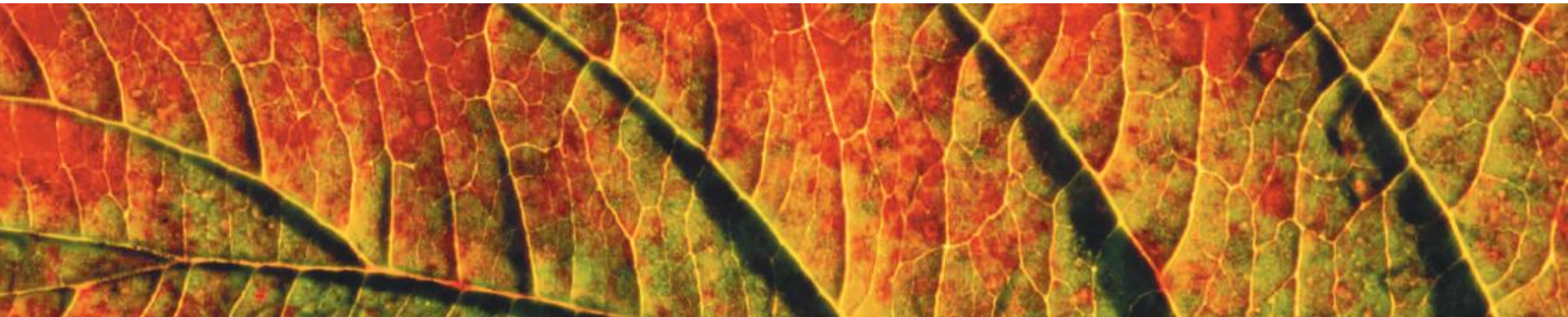


# **Excel Tutorial 3: Working with Formulas and Functions**

Microsoft® Office 2010



# 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
- Use the PMT financial function to calculate monthly mortgage payments

# Visual Overview

**Functions are organized by the category in the Function Library group. Select a function to open the Function Arguments dialog box.**

**The Insert Function button opens the Insert Function dialog box from which you can select a function.**

**An absolute reference remains fixed when the cell formula is copied to a new location, and has \$ in front of the column letter and the row number. \$D\$5 is the absolute reference to cell D5.**

**A relative reference is interpreted in relation to the location of the cell containing the formula. L19 is the relative reference to cell L19.**

		A	B	C	D	E	F	G
3								
4			Monthly Income		School	Summer		
5				Diane	3,100	2,100		
6				Glenn	1,300	2,600		
7				Total	4,400	4,700		
8								
9			Year-End Summary	Total Income		53,700		
10				Monthly Average		4,475		
11				Monthly Minimum		4,400		
12				Monthly Maximum		4,700		
13				Total Expenses		45,150		
14				Monthly Average		3,763		
15				Monthly Minimum		2,795		
16				Monthly Maximum		6,985		
17								
18			Income & Expenses	Jan	Feb	Mar	Apr	May
19	Income	Diane		3,100	3,100	3,100	3,100	3,100
20		Glenn		1,300	1,300	1,300	1,300	1,300
21		Total		4,400	4,400	4,400	4,400	4,400
22		Rent		1,050	1,050	1,050	1,050	1,050

# Cell References and Excel Functions

**Function Arguments dialog box (SUM function):**

- Number1:** C21:N21 (Required argument, in bold)
- Number2:** (Optional argument)
- Formula result: 53,700

**Worksheet Formulas:**

	Home	Savings Plan	Monthly transfer
	=SUM(C21:N21)		
	=AVERAGE(C21:N21)		
	=MIN(C21:N21)		
	=MAX(C21:N21)		
	=SUM(C32:N32)		
	=AVERAGE(C32:N32)		
	=MIN(C32:N32)		
	=MAX(C32:N32)		

**Worksheet Data:**

	Oct	Nov	Dec	Sep	Oct	Nov	Dec
	=D\$5	=D\$5	=D\$5	3,100	3,100	3,100	3,100
	=D\$6	=D\$6	=D\$6	1,300	1,300	1,300	1,300
	=L19+L20	=M19+M20	=N19+N20	4,400	4,400	4,400	4,400
	1,050	1,050	1,050	1,050	1,050	1,050	1,050

**Annotations:**

- Required arguments, in bold, are needed for the function to return a value.**
- The Function Arguments dialog box displays the arguments used by each function. Arguments are the numbers, text, or cell references used by the function to return a value.**
- Optional arguments are not required for the function to return a value.**
- The SUM function returns the sum of the values in the range.**
- The MIN function returns the minimum value in the range.**
- The AVERAGE function returns the average value of the range.**
- The MAX function returns the maximum value in the range.**
- A mixed reference contains an absolute row or an absolute column. This relative reference could be changed to the mixed reference \$N20 or N\$20.**

# Understanding Cell References

---

- To record and analyze data
  - Enter data in cells in a worksheet
  - Reference the cells with data in formulas that perform calculations on that data
- Types of cell references
  - Relative
  - Absolute
  - Mixed

# Using Relative References

---

- Cell reference as it appears in worksheet (B2)
- Always interpreted in relation (relative) to the location of the cell containing the formula
- Changes when the formula is copied to another group of cells
- Allows quick generation of row/column totals without revising formulas



# Formulas Using a Relative Reference

formula references  
a cell three rows up  
and three columns  
to the left of the  
active cell

	A	B	C	D	E	F
1	Referenced Cells					
2	10	20				
3	30	40				
4				Formulas with Relative References		
5				=A2		
6						
7						
8						

when copied to new  
cells, each formula  
still references a  
cell three rows up  
and two columns  
to the left

	A	B	C	D	E	F
1	Referenced Cells					
2	10	20				
3	30	40				
4				Formulas with Relative References		
5				=A2	=B2	
6				=A3	=B3	
7						
8						

values returned by  
each formula

	A	B	C	D	E	F
1	Referenced Cells					
2	10	20				
3	30	40				
4				Formulas with Relative References		
5				10	20	
6				30	40	
7						
8						



# Using Absolute References

---

- Cell reference that remains fixed when the formula is copied to a new location
- Have a \$ before each column and row designation (\$B\$2)
- Enter values in their own cells; reference the appropriate cells in formulas in the worksheet
  - Reduces amount of data entry
  - When a data valued is changed, all formulas based on that cell are updated to reflect the new value

# Formulas Using an Absolute Reference

formula containing an absolute reference to the sales tax rate in cell A2

	A	B	C	D	E	F
1	Sales Tax Rate		Purchase	Sales Tax	Total	
2	0.05		\$24.95	=C2*\$A\$2	=C2+D2	
3			\$122.35			
4			\$199.81			
5			\$45.40			
6						
7						

absolute reference to cell A2

relative references to cells C2 and D2

when pasted into a new location, the absolute reference remains unchanged

	A	B	C	D	E	F
1	Sales Tax Rate		Purchase	Sales Tax	Total	
2	0.05		\$24.95	=C2*\$A\$2	=C2+D2	
3			\$122.35	=C3*\$A\$2	=C3+D3	
4			\$199.81	=C4*\$A\$2	=C4+D4	
5			\$45.40	=C5*\$A\$2	=C5+D5	
6						
7						

\$A\$2 continues to be referenced in the formula

relative references change based on cell location

values returned by the cell formulas

	A	B	C	D	E	F
1	Sales Tax Rate		Purchase	Sales Tax	Total	
2	5%		\$24.95	\$1.25	\$26.20	
3			\$122.35	\$6.12	\$128.47	
4			\$199.81	\$9.99	\$209.80	
5			\$45.40	\$2.27	\$47.67	
6						
7						

# Using Mixed References

---

- Contain both relative and absolute references
- “Lock” one part of the cell reference while the other part can change
- Have a \$ before either the row or column reference (\$B2 or B\$2)

# Using a Mixed Reference

original formula with a mixed cell reference that multiplies the first row by the first column

	A	B	C	D	E	F	G
1		Multiplication Table					
2		1	2	3	4	5	
3	1	=A3*B\$2					
4	2						
5	3						
6	4						
7	5						
8							
9							

formula copied to the B3:F7 range with mixed ranges to multiply the first row entries by the first column entries

	A	B	C	D	E	F	G
1		Multiplication Table					
2		1	2	3	4	5	
3	1	=A3*B\$2	=A3*C\$2	=A3*D\$2	=A3*E\$2	=A3*F\$2	
4	2	=A4*B\$2	=A4*C\$2	=A4*D\$2	=A4*E\$2	=A4*F\$2	
5	3	=A5*B\$2	=A5*C\$2	=A5*D\$2	=A5*E\$2	=A5*F\$2	
6	4	=A6*B\$2	=A6*C\$2	=A6*D\$2	=A6*E\$2	=A6*F\$2	
7	5	=A7*B\$2	=A7*C\$2	=A7*D\$2	=A7*E\$2	=A7*F\$2	
8							(Ctrl) ▾
9							

values returned by each formula

	A	B	C	D	E	F	G
1		Multiplication Table					
2		1	2	3	4	5	
3	1	1	2	3	4	5	
4	2	2	4	6	8	10	
5	3	3	6	9	12	15	
6	4	4	8	12	16	20	
7	5	5	10	15	20	25	
8							(Ctrl) ▾
9							

# When to Use Relative, Absolute, and Mixed References

---

- Relative references
  - Repeat same formula with cells in different locations
- Absolute references
  - Different formulas to refer to the same cell
- Mixed references
  - Seldom used other than when creating tables of calculated values
- Use F4 key to cycle through different types of references

# Working with Functions

---

- Quick way to calculate summary data
- Every function follows a set of rules (**syntax**) that specifies how the function should be written
- General syntax of all Excel functions

*FUNCTION(argument1, argument2, ...)*

- Square brackets indicate optional arguments

*FUNCTION(argument1, [argument2=value2, ...])*

# Excel Function Categories

---

Category	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



# Excel Functions

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

# Working with Functions

---

- Advantage of using cell references:
  - Values used in the function are visible to users and can be easily edited as needed
- Functions can also be placed inside another function, or **nested** (must include all parentheses)

# Choosing the Right Summary Function

---

- AVERAGE function
  - To average sample data
  - Susceptible to extremely large or small values
- MEDIAN function
  - When data includes a few extremely large or extremely small values that have potential to skew results
- MODE function
  - To calculate the most common value in the data

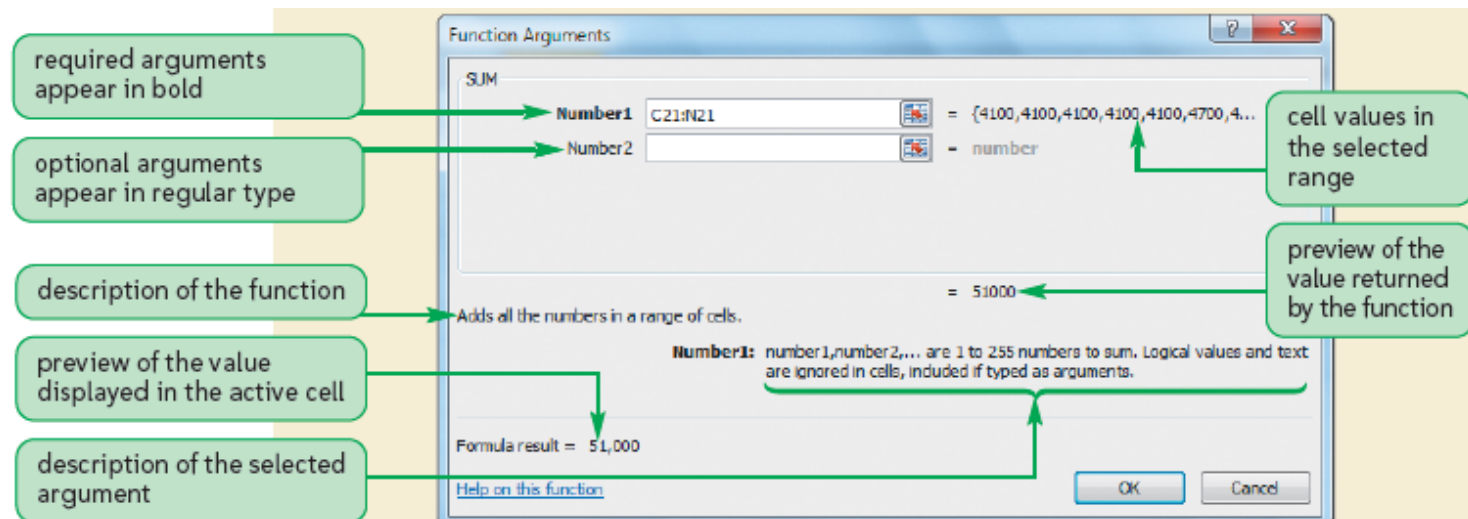
# Inserting a Function

---

- Three possible methods:
  - Select a function from a function category in the Function Library
  - Open Insert Function dialog box to search for a particular function
  - Type function directly in cells

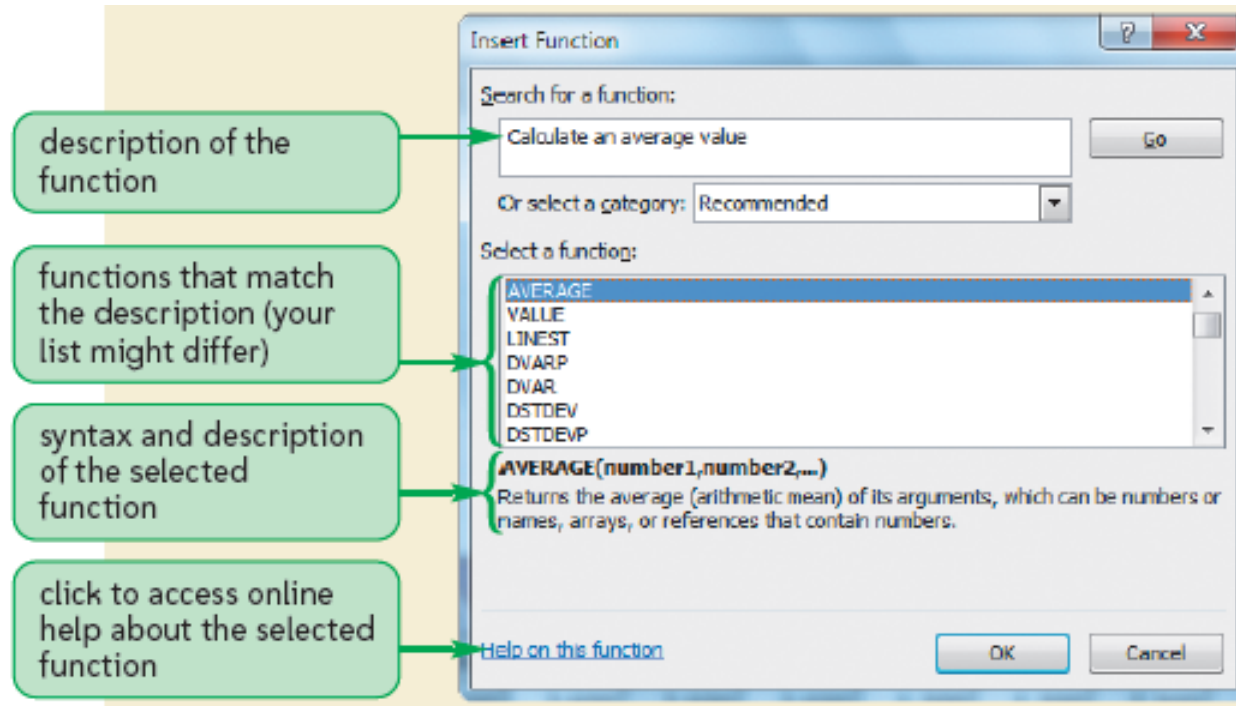
# Using the Function Library to Insert a Function

- When you select a function, the Function Arguments dialog box opens, listing all arguments associated with that function



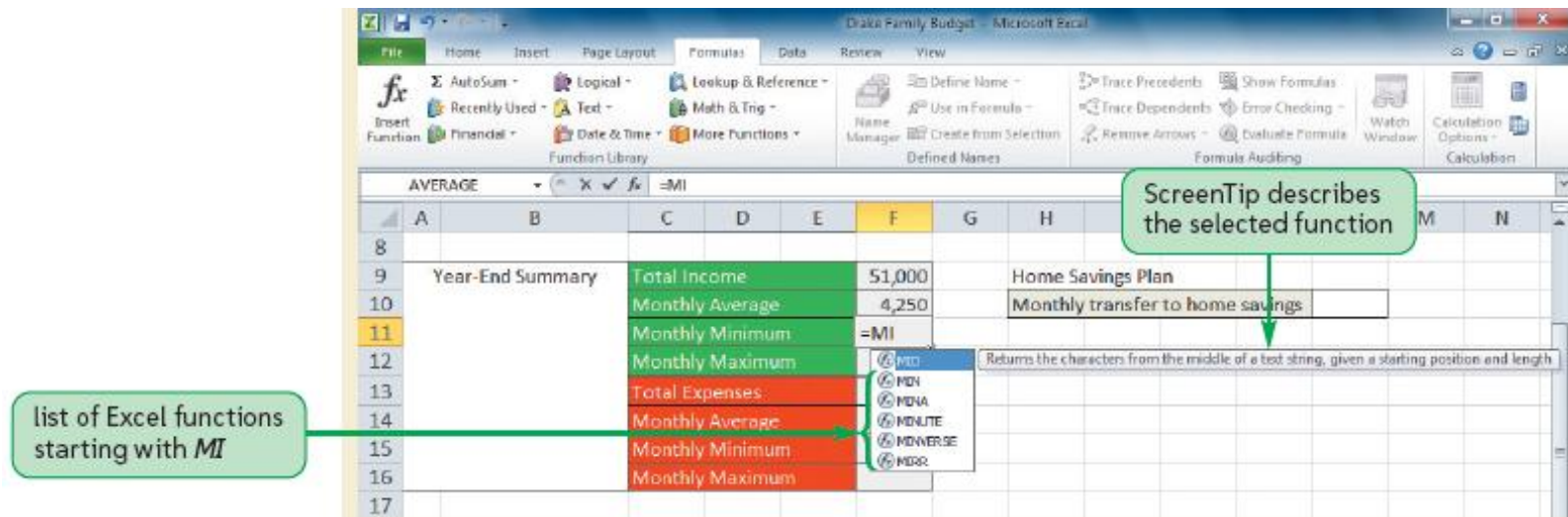
# Using the Insert Function Dialog Box

- Organizes all functions by category
- Includes a search feature for locating functions that perform particular calculations



# Typing Functions Directly in Cells

- Often faster than using Insert Function dialog box
- As you begin to type a function name within a formula, a list of functions that begin with the letters you typed appears





# Visual Overview

A **logical function** is a function that works with statements that are either true or false.

A **financial function** is a function related to monetary calculations, such as loans and payments.

A **date function** is a function that inserts or calculates dates and times.

An **IF function** is a logical function that tests a condition and then returns one value if the condition is true and another value if the condition is false.

This IF function tests whether the value of cell E33 is greater than or equal to the value in cell L11 (E33>= \$L\$11). If the condition is true, the function returns the first value (\$L\$10); if false, it returns the second value (0).

The PMT function calculates the amount of a monthly loan payment, based on rate (the interest rate per month), nper (the total number of months to pay back the loan), and pv (the present value of the loan).

The screenshot shows the Microsoft Excel 2010 interface with the 'Drake Family Budget' spreadsheet open. The ribbon is set to 'Formulas'. A green dashed circle highlights the 'Date' function in the 'Function Library' group, with a callout box stating: 'The TODAY function is a date function that displays the current date.' A red arrow points from this callout to cell F45, which contains the formula '=F43+F44'. Another red arrow points from the 'IF' function in the 'Function Library' group to cell E33, which contains the formula '=IF(E33>=\$L\$11,\$L\$10,0)'. A third red arrow points from the 'PMT' function in the 'Function Library' group to cell E33. The spreadsheet data is as follows:

		Jan	Feb	Mar	Apr	May
35						
36	Current Date	3/10/2013				
37	Monthly Savings					
38	Starting Balance	4,000	1,940	2,665	3,390	3,770
39		4,400	4,400	4,400	4,400	4,400
40		2,875	6,460	2,875	2,875	3,220
41					800	800
42		3,390	1,940	2,665	3,390	3,770
43		0	0	0	800	1,600
44	Deposit from Main	0	800	800	800	800
45	Ending Balance	0	800	1,600	2,400	3,200
46						
47	<b>Mortgage Calculator</b>					
48	Annual Interest Rate	6.00%				
49	Payments per Year	12				
50	Interest Rate per Period (RATE)	0.50%				
51	Number of Years	25				
52	Total Number of Payments (NPER)	300				
53	Loan Amount (PV)	\$190,000				
54						

The bottom of the window shows the 'Documentation' tab selected, with the text 'Drag outside selection to extend series or fill; drag inside to clear'.

# Autofill and More Functions

Family Budget - Microsoft Excel

View

Define Name ▾ Trace Precedents Show Formulas Use in Formula ▾ Trace Dependents Error Checking ▾ Create from Selection Remove Arrows ▾ Evaluate Formula Watch Window Calculation Options ▾ Defined Names Formula Auditing Calculation

	G	H	I	J	K	L	M	N
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
90	3,770	4,575	4,780	5,060	2,775	3,545	4,300	4,880
00	4,400	4,700	4,700	4,700	4,400	4,400	4,400	4,400
20	2,795	4,495	3,620	6,985	2,830	2,845	3,020	3,130
00	800	0	800	0	800	800	800	800
70	4,575	4,780	5,060	2,775	3,545	4,300	4,880	5,350
00	2,400	3,200	3,200	4,000	4,000	4,800	5,600	6,400
00	800	0	800	0	800	800	800	800
00	3,200	3,200	4,000	4,000	4,800	5,600	6,400	7,200

The **PMT function** is a financial function that calculates the monthly payment required to pay back a loan.

=PMT(E50,E52,E53)

Monthly Loan Payment (\$1,224.17)

Average: 3,288 Count: 81 Sum: 236,750 120%

AutoFill can extend a series of numbers, patterned text, and dates into the new selection. In this case, AutoFill generated the abbreviations of month names.

**AutoFill** copies content and formats from a cell or range into an adjacent cell or range. The cell contents can be text, values, or formulas.

The **fill handle** appears in the lower-right corner of a selected cell or range. Dragging the fill handle over an adjacent cell or range copies the content and formatting from the original cells into the selected range.

The Auto Fill Options button appears after you complete the fill so you can select whether to copy cell content and formatting, extend the data series, fill only the cell formatting, or fill only cell content.

Payments are expressed as negative numbers because they are treated as expenses.

# Entering Data and Formulas with AutoFill

---

- Use the fill handle to copy a formula and conditional formatting
  - More efficient than two-step process of copying and pasting
- By default, AutoFill copies both content and formatting of original range to selected range

# Entering Data and Formulas with AutoFill

The screenshot displays an Excel spreadsheet with a budget. The formula bar at the top shows the formula `=C21-C32` in cell C33. A green arrow points from the formula bar to cell C33, with a callout box stating "formula to calculate the January net cash flow".

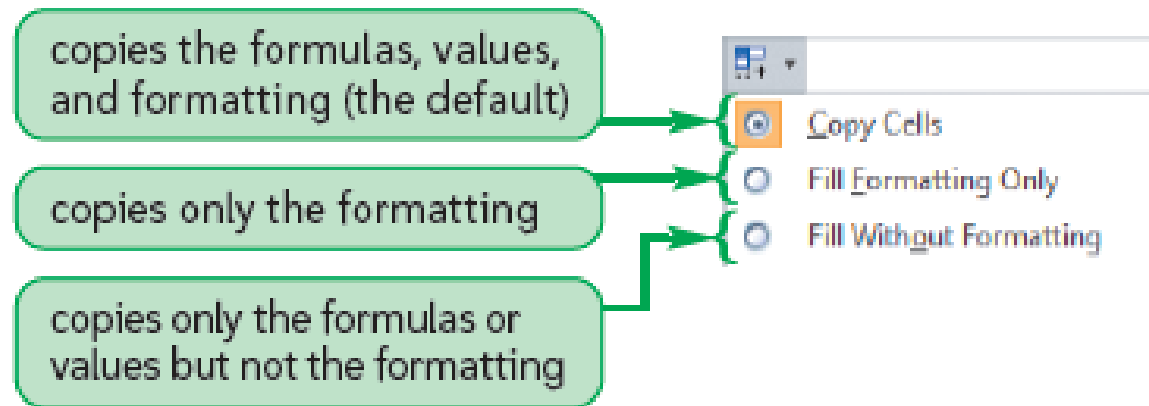
Conditional formatting is applied to the "Net Cash Flow" row (row 32). A green callout box on the left states "conditional formatting highlights months of negative cash flow". The "Net Cash Flow" row is highlighted in red, indicating negative values for January (-2,060) and August (-2,285).

The "Auto Fill Options" button is visible in the bottom right corner of the spreadsheet. A green callout box points to it, stating "Auto Fill Options button". The "fill handle" is also indicated by a green callout box at the bottom right corner of the selected range.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
18	Income & Expenses												
19	Income												
20	Diane	3,100	3,100	3,100	3,100	3,100	2,100	2,100	2,100	3,100	3,100	3,100	3,100
21	Glenn	1,300	1,300	1,300	1,300	1,300	2,600	2,600	2,600	1,300	1,300	1,300	1,300
22	Total	4,400	4,400	4,400	4,400	4,400	4,700	4,700	4,700	4,400	4,400	4,400	4,400
23	Expenses												
24	Rent	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050
25	Food	750	750	750	750	750	750	750	750	750	750	750	750
26	Utilities	255	230	200	195	150	165	175	165	160	160	200	235
27	Phone	110	110	110	110	110	110	110	110	110	110	110	110
28	Car Payments	210	210	210	210	210	210	210	210	210	210	210	210
29	Insurance	175	175	175	175	175	175	175	175	175	175	175	175
30	Tuition	2,450	0	0	0	0	1,200	0	2,650	0	0	0	0
31	Books & Supplies	1,050	0	0	0	0	425	0	1,150	0	0	0	0
32	Travel	210	150	180	530	150	210	950	525	175	190	325	400
33	Miscellaneous	200	200	200	200	200	200	200	200	200	200	200	200
34	Total	4,460	2,875	2,875	3,220	2,795	4,495	3,620	2,985	2,830	2,845	3,020	3,130
35	Net Cash Flow	-2,060	1,525	1,525	1,180	1,605	205	1,080	-2,285	1,570	1,555	1,380	1,270
36	Monthly Savings												
37	Starting Balance												

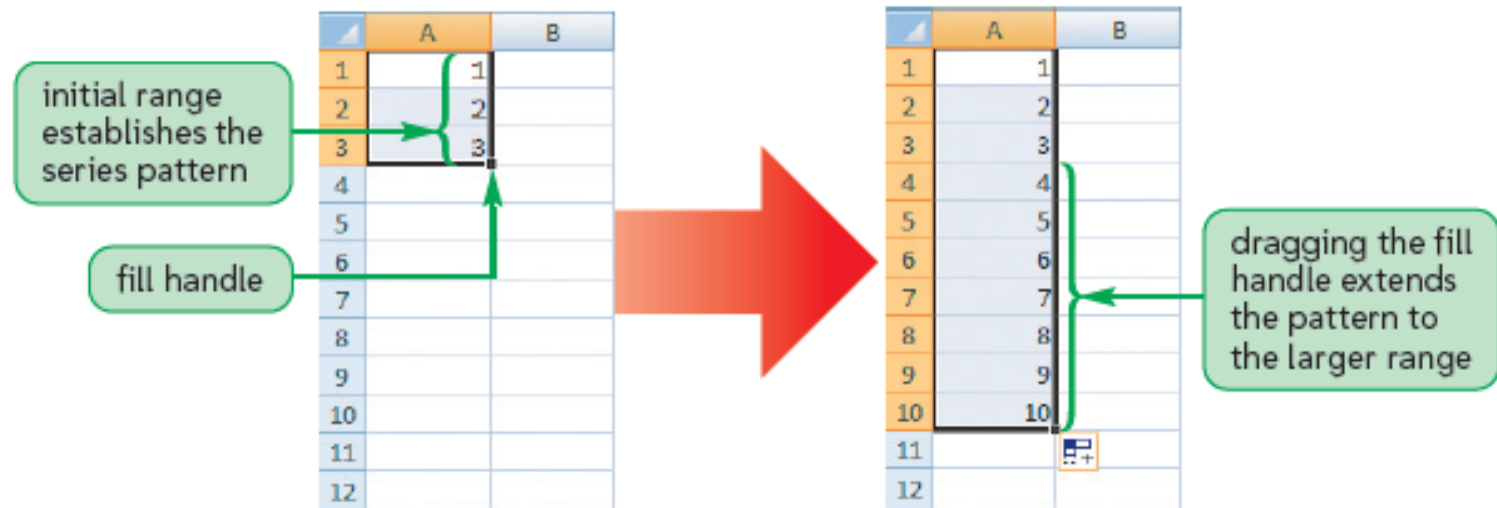
# Entering Data and Formulas with AutoFill

- Use Auto Fill Options button to specify what is copied



# Entering Data and Formulas with AutoFill

- Use AutoFill to create a series of numbers, dates, or text based on a pattern



- Use Series dialog box for more complex patterns

# Entering Data and Formulas with AutoFill

Type	Initial Pattern	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, ...
	12/30/2013	12/31/2013, 1/1/2014, 1/2/2014, ...
	12/31/2013, 1/31/2014	2/28/2014, 3/31/2014, 4/30/2014, ...
	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, ...



# Entering Data and Formulas with AutoFill

The screenshot displays the Microsoft Excel 2010 interface with a spreadsheet titled "Drake Family Budget". The ribbon is set to the "Formulas" tab. The spreadsheet contains a table with the following data:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
31		Miscellaneous	200	200	200	200	200	200	200	200	200	200	200	200
32		Total	6,460	2,875	2,875	3,220	2,795	4,495	3,620	6,985	2,830	2,845	3,020	3,130
33		Net Cash Flow	-2,060	1,525	1,525	1,180	1,605	205	1,080	-2,285	1,570	1,555	1,380	1,270
34														
35		Monthly Savings	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
36		Starting Balance												
37		Deposits												
38		Withdrawals												

Annotations and arrows indicate the use of AutoFill:

- initial entry**: Points to cell B35, which contains "Monthly Savings".
- month abbreviations inserted with AutoFill**: Points to the range C35:N35, which contains the month abbreviations (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec).

# Working with Logical Functions

---

- Logical functions
  - Build decision-making capability into a formula
  - Work with statements that are either true or false
- Excel supports many different logical functions, including the IF function

# Working with Logical Functions

- **Comparison operator**
  - Symbol that indicates the relationship between two values

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

# Using the IF Function

- Returns one value if a statement is true and returns a different value if that statement is false
- **IF** (*logical\_test*, [*value\_if\_true*,] [*value\_if\_false*])

The screenshot shows the 'Function Arguments' dialog box for the IF function. The arguments are as follows:

Argument	Value	Result
Logical_test	C33>=\$L\$11	= FALSE
Value_if_true	\$L\$10	= 800
Value_if_false	0	= 0

Callouts explain the arguments:

- test condition that is either true or false (points to Logical\_test)
- value returned if the condition is true (points to Value\_if\_true)
- value returned if the condition is false (points to Value\_if\_false)
- amount to transfer to the home account if the value is true (points to the result of Value\_if\_true)
- no money is transferred if the value is false (points to the result of Value\_if\_false)

Formula result = 0

Help on this function

OK Cancel

# Working with Date Functions

- For scheduling or determining on what days of the week certain dates occur

Function	Description
DATE( <i>year, month, day</i> )	Creates a date value for the date represented by the <i>year, month,</i> and <i>day</i> arguments
DAY( <i>date</i> )	Extracts the day of the month from the <i>date</i> value
MONTH( <i>date</i> )	Extracts the month number from the <i>date</i> value where 1=January, 2=February, and so forth
YEAR( <i>date</i> )	Extracts the year number from the <i>date</i> value
WEEKDAY( <i>date, [return_type]</i> )	Calculates the day of the week from the <i>date</i> value, where 1=Sunday, 2=Monday, and so forth; to choose a different numbering scheme, set the optional <i>return_type</i> 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

# Financial Functions for Loans and Interest Payments

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

# Working with Financial Functions

---

- Cost of a loan to the borrower is largely based on three factors:
  - **Principal:** amount of money being loaned
  - **Interest:** amount added to the principal by the lender
    - Calculated as **simple interest** or as **compound interest**
  - Time required to pay back the loan

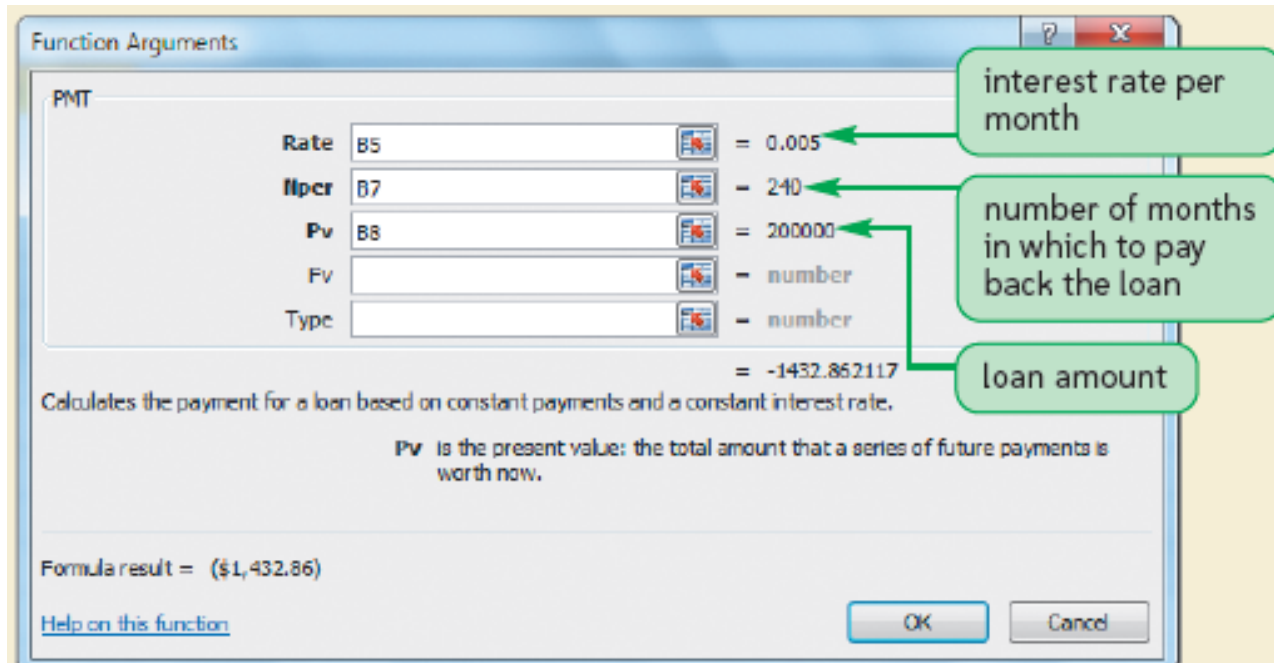


# Using Functions to Manage Personal Finances

Function	Use to determine...
FV (future value)	How much an investment will be worth after a series of monthly payments at some future time
PMT (payment)	How much you have to spend each month to repay a loan or mortgage within a set period of time
IPMT (interest payment)	How much of your monthly loan payment is used to pay the interest
PPMT (principal payment)	How much of your monthly loan payment is used for repaying the principal
PV (present value)	Largest loan or mortgage you can afford given a set monthly payment
NPER (number of periods)	How long it will take to pay off a loan with constant monthly payments

# Using the PMT Function

`PMT(rate, nper, pv, [fv=0] [type=0])`



The image shows the 'Function Arguments' dialog box for the PMT function in Excel. The dialog has a title bar 'Function Arguments' and a close button. Inside, the function name 'PMT' is listed. Below it, there are five input fields with their corresponding values and data types:

Argument	Value	Unit	Value
Rate	B5	=	0.005
Nper	B7	=	240
Pv	B8	=	200000
Fv		=	number
Type		=	number

Below the input fields, the calculated result is shown: **= -1432.852117**. A green callout box points to the 'Rate' field with the text 'interest rate per month'. Another green callout box points to the 'Nper' field with the text 'number of months in which to pay back the loan'. A third green callout box points to the 'Pv' field with the text 'loan amount'. Below the result, there is a description: 'Calculates the payment for a loan based on constant payments and a constant interest rate.' and a definition: 'Pv is the present value: the total amount that a series of future payments is worth now.' At the bottom, the 'Formula result' is displayed as '(\$1,432.86)'. There are 'OK' and 'Cancel' buttons at the bottom right.

# Using the PMT Function

The screenshot shows the Microsoft Excel interface with the 'Formulas' tab selected. The 'Financial' category is highlighted in the 'Function Library' group. The formula bar displays `=PMT(B5,B7,B8)`. The spreadsheet contains a 'Home Loan Calculator' with the following data:

	A	B
1	<b>Home Loan Calculator</b>	
2		
3	Annual Interest Rate	6.00%
4	Payments per Year	12
5	Interest Rate per Period (RATE)	0.50%
6	Number of Years	20
7	Total Number of Payments (NPER)	240
8	Loan Amount (PV)	\$200,000
9		
10	Monthly Payment (PMT)	(\$1,432.86)
11		

Callouts in the image:

- Financial functions category**: Points to the 'Financial' button in the 'Function Library' group.
- PMT function calculates loan payments**: Points to the formula bar showing `=PMT(B5,B7,B8)`.
- monthly payment expressed as a negative value (because Excel treats it as an expense)**: Points to the result `($1,432.86)` in cell B10.

# Presenting a Budget

---

- Plan the budget around a few essential goals
- Pick out a few important measures that can convey whether the proposed budget will meet your goals
- Look at your financial history to aid you in creating budget projections
- When explaining the budget, describe the results in terms of everyday examples