Python as a Calculator

Arithmetic Operators

Operator	Operation	Expression	English description	Result
`+`	addition	`11 + 56`	11 plus 56	67
`-`	subtraction	`23 - 52`	23 minus 52	-29
`*`	multiplication	`4 * 5`	4 multiplied by 5	20
`**`	exponentiation	`2 ** 5`	2 to the power of 5	32
`/`	division	`9 / 2`	9 divided by 2	4.5
`//`	integer division	`9 // 2`	9 divided by 2	4
`%`	modulo (remainder)	`9 % 2`	9 mod 2	1

Types `int` and `float`

A *type* is a set of values and operations that can be performed on those values.

Two of Python's numeric types:

- `int`: integer
  For example: `3`, `4`, `894`, `0`, `-3`, `-18`
- `float`: floating point number (an approximation to a real number)
  For example: `5.6`, `7.342`, `53452.0`, `0.0`, `-89.34`, `-9.5`

Arithmetic Operator Precedence

When multiple operators are combined in a single expression, the operations are evaluated in order of precedence.

Operator	Precedence
**	highest
- (negation)	
*, /, /, %	
+ (addition), - (subtraction)	lowest

Syntax and Semantics

Syntax: the rules that describe valid combinations of Python symbols

Semantics: the meaning of a combination of Python symbols is the meaning of an instruction â€" what a particular combination of symbols does when you execute it.

Errors

A syntax error occurs when we an instruction with invalid syntax is executed. For example:

```
>>> 3) + 2 * 4
SyntaxError: invalid syntax
```

A semantic error occurs when an instruction with invalid semantics is executed. For example:

```
>>> 89.4 / 0
Traceback (most recent call last):
  File "", line 1, in
    89.4 / 0
ZeroDivisionError: float division by zero
```

Extra reading:

- Chaper 2.2. Expressions and Values: Arithmetic in Python
- Chaper 2.3. What Is a Type?
- Chaper 2.6. How Python Tells You Something Went Wrong
- *Optional reading*

Jennifer Campbell • Paul Gries
University of Toronto