Python Syntax

Program Sequence

Programs run line by line, from top to bottom.

```
6   x = 42
7   y = 3.12
8   z = "Hans"
9   print("The value of x = ",x)
10  print("The value of y = ",y)
11  print("The value of z = ",z)
12  print("The x + y = ", x + y)
```

Program flow direction

Output

```
The value of x =  42
The value of y =  3.12
The value of z =  Hans
The x + y =  45.12
```

Python as calculator

Python knows the *normal* basic operators +, -, * and /

```
print( 341 + 56/4 - 4*12 )
print( 1344 - 16*4 + 42/12 )
```

```
307.0
1283.5
```

… as well as special operators like ** (exponentiation), // (floor division), and % (modulo)

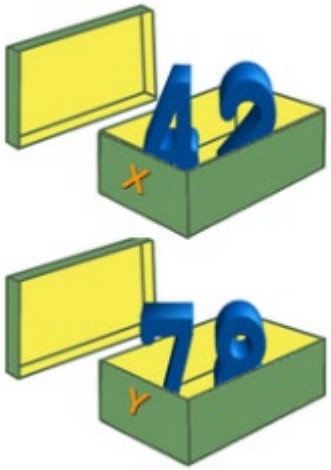
```
print( 2**4 )
print(17 // 4)
print(20 % 3)
```

```
16
4
2
```

Variables

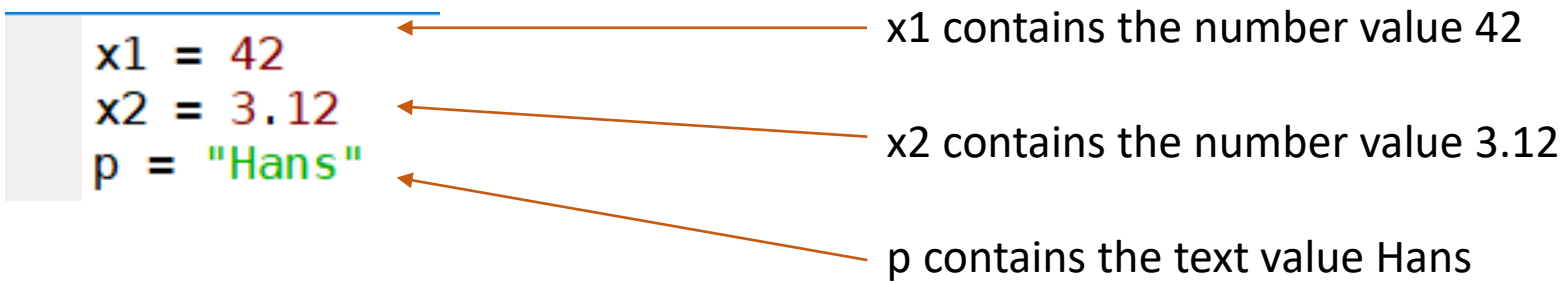
Variables can be imagined as "containers" in which a value is stored

```
x = 42
y = 78
```



Assignment

The equal sign "=" assigns a value to a variable



Variables / Values

The value of a variable can then be used later.

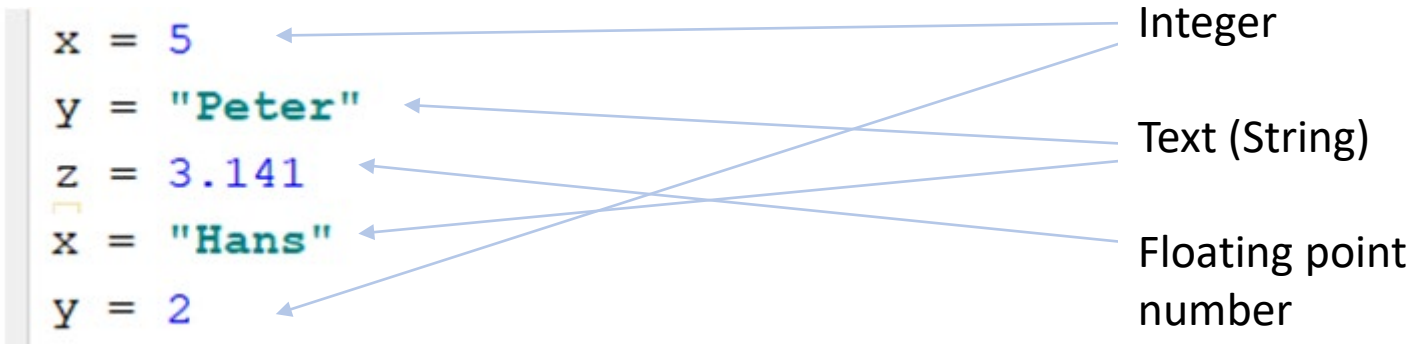
```
x1 = 42
x2 = 3.12
x3 = -1.12
z = x1 + x2 * x3
print("The value of x1 + x2 * x3 =", z)

z = x1 * x2 - x3
print("The value of x1 * x2 - x3 =", z)
```

Output ⇨

```
The value of x1 + x2 * x3 = 38.5056
The value of x1 * x2 - x3 = 132.16
```

Creating variables

- Variables are created by value assignment.
- The type of variable is determined at run time and may change.



In other programming languages all variables must be declared before they can be used, and they cannot change their type.

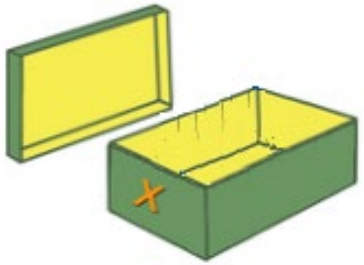
Variables without value

Variables can also have no value at the beginning.

```
x = None
```

Variable without value

None is a python keyword



Variable Names (identifiers)

Names / identifiers may contain the following characters

- Capital letters A to Z
- Lowercase letters a to z
- Underscore _
- The numbers 0 to 9 (not at the beginning: 5x)

- Examples

```
height = 23
x5 = 1.2
last_name = "Meier"
minValue = -12
```

Structure by indentation

In Python, the code is structured by indentation (here if-branches)

```
v1 = 3*4+16-9
v2 = 3*4+8*2-18/3
if 5 < v1:
    print("5 is smaller than ", v1)
if 30 > v2:
    print("30 is greater than", v2)
    print(str(v1) + " is smaller than " + str(v2))
```

Most other programming languages use parentheses to structure the code.

Structure by indentation

If the indentation is missing or unnecessary this is displayed in the editor as an error (red)

```
30  v1 = 3*4+16-9
31  v2 = 3*4+8*2-18/3
32  if 5 < v1:
33      print("5 is smaller than ", v1)
34  if 30 > v2:
35      print("30 is greater than", v2)
36          print(str(v1) + " is smaller than " + str(v2))
```

Error, wrong indentation!

Comments / Remarks

Lines after # -signs are comments or remarks

```
v1 = 3*4+16-9
v2 = 3*4+8*2-18/3
# compare v1 with 5
if 5 < v1:
    # print only if 5 < v1
    print("5 is smaller than ", v1)
if 30 > v2:
    # print only if 30 > v2
    print("30 is greater than", v2)
    print(str(v1) + " is smaller than " + str(v2))
```

Single comment lines

Comments / Remarks

- Multiline comments can be written within """ characters.

```
"""
The following lines show the python
syntax
"""
v1 = 3*4+16-9
v2 = 3*4+8*2-18/3
# compare v1 with 5
if 5 < v1:
    # print only if 5 < v1
    print("5 is smaller than ", v1)
if 30 > v2:
    # print only if 30 > v2
    print("30 is greater than", v2)
    print(str(v1) + " is smaller than " + str(v2))
```

Multi-line comments