e-eupa Certification for Administration Personnel

Level 3

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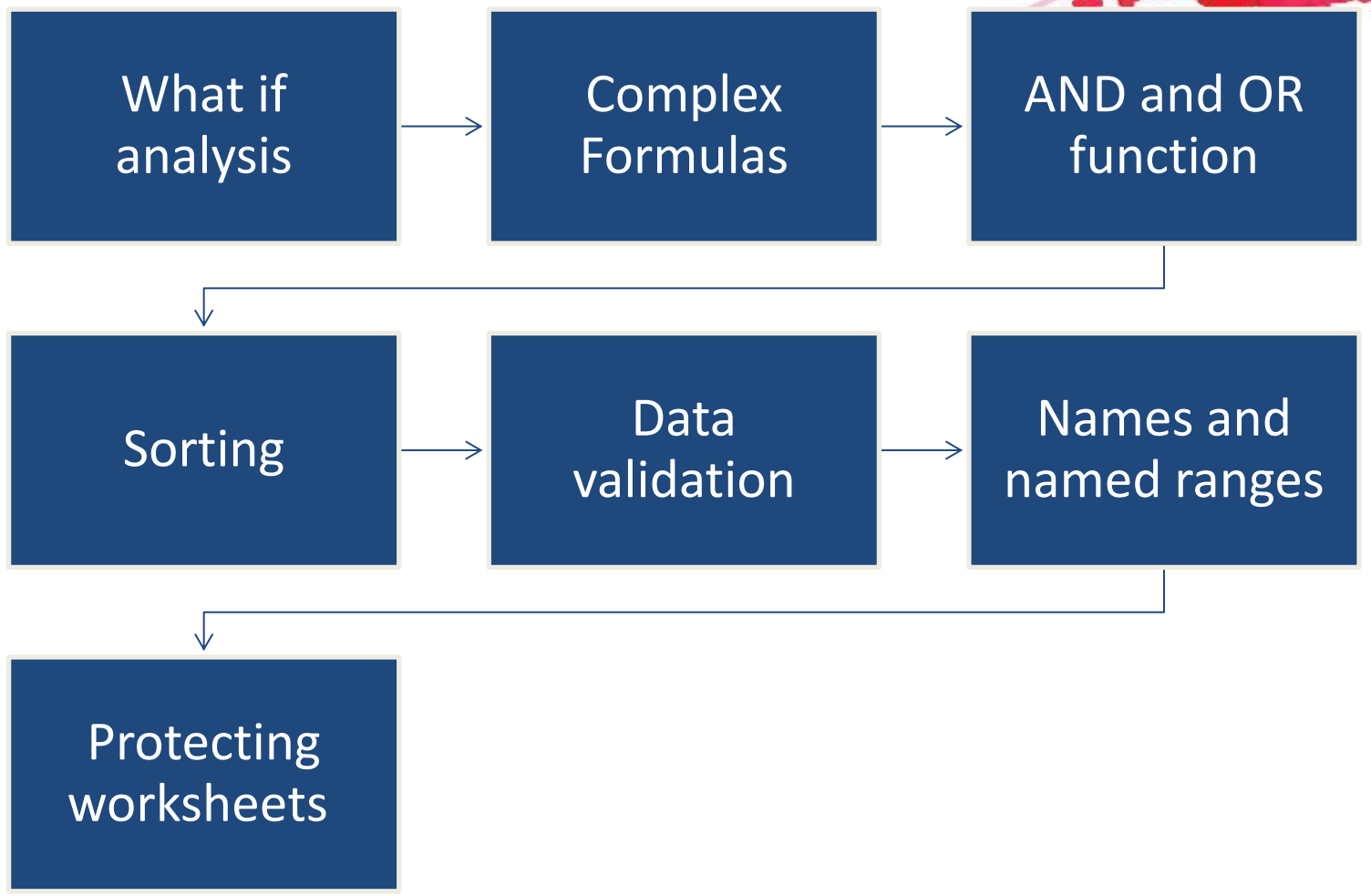
Unit Details

Work Area 9 ICT SKILLS

3.15 Use spreadsheets to produce sheets at an intermediate and advanced level: part B

LO3.53: Demonstrate skills in using spreadsheet software at an intermediate and advanced level to produce complex worksheets that conform to agreed specifications. Take some responsibility for the evaluation of the result

Route map


What if analysis
Complex Formulas
AND and OR function
Sorting
Data validation
Names and named ranges
Protecting worksheets

What if Analysis

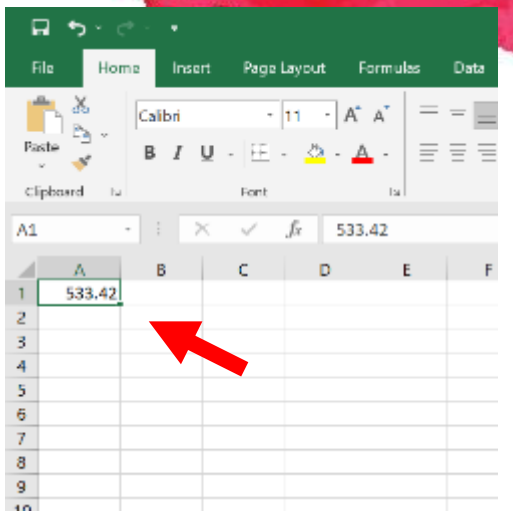
What-If Analysis in Excel allows you to try out different values (scenarios) for formulas.

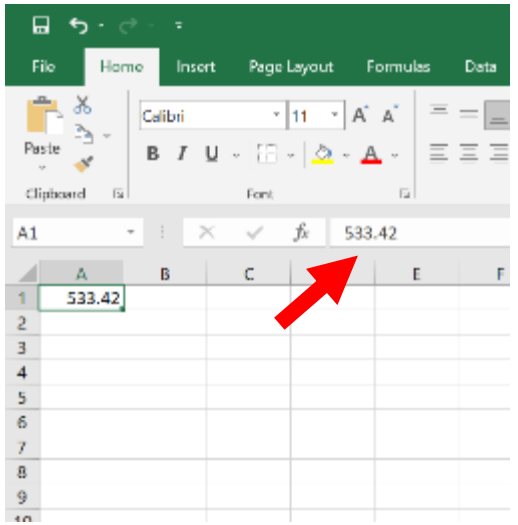
The following example helps you master what-if analysis quickly and easily.

Data Entry

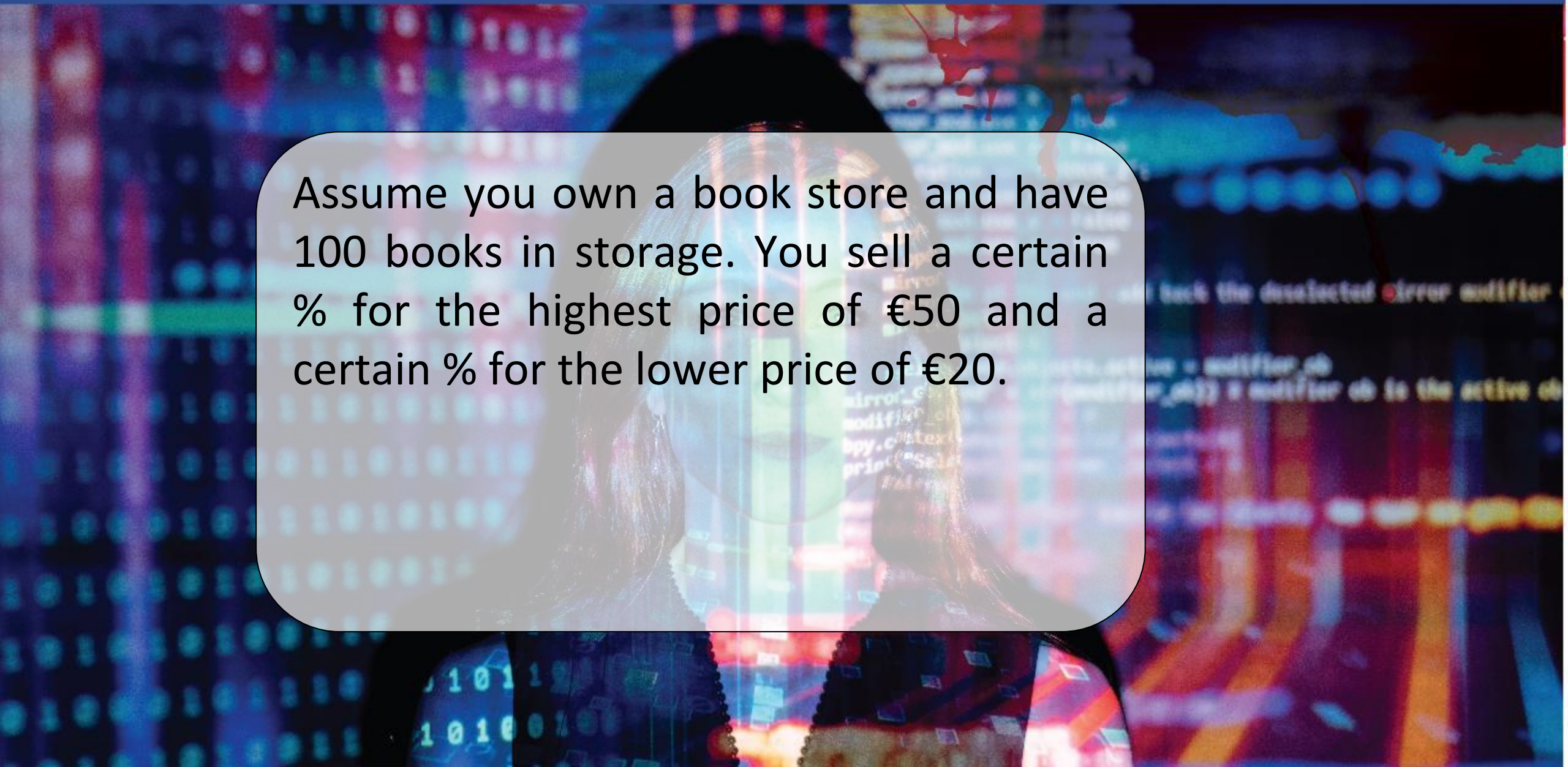
There are two ways to enter information into a cell:

1. Type directly into the cell.
Click on a cell, and type in the data (numbers or text) and press Enter.
2. Type into the formula bar.
Click on a cell, and then click in the formula bar (the space next to the). Now type the data into the bar and press Enter.





What if Analysis



Assume you own a book store and have 100 books in storage. You sell a certain % for the highest price of €50 and a certain % for the lower price of €20.

What if Analysis

D16

	A	B	C	D	E
1	**Book Store**				
2					
3		total number of books	% sold for the highest price		
4		100	60%		
5					
6			number of books	unit profit	
7		highest price	60	50,00 €	
8		lower price	40	20,00 €	
9					
10			total profit	3.800,00 €	
11					
12					
13					

If you sell 60% for the highest price, cell D10 calculates a total profit of 60 * €50 + 40 * €20 = €3800.

What if Analysis

Create Different Scenarios

But what if you sell 70% for the highest price? And what if you sell 80% for the highest price? Or 90%, or even 100%?

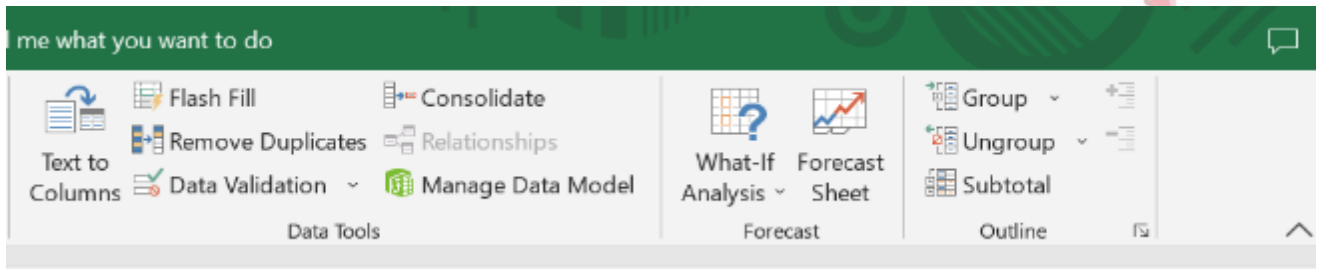
Each different percentage is a different scenario.

You can use the Scenario Manager to create these scenarios.

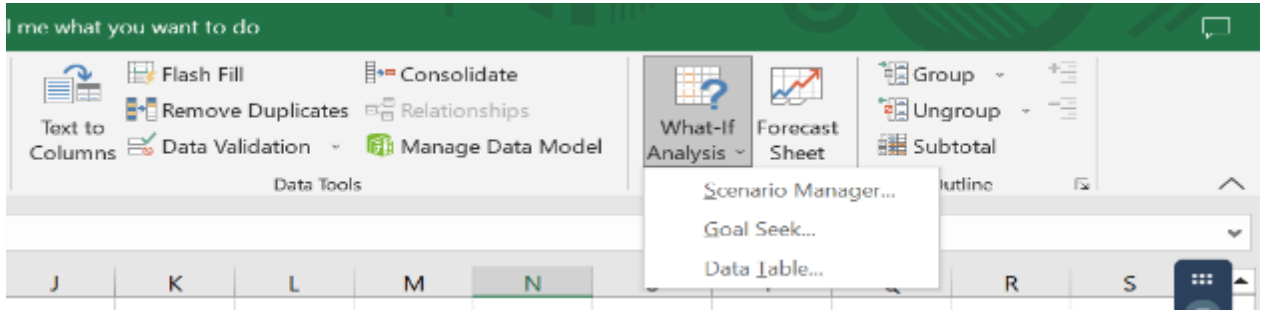
You can simply type in a different percentage into cell C4 to see the corresponding result of a scenario in cell D10. However, what-if analysis enables you to easily compare the results of different scenarios.

What if Analysis – Different Scenarios

Step 1. On the Data tab, in the Forecast group, click What-If Analysis



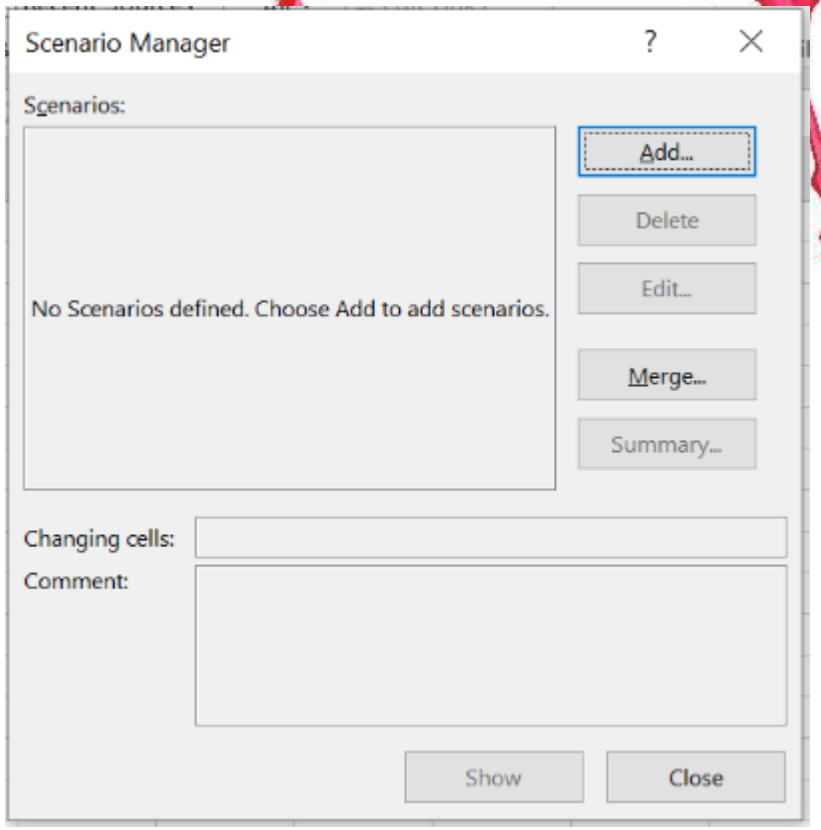
Step 2. Click Scenario Manager.



What if Analysis – Different Scenarios

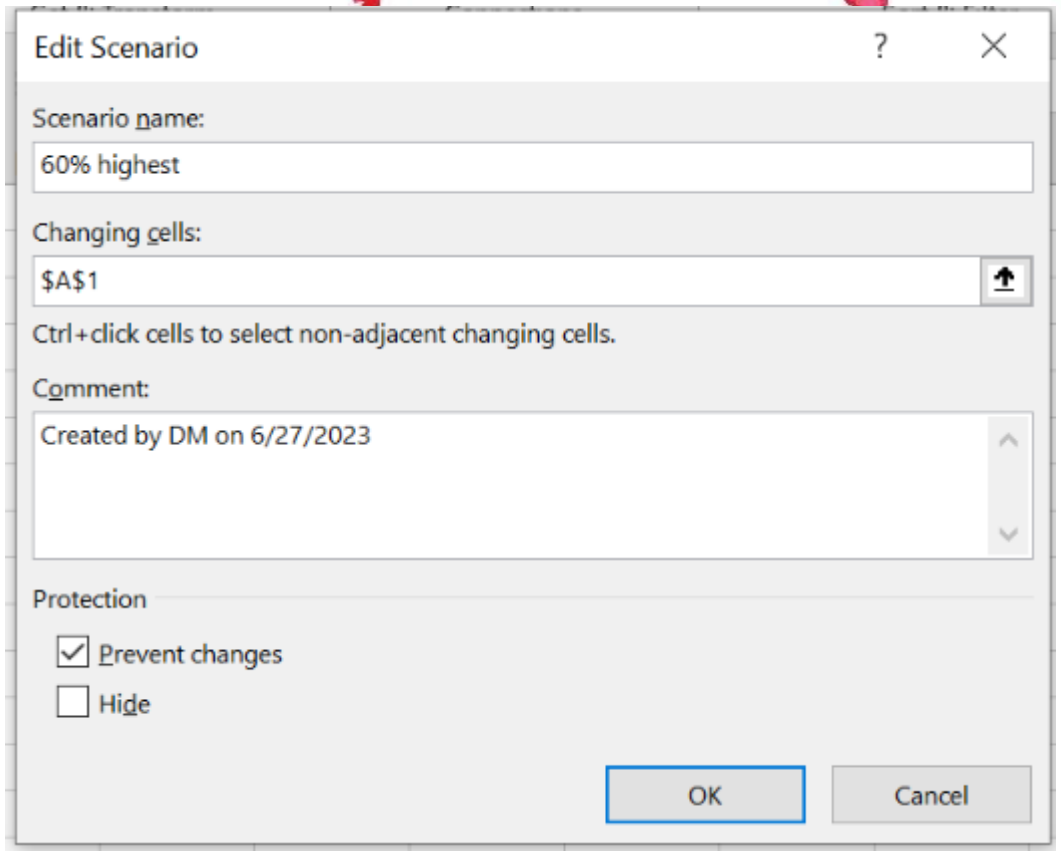
The Scenario Manager dialog box appears.

Step 3. Add a scenario by clicking on Add.



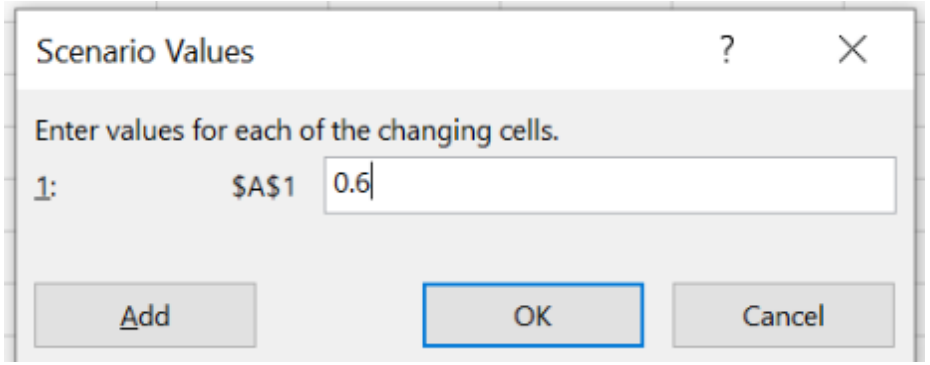
What if Analysis – Different Scenarios

Step 4. Type a name (60% highest), select cell C4 (% sold for the highest price) for the Changing cells and click on OK.



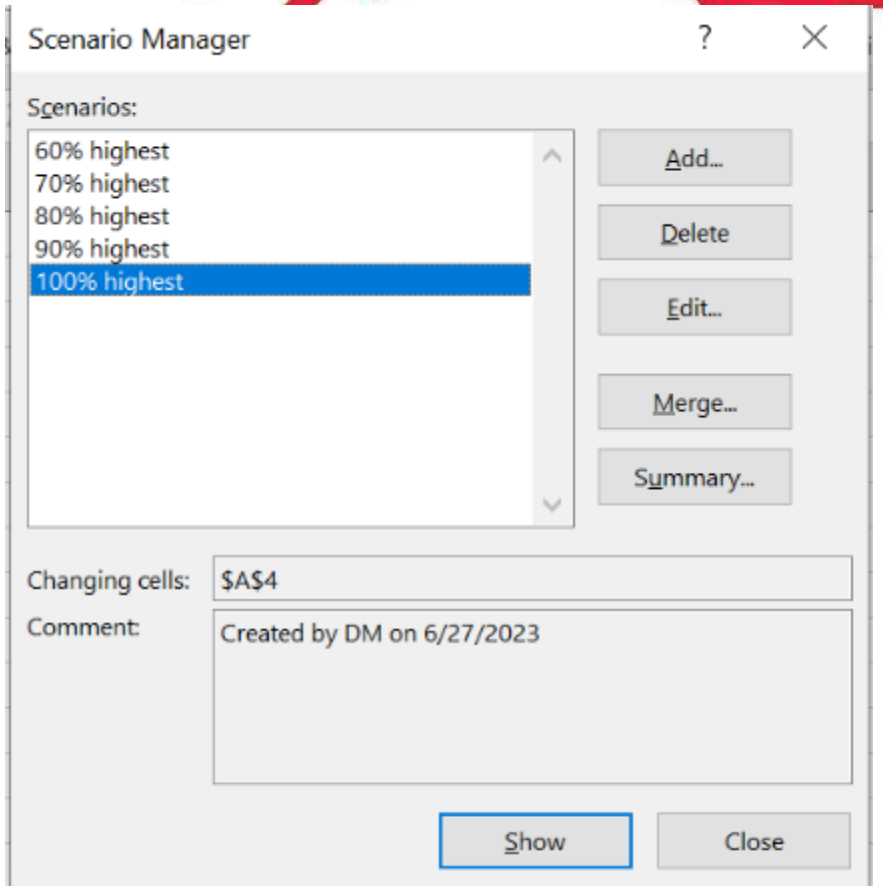
What if Analysis – Different Scenarios

Step 5. Enter the corresponding value 0.6 and click on OK again.

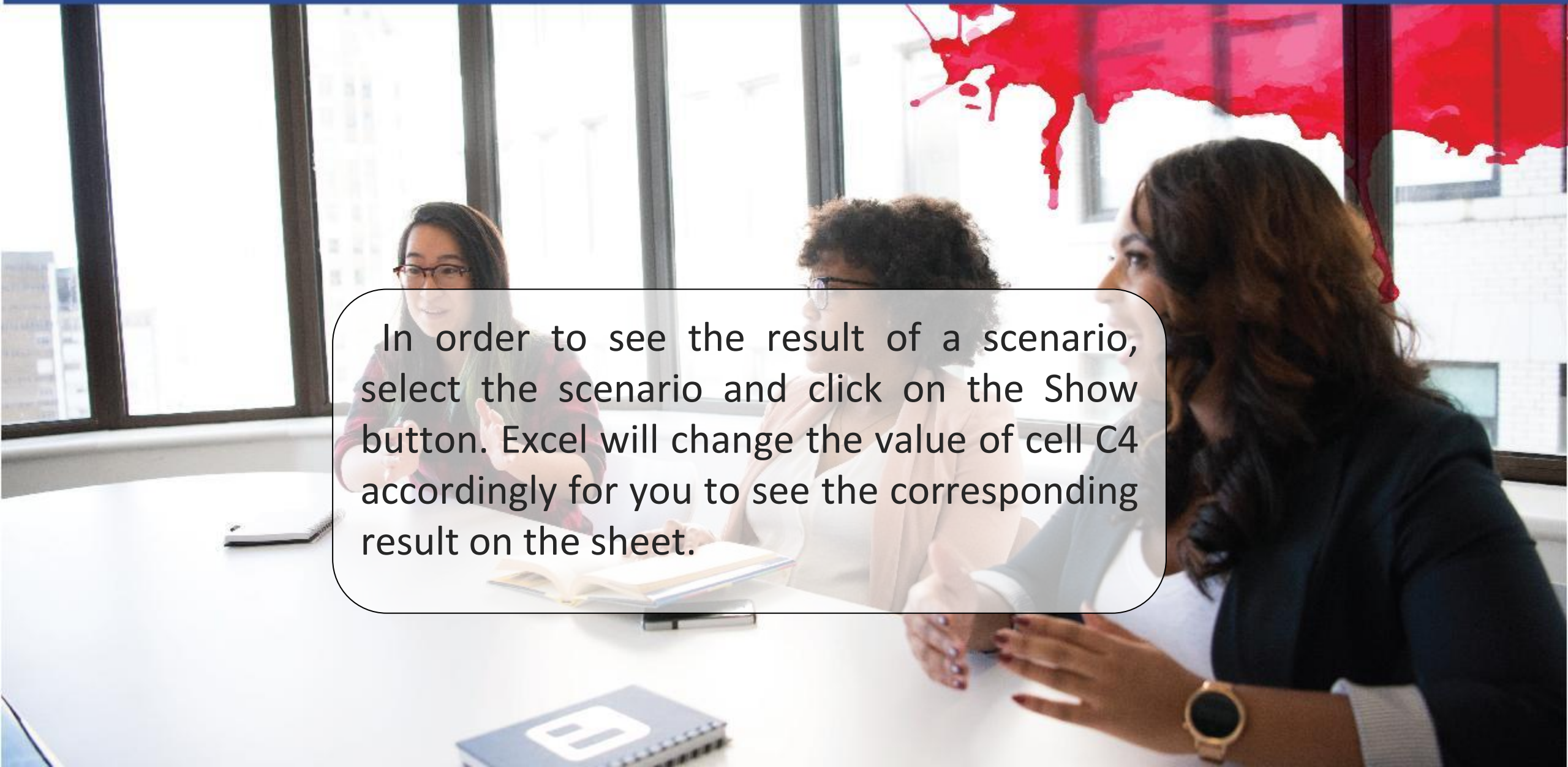


What if Analysis – Different Scenarios

Step 6. Next, add 4 other scenarios (70%, 80%, 90% and 100%).
Finally, your Scenario Manager should be consistent with the picture below:



What if Analysis – Different Scenarios



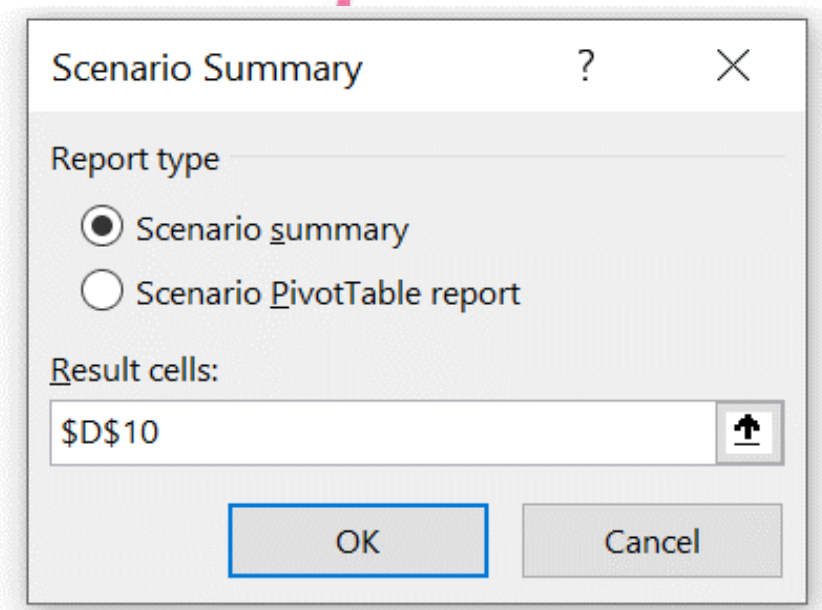
In order to see the result of a scenario, select the scenario and click on the Show button. Excel will change the value of cell C4 accordingly for you to see the corresponding result on the sheet.

What if Analysis – Different Scenarios

Scenario Summary

To easily compare the results of these scenarios, execute the following steps.

1. Click the Summary button in the Scenario Manager.
2. Next, select cell D10 (total profit) for the result cell and click on OK.



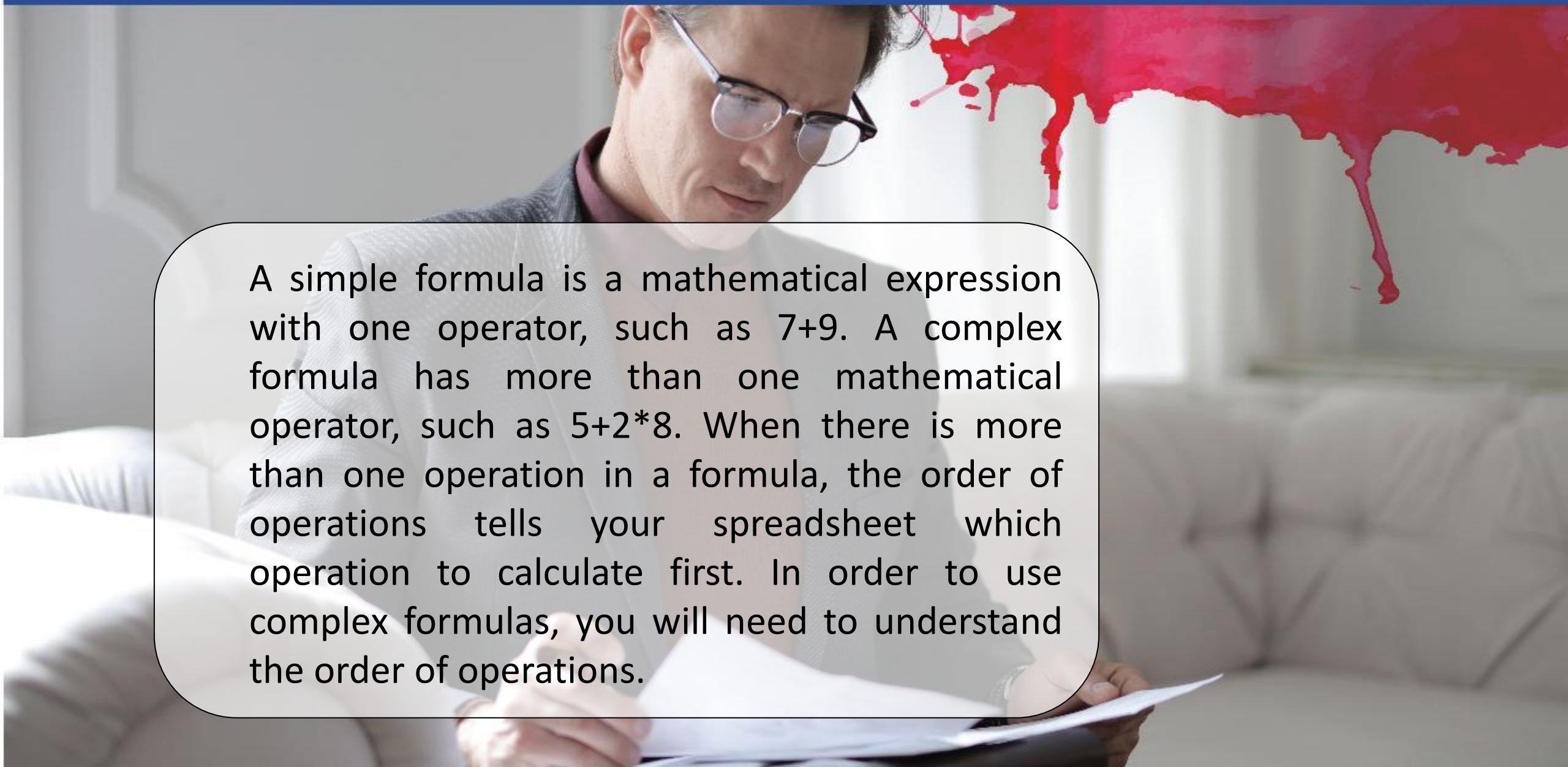
What if Analysis – Different Scenarios

And the result is……

Scenario Summary						
	Current Values:	60% highest	70% highest	80% highest	90% highest	100% highest
Changing Cells:						
C4	60%	60%	70%	80%	90%	100%
Result Cells:						
D10	$3,800	$3,800	$4,100	$4,400	$4,700	$5,000
Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.						

For conclusion:
If you sell 70% for the highest price, you obtain a total profit of 4100 €, if you sell 80% for the highest price, you obtain a total profit of 4400 €, etc.

Complex Formulas



A simple formula is a mathematical expression with one operator, such as 7+9. A complex formula has more than one mathematical operator, such as 5+2*8. When there is more than one operation in a formula, the order of operations tells your spreadsheet which operation to calculate first. In order to use complex formulas, you will need to understand the order of operations.

Complex Formulas

The order of operations

All spreadsheet programs calculate formulas based on the following order of operations:

1. Operations enclosed in parentheses
2. Exponential calculations (3^2, for example)
3. Multiplication and division, whichever comes first
4. Addition and subtraction, whichever comes first

A mnemonic that can help you remember the order is PEMDAS, or

Please Excuse My Dear Aunt Sally.

Complex Formulas

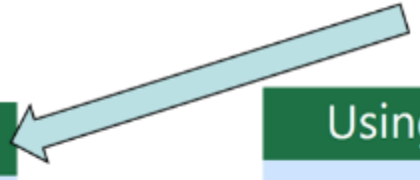
Using the Order of Operations

P
E
M
D
A
S

10+(6-3)/2^2*4-1

Using the Order of Operations

Parentheses **10+(6-3)/2^2*4-1**
E
M
D
A
S



Using the Order of Operations

P **10+(6-3)/2^2*4-1**
Exponents **10+3/2^2*4-1**
M
D
A
S

Using the Order of Operations

P **10+(6-3)/2^2*4-1**
E **10+3/2^2*4-1**
Multiplication
Division Whichever comes first! **10+3/4*4-1**
A
S

Complex Formulas

Using the Order of Operations

P	10+(6-3)/2^2*4-1
E	10+3/2^2*4-1
Multiplication	10+3/4*4-1
Division (Whichever comes first!)	10+0.75*4-1
A	
S	

Using the Order of Operations

P	10+(6-3)/2^2*4-1
E	10+3/2^2*4-1
M	10+3/4*4-1
D	10+0.75*4-1
Addition (Whichever comes first!)	10+3-1
Subtraction	

Using the Order of Operations

P	10+(6-3)/2^2*4-1
E	10+3/2^2*4-1
M	10+3/4*4-1
D	10+0.75*4-1
Addition (Whichever comes first!)	10+3-1
Subtraction	13-1

Using the Order of Operations

P	10+(6-3)/2^2*4-1
E	10+3/2^2*4-1
M	10+3/4*4-1
D	10+0.75*4-1
A	10+3-1
S	13-1 =12

Creating complex formulas

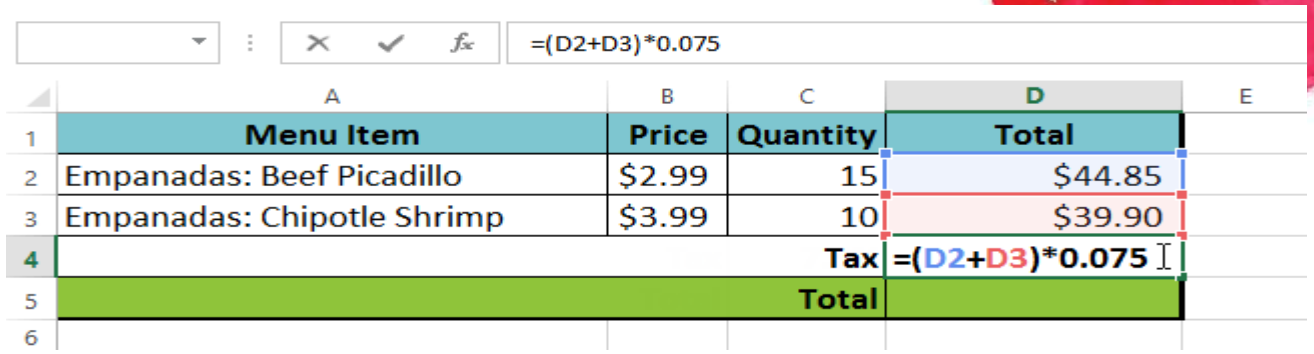
Lets demonstrate a complex formula using the order of operations.

Here, we want to calculate the cost of sales tax for a catering invoice. To do this, we'll write our formula as

=(D2+D3)*0.075

in cell D4. This formula will add the prices of our items together and then multiply that value by the 7.5% tax rate (which is written as 0.075) to calculate the cost of sales tax.

Complex Formulas

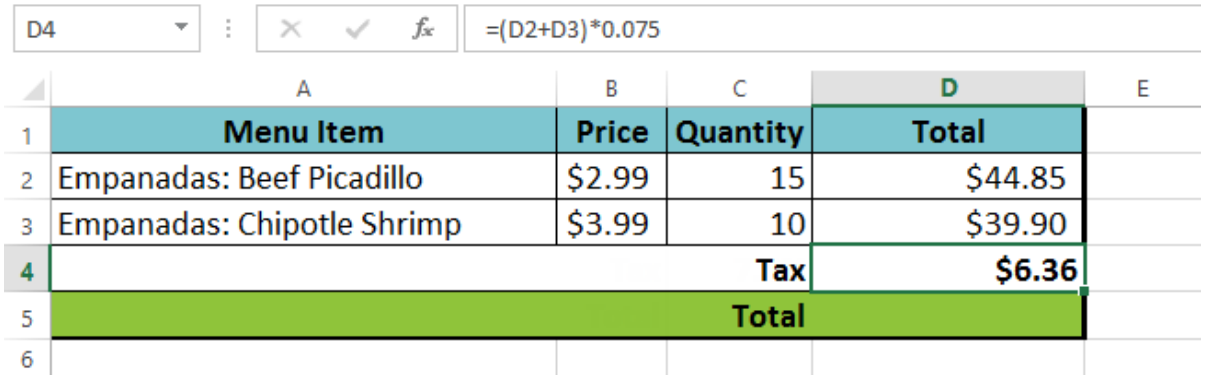


The spreadsheet then follows the order of operations and first adds the values inside the parentheses:

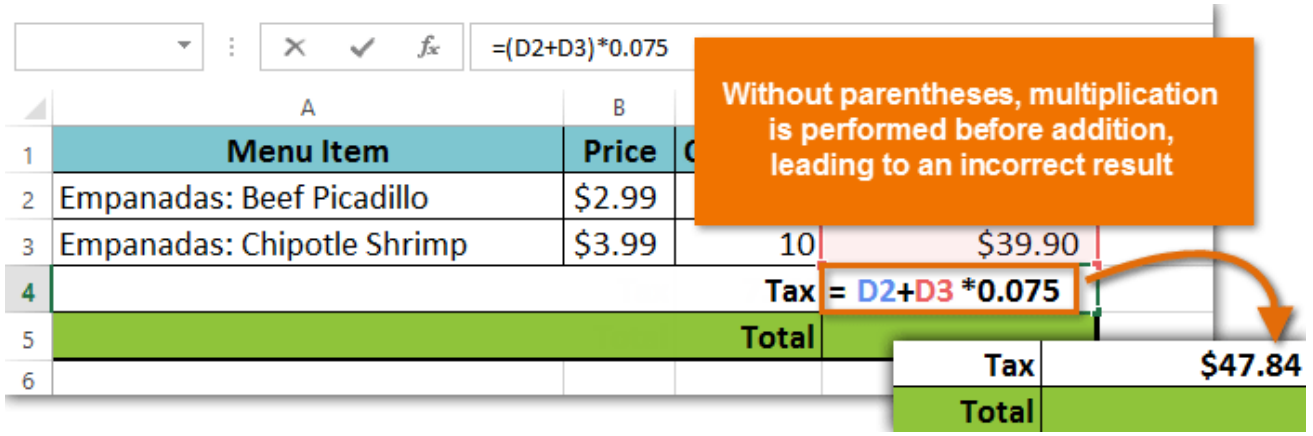
(44.85+39.90) = $84.75

Then it multiplies that value by the tax rate: $84.75*0.075. The result will show that the sales tax is $6.36.

Creating complex formulas



Caution: If you do that in a wrong way, meaning that you forget the parenthesis or change multiplication row and so on , you will get a wrong result too.

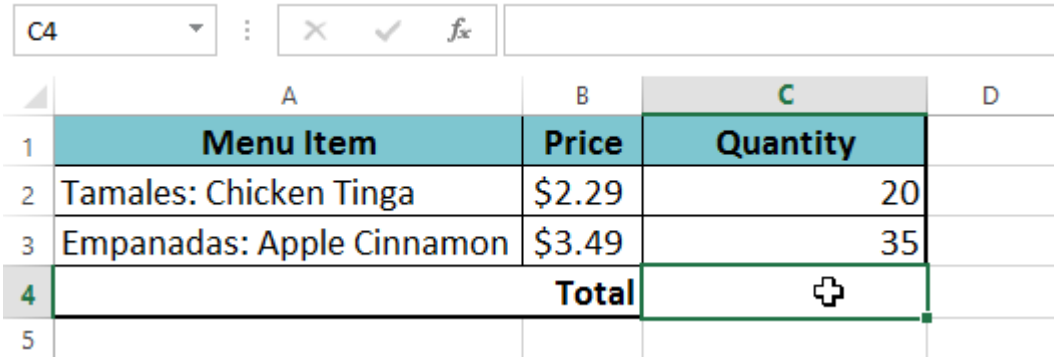


Creating complex formulas

To create a complex formula using the order of operations

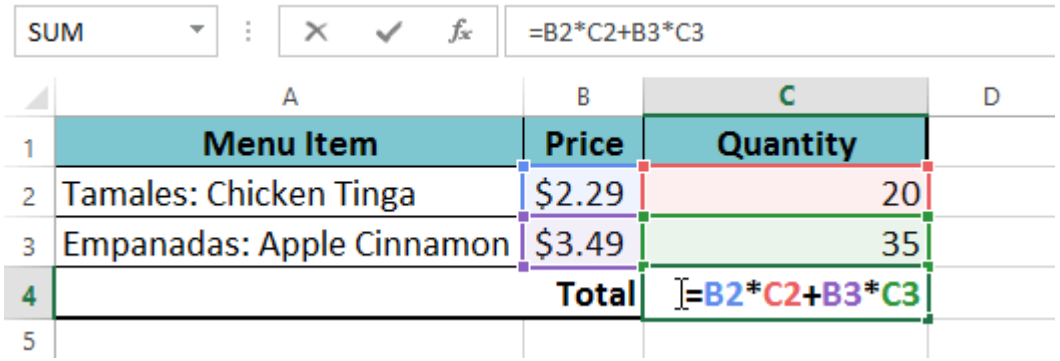
In our example below, we will use cell references along with numerical values to create a complex formula that will calculate the total cost for a catering invoice. The formula will calculate the cost for each menu item and add those values together. Lets see some steps producing a complex formula

Step 1: Select the cell that will contain the formula. In our example, we'll select cell C4.



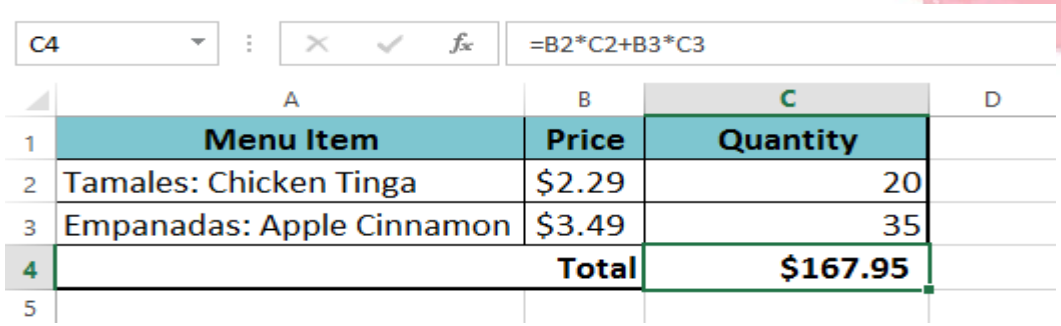
Creating complex formulas

Step 2: Enter your formula. In our example, we'll type =B2*C2+B3*C3. This formula will follow the order of operations, first performing multiplication: 2.29*20 = 45.80 and 3.49*35 = 122.15. Then it will add those values together to calculate the total: 45.80+122.15.

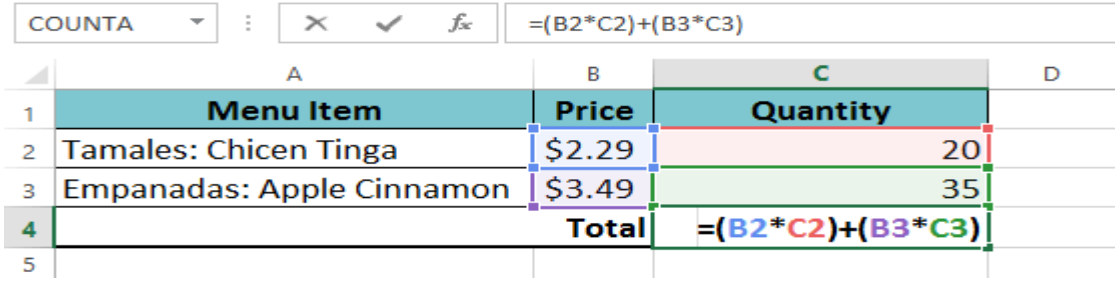


Step 3: Double-check your formula for accuracy, then press Enter on your keyboard. The formula will calculate and display the result. In our example, the result shows that the total cost for the order is $167.95.

Creating complex formulas



Notice: You can add parentheses to any equation to make it easier to read. While it won't change the result of the formula in this example, we could enclose the multiplication operations within parentheses to clarify that they will be calculated before the addition.



More on Creating complex formulas

Nested If

The IF function in Excel can be nested, when you have multiple conditions to meet. The FALSE value is being replaced by another IF function to make a further test.

Before we continue lets see an example using the if function.

Example using IF Function:

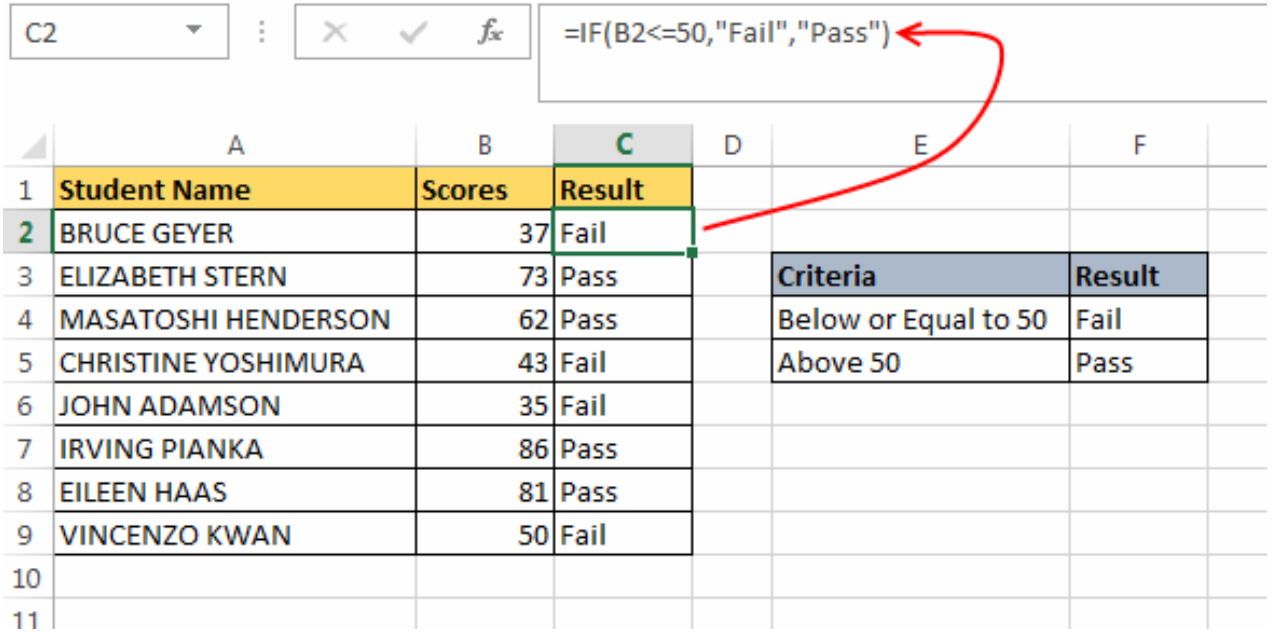
“The scores of some students are given in a table along with their names. Now for finding the Result of these students, we can use an IF statement. As you can see in the above image I have also defined the Pass and Fail criteria for these students. Sores above 50 are considered PASS, while scores that are below or equal to 50 are considered FAIL.”

More on Creating complex formulas

In this scenario we can use a formula:

=IF(B2<=50,"Fail","Pass")

seeing in the picture below.



	A	B	C	D	E	F
1	Student Name	Scores	Result			
2	BRUCE GEYER	37	Fail			
3	ELIZABETH STERN	73	Pass		Criteria	Result
4	MASATOSHI HENDERSON	62	Pass		Below or Equal to 50	Fail
5	CHRISTINE YOSHIMURA	43	Fail		Above 50	Pass
6	JOHN ADAMSON	35	Fail			
7	IRVING PIANKA	86	Pass			
8	EILEEN HAAS	81	Pass			
9	VINCENZO KWAN	50	Fail			
10						
11						

More on Creating complex formulas

This formula means that first we are comparing the number at B2 i.e. 37 (Score of First Student) with our condition.
This expression boils down to (37 <= 50) i.e. Is 37 less than or equal to 50, which is True.
Hence the result will be 'Value_if_True' (second parameter of if statement) i.e. "Fail".

Similarly, for the second student the formula will be:

=IF(B3<=50,"Fail","Pass")

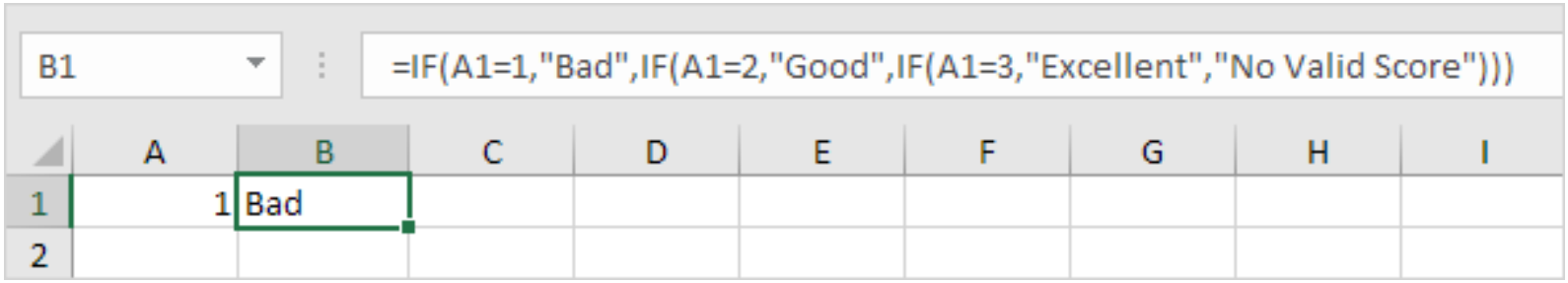
etc.

More on Creating complex formulas

Example Using Nested IF Functions

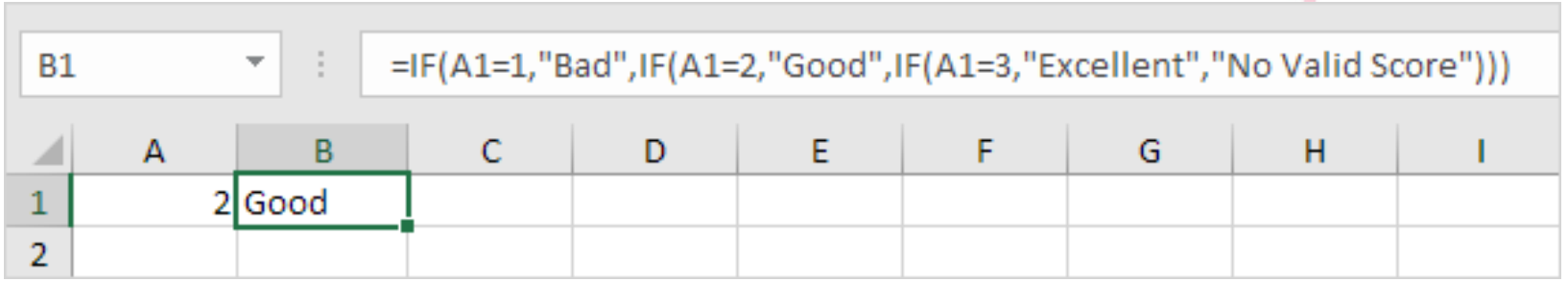
Now lets concentrate on embedded If's

Step 1a: If cell A1 equals 1, the formula returns Bad.

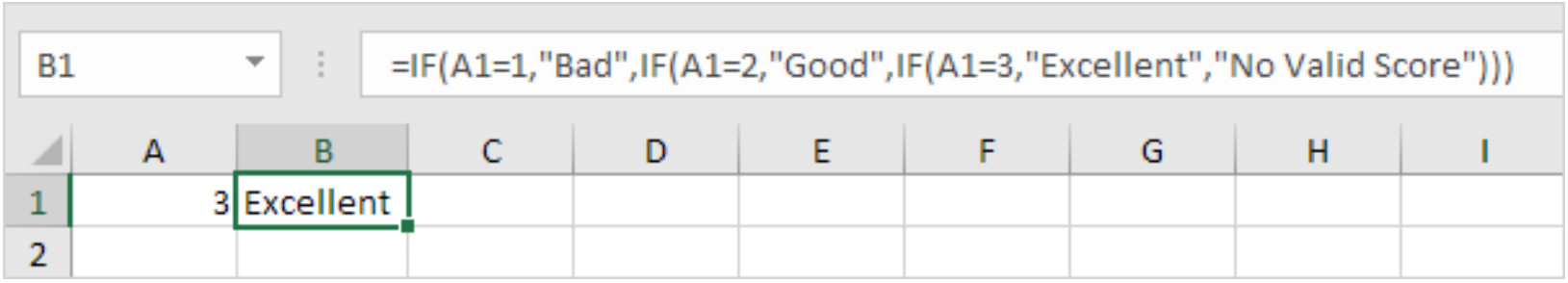


More on Creating complex formulas

Step 1b: If cell A1 equals 2, the formula returns Good.

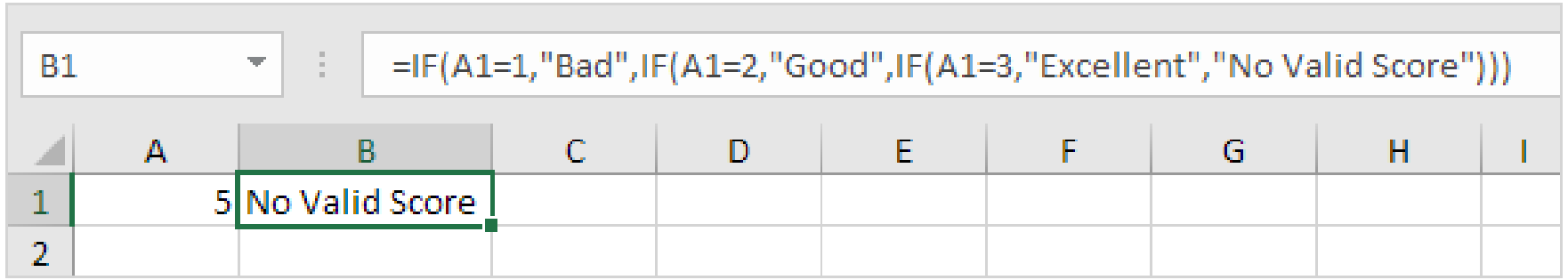


Step 1a: If cell A1 equals 1, the formula returns Bad.



More on Creating complex formulas

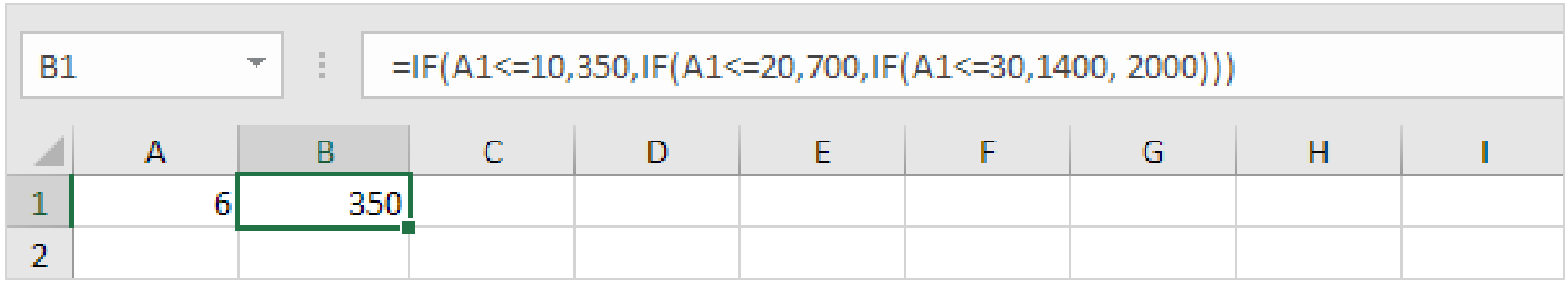
Step 1d: If cell A1 equals another value, the formula returns No Valid Score.



More on Creating complex formulas

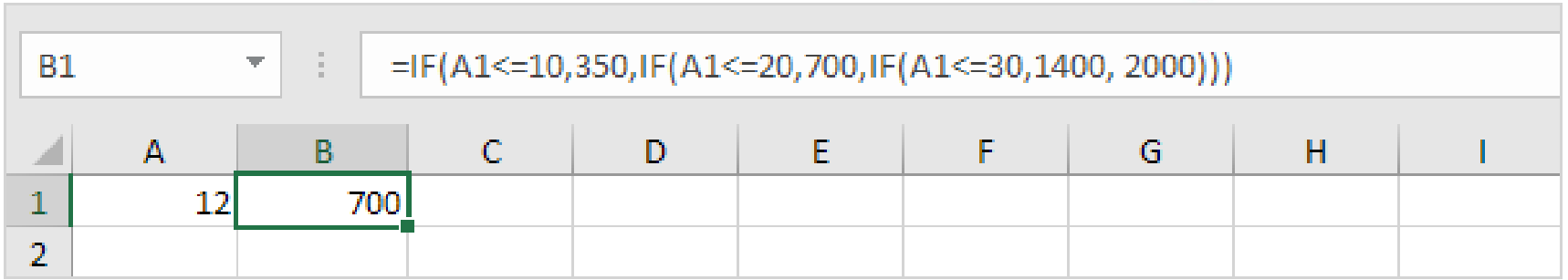
Let’s take a look on another example.

Step 2a: If cell A1 is less or equal to 10, the formula returns 350.

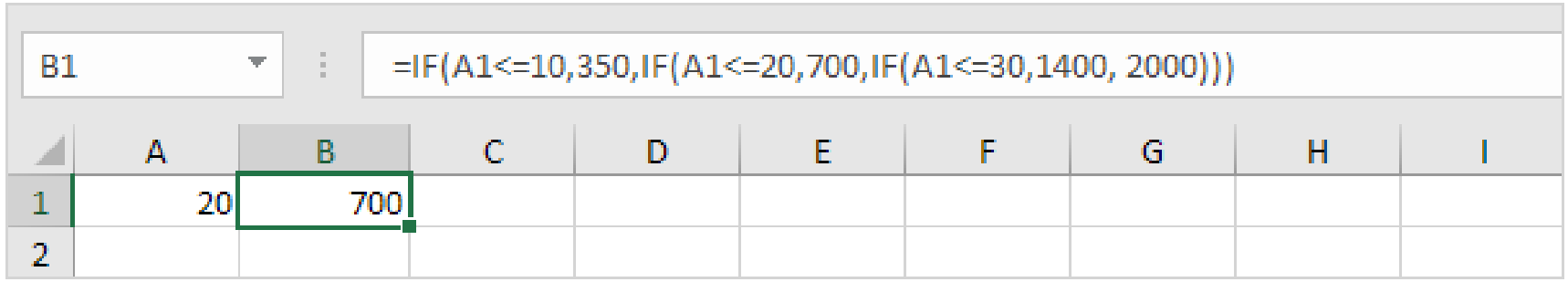


More on Creating complex formulas

Step 2b: If cell A1 is greater than 10 and less or equal to 20, the formula returns 700.

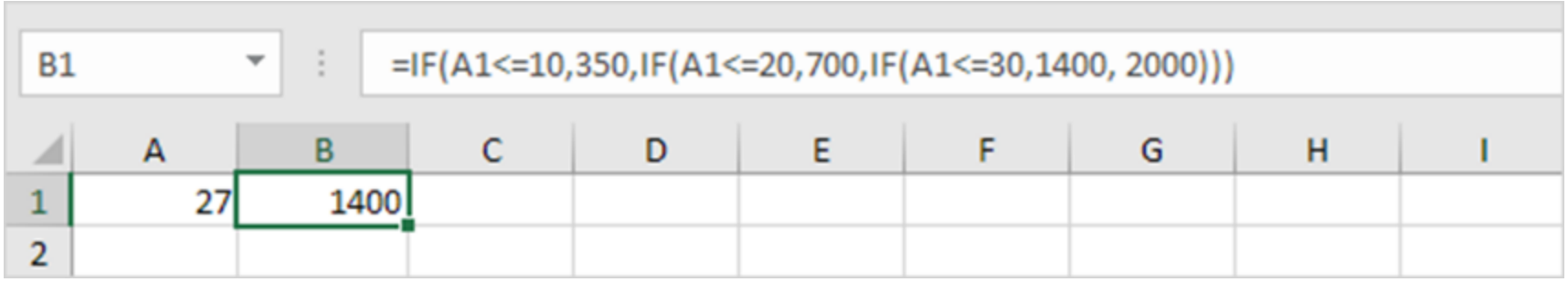


Or…..

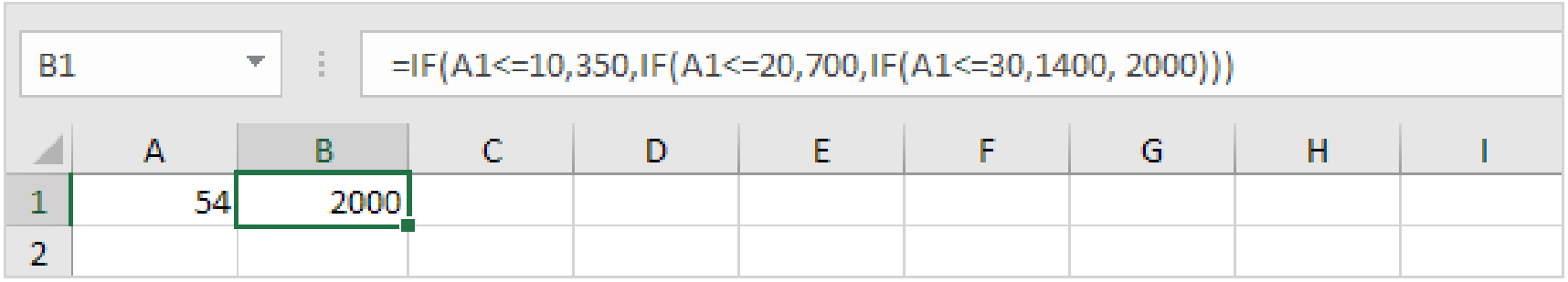


More on Creating complex formulas

Step 2c: If cell A1 is greater than 20 and less or equal to 30, the formula returns 1400.



Step 2d: If cell A1 is greater than 30, the formula returns 2000.



AND and OR function

Microsoft Excel provides 4 logical functions to work with the logical values.

The functions are AND, OR, XOR and NOT.

You use these functions when you want to carry out more than one comparison in your formula or test multiple conditions instead of just one. As well as logical operators, Excel logical functions return either TRUE or FALSE when their arguments are evaluated.

AND and OR function

The table aside provides a short summary of what each logical function does to help you choose the right formula for a specific task.

Function	Description	Formula Example	Formula Description
AND	Returns TRUE if all of the arguments evaluate to TRUE.	=AND(A2>=10, B2<5)	The formula returns TRUE if a value in cell A2 is greater than or equal to 10, and a value in B2 is less than 5, FALSE otherwise.
OR	Returns TRUE if any argument evaluates to TRUE.	=OR(A2>=10, B2<5)	The formula returns TRUE if A2 is greater than or equal to 10 or B2 is less than 5, or both conditions are met. If neither of the conditions it met, the formula returns FALSE.
XOR	Returns a logical Exclusive Or of all arguments.	=XOR(A2>=10, B2<5)	The formula returns TRUE if either A2 is greater than or equal to 10 or B2 is less than 5. If neither of the conditions is met or both conditions are met, the formula returns FALSE.
NOT	Returns the reversed logical value of its argument. I.e. If the argument is FALSE, then TRUE is returned and vice versa.	=NOT(A2>=10)	The formula returns FALSE if a value in cell A1 is greater than or equal to 10; TRUE otherwise.

The AND function

The AND function is the most popular member of the logic functions family. It comes in handy when you have to test several conditions and make sure that all of them are met. Technically, the AND function tests the conditions you specify and returns TRUE if all of the conditions evaluate to TRUE, FALSE otherwise.

The syntax for the Excel AND function is as follows:

Where logical is the condition you want to test that can evaluate to either TRUE or FALSE. The first condition (logical1) is required, subsequent conditions are optional.

The AND function

Since you got that, let's look at some formula examples that demonstrate how to use the AND functions in Excel formulas.

Formula	Description
`=AND(A2="Bananas", B2>C2)`	Returns TRUE if A2 contains "Bananas" and B2 is greater than C2, FALSE otherwise.
`=AND(B2>20, B2=C2)`	Returns TRUE if B2 is greater than 20 and B2 is equal to C2, FALSE otherwise.
`=AND(A2="Bananas", B2>=30, B2>C2)`	Returns TRUE if A2 contains "Bananas", B2 is greater than or equal to 30 and B2 is greater than C2, FALSE otherwise.

The AND function

And in an Excel sheet…

	A	B	C	D	E	F
1	Product	In Stock	Sold	Formula 1	Formula 2	Formula 3
2				=AND(A2="Bananas", B2>C1)	=AND(B2>20, B2=C2)	=AND(A2="Bananas", B2>=30, B2>C2)
3	Bananas	30	20	TRUE	FALSE	TRUE
4	Oranges	40	40	FALSE	TRUE	FALSE
5	Bananas	20	20	FALSE	FALSE	FALSE
6	Oranges	40	10	FALSE	FALSE	FALSE

The AND function - Common Uses

By itself, the Excel AND function is not very exciting and has narrow usefulness.
But in combination with other Excel functions, AND can significantly extend the capabilities of your worksheets.

One of the most common uses of the Excel AND function is found in the logical_test argument of the IF function to test several conditions instead of just one. For example, you can nest any of the AND functions above inside the IF function and get a result similar to this:

=IF(AND(A2="Bananas", B2>C2), "Good", "Bad")

The AND function - Common Uses

And in an Excel sheet…

D2

=IF(AND(A2="Bananas", B2>C2), "Good", "Bad")

	A	B	C	D
1	Product	In Stock	Sold	IF formula
2	Bananas	30	20	Good
3	Oranges	40	40	Bad
4	Bananas	20	20	Bad
5	Oranges	40	10	Bad

The OR function

As well as AND, the Excel OR function is a basic logical function that is used to compare two values or statements.

The difference is that the OR function returns TRUE if at least one if the arguments evaluates to TRUE, and returns FALSE if all arguments are FALSE.

The OR function is available in all versions of Excel 2000 – 20XX.

The OR function

The syntax of the Excel OR function is very similar to AND:

```
OR(logical1, [logical2], ...)
```

Where logical is something you want to test that can be either TRUE or FALSE. The first logical is required, additional conditions are optional.

The OR function

Since you got that too, let's look at some formula examples that demonstrate how to use the OR functions in Excel formulas.

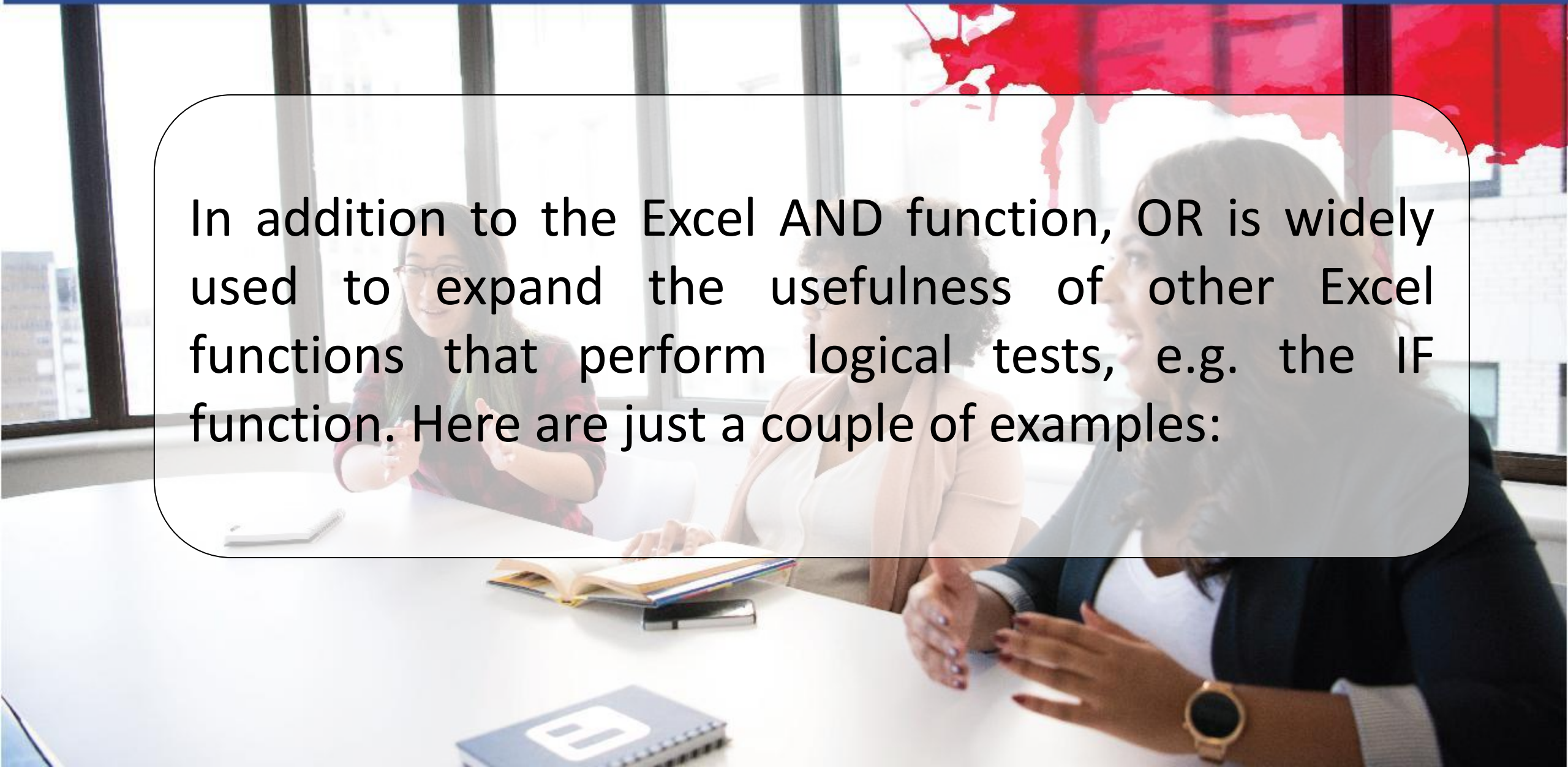
Formula	Description
=OR(A2="Bananas", A2="Oranges")	Returns TRUE if A2 contains "Bananas" or "Oranges", FALSE otherwise.
=OR(B2>=40, C2>=20)	Returns TRUE if B2 is greater than or equal to 40 or C2 is greater than or equal to 20, FALSE otherwise.
=OR(B2=" ", C2="")	Returns TRUE if either B2 or C2 is blank or both, FALSE otherwise.

The OR function

And in an Excel sheet…

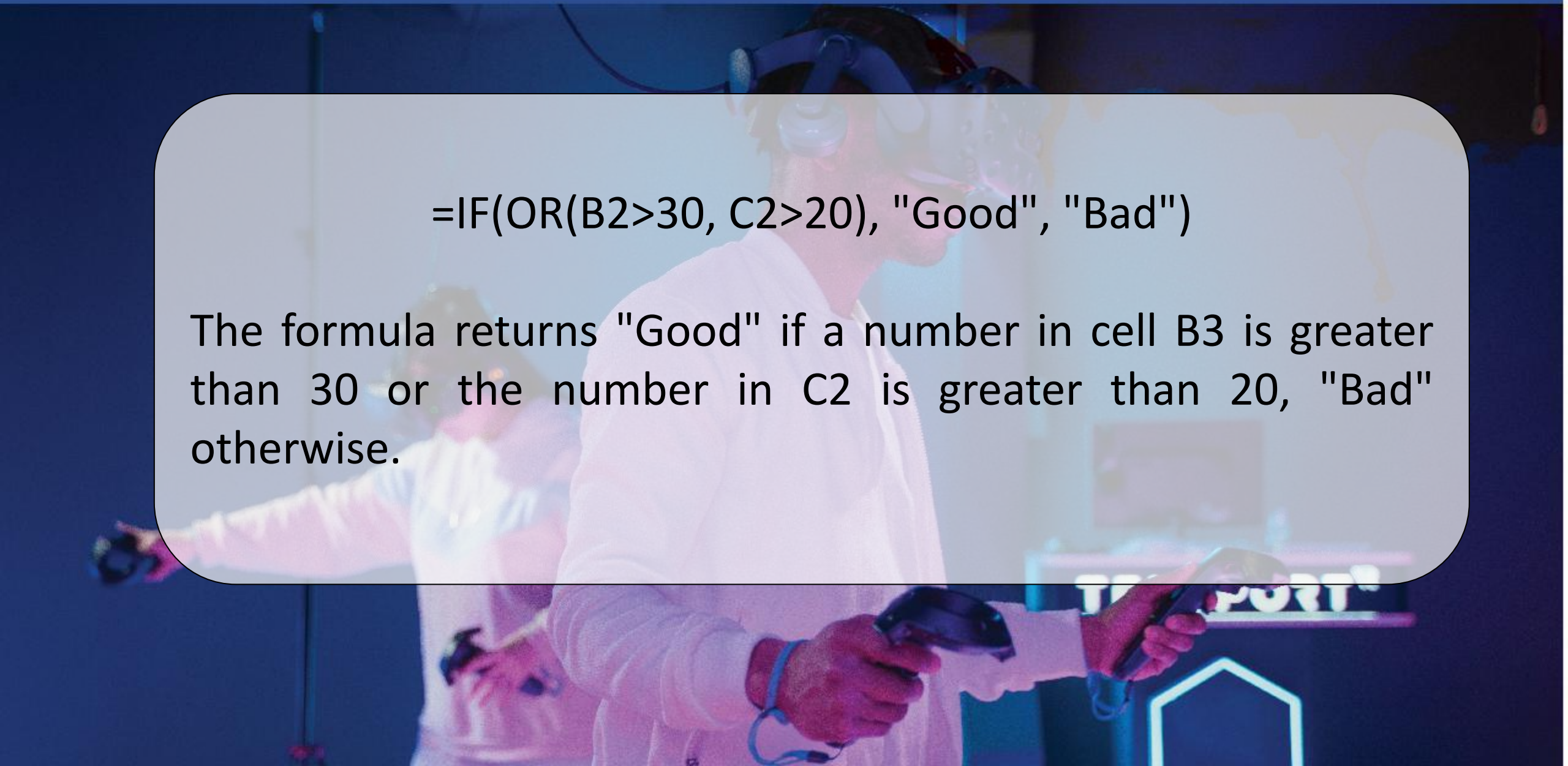
	A	B	C	D	E	F
1	Product	In Stock	Sold	Formula 1	Formula 2	Formula 3
2				=OR(A2="Bananas", A2="Oranges")	=OR(B2>=40, C2>=20)	=OR(B2="", C2="")
3	Bananas	30	10	TRUE	FALSE	FALSE
4	Oranges		20	TRUE	TRUE	TRUE
5	Cherries	20		FALSE	FALSE	TRUE
6	Oranges	30	10	TRUE	FALSE	FALSE
7	Cherries			FALSE	FALSE	TRUE

The AND and OR function – Together



In addition to the Excel AND function, OR is widely used to expand the usefulness of other Excel functions that perform logical tests, e.g. the IF function. Here are just a couple of examples:

IF function with nested OR



=IF(OR(B2>30, C2>20), "Good", "Bad")

The formula returns "Good" if a number in cell B3 is greater than 30 or the number in C2 is greater than 20, "Bad" otherwise.

Excel AND / OR functions in one formula

Naturally, nothing prevents you from using both functions, AND & OR, in a single formula if your business logic requires this. There can be infinite variations of such formulas that boil down to the following basic patterns:

=AND(OR(Cond1, Cond2), Cond3)

=AND(OR(Cond1, Cond2), OR(Cond3, Cond4)

=OR(AND(Cond1, Cond2), Cond3)

=OR(AND(Cond1,Cond2), AND(Cond3,Cond4))

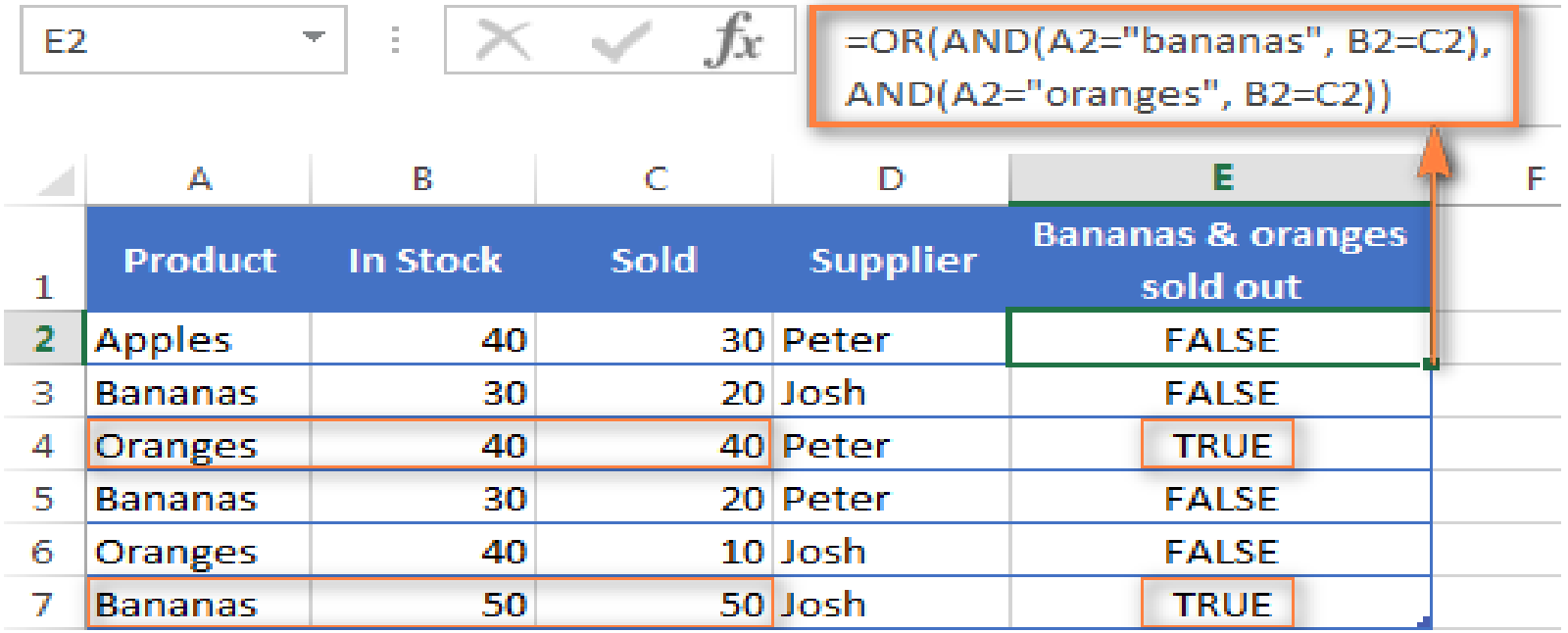
Excel AND / OR functions in one formula

For example, if you wanted to know what consignments of bananas and oranges are sold out, i.e. "In stock" number (column B) is equal to the "Sold" number (column C),
the following OR/AND formula could quickly show this to you:

=OR(AND(A2="bananas", B2=C2), AND(A2="oranges", B2=C2))

Excel AND / OR functions in one formula

And in an Excel sheet…

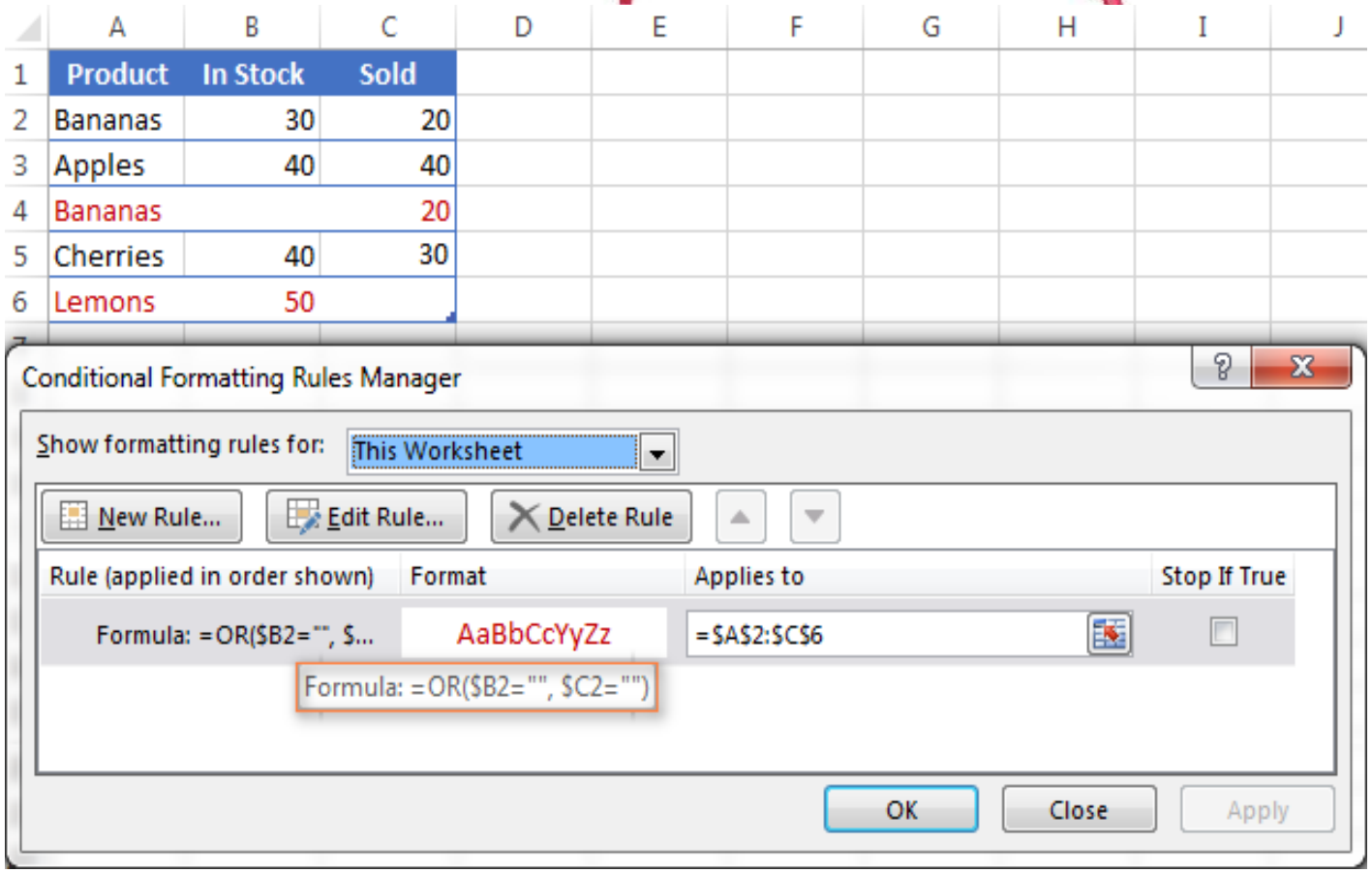


	A	B	C	D	E	F
1	Product	In Stock	Sold	Supplier	Bananas & oranges sold out	
2	Apples	40	30	Peter	FALSE	
3	Bananas	30	20	Josh	FALSE	
4	Oranges	40	40	Peter	TRUE	
5	Bananas	30	20	Peter	FALSE	
6	Oranges	40	10	Josh	FALSE	
7	Bananas	50	50	Josh	TRUE	

OR function in Excel-conditional formatting

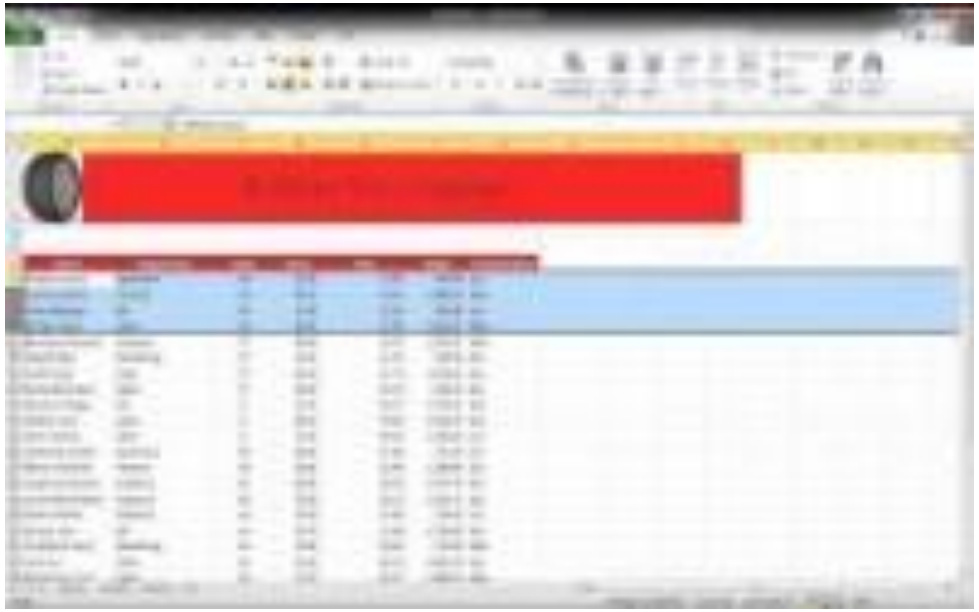
=OR($B2="", $C2="“)

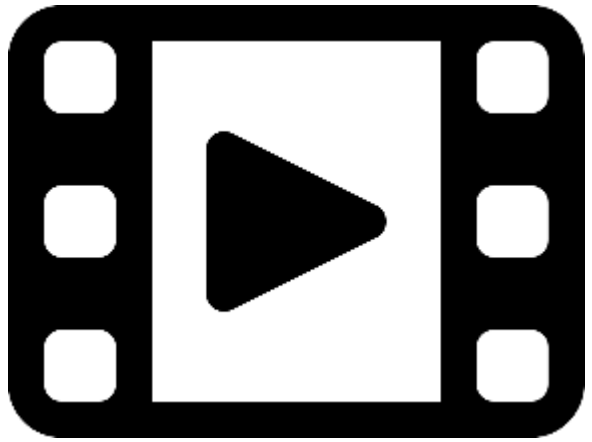
The rule with the above OR formula highlights rows that contain an empty cell either in column B or C, or in both.



Sorting

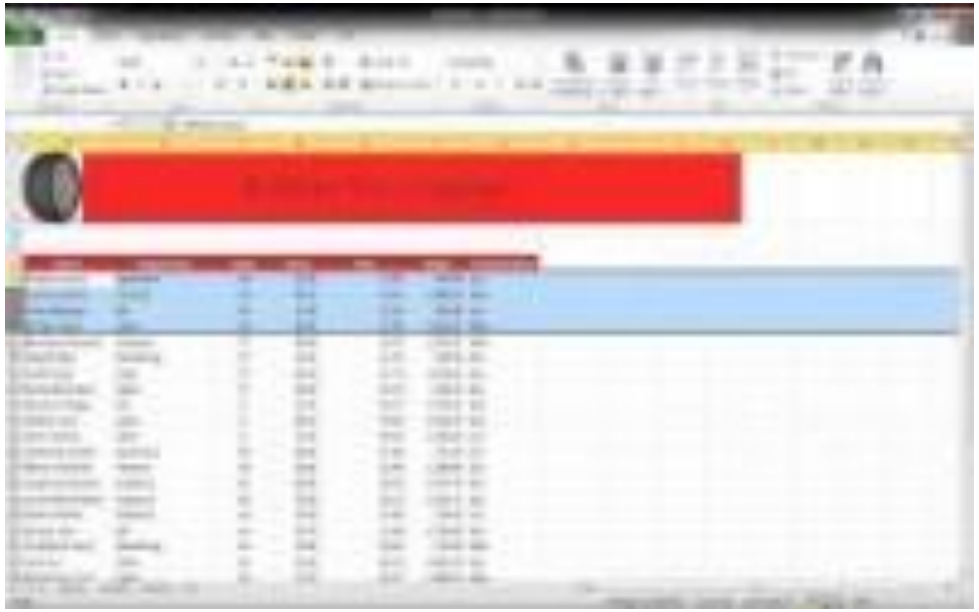
Let’s watch a video:





Sorting

Let’s watch the video:

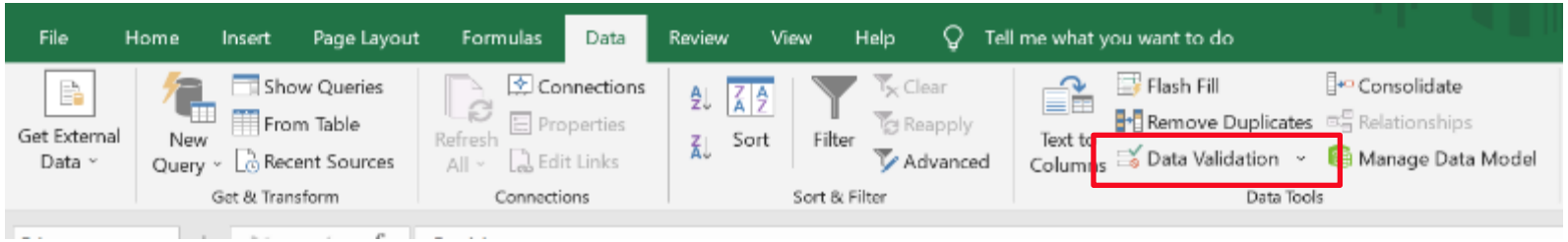


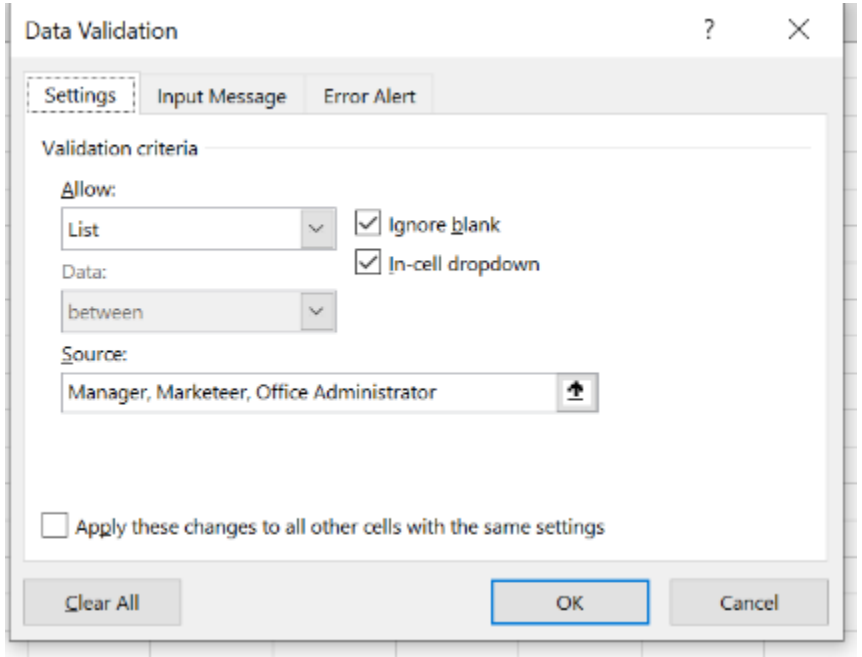
Data validation

Add data validation to a cell or a range

1. Select one or more cells to validate.
2. On the Data tab, in the Data Tools group, click Data Validation.
3. On the Settings tab, in the Allow box, select List.
4. In the Source box, type your list values, separated by commas.

	A	B
1	Employee	Position
2	Peter	Manager
3	John	Manager
4	Mary	Marketeer
5	James	Marketeer
6	Elizabeth	Office Administrator
7	Kathy	Office Administrator
8		

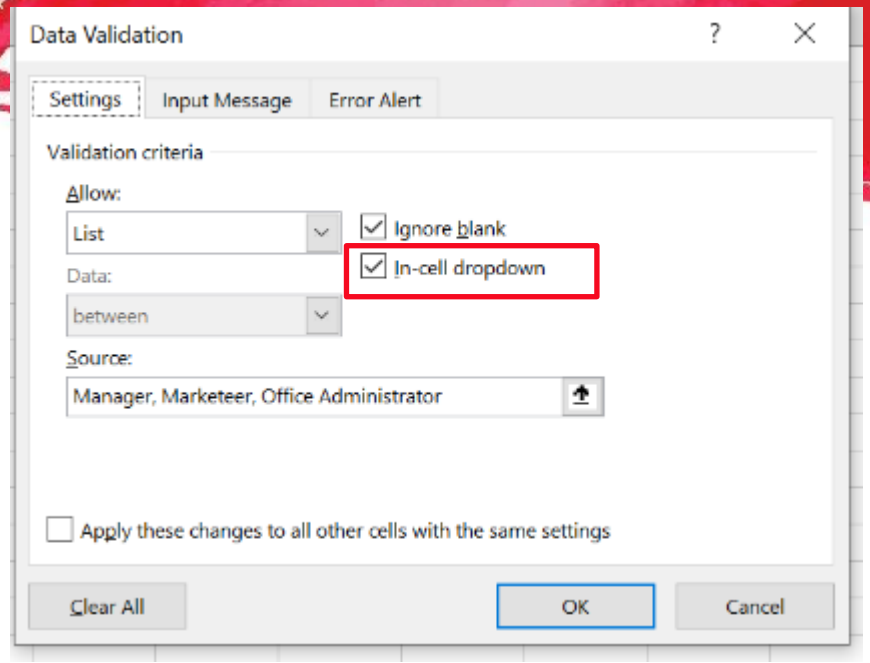


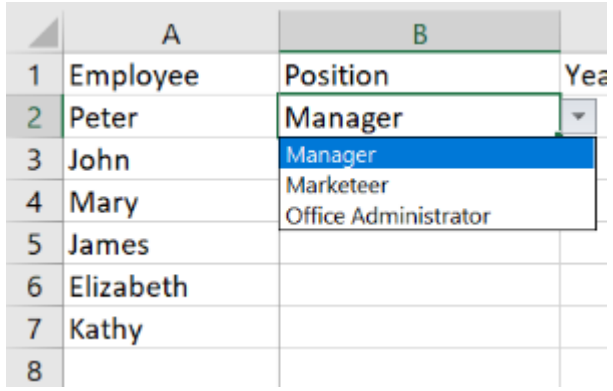


Data validation

5. Make sure that the In-cell dropdown check box is selected. Otherwise, you won't be able to see the drop-down arrow next to the cell.

6. To specify how you want to handle blank (null) values, select or clear the Ignore blank check box.

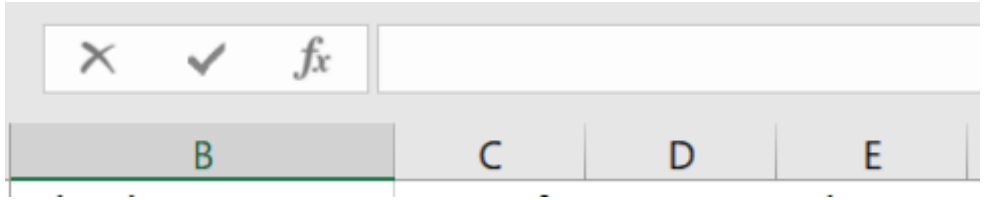




Names and named ranges

To define a name for a cell or cell range on a worksheet:

1. Select the cell, range of cells, or nonadjacent selections that you want to name.
2. Click the Name box at the right end of the formula bar.



Name box

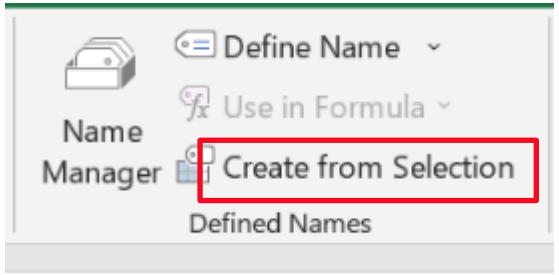
3. Type the name that you want to use to refer to your selection. Names can be up to 255 characters in length.
Press ENTER.

Names and named ranges

Define a name by using a selection of cells in the worksheet
You can convert existing row and column labels to names.

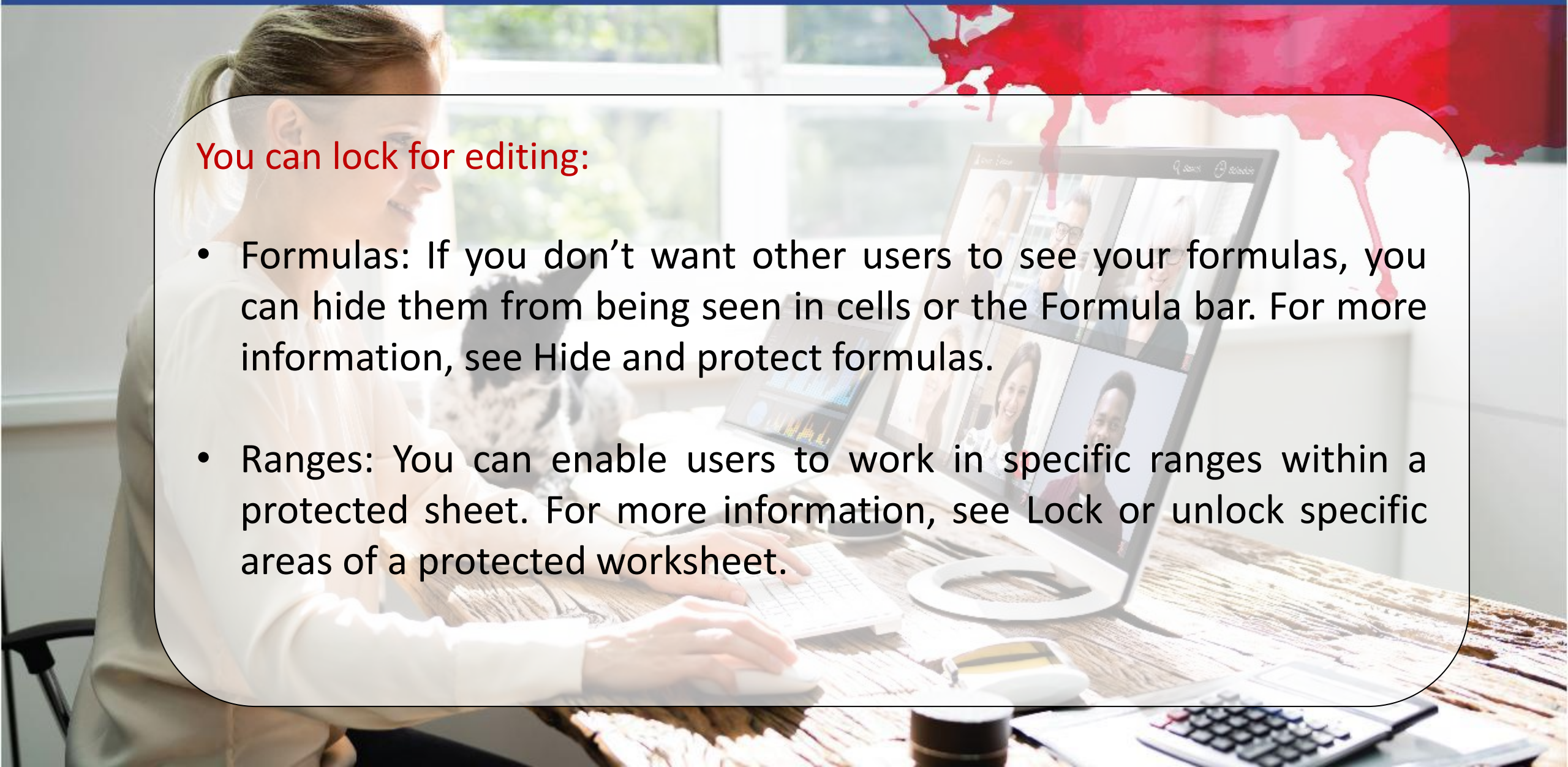
1. Select the range that you want to name, including the row or column labels.

2. On the Formulas tab, in the Defined Names group, click Create from Selection.



3. In the Create Names from Selection dialog box, designate the location that contains the labels by selecting the Top row, Left column, Bottom row, or Right column check box. A name created by using this procedure refers only to the cells that contain values and does not include the existing row and column labels.

Protecting worksheets



You can lock for editing:

- Formulas: If you don’t want other users to see your formulas, you can hide them from being seen in cells or the Formula bar. For more information, see Hide and protect formulas.

- Ranges: You can enable users to work in specific ranges within a protected sheet. For more information, see Lock or unlock specific areas of a protected worksheet.

Protecting worksheets

Step 1:

Unlock any cells that need to be editable.

In your Excel file, select the worksheet tab that you want to protect.

Select the cells that others can edit.

Right-click anywhere in the sheet and select Format Cells (or use Ctrl+1, or Command+1 on the Mac), and then go to the Protection tab and clear Locked.

Protecting worksheets

Step 2: Protect the worksheet

On the Review tab, click Protect Sheet.

In the Allow all users of this worksheet to list, select the elements you want people to be able to change.

Optionally, enter a password in the Password to unprotect sheet box and click OK. Reenter the password in the Confirm Password dialog box and click OK.

Revision Questions

Question 1

- Identify the functionalities of a spreadsheet that are necessary for the production or amendment of complex spreadsheets.

Question 2

- List more advanced formulas and functions that can be used to manipulate data

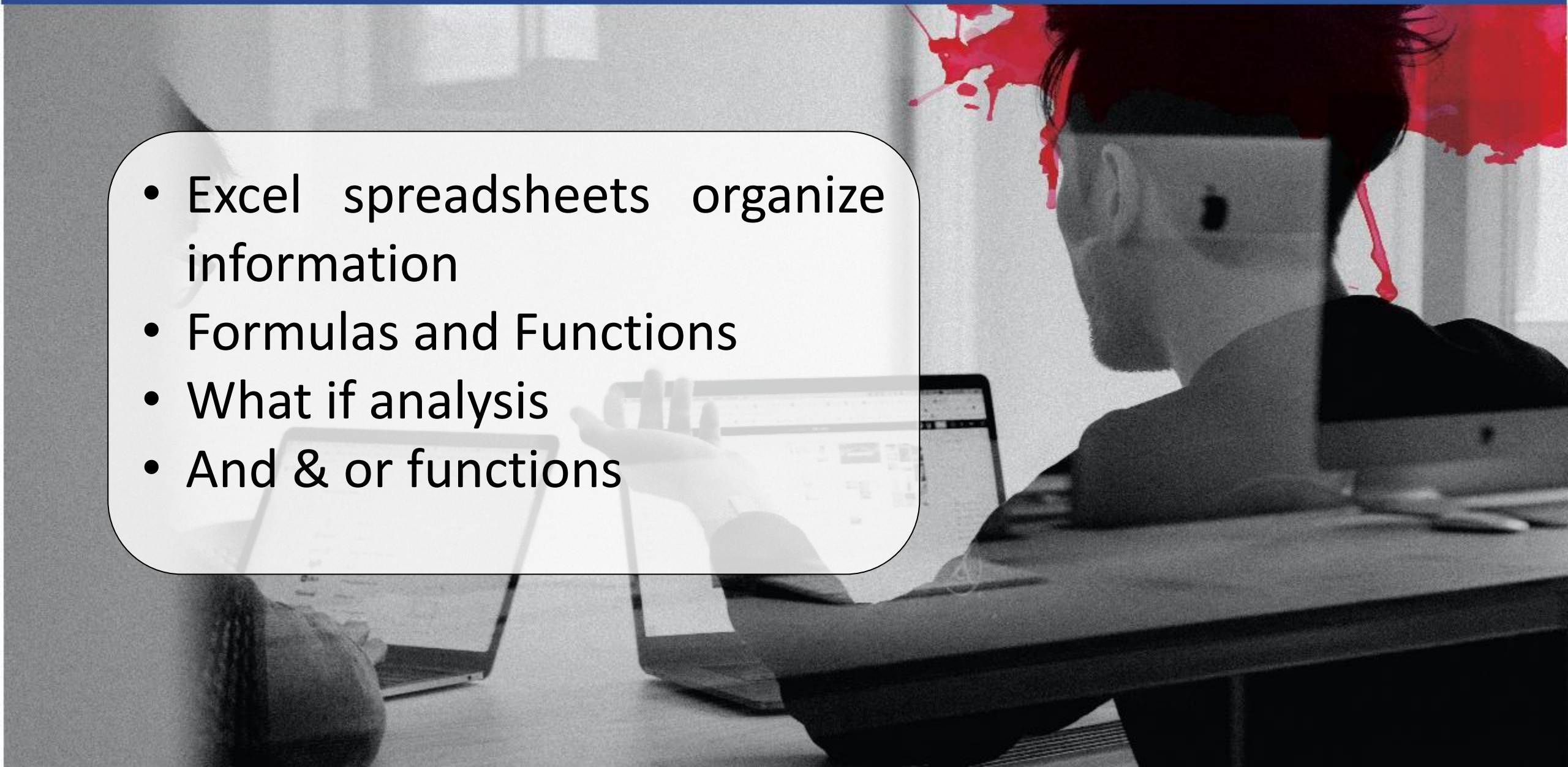
Question 3

- Describe the process of protecting a spreadsheet

Question 4

- List criteria for the evaluation of the result

Module Key points



- Excel spreadsheets organize information
- Formulas and Functions
- What if analysis
- And & or functions

WELL DONE!

You have completed Unit 3.15 Part B

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