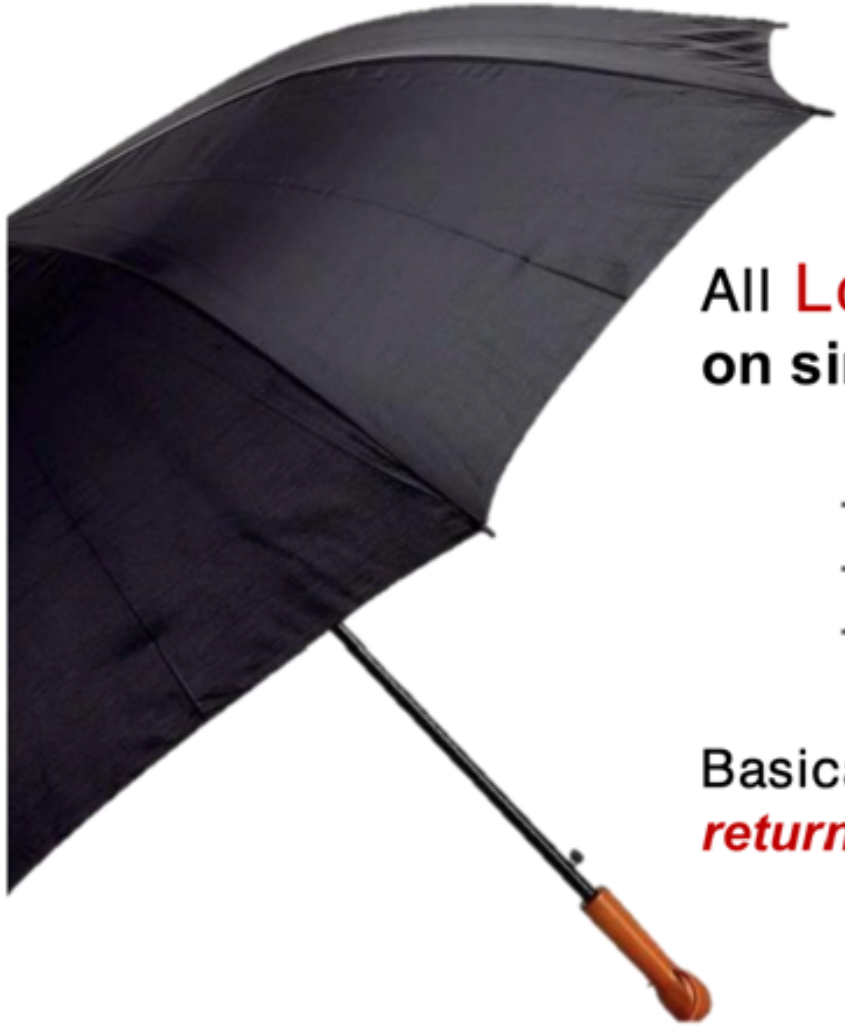
MODULE 2

LOGICAL OPERATORS

TOPICS

- Anatomy of the IF Statement
- Nested Logical Operators
- AND/OR OPERATOR
- NOT VS <>
- IS statements
- Exercises

Logical Operators



All Logical Operators in Excel are based **on simple "IF/THEN" statements:**

-IF *it's raining,* THEN bring an umbrella
-IF *it's sunny,* THEN bring sunglasses
-IF *it's sunny* AND *it's summer, skip work and go to the beach*

Basically it just says ***"Hey Excel, if this statement is true, return this value. Otherwise, return something else."***

Excel logical operators

Condition	Operator	Formula Example	Description
Equal to	=	=A1=B1	The formula returns TRUE if a value in cell A1 is equal to the values in cell B1; FALSE otherwise.
Not equal to	<>	=A1<>B1	The formula returns TRUE if a value in cell A1 is not equal to the value in cell B1; FALSE otherwise.
Greater than	>	=A1>B1	The formula returns TRUE if a value in cell A1 is greater than a value in cell B1; otherwise it returns FALSE.
Less than	<	=A1<B1	The formula returns TRUE if a value in cell A1 is less than in cell B1; FALSE otherwise.
Greater than or equal to	>=	=A1>=B1	The formula returns TRUE if a value in cell A1 is greater than or equal to the values in cell B1; FALSE otherwise.
Less than or equal to	<=	=A1<=B1	The formula returns TRUE if a value in cell A1 is less than or equal to the values in cell B1; FALSE otherwise.

IF Statement

=IF(logical_test, [Value if True], [Value if False])

Any test that results in either TRUE or FALSE

(*i.e. A1="Google", B2<100, etc*)

Value returned if logical test is TRUE

Value returned if logical test is FALSE

	A	B	C	D
1	Location	Temp (F)	Precip (mm)	Freeze
2	A	75	0	No
3	B	18	0	Yes
4	C	86	0	No
5	D	80	2.3	No
6	E	28	1.2	Yes
7	F	68	0.5	No
8	G	26	0	Yes

= IF(B2<=0,"Yes","No")

In this case we're categorizing the Freeze column as "Yes" if the temperature is equal to or below 32, otherwise "No"

Nested IF

By using Nested IF Statements, you can include multiple logical tests within a single formula:

	A	B	C	D	E
1	Location	Temp (F)	Precip (mm)	Freeze	Climate
2	A	75	0	No	Mild
3	B	18	0	Yes	Cold
4	C	86	0	No	Hot
5	D	80	2.3	No	Mild
6	E	28	1.2	Yes	Cold
7	F	68	0.5	No	Mild
8	G	26	0	Yes	Cold

= IF(B2<40,"COLD",IF(B2>80,"HOT","MILD"))

If temp<40, climate = "Cold", if temp>80, climate = "Hot", otherwise climate = "Mild"

AND / OR Statements

Excel's AND and OR statements allow you to include multiple logical tests at once:

	A	B	C	D	E	F	G
1	Location	Temp (F)	Precip (mm)	Freeze	Climate	Precip Type	Conditions
2	A	75	0	No	Mild	None	Dry
3	B	18	0	Yes	Cold	None	Dry
4	C	86	0	No	Hot	None	Dry
5	D	80	2.3	No	Mild	Rain	Wet
6	E	28	1.2	Yes	Cold	Snow	Wet
7	F	68	0.5	No	Mild	Rain	Wet
8	G	26	0	Yes	Cold	None	Dry

=IF(OR(F2="Rain",F2="Snow"),"Wet","Dry")

Here we're categorizing conditions as "Wet" if the precipitation type equals "rain" OR "snow", otherwise Conditions = "Dry"

=IF(AND(D2="Yes",C2>0),"Snow",IF(AND(D2="No",C2>0),"Rain","None"))

If the temp is below freezing AND the amount of precipitation > 0, then Precip ***Type = "Snow", if the temp is*** above freezing AND the amount of precipitation >0, then Precip ***Type = "Rain", otherwise*** Precip ***Type = "None"***

PRO TIP:

When writing nested functions, copy/paste repetitive pieces and tweak individual elements to save time (rather than starting from scratch)

NOT / <> Operators

If you want to evaluate a case where a logical statement is not true, you can use either the NOT **statement or a "<>" operator**

	A	B	C	D	E	F	G
1	Location	Temp (F)	Precip (mm)	Freeze	Climate	Precip Type	Conditions
2	A	75	0	No	Mild	None	Dry
3	B	18	0	Yes	Cold	None	Dry
4	C	86	0	No	Hot	None	Dry
5	D	80	2.3	No	Mild	Rain	Wet
6	E	28	1.2	Yes	Cold	Snow	Wet
7	F	68	0.5	No	Mild	Rain	Wet
8	G	26	0	Yes	Cold	None	Dry

=IF(NOT(C2=0),"Wet","Dry")

=IF(C2<>0,"Wet","Dry")

In both of these examples, we're defining Conditions = "Wet" if the amount of precipitation is NOT equal to 0

IF ERROR

The IFERROR statement is an excellent tool to eliminate annoying error messages (#N/A, #DIV/0!, #REF!, etc.), which is particularly useful for front-end formatting

=IFERROR(value, value_if_error)

Formula or value that may or may not result in an error

Value returned in the case of an error

PRO TIP:

If you're writing a formula that may trigger an error (i.e. a VLOOKUP where not all values have a match), WRITE THE FULL FORMULA FIRST then wrap it in an IFERROR statement

IS Statements

Excel offers a number of different IS formulas, each of which checks whether a certain condition is true:

ISBLANK = Checks whether the reference cell or value is blank

ISNUMBER = Checks whether the reference cell or value is numerical

ISTEXT = Checks whether the reference cell or value is a text string

ISERROR = Checks whether the reference cell or value returns an error

ISEVEN = Checks whether the reference cell or value is even

ISODD = Checks whether the reference cell or value is odd

ISLOGICAL = Checks whether the reference cell or value is a logical operator

ISFORMULA = Checks whether the reference cell or value is a formula