

# CS-150L

## Computing for Business Students

Instructor:

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$PMT(rate, nper, -pv)$

$$P = \frac{rate \times pv \times (1 + rate)^{nper}}{(1 + rate)^{nper} - 1}$$

10/29/2009

## Upcoming Schedule

- This Week:
  - Lab 7 – Loan Amortizations
  
- Week of Nov 2:
  - Lab 8 – Annuities
  
- Week of Nov 9:
  - Lab 9 – What IF Annuity
  
- Week of Nov 16:
  - Lab 10 – Financial Forecasting

## Lab 7: Due Sunday, Nov 1

- Understanding how a loan works.
- **Loan Amortization Schedules**
- Excel **PMT()** function
- Textbook equation **reading** and **translating**
- The meaning of **Biweekly** and **Semimonthly**.
- The meaning of **periodic rate** and how it relates to an APR (Annual Percentage Rate).
- Compute a **running tally** of interest or principal paid-to-date.
- Use of the **EOMONTH()** function.

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♪ Some of these things are not like the others, some of these things just don't belong. Can you tell.... ♪

	A	B	C	D	E	F
1	Name	Lab 1	Lab 2	Lab 3	Midterm Exam	Final Grade
2	Ori	100%	95%	93%	91%	<b>94%</b>
3	Thorin Oakenshield	99%	100%	100%	50%	<b>80%</b>

The width of the columns below must be adjusted so that the text is displayed as shown above.

	A	B	C	D	E	F
1	Name	Lab 1	Lab 2	Lab 3	Midterm Exam	Final Grade
2	Ori	100%	95%	93%	91%	<b>94%</b>
3	Thorin Oakens	99%	100%	100%	50%	<b>80%</b>

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## What is the Value of Each Equation?

	A	B	C
1	10	20	30

- 1) =A1+B1+C1                      1) 60
- 2) =SUM(A1+B1+C1)                2) =SUM(60)=60
- 3) =SUM(A1, B1, C1)                3) 60
- 4) =AVERAGE(A1+B1+C1)        4) 60
- 5) =AVERAGE(A1, B1, C1)        5) 20

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## Empty and Space in Equations

	A	B	C
1	Quantity	Unit Cost	Total Cost
2	2	\$2.50	=A2*B2
3	5	\$1.50	
4		\$4.95	
5		\$3.00	
6	1	\$7.25	

Fill down

	A	B	C
1	Quantity	Unit Cost	Total Cost
2	2	\$2.50	\$5.00
3	5	\$1.50	\$7.50
4		\$4.95	\$0.00
5		\$3.00	#VALUE!
6	1	\$7.25	\$7.25

Empty cell

Space Character

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## Space in Range of SUM Function

	A	B	C		B	C
1	Quantity	Unit Cost	Total Cost			
2	2	\$2.50	\$5.00			
3	5	\$1.50	\$7.50			
4		\$4.95	\$0.00			
5		\$3.00	#VALUE!			
6	=SUM(A2:A6)					
7						
				Quantity	Unit Cost	Total Cost
				2	\$2.50	\$5.00
				5	\$1.50	\$7.50
					\$4.95	\$0.00
					\$3.00	#VALUE!
				1	\$7.25	\$7.25
				8	19.2	#VALUE!

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=SUM(A2:A6) ignores the Space Character

## COUNT() & COUNTIF() Functions

	A	B	C	D
1	1	87	87	87
2	2	65	65	65
3	3	92	92	92
4	4	99	99	99
5	5		0	BOB
6	6	78	78	78
7				
8	AVERAGE(B1:B6)	84.2	70.2	84.2
9	COUNT(B1:B6)	5	6	5
10	COUNTIF(B1:B6,">0")	5	5	5

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## Which are Correct?

	A	B
1	Name	Lab 1
2	Ori	100%
3	Oin	78%
4	Bofur	63%

Enter an Excel equation that calculates the average of all the grades for lab 1 and will fill across correctly. The equation **must not** use any constants.

a) = SUM(B2:B4)/3

★ b) = AVERAGE(B2:B4)

c) = AVERAGE(\$B\$2:\$B\$4)

d) = B2+B3+B4/3

e) = (B2+B3+B4)/3

f) = B2/3+B3/3+B4/3

★ g) = SUM(B2:B4)/COUNT(B2:B4)

When no **weights** are given, it can be assumed that all items to be averaged have the same weight.

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## Quiz: Average()

	A	B
1	50	100

What is the value of  
=AVERAGE(A1+B1)?

a) 150

b) 75

c) 50

d) 100

e) 75%

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## Quiz: Filling Right

	A	B	C	D
1	Name	Lab 1	Lab 2	Lab 3
2	Ori	100%	95%	93%
3	Oin	78%	77%	73%
4	Bofur	63%	44%	56%

Which equation calculates the average of all the grades for lab 1 and can be **filled right** to correctly calculate the average grades in columns C through D. The equation **must not** use constants.

- a) = AVERAGE(B2+B3+B4)
- b) = AVERAGE(\$B\$2+\$B\$3+\$B\$4)
- c) = SUM(\$B\$2:\$B\$4)/3
- d) = AVERAGE(B2:B4)
- e) = AVERAGE(\$B\$2:\$B\$4)

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## Business Related Time Intervals

Usually, all of these are equally spaced intervals.

**Biannual:** Once every two years.

**Semiannual:** Twice each year.

**Quarterly:** Four times a year, at three-month intervals.

**Bimonthly:** Once every two months (6 times per year).

**Monthly:** 12 times per year.

**Semimonthly:** Twice each month (24 times per year).

**Biweekly:** Once every two weeks (26 times per year).

**Weekly:** Every week, 52 times per year.

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## Calculating Periodic Interest Rate from APR

$$\text{Periodic Interest Rate} = \frac{APR}{n}$$

Where *APR* is the Annual Percentage Rate and *n* is the number of periods in one year.

For a daily periodic interest rate, most lending institutions use an amortized base of 365.

Examples: APR = 12.99%

$$\text{Monthly Periodic Rate} = 12.99\%/12 = 1.0825\%$$

$$\text{Daily Periodic Rate} = 12.99\%/365 = 0.0356\%$$

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## Quiz: Periodic Interest Rates

	A	B
1	Loan Balance:	\$ 1,000.00
2	APR:	15.99%
3	Monthly Periodic Rate: =	

Which Excel equation will give the **Monthly Periodic Interest Rate** in the above spreadsheet?

- a) = B2/B1
- b) = B1/B2
- c) = B2/12
- d) = (B2/12) \* B1
- e) = B2/12 \* B1

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## Multiplying Every Cell By a Constant

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1. Place the constant in a cell.
2. Copy the value in the cell.
3. Select all the cells you want to Multiply by the constant.
4. Paste Special:  
Excel 2003: Edit Menu → Paste Special → Operation: Multiply.  
Excel 2007: Home Ribbon → Paste → Paste Special → Operation: Multiply.

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## Exponents

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$$5^2 = 5 \times 5 = 25 \text{ (math notation)}$$

$$5^2 = 5*5 = 25 \text{ (Excel notation)}$$

$$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32 \text{ (math notation)}$$

$$2^5 = 2*2*2*2*2 = 32 \text{ (Excel notation)}$$

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## Quiz: Exponents

■ In Excel, what is the value of =3^3

- a) 3
- b) 6
- c) 9
- d) 12
- e) 27

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## Use of Named Cells

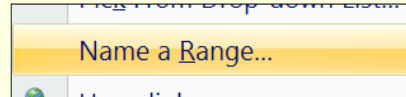
	A	B
1	APR	25%
2	Principle	1000
3	Interest, compounded annually, after 1 year:	=B2*APR

- In Excel, the user can assign a *name* to a cell or a range of cells.
- Such names can be used in equations in place of *absolute cell references*.

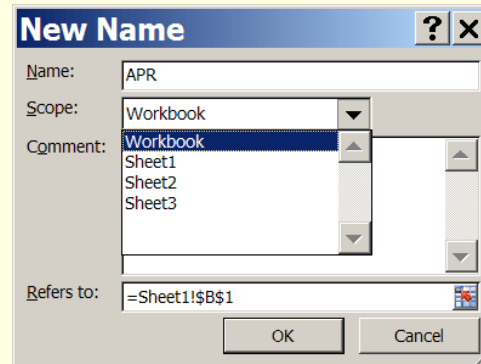
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## Named Cells: Excel 2007

	A	B
1	APR	25%

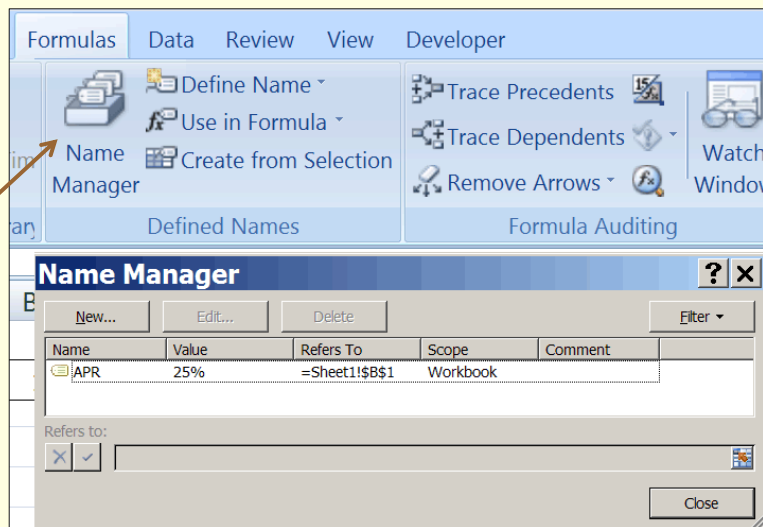


1. Select the cell you want to name.
2. Right click in the selected cell and select "Name a Range..."
3. Enter the name
4. Select the Scope.
5. Click OK.



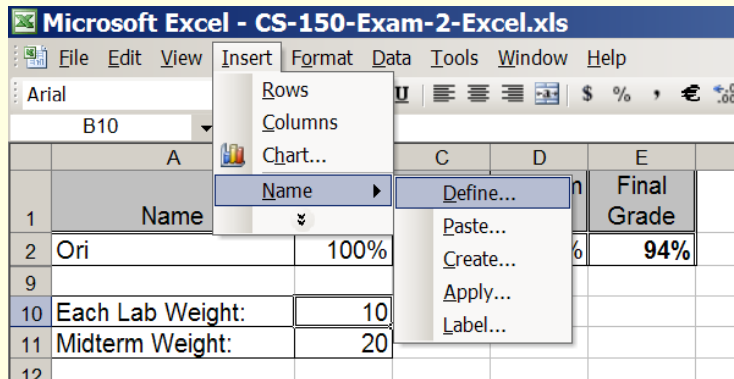
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## Name Manager



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## Named Cells: Excel 2003



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## Writing a Math Equation in Excel

The Excel PMT(*rate*, *nper*, *-pv*) function calculates the periodic payment, *P*, on a loan by the formula:

$$P = \frac{\text{rate} \times \text{pv} \times (1 + \text{rate})^{\text{nper}}}{(1 + \text{rate})^{\text{nper}} - 1}$$

- *rate*: Periodic interest rate.
- *nper*: Total number of periods.
- *pv*: Principle value of loan

$$=(\text{rate}*\text{pv}*(1+\text{rate})^{\text{nper}}) / ((1 + \text{rate})^{\text{nper}} - 1)$$

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## Quiz: Math to Excel

$$PV = FV \div (1 + i)^n$$

This is the Present Value equation given in the Financial Accounting Textbook (MGMT 202). Which is the correct translation into Excel notation?

- a) = (FV) / (1+i^n)
- b) = (FV / (1+i^n))
- c) = (FV / (1+i\*n))
- d) = (FV / (1+(i^n)))
- e) = FV / ((1+i)^n)

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## Quiz: Math to Excel

The profitability equation for earnings per share given in the Financial Accounting Textbook (MGMT 202) is:

$$\text{Earnings\_per\_share} = \frac{\text{Net\_income} - \text{Preferred\_stock\_dividends}}{\text{Average\_common\_shares\_outstanding}}$$

$$EpS = \frac{NI - PSD}{ACSO}$$

Which Excel equation is a correct translation?

- a) = (NI - PSD)/ACSO
- b) = EpS - ((NI - PSD)/ACSO)
- c) = NI - PSD/ACSO
- d) = (NI - PSD/ACSO)
- e) = EpS + ((NI - PSD/ACSO)

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## Running Totals

	A	B	C	D
1	Trans #	Date	Payment	Payments Made to Date
2	1	4-Feb	\$ 23.00	=SUM(\$C\$2:C2)
3	2	7-Feb	\$ 14.20	\$ 37.20
4	3	14-Feb	\$ 19.95	\$ 57.15
5	4	15-Feb	\$ 10.00	\$ 67.15
6	5	22-Feb	\$ 15.30	\$ 82.45
7	6	27-Feb	\$ 12.45	\$ 94.90
8	<b>Total Payments:</b>		<b>\$ 94.90</b>	

Running Total:

Sum from **Beginning** (absolute) through **Current** (relative)

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## Quiz 7-9: Running Totals

	A	B	C
1	Date	Payments	Payments Made to Date
2	3/4/08	\$ 57.00	\$ 57.00
3	4/2/08	\$ 45.00	\$ 102.00
4	5/7/08	\$ 23.00	\$ 125.00
5	6/1/08	\$ 15.00	\$ 140.00
6	7/3/08	\$ 98.00	\$ 238.00

Which Excel Equation can be entered in cell **C2** and filled down from C2:C6 to correctly calculate the Payments Made to Date?

- a) = SUM(\$C\$2:\$C\$6)
- b) = SUM(\$B\$2:B2)
- c) = SUM(B2:B6)
- d) = SUM(\$B\$2:B6)
- e) = SUM(C2:C6)

Alternate Solution:

$$C2: = B2$$

$$C3: = C2+B3$$

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## Excel PMT( ) function

- **PMT (PayMenT)** for a loan based on constant payments and a constant interest rate.
- Syntax:  $\text{PMT}(\text{rate}, \text{nper}, -\text{pv})$ 
  - *rate*: Periodic interest rate (APR divided by the number of periods per year),
  - *nper*: Total number of periods during the term of the loan,
  - *pv*: Principle value of loan.

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## PMT Example

- A five year loan is created on an original principal of \$5,000 at a fixed APR of 6.75% compounded monthly.

	A	B	C	D	E	F
1	Given	<i>pv</i>	Original Principle of Loan		\$5,000	
2			Fixed APR		6.75%	
3			Period of Compounding		1	month
4			Total Loan Term		5	years
5						
6	Calculations		Number of Periods Per Year		12	months/year
7		<i>rate</i>	Periodic Interest Rate	E2/E6	0.5625%	
8		<i>nper</i>	Total Number of Periods of the loan	E4*E6	60	months
9		<i>p</i>	Periodic Payment	$\text{PMT}(\text{E7}, \text{E8}, -\text{E1})$	\$98.42	
10			Total Amount of all Payments	E9*E8	\$5,905.04	
11			Total Finance Charge	E10-E1	\$905.04	

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## Auto Loan Scenarios

	A	B	C	D	E	F
1	First Bank of the Milky Way 1 Mandelbrot Drive, Tombal Station, USA, Mars	4 year loan, No down payment, Monthly Payments	4 year loan, No down payment, Semi-Monthly Payments	4 year loan, No down payment, Bi-weekly	6 year loan, No down payment, Monthly Payments	6 year loan, \$2000 down Monthly Payments
2	Price of 2008 Toyota Prius	\$19,692.00				
3	Manufacture's Rebate	\$1,000.00				
4	Down Payment	\$0.00	\$0.00	\$0.00	\$0.00	\$2,000.00
5	Amount to Finance	\$18,692.00	\$18,692.00	\$18,692.00	\$18,692.00	\$16,692.00
6	Term (in years)	4	4	4	6	6
7	Annual Percentage Rate (APR)	6.10%	6.10%	6.10%	7.60%	7.60%
8	Number of Payments per Year	12	24	26	12	12
9	Periodic Interest Rate	0.5083%	0.2542%	0.2346%	0.6333%	0.6333%
10	Total Number of Payments	48	96	104	72	72
11	Periodic Payment (PMT)	\$439.84	\$219.67	\$202.76	\$324.09	\$289.42
12	Periodic Payment (equation)	\$439.84	\$219.67	\$202.76	\$324.09	\$289.42
13	Total of Payments	\$21,112.30	\$21,088.70	\$21,086.88	\$23,334.67	\$20,837.92
14	Finance Charge	\$2,420.30	\$2,396.70	\$2,394.88	\$4,642.67	\$4,145.92

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## Quiz: PMT(rate, nper, -pv)

A five year loan is created on an original principal of \$5,000 at a fixed APR of 6.75% compounded monthly.

	A	B	C	D	E	F
1	Given	pv	Original Principle of Loan		\$5,000	
2			Fixed APR		6.75%	
3			Period of Compounding		1	month
4			Total Loan Term		5	years
5						
6	Calculations		Number of Periods Per Year		12	months/year
7		rate	Periodic Interest Rate	E2/E6	0.5625%	
8		nper	Total Number of Periods of the loan	E4*E6	60	months
9		p	Periodic Payment		\$98.42	
10			Total Amount of all Payments		\$5,905.04	
11		Total Finance Charge		\$905.04		

The Periodic Payment is given by:

- a) PMT(E2, E4, -E1)                      b) PMT(E7, E8, -E1)  
 c) PMT(E2, E6, -E1)                      d) PMT(E7, E6, -E1)

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## Quiz: Total Finance Charge

A five year loan is created on an original principal of \$5,000 at a fixed APR of 6.75% compounded monthly.

	A	B	C	D	E	F
1	Given	<i>pv</i>	Original Principle of Loan		\$5,000	
2			Fixed APR		6.75%	
3			Period of Compounding		1	month
4			Total Loan Term		5	years
5						
6	Calculations		Number of Periods Per Year		12	months/year
7		<i>rate</i>	Periodic Interest Rate	E2/E6	0.5625%	
8		<i>nper</i>	Total Number of Periods of the loan	E4*E6	60	months
9		<i>p</i>	Periodic Payment		\$98.42	
10			Total Amount of all Payments		\$5,905.04	
11		Total Finance Charge		\$905.04		

The Total Finance Charge is given by:

- a)  $E9 - E10$                       b)  $E10 - E9$                       c)  $E9 * E10$   
 d)  $E9 * E8$                           e)  $E10 - E1$

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## Compound Interest

The account balance (interest plus principal) is calculated at the end of each **period**.

During the next period, interest is calculated on the **full balance** at the end of the last period.

If \$100 was borrowed for **2 years** at an **annual periodic** interest rate of **10%**, the **interest compounded annually** would be:

$$\text{\$100} * 10\% * 1 \text{ period} = \text{\$10} \text{ (in the 1st period).}$$

Balance at the end of the first period:  $\text{\$100} + \text{\$10} = \text{\$110}$ .

$$\text{\$110} * 10\% * 1 \text{ period} = \text{\$11} \text{ (in the 2nd period).}$$

Thus, the total interest in the loan is:

$$\text{\$10.00} + \text{\$11.00} = \text{\$21.00}$$

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## Simple Interest vs Compound Interest

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Simple interest =

[Original Principle] \* [Periodic Rate] \* [The Number of Periods]

Compound Interest *For One Period* =

[Current Balance] \* [Periodic Rate]

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## Setting Up a Worksheet from Words

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On January 1, 2008, Austin took out a loan of \$1000.00 at an interest rate of 12.00% APR compounded monthly. He has a minimum payment of \$100.00 due the first of every month starting February. He always makes his minimum payment. What is the balance of his account on March 1, 2008?

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- **Extract** the information from the paragraph,
- **Organize** the information in a spreadsheet with assumptions clearly separated from calculations,
- **Solve** the problem within the spreadsheet such that *changing any of the assumptions automatically changes the results.*
- **Format** a assumptions, calculations and results for clarity and easy readability.

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## Words to Worksheet – Set up

On January 1, 2008, Austin took out a loan of \$1000.00 at an interest rate of 12.00% APR compounded monthly. He has a minimum payment of \$100.00 due the first of every month starting February. He always makes his minimum payment. What is the balance of his account on March 1, 2008?

	A	B	C	D	E	F
1	Assumptions	Amount Financed	\$1,000.00			
2		APR	12.00%			
3		Monthly Payment	\$100.00			
4		Date of Loan	1/1/2008			
5						
6		Periodic Interest Rate	1.0000%			
7						
8		Date	Payment	Finance Charge	Amount Applied to Principal	Principal Balance
9		February 1, 2008	\$100.00			
10		March 1, 2008	\$100.00			

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## Finance Charge

	A	B	C	D	E	F
1	Assumptions	Amount Financed	\$1,000.00			
2		APR	12.00%			
3		Monthly Payment	\$100.00			
4		Date of Loan	1/1/2008			
5						
6		Periodic Interest Rate	1.0000%			
7						
8		Date	Payment	Finance Charge	Amount Applied to Principal	Principal Balance
9		February 1, 2008	\$ 100.00	\$ 10.00		
10		March 1, 2008	\$ 100.00	=F9*\$C\$6		

- Row 1: =C1\*C6 or =\$C\$1\*\$C\$6
- Row 2: =F9\*\$C\$6 --- it is ok that F9 is empty.

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## Amount Applied to Principal

	A	B	C	D	E	F
1	PS	Amount Financed	\$1,000.00			
8		Date	Payment	Finance Charge	Amount Applied to Principal	Principal Balance
9		February 1, 2008	\$100.00	\$10.00	\$90.00	
10		March 1, 2008	\$100.00	\$0.00	\$100.00	

- Row 1 (not special – fill it down): =C9-D9
- The value showing in E11 is incorrect because the *Finance Charge* in F10 is incorrect until the *Principal Balance* equation is done.
- When *Principal Balance* equation is done, the other values will update to correct values.

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## Principal Balance

	A	B	C	D	E	F
1	Assumptions	Amount Financed	\$1,000.00			
2		APR	12.00%			
3		Monthly Payment	\$100.00			
4		Date of Loan	1/1/2008			
5						
6		Periodic Interest Rate	1.0000%			
7						
8		Date	Payment	Finance Charge	Amount Applied to Principal	Principal Balance
9		February 1, 2008	\$100.00	\$10.00	\$90.00	\$910.00
10		March 1, 2008	\$100.00	\$9.10	\$90.90	\$819.10

- Row 1: =C1-E9 or =\$C\$1-E9
- Row 2: =F9-E10

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## Quiz:

	A	B	C
1	APR	6.10%	
2			
3	Date	Interest	Balance
4	3/1/2008		\$ 550.00
5	4/1/2008	=	

Which equation entered in B5 will give the interest (compounded monthly) charged for the month of March?

- a)  $(\$B\$1 / 12) * C4$
- b)  $(\$B\$1 / 12) * (A5 - A4)$
- c)  $(\$B\$1 / 12) * (A4 - A5)$
- d)  $(\$B\$1 / 12) * (A4 - A5) * C4$
- e)  $\$B\$1 * C4$

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## Quiz:

	A	B	C	D
1	Daily Periodic Interest Rate:			0.0630%
2				
3	Number of Days	Balance	Interest	
4	41	\$1,257.52		
5				

The simple interest on the balance in cell B4 over a period of days given in cell A4 can be calculated by?

- a)  $=\$D\$1*B4$
- b)  $=\$D\$1 + B4 + A4$
- c)  $=\$D\$1*B4*A4$
- d)  $=\$D\$1 + B4*A4$
- e)  $=\$D\$1*B4 + A4$

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