Logical operations

INTERMEDIATE SPREADSHEETS

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The opposite of true

	A	B	C
1	*Value*	*Command*	*Result*
2	`TRUE`	`=NOT(A2)`	`FALSE`
3	`FALSE`	`=NOT(A3)`	`TRUE`

This and that

	A	B	C	D
1	*Value1*	*Value2*	*Command*	*Result*
2	`TRUE`	`TRUE`	`=AND(A2, B2)`	`TRUE`
3	`TRUE`	`FALSE`	`=AND(A3, B3)`	`FALSE`
4	`FALSE`	`TRUE`	`=AND(A4, B4)`	`FALSE`
5	`FALSE`	`FALSE`	`=AND(A5, B5)`	`FALSE`

One or the other

	A	B	C	D
1	*Value1*	*Value2*	*Command*	*Result*
2	`TRUE`	`TRUE`	`=OR(A1, B1)`	`TRUE`
3	`TRUE`	`FALSE`	`=OR(A2, B2)`	`TRUE`
4	`FALSE`	`TRUE`	`=OR(A3, B3)`	`TRUE`
5	`FALSE`	`FALSE`	`=OR(A4, B4)`	`FALSE`

Summary

- `NOT()` swaps `TRUE` and `FALSE`.
- `AND()` returns `TRUE` when all inputs are `TRUE`.
- `OR()` returns `TRUE` when any inputs are `TRUE`.

Let's get logical!

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Flow control

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If this then that

	A	B	C
1	*Value*	*Command*	*Result*
2	`TRUE`	`=IF(A2, "1st", "2nd")`	`1st`
3	`FALSE`	`=IF(A3, "1st", "2nd")`	`2nd`

	A	B	C
1	*Value*	*Command*	*Result*
2	`5`	`=IF(A2 > 0, "positive", "negative")`	`positive`

Dealing with lots of conditions

	A	B	C	D
1	*Value1*	*Value2*	*Command*	*Result*
2	`TRUE`	`FALSE`	`=IFS(A2, "1st", B2, "2nd")`	`1st`
3	`FALSE`	`TRUE`	`=IFS(A3, "1st", B3, "2nd")`	`2nd`
4	`TRUE`	`TRUE`	`=IFS(A4, "1st", B3, "2nd")`	`1st`
5	`FALSE`	`FALSE`	`=IFS(A5, "1st", B5, "2nd")`	`#N/A`

Transforming categorical variables

	A	B	C
1	*Value*	*Command*	*Result*
2	`1st`	`=SWITCH(A2, "1st", 1, "2nd", 2)`	`1`
3	`2nd`	`=SWITCH(A3, "1st", 1, "2nd", 2)`	`2`
4	`3rd`	`=SWITCH(A4, "1st", 1, "2nd", 2)`	`#N/A`

Summary

- `IF(condition, yes, no)` lets you return a value based on a logical condition.
- `IFS(condition1, value1, condition2, value2)` extends this to multiple conditions.
- `SWITCH(condition, category1, value1, category2, value2)` lets you transform categorical variables.

Let's practice!

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Blanks, missing values, & errors

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	A	B	C
1	*Value*	*Command*	*Result*
2	1	=ISBLANK(A2)	FALSE
3	3	=ISBLANK(A3)	FALSE
4	6	=ISBLANK(A4)	FALSE
5		=ISBLANK(A5)	TRUE
6	15	=ISBLANK(A6)	FALSE
7		=ISBLANK(A7)	TRUE
8	28	=ISBLANK(A8)	FALSE
9	X	=COUNTBLANK(A2:A8)	2

Calculating with blanks: DANGER!

	A	B	C
1	*Value*	*Command*	*Result*
2	1	`=A2 + 1`	2
3	3	`=A3 + 1`	4
4	6	`=A4 + 1`	7
5		`=A5 + 1`	1
6	15	`=A6 + 1`	16
7		`=A7 + 1`	1
8	28	`=A8 + 1`	29

Calculating with blanks: make them missing

	A	B	C
1	*Value*	*Command*	*Result*
2	1	`=IF(ISBLANK(A2), NA(), A2)`	2
3	3	`=IF(ISBLANK(A3), NA(), A3)`	4
4	6	`=IF(ISBLANK(A4), NA(), A4)`	7
5		`=IF(ISBLANK(A5), NA(), A5)`	#N/A
6	15	`=IF(ISBLANK(A6), NA(), A6)`	16
7		`=IF(ISBLANK(A7), NA(), A7)`	#N/A
8	28	`=IF(ISBLANK(A8), NA(), A8)`	29

Errors

	A	B	C	D	E
1	*Value*	*Command1*	*Result1*	*Command2*	*Result2*
2		`=ISERROR(A2)`	`FALSE`	`=ISERR(A2)`	`FALSE`
3	`#N/A`	`=ISERROR(A3)`	`TRUE`	`=ISERR(A3)`	`FALSE`

Types of error

Error	Cause
`#DIV/0!`	Dividing by zero.
`#VALUE!`	Nonsense data in a calculation.
`#REF!`	Referencing a cell that has been deleted.
`#NAME?`	Forgetting to quote a string.
`#NUM!`	Numbers being out of range.
`#N/A`	Missing value.
`#ERROR!`	Syntax problem in a formula.

Summary

- Cells with nothing in are called "blank".
- Calculating with blank cells will give you the wrong answer.
- Instead, use `NA()` to create missing values.
- Missing values are a type of error.

Let's practice!

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