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Handout: Python cheat sheets

Introduction

This is a reference handout for the Python elements covered in this unit. The sheets include short explanations, brief notes, syntax, and selected examples.

The content has been grouped into categories:

- Variables, assignments, operators, and expressions
- Output and input
- Libraries: randomness and time
- Selection
- Iteration

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Output

The `print` function displays literals (e.g. numbers, text) and the values of variables and expressions.

Syntax

```
print(comma-separated literals, variables, expressions)
```

Examples

```
print("Hello world")
```

Display the string literal `"Hello world"`

```
print("Hello", user)
```

Display a string literal and the value of the `user` variable

```
print(x, "times two is", 2*x)
```

Display, among others, the value of the expression `2*x`

Input

The `input` function reads a line of text from the keyboard and **returns** it.

Syntax

```
input()
```

Notes

Assign the value returned by `input` to a variable, if you need to refer to that value later in your program.

Use the `int` function to convert the text returned by `input` to an integer.

Use the `float` function to convert the text returned by `input` to a floating-point number.

Examples

```
name = input()
```

Read text from the keyboard and assign it to the `name` variable

```
years = int(input())
```

Read text from the keyboard, convert it to an integer, and assign it to the `years` variable

```
input()
```

Read text from the keyboard and discard it (useful for pausing execution until Enter is pressed)

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Assignment

An assignment statement evaluates an expression and associates its value with the name of a variable (an identifier).

Syntax

```
variable name = expression
```

Notes

Do not interpret the = sign as an equation. Assignments are actions to be performed.

Read assignments from right to left, i.e. evaluate the expression and then assign the value to the variable.

A variable name can only refer to a single value. A new assignment to a variable **replaces** the previous value of the variable.

Examples

```
name = "Ada"
```

Assign the string literal `"Ada"` to the `name` variable

```
days = 365*years
```

Evaluate the expression `365*years` and assign the value to the `days` variable

```
dice = randint(1,6)
```

Call the `randint` function and assign the value it returns to the `dice` variable

```
count = count+1
```

Evaluate the expression `count+1` and assign the value to `count`, i.e. increase `count` by 1

```
a = 2*a
```

Evaluate the expression `2*a` and assign the value to `a`, i.e. double the value of `a`

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Operators and expressions

Arithmetic

Perform calculations with numbers. The result of these operations is also a number.

Addition:	`+`
Subtraction:	`-`
Multiplication:	`*`
Division:	`/`
Integer division:	`//`
Remainder:	`%`
Exponent:	`**`

Notes

Logical expressions evaluate to either `True` or `False`.

'Logical expression' is a synonym for **condition**. To evaluate a logical expression is to check a condition.

Relational (comparisons)

Compare the values of expressions. The result of these operations is either `True` or `False` (so relational operators form logical expressions).

Equal to:	`==`
Not equal to:	`!=`
Less than:	`<`
Less than or equal to:	`<=`
Greater than:	`>`
Greater than or equal to:	`>=`

Logical

Negate or combine logical expressions. The result of these operations is either `True` or `False`.

Negation:	`not`
Conjunction:	`and`
Disjunction:	`or`

Examples

`3 + 13 * 3`	An arithmetic expression involving operators and literals
`2**8 - letters - numbers - symbols`	An arithmetic expression involving operators, literals, and variables
`applications <= positions`	A logical expression, comparing the values of two variables
`a + b == c - d`	A logical expression, checking if the values of two expressions are equal
`user != "Ada" and logins < 3`	A logical expression, which is the conjunction of two simpler logical expressions

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Modules

Modules are libraries of existing code.

They extend the functionality of the language by offering components (such as functions) that can be imported and used in programs.

Syntax

```
from variable import component
```

Note

It is standard practice that you place all `import` statements at the beginning of the program.

Examples

The `random` module

docs.python.org/3/library/random.html

Provides functionality for generating random numbers

```
from random import randint
dice = randint(1,6)
```

Call the `randint` function to generate a random integer from 1 to 6 and assign the value that it returns to the `dice` variable

```
from random import randint
coin = randint(0,1)
```

Call the `randint` function to generate a random integer from 0 to 1 and assign the value that it returns to the `coin` variable

The `time` module

https://docs.python.org/3/library/time.html

Provides functionality for time and date handling

```
from time import sleep
sleep(3)
```

Call the `sleep` function to pause program execution for 3 seconds

```
from time import localtime
year = locatime().tm_year
```

Use the `localtime` function to retrieve the current year and assign it to the `year` variable

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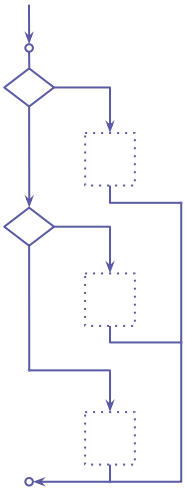
Selection

The `if` statement creates **branches** in the flow of program execution.

At runtime, a **condition** or a sequence of conditions are checked, to **select** which one of the possible branches will be followed.

Syntax

```
if condition:
    block of statements
    (the if block)
elif condition:
    block of statements
    (an elif block — optional, there may be many)
else:
    block of statements
    (the else block — optional)
```



Notes

Out of the different blocks of statements contained in a selection structure, **at most one** block will be executed at runtime.

The blocks of statements can contain **nested** `if` and `while` statements.

Examples

```
if dice1 == dice2:
    print("A double roll")
    total = 4*sum
else:
    total = sum
```

Check if the values of the `dice1` and `dice2` variables are equal and perform the appropriate actions, depending on the outcome

There are two possible, mutually exclusive branches.

```
if temperature < 4:
    print("Freezing")
elif temperature < 18:
    print("Tolerable")
else:
    print("Nice and warm")
```

Check the range in which the value of the `temperature` variable lies and print an appropriate message, depending on the outcome

There are three possible, mutually exclusive branches.

```
max = x
if y > max:
    max = y
if z > max:
    max = z
```

Compute `max`, the greatest value among `x`, `y`, and `z`

These `if` statements compare `y` and `z` to the current `max` and raise `max`, if necessary.

Without an `elif`, the two `if` statements are not mutually exclusive.

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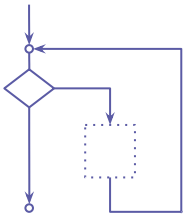
Iteration

The `while` statement creates a **loop** in the **flow** of program execution.

At runtime, a set of actions is repeated and a **condition** is checked to determine if the loop should continue.

Syntax

```
while condition:
    block of statements
    (the while block)
```



Notes

The block of statements in the iterative structure may be executed many times, once, or even not executed at all (if the `while` condition is `False` when it is first checked).

The block of statements can contain **nested** `if` and `while` statements.

Examples

```
# display a count from 1 to 10
count = 1
while count <= 10:
    print(count)
    count = count+1
```

Repeat the indented block of statements while `count` does not exceed 10

```
print("What is your name?")
name = input()
# only take "Ada" for an answer
while name != "Ada":
    print("I was expecting Ada")
    print("What is your name?")
    name = input()
# end of loop, welcome user
print("Welcome")
```

Repeat the indented block of statements while `name` does not equal `"Ada"`

```
non_zero = True
while non_zero == True:
    a = int(input())
    if a != 0:
        # display inverse of a
        print(1/a)
    else:
        non_zero = False
```

Repeat the indented block of statements while the Boolean flag `non_zero` remains `True`