KOLT Python

Basic Operators & Branching

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Agenda

1. Recap

2. Logical 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
`int`	represent **integers**	3, 4, 17, -10
`float`	represent **real numbers**	3.0, 1.11, -109.123123
`bool`	represent **boolean** truth values	`True`, `False`
`str`	A sequence of characters.	'Hello', '', '3'
`NoneType`	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'$\rightarrow$ 2

Casting

- `int('2')` $\rightarrow$ 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!**

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   # => 2.333333333333
3.5 // 1.5 # => 2.0
3.5 % 1.5   # => 0.5
2 ** 10   # => 1024
```

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
`+=`	`val += 3`	`val = val + 3`
`-=`	`val -= 3`	`val = val - 3`
`*=`	`val *= 3`	`val = val * 3`
`/=`	`val /= 3`	`val = val / 3`
`%=`	`val %= 3`	`val = val % 3`
`**=`	`val **= 3`	`val = val ** 3`
`//=`	`val //= 3`	`val = val // 3`

`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` ⇒ **`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` ⇒ **`False`**

Short-Circuit Evaluation

`X`: Any boolean value

`True or X` ⇒ **`True`**

`False and X` ⇒ **`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
```

Truthy & Falsy Values

```
# '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
```

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.

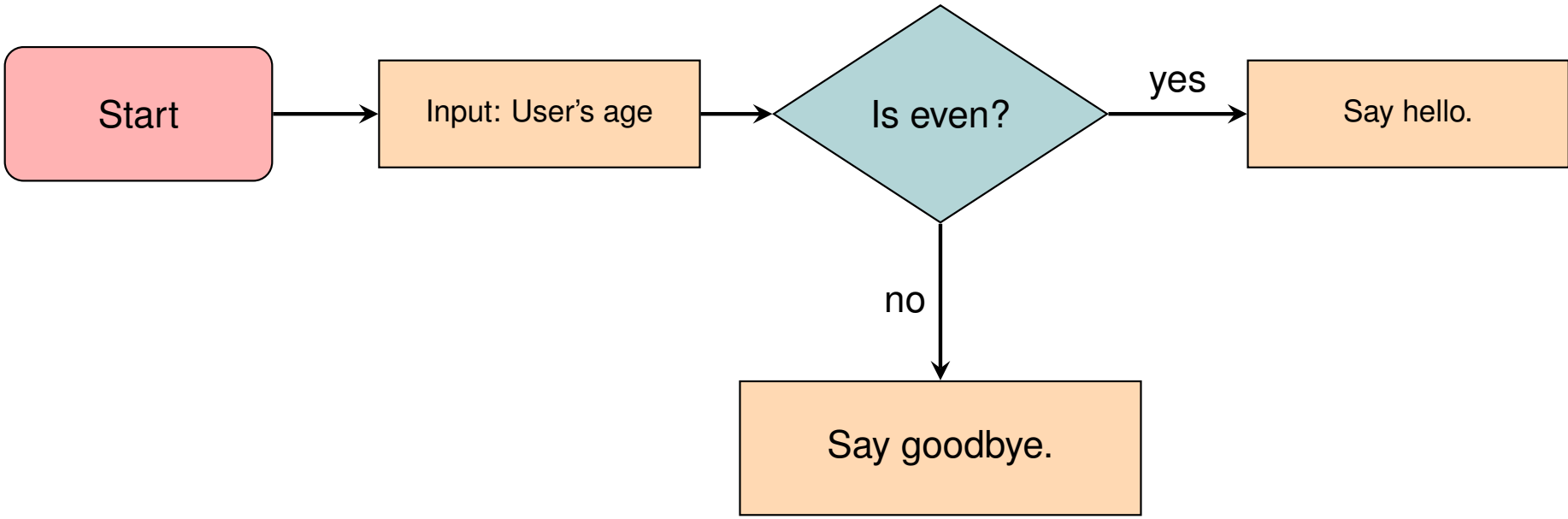
v_i: variables/values, op_i: comparison operators

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

v_1 op_1 v_2 **`and`** v_2 op_2 v_3 **`and`** **`...`** 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
```

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?