Microsoft Excel 2016

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204100 IT AND MODERN LIFE

Outline

1. Excel Basics
2. Calculation and Formula
3. Charts
4. Other Spreadsheet Works on Excel

2. Calculation and Formula

2.1 Writing a Formula in Excel

1) Precedence of Mathematical Operations
2) Using Cell Reference in Formula
3) Error Messages from Using Formula

2.2 Functions in Excel

1) Using Functions in Excel
2) Using Range of Data in Function
3) Examples of Functions in Excel

2.3 IF Functions

2.4 Cell References

1) Relative Cell Reference
2) Absolute Cell Reference

2.5 Referencing Cells in Another Worksheet

2.1 Writing a Formula in Excel

- **Components of a Formula in Excel**
  - **A formula always starts with equal sign (=), to let Excel knows that this cell contain a formula.**
  - **Mathematical operators such as +, -, *, /**
  - **Numbers, cell references, and/or functions.**

- **Mathematical Operators**

Symbol	Operators	Example
+	Addition	=71+12
-	Subtraction	=15-5
*	Multiplication	=8*3
/	Division	=15/5
- (in front of a number)	Negative value	=-10
^	Power	=5^3

2.1.1 Order of Precedence

- In a formula with multiple operators, the order of precedence will tell you which one will be performed first, from higher precedence to lower precedence.
- In case of Parenthesis (()) the part inside the parenthesis will be performed first.
- In case with two operators with the same precedence, excel will perform calculation from left to right.

2.1.1 Order of Precedence

Order of Precedence	Symbols
1. Parenthesis	( )
2. Semicolon and comma (for cell reference)	: and ,
3. Negation	-
4. Percent	%
5. Power	^
6. Multiplication and Division	* and /
7. Addition and Subtraction	+ and -
8. Concatenation (for text)	&
9. Comparison	=, <, >, <=, >=,<>

2.1.1 Order of Precedence

Example formula and order of Precedence

Formula	Order of Operations
=3*4/2	= 12/2 = 6
=15-3/2-1	= 15-(3/2)-1 =15-1.5-1 =12.5
=-20+2*-1	= -20+(2*-1) =-20 + -2 =-22

2.1.1 Order of Precedence

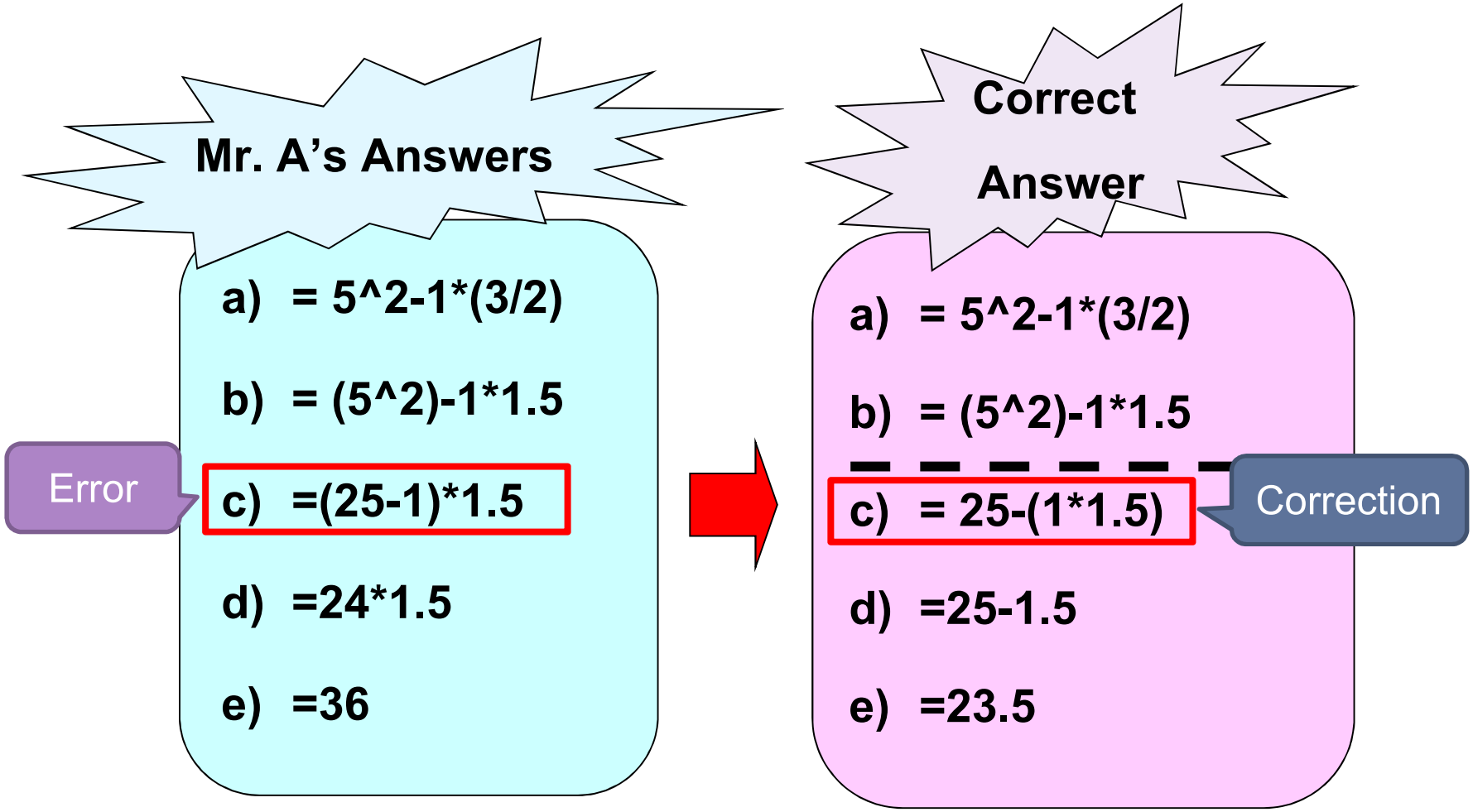
Example 1. **If we put formula =5^2-1*(3/2) on cell A1**

Mr. A tried to perform calculation by himself, to see how Excel works. He calculated the results using the following steps.

a) = 5^2-1*(3/2)
b) = (5^2)-1*1.5
c) =(25-1)*1.5
d) =24*1.5
e) =36

Question: **Are these steps correct? If not, where did they go wrong, and how can we correct it?**

2.1.1 Order of Precedence



2.1.1 Order of Precedence

Example 2. If we put formula =2^3^2/2^3*10 on cell B1

Ms. B tried to perform calculation by himself, to see how Excel works. She calculated the results using the following steps.

a) = 2^3^2/2^3*10

b) = (2^3)^2/(2^3)*10

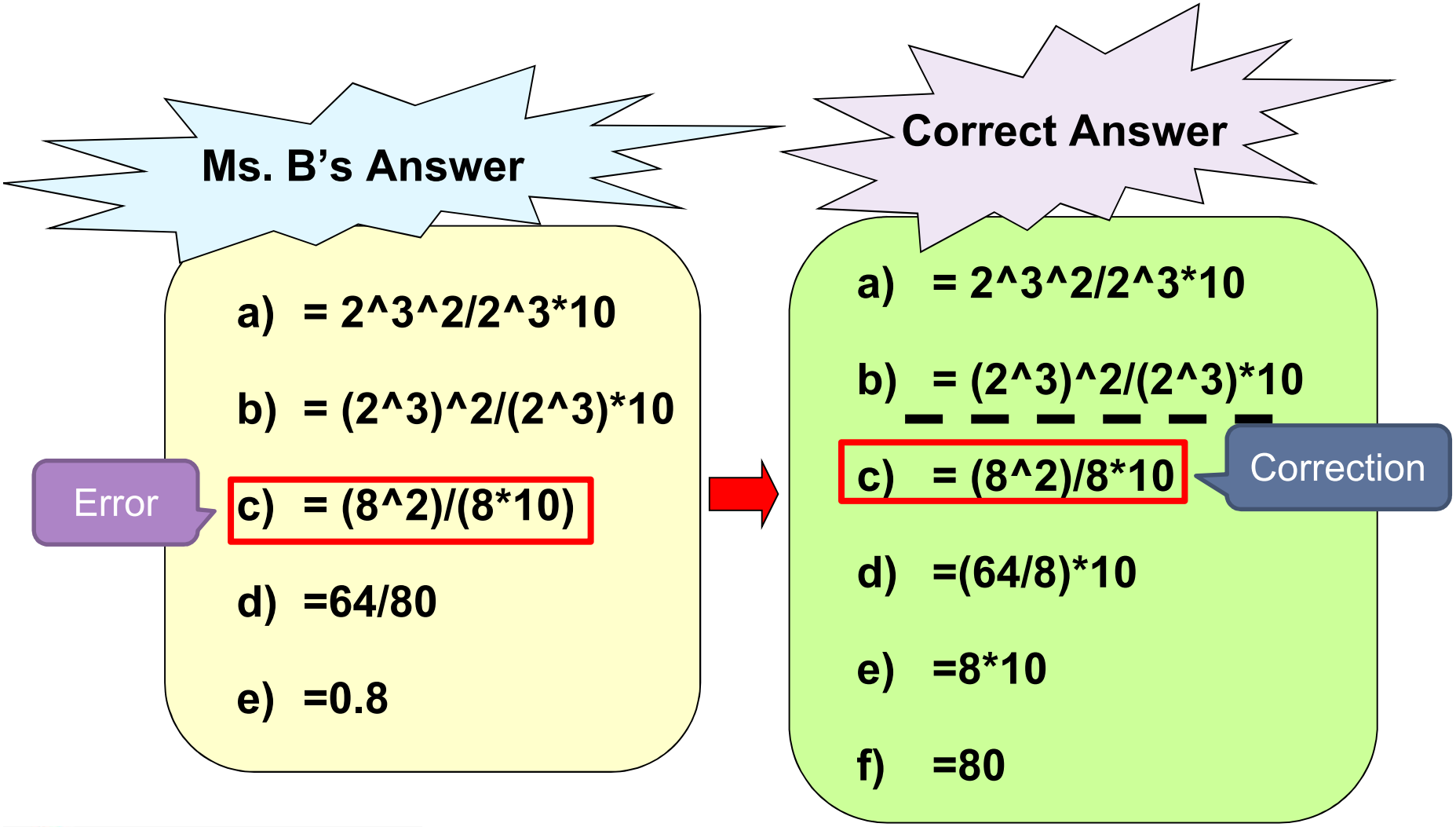
c) = (8^2)/(8*10)

d) =64/10

e) =6.4

Question: Are these steps correct? If not, where did they go wrong, and how can we correct it?

2.1.1 Order of Precedence



2.1.2 Using Cell Reference

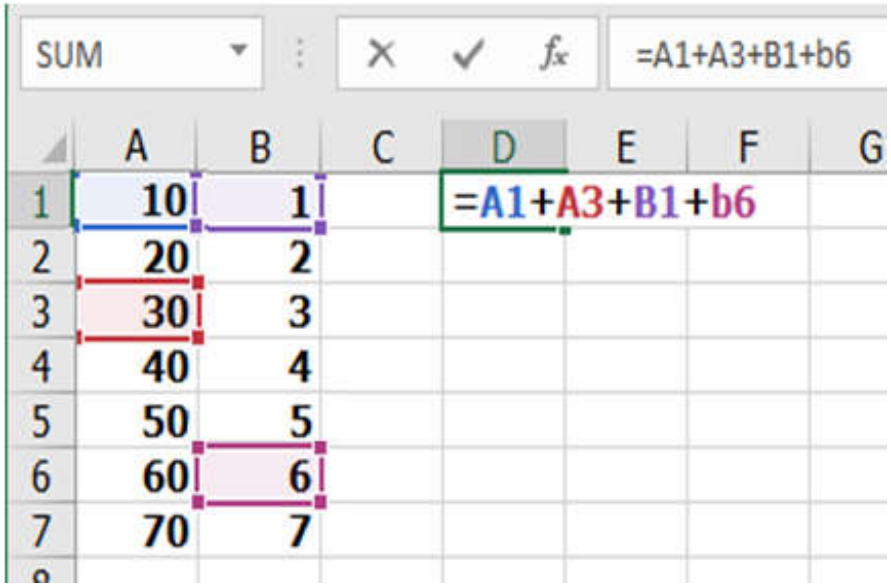
- In term of cell name and function name, Microsoft Excel is case-insensitive, it treats capital letter (A) and lowercase letter (a) as the same.
- When you reference a cell, a color box will appear around the cell with the same color as the cell name.

Example We want to find the sum of values on cells A1, A3, B1, and B6 and put it on cell D1

(1) Click cell D1

(2) Type =A1+A3+B1+b6

(3) Press Enter to finish the formula



2.1.3 Error Messages from Formula

(1) #DIV/0! Division by zero

- For example, =A1/B1 While the value of B1 is 0.

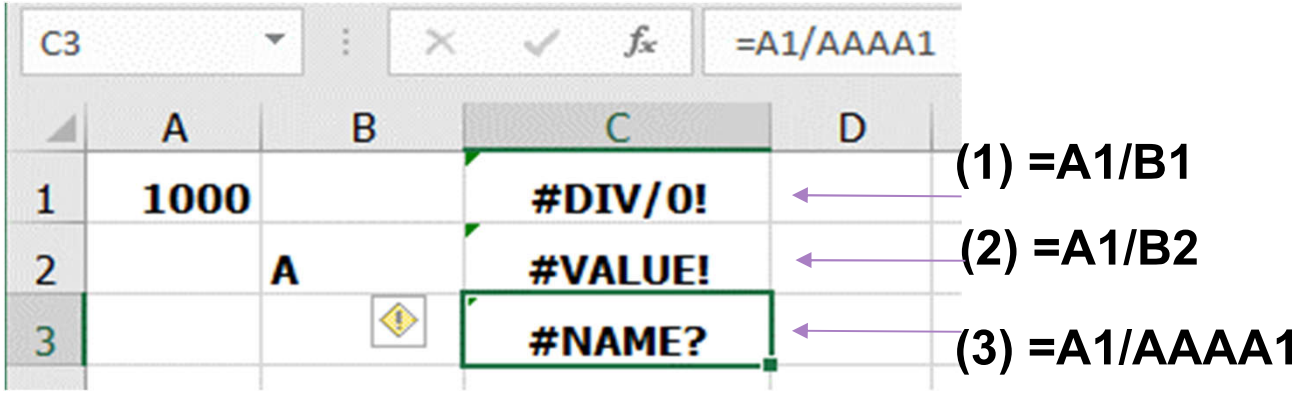
(2) #VALUE! Wrong type in a function

- For example, =A1/B2 While the values of A1 and/or B2 are Text

(3) #NAME? Wrong cell or function name

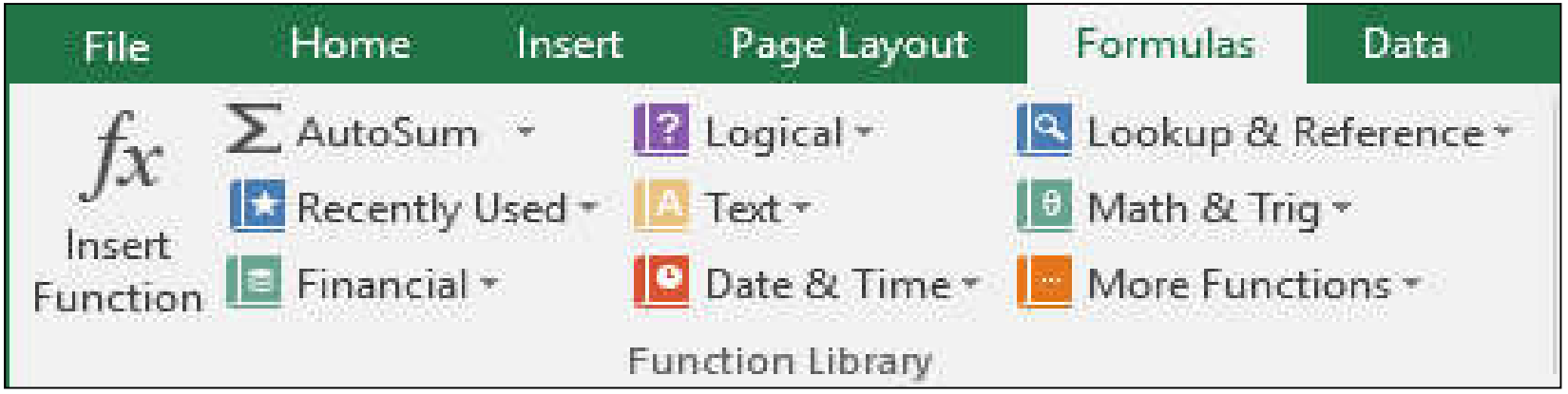
- For example, =A1/AAAA1

(There is also ########, which will occur when the cell isn't wide enough.)



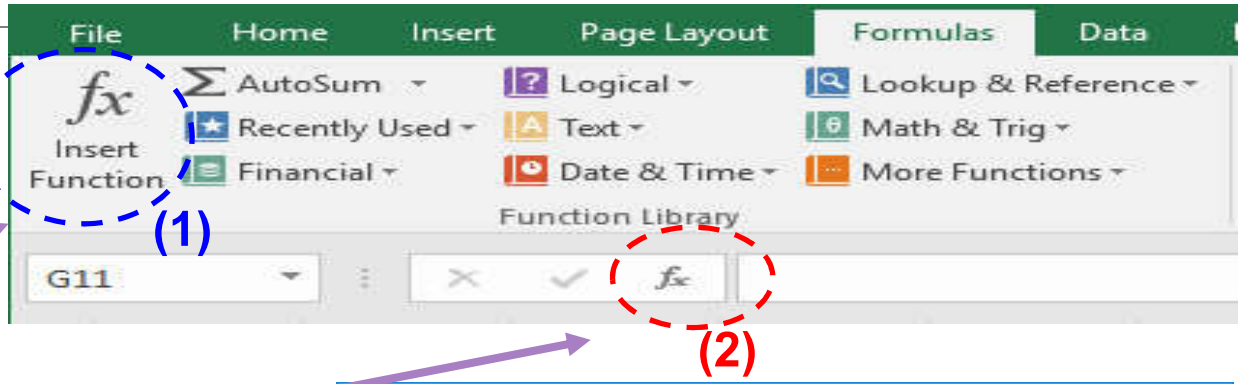
2.2 Functions in Excel

Functions are provided formulas for various purposes. For examples, SUM for finding summation, MIN for finding minimum value. Microsoft Excel has provided and groups these functions for ease of use under Function Library group in Formulas tab.



2.2.1 Using Functions in Excel

(1) Click Formulas tab, the click *fx* Insert Function button.



(2) Or Click f_x button at the formula bar.

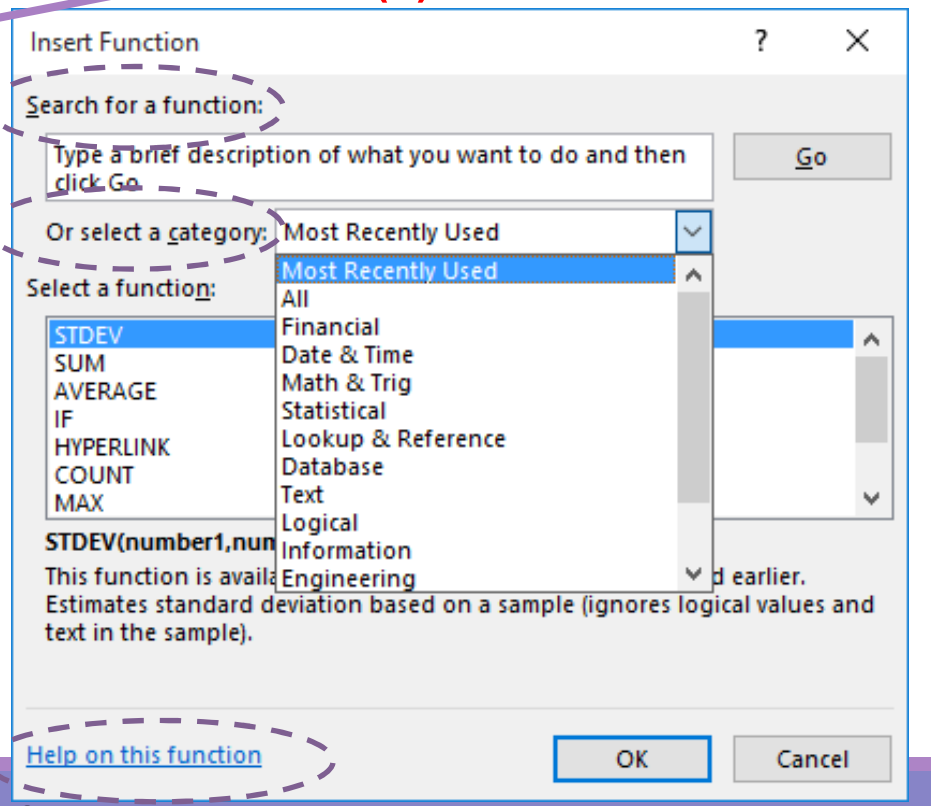
Insert Function dialog will appear, where you can:

Search for a function:

Search of a function by keywords

Or select a category: look for a function by group.

Help on this function : read help text about the function you are selecting.



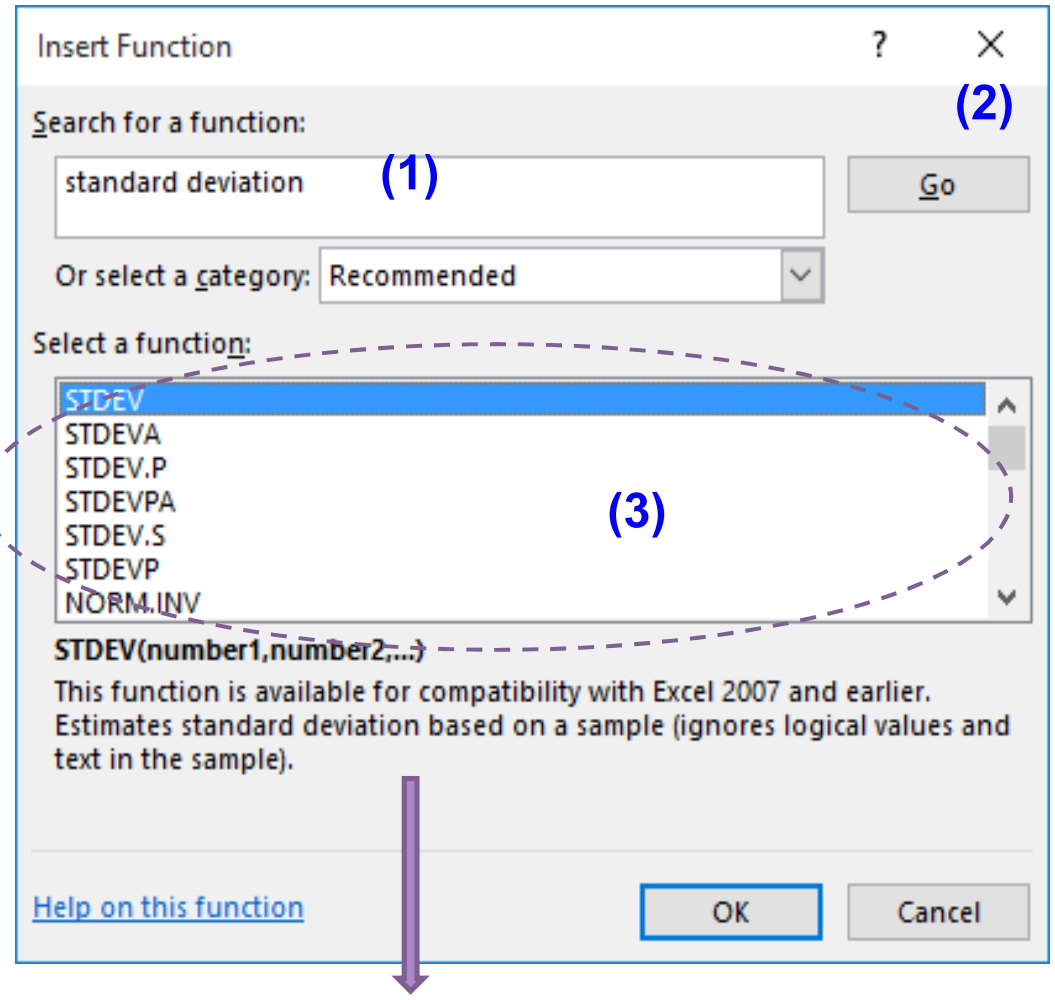
2.2.1 Using Functions in Excel

Example of Searching

(1) Under Search for a function type standard deviation

(2) Click Go button

(3) Under Select a function List of functions that are related to standard deviation will appear



This will summarize the structure and purpose of the function

2.2.1 Using Functions in Excel

Structure of a Function

function_name(argument1, argument2,...)

- We refer to a function by its function name such as, SUM, AVERAGE.
- The arguments follows the function name, inside the parentheses. This will be inputs for the function. Arguments can be cell reference, condition, text, number, etc. For some functions, order of arguments is important.

2.2.1 Using Functions in Excel

Example of Function's Structure

= SUM (number1, number2, …)

- The function name is SUM. It will calculate the summation of arguments Number1, Number2, …
- For SUM's arguments, there can be two types:

(1) Direct value: = SUM(1700, 9800, 7200)

(2) Cell reference: = SUM(A4:D7)

or =SUM(A1, A4:D7)

or =SUM(700, A4:D7)

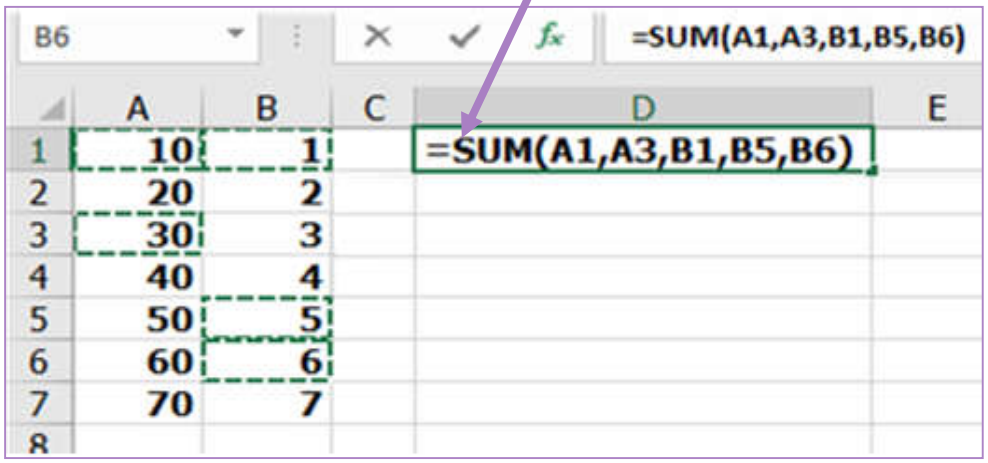
2.2.1 Using Functions in Excel

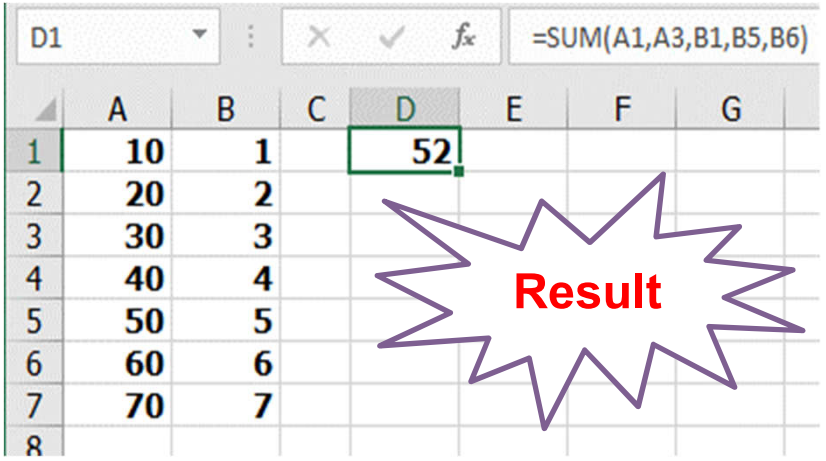
Example of SUM usage to find summation of values in cell A1, A3, B1, B5 and B6. The result will be at cell D1

Method 1

Type =SUM(A1, A3, B1, B5, B6) on cell D1

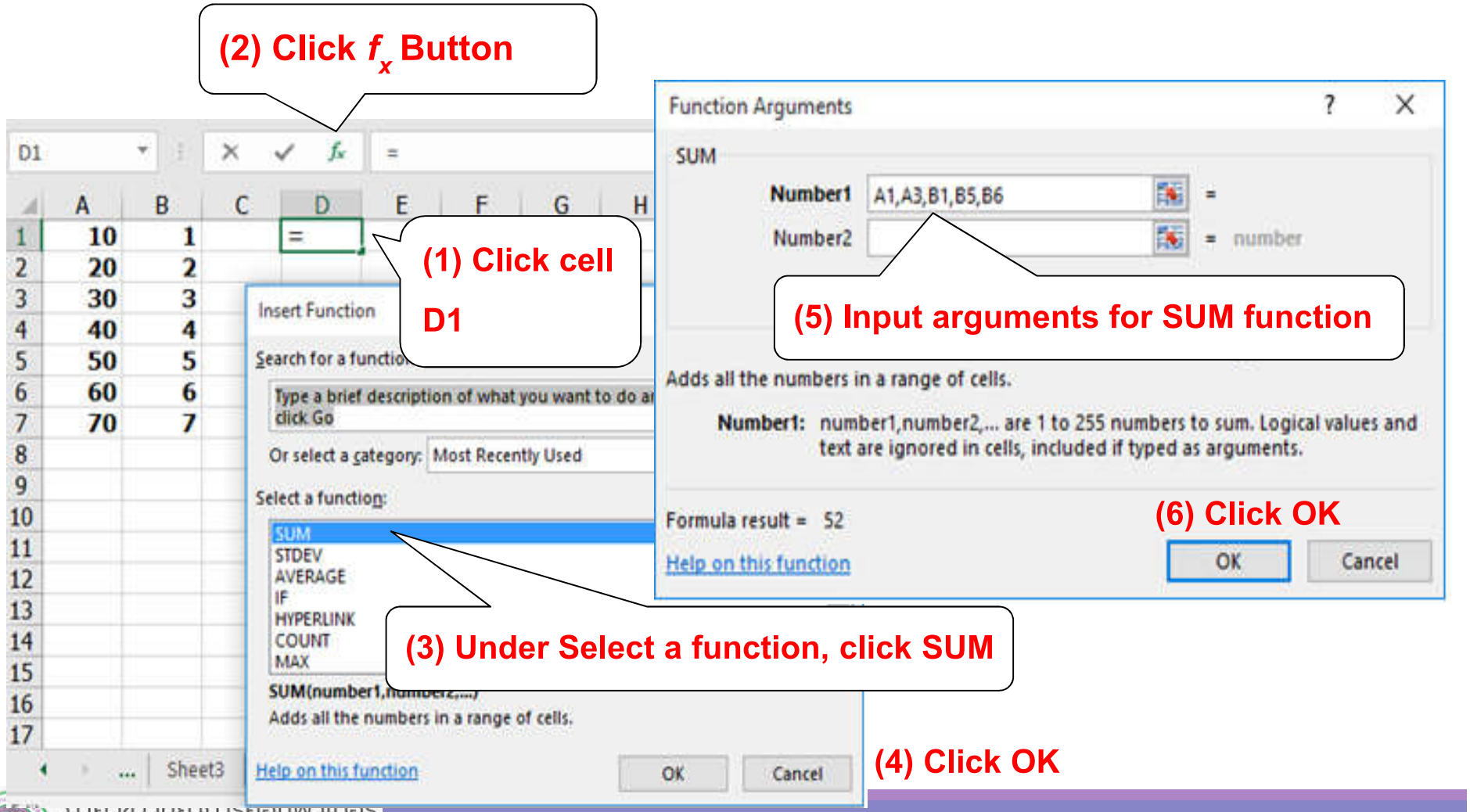
and press Enter





2.2.1 Using Functions in Excel

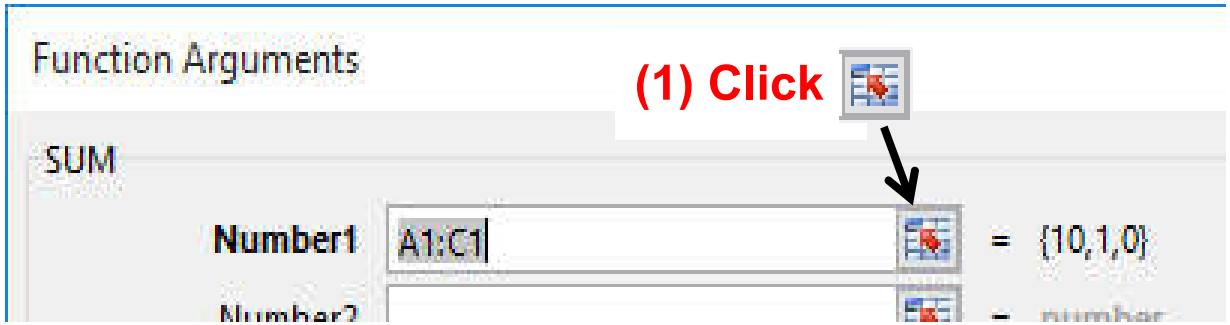
Method 2: using Insert Function dialog.



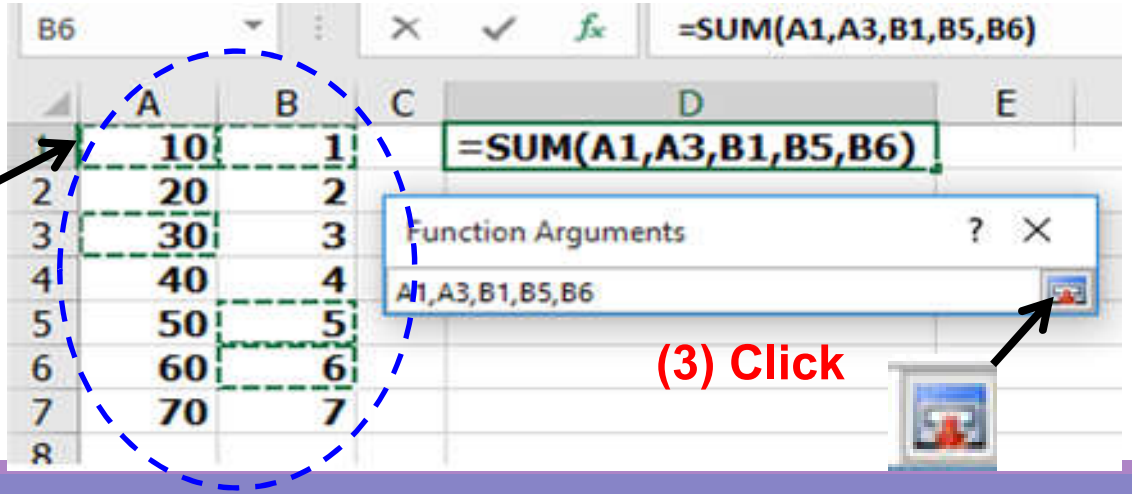
2.2.1 Using Functions in Excel

Method 2: using Insert Function dialog. (cont.)

How to select cells form worksheet as arguments.



(2) Select cells A1, A3, B1, B5 and B6. Use Ctrl-click to add individual cells in selection



2.2.2 Using Range of Data for Functions

Range of Data, or "block" of contiguous cells, can be use for argument. You can specify a range by using : (Colon) to specify the block from top-left corner cell, following by the colon, follow by the lower-right corner of the block.

Starting Cell (top-left corner) : Ending Cell (lower-right corner)

Example

If you want to find a summation of values in cells A1 to B5

You can use the following formula =sum(A1:B5)

2.2.3 Examples of Functions in Excel

Statistical Functions

Function	Purpose
MIN(number1, number2, …)	Find minimum value of arguments
MAX(number1, number2, …)	Find maximum value of arguments
AVERAGE(number1, number2, …)	Find average value of arguments
STDEV.P(number1, number2, …)	Find population standard deviation of arguments
COUNT(value1,value2, ...)	Count cell in range that contains number
COUNTA(value1,value2, ...)	Count cell in range that is not empty
COUNTIF(range, criteria)	Count cell in range that satisfy the criteria (condition)

2.2.3 Examples of Functions in Excel

Mathematical Functions

Function	Purpose
SUM(number1, number2, …)	Return summation of arguments
INT(number)	Convert argument into integer
ABS(number)	Find absolute value of argument
SQRT(number)	Find square root of argument
ROUND(number, num_digits)	Round number argument to the decimal points of num_digits

2.2.3 Examples of Functions in Excel

❖ Example of Functions Usages

	A	B	
1	30.5123	30.5	=ROUND(A1,1)
2	30.5123	31	=ROUND(A2,0)
3	30.5123	30	=INT(A3)
4	30.5123	5.523793986	=SQRT(A4)
5	16	4	=SQRT(A5)

2.2.3 Examples of Functions in Excel

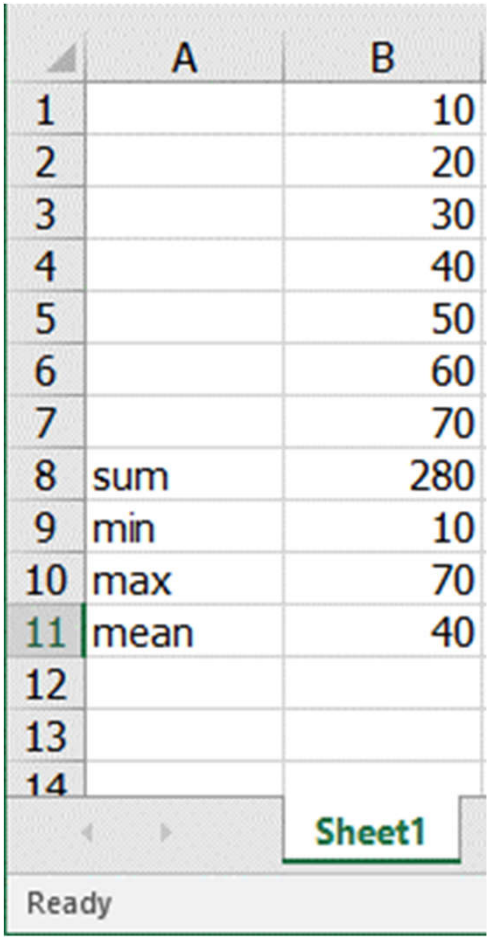
More Example of Functions Usages

	A	B
1		10
2		20
3		30
4		40
5		50
6		60
7		70
8	sum	280
9	min	10
10	max	70
11	mean	40

Formula	Result
=SUM(B1:B7)	280
=MIN (B1:B7)	10
=MAX(B1:B7)	70
=AVERAGE(B1:B7)	40

2.2.3 Examples of Functions in Excel

More Example of Functions Usages



	A	B
1		10
2		20
3		30
4		40
5		50
6		60
7		70
8	sum	280
9	min	10
10	max	70
11	mean	40
12		
13		
14		

Sheet1

Ready

Formula	Result
=COUNT(A1:B11)	11
=COUNTA(A1:B11)	15
=COUNTIF(B1:B11,“>=60”)	4
=COUNTIF(B1:B11, “min”)	1

2.2.3 Examples of Functions in Excel

❖ Date & Time Functions

Function	Purpose
NOW()	Return current system date/time
TODAY()	Return current system date
DAY(serial_number)	Return day part of date argument
MONTH(serial_number)	Return month part (1 to 12) of date argument
YEAR(serial_number)	Return year part of date argument
WEEKDAY(serial_number, return_type)	Return day-of-the-week (1 to 7) of date argument (Example, Wednesday = 4)

2.2.3 Examples of Functions in Excel

❖ Examples of Date & Time Functions Usages

	A	B	C
1		13/7/2017 16:40	
2		13/7/2017	
3		13	
4		7	
5	16/10/2010	2010	
6		5	

=NOW()
=TODAY()
=DAY(TODAY())
=MONTH(TODAY())
=YEAR(A5)
=WEEKDAY(TODAY())

Date is 13 July 2017, which is Thursday.

2.2.3 Examples of Functions in Excel

❖ Text Functions

Function	Purpose
BAHTTEXT(number)	Return thai text of monetary value (bath) in number
UPPER(text)	Convert text's characters to uppercase.
LOWER(text)	Convert text's characters to lowercase.

	A	B	
1	30.512	สามสิบบาทห้าสิบเอ็ดสตางค์	=BAHTEXT(A1)
2	1234	หนึ่งพันสองร้อยสามสิบสี่บาทถ้วน	=BAHTTEXT(A2)
3	Abc	ABC	=UPPER(A3)
4	Abc	abc	=LOWER(A4)

2.3 IF Function

- IF function allow logical computation. It will check the provided logical test and return a result based on the logical test (TRUE or FALSE)
- IF Function Structure:

```
=IF (logical_test, value_if_true,value_if_false)
```

  - logical_test is the condition of logical test, the test can return TRUE or FALSE.
  - value_if_true is the result if the test return TRUE.
  - value_if_false is the result if the test return FALSE.

2.3 IF Function

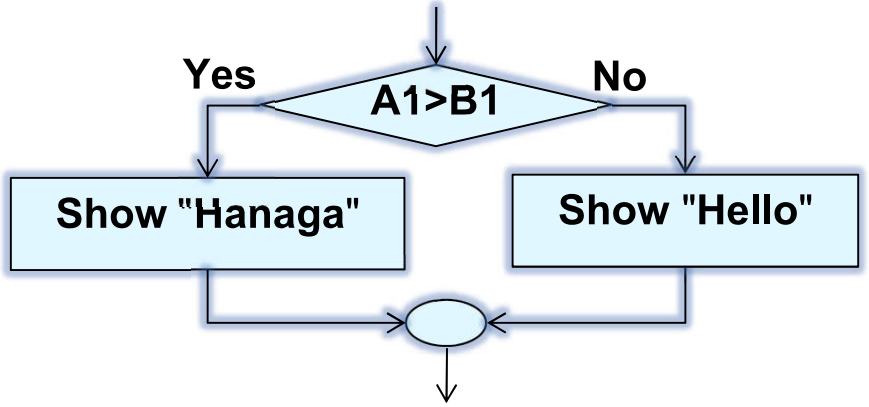
You can use the following comparison operators, which can return TRUE or FALSE

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

2.3 IF Function

❖ **Example 1**

= IF(A1>B1, "Hanaga", "Hello")

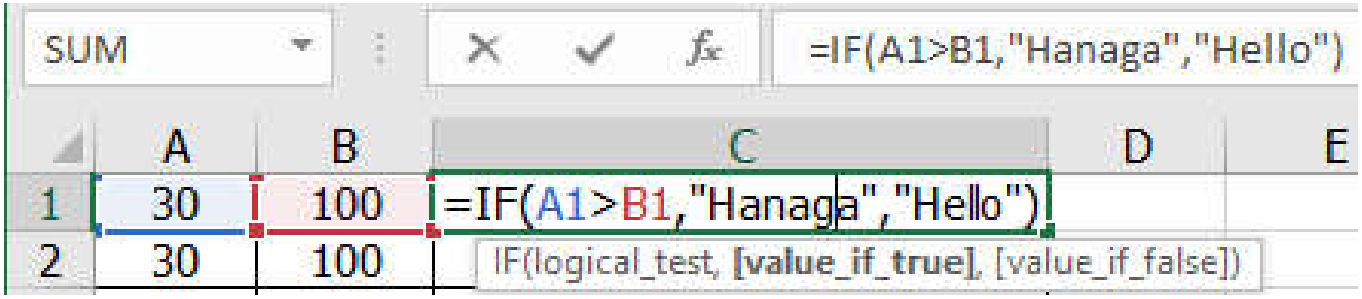


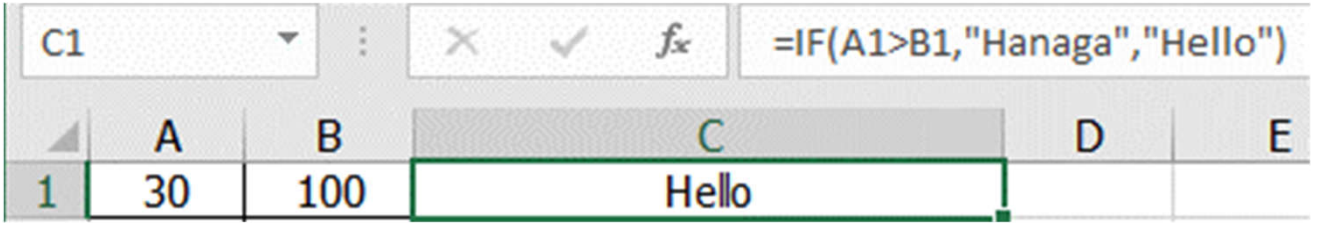
If A1 is greater than B1

Hanaga will be displayed

Else

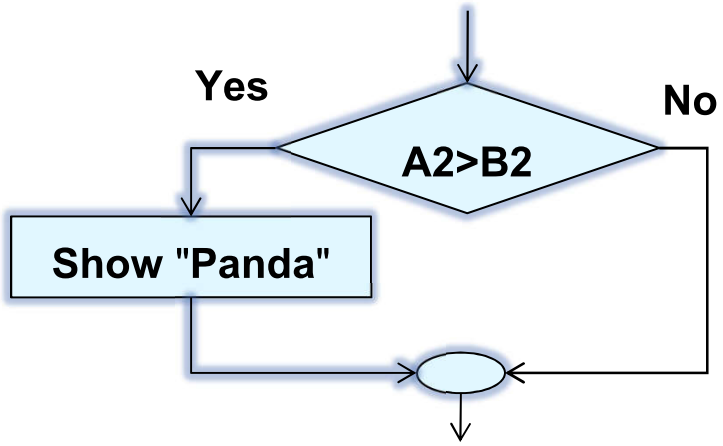
Hello will be displayed





2.3 IF Function

❖ **Example 2** **= IF(A2>B2, "Panda")**

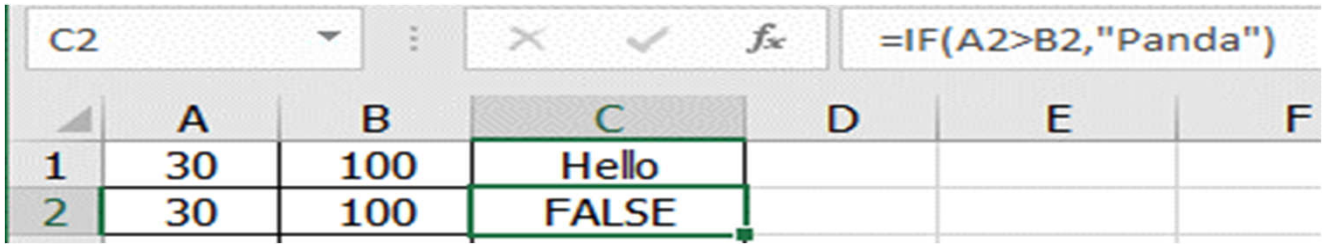


If A2 is greater than B2

Panda will be displayed

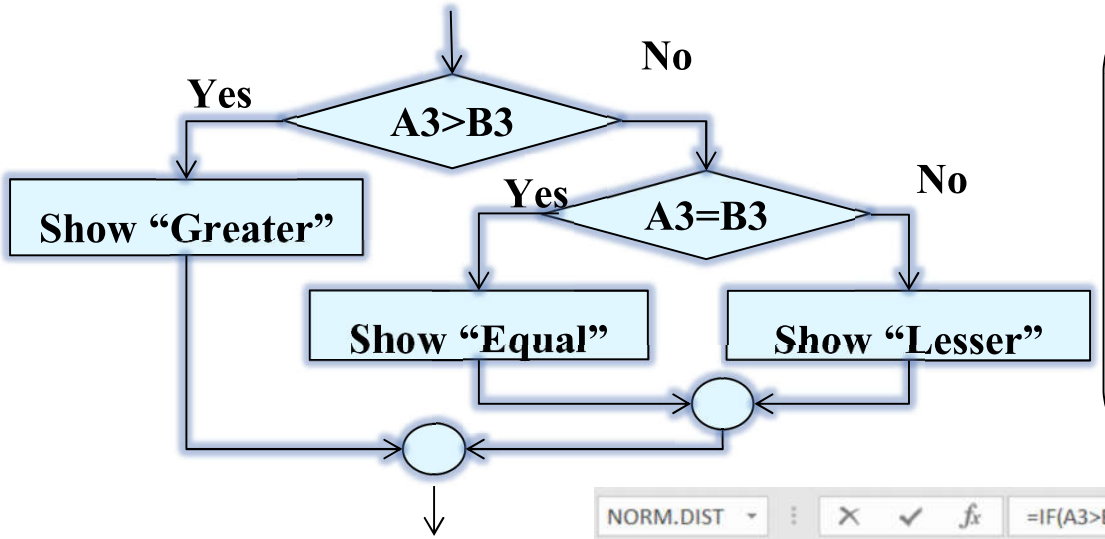
Else

FALSE will be displayed, this is a default output.

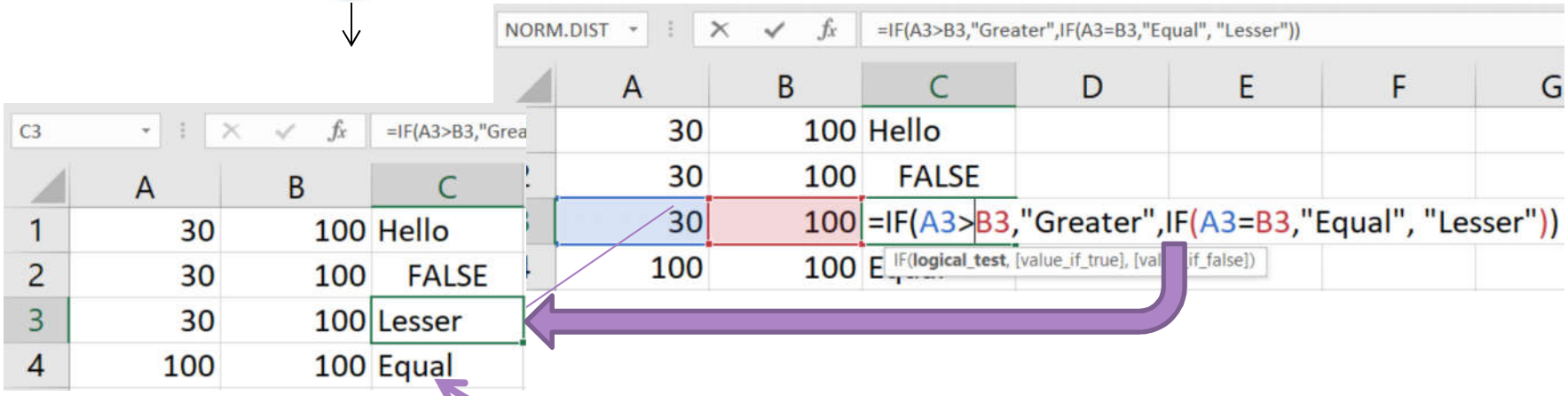


2.3 IF Function

- **Example 3 (nested IFs)** = IF(A3>B3, “Greater”, IF(A3=B3,“Equal”, “Lesser”))



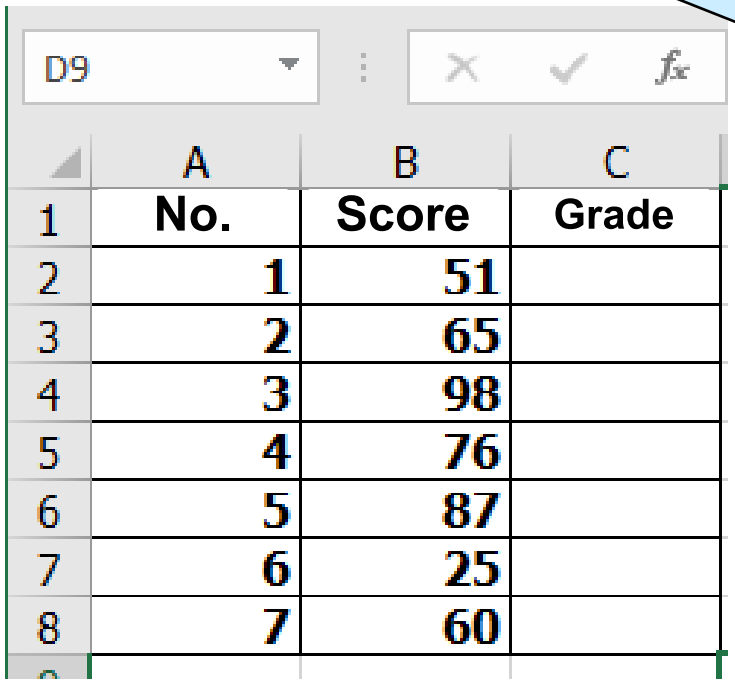
If A3 is greater than B3
    Display “Greater”
Else, perform the inner IF
    If A3 is equal to B3
        Display “Equal”
    Else
        Display “Lesser”



= IF(A4>B4, “Greater”, IF(A4=B4,“Equal”, “Lesser”))

2.3 2.3 IF Function

❖ **Grading Example**



Score	Grade
80 - 100	A
65 - 79	B
50 - 64	C
0 - 49	F

=IF(B2>=80,"A",IF(B2>=65,"B",IF(B2>=50,"C","F")))

2.4 Cell Reference

There are two ways to reference a cell in Excel

1) **Relative Reference**

When you copy the cell to another cell, Excel will change the cell reference based on how many rows/columns between the source and the destination of the copying. The structure of the formula remain the same.

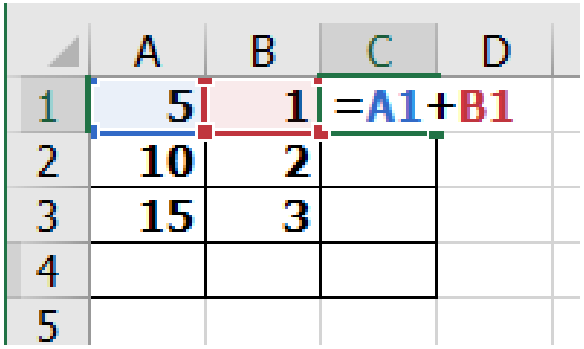
2) **Absolute Reference**

When you copy the cell to another cell, the cell reference will not change.

2.4.1 Relative Cell Reference

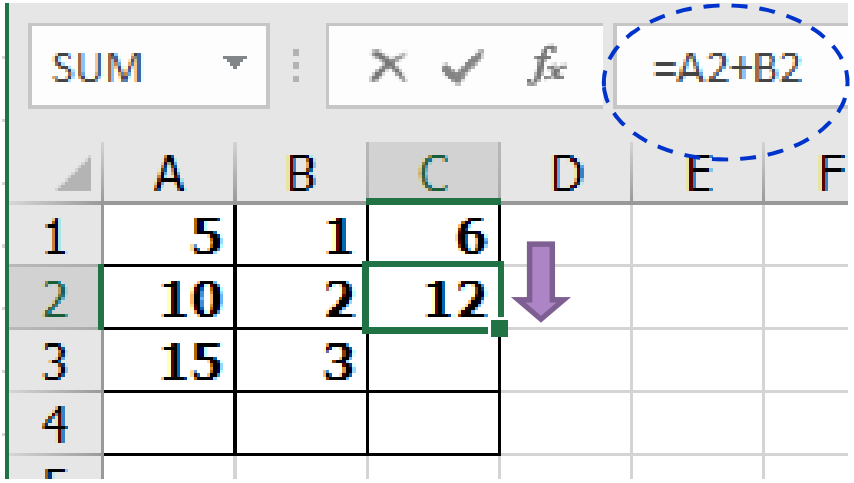
Example 1

1) The formula on C1 is =A1+B1
   - Find the sum of 2 cells
   - Using relative references



2) We copy cell C1 to cell C2

   (moving down 1 row)

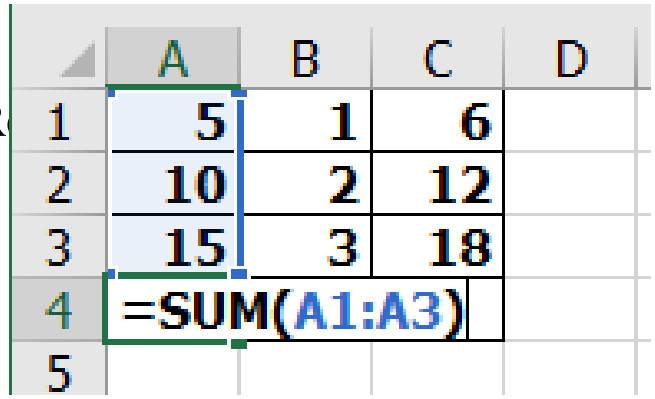


The formula on C2 is now =A2+B2

- ✓ The relative references have move down 1 row. A1 → A2, for example.
- ✓ Still finding the sum between 2 cells

2.4.1 Relative Cell Reference

Example 2

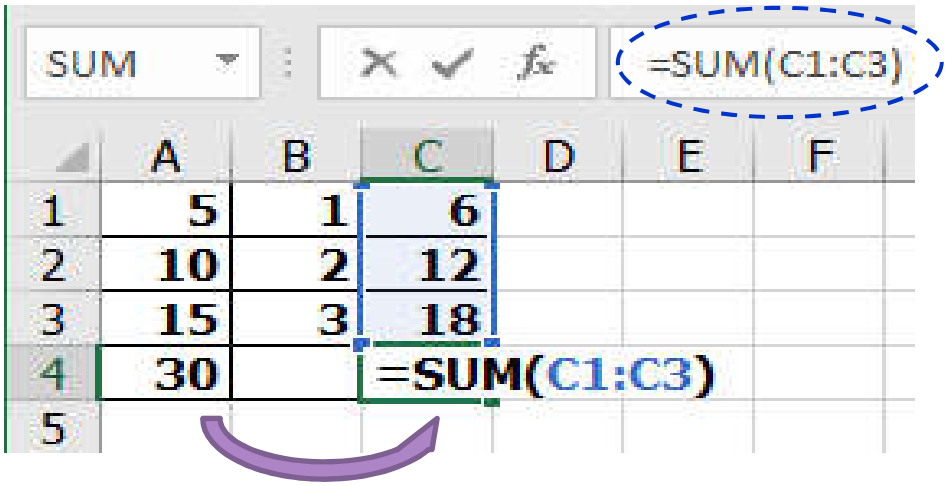


	A	B	C	D
1	5	1	6	
2	10	2	12	
3	15	3	18	
4	=SUM(A1:A3)			
5				

1) Formula in A4 is =SUM(A1:ARelative Cell R

- ❑ Using SUM function to find the sum of 3 contiguous cells
- ❑ Using relative references

2) We now copy cell A4 to cell C4 (moving right 2 columns)



Formula in C4 is now =SUM(C1:C3)

- ✓ The relative reference also move right 2 columns.
- ✓ Still using SUM function to find the sum of 3 contiguous cells.

2.4.1 Relative Cell Reference

❖ Example of Using Relative Reference

	A	B	C	D	E
1			Discount	5%	
2	Item	Quan.	Price/Unit	Price	
3	AA1	5	10	=B3*C3	
4	BB1	10	20		
5	CC1	15	30		
6	AA2	10	40		
7	AAA1	10	50		
8			Total		

Formula in D3 is =B3*C3

Copy cell D3 to cell D4, and we get formula =B4*D4

When you copy D3 to cells D4, D5, D6, and D7.

Relative reference will change according, produce the result we want.

	A	B	C	D
1			Discount	5%
2	Item	Quan.	Price/Unit	Price
3	AA1	5	10	50
4	BB1	10	20	200
5	CC1	15	30	450
6	AA2	10	40	400
7	AAA1	10	50	=B7*C7

2.4.2 Absolute Reference

- For absolute reference, the reference will not change regardless of where it is copied to.
- We use dollar sign ($) in front of the row and/or column part of the cell reference to mark the part(s) that will not change. If you mark both, both will not change. The unmarked part can change as relative reference.

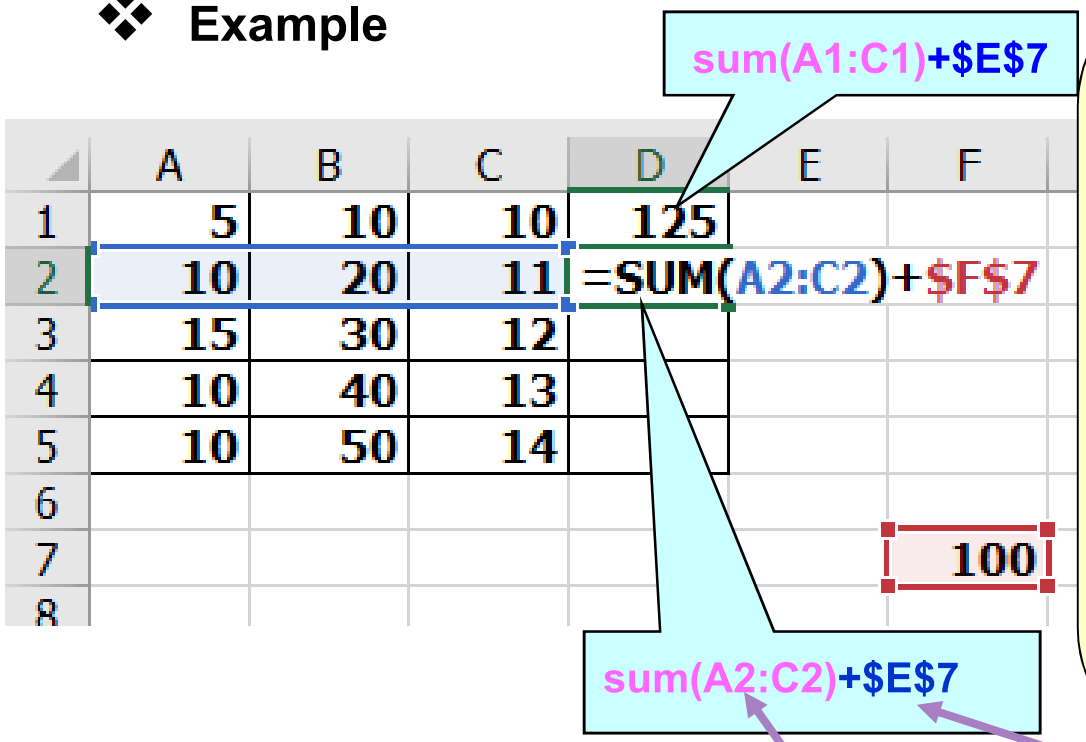
  $A1 Column will always be A, but row can change

  A$2 Row will always be 2, but column can change

  $A$1 Cell reference will always be A2

2.4.2 Absolute Reference

❖ **Example**



	A	B	C	D	E	F
1	5	10	10	125		
2	10	20	11			
3	15	30	12			
4	10	40	13			
5	10	50	14			
6						
7						100
8						

- **Formula in cell D1 is**

  = SUM(A1:C1)+$F$7

Adding the value in cell F7 to sum of cells A2:C2.

- **When you copy cell D1 to cell D2 you will get:**

  = SUM(A2:C2)+$F$7

Notice:

1) Cell references without the $ marking are relative references, and can change.

2) The reference $F$7 uses absolute reference to cell F7 and will not change the reference with copying

2.4.2 Absolute Reference

❖ Example of Using Absolute Reference

	A	B	C	D	E
1			Discount	5%	
2	Item	Quan.	Price/Unit	Price	Discounted Price
3	AA1	5	10	50	=D3-D3*$D$1
4	BB1	10	20	200	
5	CC1	15	30	450	
6	AA2	10	40	400	
7	AAA1	10	50	500	
8			Total		

Cell E3 has =D3-D3*$D$1

Copying E3 to E4 we get =D4-D4*$D$1

When cell E3 is copied to other cells:

- **Only relative references will change with the destination.**
- **The absolute relation ($) will not change.**

This can get the result you want

	A	B	C	D	E
1			Discount	5%	
2	Item	Quan.	Price/Unit	Price	Discounted Price
3	AA1	5	10	50	47.5
4	BB1	10	20	200	190
5	CC1	15	30	450	427.5
6	AA2	10	40	400	380
7	AAA1	10	50	500	=D7-D7*$D$1
8			Total	1600	1520

=SUM(D3:D7)

2.5 Referencing Cells in Another Worksheet

- If you want to access values in cells in another worksheet, you need to specify the worksheet the cells are located.
- Referencing worksheet format

[filename.xlsx]sheetname!datarange

- ✓ filename is the name of the workbook/file, that file need to be open.
- ✓ sheetname is the name of the worksheet to reference
- ✓ datarange is the data range in the worksheet we want to reference

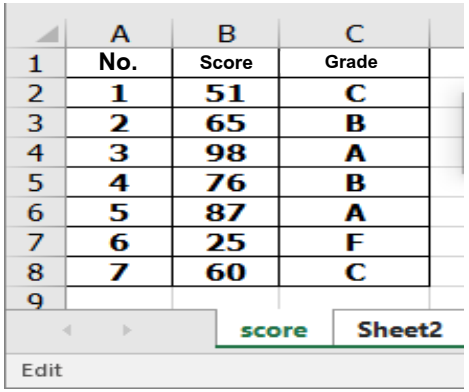
- Example: [Product.xlsx]Sheet1!$C$19
- If the worksheet is in the same workbook you don't need to specify the workbook, for example: sheet2!A1

2.6 Referencing Cells in Another Worksheet

❖ **Example of referencing another worksheet in the same workbook**

Example On score worksheet, we have grading data on cells C2 to C8

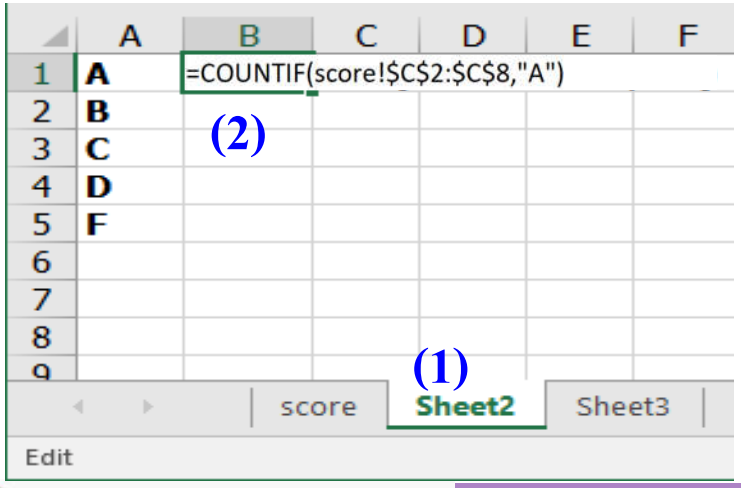
We want to count number of A and display the result at Sheet2 worksheet.



	A	B	C
1	No.	Score	Grade
2	1	51	C
3	2	65	B
4	3	98	A
5	4	76	B
6	5	87	A
7	6	25	F
8	7	60	C
9			

score | Sheet2

Edit



	A	B	C	D	E	F
1	A	=COUNTIF(score!$C$2:$C$8,"A")				
2	B					
3	C					
4	D					
5	F					
6						
7						
8						
9						

(2)

(1)

score | Sheet2 | Sheet3

Edit

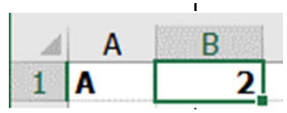
(1) Select Sheet2

(2) Click cell B1 on Sheet2 to enter formula

=COUNTIF(score!$C$2:$C$8, “A”)

(3) Press Enter to finish the formula

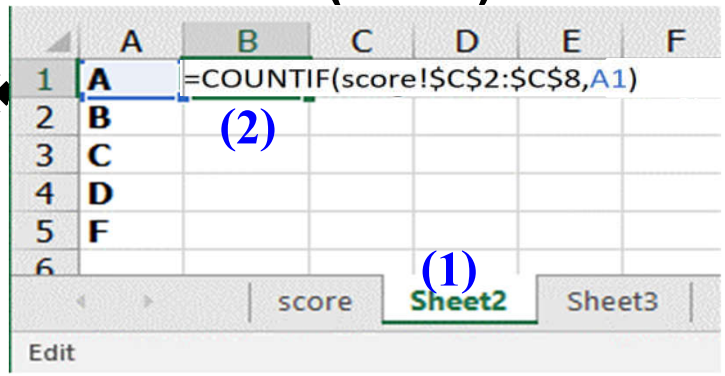
You will get the result on cell B1 on Sheet2



	A	B
1	A	2

2.6 Referencing Cells in Another Worksheet

- **Example of referencing another worksheet in the same workbook (cont.) – counting every grade**



(1) Select Sheet2

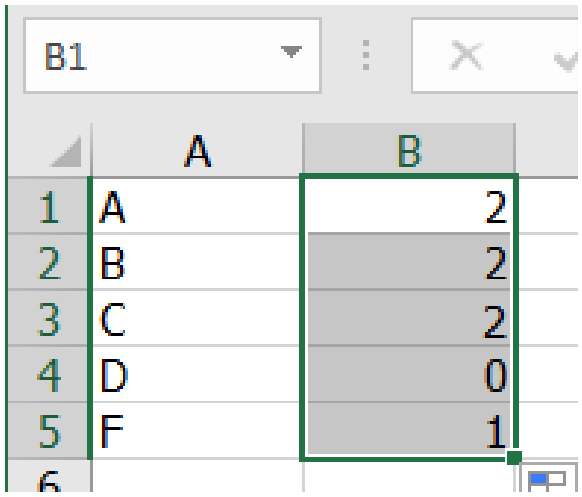
(2) Click cell B1 on Sheet2 to enter formula

=COUNTIF(score!$C$2:$C$8, A1)

(3) Press Enter to finish the formula

You will get the result on cell B1 on Sheet2

(4) Copy cell B1 to cell B2 to B5



The formula in B1 use relative reference to A1 to get which grade to count, this can be copied to cells B2 to B5 and still count the correct grade