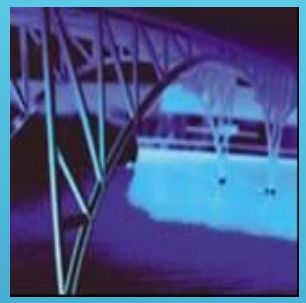
APPLIED FINANCE

Lecture 14



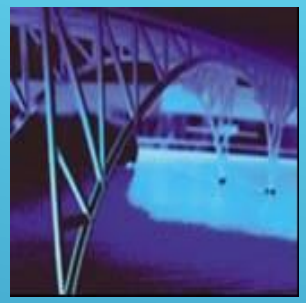
FREQUENCY OF COMPOUNDING

General Formula:

$FV_n = PV_0(1 + [i/m])^{mn}$

n: Number of Years m: Compounding Periods per Year i: Annual Interest Rate $FV_{n,m}$: FV at the end of Year n

PV_0: PV of the Cash Flow today

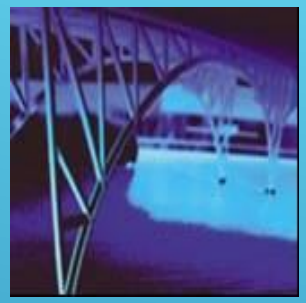


IMPACT OF FREQUENCY

Julie Miller has $1,000 to invest for 2 Years at an annual interest rate of 12%.

Annual $FV_2 = 1{,}000(1 + [.12/1])^{(1)(2)} = 1{,}254.40$

Semi $FV_2 = 1{,}000(1 + [.12/2])^{(2)(2)} = 1{,}262.48$

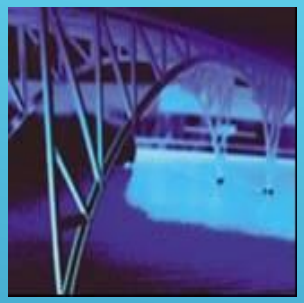


IMPACT OF FREQUENCY

Qrtly $FV_2 = 1{,}000(1 + [.12/4])^{(4)(2)} = 1{,}266.77$

Monthly $FV_2 = 1{,}000(1 + [.12/12])^{(12)(2)} = 1{,}269.73$

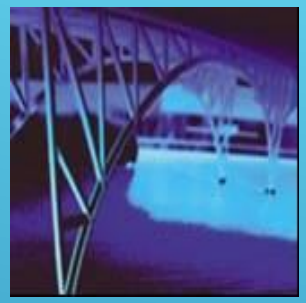
Daily $FV_2 = 1{,}000(1 + [.12/365])^{(365)(2)} = 1{,}271.20$



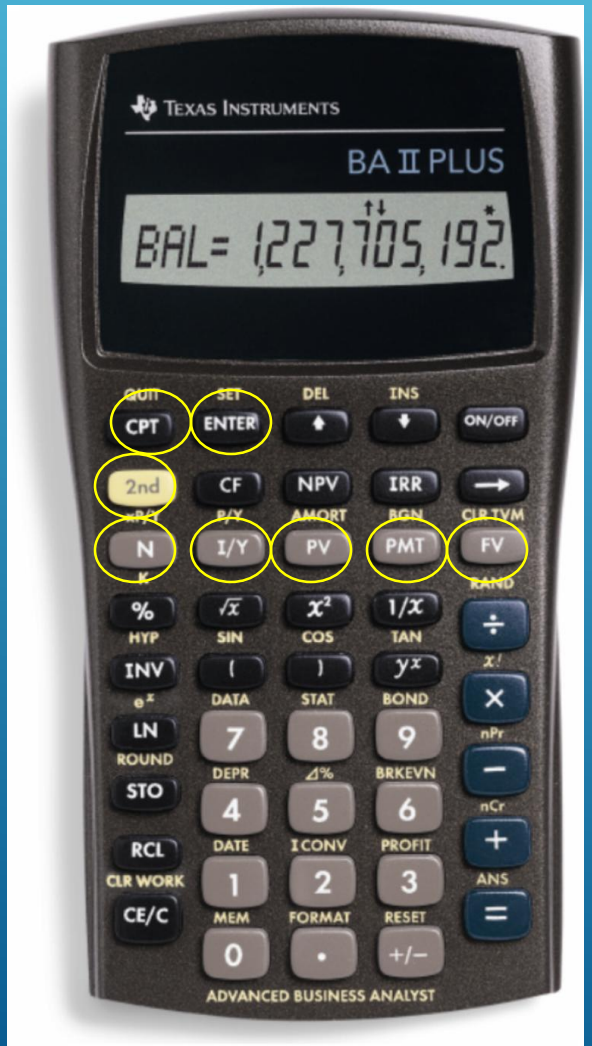
SOLVING THE FREQUENCY PROBLEM (QUARTERLY)

Inputs	2(4)	12/4	-1,000	0	
	N	I/Y	PV	PMT	FV
Compute					1266.77

The result indicates that a $1,000 investment that earns a 12% annual rate compounded quarterly for 2 years will earn a future value of $1,266.77.



Solving the Frequency Problem (Quarterly Altern.)



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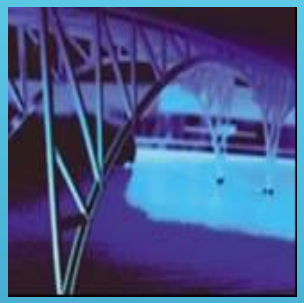
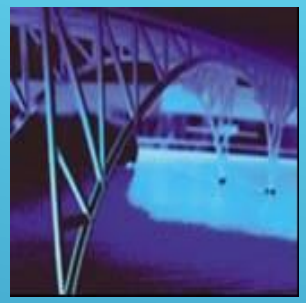


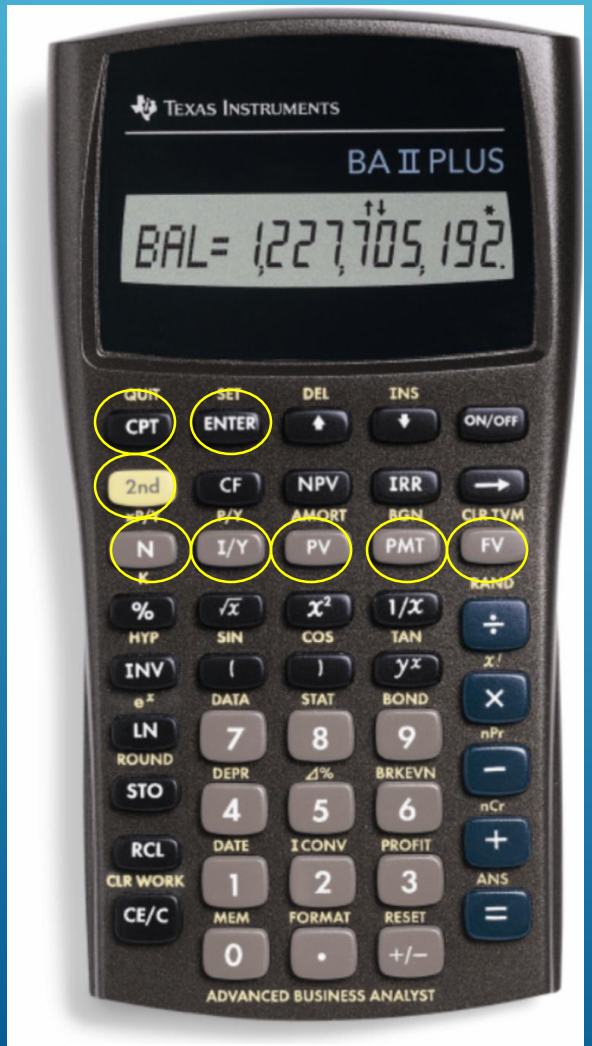
SOLVING THE FREQUENCY PROBLEM (DAILY)

Inputs	2(365)	12/365	-1,000	0	
	N	I/Y	PV	PMT	FV
Compute					1271.20

The result indicates that a $1,000 investment that earns a 12% annual rate compounded daily for 2 years will earn a future value of $1,271.20.



Solving the Frequency Problem (Daily Alternative)



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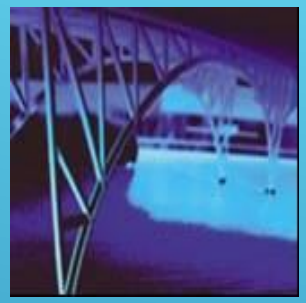
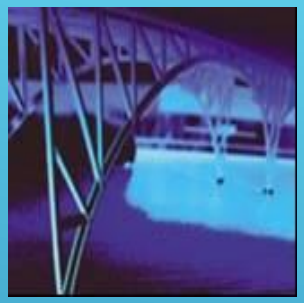


EFFECTIVE ANNUAL INTEREST RATE

Effective Annual Interest Rate

The actual rate of interest earned (paid) after adjusting the *nominal rate* for factors such as the number of compounding periods per year.

$$(1 + [\, i / m \,])^m - 1$$

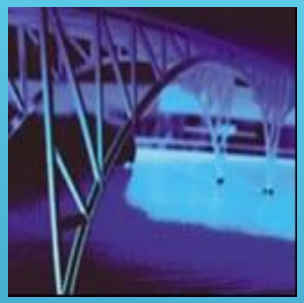


BWS EFFECTIVE ANNUAL INTEREST RATE

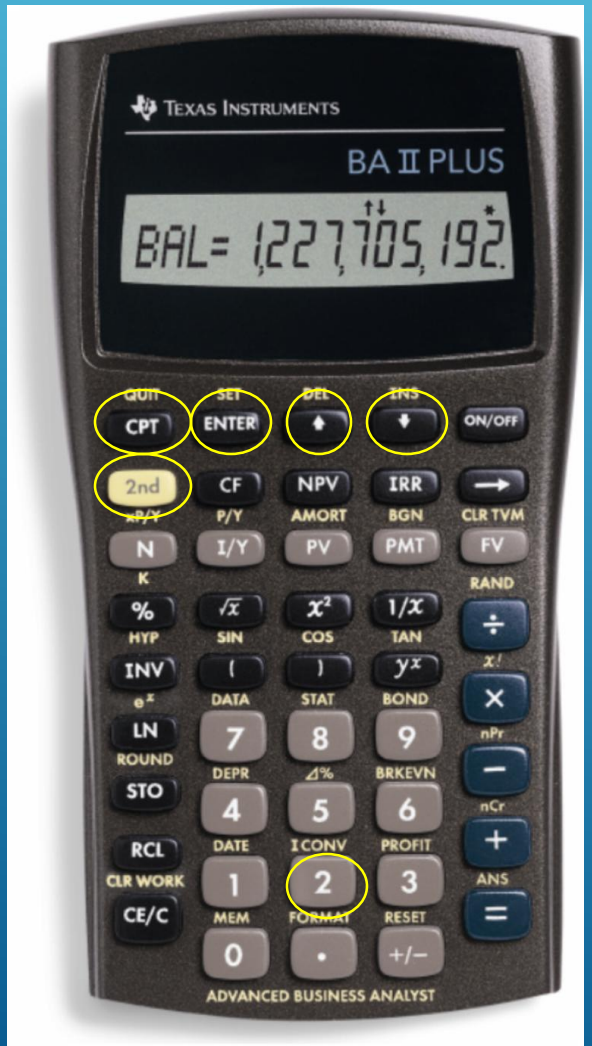
Basket Wonders (BW) has a $1,000 CD at the bank. The interest rate is 6% compounded quarterly for 1 year. What is the Effective Annual Interest Rate (EAR)?

EAR $= (1 + 6\% / 4)^4 - 1 = 1.0614 - 1 = .0614$

or 6.14%!



CONVERTING TO AN EAR



Press:

2^{nd} [ ] C [ ]

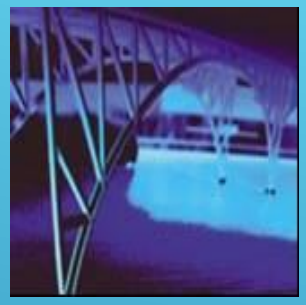
6 [ ] E [ ]

[ ] [ ]

4 [ ] E [ ]

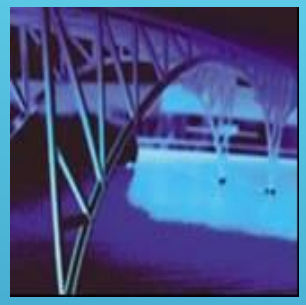
[ ] [ ]

2^{nd} [ ] C [ ]



STEPS TO AMORTIZING A LOAN

1. Calculate the payment per period.
2. Determine the interest in Period t.
   (Loan Balance at t-1) x (i% / m)
3. Compute principal payment in Period t.
   (Payment - Interest from Step 2)
4. Determine ending balance in Period t.
   (Balance - principal payment from Step 3)
5. Start again at Step 2 and repeat.



AMORTIZING A LOAN EXAMPLE

Julie Miller is borrowing $10,000 at a compound annual interest rate of 12%. Amortize the loan if annual payments are made for 5 years.

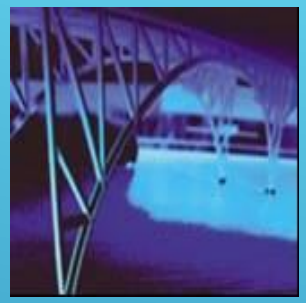
Step 1: Payment

$$PV_0 = R\ (PVIFA_{i\%,n})$$

$$\$10,000 = R\ (PVIFA_{12\%,5})$$

$$\$10,000 = R\ (3.605)$$

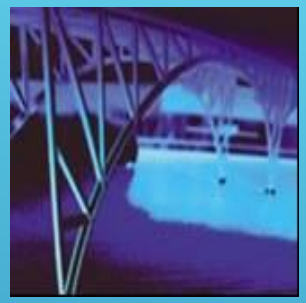
$$R = \$10,000 / 3.605 = \$2,774$$



AMORTIZING A LOAN EXAMPLE

End of Year	Payment	Interest	Principal	Ending Balance
0	---	---	---	$10,000
1	$2,774	$1,200	$1,574	8,426
2	2,774	1,011	1,763	6,663
3	2,774	800	1,974	4,689
4	2,774	563	2,211	2,478
5	2,775	297	2,478	0
	$13,871	$3,871	$10,000	

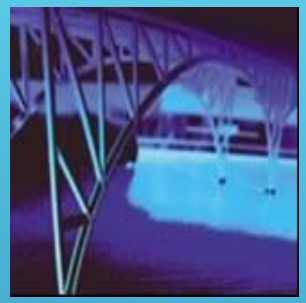
[Last Payment Slightly Higher Due to Rounding]



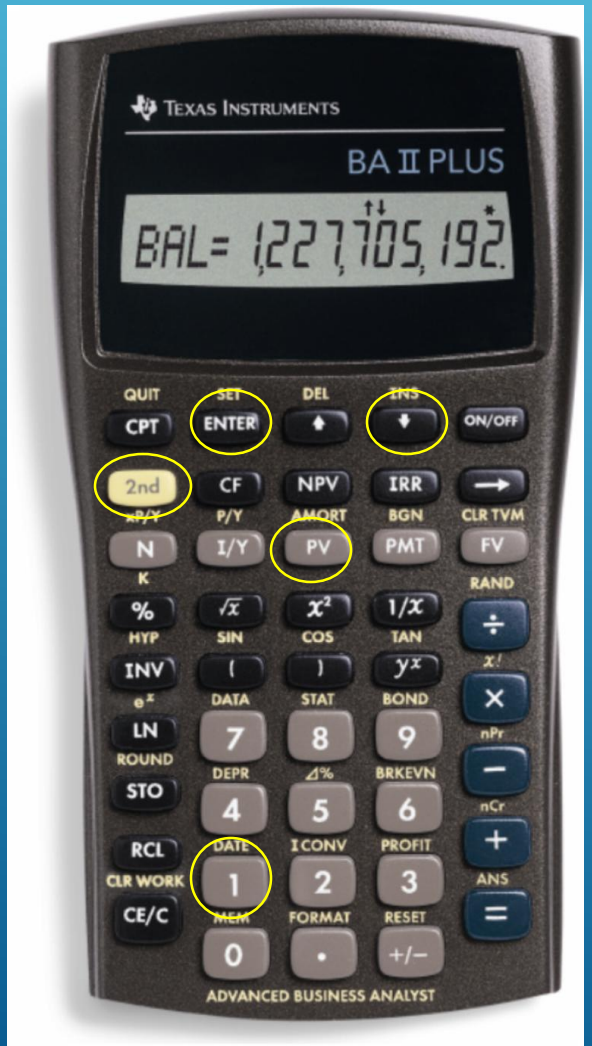
SOLVING FOR THE PAYMENT

	N	I/Y	PV	PMT	FV
Inputs	5	12	10,000		0
Compute				-2774.10	

The result indicates that a $10,000 loan that costs 12% annually for 5 years and will be completely paid off at that time will require $2,774.10 annual payments.



USING THE AMORTIZATION FUNCTIONS OF THE CALCULATOR



Press:

2^{nd} [ ] A [ ]

1 [ ] E [ ]

[ ] [ ]

Results:

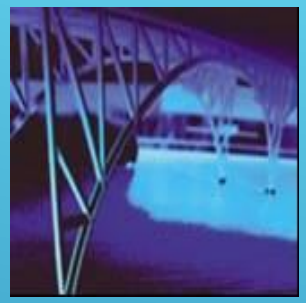
BAL = 8,425.90*

PRN = -1,574.10*

INT = -1,200.00*

Year 1 information only

***Note: Compare to 3-82**



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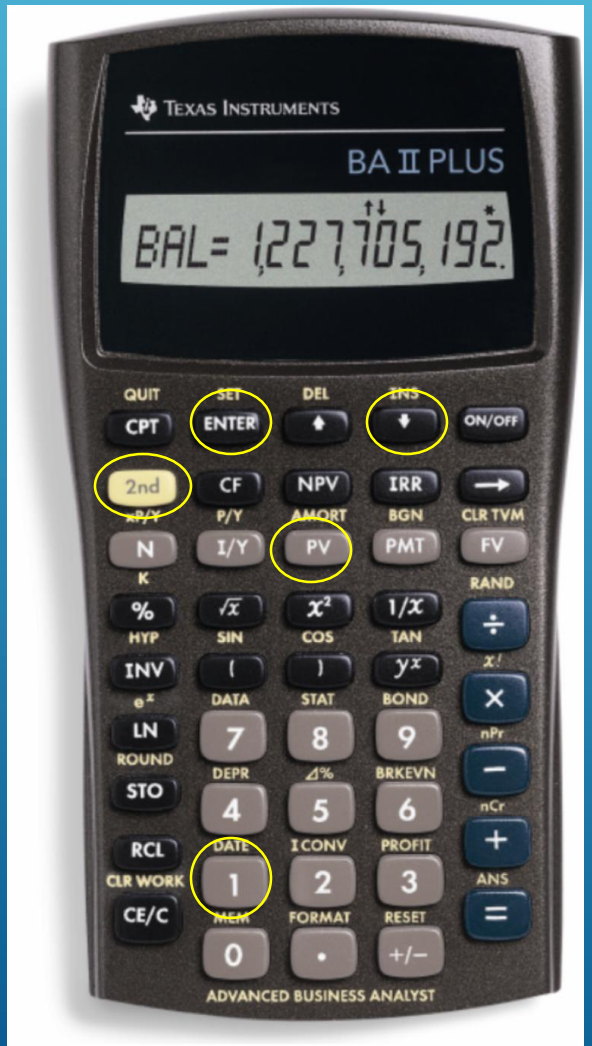

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2nd [ ] A [ ]

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Results:

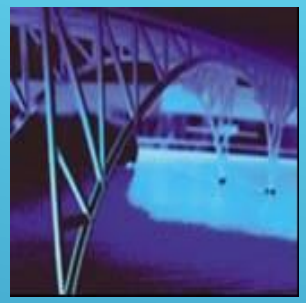
BAL = 6,662.91*

PRN = -1,763.99*

INT = -1,011.11*

Year 2 information only

***Note: Compare to 3-82**



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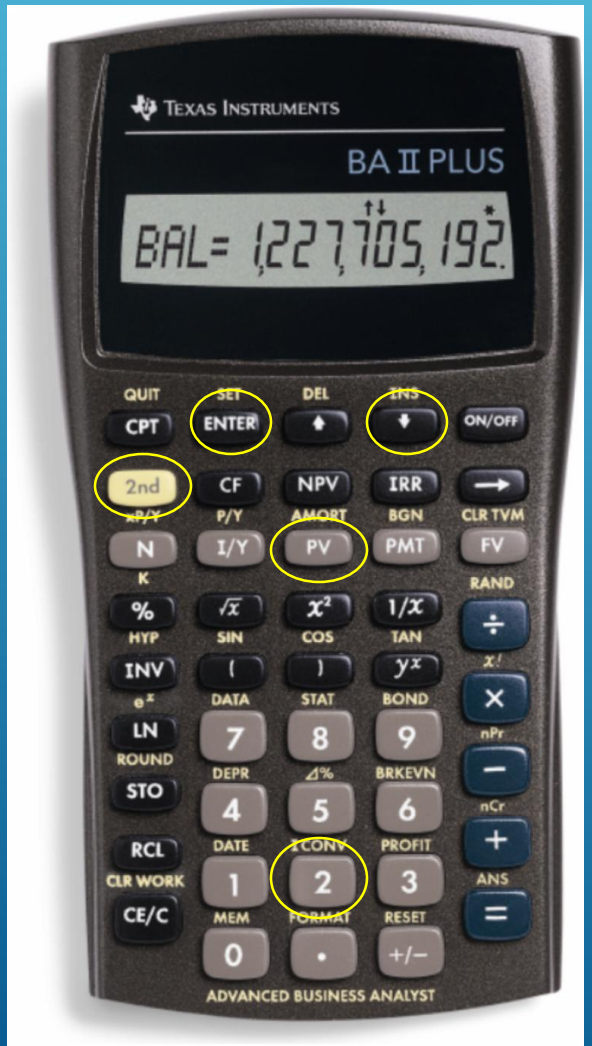

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2nd [ ] A [ ]

1 [ ] E [ ]

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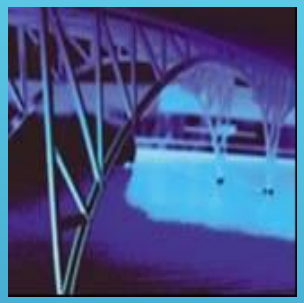
Results:

BAL = 0.00

PRN =-10,000.00

INT = -3,870.49

Entire 5 Years of loan information (see the total line of 3-82)



USEFULNESS OF AMORTIZATION

1. **Determine Interest Expense -- Interest expenses may reduce taxable income of the firm.**

2. Calculate Debt Outstanding -- The quantity of outstanding debt may be used in financing the day-to-day activities of the firm.