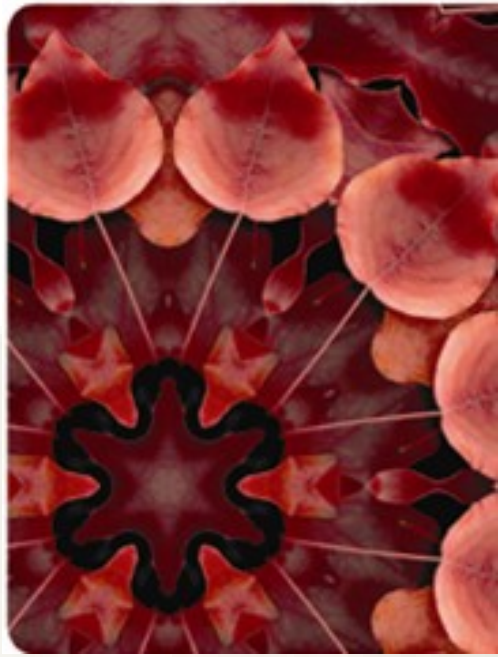
MICROSOFT® OFFICE
Excel 2007

Excel Tutorial 3

Working with Formulas and Functions



NEW PERSPECTIVES

COMPREHENSIVE

Objectives

- Copy formulas
- Build formulas containing relative, absolute, and mixed references
- Review function syntax
- Insert a function with the Insert Function dialog box
- Search for a function
- Type a function directly in a cell

Objectives

- Use AutoFill to fill in a formula and complete a series
- Enter the IF logical function
- Insert the date with the TODAY function
- Calculate monthly mortgage payments with the PMT financial function

Using Relative References

Figure 3-2 Formula using a relative reference

original formula with a relative reference

	A	B	C	D
1	10	20	30	
2				
3	=A1			
4				
5				

formula copied to a new range (column and row references shift based on cell location)

	A	B	C	D
1	10	20	30	
2				
3	=A1	=B1	=C1	
4				
5				

formula results

	A	B	C	D
1	10	20	30	
2				
3	10	20	30	
4				
5				

Using Absolute References

Formula using an absolute reference — Figure 3-3

original formula with an absolute reference

	A	B	C	D
1	10	20	30	
2				
3	=$A$1			
4				
5				

formula copied into a new range (column and row references fixed regardless of cell location)

	A	B	C	D
1	10	20	30	
2				
3	=$A$1	=$A$1	=$A$1	
4				
5				

formula results

	A	B	C	D
1	10	20	30	
2				
3	10	10	10	
4				
5				

Using Mixed References

Formulas using mixed references — Figure 3-5

original formula with a mixed reference

	A	B	C	D
1	10	20	30	
2				
3	=A$1			
4				
5				

formula copied to a new range (row reference fixed on row 1, column reference shifts based on the cell location)

	A	B	C	D
1	10	20	30	
2				
3	=A$1	=B$1	=C$1	
4	=A$1	=B$1	=C$1	
5	=A$1	=B$1	=C$1	

formula results

	A	B	C	D
1	10	20	30	
2				
3	10	20	30	
4	10	20	30	
5	10	20	30	

Entering Relative, Absolute, and Mixed References

- To enter a relative reference, type the cell reference as it appears in the worksheet. For example, enter B2 for cell B2
- To enter an absolute reference, type $ (a dollar sign) before both the row and column references. For example, enter $B$2
- To enter a mixed reference, type $ before either the row or column reference. For example, enter $B2 or B$2

or

- Select the cell reference you want to change
- Press the F4 key to cycle the reference from relative to absolute to mixed and then back to relative

Understanding Function Syntax

- Every function has to follow a set of rules, or **syntax**, which specifies how the function should be written
  - **Arguments**

Figure 3-6 Categories of Excel functions

Category	Contains functions that
Cube	Retrieve data from multidimensional databases involving online analytical processing or OLAP
Database	Retrieve and analyze data stored in databases
Date & Time	Analyze or create date and time values and time intervals
Engineering	Analyze engineering problems
Financial	Have financial applications
Information	Return information about the format, location, or contents of worksheet cells
Logical	Return logical (true-false) values
Lookup & Reference	Look up and return data matching a set of specified conditions from a range
Math & Trig	Have math and trigonometry applications
Statistical	Provide statistical analyses of a set of data
Text	Return text values or evaluate text

Understanding Function Syntax

Figure 3-7 Math, Trig, and Statistical functions

Function	Category	Description
AVERAGE(*number1* [, *number2*, *number3*, ...])	Statistical	Calculates the average of a collection of numbers, where *number1*, *number2*, and so forth are either numbers or cell references. Only *number1* is required. For more than one cell reference or to enter numbers directly into the function, use the optional arguments *number2*, *number3*, and so forth.
COUNT(*value1* [, *value2*, *value3*, ...])	Statistical	Counts how many cells in a range contain numbers, where *value1*, *value2*, and so forth are text, numbers, or cell references. Only *value1* is required. For more than one cell reference or to enter numbers directly into the function, use the optional arguments *value2*, *value3*, and so forth.
COUNTA(*value1*, [,*value2*, *value3*, ...]	Statistical	Counts how many cells are not empty in ranges *value1*, *value2*, and so forth, or how many numbers are listed within *value1*, *value2*, and so forth.
INT(*number*)	Math & Trig	Displays the integer portion of a number, *number*.
MAX(*number1* [, *number2*, *number3*, ...])	Statistical	Calculates the maximum value of a collection of numbers, where *number1*, *number2*, and so forth are either numbers or cell references.
MEDIAN(*number1* [, *number2*, *number3*, ...])	Statistical	Calculates the median, or middle, value of a collection of numbers, where *number1*, *number2*, and so forth are either numbers or cell references.
MIN(*number1* [, *number2*, *number3*, ...])	Statistical	Calculates the minimum value of a collection of numbers, where *number1*, *number2*, and so forth are either numbers or cell references.
RAND()	Math & Trig	Returns a random number between 0 and 1.
ROUND(*number*, *num_digits*)	Math & Trig	Rounds a number to a specified number of digits, where *number* is the number you want to round and *num_digits* specifies how many digits to which you want to round the number.
SUM(*number1* [, *number2*, *number3*, ...])	Math & Trig	Adds a collection of numbers, where *number1*, *number2*, and so forth are either numbers or cell references.

Inserting a Function

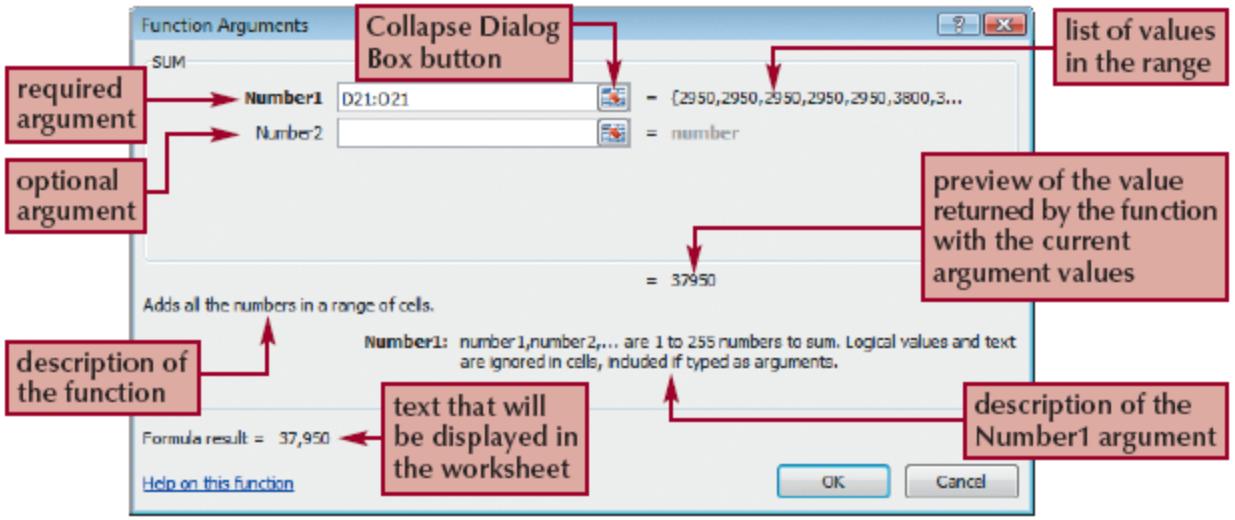
- Click the Formulas tab on the Ribbon
- To insert a function from a specific category, click the appropriate category button in the Function Library group. To search for a function, click the Insert Function button in the Function Library group, enter a description of the function, and then click the Go button
- Select the appropriate function from the list of functions
- Enter the argument values in the Function Arguments dialog box, and then click the OK button

Inserting a Function

Figure 3-8 Function Arguments dialog box

Tip

You can click the Collapse Dialog Box button to shrink the Function Arguments dialog box to see more of the worksheet, select the range, and then click the Expand Dialog Box button to restore the dialog box.

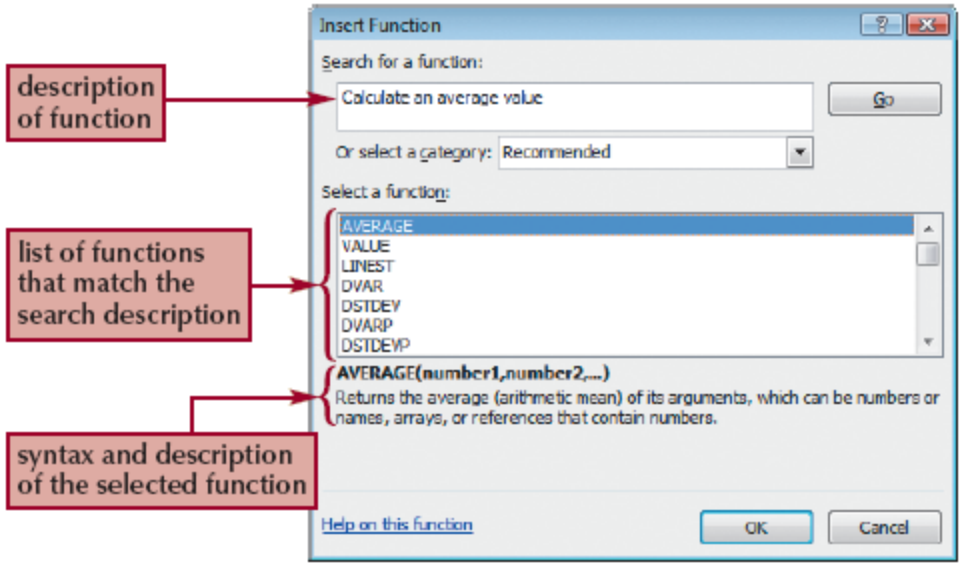


Inserting a Function

Figure 3-10 Insert Function dialog box

Tip

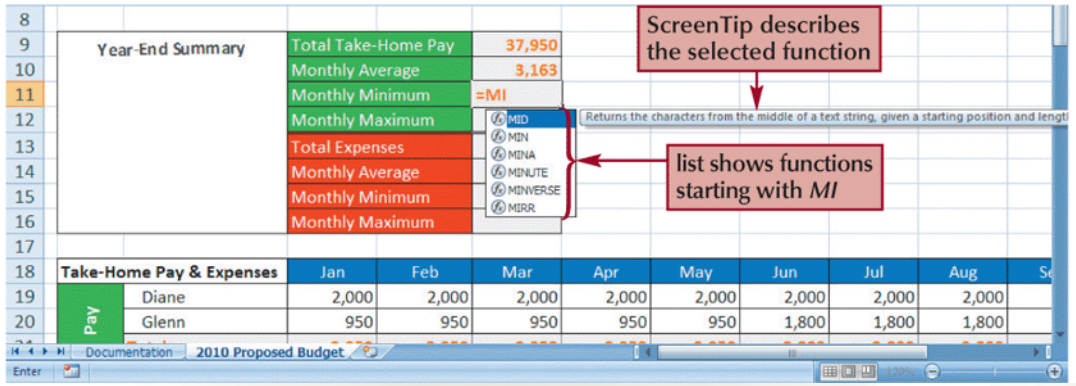
You can also open the Insert Function dialog box by clicking the Insert Function button on the formula bar.



Typing a Function

- As you begin to type a function name within a formula, a list of functions that begin with the letters you typed appears

Figure 3-12 Typing a function



Working with AutoFill

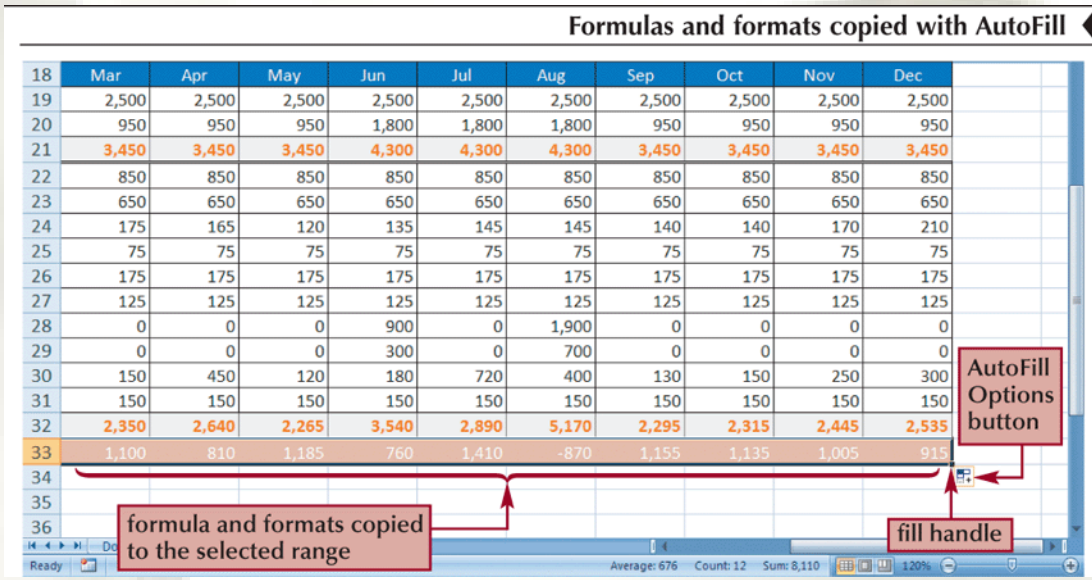
- **AutoFill** copies content and formats from a cell or range into an adjacent cell or range
- Select the cell or range that contains the formula or formulas you want to copy
- Drag the fill handle in the direction you want to copy the formula(s) and then release the mouse button
- To copy only the formats or only the formulas, click the AutoFill Options button and select the appropriate option

or

- Select the cell or range that contains the formula or formulas you want to copy
- In the Editing group on the Home tab, click the Fill button
- Select the appropriate fill direction and fill type (or click Series, enter the desired fill series options, and then click the OK button)

Working with AutoFill

Formulas and formats copied with AutoFill — Figure 3-17

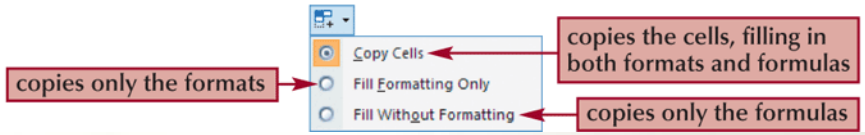


	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
19	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
20	950	950	950	1,800	1,800	1,800	950	950	950	950
21	3,450	3,450	3,450	4,300	4,300	4,300	3,450	3,450	3,450	3,450
22	850	850	850	850	850	850	850	850	850	850
23	650	650	650	650	650	650	650	650	650	650
24	175	165	120	135	145	145	140	140	170	210
25	75	75	75	75	75	75	75	75	75	75
26	175	175	175	175	175	175	175	175	175	175
27	125	125	125	125	125	125	125	125	125	125
28	0	0	0	900	0	1,900	0	0	0	0
29	0	0	0	300	0	700	0	0	0	0
30	150	450	120	180	720	400	130	150	250	300
31	150	150	150	150	150	150	150	150	150	150
32	2,350	2,640	2,265	3,540	2,890	5,170	2,295	2,315	2,445	2,535
33	1,100	810	1,185	760	1,410	-870	1,155	1,135	1,005	915

Using the AutoFill Options Button

- By default, AutoFill copies both the formulas and the formats of the original range to the selected range
- You can specify what is copied by using the AutoFill Options button that appears after you release the mouse button

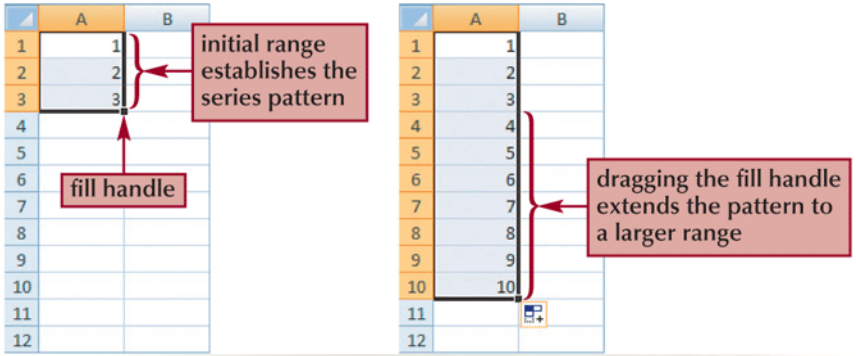
AutoFill options Figure 3-18



Filling a Series

- AutoFill can also be used to create a series of numbers, dates, or text based on a pattern

Figure 3-19 AutoFill extends a numeric sequence



Filling a Series

Figure 3-20 AutoFill applied to different series

Type	Initial Entry	Extended Series
Values	1, 2, 3	4, 5, 6, ...
	2, 4, 6	8, 10, 12, ...
Dates and Times	Jan	Feb, Mar, Apr, ...
	January	February, March, April, ...
	15-Jan, 15-Feb	15-Mar, 15-Apr, 15-May, ...
	12/30/2010	12/31/2010, 1/1/2011, 1/2/2011, ...
	12/31/2010, 1/31/2011	2/28/2011, 3/31/2011, 4/30/2011, ...
	Mon	Tue, Wed, Thu, ...
	Monday	Tuesday, Wednesday, Thursday, ...
	11:00AM	12:00PM, 1:00PM, 2:00PM, ...
Patterned Text	1st period	2nd period, 3rd period, 4th period, ...
	Region 1	Region 2, Region 3, Region 4, ...
	Quarter 3	Quarter 4, Quarter 1, Quarter 2, ...
	Qtr3	Qtr4, Qtr1, Qtr2, ...

Creating a Series with AutoFill

- Enter the first few values of the series into a range
- Select the range, and then drag the fill handle of the selected range over the cells you want to fill

or

- Enter the first few values of the series into a range
- Select the entire range into which you want to extend the series
- In the Editing group on the Home tab, click the Fill button, and then click Down, Right, Up, Left, Series, or Justify to set the direction you want to extend the series

Working with Logical Functions

- A **logical function** is a function that works with values that are either true or false
- The **IF function** is a logical function that returns one value if the statement is true and returns a different value if the statement is false
- IF(*logical_test*, *value_if_true*, [*value_if_false*])

Working with Logical Functions

- A **comparison operator** is a symbol that indicates the relationship between two values

Comparison operators — Figure 3-27

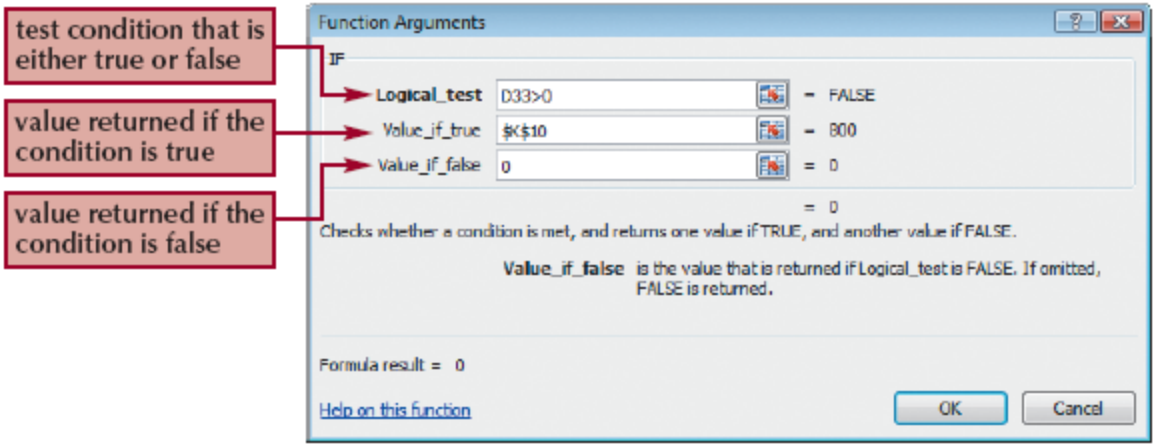
Operator	Statement	Tests whether
=	A1 = B1	the value in cell A1 *is equal to* the value in cell B1
>	A1 > B1	the value in cell A1 *is greater than* the value in cell B1
<	A1 < B1	the value in cell A1 *is less than* the value in cell B1
>=	A1 >= B1	the value in cell A1 *is greater than or equal to* the value in cell B1
<=	A1 <= B1	the value in cell A1 *is less than or equal to* the value in cell B1
<>	A1 <> B1	the value in cell A1 *is not equal to* the value in cell B1

Working with Logical Functions

- =IF(A1="YES", "DONE", "RESTART")
- =IF(A1="MAXIMUM", MAX(B1:B10), MIN(B1:B10))
- =IF(D33>0, $K$10, 0)

Working with Logical Functions

Function arguments for the IF function **Figure 3-28**



Working with Date Functions

Date functions Figure 3-31

Function	Description
DATE(*year*, *month*, *day*)	Creates a date value for the date represented by the *year*, *month*, and *day* arguments
DAY(*date*)	Extracts the day of the month from the *date* value
MONTH(*date*)	Extracts the month number from the *date* value where 1=January, 2=February, and so forth
YEAR(*date*)	Extracts the year number from the *date* value
WEEKDAY(*date*, [*return_type*])	Calculates the day of the week from the *date* value, where 1=Sunday, 2=Monday, and so forth; to choose a different numbering scheme, set the optional *return_type* value to "1" (1=Sunday, 2=Monday, ...), "2" (1=Monday, 2=Tuesday, ...), or "3" (0=Monday, 1=Tuesday, ...)
NOW( )	Displays the current date and time
TODAY( )	Displays the current date

Working with Financial Functions

Figure 3-33 Financial functions for loans and investments

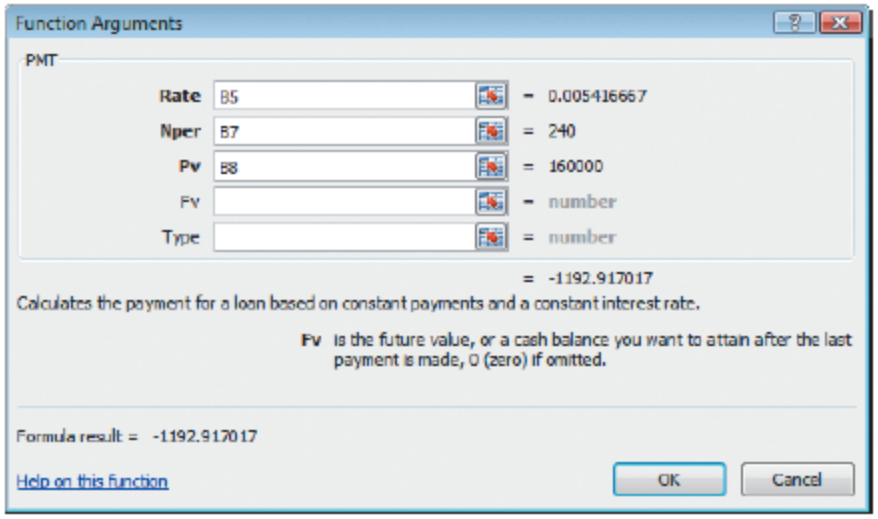
Function	Description
FV(*rate*, *nper*, *pmt*, [*pv*=0] [,*type*=0])	Returns the future value of an investment, where *rate* is the interest rate per period, *nper* is the total number of periods, *pmt* is the payment in each period, *pv* is the present value of the investment, and *type* indicates whether payments should be made at the end of the period (0) or the beginning of the period (1)
PMT(*rate*, *nper*, *pv*, [*fv*=0] [,*type*=0])	Calculates the payments required each period on a loan or investment
IPMT(*rate*, *per*, *nper*, *pv*, [*fv*=0] [,*type*=0])	Calculates the amount of a loan payment devoted to paying the loan interest, where *per* is the number of the payment period
PPMT(*rate*, *per*, *nper*, *pv*, [*fv*=0] [,*type*=0])	Calculates the amount of a loan payment devoted to paying off the principal of a loan, where *per* is the number of the payment period
PV(*rate*, *nper*, *pmt*, [*fv*=0] [,*type*=0])	Calculates the present value of a loan or investment based on periodic, constant payments
NPER(*rate*, *pmt*, *pv*, [*fv*=0] [,*type*=0])	Calculates the number of periods required to pay off a loan or investment
RATE(*nper*, *pmt*, *pv*, [*fv*=0] [,*type*=0])	Calculates the interest rate of a loan or investment based on periodic, constant payments

Using the PMT Function to Determine a Monthly Loan Payment

- For loan or investment calculations, you need to know the following information:
  - The annual interest rate
  - The payment period, or how often payments are due and interest is compounded
  - The length of the loan in terms of the number of payment periods
  - The amount being borrowed or invested
- PMT(*rate*, *nper*, *pv*, [*fv*=0] [*type*=0])

Using the PMT Function to Determine a Monthly Loan Payment

Function Arguments dialog box for the PMT function **Figure 3-35**



Using the PMT Function to Determine a Monthly Loan Payment

Figure 3-36 Monthly payment for a $160,000 loan