

1. Recap
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2. Basic Operators
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3. Branching
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KOLT Python

Basic Operators & Branching

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Monday 25th February, 2019

KOLT



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Agenda

1. Recap

2. Basic Operators

3. Branching



Comments

```
# Single line comments start with a '#'  
  
"""  
Multiline comments can be written between  
three "s and are often used as function  
and module comments.  
"""  
print('Hello, stranger!')
```

Python will basically ignore comments, they are purely written **for humans!**



Variables

Type	Explanation	Examples
<code>int</code>	represent integers	3, 4, 17, -10
<code>float</code>	represent real numbers	3.0, 1.11, -109.123123
<code>bool</code>	represent boolean truth values	True, False
<code>str</code>	A sequence of characters.	'Hello', '', '3'
<code>NoneType</code>	special and has one value, None	None

- How to create a variable? `variable_name = value`
- How about types? use `type()`
- Can a variable change type? **Yes!** Just assing a new value with any type.
- What if we if want to convert a value between types, i.e, '2' → 2

Casting

- `int('2') → 2`
- Any possible reasons for casting? -taking user input -reading numbers from a file?
- Can we cast every value to every type? **NO!** try `int('hello')`



Console I/O(Input/Output)

`print(*args, sep=' ', end='\n')`

- Can take arbitrary number of arguments
- Separates elements with space by default
- Adds newline character '`\n`' to end by default

`input([prompt])`

- Prints the prompt to Console
- Program is paused until user enters something
- **returns an `str` object!**



Truthy & Falsy Values

Last week, we tried to cast some values to `bool`, let's look at them in detail.

```
# 'Falsy' values
bool(None) # => False
bool(False) # => False
bool(0) # => False
bool(0.0) # => False
bool('') # => False
# Empty data structures
bool([]) # => False
```

```
# Everything else is 'truthy'
bool(-100000) # => True
bool('False') # => True
bool(3.14) # => True
bool(int) # => True
# Nonempty data structures
bool([1, 'a', []]) # => True
bool([False]) # => True
```

bool Operators

How to represent logical operations in Python? (and, or, not)

A	B	A or B	A and B	not A
True	True	True	True	False
True	False	True	False	False
False	True	True	False	True
False	False	False	False	True

True or False and False \Rightarrow **True**

- and
- or
- not

WHY?

Operator Precedence

Logical operators are evaluated in this order:

1. not
2. and
3. or

You can override this order with parentheses
(True or False) and False \Rightarrow **False**

Short-Circuit Evaluation

x: Any boolean value

True or X \Rightarrow **True**

False and X \Rightarrow **False**

Python is smart enough to take advantage of this!

```
1/0 # => ZeroDivisionError
True or 1/0 # => True
False and 1/0 # => False
1/0 or True # => ZeroDivisionError
1/0 and False # => ZeroDivisionError
```

Arithmetic Operators

These operations are applicable on Numeric types: `int` and `float`

- `+`: Addition
- `-`: Subtraction
- `*`: Multiplication
- `/`: Division
- `//`: Floor(integer)
Division
- `%`: Modulo
- `**`: Power

```
3.2 + 1.4 # => 4.6
3.2 - 1    # => 2.2
3.2 * 1.2  # => 3.84
3.5 / 1.5  # => 2.3333333333333335
3.5 // 1.5 # => 2.0
3.5 % 1.5  # => 0.5
2 ** 10    # => 1024
```

Comparison Operators

- <: Strictly less than
- <=: Less than or equal
- >: Strictly greater than
- >=: Greater than or equal
- ==: Equal
- !=: Not equal

```
3.0 == 3    # => True
3.0 >= 3    # => True
# Small-case characters
# have bigger ASCII value
'Aa' > 'aa' # => False
'hi' == 'hi' # => True
'a' == None  # => True
3 > 'a'     # => TypeError
3 == 'a'    # => False
```

Chained Comparisons

`1 < 2 < 3` \Rightarrow **True**

You can chain arbitrarily many comparison operations together.

v_i : variables/values, op_i : comparison operators

$v_1 \ op_1 \ v_2 \ op_2 \ v_3 \ \dots \ op_{n-1} \ v_n$ is equivalent to:

$v_1 \ op_1 \ v_2$ **and** $v_2 \ op_2 \ v_3$ **and** $\dots v_{n-1} \ op_{n-1} \ v_n$

```
3 > 2 == 1 < 5 > 4 # => False
```

```
3 > (2 == 1) < 5 > 4 # => True
```

```
3 > True > False # => True
```

```
3 > 5 < 1/0 # => False
```

```
3 < 5 < 1/0 # => ZeroDivisionError
```

Assignment Operators

We have already seen '=': `variable_name = value`
Frequently we will update variables' values based on their **old value**.

Ex: Increment a number: `num = num + 1`

Python has shorthand representations for these updates with arithmetic operators.

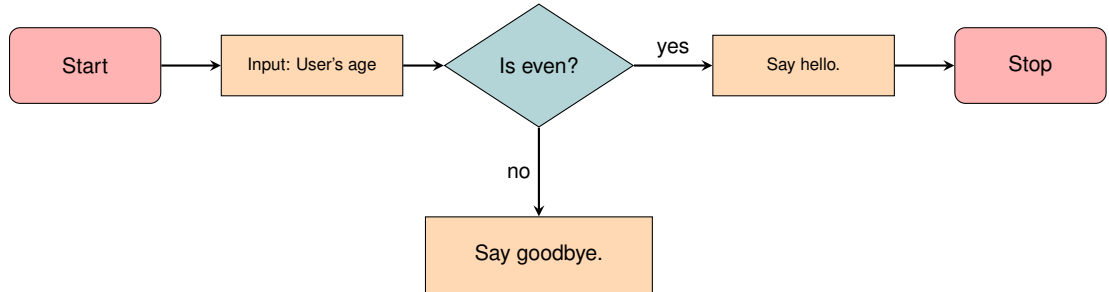
`num += 1` is equivalent to `num = num + 1`

`result *= 2` is equivalent to `result = result * 2`

Assignment Operators

Operator	Usage	Equivalent
+=	<code>val += 3</code>	<code>val = val + 3</code>
-=	<code>val -= 3</code>	<code>val = val - 3</code>
*=	<code>val *= 3</code>	<code>val = val * 3</code>
/=	<code>val /= 3</code>	<code>val = val / 3</code>
%=	<code>val %= 3</code>	<code>val = val % 3</code>
**=	<code>val **= 3</code>	<code>val = val ** 3</code>
//=	<code>val //= 3</code>	<code>val = val // 3</code>

Branching



Branching

```
if <condition>:  
    <expression>  
    <expression>  
    ...
```

```
if <condition>:  
    <expression>  
    <expression>  
    ...  
else:  
    <expression>  
    <expression>  
    ...
```

```
if <condition>:  
    <expression>  
    <expression>  
    ...  
elif <condition>:  
    <expression>  
    <expression>  
    ...  
...  
else:  
    <expression>  
    <expression>  
    ...
```

- <condition> has a **bool** value (True or False)
- Which expressions will be evaluated in which conditions?