`boolean` Expressions
Relational, Equality, and Logical Operators

How do we *compare* **number** and **string** data?

*… with **relational and equality** operators!*

Test	Math	TypeScript Operator
"is greater than?"	>	>
"is at least?"	≥	>=
"is less than?"	<	<
"is at most?"	≤	<=
"is equal to?"	=	===
"is not equal to?"	≠	!==

The **`equal to`** Operator is **`===`**

- THREE equals symbols side-by-side means ***"is equal to?"***

  `1 === 1` … **`true`** **`1 === 2`** … **`false`**

- **Important!** Equality operator is very different from the assignment operator.
  - = is read as "is assigned a value of"
  - === is read as "is equal to?"

- **`let b = x === y;`**
  - "The **`boolean`** variable **`b`** is declared and **assigned an initial value** of testing 'is x **equal to** y?'"

- Use ***only*** w/ simple types (`string, number, boolean`), ***not*** w/ Objects/Arrays.

The **`not equal to`** Operator is **`!==`**

- The ! symbol in many programming languages means "NOT"

`1 !== 1` … **`false`**

`1 !== 2` … **`true`**

- **`let b: boolean = x !== y;`**
  - "The `boolean` variable **`b`** is declared and **assigned an initial value** of testing 'is x ***not*** **equal to** y?'"

How do we form compound logical statements?

- IF UNC has a game **AND** it is a home game, THEN I'll go watch.
- IF it is raining **OR** it is cold, THEN I'll grab my jacket.
- IF it is **NOT** a COMP110 assignment, THEN I will procrastinate.

The **AND** operator is **&&**

- The double ampersand && is a `boolean` operator

```
<boolean a> && <boolean b>
```

```
boolean value
```

- If **both expressions** connected by the && symbol **are true**, then the resulting boolean will be true. Otherwise it will be false.

AND truth table

	true	**false**
true	**true**	**false**
false	**false**	**false**

You read a truth table like a multiplication table. Start with a finger on one column label and one row label, per each side of the operator, and trace your way in.

The **OR** operator is ||

- The double vertical bar || is a boolean operator

```
<boolean a> || <boolean b>
```

```
boolean value
```

- If **either expression** connected by the || symbol **is true**, then the resulting boolean will be **true**. Otherwise it will be false.

OR truth table

	true	false
true	**true**	**true**
false	**true**	**false**

You read a truth table like a multiplication table. Start with a finger on one column label and one row label, per each side of the operator, and trace your way in.

The **NOT** operator is !

- The exclamation point is a unary `boolean` operator.

```
!<boolean a>
```

```
boolean value
```

- The expression following the NOT operator will evaluate to the opposite `boolean` value. True becomes false and false becomes true.

NOT truth table

	true	**false**
not	**false**	**true**

Logical Operator Reference

&& AND

Expression	Is
true && true	true
true && false	false
false && true	false
false && false	false

|| OR

Expression	Is
true || true	true
true || false	true
false || true	true
false || false	false

! NOT

Expression	Is
!true	false
!false	true

It is worth committing these to memory. Every programming language (including Excel) shares the same notion of these logical operations.