Arithmetic Operators in Python

Operator	Description
+	Addition or unary plus
–	Subtraction or unary minus
*	Multiplication
/	Floating point division
//	Integer division (fraction discarded)
%	Integer modulus (remainder)
**	Exponentiation (power)

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Exercises:

- Type the following at the prompt and then execute the command, observe what you get and try to understand the meaning of the arithmetic operators

```
2 * 4
2 ** 4
10 / 7
10 // 7
10 % 7
10 - -7
```


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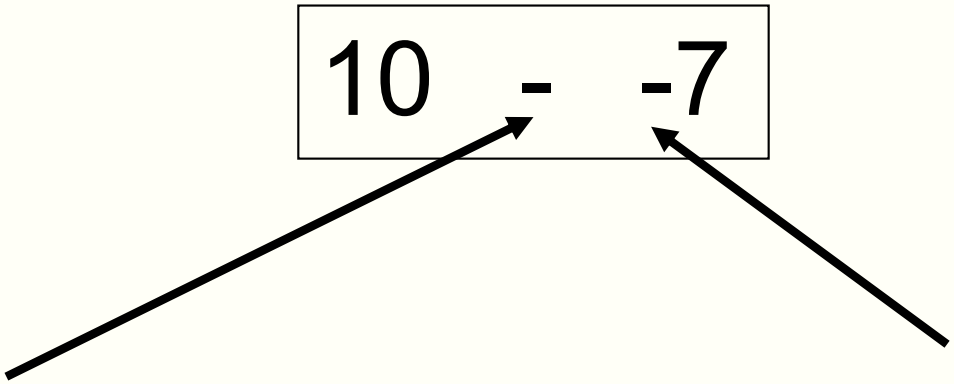
Unary and binary operations

- + and – can be unary or binary
- For example,



Binary minus
= Subtract 2 numbers

Unary minus
= Negative sign

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Precedence

- You can use the arithmetic operators to calculate complicated expressions
- You can type: `1 + 2 * 3 - 4`
  - Should this be 3 or 5?
- The computers evaluate arithmetic expressions according to the rule of precedence

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Precedence

- When evaluating arithmetic expressions, order of evaluating operations determined by ***precedence***

Operator
( )
**
+ – (unary: sign)
* / % //
+ - (binary)

Higher precedence

Lower precedence

- You do not need to memorise this. Look it up when you need. We will give this to you in the exam.

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Evaluating Expressions – Rules of Precedence

- When evaluating expressions, operations of higher precedence are performed before those of lower precedence

  `2 + 3 * 4 = 2 + (3 * 4) = 14`

- If there are multiple operations with the same precedence
  - Case 1: Multiple **. Evaluate from right to left
    - Example: `4 ** 3 ** 2 = 4 ** (3 ** 2) = 262144` Error!
  - Case 2: Other operators. Evaluate from left to right
    - Example: `30 // 4 % 2 = (30 // 4) % 2 = 7 % 2 = 1`
- If unsure, use parentheses or test using a simple expression

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Quiz:

- You want to calculate:

$$\frac{20}{5 \times 2}$$

- Which one can you not use?

a) 20 / 5 / 2

b) 20 / 5 * 2

c) 20 / (5 * 2)

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Quiz

- What is -2**2 in Python?

a) 4 i.e. (-2)**2

b) -4 i.e. –(2**2)

Operator
( )
**
+ – (unary: sign)
* / % //
+ - (binary)

Higher precedence

Lower precedence

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