

# Python Control Flow

## elif Statement

The Python `elif` statement allows for continued checks to be performed after an initial `if` statement.

An `elif` statement differs from the `else` statement because another expression is provided to be checked, just as with the initial `if` statement.

If the expression is `True`, the indented code following the `elif` is executed. If the expression evaluates to `False`, the code can continue to an optional `else` statement. Multiple `elif` statements can be used following an initial `if` to perform a series of checks. Once an `elif` expression evaluates to `True`, no further `elif` statements are executed.

```
# elif Statement

pet_type = "fish"

if pet_type == "dog":
    print("You have a dog.")
elif pet_type == "cat":
    print("You have a cat.")
elif pet_type == "fish":
    # this is performed
    print("You have a fish")
else:
    print("Not sure!")
```

## or Operator

The Python `or` operator combines two Boolean expressions and evaluates to `True` if at least one of the expressions returns `True`. Otherwise, if both expressions are `False`, then the entire expression evaluates to `False`.

```
True or True      # Evaluates to True
True or False     # Evaluates to True
False or False    # Evaluates to False
1 < 2 or 3 < 1     # Evaluates to True
3 < 1 or 1 > 6     # Evaluates to False
1 == 1 or 1 < 2    # Evaluates to True
```

## Equal Operator ==

The equal operator, `==`, is used to compare two values, variables or expressions to determine if they are the same.

If the values being compared are the same, the operator returns `True`, otherwise it returns `False`. The operator takes the data type into account when making the comparison, so a string value of `"2"` is *not* considered the same as a numeric value of `2`.

```
# Equal operator

if 'Yes' == 'Yes':
    # evaluates to True
    print('They are equal')

if (2 > 1) == (5 < 10):
    # evaluates to True
    print('Both expressions give the same result')

c = '2'
```

```
d = 2
```

```
if c == d:
    print('They are equal')
else:
    print('They are not equal')
```

## Not Equals Operator !=

The Python not equals operator, `!=`, is used to compare two values, variables or expressions to determine if they are NOT the same. If they are NOT the same, the operator returns `True`. If they are the same, then it returns `False`.

The operator takes the data type into account when making the comparison so a value of `10` would NOT be equal to the string value `"10"` and the operator would return `True`. If expressions are used, then they are evaluated to a value of `True` or `False` before the comparison is made by the operator.

```
# Not Equals Operator
```

```
if "Yes" != "No":
    # evaluates to True
    print("They are NOT equal")
```

```
val1 = 10
```

```
val2 = 20
```

```
if val1 != val2:
    print("They are NOT equal")
```

```
if (10 > 1) != (10 > 1000):
    # True != False
    print("They are NOT equal")
```

## Comparison Operators

In Python, *relational operators* compare two values or expressions. The most common ones are:

- `<` less than
- `>` greater than
- `<=` less than or equal to
- `>=` greater than or equal too

If the relation is sound, then the entire expression will evaluate to `True`. If not, the expression evaluates to `False`.

```
a = 2
```

```
b = 3
```

```
a < b # evaluates to True
a > b # evaluates to False
a >= b # evaluates to False
a <= b # evaluates to True
a <= a # evaluates to True
```

## if Statement

The Python `if` statement is used to determine the execution of code based on the evaluation of a Boolean expression.

- If the `if` statement expression evaluates to `True`, then the indented code following the statement is executed.
- If the expression evaluates to `False` then the indented code following the `if` statement is skipped and the program executes the next

```
# if Statement
```

```
test_value = 100
```

```
if test_value > 1:
    # Expression evaluates to True
    print("This code is executed!")
```

line of code which is indented at the same level as the `if` statement.

```
if test_value > 1000:
    # Expression evaluates to False
    print("This code is NOT executed!")

print("Program continues at this point.")
```

## else Statement

The Python `else` statement provides alternate code to execute if the expression in an `if` statement evaluates to `False`.

The indented code for the `if` statement is executed if the expression evaluates to `True`. The indented code immediately following the `else` is executed only if the expression evaluates to `False`. To mark the end of the `else` block, the code must be unindented to the same level as the starting `if` line.

```
# else Statement

test_value = 50

if test_value < 1:
    print("Value is < 1")
else:
    print("Value is >= 1")

test_string = "VALID"

if test_string == "NOT_VALID":
    print("String equals NOT_VALID")
else:
    print("String equals something else!")
```

## and Operator

The Python `and` operator performs a Boolean comparison between two Boolean values, variables, or expressions. If both sides of the operator evaluate to `True` then the `and` operator returns `True`. If either side (or both sides) evaluates to `False`, then the `and` operator returns `False`. A non-Boolean value (or variable that stores a value) will always evaluate to `True` when used with the `and` operator.

<code>True and True</code>	# Evaluates to True
<code>True and False</code>	# Evaluates to False
<code>False and False</code>	# Evaluates to False
<code>1 == 1 and 1 &lt; 2</code>	# Evaluates to True
<code>1 &lt; 2 and 3 &lt; 1</code>	# Evaluates to False
<code>"Yes" and 100</code>	# Evaluates to True

## Boolean Values

Booleans are a data type in Python, much like integers, floats, and strings. However, booleans only have two values:

- `True`
- `False`

Specifically, these two values are of the `bool` type. Since booleans are a data type, creating a variable that holds a boolean value is the same as with other data types.

```
is_true = True
is_false = False

print(type(is_true))

# will output: <class 'bool'>
```

## not Operator

The Python Boolean `not` operator is used in a Boolean expression in order to evaluate the expression to its inverse value. If the original expression was `True`, including the `not` operator would make the expression `False`, and vice versa.

```
not True      # Evaluates to False
not False     # Evaluates to True
1 > 2         # Evaluates to False
not 1 > 2      # Evaluates to True
1 == 1        # Evaluates to True
not 1 == 1     # Evaluates to False
```

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