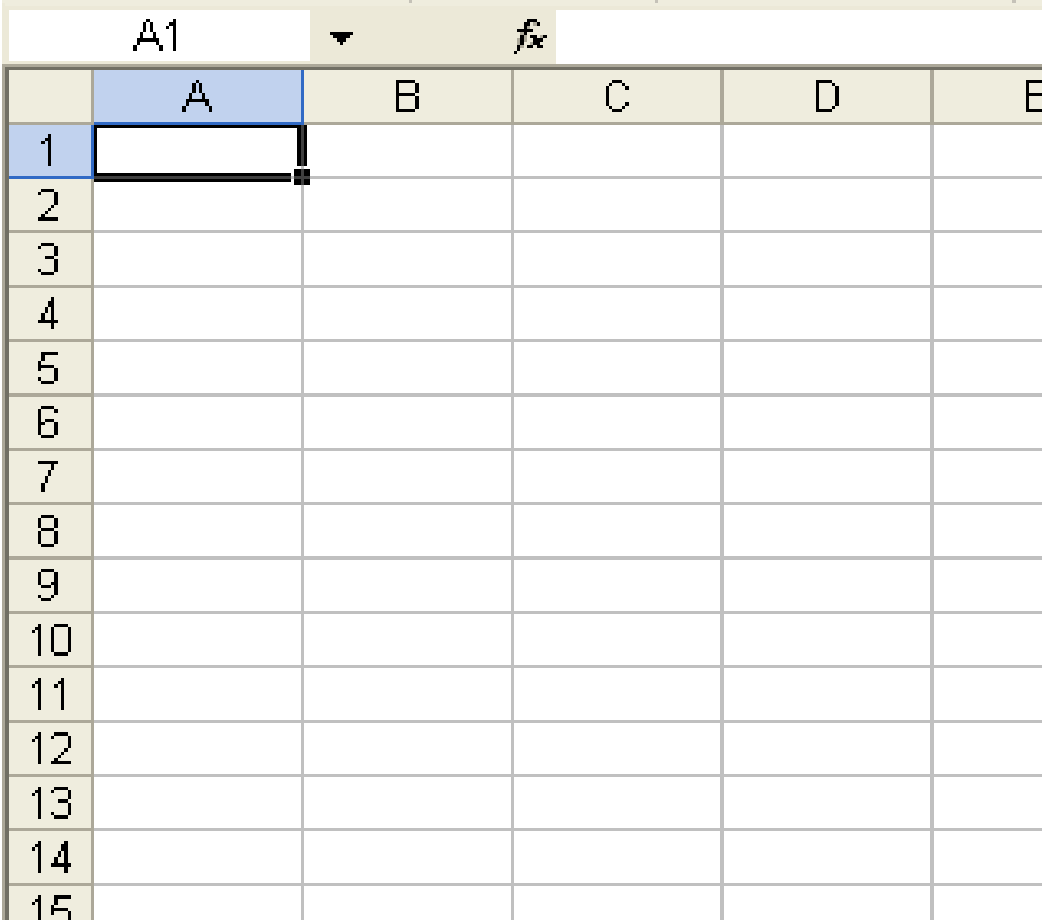


Worksheet Basics

Worksheets

- Excel's main screen is called a “**worksheet**”.
- Each worksheet is comprised of many boxes, called “**cells**”.



	A1				
	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Organize Information

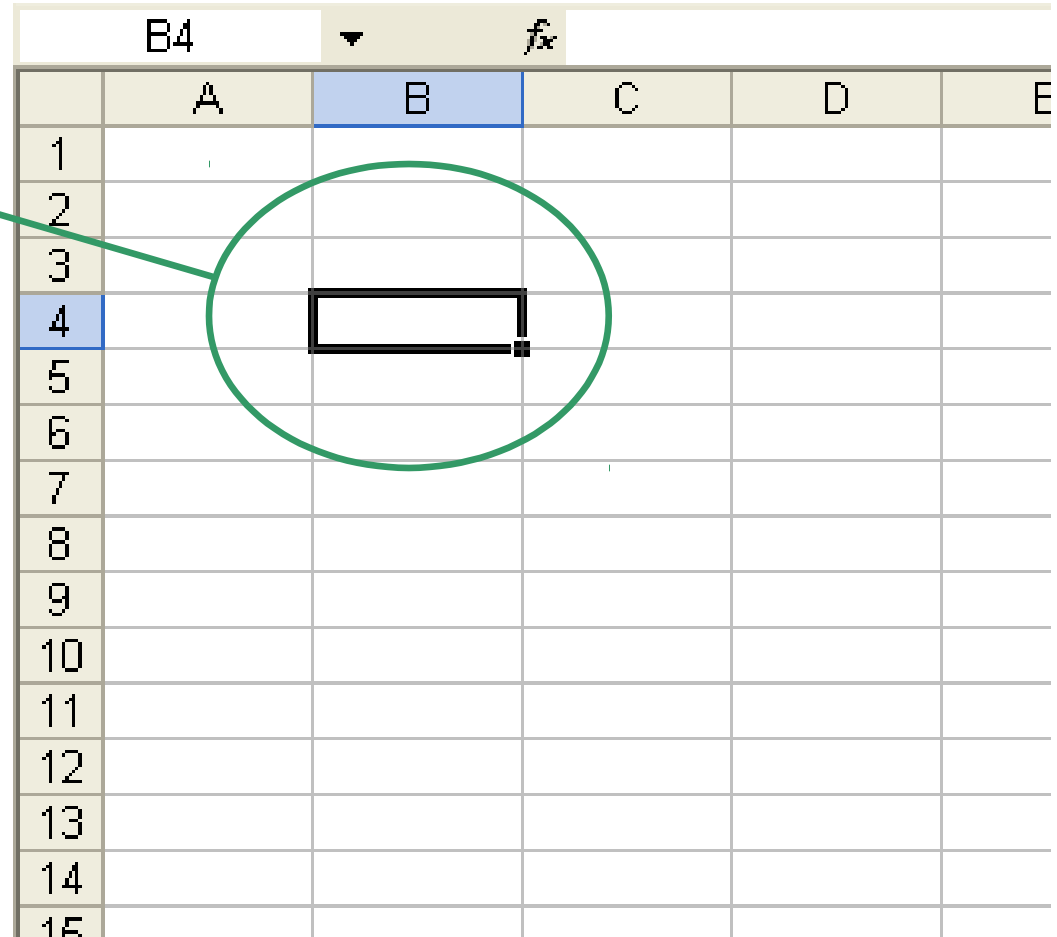
- You can organize information by typing a single piece of data into each cell. (see next slides)

	A	B	C	D	E
1	Payroll				
2	From	6/1/2008			
3	To	6/7/2008			
4					
5	Name	Hours	\$ per hr	Paycheck	
6	Sue	40	15	\$ 600.00	
7	Joe	20	10	\$ 200.00	
8	Meg	30	20	\$ 600.00	
9	Abe	40	14	\$ 560.00	
10					
11	Total			\$ 1,400.00	
12					
13					
14					
15					

How to Enter Information

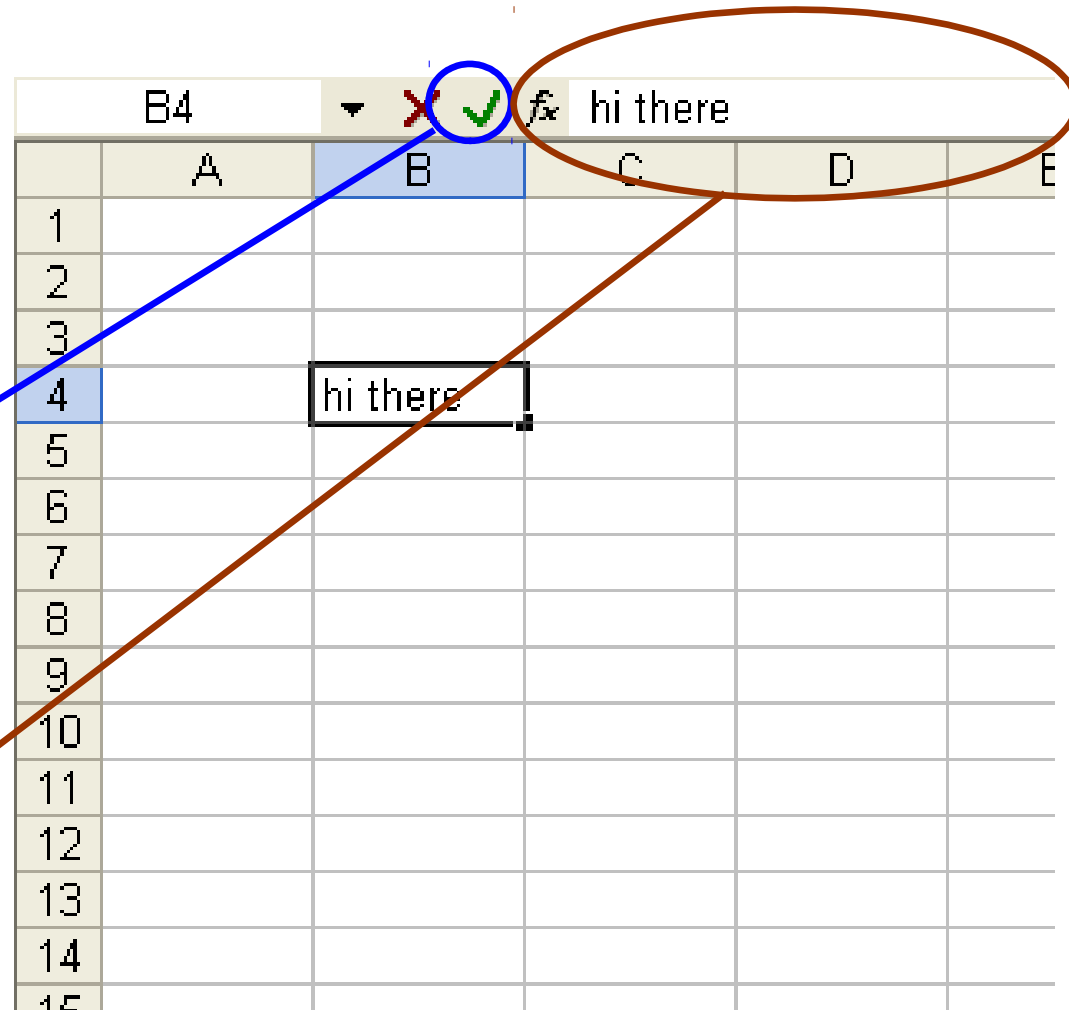
Selecting a Cell

- “**Select**” a cell by clicking on it once (don’t double click).
- You can **move** from cell to cell with the **arrow keys** or by pressing the “**Enter**” key.



Entering Information / The Formula Bar

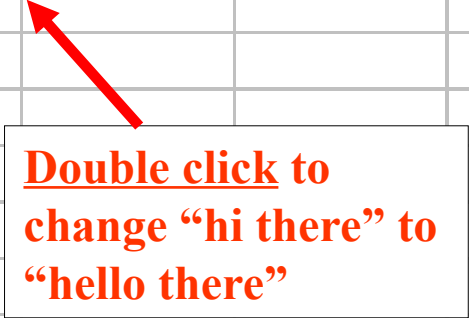
- To enter information in a cell, just start typing.
- When you are done either
 - Press the **Enter Key**
 - Press an **arrow key**
 - Click on the “**check button**” (only visible when entering data into a cell)
- The information in the selected cell is also displayed in the “**formula bar**” above the worksheet.



Double Click to Modify a Cell

- To modify the contents of a cell double click on the cell.
- Then use the right, left arrow keys and the Insert and Delete keys to modify the data.
- When you are done:
 - Press the Enter key
 - or
 - Click on the check box.

	B4	▼	✗	✓	f _x	hello there
	A	B	C	D	E	
1						
2						
3						
4		hello there				
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

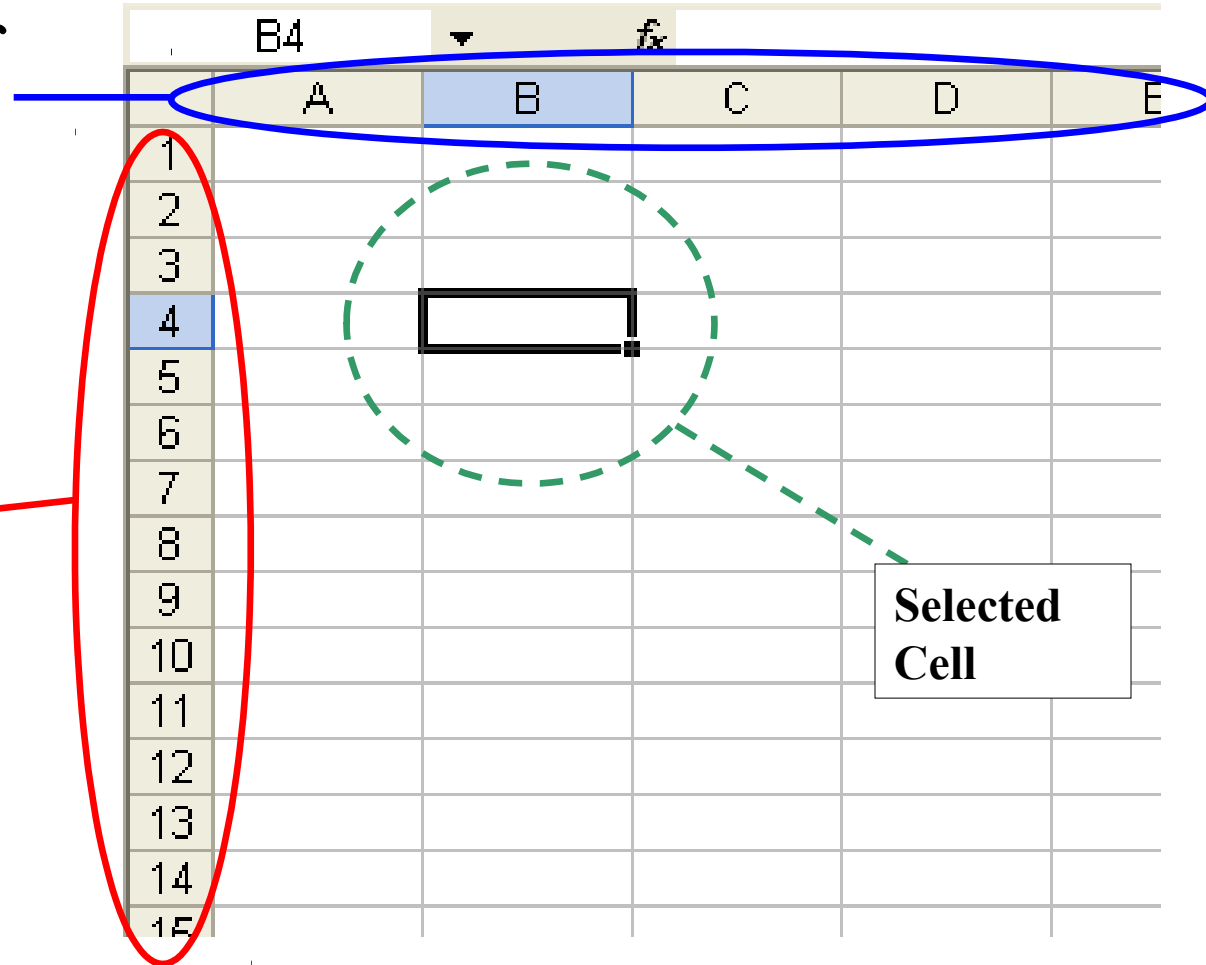


**Double click to
change “hi there” to
“hello there”**

Names of Rows, Columns and Cells

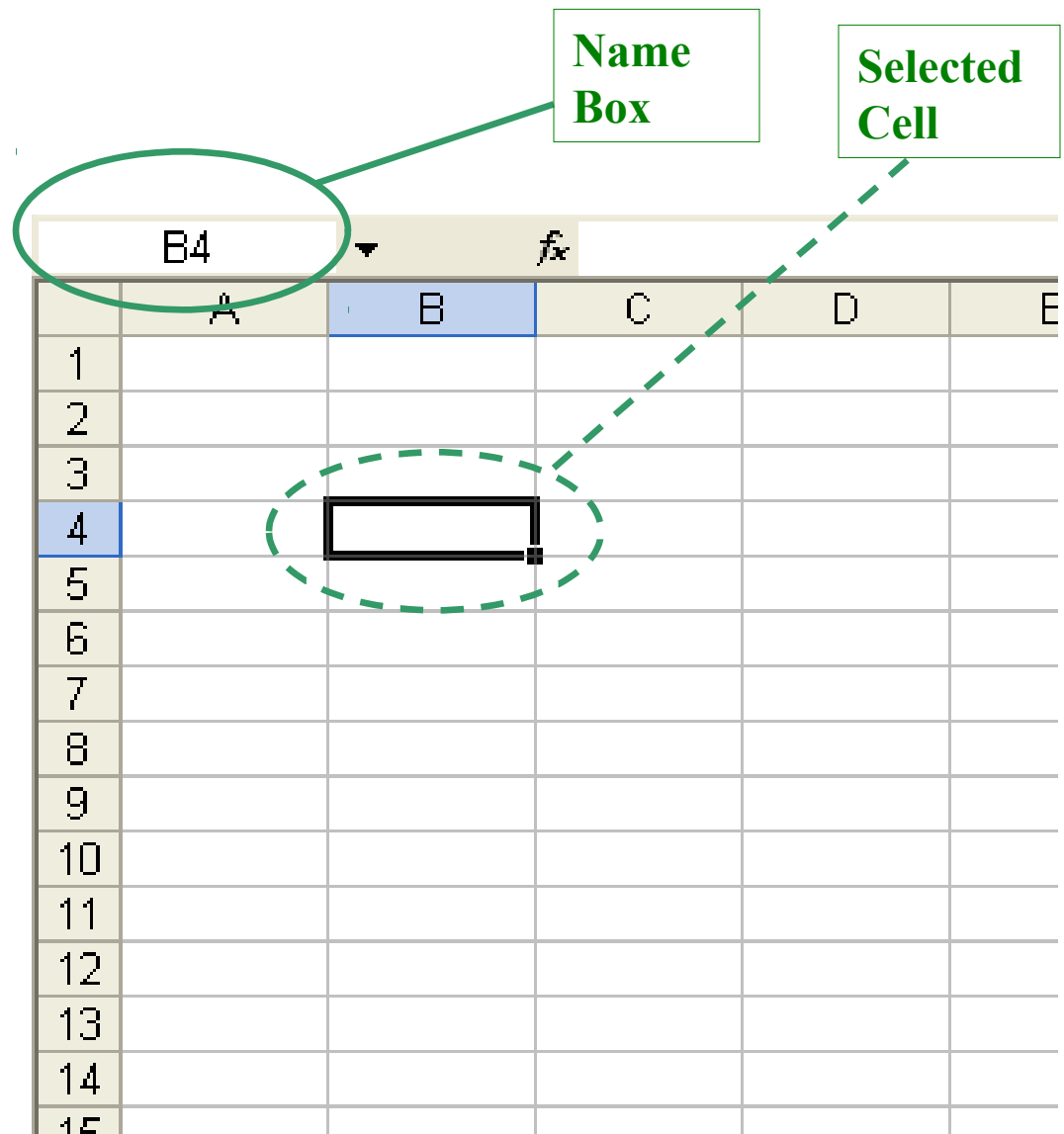
Column Names (letters) & Row Names (numbers)

- The **columns** of the worksheet are named with letters
- The **rows** are named with numbers



Cell Names (ex. B4)

- The name of a cell is a combination of the **Letter Of The Column** that the cell is in followed by the **Number Of The Row** that the cell is in.
- Example: the selected cell in the picture is named **B4** (*NOT 4B*)
- Excel automatically shows the the name of the **currently selected cell** in the “**name box**” (located above the worksheet).
- The letter ***must*** come first (i.e. B4, NOT 4B) and there may NOT be any spaces between the letter and the number.
- We will learn later why it is important to understand how to name cells.



Longggggggggg Data

Information that is “too wide” for a cell

- The word “Name” is in cell A5
- The words “Hours Worked” are in cell **B5** (NOT in cell C5). However, since the information is too wide for cell B5, it looks like it extends into cell C5.
- You can determine that the information is **really only IN cell B5** by selecting cell B5 and looking at the formula bar and then selecting cell C5 and looking at the formula bar.

	A	B	C	D	E
1					
2					
3					
4					
5	Name	Hours Worked			
6					

	B5		fx Hours Worked		
	A	B	C	D	E
1					
2					
3					
4					
5	Name	Hours Worked			
6					

“Hours Worked” is in cell B5 (look at formula bar)

C5		fx			
	A	B	C	D	E
1					
2					
3					
4					
5	Name	Hours Worked			
6					

“Hours Worked” is NOT in cell C5 (formula bar is empty)

Information that is “Chopped Off”

- If there is information in the cell to the right, then the original cell still contains all of the data, but the data appears to be “chopped off”.
- You can see the complete data by selecting the cell and looking in the formula bar.

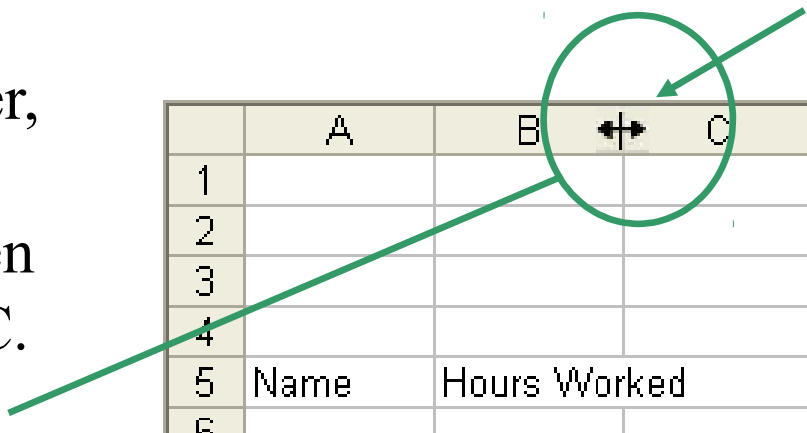
The screenshot shows an Excel spreadsheet with columns A through E and rows 1 through 7. Cell B5 is selected and highlighted with a black border. A red arrow points from the text 'chopped off' in the first bullet point to cell B5. The formula bar at the top shows 'Hours Worked' and is highlighted with a green arrow pointing from the text 'complete data by selecting the cell and looking in the formula bar' in the second bullet point. The spreadsheet data is as follows:

	A	B	C	D	E
1					
2					
3					
4					
5	Name	Hours Worked	Salary		
6					
7					


Change the Width of a Column or
the Height of a Row

Make a column wider

Drag column separator to the right



	A	B	C	D	E
1					
2					
3					
4					
5	Name	Hours Worked			
6					



	A	B	C	D	
1					
2					
3					
4					
5	Name	Hours Worked			
6					

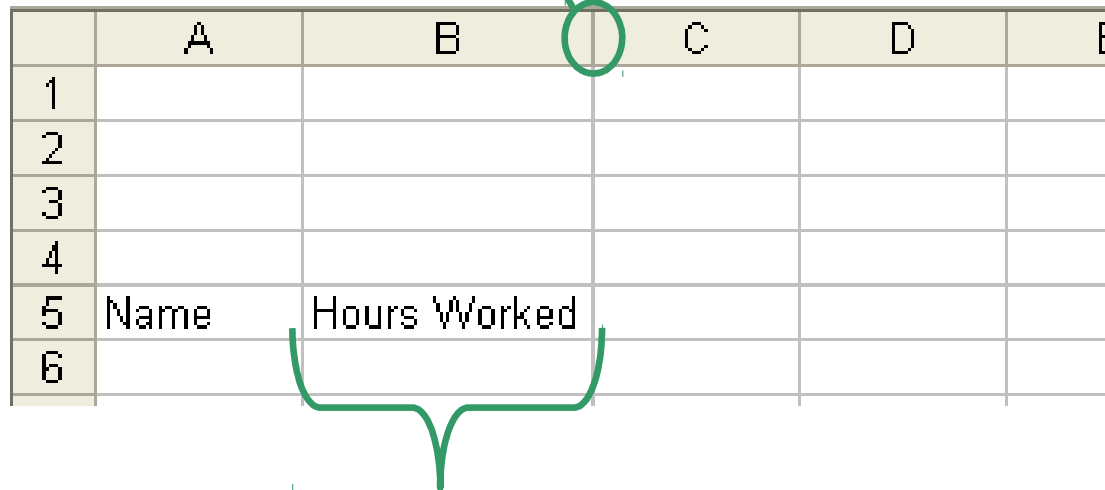
Column is now wider

- To make Column B wider, point the cursor to the column separator between columns B and column C.
- The cursor changes to a “Double headed arrow”.
- Now, click the left mouse button and without letting go of the button, drag the separator to the right to make the column wider (or to the left to make the column narrower).

Getting the Exact Width

- ~~To get the “exact” width, double click on the separator instead of dragging it.~~

Double click here



The diagram shows a spreadsheet with columns A, B, C, D, and E. A green circle highlights the separator between columns B and C. A green arrow points from the text 'Double click here' to this circle. Below the table, a green bracket spans the width of column B, with an arrow pointing to the text 'Column is now EXACTLY the correct width'.

	A	B	C	D	E
1					
2					
3					
4					
5	Name	Hours Worked			
6					

Column is now EXACTLY the correct width

Resizing a Row

- Make a row taller or shorter by dragging the separator between the rows.

	A	B	C	D	E
1					
2					
3					
4					
5	Name	Hours Worked			
6					
7					


- Click and drag here to resize row 5.

Row is now taller

Putting an “Enter” inside a cell

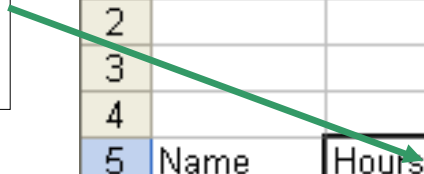
- To add a new line inside a cell
 - Double click inside the cell where you want the new line.
 - ~~Press Ctrl-Enter (i.e. hold down the Ctrl key and press Enter while still holding down Ctrl).~~
 - When you are done editing, press Enter (without holding down Ctrl) to accept the changes.

Step 1: Originally “Hours Worked” is on one line.




	A	B	C
1			
2			
3			
4			
5	Name	Hours Worked	
6			

Step 2: Double click to edit cell and then press Ctrl-Enter



	A	B	C
1			
2			
3			
4			
5	Name	Hours	
6		Worked	
7			

Step 3: Press Enter (without Ctrl) to accept the changes.



	A	B	C
1			
2			
3			
4			
5	Name	Hours Worked	
6			
7			

Basic Formatting

(e.g. bold, colors, fonts, etc)

Formatting Cells

- Select **one or more cells** and then click on any of the formatting buttons (see below) to change the formatting of the **selected cells**.
- Formatting buttons:

The image shows the Microsoft Excel ribbon with the 'Home' tab selected. The ribbon is divided into several groups of buttons, each with a specific function. Annotations are provided for many of these groups.

Font Group: Includes buttons for font name (Arial), font size (10), bold (B), italic (I), and underline (U). Annotations include:

- font name
- font size
- click on downward pointing arrows for other font names and sizes
- bold
- italics
- underline

Paragraph Group: Includes buttons for text alignment (left justify, center, right justify), bullet points, and numbered lists. Annotations include:

- center
- left justify
- right justify
- center & merge cells (will explain later)

Number Group: Includes buttons for currency (\$), percentage (%), comma (,), and decimal places (0.00, 0.00). Annotations include:

- These change the way numbers are displayed in cells. (these don't affect words).
- show fewer decimal points (ex. 10.507 is displayed as 10.51)
- show more decimal points (ex. 10.507 is displayed as 10.5070)
- show with commas (e.g. 12345 becomes 12,345)
- show as percent (ex. 0.5 becomes 50%)
- show as currency- (ex. 1000.507 becomes \$1000.50)

Styles Group: Includes buttons for indent (increase indent, decrease indent), border (border, no border), and fill color (background color). Annotations include:

- indent within cell
- put border around cell(s)
- color of cell
- color of text in cell
- remove indent
- click on downward pointing arrows for other colors and border styles

Example – unformatted worksheet

- Unformatted worksheet – see next slide for formatting.

	A	B	C	D	
1	Payroll				
2	From	6/1/2008			
3	To	6/7/2008			
4					
	Employee	Hours	Salary		
5	Name	Worked	Per Hour	Paycheck	
6	Sue	40	15	\$ 600.00	
7	Joe	20	10	\$ 200.00	
8	Meg	30	20	\$ 600.00	
9	Abe	40	14	\$ 560.00	
10					
11	Total			\$ 1,960.00	
12					

Example –making cells bold

- Click on cell A1 and drag to cell A3.
- Then press the Bold button to make cells A1,A2,A3 bold.
- You could also press the font or background color buttons to change the color or apply any other formatting you like (this is not shown below).

	A	B	C	D
1	Payroll			
2	From	6/1/2008		
3	To	6/7/2008		
4				
	Employee	Hours	Salary	
5	Name	Worked	Per Hour	Paycheck
6	Sue	40	15	\$ 600.00
7	Joe	20	10	\$ 200.00
8	Meg	30	20	\$ 600.00
9	Abe	40	14	\$ 560.00
10				
11	Total			\$ 1,960.00

Other Ways of Selecting More Than One Cell

- ~~• To select a large range of cells, click on the upper left cell in the range. Then hold the shift key and click on the lower right cell in the range.~~
- ~~• You can select different “non-contiguous” areas of cells by holding down the Ctrl key while clicking and dragging.~~

Selecting Non-Contiguous Ranges

- Click and drag to select the first range.

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

- Ctrl-click and drag to select additional ranges

(This cell is also selected even though it appears white).

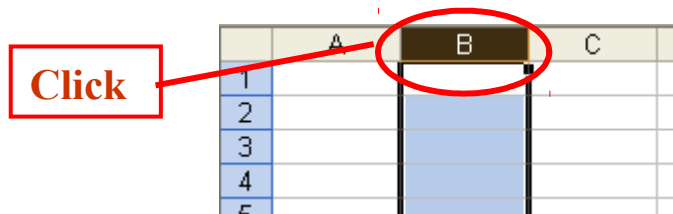
Selecting entire Rows, entire Columns or²⁵ all cells on the worksheet.

- To select an entire column, click on the letter for the column header. To select several columns, click on the header for the first column and drag to the right.
- To select an entire row, click on the number for the row header. To select several rows, click on the header for the first row and drag down.
- To select all of the cells on the spreadsheet, click on the upper left hand corner of the spreadsheet (where the column headers meet the row headers)

Select Entire Columns/Rows/Worksheet

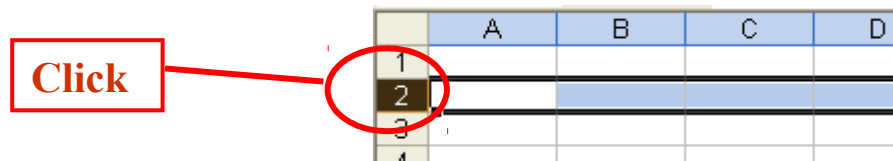
To select **ENTIRE COLUMN B**

click on "B" column header



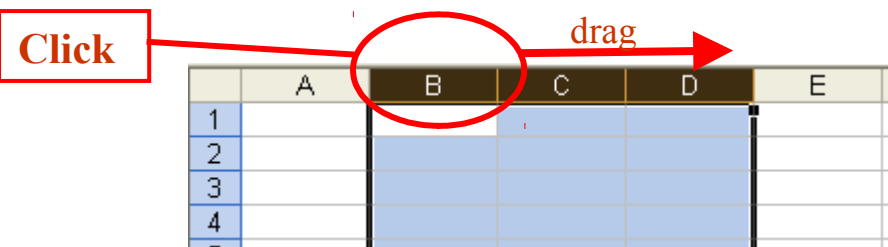
To select **ENTIRE ROW 2**

click on "2" row header



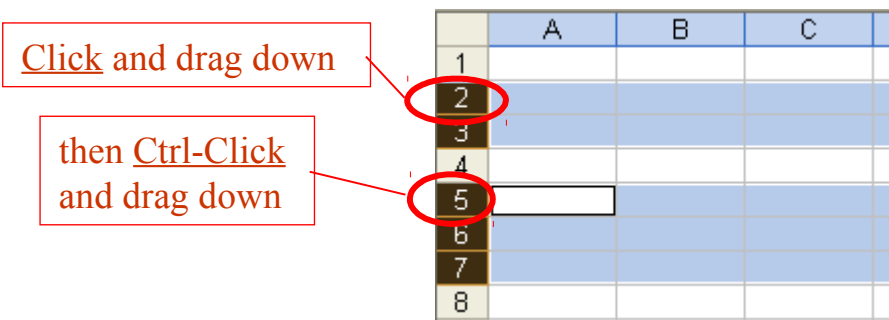
To select **COLUMNS B,C,D**

click on "B" column header and drag to right



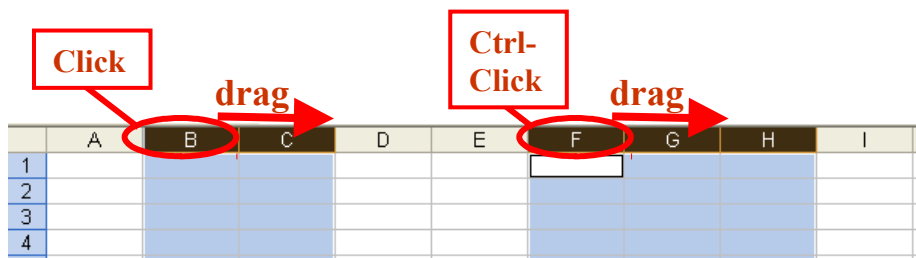
To select **ROWS 2,3 and 5,6,7**

- click on "2" row header, drag down,
- then Ctrl-Click on "5" row header and drag down



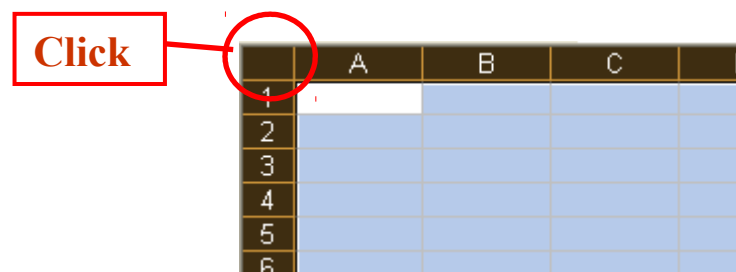
To select **COLUMNS B,C and F,G,H**

- click on "B" column header, drag to right,
- then Ctrl-Click on "F" column header and drag right



To select **ENTIRE WORKSHEET**

click on select worksheet button
(in corner between "1" and "A" buttons)



Example - continued

- **Step 1:** Click on row header for row 5

- **Step 2:** Ctrl-click on row-header for row 11

- **Step 3:** Press Bold button or type ctrl-b

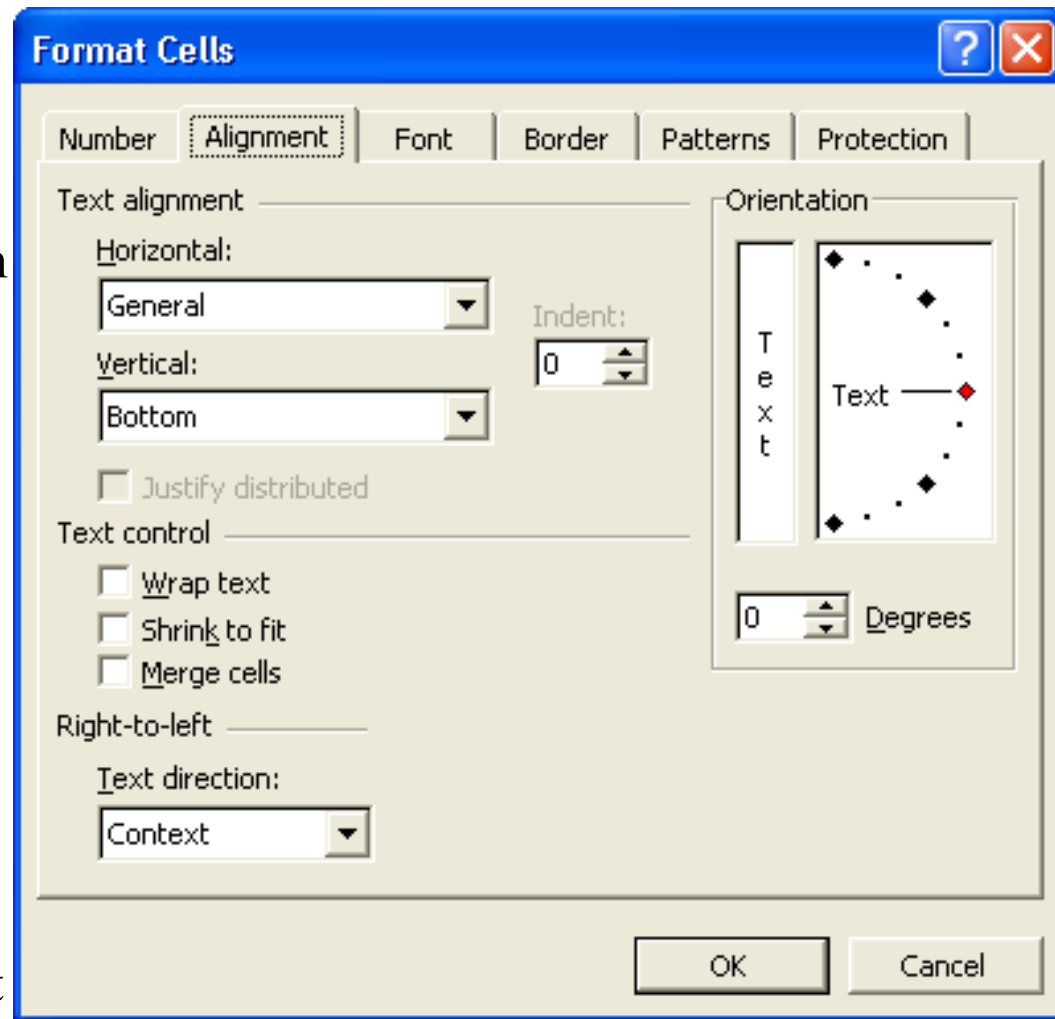
- **Note:** After being “bolded”, the word “Employee” is now too wide for the column, so make the column wider if necessary (this step is not shown).

	A	B	C	D	E	F
1	Payroll					
2	From	6/1/2008				
3	To	6/7/2008				
4						
5	Employee Name	Hours Worked	Salary Per Hour	Paycheck		
6	Sue	40	15	\$ 600.00		
7	Joe	20	10	\$ 200.00		
8	Meg	30	20	\$ 600.00		
9	Abe	40	14	\$ 560.00		
10						
11	Total			\$ 1,960.00		
12						

More Advanced Formatting

Format Cells

- Using the formatting buttons only give you a limited amount of formatting ability.
- For more formatting ability, select one or more cells and right click on the selection. Then choose “format cells” from the popup menu.
- Choose options from the Number, Alignment, Font, Border and Patterns tabs and press OK to change the way your information looks on the screen.
- The Protection tab is used to lock cells so that their contents can’t be modified.
- We will not go into the details of using the format cells dialog box at this time but you should be able to figure out most of it by yourself.



Formatting changes how things LOOK, not how they WORK.

- NOTE: you will probably not understand this slide until after you learn about Excel Formulas. Formulas are covered later in this presentation.
- When you change the format of a cell, Excel still “remembers” the original value.
- Excel will use the un-formatted value when calculating formula values.
- Example: if you change numbers to appear with fewer decimal points the original number with all of its decimal points are used in calculations.

Formulas

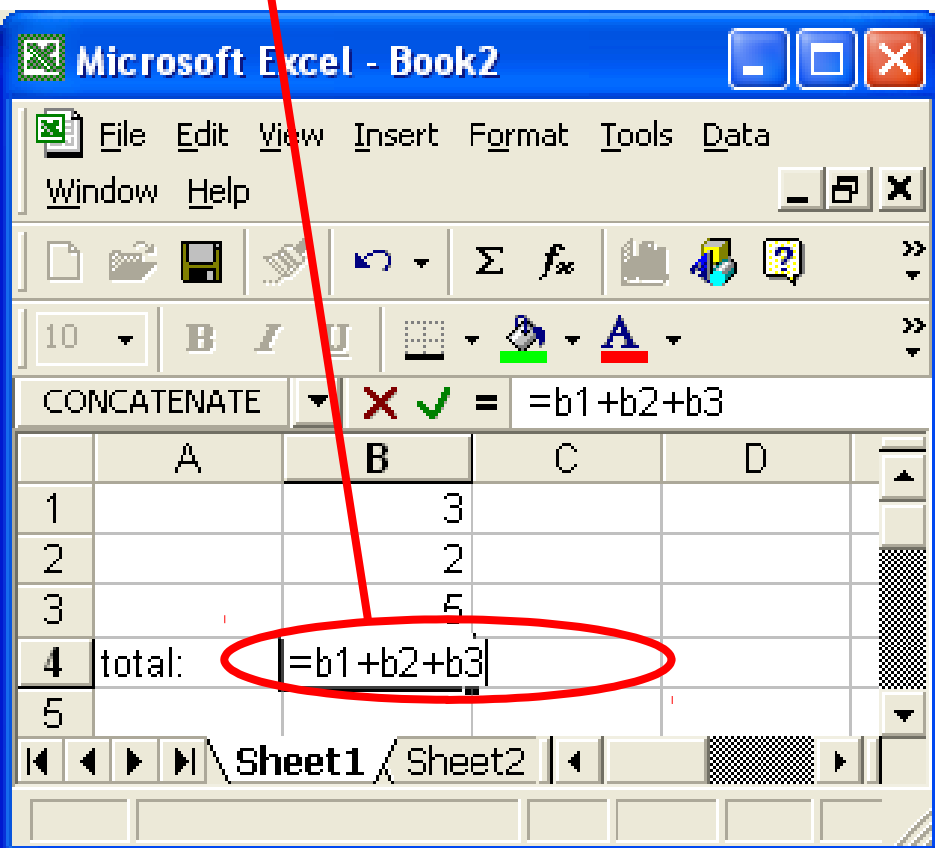
The bread and butter of Excel

Excel Formulas

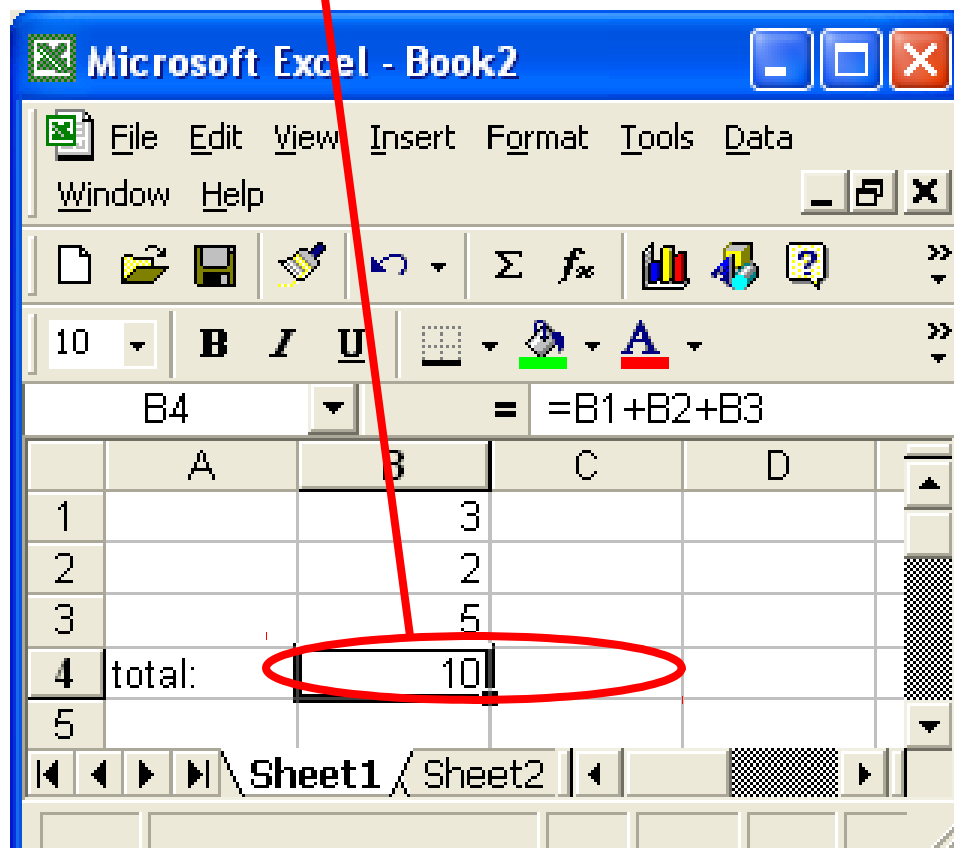
- You must have an equals sign (=) as the first character in a cell that contains a formula.
- The = sign tells excel that the contents of the cell is a formula
- Without the = sign, the formula will not calculate anything. It will simply display the text of the formula.

Formulas - correct

formula with = sign



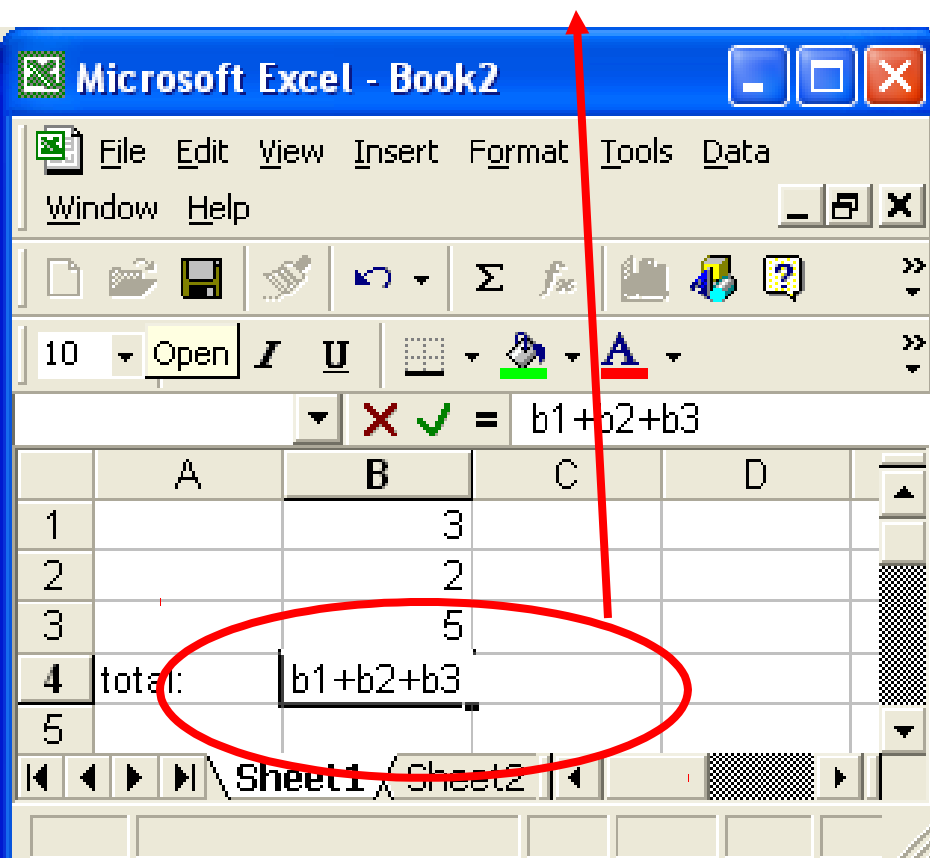
After pressing ENTER



Missing = sign

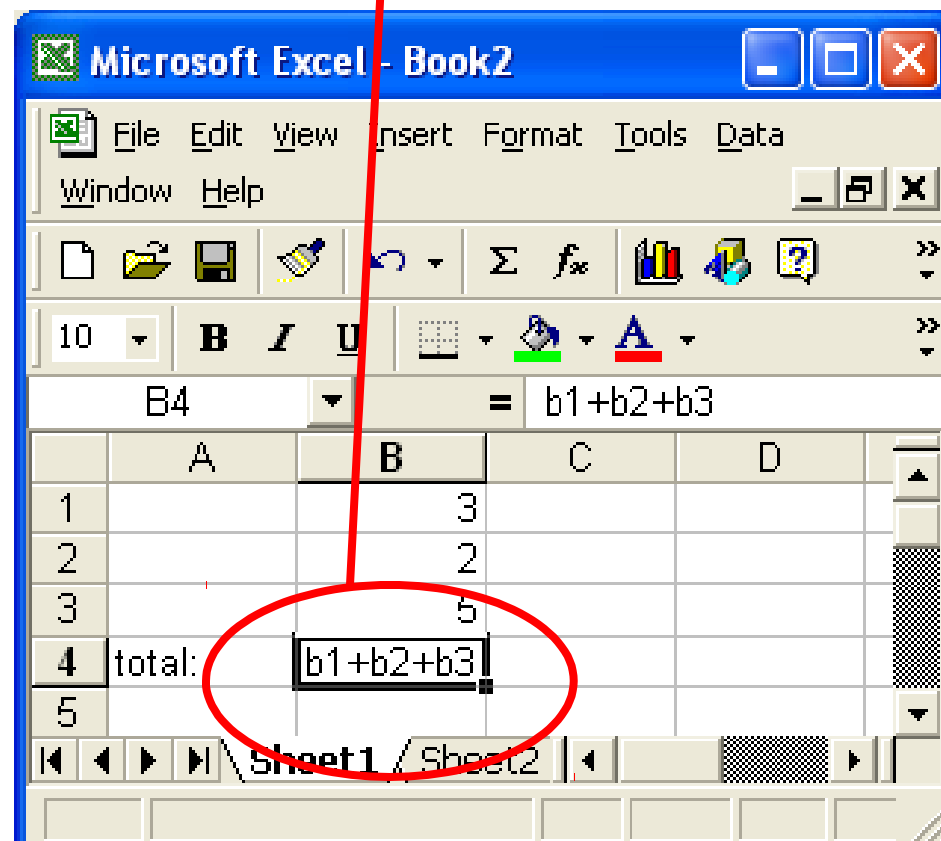
Missing = sign!

Before pressing enter



After pressing ENTER

(no change - not a function)



Types of operations

- You can use any of the following operations in a formula:

<u>operation</u>	<u>symbol</u>	<u>example</u>
addition:	+	=a1+3
subtraction:	-	=100-b3
multiplication:	*	=a1*b1
division:	/	=d1/100
exponentiation	^	=a2^2
negation	-	=-a2+3
(same symbol as subtraction)		

Explicit (literal) values and cell references

- You can use both explicit values and cell references in a formula
- An explicit value is also called a **literal value**
 - Formula with only cell references: $=a1*b1$
 - Formula with only literal values: $=100/27$
 - Formula with both cell references and literal values:
 $=a1/100$

Errors in Formulas

Common Errors

- The following are some errors that may appear in a spreadsheet (there are others too).
 - #####
 - Cell is too narrow to display the results of the formula. To fix this simply make the column wider and the “real” value will be displayed instead of the ##### signs. Note that even when the ##### signs are being displayed, Excel still uses the “real” value to calculate formulas that reference this cell.
 - #NAME?
 - You used a cell reference in the formula that is not formed correctly (e.g. =BB+10 instead of =B3+10)
 - #VALUE!
 - Usually the result of trying to do math with a textual value. Example: =A1*3 where A1 contains the word “hello”
 - #DIV/0!
 - Trying to divide by zero. Example: =3/A1 where A1 contains 0 (zero)
 - Circular Reference
 - ~~Using a formula that contains a reference to the cell that the formula “lives in”. Example: putting the formula =A1+1 in cell A1 or putting the formula =SUM(A1:B2) in any of the cells A1, B1, A2, B2~~

Order of Operations

Complex formulas

- You can use several operations in one function
- You can group those operations with parentheses
- Examples

$$=3*2+1$$

$$=c1*(a1+b1)$$

$$=(100*a2-10)+(200*b3-20)+30$$

$$=(3+2*(50/b3+3)/7)*(3+b7)$$

Order of operations

- When using several operations in one formula, Excel follows the order of operations for math.
 - first: all parentheses - innermost first
 - second: exponents (^)
 - third: all multiplication (*) and division (/). Do these starting with the leftmost * or / and work to the right.
 - fourth: all addition (+) and subtraction (-). Do these starting with the leftmost + or - and work to the right.

Please Excuse My Dear Aunt Sally

- The sentence "Please excuse my dear aunt Sally" is a popular mnemonic to remember the order of operations:

<u>Mnemonic</u>	<u>Meaning</u>
– P lease	parentheses
– E xcuse	exponents
– M y D ear	multiplication and division (going left to right)
– A unt S ally	addition and subtraction (going left to right)

Order of operations

- **The value of**

$$3 + 2 * 5$$

is

13

NOT 25!

Order of operations

$$3 + (100 - 20) / 10 - 6 * 2 / 4 + 9$$

$$3 + 80 / 10 - 6 * 2 / 4 + 9$$

$$3 + 8 - 6 * 2 / 4 + 9$$

$$3 + 8 - 12 / 4 + 9$$

$$3 + 8 - 3 + 9$$

$$11 - 3 + 9$$

$$8 + 9$$

answer: 17

Cntrl-`

- To see the formulas in the worksheet
 - Press the Cntrl key at the same time as you press the ` key (i.e. Cntrl-`)
 - Press Cntrl-` again to see the values

Functions

What is a function?

- A function is a "named operation"
- Functions have
 - a name
 - parentheses
 - parameters/arguments inside the parentheses
 - The words parameter and argument mean the same thing
 - ~~you can have many parameters for one function separated with commas (,)~~
 - The number of parameters is one more than the number of commas.

The SUM function

- Examples

Function

Result

=SUM(1,2,3,4,5)

15

=SUM(a1,b1,c1)

a1+b1+c1

=SUM(9,a1,b2,5,c1)

9+a1+b2+5+c1

Terminology

SUM(1,2,3,4,5)

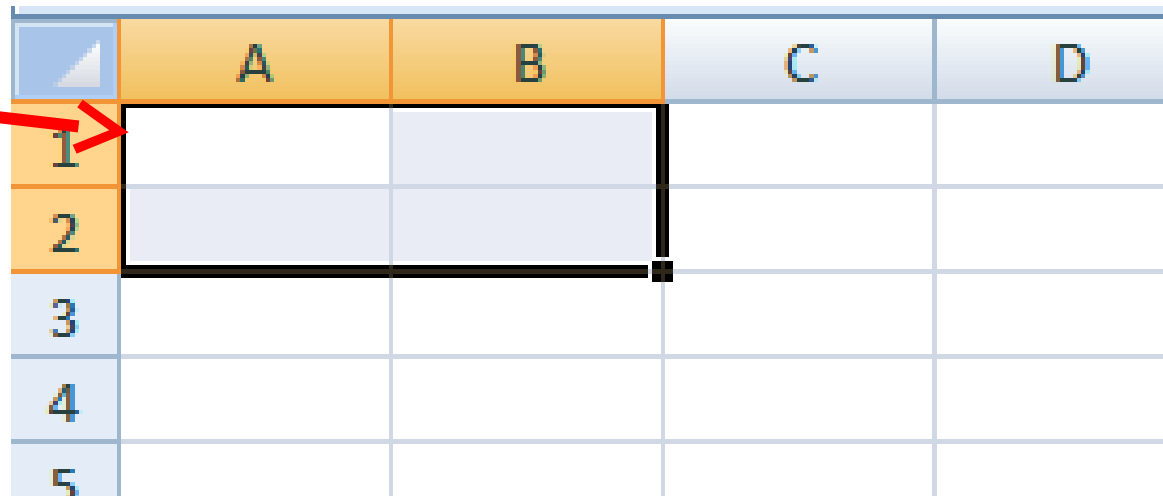
- The **name** of the function is "SUM"
- The **parameters** or **arguments** to this function are 1,2,3,4 and 5
- The entire thing, i.e. SUM(1,2,3,4,5), is a **function call**
- The **value** of this function call is 15.
Another way to say this is that this function call **returns** 15.

Ranges (e.g. a1:c3)

Ranges

- A rectangular box of cells is called a “range”.
- The name of a range is
 - the name of the upper left cell of the range
 - Followed by a colon :
 - Followed by the lower right cell of the range
- Example: A1:B2 is shorthand for A1,A2,B1,B2
 - See next slide for more examples

A1:B2



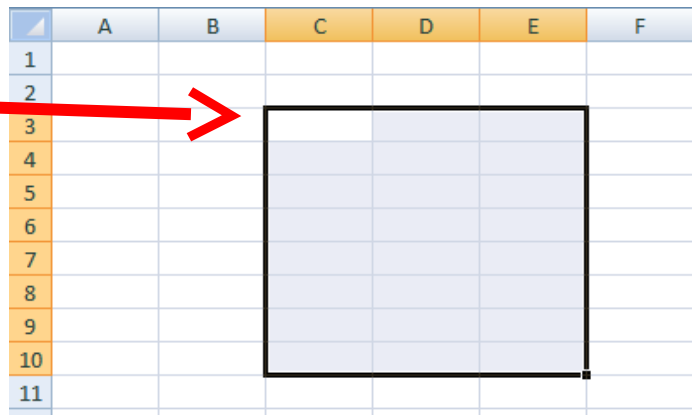
The image shows a portion of an Excel spreadsheet. The columns are labeled A, B, C, and D. The rows are numbered 1 through 5. The cells A1 and B2 are highlighted with a thick black border, indicating a selected range. A red arrow points from the text 'A1:B2' to the top-left corner of this range (cell A1).

	A	B	C	D
1				
2				
3				
4				
5				

Examples of Range Names

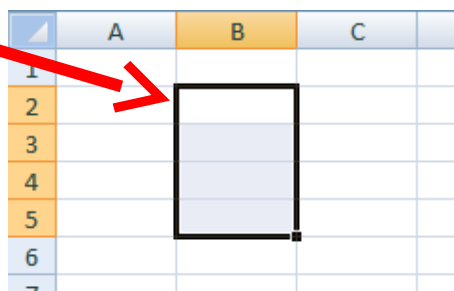
- Examples

C3:E10



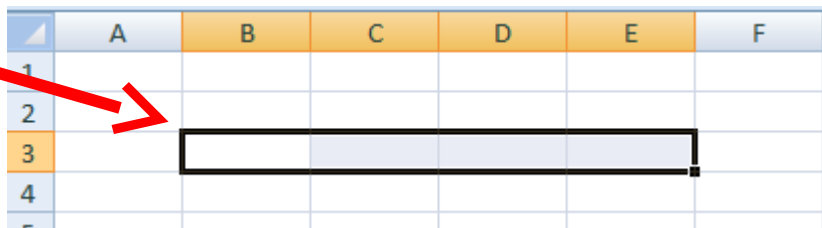
	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

B2:B5



	A	B	C
1			
2			
3			
4			
5			
6			
7			

B3:E3



	A	B	C	D	E	F
1						
2						
3						
4						

Using a range as a parameter

- Ranges can be specified as a parameters to a function call.
- Both of the following function calls produce the same result as $=a1+b1+c1+a2+b2+c2+a3+b3+c3+a4+b4+c4$ however the 2nd version uses a range and is much shorter.

without a range

~~$=\text{SUM}(a1,b1,c1,a2,b2,c2,a3,b3,c3,a4,b4,c4)$~~

with a range

~~$=\text{SUM}(a1:c4)$~~

Function calls with multiple parameters

- You can include multiple ranges and cells as parameters
- Example: the following function call has 3 parameters.
There are two ranges (a1:b2 and c4:c7), one number (100) and one cell reference (d3)

=SUM(a1:b2,100,c4:c7,d3)

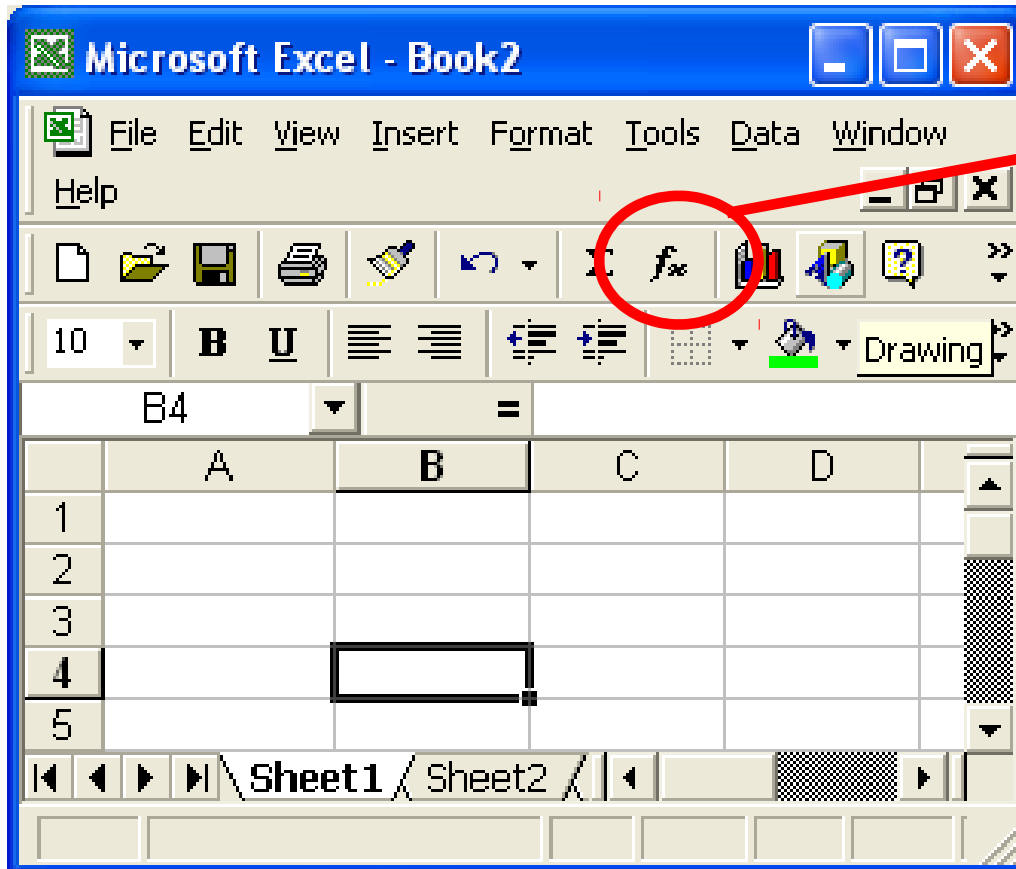
Is the same as:

=SUM(a1,a2,b1,b2,100,c4,c5,c6,c7,d3)

Other Functions

Other functions

- Click the function button to see the available functions:



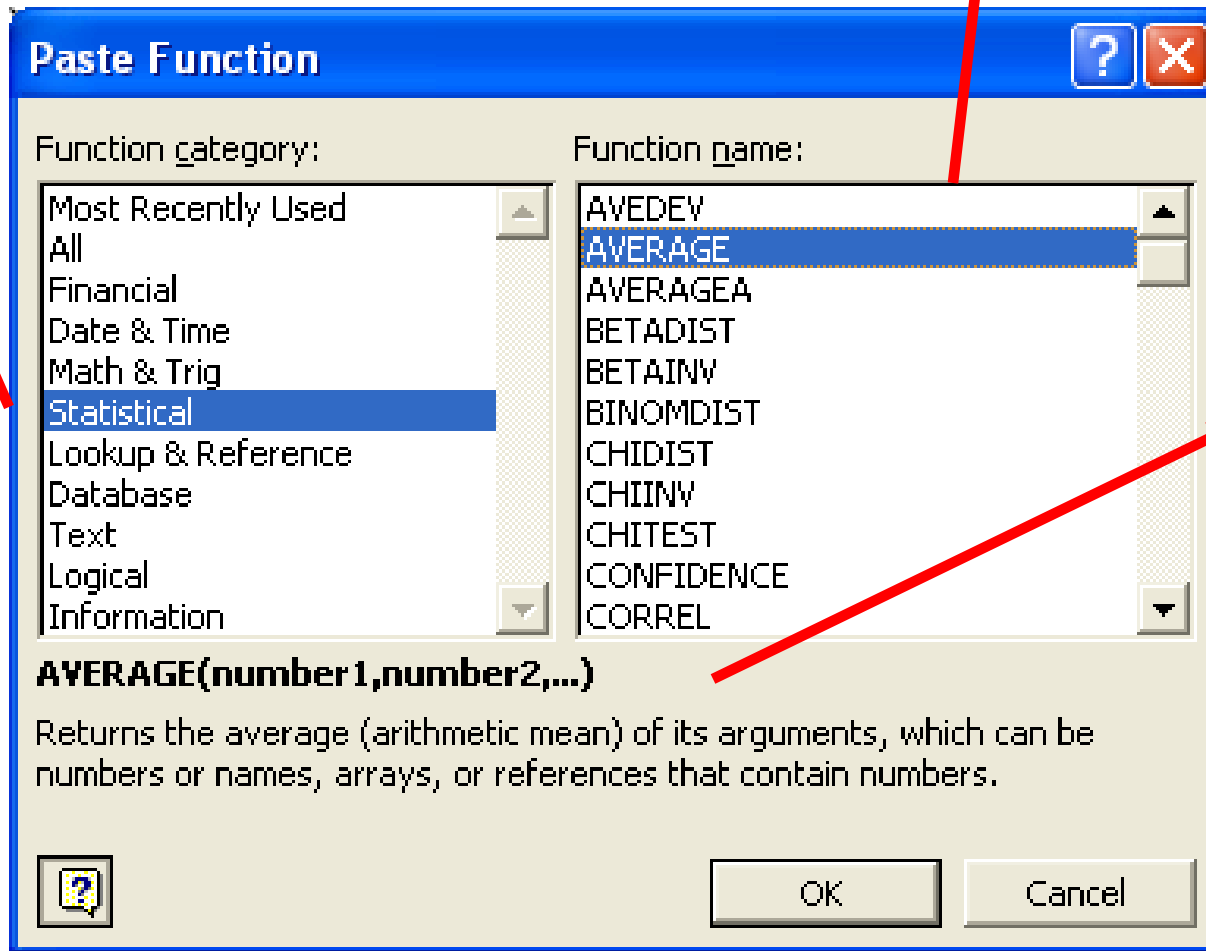
Function button

brings up the
function dialog box
(see next slide)

Function dialog box

categories
(i.e. groups of functions)

Functions for the selected category



Description
of currently
selected
function

Function Editor

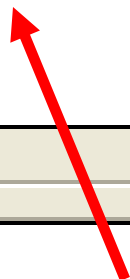
- Double click on the function name to get a dialog box that helps you enter values for the parameters of the function.
(see next slide)

Function Editor

Put values for the parameters in the edit boxes.

When you press OK, this will create the function call:


AVERAGE(2,a1:c2,f13)



AVERAGE

Number1


2



= 2

Number2


a1:c2



= {1,2,3;0,0,0}


Number3

f13



= 0

Number4




= number

= 2

Returns the average (arithmetic mean) of its arguments, which can be numbers or names, arrays, or references that contain numbers.

Number3: number1,number2,... are 1 to 30 numeric arguments for which you want the average.



Formula result =2

OK

Cancel

Example

- AVERAGE

<u>formula that contains a function</u>	<u>value</u>
=AVERAGE(2,4,10,4)	5
=AVERAGE(a1,f32)	$(a1+f32) / 2$
=AVERAGE(a1:c1)	$(a1+b1+c1) / 3$
=AVERAGE(a1:c1,10)	$(a1+b1+c1+10) / 4$

Combining Functions and other values in a single formula

Functions and other values

- You can combine functions, cell references and literal values to make a complex Excel formula
- Examples

=3 + b23 * SUM(d20:g20)

=SUM(a1,100) * AVERAGE(d10:j10)

=100 / (AVERAGE(b2,c2,d30) + AVERAGE(f1:f20))

Other Types of Cell References

References to entire ROWs

References to entire COLUMNs

References to cells or ranges on other worksheets (i.e. tabs)

Entire Rows (e.g. 2:2 or 2:4)

- ~~A cell reference of the form <rowName>:<rowName> refers to the range of all the cells for those rows.~~
- Example:
 - The reference, 2:2, refers to all of the cells on the 2nd row.
 - The following formula adds up all of the values on the 2nd and 4th rows of the spreadsheet:

=sum(2:2,4:4)

- Another Example:
 - The reference, 2:4, refers to all of the cells on the 2nd, 3rd and 4th rows.
 - The following formula adds up all of the values on the 2nd, 3rd, 4th, 10th, 11th, 12th, 13th, 14th and 15th rows of the spreadsheet:

=sum(2:4,10:15)

Entire Columns (e.g. B:B or B:D)

- A cell reference of the form <colName>:<colName> refers to the range of all the cells for those columns.
- Example:
 - The reference, B:B, refers to all of the cells in the 2nd column.
 - The following formula adds up all of the values in the 2nd and 4th columns of the spreadsheet:

~~=sum(B:B,D:D)~~

- Another Example:
 - The reference, B:D, refers to all of the cells in the 2nd, 3rd and 4th columns.
 - The following formula adds up all of the values in the 2nd, 3rd, 4th, 6th and 7th columns of the spreadsheet:

~~=sum(B:D,F:G)~~

References to cells on other worksheets

- Cell on another sheet: *sheetName!cellReference*
- Range on another sheet: *sheetName!range*
- Row on another sheet: *sheetName!row:row*
- Column on another sheet: *sheetName!column:column*
- **If a sheet name has a space in it, you must surround the sheet name with apostrophes (i.e. single quotes)**
- Examples
 - sheet2!a1
 - sheet2!b4:c8
 - '2002 Forecasts'!f3:f10
 - =sum('2002 Forecasts'!f3:f10)
 - =sum('2202 Forecasts'!f:f)

More examples

- Add up values from 2 different sheets
`=sum ('great stocks'!b2:c4, 'so so stocks'!b2:c4)`
- This next one is a little confusing
`=sum (a1,a!a1,b1:b4,b1!b4,c!c:c)`

Explanation

a1	this is a cell reference on the current sheet
a!a1	"a" is the name of sheet. "a1" is a cell on the "a" sheet
b1:b4	this is a range on the current sheet
b1!b4	"b1" is the name of a sheet. "b4" is a cell on the "b1" sheet
c!c:c	"c" is the name of a sheet. "c:c" is all of the cells in the c column on the "c" sheet

Absolute and Relative Cell References

Absolute and Relative Cell References

- By default, when you copy a formula that contains a cell reference, excel will automatically adjust the cell reference.
- You can stop Excel from automatically adjusting the cell reference by using one or more dollar signs (\$) in the cell reference. These are called absolute cell references.
- A cell reference without a dollar sign is a relative cell reference.

Examples

- The following all refer to the same cell

d9

\$d\$9

\$d9

d\$9

- The only difference between these cell references relates to what happens when you copy a formula that contains the cell reference.

Relative Cell Reference

- **d9** This is a "relative cell reference".
 - Changing the column: If I copy this cell reference to another cell:
 - the "d" will increment one letter for every cell that I move over to the right.
 - The "d" will decrement one letter for every cell that I move over to the left
 - Changing the row: If I copy this cell reference to another cell:
 - the "9" will increment by one for every cell that I move down.
 - The "9" will decrement by one for every cell that I move up

Absolute cell reference

- **\$d\$9** This is an absolute cell reference.
 - If I copy a formula with this cell reference, the cell reference will NOT change AT ALL.

Mixed References

- **\$d9** and **d\$9** These are "Mixed" cell references:
- **\$d9**
 - The "d" will stay the same when you copy the cell, but the "9" will change.
- **d\$9**
 - The "d" will change when you copy the cell, but the "9" will stay the same.

Data Types

Data Types

- Numeric
 - values: any number
 - operators: + - * / ^ %
 - sample functions: sum(), average(), max(), min() etc.
- Text (AKA Character or String)
 - values: Any group of letters or numbers or special characters.
Prefix value in cell with an apostrophe (') to force a text value
 - operators: & (concatenation)
 - sample functions: right(), left(), mid(), lower(), upper(), len(), etc
- Dates
 - values: dates and times
 - operators: N/A
 - sample functions: now(), today(), hour(), minute(), etc.
- Logical (AKA boolean)
 - values: true false
 - Operators: < > = <> <= >=
 - sample functions: if(), and(), or(), not(), isblank()

Data Types for Values in Cells

- By default:
 - a cell that contains a number is treated as numeric data
 - a cell that contains a date is treated as date data (we'll see more about this later)
 - a cell that contains data which is not numeric and not a date is treated as "text"

Text Data

Text / String / Character

- The following three terms all used to refer to "text" data. All three terms mean the same thing.
 - text data
 - string data
 - character data
- This presentation will generally use the term "text data" but you should be familiar with the terms "string data" and "character data"

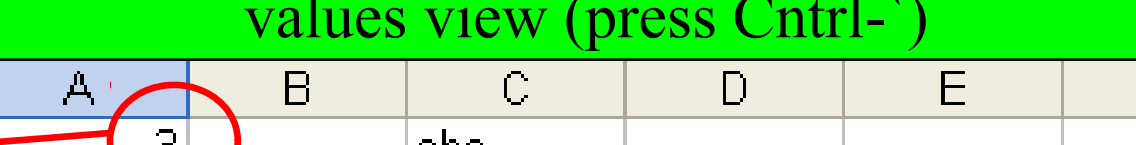
Text data

- Text data is used to store general purpose text (e.g. names, places, descriptions, etc)
- You can't do "math" with text values (obviously)

formula view (press Cntrl-`)

	A	B	C
1	=SUM(C:C)		abc
2			1
3			2
4			
5			

Sheet1 / Sheet2 / Sheet3



values view (press Cntrl-')

	A	B	C	D	E	F
1	3		abc			
2			1			
3			2			
4						

Sheet1 / Sheet2 / Sheet3

Text data in
C1 is not
included in
the Sum

Text Functions

Text Functions

- Many functions are used to manipulate text values.
- The following are only some of them

right()

left()

mid()

concatenate()

lower()

upper()

len()

RIGHT, LEFT and MID functions

RIGHT function

- The RIGHT function is used to isolate a specific number of “characters” from the right hand side of a text value.
- (example on next slide)

~~RIGHT(<text>, <numCharacters>)~~

Formula View

	A	B
1	SSN	Last 4 digits
2	012345678	=RIGHT(A2,4)
3	0001112222	=RIGHT(A3,4)
4		

Values View

	A	B
1	SSN	Last 4 digits
2	012345678	5678
3	0001112222	2222
4		

RIGHT – numCharacters is optional

- The <numCharacters> parameter in the RIGHT function is optional. If you don't specify it the default is 1 (one).

Formula View

	A	B	C	D	E
1	Word	Calls to the "RIGHT" function			
2	ABCDE	=RIGHT(A2,3)	=RIGHT(A2,2)	=RIGHT(A2,1)	=RIGHT(A2)

These produce the same results.

Values View

	A	B	C	D	E
1	Word	Calls to the "RIGHT" function			
2	ABCDE	CDE	DE	E	E

LEFT

- The LEFT function is the same as the RIGHT function, but it returns characters from the LEFT side of the value.

MID (<text>, <startPosition> ,
<numCharacters>)

- MID is used to get values from the middle of some text.
- MID takes 3 parameters:
 - The original text
 - The position to start taking the new value from
 - The number of characters to take for the new value
- Example on next slide

Example: MID (<text>, <startPosition> ,
<numCharacters>)

- This example extracts the second through the fourth characters from the original text value:

Formula View

	A	B
1	ABCDEFGHIJKL	=MID(A1,2,3)

Values View

	A	B
1	ABCDEFGHIJKL	BCD

Concatenation
(&) and
CONCATENATE function

Concatenation (&)

- Use & to combine (or concatenate) two different text values

Formula View

	A	B	C
1	FIRST NAME	LAST NAME	FULL NAME
2	John	Doe	=A2&B2
3	Paul	Smith	=A3&B3
4	David	Washington	=A4&B4

Values View

	A	B	C
1	FIRST NAME	LAST NAME	FULL NAME
2	John	Doe	JohnDoe
3	Paul	Smith	PaulSmith
4	David	Washington	DavidWashington

Notice that there is no space between the two values

Concatenate many values

- You may concatenate many values together

Formula View

	A	B	C	D
1	FIRST	MIDDLE	LAST	FULL
2	John	Quincy	Doe	=A2&B2&C2
3	Paul	Walker	Smith	=A3&B3&C3
4	David	Steven	Washington	=A4&B4&C4

Values View

	A	B	C	D
1	FIRST	MIDDLE	LAST	FULL
2	John	Quincy	Doe	JohnQuincyDoe
3	Paul	Walker	Smith	PaulWalkerSmith
4	David	Steven	Washington	DavidStevenWashington

Concatenation with "literal" values

- You can also concatenate "literal" values.
- You must include the literal values inside quotes
- For example to display spaces in the "full name" in the previous example you could use the following formula. Each space that you want to display must be included in quotes.

=A2&" "&B2&" "&C2

(Don't forget any of the &'s)

- See next slide ...

Concatenating spaces - Example

- You can concatenate spaces into a formula

Formula View

	A	B	C	D
1	FIRST	MIDDLE	LAST	FULL
2	John	Quincy	Doe	=C2&" "&B2&" "&A2
3	Paul	Walker	Smith	=C3&" "&B3&" "&A3
4	David	Steven	Washington	=C4&" "&B4&" "&A4

Values View

	A	B	C	D
1	FIRST	MIDDLE	LAST	FULL
2	John	Quincy	Doe	Doe Quincy John
3	Paul	Walker	Smith	Smith Walker Paul
4	David	Steven	Washington	Washington Steven David

values
contain
spaces

LEFT() with & in same formula

- You can combine the results of different function calls with concatenation.

Formula View

	A	B	C
1	FIRST	LAST	INITIALS
2	John	Doe	=LEFT(A1)&LEFT(B1)
3	Paul	Smith	=LEFT(A2)&LEFT(B2)
4	David	Washington	=LEFT(A3)&LEFT(B3)

Values View

	A	B	C
1	FIRST	LAST	INITIALS
2	John	Doe	FL
3	Paul	Smith	JD
4	David	Washington	PS

Putting it all together

- In this example we concatenate periods into the initials.

Formula View

	A	B	C
1	FIRST	LAST	INITIALS
2	John	Doe	=LEFT(A1)&"."&LEFT(B1)&"."
3	Paul	Smith	=LEFT(A2)&"."&LEFT(B2)&"."
4	David	Washington	=LEFT(A3)&"."&LEFT(B3)&"."

Values View

	A	B	C
1	FIRST	LAST	INITIALS
2	John	Doe	F.L.
3	Paul	Smith	J.D.
4	David	Washington	P.S.

The initials now contain periods

CONCATENATE Function

- You can use the CONCATENATE function instead of the ampersand (&).
- The following formulas are equivalent:

=A1&B1&C1

=CONCATENATE(A1,B1,C1)

- The CONCATENATE function can take as many parameters as you like.

More Text Functions:

LOWER

UPPER

LEN

LOWER (<textValue>)

UPPER (<textValue>)

- LOWER converts text to lower case.
- UPPER converts text to upper case.
- Example:

Formula View

	A	B	C
1	Hello There	=LOWER(A1)	=UPPER(A1)

Values View

	A	B	C
1	Hello There	hello there	HELLO THERE

LEN (<textValue>)

- LEN returns a numeric value equal to the number of character in a text value (i.e. the “length” of the text value).
- Spaces ARE included in the length.
- Example

Formula View

	A	B
1	Hello There	=LEN(A1)

Values View

	A	B
1	Hello There	11

Dates and Times

How Excel Stores Dates

- Dates are stored in Excel as the number of days since Dec 31, 1899 for that date. (ex. Jan 1, 1900 is stored as the number 1).
- To see this, type a date in a cell and then press Ctrl-` to see the “formulas view”.

- **Example**

- **Values View**

	A	B
1	long time ago	1/1/1900
2	more recent	2/1/1900
3	much more recent	1/1/2008

**Dates become
numbers in
“formulas
view”**

- **Formulas View**

	A	B
1	long time ago	1
2	more recent	32
3	much more recent	39448

Times and Dates in the same Cell

- A cell can contain both a date and a time.
- The value of both the date and the time is stored internally as a single decimal number.
- The whole number portion represents the DATE and is the number of days since Dec. 31, 1899
- The decimal part represents the TIME and is the fraction of the day that has elapsed.
- Examples:
 - Jan 1, 1900 at 12AM is 1.0 (i.e. 1 day since Dec 31, 1899 and 0 percent of the day elapsed so far)
 - Jan 1, 1900 at 12PM is 1.5 (i.e. 0.5 of the day elapsed)
 - Jan 2, 1900 at 12PM is 2.5 (i.e. 2 days since Dec. 31, 1899)
 - Feb 1, 1900 at 1:05 PM is 32.5451388888889 (i.e. 32 days since Dec 31, 1899 and 0.5451388888889 of the day elapsed by 1:05 PM. This makes sense as it is a little past noon so a

Times and Dates - Example

- Values View

	A	B
1	long time ago	1/1/1900 6:00 AM
2	more recent	2/1/1900 12:00 PM
3	much more recent	1/1/2008 7:00 PM

- Formulas View

	A	B
1	long time ago	1.25
2	more recent	32.5
3	much more recent	39448.7916666667

Date Arithmetic

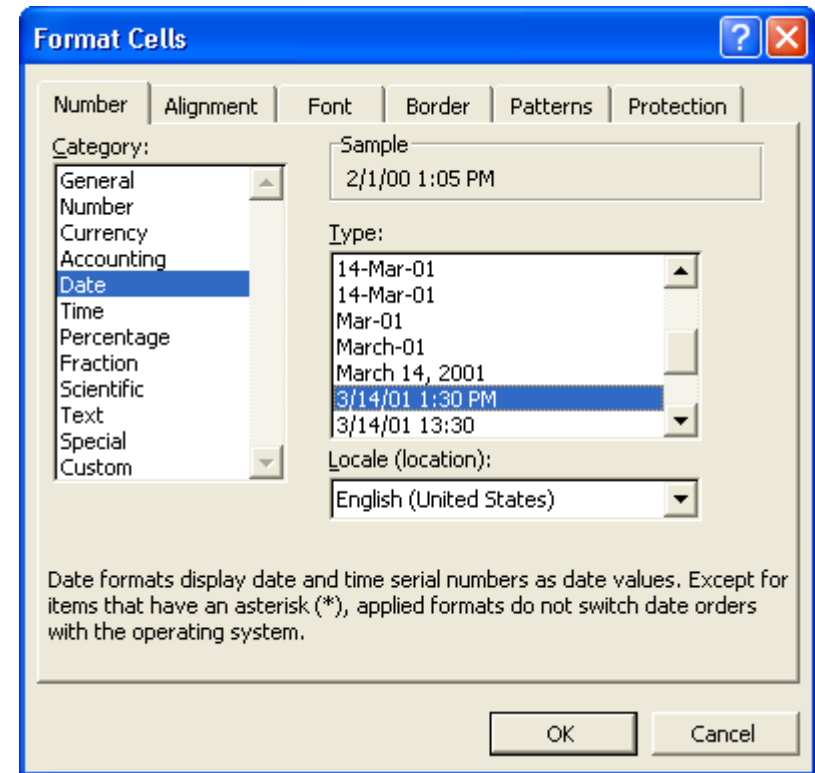
- You can do arithmetic with dates.
- Add and subtract days by adding and subtracting whole numbers.
- Add and subtract times by adding and subtracting fractional values.
- Examples
 - =A1+7 (one week after the date in A1)
 - =A1-5*7 (5 weeks before the date in A1)
 - =A1- (1/24) (one hour before the time specified in A1)
 - =A1+ (3/24) (three hours after the time specified in A1)
 - =A1+2.5 (two and a half days after the time specified in A1)
 - =A1-A2+1 (the # of days between the date in A1 and the date in A2)

Formatting cells with Dates and Times

- Right click on the cell and choose “Format Cells”
- From the “Category” list in the “Number” tab either
 - Choose “Date”, “Time” or “Custom” and choose an appropriate looking format

OR

- If you choose “General” or “Number”, the internal number for the Date/Time will be displayed in the spreadsheet even in the “values” view.



Logical (AKA boolean) values

TRUE and FALSE

- A logical value can be one of only two values

TRUE

or

FALSE

TRUE

- The following statements are TRUE:

Fish live in water.

Deer live on land.

- The following statements are also TRUE:

3 is greater than 2

2 is less than 3

2 is less than or equal to 3

2 is less than or equal to 2

3 is greater than or equal to 2

3 is greater than or equal to 3

2 is equal to 2

2 is not equal to 3

FALSE

- The following statements are FALSE:

Fish live on land.

Deer live in water.

- The following statements are also FALSE:

2 is greater than 3

3 is less than 2

3 is less than or equal to 2

2 is greater than or equal to 3

2 is equal to 3

2 is not equal to 2

Logical operators

- In Excel the following "operators" are used

<u>Operator</u>	<u>Meaning</u>
-----------------	----------------

>	greater than
---	--------------

<	less than
---	-----------

>=	greater than or equal to
----	--------------------------

<=	less than or equal to
----	-----------------------

=	equal to
---	----------

<>	not equal to
----	--------------

- Examples

3 > 2	true
-------	------

3 < 2	false
-------	-------

Logical Formulas

Formula View

Values View

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

A8 =

	A	B
1	Numerical Values	Logical formulas
2	1	=A2<A3
3	2	=A2>A3
4		=A2<=A3
5		=A2>=A3
6		=A2=A3
7		=A2<>A3
8		
9		

Sheet1 / Sheet2

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

A7 =

	A	B	C
1	Numerical Values	Logical formulas	
2	1	TRUE	
3	2	FALSE	
4		TRUE	
5		FALSE	
6		FALSE	
7		TRUE	
8			
9			

Sheet1 / Sheet2

Same formulas, different values

Formula View

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

A8 =

	A	B
1	Numerical Values	Logical formulas
2	3	=A2<A3
3	2	=A2>A3
4		=A2<=A3
5		=A2>=A3
6		=A2=A3
7		=A2<>A3
8		
9		

Sheet1 Sheet2

Values View

Microsoft Excel - Book1

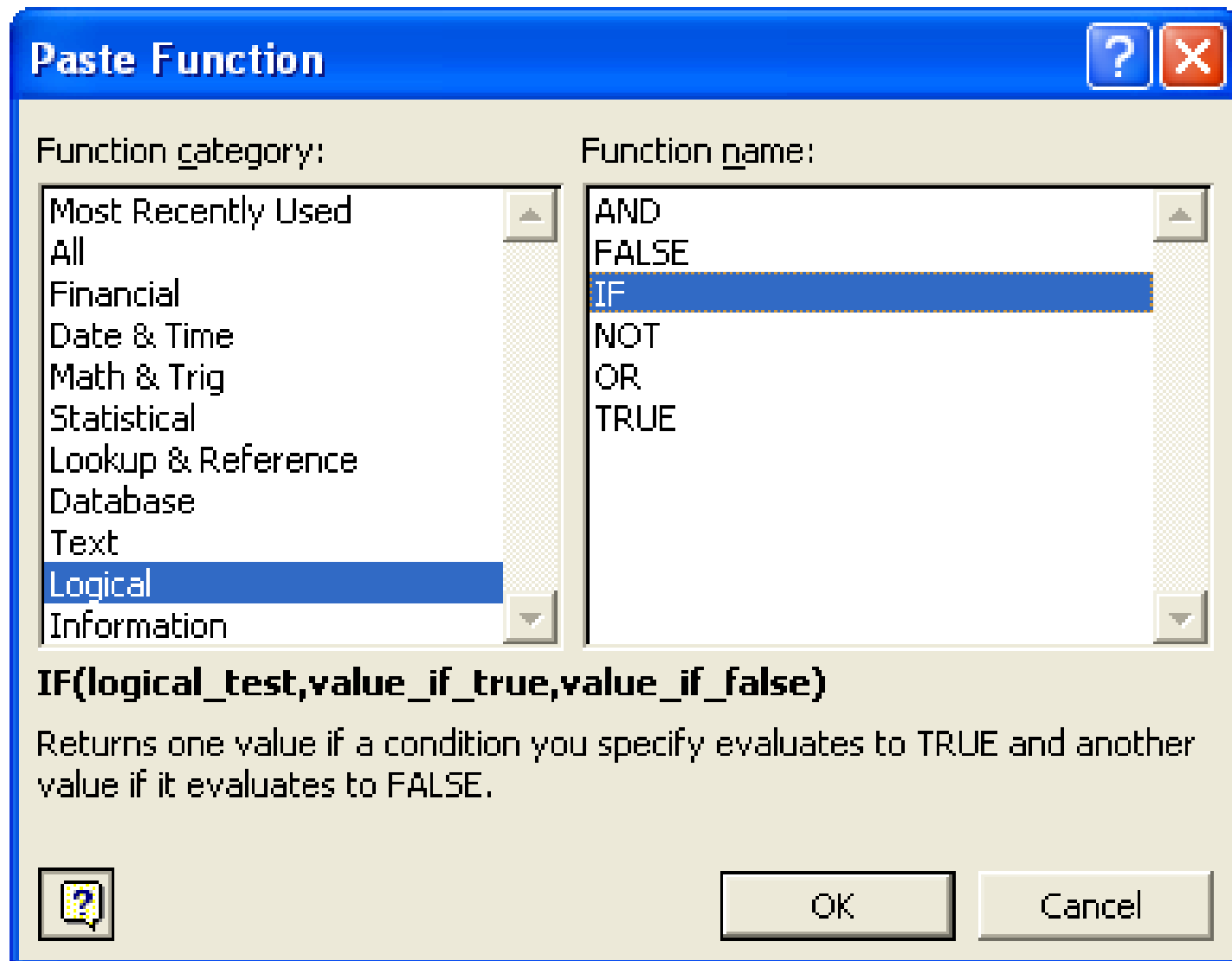
File Edit View Insert Format Tools Data Window Help

A8 =

	A	B	C
1	Numerical Values	Logical formulas	
2	3	FALSE	
3	2	TRUE	
4		FALSE	
5		TRUE	
6		FALSE	
7		TRUE	
8			
9			




Sheet1 Sheet2

IF Function



Parameters for IF function


IF

Logical_test	a2>a3		= TRUE
Value_if_true	"I am happy."		= "I am happy."
Value_if_false	"I am sad."		= "I am sad."

= "I am happy."

Returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE.

Value_if_false is the value that is returned if Logical_test is FALSE. If omitted, FALSE is returned.

 Formula result =I am happy.

OK Cancel

IF function

Formula View

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

10 B I U \$

B2 = =IF(A2>A3,"I am happy.", "I am sad.")

	A	B
1	Numerical Values	Logical formulas
2	3	=IF(A2>A3,"I am happy.", "I am sad.")
3	2	
4		
5		
6		
7		
8		
9		
10		

Sheet1 Sheet2 Sheet3

Values View

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

10 B I U \$

B2 = =IF(A2>A3,"I am happy.", "I am sad.")

	A	B	C
1	Numerical Values	Logical formulas	
2	3	I am happy.	
3	2		
4			
5			
6			
7			
8			
9			
10			

Sheet1 Sheet2 Sheet3

IF with a numeric result


IF

Logical_test	A2>A3	= TRUE
Value_if_true	500	= 500
Value_if_false	1000	= 1000

= 500

Returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE.

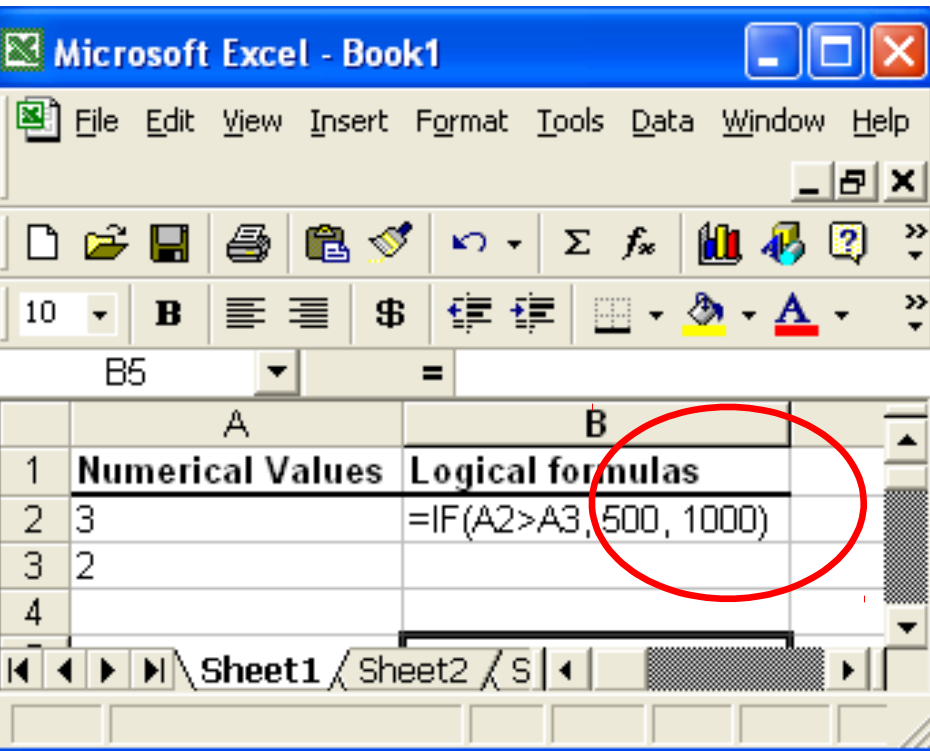
Value_if_true is the value that is returned if Logical_test is TRUE. If omitted, TRUE is returned. You can nest up to seven IF functions.

 Formula result = 500

OK Cancel

IF with a numerical result

Formula View



Microsoft Excel - Book1

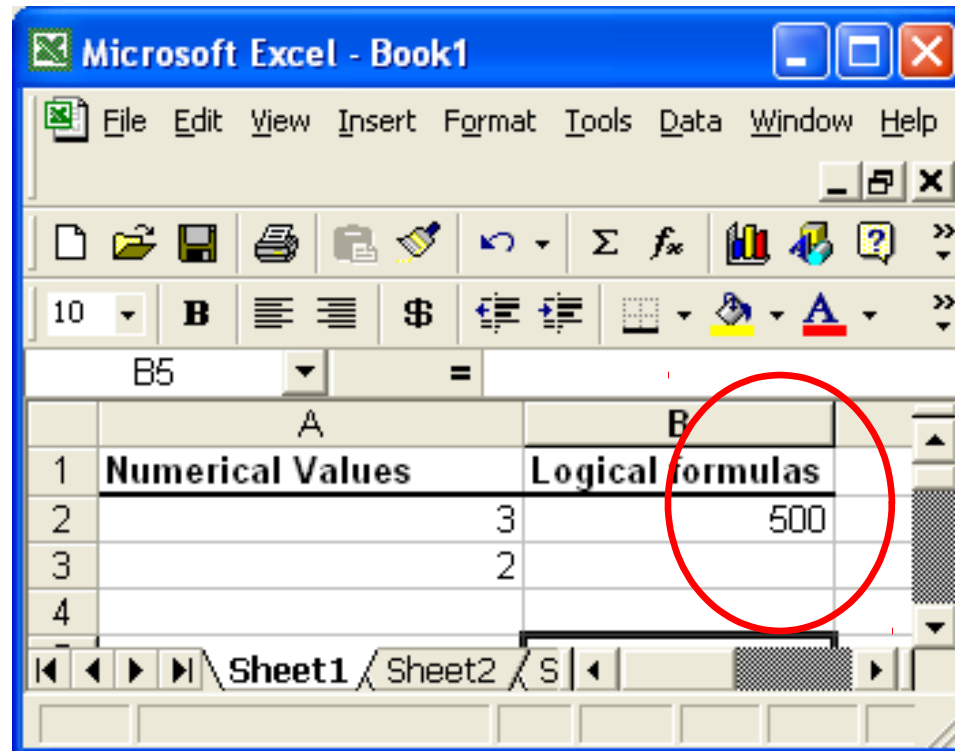
File Edit View Insert Format Tools Data Window Help

10 B \$

	A	B
1	Numerical Values	Logical formulas
2	3	=IF(A2>A3, 500, 1000)
3	2	
4		

Sheet1 Sheet2 S

Values View



Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

10 B \$

	A	B
1	Numerical Values	Logical formulas
2	3	500
3	2	
4		

Sheet1 Sheet2 S

AND

OR

NOT

AND

- The following is TRUE

Fish live in water AND deer live on land.

- The following are all FALSE






Fish live in water AND deer live in water.

Fish live on land AND deer live on land.

Fish live on land AND deer live in water.

AND function


AND

Logical1	A2<A3		= TRUE
Logical2	B2<B3		= FALSE
Logical3			= logical
Logical4			= logical
Logical5			= logical

= FALSE

Returns TRUE if all its arguments are TRUE; returns FALSE if any argument is FALSE.

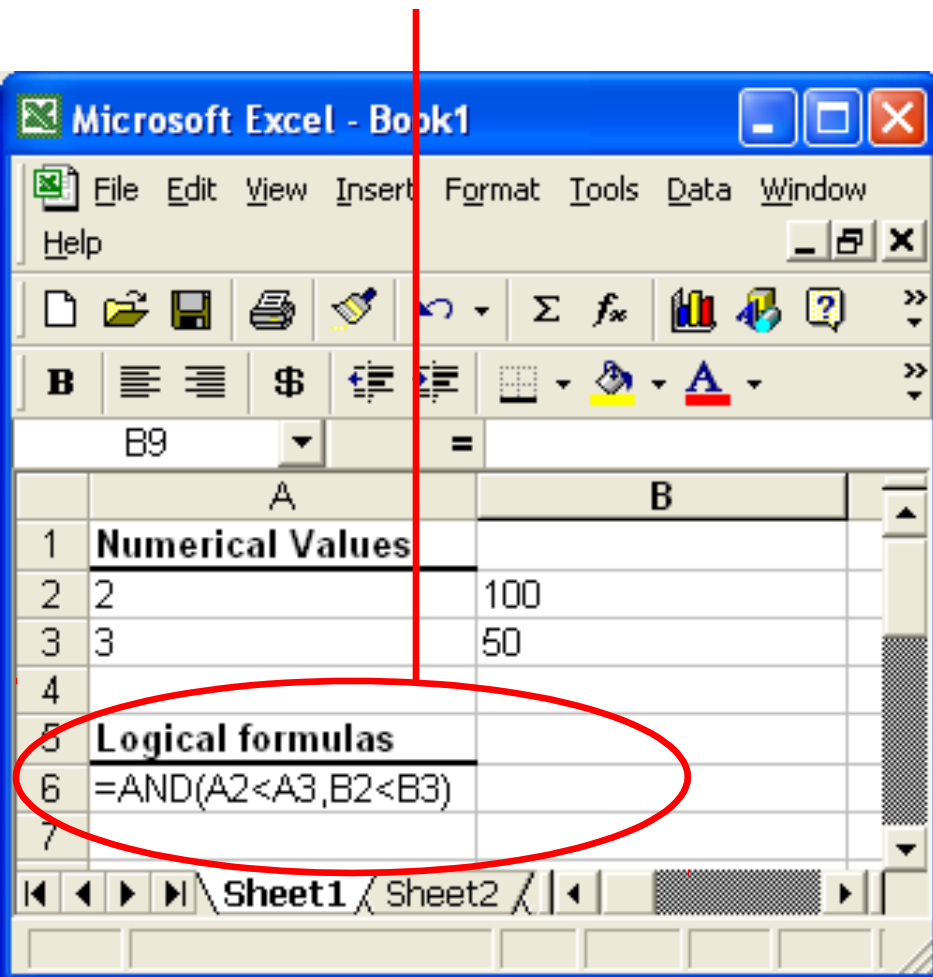
Logical4: logical1,logical2,... are 1 to 30 conditions you want to test that can be either TRUE or FALSE and can be logical values, arrays, or references.

 Formula result =FALSE

OK Cancel

AND

Formula View



Microsoft Excel - Book1

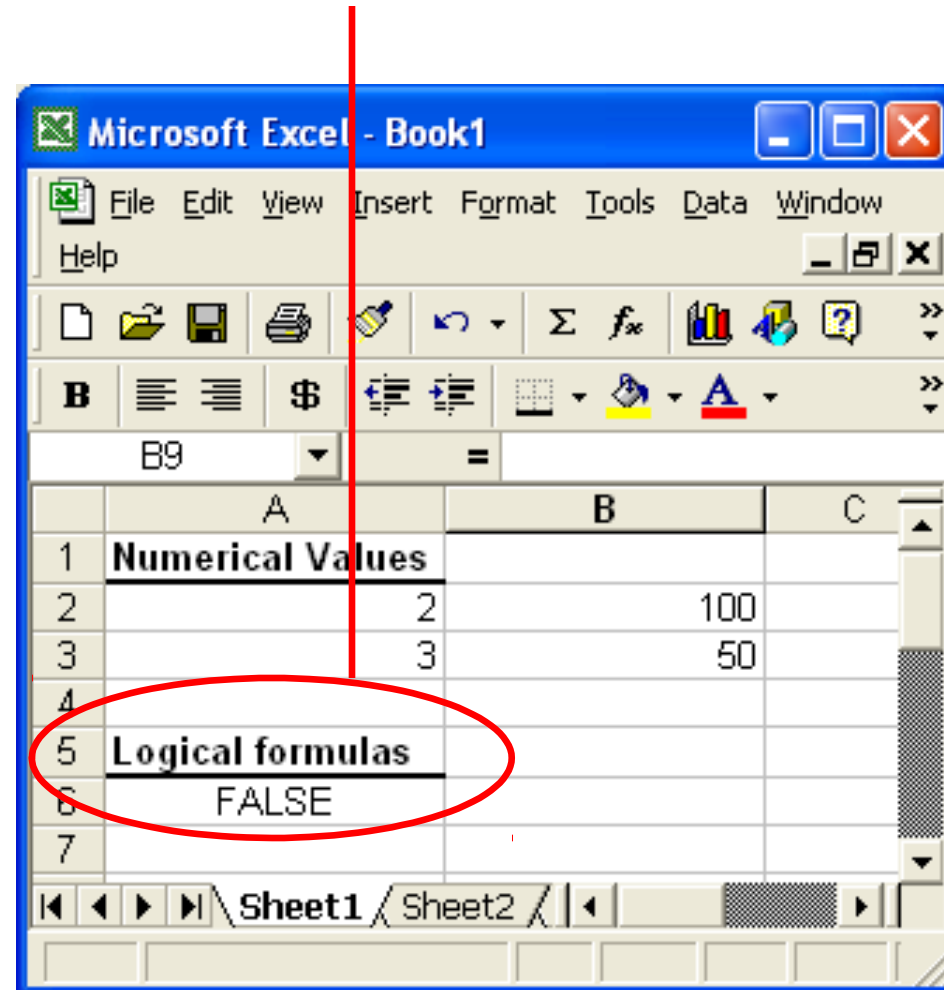
File Edit View Insert Format Tools Data Window Help

B9 =

	A	B
1	Numerical Values	
2	2	100
3	3	50
4		
5	Logical formulas	
6	=AND(A2<A3,B2<B3)	
7		

Sheet1 / Sheet2

Values View



Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

B9 =

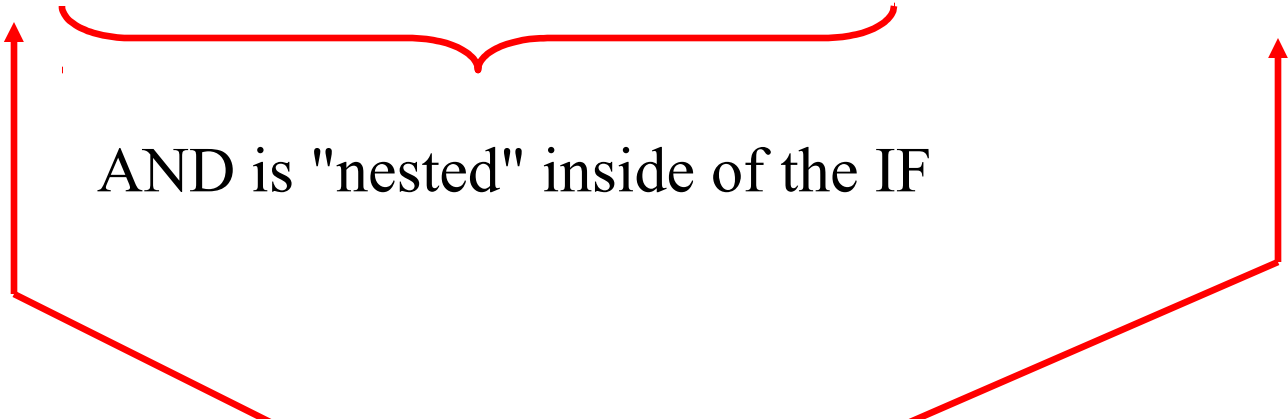
	A	B	C
1	Numerical Values		
2	2	100	
3	3	50	
4			
5	Logical formulas		
6	FALSE		
7			

Sheet1 / Sheet2

IF with AND - nested function calls

- You can use an AND inside of an IF.
- This is called a NESTED FUNCTION CALL
- Example

=IF(AND (A2>A3,B2<>B3) , 500, 1000)






AND is "nested" inside of the IF

These parentheses "belong to" the if

IF with AND - parameters

Parameters for IF function:


IF

Logical_test	AND(A2<A3,B2<B3)		= FALSE
Value_if_true	"I am happy"		= "I am happy"
Value_if_false	"I am sad"		= "I am sad"

= "I am sad"

Returns one value if a condition you specify evaluates to TRUE and another value if it evaluates to FALSE.

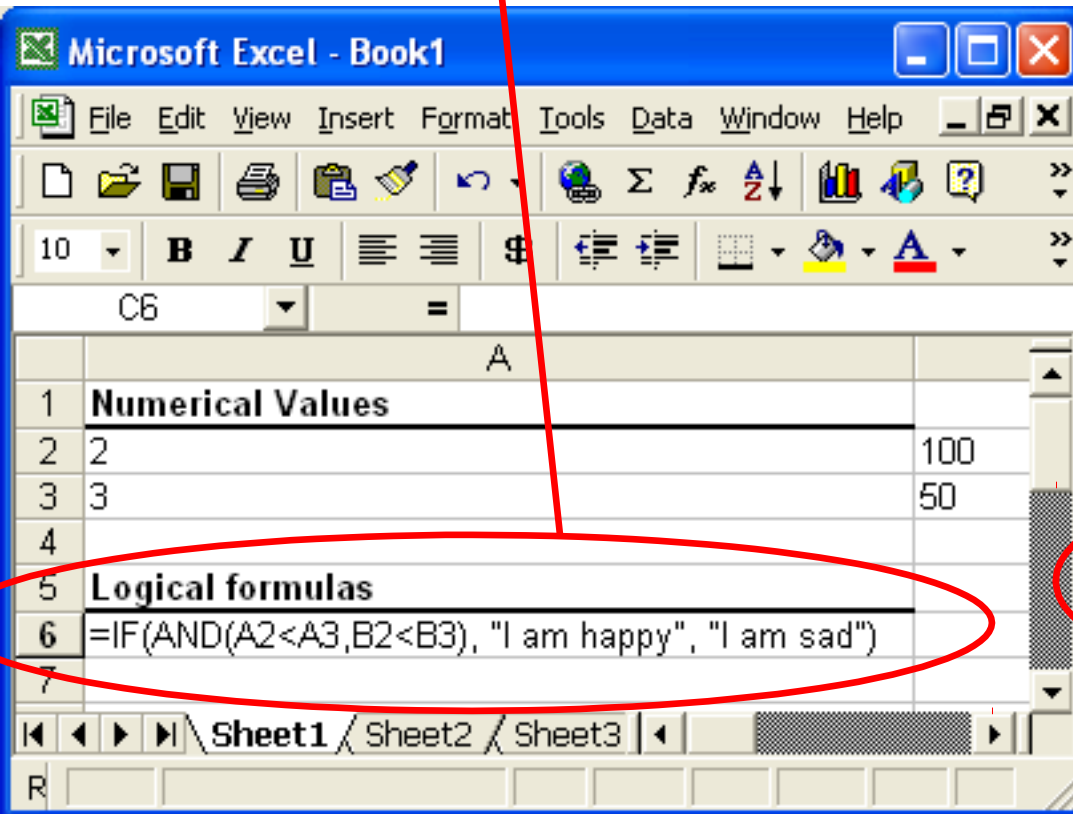
Value_if_false is the value that is returned if Logical_test is FALSE. If omitted, FALSE is returned.

 Formula result =I am sad

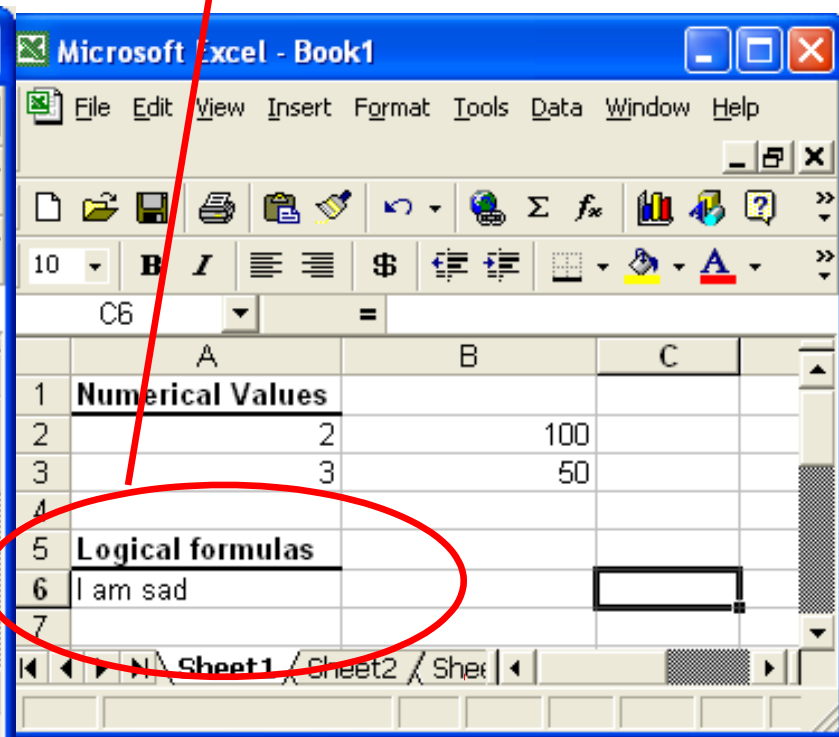
OK Cancel

IF with AND - spreadsheet views

Formula View



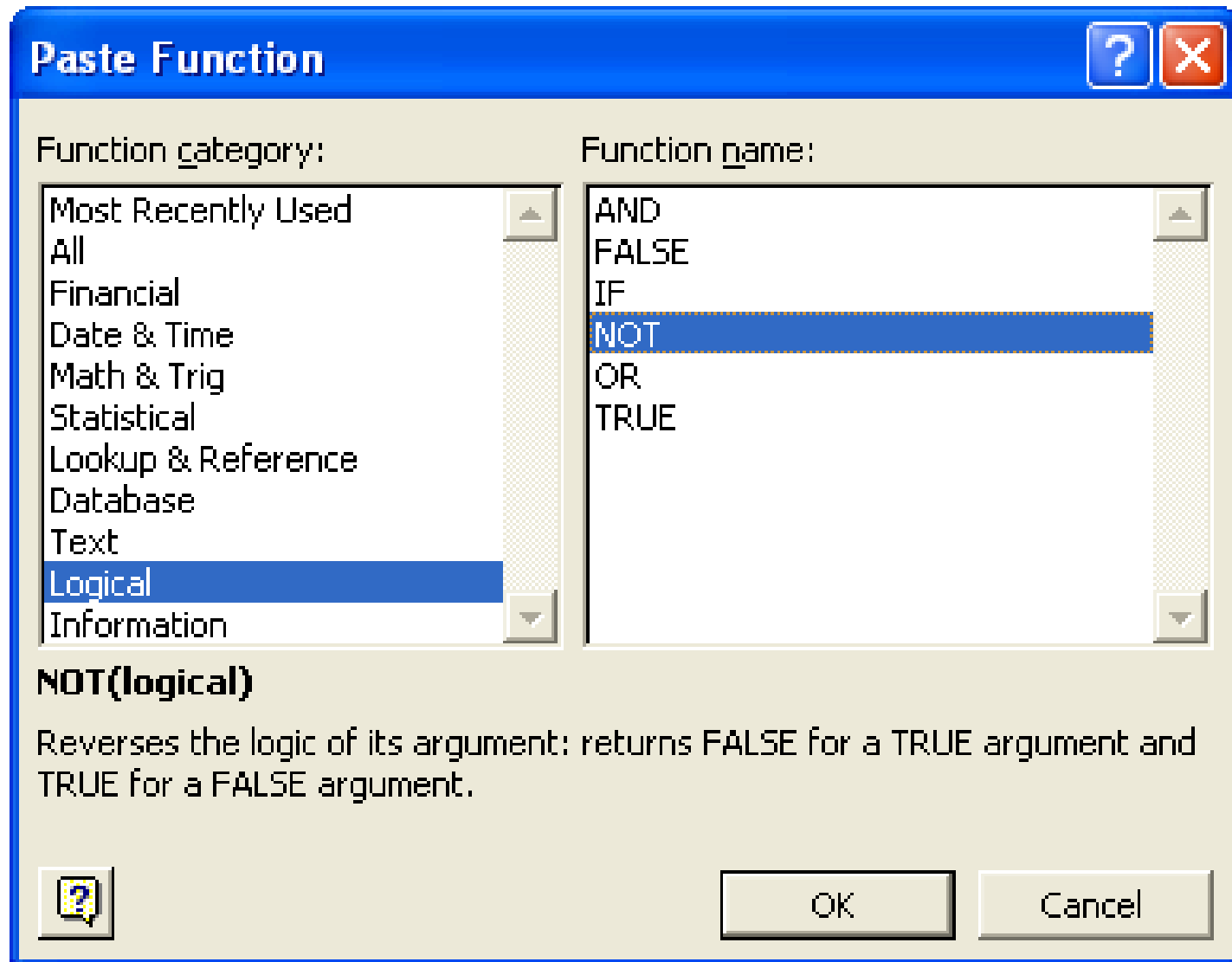
Values View



AND function

- Takes any number of parameters
- Returns TRUE if ALL of the parameters evaluate to TRUE otherwise returns FALSE.

OR and NOT functions



OR

- Takes any number of parameters
- Returns TRUE if ANY of the parameters evaluate to TRUE otherwise returns FALSE

NOT

- Takes ONLY ONE parameter
- Returns the "opposite" of the value of the parameter
 - returns FALSE if the parameter value is TRUE
 - returns TRUE if the parameter value is FALSE

Examples of Complex Nested Function Calls

- =IF(AND(A2>A3, OR(B2=B3,C2<C3)), 500, 1000)
- =IF(NOT(AND(A2>A3, OR(B2=B3,C2<C3))), 500, 1000)
- =IF(AND(A2>A3, NOT(OR(B2=B3,C2<C3))), 500, 1000)

Other Logical Functions: ISBLANK

ISBLANK(<value>)

- ISBLANK returns TRUE if the value is blank and false otherwise. (see example below)

Total will be wrong if quantity is blank (since a blank is normally treated as zero)

Total will be correct even if quantity is blank (quantity is assumed to be 1 in that case)

Formula View

	A	B	C	D
1	Price	Quantity	Total	Total
2	100		=A2*(IF(ISBLANK(B2),1,B2))	=A2*B2

blank value

Values View

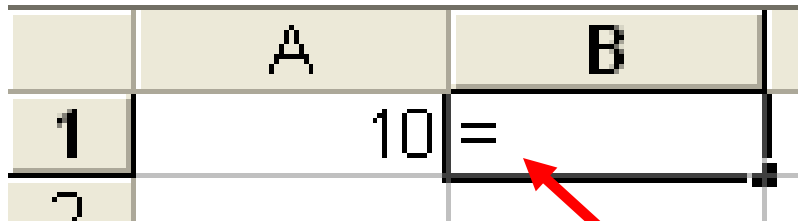
	A	B	C	D
1	Price	Quantity	Total	Total
2	\$100.00		\$100.00	\$0.00

APPENDICIES

Using the mouse to create
formulas.

Click to choose cell references

- Once you type the equal sign (=) you can click with your mouse to enter cell references into a formula.



	A	B
1	10	=
2		

Now you can click with your mouse to enter cell references.

- Example on following slides

Example: click to get cell reference

- Type a number in cell A1

	A	B
1	10	

- type an

	A	B
1	10	=

- Click on cell A1. You will see a dashed line around cell A1 and the text “A1” (without the quotes) will be entered into the formula in B1. The dashed line indicates that this is the

- Type a plus sign (+) sign and the dashed line around cell A1 disappears.

	A	B
1	10	=A1+

- You can continue to fill out the rest of the formula now:

	A	B
1	10	=A1+3

- Press ENTER to get the result:

	A	B
1	10	13

	A	B
--	---	---

Example: changing the cell reference

- Type numbers in cells A1 and B1

	A	B	C
1	10	20	

- Type an equal sign (=) in C1

	A	B	C
1	10	20	=

- Click on cell A1. You will see a dashed line around cell A1 and the text "A1" (without the quotes) will be entered into the formula in C1. The dashed line

	A	B	C
1	10	20	=A1

- Click cell B1. The dashed line moves to cell B1 and the text in cell C1 changes to "B1". You can keep clicking on different cells until you click on the right one.

	A	B	C
1	10	20	=B1

- Type a plus sign (+) sign. The dashed line around cell B1 disappears.

	A	B	C
1	10	20	=B1+

- If you click on another cell now, a new cell reference will be entered.

	A	B	C
1	10	20	=B1+A1

- You can continue to fill out the rest of the formula now ...

Use mouse to enter other types of cell¹³⁸ references.

- Cell ranges:
 - Click and drag on a cell to enter a cell range reference
- Cells on a different worksheet
 - Click on a cell on another worksheet to enter a reference from a different worksheet.
 - Be sure to type the next symbol in the formula (e.g. a plus sign (+) , a comma (,) , etc before you click on the original tab. If you don't then the formula will be incorrect (try it).

FORMATTING A CELL AS TEXT

Numbers with leading zeros

- Sometimes you desire to have to have zeroes displayed at the beginning of a number.
- For example, US social security numbers are made up of 9 digits. The first few digits may be zeroes.
- This causes in a problem in Excel. When you type in a number with leading zeroes into a cell, Excel removes the leading zeroes when you press Enter.

- **EXAMPLE:**

If you type the following into a cell (before you press Enter)

	A
1	SSN
2	000123456
3	

When you press Enter you get this:

Leading zeroes are missing →

	A
1	SSN
2	123456
3	

- See next slides for how to fix this ...

Formatting a cell to display as text

- To fix this problem you can “format” the cell to display as “text” instead of as a “number”.
- The value will still be able to be used in calculations but it will be displayed on the screen using the rules for text values instead of the rules to display numbers
- One of the rules Excel uses to displaying numbers is to remove leading zeroes.
- However, if a number displayed as "text" data then Excel WILL display leading zeros.
- See next slide for instructions on how to do this ...

Opening the "Format cells" dialog box

- Select the cell or cells that you want to format as text.
- Right click on the selected cell(s) and choose the following from the popup menu

format cells

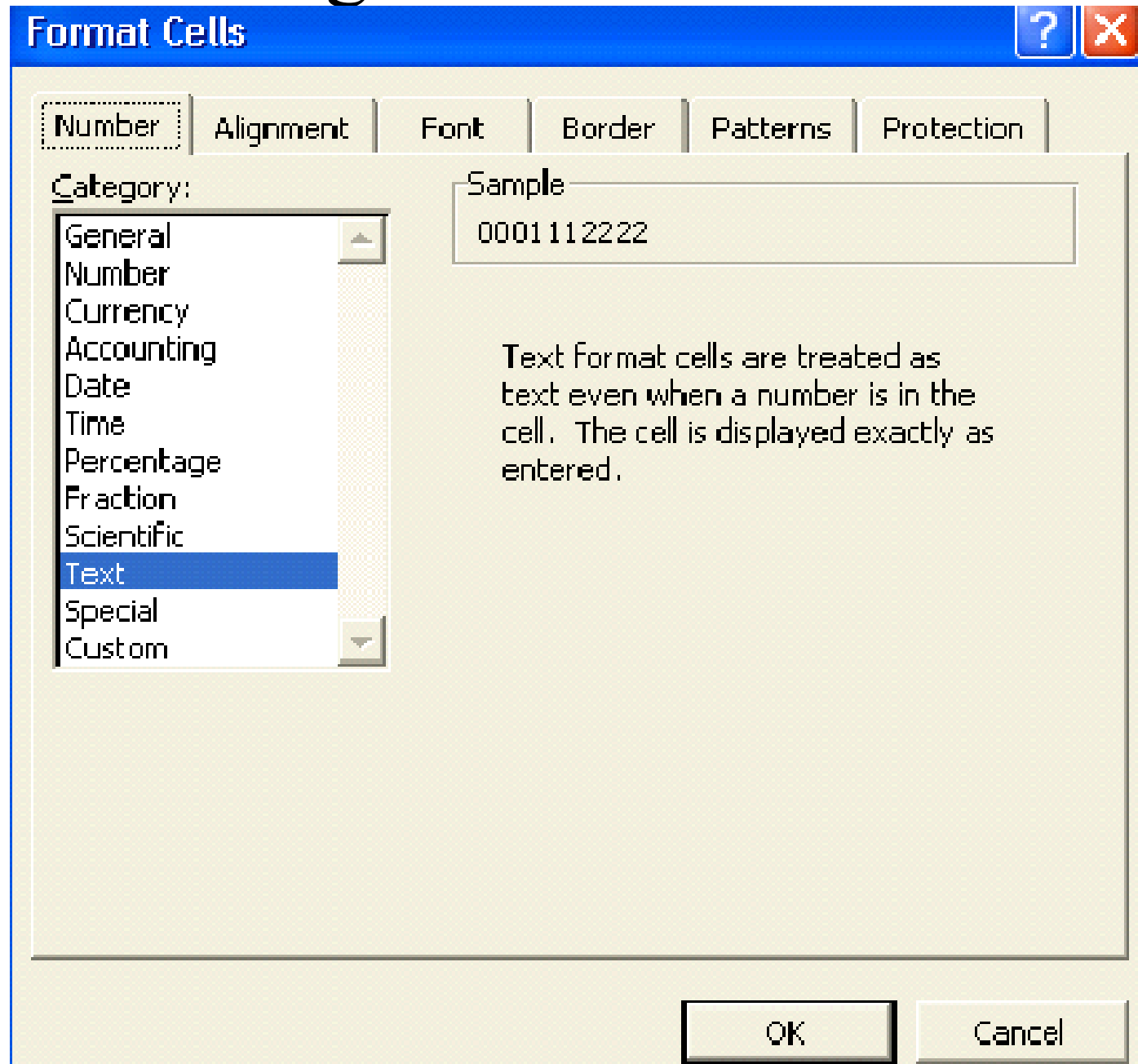
or click on a cell and choose the following menu choice

format | cells

- Then you will see the "Format Cells" dialog box.
(See the next slide ...)

"Format Cells" dialog box

- Choose "Text" from the "Number" tab and press the OK button.



Not a Perfect Solution ...

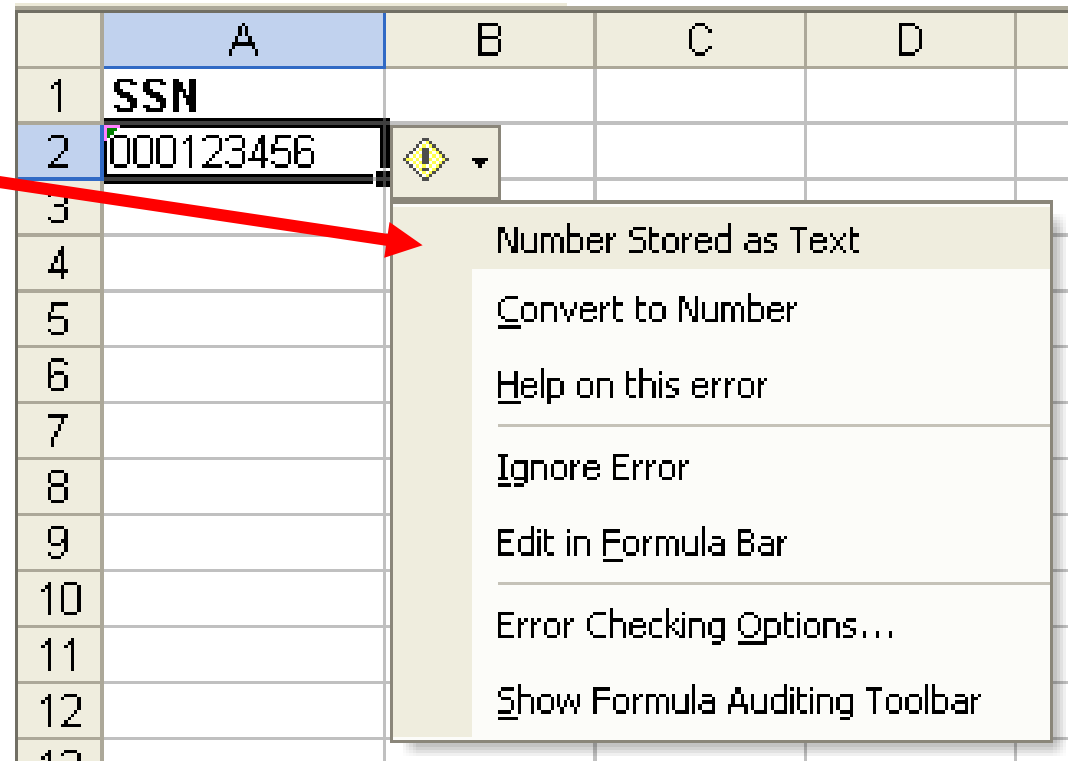
- When you format the cell as “text” it will display the leading zeroes (you must type them in again).
- **However**, Excel will warn you that a number is formatted as text. (see next slide)

Result of Formatting a Number as Text

- Excel indicates this issue with a green triangle in the upper left hand corner of the cell:



- If you select the cell you can see the error message.
- You can have Excel to ignore this type of “error” by choosing the “Tools | Options” menu choice and unchecking the “Number stored as text” option from the “Error Checking” tab. (this solution is not shown on this slide)



Another Option – using an
Apostrophe (‘)

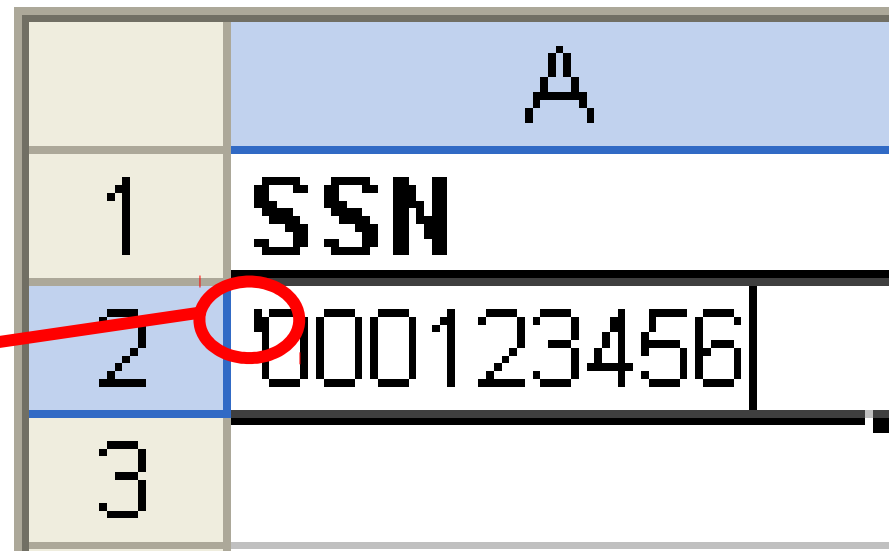
Force a Cell to Display as Text by Using an Apostrophe (')

- Another way to display leading zeroes in a number is to type an apostrophe as the first character in the cell.
- When you press Enter, the apostrophe is NOT displayed in the cell (it is displayed in the formula bar).
- The apostrophe tells Excel that the contents of the cell should be treated as text.
- The apostrophe is similar to the = sign.
 - The = sign tells Excel that the cell contains a formula.
 - The apostrophe (') tells Excel that the cell contains a text value.

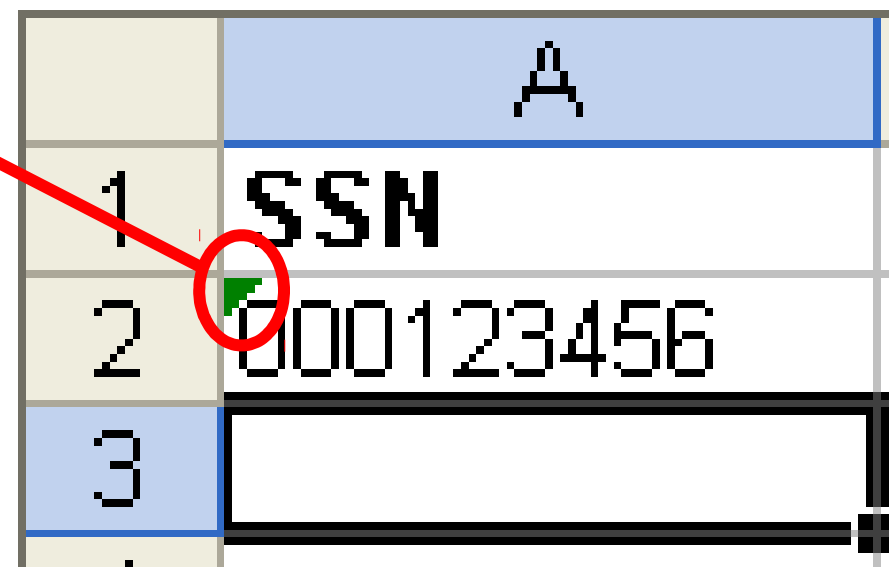
Results of Using an Apostrophe

- Type an apostrophe followed by the SSN.
- Before pressing Enter you can see the apostrophe.
- After pressing Enter you can't see the apostrophe anymore and leading zeroes remain.

However, Excel will warn you that a number is formatted as text via the green triangle. (see earlier slides)



	A
1	SSN
2	'000123456
3	



	A
1	SSN
2	000123456
3	

Ignoring numbers in calculations

Ignoring numbers in calculations

- Typing an apostrophe (‘) as the first character in a cell with a number has the additional effect of causing the number to be ignored in calculations.
- **NOTE**: This does not happen when you format the cell that contains a number to display as text.

Ignoring numbers in calculations.

- *By default*, all numbers *are* included in numeric calculations.
- However, you can force a cell that contains a number to be treated as text and not be included in calculations with numeric functions (ex. SUM, AVERAGE, etc.) by placing an apostrophe as the first character in the cell

Example

Formula to
add up all
numbers in
column D

formula view (press Cntrl-')				
	A	B	C	D
1	Total Expenses		Year:	2004
2	=SUM(D:D)			
3			Line Items	
4			Payroll	100000
5			Rent	100000

(Same
Spreadsheet)

The **Year** is
incorrectly
included in
the sum.

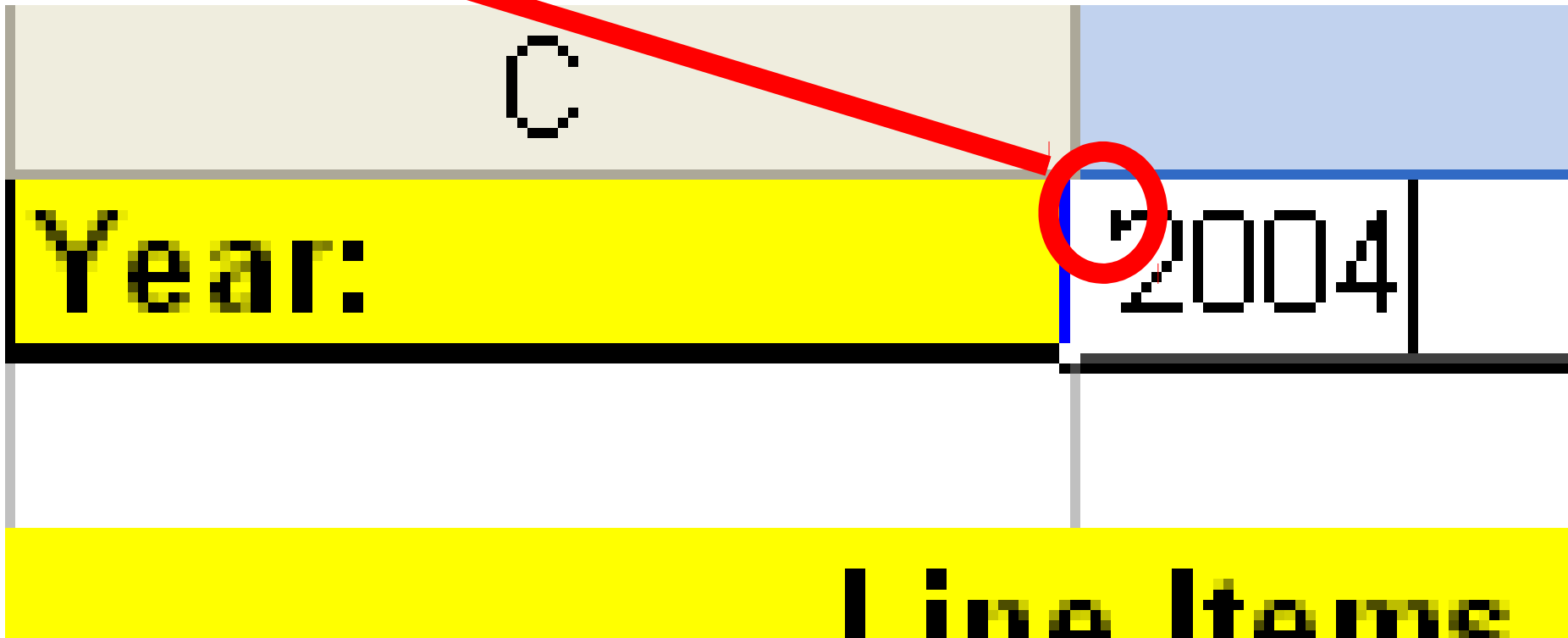
values view (press Cntrl-')							
	A	B	C	D	E	F	G
1	Total Expenses		Year:	2004			
2	202,004						
3			Line Items				
4			Payroll	100,000			
5			Rent	100,000			

Example - continued

To fix the problem you can add an apostrophe (') before the data for the year (no space necessary after the apostrophe).

This will force the number to be treated as text (see next slide).

NOTE: When you stop editing the cell, the apostrophe will NOT be visible in the spreadsheet. However, it will be visible in the formula bar.



Example - finished

The number for the year is now treated as text and is not included in the sum.

The apostrophe is not visible in the spreadsheet (unless you're editing the cell).

The apostrophe IS visible in the formula bar.

	A	B	C	D
1	Total Expenses		Year:	2004
2	200,000			
3			Line Items	
4			Payroll	100,000
5			Rent	100,000