

Lab 02: Python Variables

Setting the Specific Data Type

If you want to specify the data type, you can use the following constructor functions:

Example	Data Type
<code>x = str("Hello World")</code>	str
<code>x = int(20)</code>	int
<code>x = float(20.5)</code>	float
<code>x = complex(1j)</code>	complex
<code>x = list(("apple", "banana", "cherry"))</code>	list
<code>x = tuple(("apple", "banana", "cherry"))</code>	tuple
<code>x = range(6)</code>	range
<code>x = dict(name="John", age=36)</code>	dict
<code>x = set(("apple", "banana", "cherry"))</code>	set
<code>x = frozenset(("apple", "banana", "cherry"))</code>	frozenset
<code>x = bool(5)</code>	bool
<code>x = bytes(5)</code>	bytes
<code>x = bytearray(5)</code>	bytearray
<code>x = memoryview(bytes(5))</code>	memoryview

Type Conversion

You can convert from one type to another with the `int()`, `float()`, and `complex()` methods:

```
x = 1      # int
y = 2.8    # float
z = 1j     # complex

#convert from int to float:
a = float(x)

#convert from float to int:
b = int(y)

#convert from int to complex:
c = complex(x)

print(a)
print(b)
print(c)

print(type(a))
print(type(b))
print(type(c))
```

Random Number

Python does not have a `random()` function to make a random number, but Python has a built-in module called `random` that can be used to make random numbers:

Example

Import the random module, and display a random number from 1 to 9:

```
import random

print(random.randrange(1, 10))
```

Looping Through a String

Since strings are arrays, we can loop through the characters in a string, with a `for` loop.

Example

Loop through the letters in the word "banana":

```
for x in "banana":  
    print(x)
```

String Length

To get the length of a string, use the `len()` function.

Example

The `len()` function returns the length of a string:

```
a = "Hello, World!"  
print(len(a))
```

Check String

To check if a certain phrase or character is present in a string, we can use the keyword `in`.

Example

Check if "free" is present in the following text:

```
txt = "The best things in life are free!"  
print("free" in txt)
```

Slicing

You can return a range of characters by using the slice syntax.

Specify the start index and the end index, separated by a colon, to return a part of the string.

Example

Get the characters from position 2 to position 5 (not included):

```
b = "Hello, World!"  
print(b[2:5])
```

```
b = "Hello, World!"  
print(b[:5])
```

Negative Indexing

Use negative indexes to start the slice from the end of the string:

Example

Get the characters:

From: "o" in "World!" (position -5)

To, but not included: "d" in "World!" (position -2):

```
b = "Hello, World!"  
print(b[-5:-2])
```

Upper Case

Example

The `upper()` method returns the string in upper case:

```
a = "Hello, World!"  
print(a.upper())
```

```
a = "HELLO, WORLD"  
print(a.lower())
```

Remove Whitespace

Whitespace is the space before and/or after the actual text, and very often you want to remove this space.

Example

The `strip()` method removes any whitespace from the beginning or the end:

```
a = " Hello, World! "  
print(a.strip()) # returns "Hello, World!"
```

Replace String

Example

The `replace()` method replaces a string with another string:

```
a = "Hello, World!"  
print(a.replace("H", "J"))
```

Split String

The `split()` method returns a list where the text between the specified separator becomes the list items.

Example

The `split()` method splits the string into substrings if it finds instances of the separator:

```
a = "Hello, World!"  
print(a.split(",")) # returns ['Hello', ' World!']
```

Placeholders and Modifiers

A placeholder can contain variables, operations, functions, and modifiers to format the value.

Example

Add a placeholder for the `price` variable:

```
price = 59  
txt = f"The price is {price} dollars"  
print(txt)
```

Example

Display the price with 2 decimals:

```
price = 59
txt = f"The price is {price:.2f} dollars"
print(txt)
```

String Methods

Python has a set of built-in methods that you can use on strings.

Method	Description
<u>capitalize()</u>	Converts the first character to upper case
<u>casefold()</u>	Converts string into lower case
<u>center()</u>	Returns a centered string
<u>count()</u>	Returns the number of times a specified value occurs in a string
<u>encode()</u>	Returns an encoded version of the string
<u>endswith()</u>	Returns true if the string ends with the specified value
<u>expandtabs()</u>	Sets the tab size of the string
<u>find()</u>	Searches the string for a specified value and returns the position of where it was found
<u>format()</u>	Formats specified values in a string
<u>format_map()</u>	Formats specified values in a string
<u>index()</u>	Searches the string for a specified value and returns the position of where it was found
<u>isalnum()</u>	Returns True if all characters in the string are alphanumeric
<u>isalpha()</u>	Returns True if all characters in the string are in the alphabet
<u>isascii()</u>	Returns True if all characters in the string are ascii characters
<u>isdecimal()</u>	Returns True if all characters in the string are decimals
<u>isdigit()</u>	Returns True if all characters in the string are digits
<u>isidentifier()</u>	Returns True if the string is an identifier
<u>islower()</u>	Returns True if all characters in the string are lower case
<u>isnumeric()</u>	Returns True if all characters in the string are numeric

<code>isprintable()</code>	Returns True if all characters in the string are printable
<code>isspace()</code>	Returns True if all characters in the string are whitespaces
<code>istitle()</code>	Returns True if the string follows the rules of a title
<code>isupper()</code>	Returns True if all characters in the string are upper case
<code>join()</code>	Joins the elements of an iterable to the end of the string
<code>ljust()</code>	Returns a left justified version of the string
<code>lower()</code>	Converts a string into lower case
<code>lstrip()</code>	Returns a left trim version of the string
<code>maketrans()</code>	Returns a translation table to be used in translations
<code>partition()</code>	Returns a tuple where the string is parted into three parts
<code>replace()</code>	Returns a string where a specified value is replaced with a specified value
<code>rfind()</code>	Searches the string for a specified value and returns the last position of where it was found
<code>rindex()</code>	Searches the string for a specified value and returns the last position of where it was found
<code>rjust()</code>	Returns a right justified version of the string
<code>rpartition()</code>	Returns a tuple where the string is parted into three parts
<code>rsplit()</code>	Splits the string at the specified separator, and returns a list
<code>rstrip()</code>	Returns a right trim version of the string
<code>split()</code>	Splits the string at the specified separator, and returns a list
<code>splitlines()</code>	Splits the string at line breaks and returns a list
<code>startswith()</code>	Returns true if the string starts with the specified value
<code>strip()</code>	Returns a trimmed version of the string
<code>swapcase()</code>	Swaps cases, lower case becomes upper case and vice versa
<code>title()</code>	Converts the first character of each word to upper case
<code>translate()</code>	Returns a translated string
<code>upper()</code>	Converts a string into upper case
<code>zfill()</code>	Fills the string with a specified number of 0 values at the beginning

Arithmetic Operators

Arithmetic operators are used with numeric values to perform common mathematical operations:

Operator	Name	Example
+	Addition	$x + y$
-	Subtraction	$x - y$
*	Multiplication	$x * y$
/	Division	x / y
%	Modulus	$x \% y$
**	Exponentiation	$x ** y$
//	Floor division	$x // y$

Assignment Operators

Assignment operators are used to assign values to variables:

Operator	Example	Same As
=	$x = 5$	$x = 5$
+=	$x += 3$	$x = x + 3$
-=	$x -= 3$	$x = x - 3$
*=	$x *= 3$	$x = x * 3$
/=	$x /= 3$	$x = x / 3$
%=	$x \% = 3$	$x = x \% 3$
//=	$x //= 3$	$x = x // 3$
**=	$x ** = 3$	$x = x ** 3$

<code>&=</code>	<code>x &= 3</code>	<code>x = x & 3</code>
<code> =</code>	<code>x = 3</code>	<code>x = x 3</code>
<code>^=</code>	<code>x ^= 3</code>	<code>x = x ^ 3</code>
<code>>>=</code>	<code>x >>= 3</code>	<code>x = x >> 3</code>
<code><<=</code>	<code>x <<= 3</code>	<code>x = x << 3</code>
<code>:=</code>	<code>print(x := 3)</code>	<code>x = 3</code> <code>print(x)</code>

Comparison Operators

Comparison operators are used to compare two values:

Operator	Name	Example
<code>==</code>	Equal	<code>x == y</code>
<code>!=</code>	Not equal	<code>x != y</code>
<code>></code>	Greater than	<code>x > y</code>
<code><</code>	Less than	<code>x < y</code>
<code>>=</code>	Greater than or equal to	<code>x >= y</code>
<code><=</code>	Less than or equal to	<code>x <= y</code>

Logical Operators

Logical operators are used to combine conditional statements:

Operator	Description	Example
<code>and</code>	Returns True if both statements are true	<code>x < 5 and x < 10</code>
<code>or</code>	Returns True if one of the statements is true	<code>x < 5 or x < 4</code>
<code>not</code>	Reverse the result, returns False if the result is true	<code>not(x < 5 and x < 10)</code>

Bitwise Operators

Bitwise operators are used to compare (binary) numbers:

Operator	Name	Description	Example
&	AND	Sets each bit to 1 if both bits are 1	<code>x & y</code>
	OR	Sets each bit to 1 if one of two bits is 1	<code>x y</code>
^	XOR	Sets each bit to 1 if only one of two bits is 1	<code>x ^ y</code>
~	NOT	Inverts all the bits	<code>~x</code>
<<	Zero fill left shift	Shift left by pushing zeros in from the right and let the leftmost bits fall off	<code>x << 2</code>
>>	Signed right shift	Shift right by pushing copies of the leftmost bit in from the left, and let the rightmost bits fall off	<code>x >> 2</code>

Exercise 01:

Write a program that asks the user to enter the width and length of a field and then displays its perimeter and area.

Exercise 02:

Write a program that asks the user to enter 5 integers and then displays their average. The program should only use 2 variables.

Exercise 03:

Write a program that asks the user to enter two integers A and B, swaps the contents of variables A and B, and then displays A and B.

Exercise 04:

Write a program that asks the user to enter the price excluding tax of one kilogram of tomatoes, the number of kilograms of tomatoes purchased, and the VAT rate (e.g., 10%, 20%, etc.). The program then displays the total price including tax.