Booleans and Comparison Operators

Word Soup: Conditionals, Booleans, expressions, statements

As you saw in the video there are a bunch of terms that generally are all talking about the same thing.

Boolean, Boolean values, Boolean expressions:

- A **Boolean value** is simply a computer science-y term that means **a true/false value**.
- A **Boolean expression** is a statement that *evaluates* to a Boolean value (a single true/false).

Condition, Conditionals, Conditional Statements:

- "Conditional" is simply a generic term for code that alters program flow based on true/false values (like an `if` statement)
- Examples: Condition, Conditionals, Conditional statements, conditional execution

Historical Notes on Booleans
- Named after mathematician George Boole
- He invented a corner of mathematics that is now named after him called "Boolean Algebra"
- Boolean Algebra is math that operates using only true/false values.
- This is important work for computer science because true/false maps very easily to binary.

Comparison Operators

A common type of condition to check is a comparison of two values. Here are 6 common **comparison operators**. Each compares a value on the left with a value on the right and returns a Boolean value -- **true** or **false**. Most of these do what you would expect.

Why these symbols: **==**, **!=**, **<=**, and **>=**?

1. We use `==` because the single equal sign `=` is the assignment operator. We need something different to indicate we want to compare two values instead of assign one to the other.

   Common mistake: writing something like `if (age = 18)` instead of `if (age == 18)`. We'll make sure we get this down later.

2. We use `!=`, `<=`, and `>=` because they only require ASCII symbols. Historically the mathematical symbols `≠`, `≤` and `≥` were hard or impossible to produce on some systems. The `!` is universally read as "not".

Reference: Examples

Below are a bunch of examples of how you might see comparisons in code. Review them if you like or continue on and come back if you need reference.

Compares two values - numbers, strings, or other booleans - and returns *true* if they are equal, otherwise *false*.

- `"Hello" == "hello"` returns *false* -- because the strings are are capitalized differently.
- `"3" == 3` returns *true* -- because `==` tries to be forgiving. If it can "coerce" a string into a number it will do so to compare. [1]
- `(2+1) == 3` returns *true* -- because the arithmetic expression evaluates to 3.
- `x == 7` returns *true* -- when the variable x has the value 7.

[1]. While it is a useful feature that `==` will coerce a string into a number, it is considered **TRICKY** because the string "3" is not the same as the integer 3. There are times when you would believe these are not equal. There is a "strict" equality operator - the "triple equal" `===` which makes sure that both the type of data and value are equal. So `"3" === 3` is false.

Compares two values - numbers, strings, or other booleans - and returns `true` if they are **not equal**, otherwise `false`.

- `"Hello" != "hello"` returns *true* -- because the strings are slightly different.
- `"3" != 3` returns *false* -- because the string 3 can be coerced into a number before comparing with 3. (see notes above about the forgiving ==).
- `(2+1) != 3` returns *false* -- because the arithmetic expression evaluates to 3.
- `x != 7` returns *true* -- when the variable x *is any value other than* 7.

Compares two values to see if the number on the left is *greater than* the number on the right.

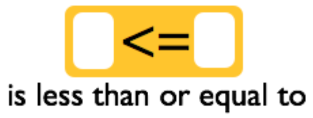
- `4 > 3` returns *true*
- `3 > 7` returns *false*
- `age > 17` returns *true* -- when the value of the variable "age" is strictly greater than 17, otherwise false.

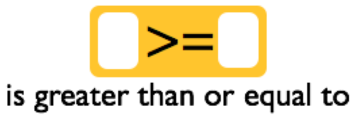
Compares two values to see if the number on the left is *less than* the number on the right.

- `4 < 3` returns *false*
- `3 < 7` returns *true*
- `age < 17` returns *true* -- when the value of the variable "age" is strictly less than 17, otherwise false.

Compares two values to see if the number on the left is *less than or equal to* the number on the right.

- `3 <= 4` returns *true*
- `4 <= 3` returns *false*
- `age <= 18` returns *true* -- when the value of the variable "age" is 18 or less.





Compares two values to see if the number on the left is *greater than or equal to* the number on the right.

- `3 >= 4` returns *false*
- `4 >= 3` returns *true*
- `age >= 18` returns *true* -- when the value of the variable "age" is 18 or greater.

Found a bug in the documentation? Let us know at **documentation@code.org**