Microsoft Excel

Part 2: Calculations & Functions

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Outlines

1. Creating you own formula
2. Using functions in Excel
3. Using cell references with functions
4. Cell reference from other worksheets
5. Sorting

Performing Calculation

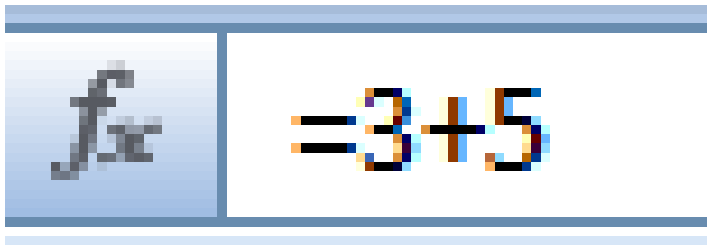
2 Ways to perform calculation in Excel

1. Write your own formula
2. Using functions provided by Excel

1. Writing your own formula

Main components of a formula

1. Cell value starts with equation symbol (=)
2. The calculation



1. Writing your own formula (2)

1. Mathematical Operations in Excel

Symbol	Description	Example
+	Plus	71+12
-	Minus	15-5
*	Multiply	3*8
/	Divide	6/2
-	Minus sign	-27
^	Power	5^4

1. Writing your own formula (3)

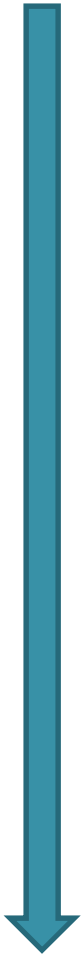
2. Precedence for mathematical operations in Excel

- If there are multiple operators in a formula, Excel will perform calculation for operators with the **higher precedence first**.
- If there are multiple operators with equal precedence, Excel will perform calculation from **left to right**.

Operation	Symbol
1. Parentheses	**( )**
2. Colon and Comma	**: and ,**
3. Additive Inverse	**-**
4. Percent	**%**
5. Power	**^**
6. Multiplication and Division	*** and /**
7. Addition and Subtraction	**+ and -**
8. Concatenation (for text)	**&**
9. Comparison	**=, <, >, <=, >=,<>**

Precedence

Highest



Lowest

1. Writing your own formula (5)

- Example:

  If the formula in cell A1 is **=15 – 3/2 – 1**, what is the result?

- Calculation steps:

  1. = 15 – 3/2 – 1
     = 15 – 1.5 – 1
  2. = 15 – 1.5 – 1
     = 13.5 – 1
  3. = 13.5 – 1 = 12.5

1. Writing your own formula (6)

- Another Example:

  If the formula in cell A2 is **= –22 + 2 * –1**, what is the result?

- Calculation steps:

  1. = –22 + 2 * –1
     = –22 + –2
  2. = –22 + –2
     = –24

1. Writing your own formula (7)

Exercise 1:

Follow these steps to calculate the final values, when the formula of the cell is **= 5^2 – 1 * (3/2)**

Steps:

1. = 5^2 – 1 * (3/2)
2. = 5^2 – 1 * 1.5
3. = 25 – 1 * 1.5
4. = 24 * 1.5
5. = 36

Question: Are the steps correct? If not, which one is not correct? And how to fix them?

1. Writing your own formula (8)

Steps:

1. = 5^2 – 1 * (3/2)
2. = 5^2 – 1 * 1.5
3. = 25 – 1 * 1.5
4. = 24 * 1.5
5. = 36

Incorrect

Corrections:

1. = 5^2 – 1 * (3/2)
2. = 5^2 – 1 * 1.5
3. = 25 – 1 * 1.5
4. = 25 – 1.5
5. = 23.5

1. Writing your own formula (9)

Exercise 2:

Follow these steps to calculate the final values, when the formula of the cell is **= 2^3^2/2^3*10**

Steps:

1. = 2^3^2/2^3*10
2. = 2^3^2/2^3*10
3. = 8^2/8*10
4. = 64/80
5. = 0.8

Question: Are the steps correct? If not, which one is not correct? And how to fix them?

1. Writing your own formula (10)

Steps:

1. =2^3^2/2^3*10
2. =2^3^2/2^3*10
3. =8^2/8*10
4. =64/80
5. =0.8

Incorrect

Corrections:

1. ==2^3^2/2^3*10
2. =2^3^2/2^3*10
3. =8^2/8*10
4. =64/8*10
5. =8*10
6. =80

1. Writing your own formula (11)

Exercise 3:

Follow these steps to calculate the final values, when the formula of the cell is **-15*-3^1*2**

Steps:

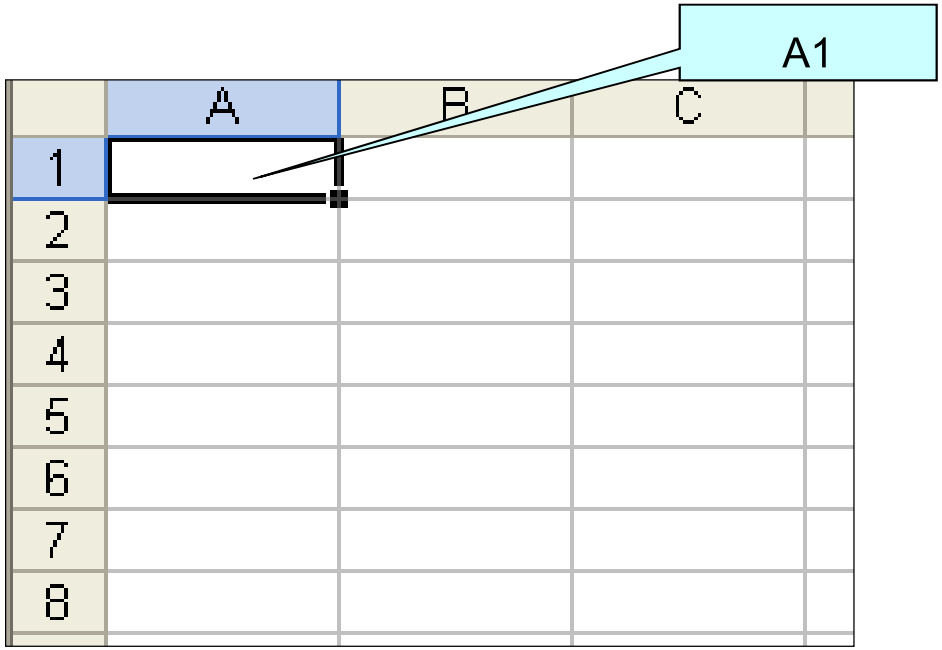
1. = -15*-3^1*2
2. = -15*-3*2
3. = 45*2
4. = 90

Question: Are the steps correct? If not, which one is not correct? And how to fix them?

The steps are correct, but equation symbol (=) is missing.

1. Writing your own formula (12)

3. Calculation with cell reference

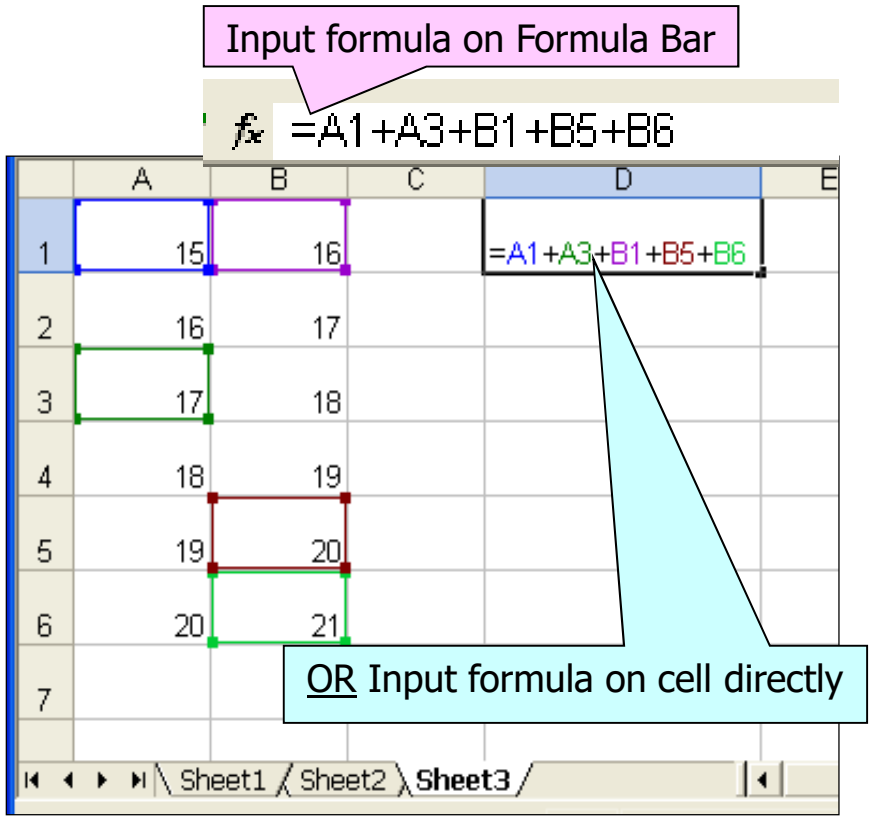


Notice: In Excel, cell name is **not** case-sensitive. That is *a1* will work like *A1*.

1. Writing your own formula (13)

- Example Fine the sum of cell A1, A3, B1, B5, and B6.

  Display the result at cell D1.



1. Click on the cell you want to display the result. (D1, in this case)
2. Type in the formula ***=A1+A3+B1+B5+B6***. This can be done in 2 ways:
   1. Type the formula directly to cell D1.
   2. Click on cell D1, then type in the formula at the formula bar.

   Notice Reference cells will have colored borders matching its color at the formula.
3. When you finish, press *Enter* key.

2. Using Function

Structure of a Function

=function_name(argument1, argument2m,…)

- Before we input something as an argument, we need to know what type of data the function will accept as an argument.
- You can input the data directly:

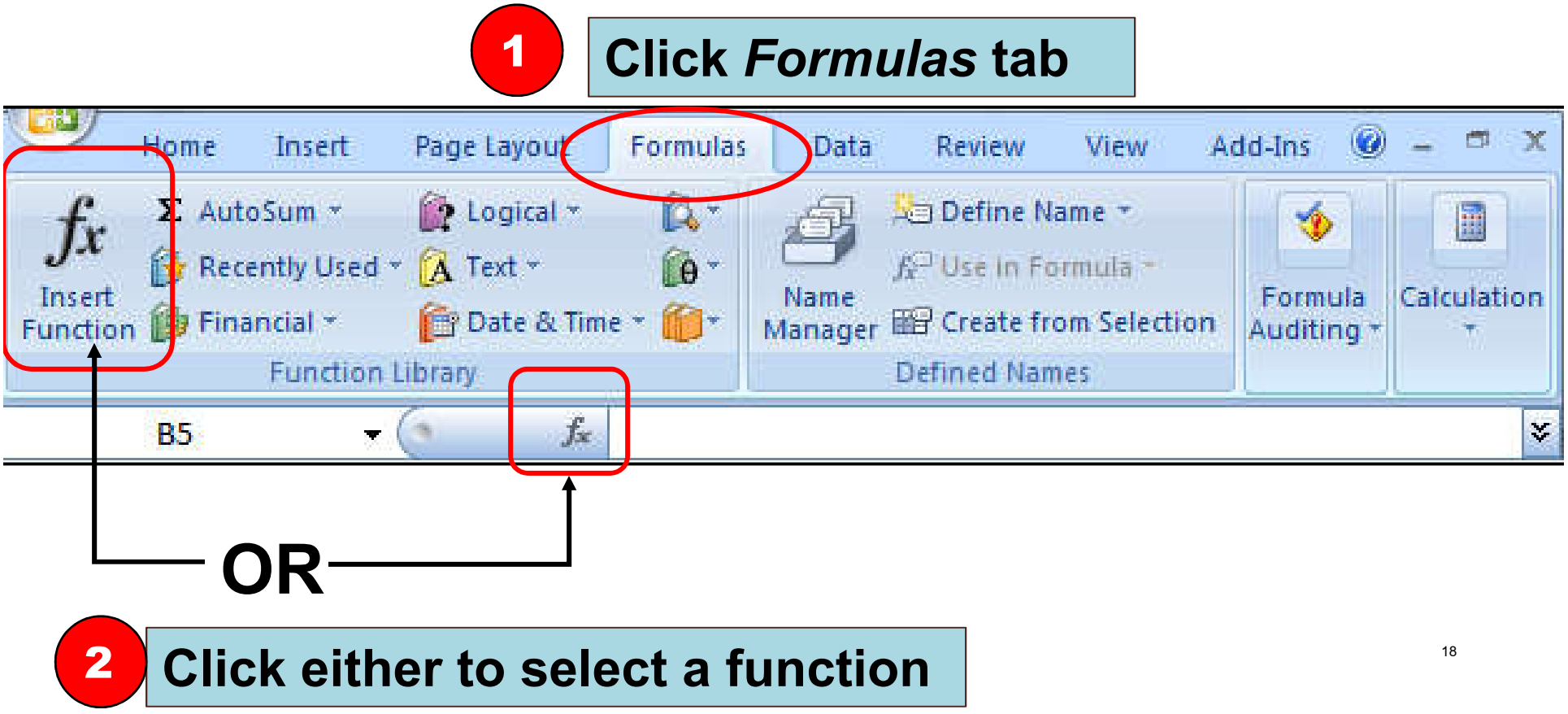
  =SUM(1700,9800,7200)

- Or use cell reference:

  =SUM(E4:E7)

2. Using Function (2)

1. Looking for a function in Excel

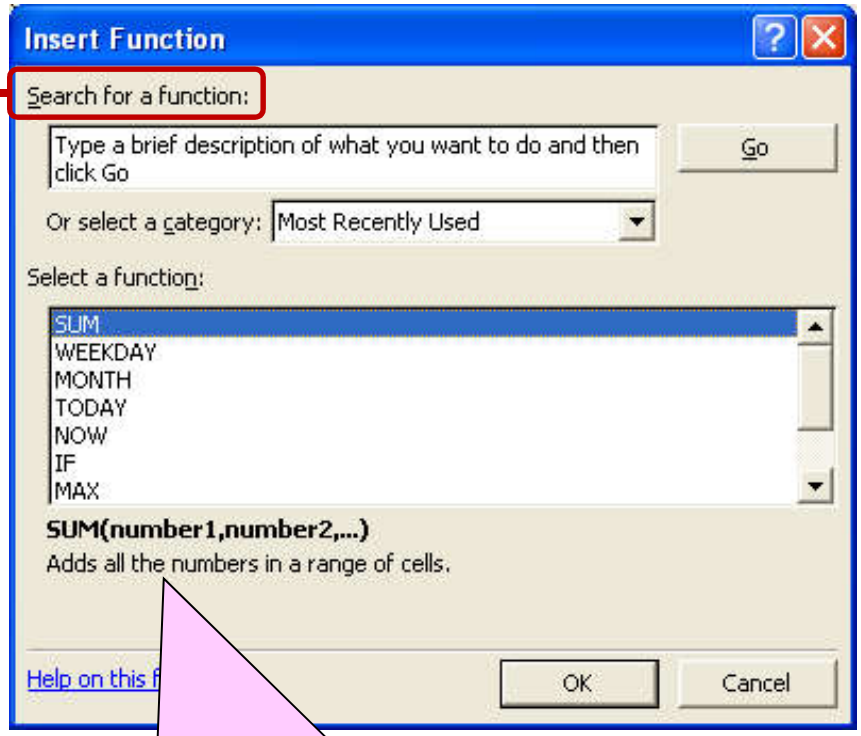


2. Using Function (3)

Search for a function:

- User can type in keywords and click *Go* to search for related functions.

  For example, type in *Summation* will result in SUM function appear in *Select a function:* box.



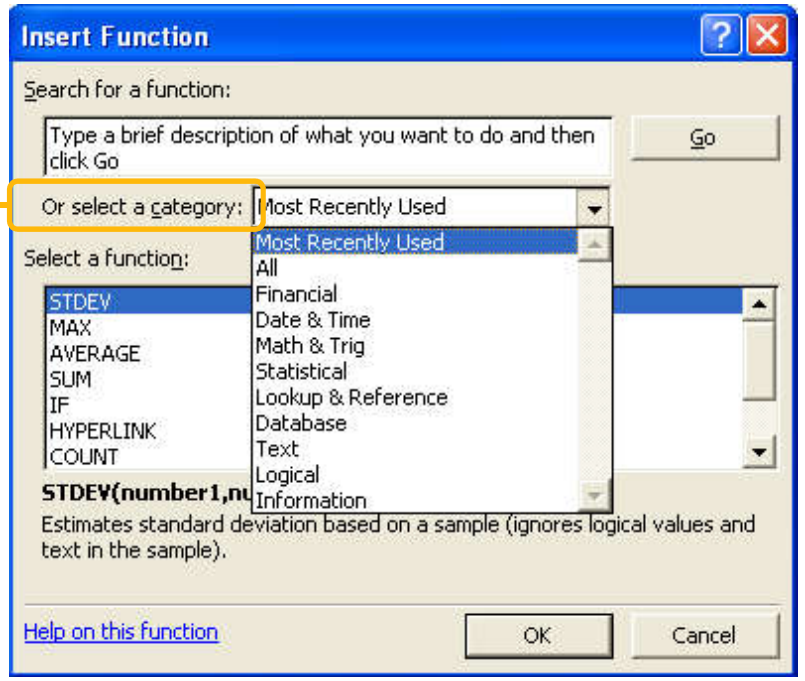
Show structure of function, arguments, and short description.

2. Using Function (4)

Or select a category:

Functions are grouped into categories such as *Accounting*, or *Statistics*.

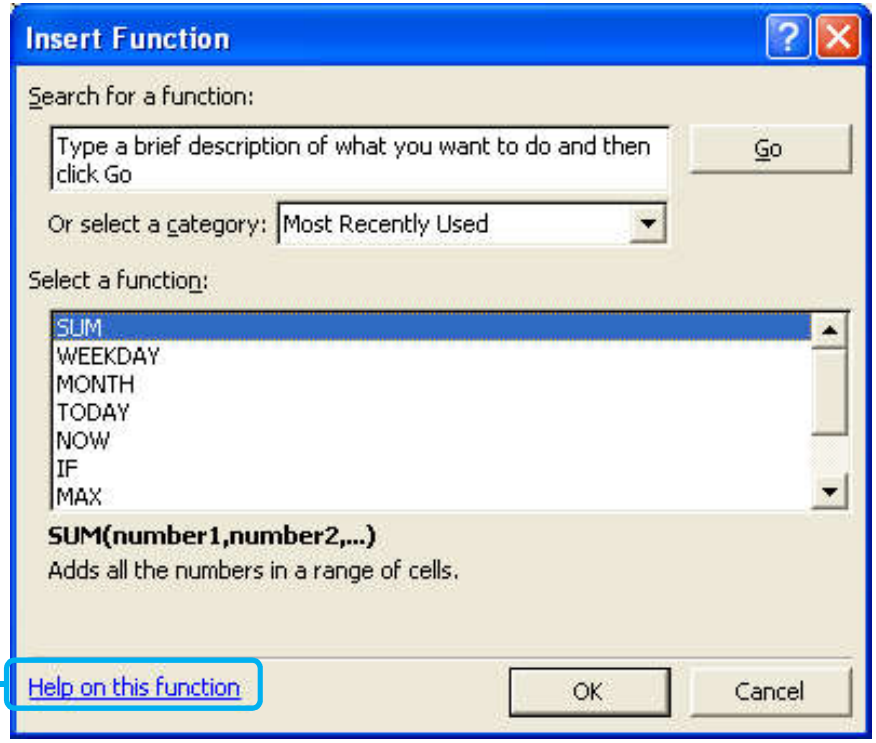
When you pick a category, functions under that category will appear under *Select a function:* box.



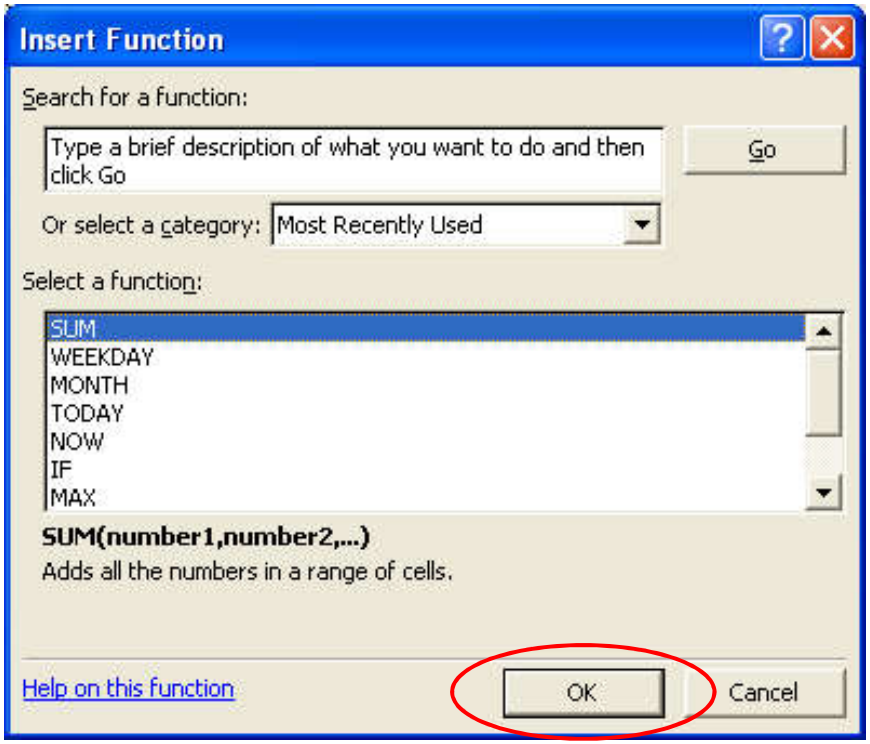
2. Using Function (5)

Help on this function

Display help text for selected function for better understanding.



2. Using Function (6)

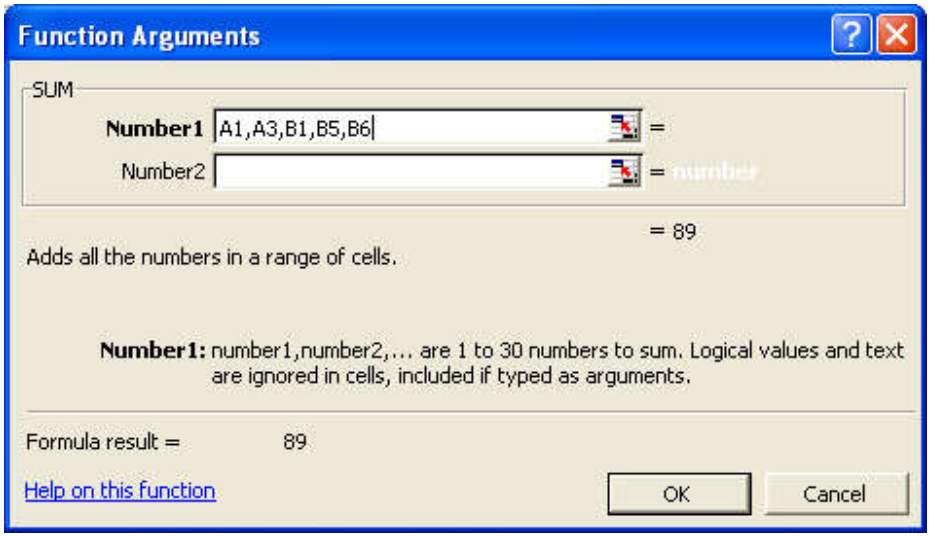


When you find the function you want, click *OK* to use the function.

2. Using Function (7)

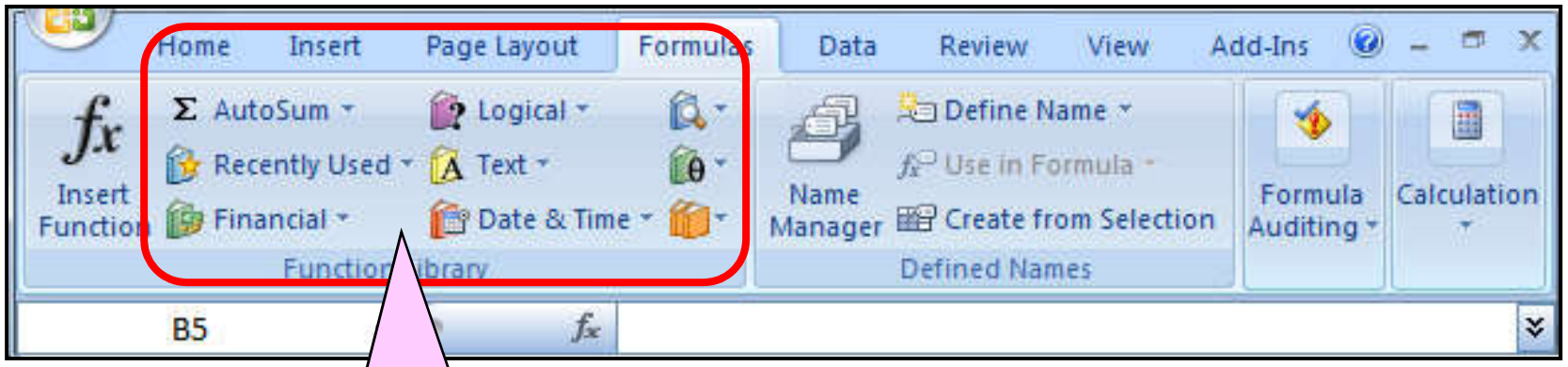
Calculating sum using SUM function

Example: We want to find the sum of cell *A1, A3, B1, B5* and *B6.*



1. Click on cell *D1*.
2. Click at  and then type *Summation* or *sum* in the search box, then click *Go.*
3. Look at the function list in *Select a function* box, a **SUM** function will appear. Click on **SUM** function.
4. Click OK. *Function Argument* dialog box will appear. Type in the cell names as shown.

2. Using Function (8)



You can also pick function from the categories under *Function Library* group, in *Formulas* tab.

2. Using Function (9)

Calculating sum using SUM function (cont.)

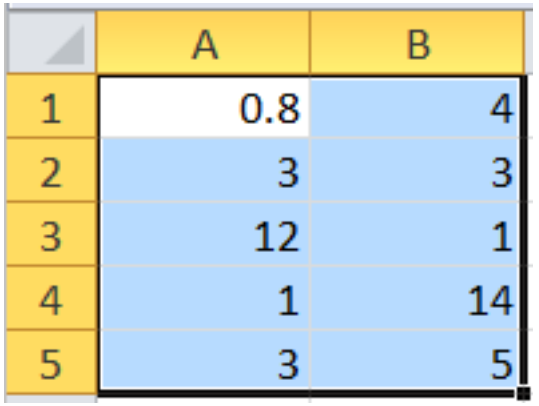
Example: We want to find the sum of cell *A1, A3, B1, B5* and *B6.*

5. Under *SUM*, type in the arguments in *Number1* box or *Number2* box. Even when we have more than 2 numbers, each box can take more than one. Use comma (,) to separate each value.
6. After you have typed in all arguments, click *OK.*
7. When you click on cell *D1*, the function and the arguments will appear in the formula bar.

2. Using Function (10)

2. Using Range of Data

You can specify the range of data by using colon symbol (:) in this format:



	A	B
1	0.8	4
2	3	3
3	12	1
4	1	14
5	3	5

Starting_Cell:Ending_Cell

Where *Starting_cell* is the top left corner of the group, and Ending_Cell is the bottom right corner.

Example: If you want to add all cells from *A1* to *B5*, you can write the formula as **=SUM(A1:B5)**

2. Using Function (11)

3. Functions you should know

3.1 Functions for basic calculations

- SUM for getting adding all of selected cells
- MAX for finding the maximum value of selected cells
- MIN for finding minimum value of selected cells
- AVERAGE for finding average value of selected cells

2. Using Function (12)

3. Functions you should know (2)

3.2 Functions for date/time information

- NOW displays current system date/time
- TODAY displays current system date
- DAY displays day part of date argument
- MONTH displays month part of date argument
- YEAR displays year part of date argument
- WEEKDAY displays weekday of the date argument. Return 1 (Sunday) – 7 (Saturday)

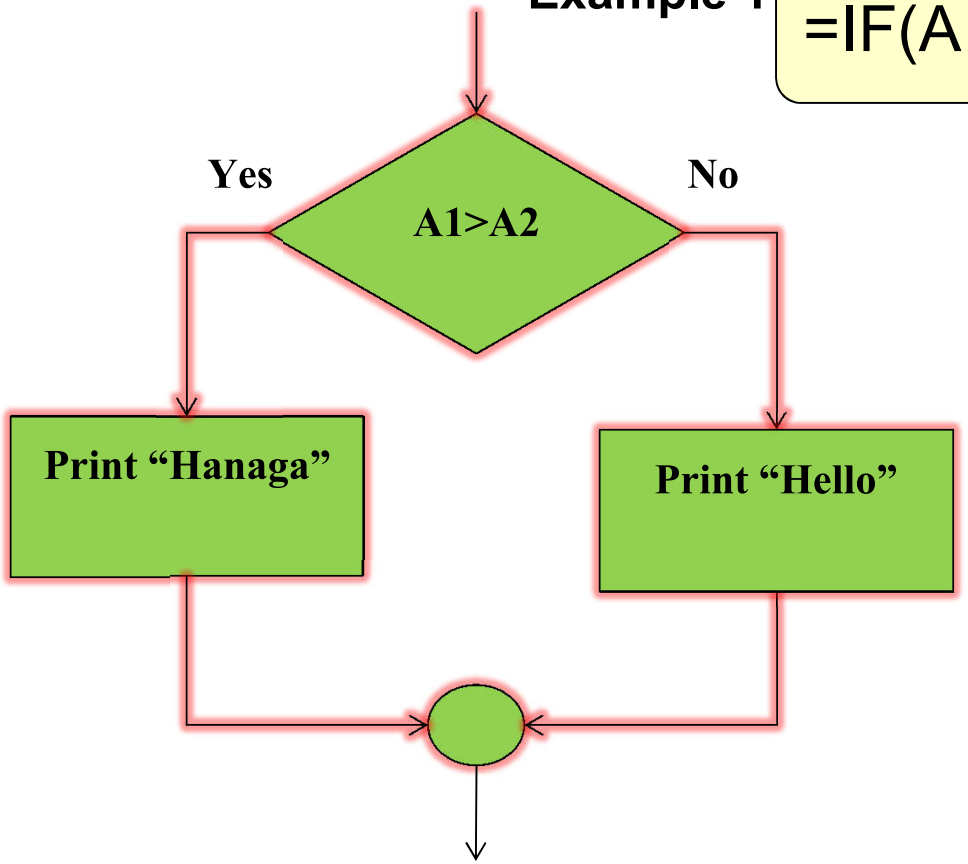
2. Using Function (12)

3. Functions you should know (3)

3.3 IF function for logical computation

Example 1

=IF(A1>A2, “Hanaga”, “Hello”)



If A1 > A2

Print “Hanaga”

Else

Print “Hello”

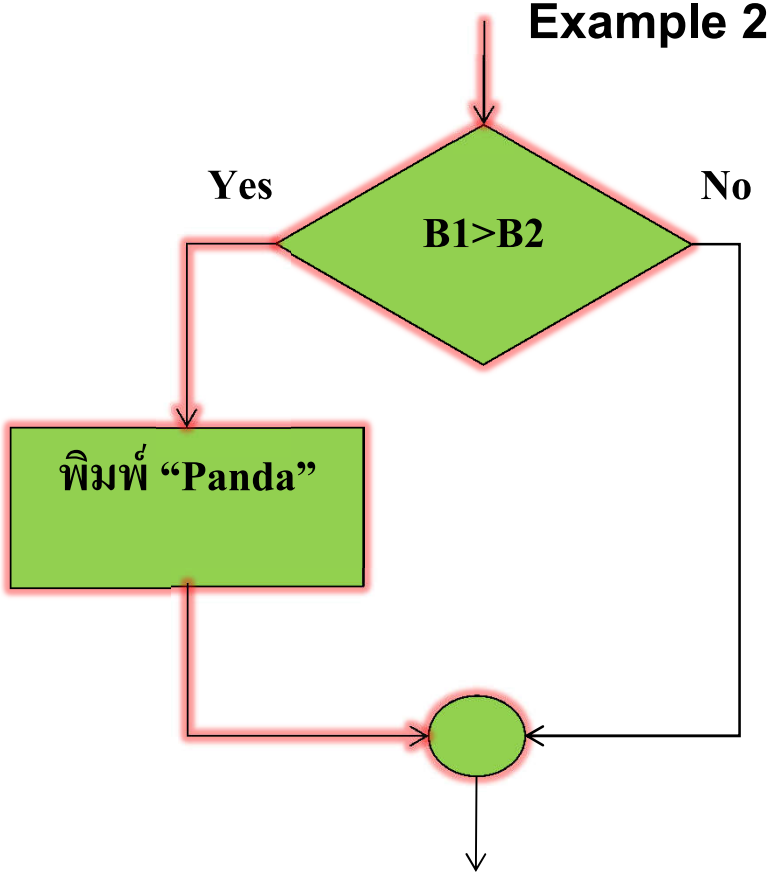
2. Using Function (13)

3. Functions you should know (4)

3.3 IF function for logical computation (2)

Example 2

=IF(B1>B2, “Panda”)



If B1 > B2

Print “Panda”

Else

Excel will print “FALSE”

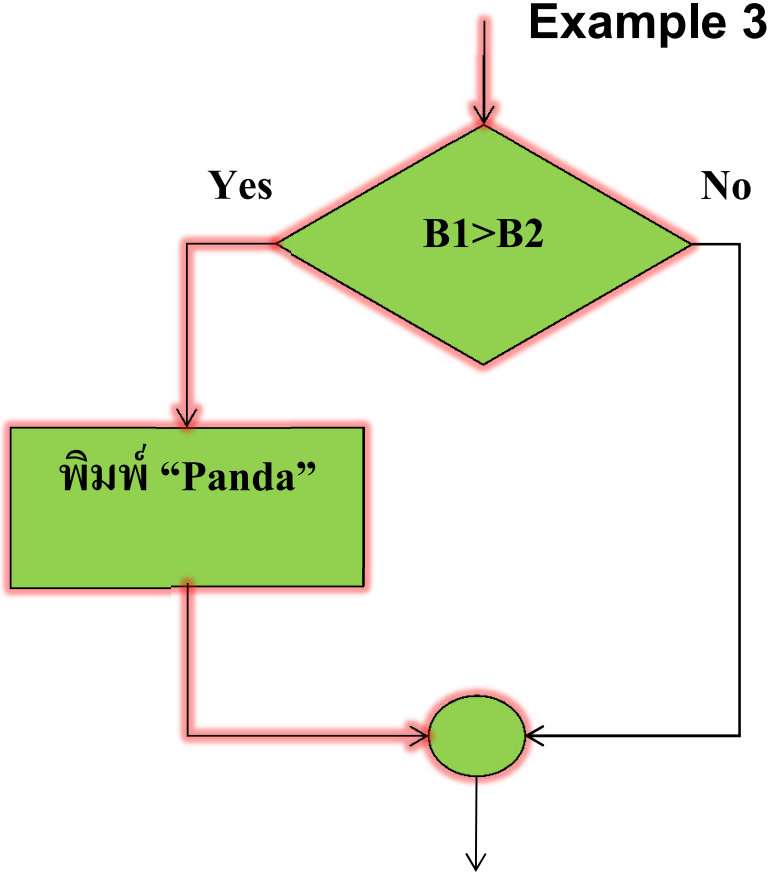
2. Using Function (14)

3. Functions you should know (4)

3.3 IF function for logical computation (2)

Example 3

=IF(B1>B2, “Panda”, “”)



If B1 > B2

Print “Panda”

Else

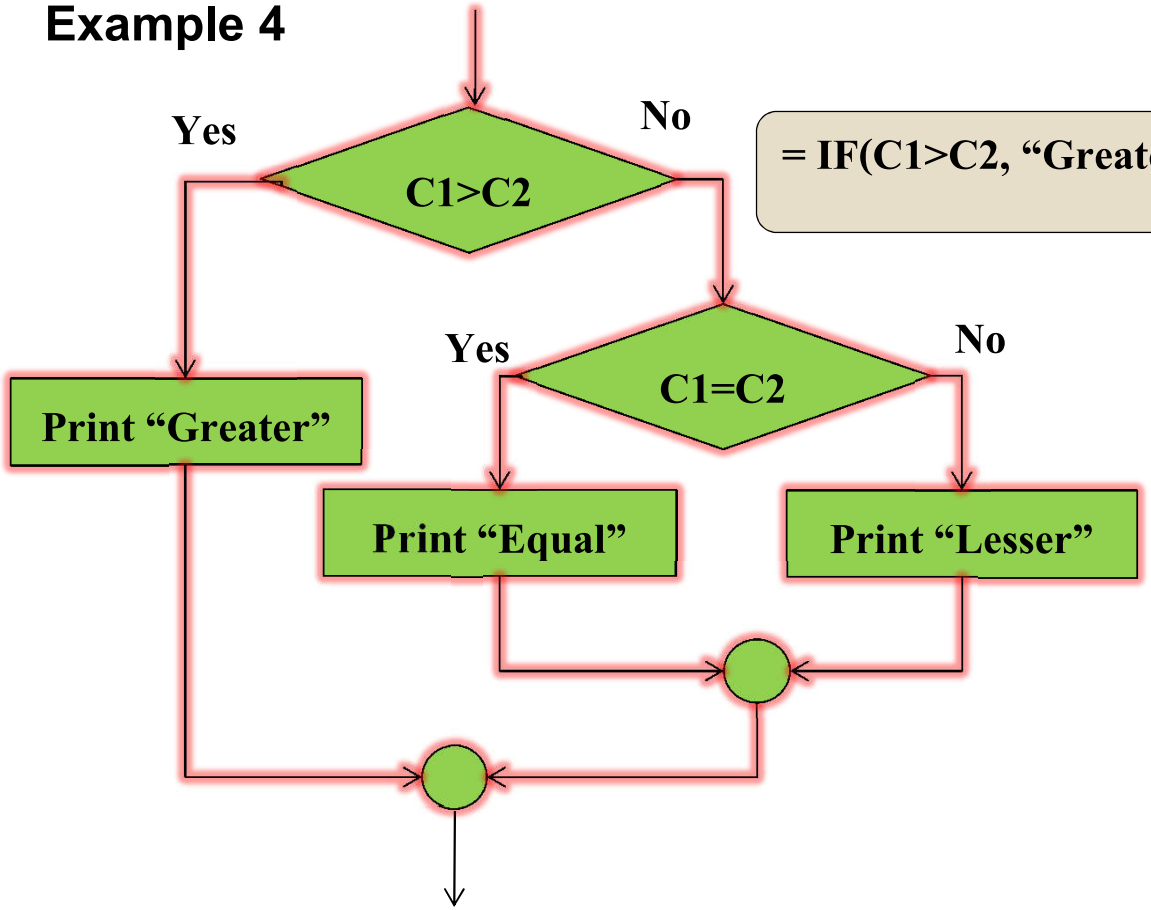
Nothing will be printed

2. Using Function (15)

3. Functions you should know (5)

3.3 IF function for logical computation (3)

Example 4



= IF(C1>C2, "Greater", IF(C1=C2,"Equal", "Lesser"))

```
If C1 > C2
        Print "Greater"
Else
        If C1 = C2
                Print "Equal"
        Else
                Print "Lesser"
```

2. Using Function (16)

Example: Grading

	A	B	C
1	ID	Point	Grade
2	1	51	
3	2	65	
4	3	98	
5	4	76	
6	5	87	
7	6	25	

Range	Grade
80 - 100	A
60 - 79	B
40 - 59	C
0 - 39	F

=IF(B2>=80,"A",IF(B2>=60,"B",IF(B2>=40,"C","F")))

2. Using Function (17)

3.4 Comparison Operators

Greater Than	>
Greater or equal to	>=
Less than	<
Less than or equal to	<=
Not equal	<>

2. Using Function (18)

3. Functions you should know (6)

3.5 Counting functions

- COUNT counts cell in range that contains number.
- COUNTA counts cell in range that is not empty.
- COUNTIF counts cell in range that fit given condition.

2. Using Function (19)

3. Functions you should know (7)

3.5 Counting functions (2)

Example

	A
1	15
2	5
3	abc
4	
5	"20"
6	
7	

Formula	Result
= COUNT (A1:A5)	2
=COUNTA(A1:A5)	4
=COUNTIF(A1:A5,15)	1
=COUNTIF(A1:A5,abc)	0
=COUNTIF(A1:A5, “abc”)	1

2. Using Function (20)

3. Functions you should know (8)

- AND(argument1, argument2) will return TRUE if **both** arguments are TRUE, and return FALSE otherwise.
- OR() will return TRUE if **at least one of the two** arguments is TRUE, and return FALSE if **both** arguments are FALSE.

2. Using Function (21)

- AND() and OR() can be use to make IF() function conditions easier to write.
- Example: If you want to know if the value of cell B3 is in the range of 0 and 10 or not.
- You can use:
  - IF(AND(B3 >= 0, B3 <=10), “Yes”, “No”)
- Or you can use:
  - IF(OR(B3 < 0, B3 > 50), “No”, “Yes”)

3. Cell Reference

- Cell Reference is using cell name to get to cell data.
- There are two ways to reference a cell in Excel
    1. Relative Reference
    2. Absolute Reference

3. Cell Reference (2)

3.1 Relative Reference

- Default reference
- When you copy the reference to another cell, the reference will change, but formula remain the same.

3. Cell Reference (3)

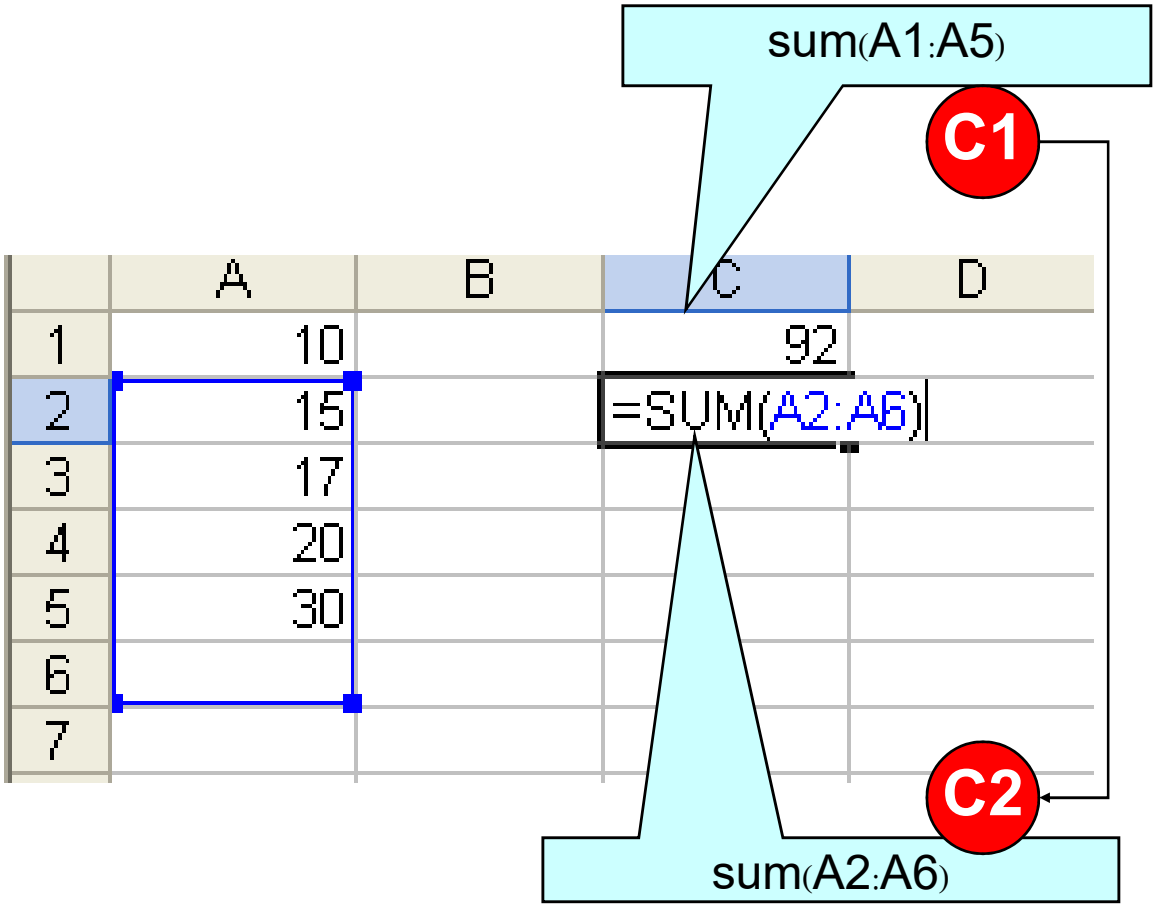
3.1 Relative Reference (2)

Example: Formula is on cell *C1.* The formula is the sum of 5 consecutive cells *A1* to *A5.* The formula is **=sum(A1:A5)**

	A	B	C
1	10		=sum(a1:a5)
2	15		
3	17		
4	20		
5	30		
6			

3. Cell Reference (4)

3.1 Relative Reference (3)



When you copy formula with relative reference to cell *C2*. The reference will change. Since C2 is one row down from C1, all relative reference will move down one row as well. The resulting formula will be **=sum(A2:A6)**

3. Cell Reference (5)

3.2 Absolute Reference

- For absolute reference, the reference will not change regardless of where it is copied to.
- We use dollar sign ($) to mark the reference as absolute reference.
- When the $ is in front of the row part of the cell name, row will not change. Same applies to column.

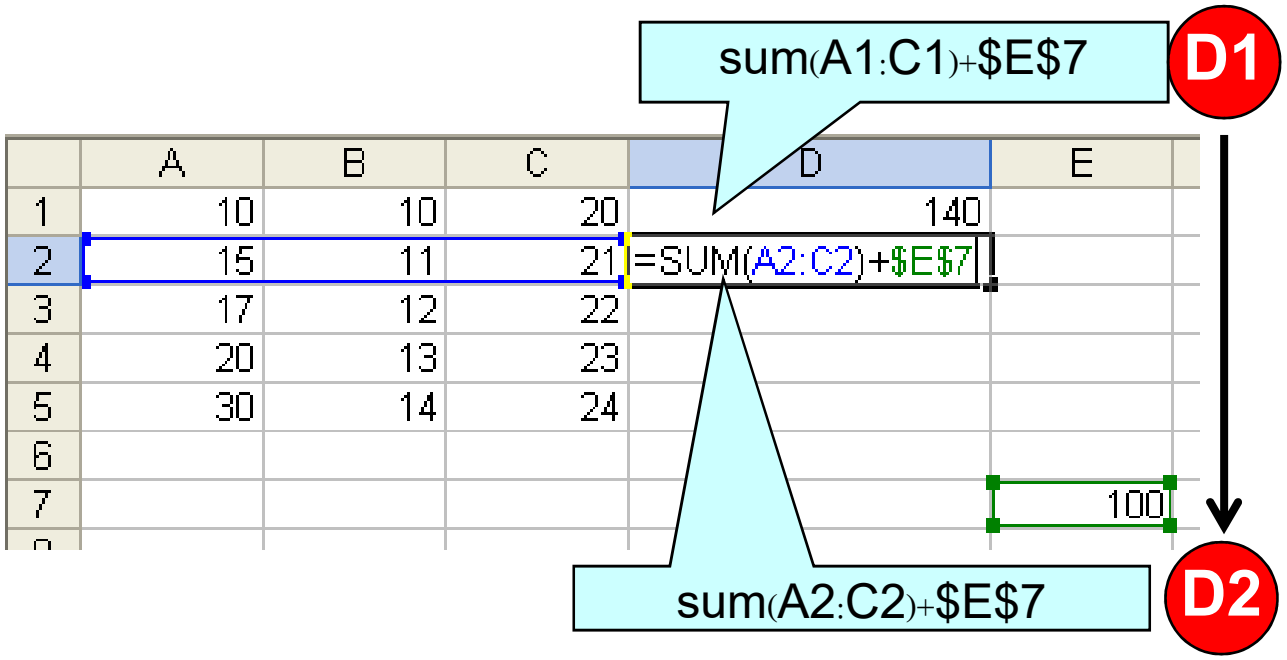
3. Cell Reference (6)

3.2 Absolute Reference (2)

- For example, if you want the column to be **A** regardless of where you copy it to, use **$A1**
- If you want column changing, but also want to the row to always be 2, use **A$2**
- If you want column to always be A and row to always be 1, use **$A$1**
- You can select the reference, then press **F4** to toggle between absolute and relative reference.

3. Cell Reference (7)

3.2 Absolute Reference (3)



	A	B	C	D	E
1	10	10	20	140	
2	15	11	21	=SUM(A2:C2)+$E$7	
3	17	12	22		
4	20	13	23		
5	30	14	24		
6					
7					100

- You want to add fixed value at cell E1 to sum of column A, B, C in a row and put the result on column D. The formula at D1 will be

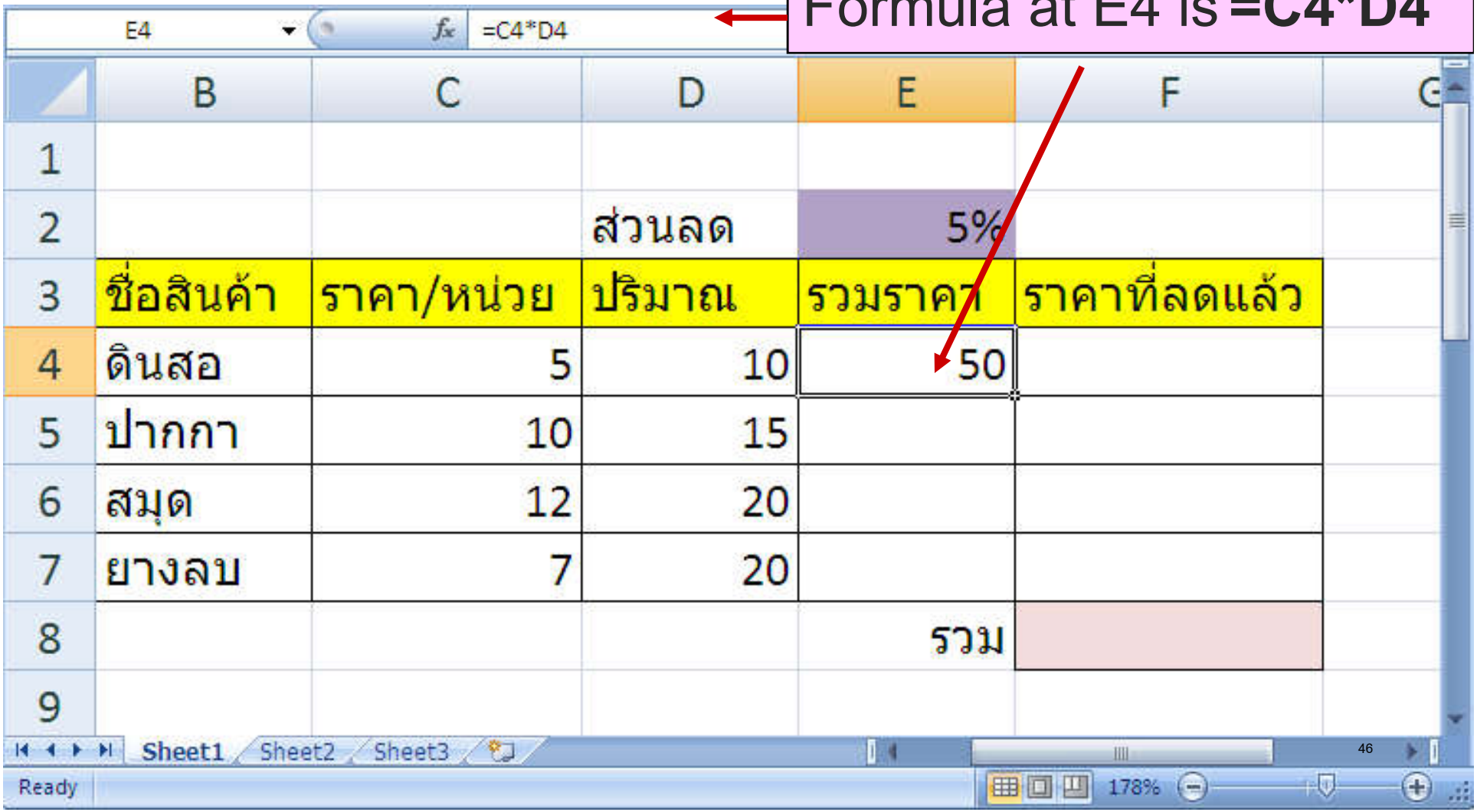
= sum(A1:C1) + $E$7

- When you copy the formula to D2, it will become

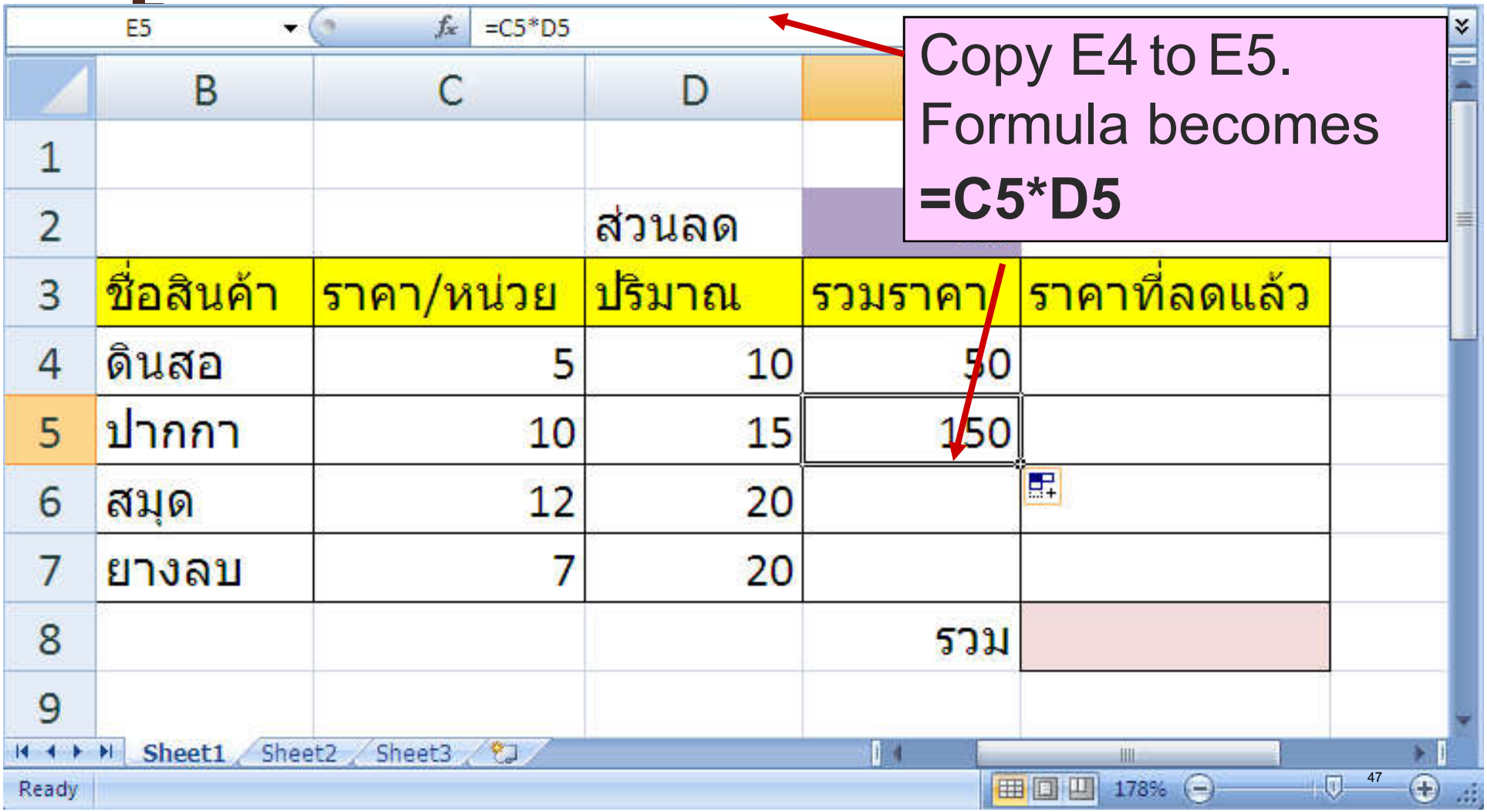
= sum(A2:C2) + $E$7

Example of Relative Reference

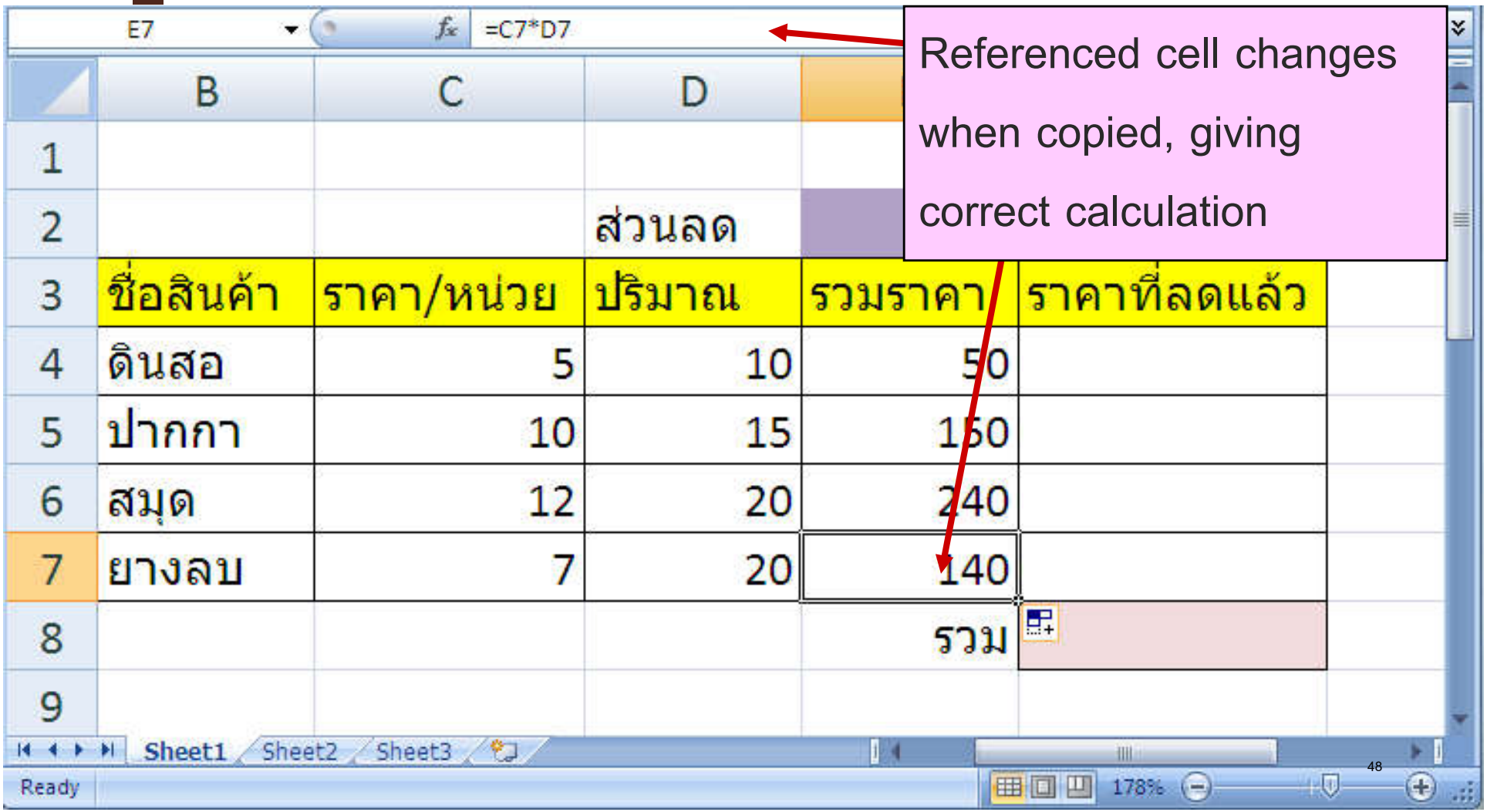
Formula at E4 is **=C4*D4**



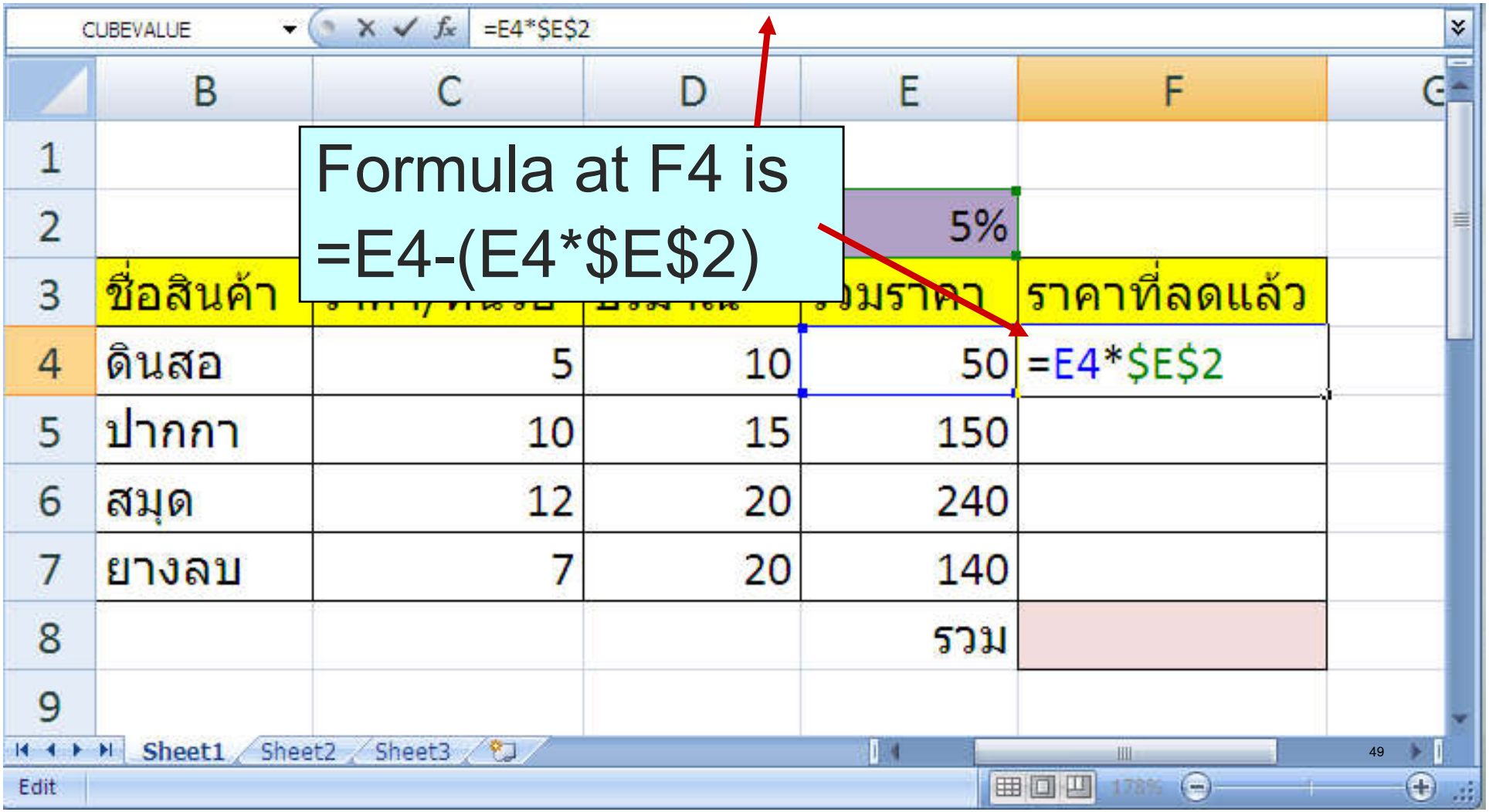
Example of Relative Reference (2)



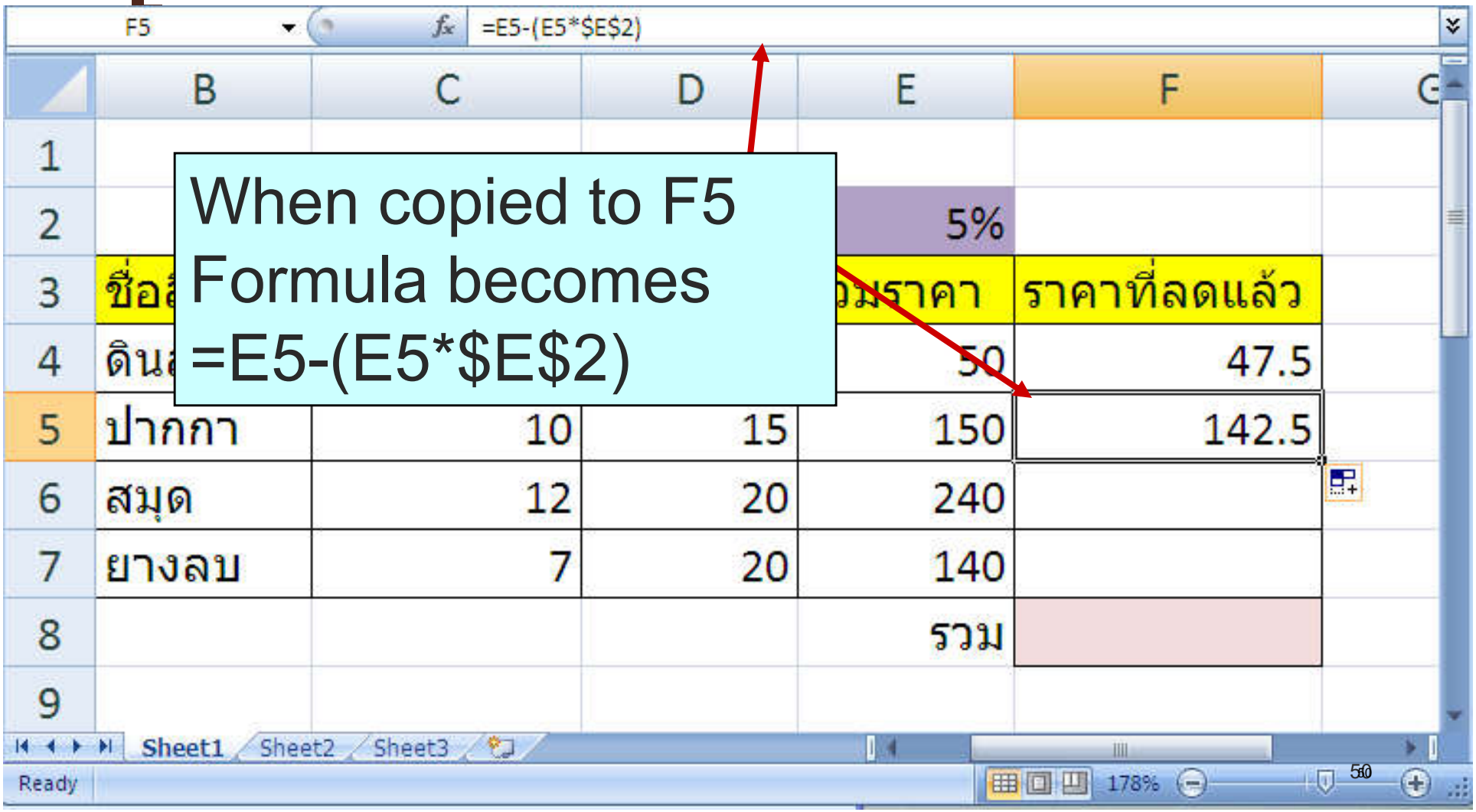
Example of Relative Reference (3)



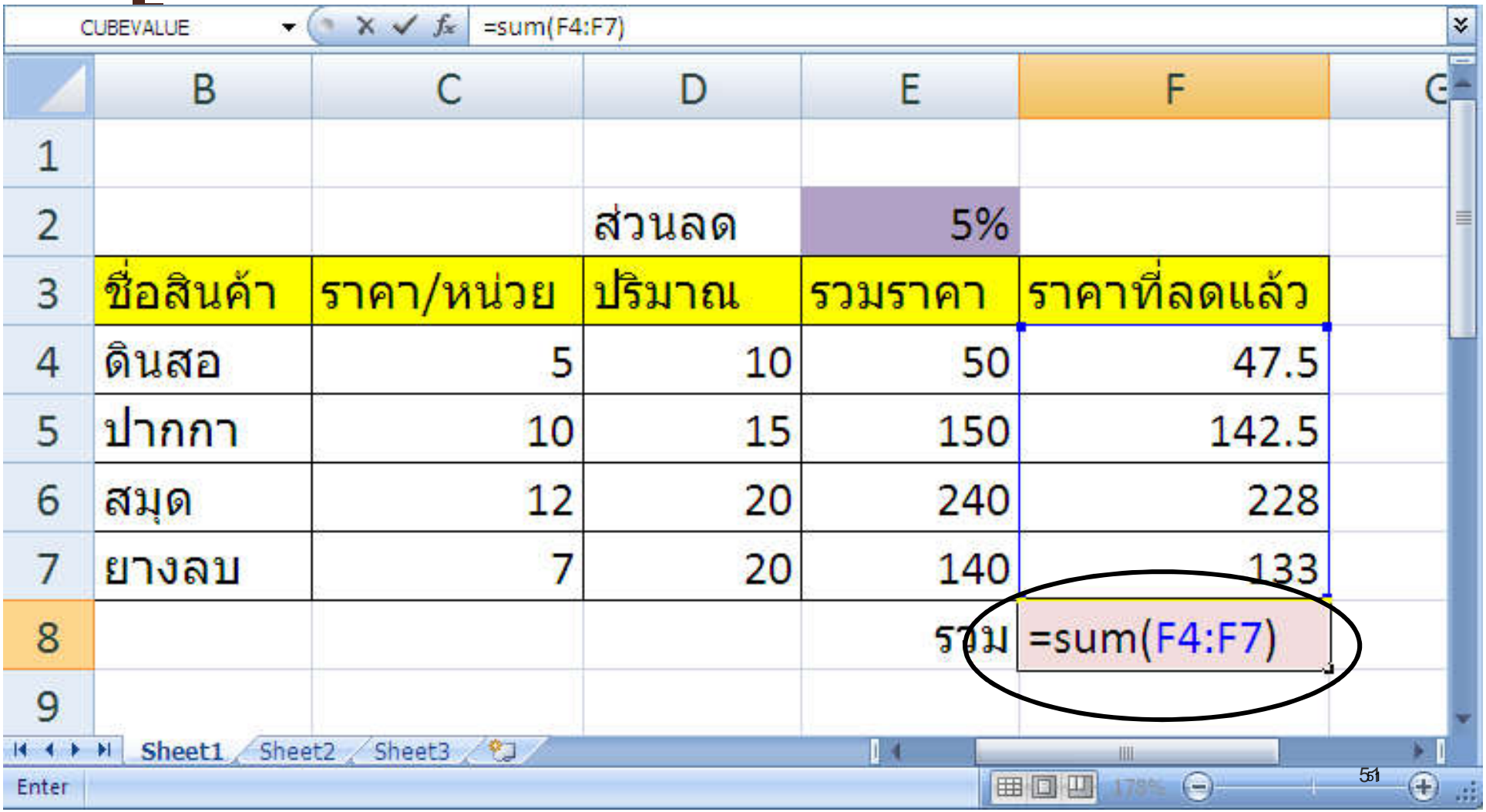
Example of Absolute Reference



Example of Absolute Reference (2)



Example of Reference by Range



4. Reference from Other Worksheet

If you want to access values in cells in other worksheet, they can be referenced as follows:

worksheet_name!range_of_cells

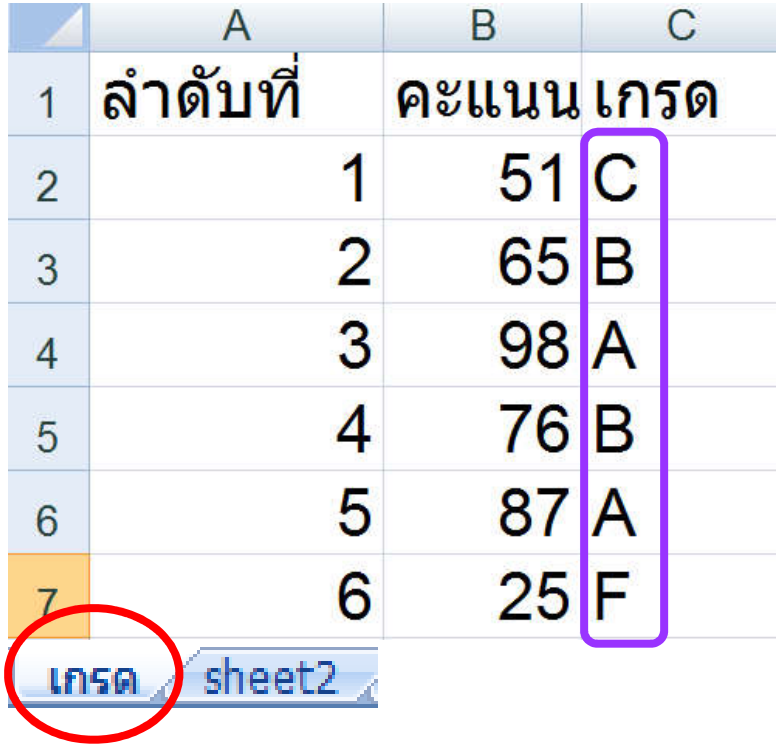
Naming Cells

- You can assigned a group of cells with a name, making referencing easier.
- Cell name can be referenced from other worksheet as well.

- Steps:
  1. Select cells
  2. Click the name box
  3. Type in the name
  4. Press Enter

4. Reference from Other Worksheet (2)

Example We want to count student with A for grade, which is in cell *C2* to *C7*, and display the result at cell *B2*, on another worksheet, *Sheet2*.



	A	B	C
1	ลำดับที่	คะแนน	เกรด
2	1	51	C
3	2	65	B
4	3	98	A
5	4	76	B
6	5	87	A
7	6	25	F

เกรด | sheet2

4. Reference from Other Worksheet (3)

	A	B	C
1	ลำดับที่	คะแนน	เกรด
2	1	51	C
3	2	65	B
4	3	98	A
5	4	76	B
6	5	87	A
7	6	25	F

เกรด | sheet2

1. Click at *sheet2* on worksheet tab.
2. Click cell *B2* on *sheet2*. Then type the formula

   =COUNTIF(เกรด!C2:C7, “A”)

3. Press *Enter* to finish the formula. The result will appear.

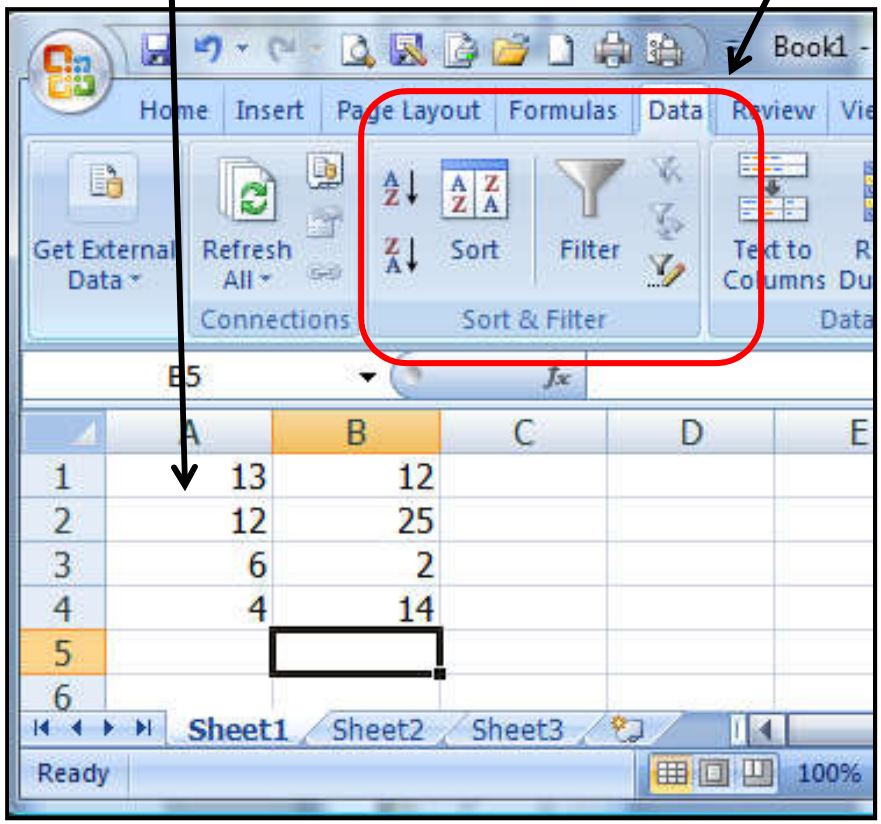
	A	B	C	D	E	F
1	A	=COUNTIF(เกรด!$C$2:$C$7,"A")				
2	B	2				
3	C	1				
4	F	1				

เกรด | sheet2

5. Sorting

1 **Type in data**

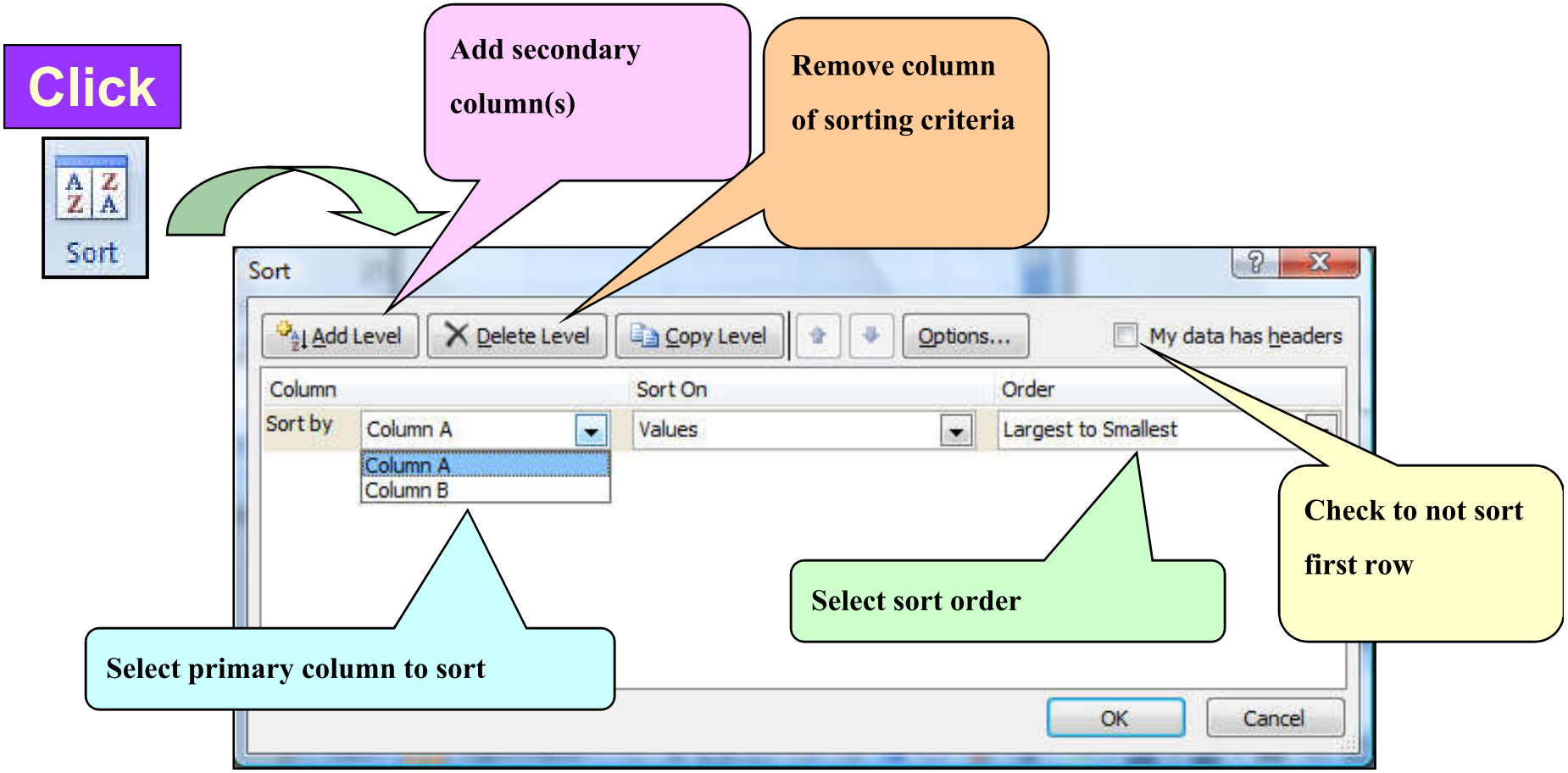
2 Click *Data* tab



- **Ascending Sort (small to large)**
- **Descending Sort (large to small)**
- **Select your own criteria**

5. Sorting (2)

1. Select primary column to sort [Sort by]



5. Sorting (3)

2. Select Secondary Column [Then by]

Click