**

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A General Annuity Due Problem

What monthly payment in advance is necessary to reduce a 30 year, 11.6% compounded quarterly, $75,000 note to $25,000 if there are no payments made in the first 12 months?

SOLUTION OVERVIEW:

The problem to be solved is not a simple annuity problem because the compounding period is different from the payment period and all payments are not equal. The 11.6% compounded quarterly rate must be converted to it's equivalent compounded monthly rate before any financial calculations are performed. This computed equivalent rate will then be used for all future calculations. The problem will then be broken down into a series of simple annuity solutions that can be solved by one of the 17 basic solution methods.

THE SOLUTION:

STEP 1: As the first step in the process of calculating an equivalent rate, determine the growth of any dollar value at the given rate for one year. Any equivalent rate will have this same growth relationship.

	n	i	PV	PMT	[FV]	
CASE 15	4	11.60/4	–100	0	112.11	G

STEP 2: Complete the equivalent rate calculation process, by changing the value in "n" to reflect the number of compounding periods per year for the desired equivalent rate and calculate "i".

	n	[i]	PV	PMT	FV	
CASE 6	12	.957470	–100	0	112.11	G

STEP 3: Eliminate the 12 periods with no payments by calculating the future value of the $75,000 initial investment at the end of the 12th period.

	n	i	PV	PMT	[FV]	
CASE 15	12	.957470	75,000	0	–84,085.82	G

STEP 4: Change the value in "n" to reflect the number of payments that will be made. Recall the contents of the "FV" register and store it into "PV". Enter the balloon amount into "FV" and compute the unknown monthly in advance payment.

	n	i	PV	[PMT]	FV	
CASE 14	348	.957470	–84,085.82	818.56	25,000	A
				BEG		

The Financial Solutions "Alphabet"

CASE 1 How many payments are necessary to fully amortize an initial balance and achieve a desired yield?

CASE 2 How many periods must an initial value be compounded at the given rate to achieve a desired future value?

CASE 3 How many payments must be made to achieve a desired future value using the given compounding rate?

CASE 4A How many payments are necessary to partially amortize an initial balance at the given rate to reach a specific future value?

CASE 4G How long must an initial value and a series of payments be compounded at the given rate to achieve a specific future value?

CASE 5 What periodic yield will be achieved when an initial balance is fully amortized by the specified payment series within the defined payment term?

CASE 6 What periodic compounding rate must be applied to an initial value to achieve a desired future value within the defined term?

CASE 7 What periodic compounding rate must be applied to a series of payments to achieve a desired future value within the defined term?

CASE 8A What periodic yield will be achieved when an initial balance is partially amortized by a series of payments to a specific future balance within the defined payment term?

CASE 8G What periodic compounding rate must be applied to an initial value and a series of payments to achieve a specific future value within the given payment term?

CASE 9 What initial amount will be fully amortized by a series of payments made over the defined payment term using the given compounding rate?

CASE 10 What initial amount must be compounded by the given periodic rate to achieve a specific future value within the defined term?

CASE 11A What initial amount will be partially amortized at the given rate by a series of payments to achieve a specific future balance within the defined payment term?

CASE 11G What initial amount must be introduced in addition to a series of payments to achieve a desired future value when compounded at the given rate over the defined payment period?

CASE 12 What payment amount must be made each period to fully amortize an initial value within the defined payment term using the given compounding rate?

CASE 13 What payment amount must be made each period to achieve a specific future value within the defined payment term using the given compounding rate?

CASE 14A What payment amount must be made each period to partially amortize an initial balance to a specific future balance at the given rate within the defined payment term?

CASE 14G What payment amount must be made each period in addition to an initial value to achieve a specific future value when compounded at the given rate over the defined payment period?

CASE 15 What is the future value of an initial amount, compounded at the given periodic rate, at the end of the defined term?

CASE 16 What is the future value of a series of payments, compounded at the given periodic rate, at the end of the defined term?

CASE 17A What is the current balance of an initial value that has been amortized by a series of payments, using the given periodic rate, at the end of the defined term?

CASE17G What is the future value of an initial amount and a series of payments, compounded at the given periodic rate, at the end of the defined term?

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"POWER PAC" CONTENTS

* 1 SOLUTION CHART CARD

* 22 SOLUTION METHOD CARDS

* 1 REFERENCE CARD

* 2 TERMINOLOGY CARDS

INDEX

The answer to all of the following questions must be YES !!

Are all payments equal?

Is the interest compounding period the same as the payment period?

Do all payments occur at either the beginning or the end of the period?

Does the compounding operation always occur at the end of the period?

The House Rules

The Royalty Rule:

The values of "n" and "i" are required for all simple annuity calculations because they make all the rules! When solving for either "n" or "i" the other must always be present.

The Majority Rule:

A minimum of 3 "non-zero" simple annuity variables must be present in order to perform any calculation.

The Peon Rule:

At least one and when possible both of the values of "n" and "i" must be part of the Majority Rule. The laboring class variables (PV, PMT, FV) may then be employed to fulfill any remaining Majority Rule requirement.

How to use the Solution Chart

(1) Determine which of the simple annuity variables to solve for.

(2) Select one of the five charts that reflects your choice in Step 1.

(3) Examine the information required for each case in the selected chart.

(4) Match the problems information with that of each case to determine the most complete case to use.

(5) Input all simple annuity variables as defined by the selected case. Make sure that the value for "i" reflects the periodic rate, the value of "n" is the total number of compounding periods (payments), and that the proper cash flow sign convention is maintained for each variable.

(6) Enter the correct payment mode by pressing either [g] END or [g] BEG.

(7) Solve for the desired simple annuity variable by pressing its key.

The Solution Chart

Solve for "n"

	n	i	PV	PMT	FV	
(1)	?	R	X	X		A
(2)	?	R	X		X	G
(3)	?	R		X	X	G
(4)	?	R	X	X	X	A/G

Solve for "i"

	n	i	PV	PMT	FV	
(5)	R	?	X	X		A
(6)	R	?	X		X	G
(7)	R	?		X	X	G
(8)	R	?	X	X	X	A/G

Solve for "PV"

	n	i	PV	PMT	FV	
(9)	R	R	?	X		A
(10)	R	R	?		X	G
(11)	R	R	?	X	X	A/G

Solve for "PMT"

	n	i	PV	PMT	FV	
(12)	R	R	X	?		A
(13)	R	R		?	X	G
(14)	R	R	X	?	X	A/G

Solve for "FV"

	n	i	PV	PMT	FV	
(15)	R	R	X		?	G
(16)	R	R		X	?	G
(17)	R	R	X	X	?	A/G

Legend

17 - Simple Ordinary Annuity Cases
* Cases 1 through 17 with **END**ing payment mode set.

17 - Simple Annuity Due Cases
* Cases 1 through 17 with **BEG**inning payment mode set.

R = required information

X = Any non-Zero value (+ or -)

A = An Amortization Process

G = A Growth Process

A/G = Either Amortization or Growth

Solve for "n"

CASE 1

n	i	PV	PMT	FV	
?	R	X	X		A

?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount in the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	Set the appropriate payment mode.
n	Calculate the value of "n".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−		−	+	
Amortization (+) . . .						
Growth						

A Case 1 "Amortization" Problem

How many monthly payments of $813.40 will be necessary to fully amortize a $73,500 note, bearing an 11⅝% interest rate?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**11.625**	11.625	Enter the nominal rate.
3 §	**ENTER**	11.63	
4 §	**12**	12.	No. of compounding periods/year.
5 §	**÷**	.97	Calculate the periodic rate.
6 §	**i**	.97	Store the periodic rate.
7	**73500**	73,500.	Enter the present value amount.
8	**PV**	73,500.00	Store the present value amount.
9	**813.40**	813.40	Enter the payment amount.
10	**CHS**	– 813.40	Set "PMT" cash flow convention.
11	**PMT**	– 813.40	Store the payment value.
12	**[g] END**	– 813.40	Set the payment mode.
13	**n**	"running"	Calculate the value of "n".
14 ★		216.00	

Answer: 216 months

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12CASE1

Solve for "n"

CASE 2

n	i	PV	PMT	FV	
?	R	X		X	G

?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
n	Calculate the value of "n".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+).						
Growth	−		+	+		−

A Case 2 "Growth" Problem

What length of time will be required for a single deposit of $1,000 to grow to $5,000, if the rate of growth is 7.5% compounded daily?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**7.5**	7.5	Enter the nominal rate (APR).
3	**ENTER**	7.50	
4	**365**	365.	No. of compounding periods/year.
5	**÷**	.02	Calculate the periodic rate.
6	**i**	.02	Store the periodic rate.
7	**1000**	1,000.	Enter the present value amount.
8	**CHS**	– 1.000.	Set "PV" cash flow convention.
9	**PV**	– 1,000.00	Store the present value amount.
10	**5,000**	5,000.	Enter the future value amount.
11	**FV**	5,000.00	Store the future value amount.
12	**n**	"running"	Calculate the value of "n".
13		7,834.00	

Answer: 7,834 days

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12CASE2

Solve for "n"

CASE 3

n	i	PV	PMT	FV	
?	R		X	X	G

?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	} Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
n	Calculate the value of "n".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+).						
Growth	−		+	+		−

A Case 3 "Growth" Problem

How long must an 18.4% compounded quarterly annuity of $2,000 continue to be invested at the beginning of each period, if the desired goal is $146,308.12.

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**18.4**	18.4	Enter the nominal rate (APR).
3	**ENTER**	18.40	
4	**4**	4.	No. of compounding periods/year.
5	**÷**	4.60	Calculate the periodic rate.
6	**i**	4.60	Store the periodic rate.
7	**2000**	2,000.	Enter the payment amount.
8	**CHS**	– 2,000.	Set "PMT" cash flow convention.
9	**PMT**	– 2,000.00	Store the payment value.
10	**[g] BEG**	– 2,000.00	Set to a beginning payment mode.
11	**146308.12**	146,308.12	Enter the future value amount.
12	**FV**	146,308.12	Store the future value amount.
13	**n**	"running"	Calculate the value of "n".
14		32.00	

Answer: 32 Quarters

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12CASE3

Solve for "n"

CASE 4

n	i	PV	PMT	FV	
?	R	X	X	X	A/G

?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
n	Calculate the value of "n".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−	−	−	+	+
Amortization (+) .	+	−	+	−	+	−
Growth	−	−	+	+	+	−

A Case 4 "Amortization" Problem

How many payments of $1,134.28 will be required on a 30 year, 10.5% compounded monthly note in order to pay off half of the original $124,000 principal?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**10.5**	10.5	Enter the nominal rate (APR).
3 §	**ENTER**	10.50	
4 §	**12**	12.	No. of compounding periods/year.
5 §	**÷**	.88	Calculate the periodic rate.
6 §	**i**	.88	Store the periodic rate.
7	**124000**	124,000.	Enter the present value amount.
8	**PV**	124,000.00	Store the present value amount.
9	**1134.28**	1,134.28	Enter the payment amount.
10	**CHS**	– 1,134.28	Set "PMT" cash flow convention.
11	**PMT**	– 1,134.28	Store the payment value.
12	**[g] END**	– 1,134.28	Set to an ending payment mode.
13	**124000**	124,000.	Enter the present value amount.
14	**ENTER**	124,000.00	
15	**2**	2.	
16	**÷**	62,000.00	Calculate the future value.
17	**CHS**	– 62,000.00	Set "FV" cash flow convention.
18	**FV**	– 62,000.00	Enter the future value amount.
19	**n**	"running"	Calculate the value of "n".
20 ★		286.00	

Answer: 286 months

12CASE4A
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Solve for "n"

CASE 4

n	i	PV	PMT	FV	
?	R	X	X	X	A/G

?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
n	Calculate the value of "n".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−	−	−	+	+
Amortization (+).	+	−	+	−	+	−
Growth	−	−	+	+	+	−

A Case 4 "Growth" Problem

How many payments of $500 must be made at the beginning of each month in addition to an initial deposit of $1,500 to achieve a $10,387.80 savings goal if the maximum investment rate is 12%?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**12**	12.	Enter the nominal rate (APR).
3 §	**ENTER**	12.00	
4 §	**12**	12.	No. of compounding periods/year.
5 §	**÷**	1.00	Calculate the periodic rate.
6 §	**i**	1.00	Store the periodic rate.
7	**1500**	1,500.	Enter the present value amount.
8	**CHS**	– 1,500.	Set the "PV" cash flow convention.
9	**PV**	– 1,500.00	Store the present value amount.
10	**500**	500.	Enter the payment amount.
11	**CHS**	– 500.	Set "PMT" cash flow convention.
12	**PMT**	– 500.00	Store the payment value.
13	**[g] BEG**	– 500.00	Set to a beginning payment mode.
14	**10387.80**	10,387.80	Enter the future value amount.
15	**FV**	10,387.80	Store the future value amount.
16	**n**	"running"	Calculate the value of "n".
17		16.00	

Answer: 16 payments

12CASE4G
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Solve for "i"

CASE 5

n	i	PV	PMT	FV	
R	?	X	X		A

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	} Set the appropriate payment mode.
i	Calculate the periodic interest rate "i".
?	Key in the number of compounding periods per year.
X	Press the times key to calculate the APR nominal rate.

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−		−	+	
Amortization (+) .						
Growth						

A Case 5 "Amortization" Problem

What will the yield of a 30 year amortized note of $95,000 be, if the monthly payment is $824.93?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**30**	30.	Enter the term (years).
3 ‡	**ENTER**	30.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	360.00	Compounding periods "n" in term.
6 ‡	**n**	360.00	Store the value of "n".
7	**95000**	95,000.	Enter the present value amount.
8	**PV**	95,000.00	Store the present value amount.
9	**824.93**	824.93	Enter the payment amount.
10	**CHS**	– 824.93	Set "PMT" cash flow convention.
11	**PMT**	– 824.93	Store the payment value.
12	**[g] END**	– 824.93	Set to an ending payment mode.
13	**i**	"running"	Calculate the value of "i".
14		.82	
15 ☆	**12**	12.	No. of compounding periods/year.
16 ☆	**X**	9.87	Calculate the nominal rate (APR).

Answer: 9.87% Compounded Monthly

12CASE5
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Solve for "i"

CASE 6

n	i	PV	PMT	FV	
R	?	X		X	G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
i	Calculate the periodic interest rate "i".
?	Key in the number of compounding periods per year.
X	Press the times key to calculate the APR nominal rate.

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+) . . .						
Growth	−		+	+		−

A Case 6 "Growth" Problem

At what interest rate must a single deposit of $30,000 be invested to yield $285,688.20 within 10 years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**10**	10.	Enter the term (years).
3 ‡	**ENTER**	10.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	120.00	Compounding periods "n" in term.
6 ‡	**n**	120.00	Store the value of "n".
7	**30000**	30,000.	Enter the present value amount.
8	**CHS**	– 30,000.	Set "PV" cash flow convention.
9	**PV**	– 30,000.00	Store the present value amount.
10	**285688.20**	285,688.20	Enter the future value amount.
11	**FV**	285,688.20	Store the future value amount.
12	**i**	"running"	Calculate the value of "i".
13		1.90	
14 ☆	**12**	12.	No. of compounding periods/year.
15 ☆	**X**	22.75	Calculate the nominal rate (APR).

Answer: 22.75% Compounded Monthly

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Solve for "i"

CASE 7

n	i	PV	PMT	FV	
R	?		X	X	G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END / g BEG	Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
i	Calculate the periodic interest rate "i".
?	Key in the number of compounding periods per year.
X	Press the times key to calculate the APR nominal rate.

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+).						
Growth	−		+	+		−

A Case 7 "Growth" Problem

An annuity of $725 is to be paid at the beginning of each month. What rate will be required to achieve an investment goal of $63,606.13 within a 5 year period?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**5**	5.	Enter the term (years)
3 ‡	**ENTER**	5.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	60.00	Compounding periods "n" in term.
6 ‡	**n**	60.00	Store the value of "n".
7	**725**	725.	Enter the payment amount.
8	**CHS**	– 725.	Set the "PMT" cash flow convention.
9	**PMT**	– 725.00	Store the payment value.
10	**[g] BEG**	– 725.00	Set to a beginning payment mode.
11	**63606.13**	63,606.13	Enter the future value amount.
12	**FV**	63,606.13	Store the future value amount.
13	**i**	"running"	Calculate the value of "i".
14		1.18	
15 ☆	**12**	12.	No. of compounding periods/year.
16 ☆	**X**	14.22	

Answer: 14.22% Compounded Monthly

12CASE7
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Solve for "i"

CASE 8

n	i	PV	PMT	FV	
R	?	X	X	X	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	} Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
i	Calculate the periodic interest rate "i".
?	Key in the number of compounding periods per year.
X	Press the times key to calculate the APR nominal rate.

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−	−	−	+	+
Amortization (+) .	+	−	+	−	+	−
Growth	−	−	+	+	+	−

A Case 8 "Amortization" Problem

The current balance of a $100,000 loan is $86,129.88. What is the interest rate of the note, if 120 monthly payments of $1,574.16 have been made.

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**120**	120.	Enter the term (months).
3	**n**	120.00	Store the value of "n".
4	**100000**	100,000.	Enter the present value amount.
5	**PV**	100,000.00	Store the present value amount.
6	**1574.16**	1,574.16	Enter the payment amount.
7	**CHS**	– 1,574.16	Set "PMT" cash flow convention.
8	**PMT**	– 1,574.16	Store the payment value.
9	**[g] END**	– 1,574.16	Set to an ending payment mode.
10	**86129.88**	86,129.88	Enter the future value amount.
11	**CHS**	– 86,129.88	Set "FV" cash flow convention.
12	**FV**	– 86,129.88	Store the future value amount.
13	**i**	"running"	Calculate the value of "i".
14		1.53	
15 ☆	**12**	12.	No. of compounding periods/year.
16 ☆	**X**	18.40	Calculate the nominal rate (APR).

Answer: 18.40% Compounded Monthly

P. O. Box 218648 Houston, Texas 77218

Solve for "i"

CASE 8

n	i	PV	PMT	FV	
R	?	X	X	X	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	} Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
i	Calculate the periodic interest rate "i".
?	Key in the number of compounding periods per year.
X	Press the times key to calculate the APR nominal rate.

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−	−	−	+	+
Amortization (+) .	+	−	+	−	+	−
Growth	−	−	+	+	+	−

A Case 8 "Growth" Problem

What interest rate is necessary for an initial investment of $5,000 and a series of $200 monthly payments made in advance to achieve a $162,908.29 goal within 15 years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**15**	15.	Enter the term (years).
3 ‡	**ENTER**	15.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	180.00	Compounding periods "n" in term.
6 ‡	**n**	180.00	Store the value of "n".
7	**5000**	5,000.	Enter the present value amount.
8	**CHS**	– 5,000.	Set "PV" cash flow convention.
9	**PV**	– 5,000.00	Store the present value amount.
10	**200**	200.	Enter the payment amount.
11	**CHS**	– 200.	Set "PMT" cash flow convention.
12	**PMT**	– 200.00	Store the payment value.
13	**[g] BEG**	– 200.00	Set to a beginning payment mode.
14	**162908.29**	162,908.29	Enter the future value amount.
15	**FV**	162,908.29	Store the future value amount.
16	**i**	"running"	Calculate the value of "i".
17		1.17	
18 ☆	**12**	12.	No. of compounding periods/year.
19 ☆	**X**	14.00	Calculate the nominal rate (APR).

Answer: 14% Compounded Monthly

12CASE8G
P. O. Box 218648 Houston, Texas 77218

Solve for "PV"

CASE 9

n	i	PV	PMT	FV	
R	R	?	X		A

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	Set the appropriate payment mode.
PV	Calculate the present value "PV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	[+]	−		[−]	+	
Amortization (+).						
Growth						

A Case 9 "Amortization" Problem

What will be the value today of a series of future $2,500 payments made at the beginning of each year with a 12.25% compounded annual rate for 25 years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**25**	25.	Enter the term (years).
3	**ENTER**	25.00	
4	**1**	1.	No. of compounding periods/year.
5	**X**	25.00	Compounding periods "n" in term.
6	**n**	25.00	Store the value of "n".
7	**12.25**	12.25	Enter the nominal rate (APR).
8	**ENTER**	12.25	
9	**1**	1.	No. of compounding periods/year.
10	**÷**	12.25	Calculate the periodic rate.
11	**i**	12.25	Store the periodic rate.
12	**2500**	2,500.	Enter the payment amount.
13	**CHS**	– 2,500.	Set "PMT" cash flow convention.
14	**PMT**	– 2,500.00	Store the payment value.
15	**[g] BEG**	– 2,500.00	Set to a beginning payment mode.
16	**PV**	"running"	Calculate the value of "PV".
17		21,633.69	

Answer: $21,633.69

12CASE9
P. O. Box 218648 Houston, Texas 77218

Solve for "PV"

CASE 10

n	i	PV	PMT	FV	
R	R	?		X	G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic interest rate into the "i" register.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
PV	Calculate the present value "PV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+).						
Growth	[−]		+	[+]		−

A Case 10 "Growth" Problem

What will be the value today of a single $250,000 payment in the future using a 11.875% compounded semi-annual rate for 20 years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**20**	20.	Enter the term (years).
3	**ENTER**	20.00	
4	**2**	2.	No. of compounding periods/year.
5	**X**	40.00	Compounding periods "n" in term.
6	**n**	40.00	Store the value of "n".
7	**11.875**	11.875	Enter the nominal rate (APR).
8	**ENTER**	11.88	
9	**2**	2.	No. of compounding periods/year.
10	**÷**	5.94	Calculate the periodic rate.
11	**i**	5.94	Store the periodic rate.
12	**250000**	250,000.	Enter the future value amount.
13	**FV**	250,000.00	Store the future value amount.
14	**PV**	"running"	Calculate the value of "PV".
15		–24,885.78	

Answer: $24,885.78

P. O. Box 218648 Houston, Texas 77218

12CASE10

Solve for "PV"

CASE 11

n	i	PV	PMT	FV	
R	R	?	X	X	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate.
i	Store the periodic rate into the "i" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register..
g END g BEG	Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
PV	Calculate the present value of "PV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	[+]	−	−	[−]	+	+
Amortization (+) . . .	[+]	−	+	[−]	+	−
Growth	[−]	−	+	[+]	+	−

A Case 11 "Amortization" Problem

What is the largest sum of money that can be loaned at a 11.5% rate compounded monthly, if the borrower's monthly payment cannot exceed $850.00 with a $15,000 balloon payment due at the end of ten years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**10**	10.	Enter the term (years).
3 ‡	**ENTER**	10.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	120.00	Compounding periods "n" in term.
6 ‡	**n**	120.00	Store the value of "n".
7	**11.5**	11.5	Enter the nominal rate (APR).
8 §	**ENTER**	11.50	
9 §	**12**	12.	No. of compounding periods/year.
10 §	**÷**	.96	Calculate the periodic rate.
11 §	**i**	.96	Store the periodic rate.
12	**850**	850.	Enter the payment amount.
13	**CHS**	– 850.	Set "PMT" cash flow convention.
14	**PMT**	– 850.00	Store the payment value.
15	**[g] END**	– 850.00	Set to an ending payment mode.
16	**15000**	15,000.	Enter the present value amount.
17	**CHS**	– 15,000.	Set "FV" cash flow convention.
18	**FV**	– 15,000.00	Store the future value amount.
19	**PV**	"running"	Calculate the value of "PV".
20		65,232.78	

Answer: $65,232.78

12CASE11A
P. O. Box 218648 Houston, Texas 77218

Solve for "PV"

CASE 11

n	i	PV	PMT	FV	
R	R	?	X	X	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate.
i	Store the periodic rate into the "i" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register..
g END g BEG	Set the appropriate payment mode.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
PV	Calculate the present value of "PV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	[+]	−	−	[−]	+	+
Amortization (+) . . .	[+]	−	+	[−]	+	−
Growth	[−]	−	+	[+]	+	−

A Case 11 "Growth" Problem

What single initial payment must be made in addition to a series of 50 payments of $750, payable in advance each month, to reach a $60,000 goal if invested at 10%?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**50**	50.	Enter the term (months).
3	**n**	50.00	Store the value of "n".
4	**10**	10.	Enter the nominal rate (APR).
5 §	**ENTER**	10.00	
6 §	**12**	12.	No. of compounding periods/year.
7 §	**÷**	.83	Calculate the periodic rate.
8 §	**i**	.83	Store the periodic rate.
9	**750**	750.	Enter the payment amount.
10	**CHS**	– 750.	Set "PMT" cash flow convention.
11	**PMT**	– 750.00	Store the payment amount.
12	**[g] BEG**	– 750.00	Set to a beginning payment mode.
13	**60000**	60,000.	Enter the future value amount.
14	**FV**	60,000.00	Store the future value amount.
15	**PV**	"running"	Calculate the value of "PV".
16		– 8,802.26	

Answer: $8,802.26

12CASE11G
P. O. Box 218648 Houston, Texas 77218

Solve for "PMT"

CASE 12

n	i	PV	PMT	FV	
R	R	X	?		A

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
g END g BEG	Set the appropriate payment mode.
PMT	Calculate the payment value "PMT".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	[−]		−	[+]	
Amortization (+).						
Growth						

A Case 12 "Amortization" Problem

What annuity certain payment, payable at the end of each month, is necessary to fully amortize $175,000 today with a 15% compounded monthly rate for 30 years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**30**	30.	Enter the term (years).
3 ‡	**ENTER**	30.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	360.00	Compounding periods "n" in term.
6 ‡	**n**	360.00	Store the value of "n".
7	**15**	15.	Enter the nominal rate (APR).
8 §	**ENTER**	15.00	
9 §	**12**	12.	No. of compounding periods/year.
10 §	**÷**	1.25	Calculate the periodic rate.
11 §	**i**	1.25	Store the periodic rate.
12	**175000**	175,000.	Enter the present value amount.
13	**PV**	175,000.00	Store the present value amount.
14	**[g] END**	175,000.00	Set to an ending payment mode.
15	**PMT**	"running"	Calculate the value of "PMT".
16		–2,212.78	

Answer: $2,212.78

P. O. Box 218648 Houston, Texas 77218

Solve for "PMT"

CASE 13

n	i	PV	PMT	FV	
R	R		?	X	G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
g END g BEG	Set the appropriate payment mode.
PMT	Calculate the payment value "PMT".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+).						
Growth		[−]	+		[+]	−

A Case 13 "Growth" Problem

What amount must be deposited at the end of each quarter to grow to $120,000 in the future with a 11.375% compounded quarterly rate for 12 years.

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**12**	12.	Enter the term (years).
3	**ENTER**	12.00	
4	**4**	4.	No. of compounding periods/year.
5	**X**	48.00	Compounding periods "n" in term.
6	**n**	48.00	Store the value of "n".
7	**11.375**	11.375	Enter the nominal rate (APR).
8	**ENTER**	11.38	
9	**4**	4.	No. of compounding periods/year.
10	**÷**	2.84	Calculate the periodic rate.
11	**i**	2.84	Store the periodic rate.
12	**120000**	120,000.	Enter the future value amount.
13	**FV**	120,000.00	Store the future value amount.
14	**[g] END**	120,000.00	Set to an ending payment mode.
15	**PMT**	"running"	Calculate the value of "PMT".
16		– 1,200.81	

Answer: $1,200.81

P. O. Box 218648 Houston, Texas 77218

12CASE13

Solve for "PMT"

CASE 14

n	i	PV	PMT	FV	
R	R	X	?	X	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
g END g BEG	} Set the appropriate payment mode.
PMT	Calculate the payment value "PMT".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	[−]	−	−	[+]	+
Amortization (+).	+	[−]	+	−	[+]	−
Growth	−	[−]	+	+	[+]	−

A Case 14 "Amortization" Problem

What monthly payment in arrears is necessary to reduce a 10 year, 9.75% compounded monthly, $50,000 note to $15,000?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**10**	10.	Enter the term (years).
3 ‡	**ENTER**	10.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	120.00	Compounding periods "n" in term.
6 ‡	**n**	120.00	Store the value of "n".
7	**9.75**	9.75	Enter the nominal rate (APR).
8 §	**ENTER**	9.75	
9 §	**12**	12.	No. of compounding periods/year.
10 §	**÷**	.81	Calculate the periodic rate.
11 §	**i**	.81	Store the periodic rate.
12	**50000**	50,000.	Enter the present value amount.
13	**PV**	50,000.00	Store the present value amount.
14	**15000**	15,000.	Enter the future value amount.
15	**CHS**	– 15,000.	Set "FV" cash flow convention.
16	**FV**	– 15,000.00	Store the future value amount.
17	**[g] END**	– 15,000.00	Set to an ending payment mode.
18	**PMT**	"running"	Calculate the value of "PMT".
19		– 579.57	

Answer: $579.57

P. O. Box 218648 Houston, Texas 77218

Solve for "PMT"

CASE 14

n	i	PV	PMT	FV	
R	R	X	?	X	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the future value amount into the calculator.
FV	Store the future value amount into the "FV" register.
g END g BEG	} Set the appropriate payment mode.
PMT	Calculate the payment value "PMT".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	[−]	−	−	[+]	+
Amortization (+).	+	[−]	+	−	[+]	−
Growth	−	[−]	+	+	[+]	−

A Case 14 "Growth" Problem

What additional quarterly cash contribution is necessary with a single lump sum payment of $25,000 to yield $125,000 at the end of 5 years if the maximum attainable growth rate is 14% compounded quarterly?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**5**	5.	Enter the term (years).
3	**ENTER**	5.00	
4	**4**	4.	No. of compounding periods/year.
5	**X**	20.00	Compounding periods "n" in term.
6	**n**	20.00	Store the value of "n".
7	**14**	14.	Enter the nominal rate (APR).
8	**ENTER**	14.00	
9	**4**	4.	No. of compounding periods/year.
10	**÷**	3.50	Calculate the periodic rate.
11	**i**	3.50	Store the periodic rate.
12	**25000**	25,000.	Enter the present value amount.
13	**CHS**	– 25,000.	Set "PV" cash flow convention.
14	**PV**	– 25,000.00	Store the present value amount.
15	**125000**	125,000.	Enter the future value amount.
16	**FV**	125,000.00	Store the future value amount.
17	**[g] END**	125,000.00	Set to an ending payment mode.
18	**PMT**	"running"	Calculate the value of "PMT".
19		– 2,661.11	

Answer: $2,661.11

P. O. Box 218648 Houston, Texas 77218

Solve for "FV"

CASE 15

n	i	PV	PMT	FV	
R	R	X		?	G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
FV	Calculate the future value "FV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+).						
Growth	−		[+]	+		[−]

A Case 15 "Growth" Problem

What will a single $10,000 deposit grow to in the future when the payment is made at the beginning of the first period with a 14.5% compounded daily rate for 10 years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**10**	10.	Enter the term (years).
3	**ENTER**	10.00	
4	**365**	365.	No. of compounding periods/year.
5	**X**	3,650.00	Compounding periods "n" in term.
6	**n**	3,650.00	Store the value of "n".
7	**14.5**	14.5	Enter the nominal rate (APR).
8	**ENTER**	14.50	
9	**365**	365.	No. of compounding periods/year.
10	**÷**	.04	Calculate the periodic rate.
11	**i**	.04	Store the periodic rate.
12	**10000**	10,000.	Enter the present value amount.
13	**CHS**	– 10,000.	Set "PV" cash flow convention.
14	**PV**	– 10,000.00	Store the present value amount.
15	**FV**	"running"	Calculate the value of "FV".
16		42,618.87	

Answer: $42,618.87

P. O. Box 218648 Houston, Texas 77218

Solve for "FV"

CASE 16

n	i	PV	PMT	FV	
R	R		X	?	G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	Set the appropriate payment mode.
FV	Calculate the future value "FV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization						
Amortization (+).						
Growth	−	[+]		+	[−]	

A Case 16 "Growth" Problem

What will a series of $200 deposits grow to in the future when each deposit is made at the beginning of each month with a 14.75% compounded monthly rate for 15 years?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**15**	15.	Enter the term (years).
3 ‡	**ENTER**	15.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	180.00	Compounding periods "n" in term.
6 ‡	**n**	180.00	Store the value of "n".
7	**14.75**	14.75	Enter the nominal rate (APR).
8 §	**ENTER**	14.75	
9 §	**12**	12.	No. of compounding periods/year.
10 §	**÷**	1.23	Calculate the periodic rate.
11 §	**i**	1.23	Store the periodic rate.
12	**200**	200.	Enter the payment amount.
13	**CHS**	– 200.	Set "PMT" cash flow convention.
14	**PMT**	– 200.00	Store the payment value.
15	**[g] BEG**	– 200.00	Set to a beginning payment mode.
16	**FV**	"running"	Calculate the value of "FV".
17		132,034.81	

Answer: $132,034.81

12CASE16
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Solve for "FV"

CASE 17

n	i	PV	PMT	FV	
R	R	X	X	?	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END g BEG	Set the appropriate payment mode.
FV	Calculate the future value "FV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−	[−]	−	+	[+]
Amortization (+).	+	−	[+]	−	+	[−]
Growth	−	−	[+]	+	+	[−]

A Case 17 "Amortization" Problem

A $225,000 mortgage note has a 9.75% compounded monthly rate and a monthly payment of $1,933.10 based on a 30 year amortization. What will the balance of the note be at the end of the 8th year?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**8**	8.	Enter the term (years).
3 ‡	**ENTER**	8.00	
4 ‡	**12**	12.	No. of compounding periods/year.
5 ‡	**X**	96.00	Compounding periods "n" in term.
6 ‡	**n**	96.00	Store the value of "n".
7	**9.75**	9.75	Enter the nominal rate (APR).
8 §	**ENTER**	9.75	
9 §	**12**	12.	No. of compounding periods/year.
10 §	**÷**	.81	Calculate the periodic rate.
11 §	**i**	.81	Store the periodic rate.
12	**225000**	225,000.	Enter the present value amount.
13	**PV**	225,000.00	Store the present value amount.
14	**1933.10**	1,933.10	Enter the payment amount.
15	**CHS**	– 1,933.10	Set "PMT" cash flow convention.
16	**PMT**	– 1,933.10	Store the payment value.
17	**[g] END**	– 1,933.10	Set to an ending payment mode.
18	**FV**	"running"	Calculate the value of "FV".
19		– 209,824.07	

Answer: $209,824.07

12CASE17A
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Solve for "FV"

CASE 17

n	i	PV	PMT	FV	
R	R	X	X	?	A/G

?	Enter the number of compounding periods.
n	Store the number of compounding periods into the "n" register.
?	Key the annual nominal rate into the calculator.
ENTER	Press the ENTER key.
?	Key in the number of compounding periods per year.
÷	Calculate the periodic interest rate "i".
i	Store the periodic rate into the "i" register.
?	Key the present value amount into the calculator.
PV	Store the present value amount into the "PV" register.
?	Key the payment amount into the calculator.
PMT	Store the payment amount into the "PMT" register.
g END / g BEG	Set the appropriate payment mode.
FV	Calculate the future value "FV".

Cash Flow Sign Relationships

	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−	[−]	−	+	[+]
Amortization (+).	+	−	[+]	−	+	[−]
Growth	−	−	[+]	+	+	[−]

A Case 17 "Growth" Problem

What will an initial deposit of $400 and a series of seventy $100 deposits made in advance each month grow to in the future, if the investment rate is 15%?

Procedure Analysis:

Step	Keystrokes	Display	Comments
1	**[f] REG**	0.00	Clear all storage registers.
2	**70**	70.	Enter the term (months).
3	**n**	70.00	Store the value of "n".
4	**15**	15.	Enter the nominal rate (APR).
5 §	**ENTER**	15.00	
6 §	**12**	12.	No. of compounding periods/year.
7 §	**÷**	1.25	Calculate the periodic rate.
8 §	**i**	1.25	Store the periodic rate.
9	**400**	400.	Enter the present value amount.
10	**CHS**	– 400.	Set "PV" cash flow convention.
11	**PV**	– 400.00	Store the present value amount.
12	**100**	100.	Enter the payment amount.
13	**CHS**	– 100.	Set "PMT" cash flow convention.
14	**PMT**	– 100.00	Store the payment value.
15	**[g] BEG**	– 100.00	Set to a beginning payment mode.
16	**FV**	"running"	Calculate the value of "FV".
17		12,180.15	

Answer: $12,180.15

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Assumptions made for each SIMPLE ANNUITY SOLUTION procedure:

(1) The contents of the Financial Registers (n, i, PV, PMT, FV) are set to zero by executing the [f] FIN or [f] REG clearing function prior to the start of each new problem.

(2) All interest rates are expressed and entered as percentage values.

(3) Either the Borrower's or Lender's cash flow perspective can be used as long as the same perspective is maintained throughout a common solution. (All solution Card CASE examples adopt the Borrower's cash flow perspective.)

(4) Once a series of CASE solutions is underway, an adequate level of concentration must be maintained as to the proper contents of all financial registers.

Footnotes for Solution Card Examples:

‡ These steps can be replaced by using the monthly compounding entry aid key [g] [12×].

§ These steps can be replaced by using the monthly compounding entry aid key [g] [12÷].

★ This step can be converted to the number of years by pressing RCL [g] [12×]. (The undocumented reverse operation of the monthly compounding entry aid key [g] [12×]).

☆ These steps can be replaced by pressing RCL [g] [12÷]. (The undocumented reverse operation of the monthly compounding entry aid key [g] [12÷]).

The Six Functions of a Dollar:

CASE 9	Present Worth of 1 Per Period
CASE 10	Present Worth of 1
CASE 12	Periodic Payment to Amortize 1
CASE 13	Sinking Fund Payment
CASE 15	Amount of 1
CASE 16	Amount of 1 Per Period

Establishing the Cash Flow Sign Convention:

	Perspective					
	Borrower			Lender		
	PV	PMT	FV	PV	PMT	FV
Amortization	+	−	−	−	+	+
Amortization (+) . . .	+	−	+	−	+	−
Growth	−	−	+	+	+	−

Having already entered the cash flow amount (PV, PMT, or FV) into the calculator as directed by a CASE's procedure, do the following steps.

(A) Adopt a common cash flow perspective of either the Borrower or Lender for all cash flows to be entered in the analysis.

(B) Select the appropriate sign from under the column heading of the cash flow to be entered in the row that defines the implicit financial process occuring between all cash flows.

(C) If the determined sign is negative (−), press the CHS key. Should the sign be positive (+), no action is required.

Upon completion of steps (A) through (C) execute the remaining steps of the CASE's procedure beginning with the step that stores the cash flow amount into it's appropriate financial register.

Notes:
- The amortization (+) financial process is when the entered value of "n" exceeds that of the value which determined the given payment based on the original balance and interest rate.
- A bracket [ ] around any positive [+] or negative [−] sign represents that this is the value being solved for and the sign to be expected once a calculated result is achieved.

SIMPLE ANNUITY TERMINOLOGY 1

Amortization Process:

The systematic elimination of debt, consisting of principal and interest, over a defined period of time "n" by means of a series of payments. The cash flow signs of the values contained within the "PV" and "PMT" financial registers will always be *opposite in sign.*

Annuity Due:

All payments are due and payable at the beginning of each compounding period. One of the two classifications of simple annuities.

Banker's Rule:

The method of maximizing the simple interest earned on principal by using the exact time and a periodic rate based on a 360 day basis.

Cash Flow Sign Convention:

The method of expressing the perception of how money is employed. Money that is received, a positive cash flow, is entered or displayed as a positive value (+). Money that is paid out, a negative cash flow, is entered or displayed as a negative value (–). The cash flow sign convention may be perceived from one of two perspectives, either that of a borrower or that of a lender. The selected perspective must be consistently maintained throughout the solution of a problem!

Compounding:

The method by which values today can be expressed in future terms. The compounding operation is controlled by the periodic rate "i".

Discounting:

The method by which values at maturity in the future can be expressed in terms of a present value occurring at some point in time before maturity. The discounting operation is controlled by the periodic rate "i".

Effective Rate:

The interest rate determined by the ratio of the annual interest earned to the original principal at the beginning of the year. It is the rate which reflects the true cost or use of funds.

Equivalent Rate:

The corresponding interest rate utilizing a different number of compounding periods that will yield the same yearly compounded growth. Any given rate can be directly replaced by an equivalent rate.

Future Value "FV":

The compounded value of an initial investment and/or a series of prior cash flows at maturity.

General Annuity:

A series of equal payments in which the interest compounding period *is not* the same as the payment period. All payments may occur at either the beginning or the end of the period. The interest compounding operation is assumed to occur at the end of each period.

Growth Process:

The systematic accumulation of wealth, consisting of principal and interest, over a defined period of time "n" by means of compounded cash flows. The cash flow signs of the values contained within the "PV" and "PMT" financial registers will always be the *same sign.*

Interest:

The income generated from invested capital. The cost for the use of money.

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"n"

The number of compounding periods in the term of an analysis. It is determined by multiplying the term, expressed in years, by the number of compounding periods per year.

Nominal Rate:

A convenient expression of the periodic interest rate "i" defined in annual terms. It's value is determined by multiplying the periodic rate "i" by the number of compounding periods per year. This rate is often referred to as the Annual Percentage Rate (APR) or Annual Nominal Rate.

Periodic Rate "i":

The compounding interest rate employed at the end of each period that is used to calculate the interest earned on principal. It's value is determined by dividing the annual nominal rate by the number of compounding periods per year.

Payment "PMT":

The periodic value that reflects the series of future equal amounts that will occur at the beginning or end of each compounding period.

Payment Mode:

The specification of what time frame a payment is made within the compounding period. By definition, all simple annuity payments must occur at either the beginning or end of the compounding period.

Present Value "PV"

The initial investment and/or discounted value of a series of future cash flows.

Principal:

The amount of a debt or investment to which interest earnings is derived.

Simple Annuity:

A series of equal payments in which the interest compounding period is the same as the payment period. All payments occur at either the beginning or the end of the period. The interest compounding operation is assumed to occur at the end of each period.

Source of Funds:

A flow of funds concept that reflects money received by or supplied to a holder in a cash flow exchange.

Term:

The length of time from the beginning of the first compounding period to the end of the last.

Time Line:

The segmented horizontal line in a cash flow diagram that reflects the compounding frequency and the duration of the analysis period in which all cash flows are exchanged.

Use of Funds:

A flow of funds concept that reflects the application or disbursement of money from a holder in a cash flow exchange.

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