

## Python Tutorial

- Python HOME
- Python Intro
- Python Get Started
- Python Syntax
- Python Comments
- Python Variables
- Python Data Types
- Python Numbers
- Python Casting
- Python Strings
- Python Booleans
- Python Operators
- Python Lists
- Python Tuples
- Python Sets
- Python Dictionaries
- Python If...Else
- Python While Loops
- Python For Loops

# Python RegEx

[◀ Previous](#)
[Next ▶](#)

A RegEx, or Regular Expression, is a sequence of characters that forms a search pattern.

RegEx can be used to check if a string contains the specified search pattern.

## RegEx Module

Python has a built-in package called `re`, which can be used to work with Regular Expressions.

Import the `re` module:

```
import re
```

## RegEx in Python

When you have imported the `re` module, you can start using regular expressions:

### Example

Search the string to see if it starts with "The" and ends with "Spain":

```
import re

txt = "The rain in Spain"
x = re.search("^The.*Spain$", txt)
```

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## RegEx Functions

The `re` module offers a set of functions that allows us to search a string for a match:

Function	Description
<code>findall</code>	Returns a list containing all matches
<code>search</code>	Returns a <code>Match object</code> if there is a match anywhere in the string
<code>split</code>	Returns a list where the string has been split at each match
<code>sub</code>	Replaces one or many matches with a string

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## Metacharacters

Metacharacters are characters with a special meaning:

Character	Description	Example	Try it
<code>[]</code>	A set of characters	<code>"[a-m]"</code>	<a href="#">Try it »</a>
<code>\</code>	Signals a special sequence (can also be used to escape special characters)	<code>"\d"</code>	<a href="#">Try it »</a>
<code>.</code>	Any character (except newline character)	<code>"he..o"</code>	<a href="#">Try it »</a>
<code>^</code>	Starts with	<code>"^hello"</code>	<a href="#">Try it »</a>

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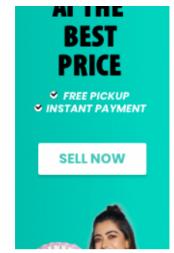

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\$	Ends with	"planet\$"	<a href="#">Try it »</a>
*	Zero or more occurrences	"he.*o"	<a href="#">Try it »</a>
+	One or more occurrences	"he.+o"	<a href="#">Try it »</a>
?	Zero or one occurrences	"he.?o"	<a href="#">Try it »</a>
{}	Exactly the specified number of occurrences	"he.{2}o"	<a href="#">Try it »</a>
	Either or	"falls stays"	<a href="#">Try it »</a>
( )	Capture and group		



## Special Sequences

A special sequence is a `\` followed by one of the characters in the list below, and has a special meaning:

Character	Description	Example	Try it
\A	Returns a match if the specified characters are at the beginning of the string	"\AThe"	<a href="#">Try it »</a>
\b	Returns a match where the specified characters are at the beginning or at the end of a word (the "r" in the beginning is making sure that the string is being treated as a "raw string")	r"\bain" r"ain\b"	<a href="#">Try it »</a> <a href="#">Try it »</a>
\B	Returns a match where the specified characters are present, but NOT at the beginning (or at the end) of a word (the "r" in the beginning is making sure that the string is being treated as a "raw string")	r"\Bain" r"ain\B"	<a href="#">Try it »</a> <a href="#">Try it »</a>
\d	Returns a match where the string contains digits (numbers from 0-9)	"\d"	<a href="#">Try it »</a>
\D	Returns a match where the string DOES NOT contain digits	"\D"	<a href="#">Try it »</a>
\s	Returns a match where the string contains a white space character	"\s"	<a href="#">Try it »</a>
\S	Returns a match where the string DOES NOT contain a white space character	"\S"	<a href="#">Try it »</a>
\w	Returns a match where the string contains any word characters (characters from a to Z, digits from 0-9, and the underscore _ character)	"\w"	<a href="#">Try it »</a>
\W	Returns a match where the string DOES NOT contain any word characters	"\W"	<a href="#">Try it »</a>
\Z	Returns a match if the specified characters are at the end of the string	"Spain\Z"	<a href="#">Try it »</a>

## Sets

A set is a set of characters inside a pair of square brackets `[]` with a special meaning:

Set	Description	Try it
[arn]	Returns a match where one of the specified characters ( <code>a</code> , <code>r</code> , or <code>n</code> ) is present	<a href="#">Try it »</a>
[a-n]	Returns a match for any lower case character, alphabetically between <code>a</code> and <code>n</code>	<a href="#">Try it »</a>
[^arn]	Returns a match for any character EXCEPT <code>a</code> , <code>r</code> , and <code>n</code>	<a href="#">Try it »</a>
[0123]	Returns a match where any of the specified digits ( <code>0</code> , <code>1</code> , <code>2</code> , or <code>3</code> ) are present	<a href="#">Try it »</a>
[0-9]	Returns a match for any digit between <code>0</code> and <code>9</code>	<a href="#">Try it »</a>
[0-5][0-9]	Returns a match for any two-digit numbers from <code>00</code> and <code>59</code>	<a href="#">Try it »</a>
[a-zA-Z]	Returns a match for any character alphabetically between <code>a</code> and <code>z</code> , lower case OR upper case	<a href="#">Try it »</a>
[+]	In sets, <code>+</code> , <code>*</code> , <code>.</code> , <code> </code> , <code>( )</code> , <code>\$</code> , <code>{}</code> has no special meaning, so <code>[+]</code> means: return a match for any + character in the string	<a href="#">Try it »</a>

## The findall() Function

The `findall()` function returns a list containing all matches.

### Example

Print a list of all matches:

```
import re

txt = "The rain in Spain"
x = re.findall("ai", txt)
print(x)
```

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The list contains the matches in the order they are found.

If no matches are found, an empty list is returned:

### Example

### Example

Return an empty list if no match was found:

```
import re

txt = "The rain in Spain"
x = re.findall("Portugal", txt)
print(x)
```

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## The search() Function

The `search()` function searches the string for a match, and returns a `Match object` if there is a match.

If there is more than one match, only the first occurrence of the match will be returned:

### Example

Search for the first white-space character in the string:

```
import re

txt = "The rain in Spain"
x = re.search("\s", txt)

print("The first white-space character is located in position:", x.start())
```

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If no matches are found, the value `None` is returned:

### Example

Make a search that returns no match:

```
import re

txt = "The rain in Spain"
x = re.search("Portugal", txt)
print(x)
```

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## The split() Function

The `split()` function returns a list where the string has been split at each match:

### Example

Split at each white-space character:

```
import re

txt = "The rain in Spain"
x = re.split("\s", txt)
print(x)
```

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You can control the number of occurrences by specifying the `maxsplit` parameter:

### Example

Split the string only at the first occurrence:

```
import re

txt = "The rain in Spain"
x = re.split("\s", txt, 1)
print(x)
```

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## The sub() Function

The `sub()` function replaces the matches with the text of your choice:

## Example

Replace every white-space character with the number 9:

```
import re

txt = "The rain in Spain"
x = re.sub("\s", "9", txt)
print(x)
```

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You can control the number of replacements by specifying the `count` parameter:

## Example

Replace the first 2 occurrences:

```
import re

txt = "The rain in Spain"
x = re.sub("\s", "9", txt, 2)
print(x)
```

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## Match Object

A Match Object is an object containing information about the search and the result.

**Note:** If there is no match, the value `None` will be returned, instead of the Match Object.

## Example

Do a search that will return a Match Object:

```
import re

txt = "The rain in Spain"
x = re.search("ai", txt)
print(x) #this will print an object
```

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The Match object has properties and methods used to retrieve information about the search, and the result:

`.span()` returns a tuple containing the start- and end positions of the match.  
`.string` returns the string passed into the function  
`.group()` returns the part of the string where there was a match

## Example

Print the position (start- and end-position) of the first match occurrence.

The regular expression looks for any words that starts with an upper case "S":

```
import re

txt = "The rain in Spain"
x = re.search(r"\bS\w+", txt)
print(x.span())
```

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## Example

Print the string passed into the function:

```
import re

txt = "The rain in Spain"
x = re.search(r"\bS\w+", txt)
print(x.string)
```

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## Example

Print the part of the string where there was a match.

The regular expression looks for any words that starts with an upper case "S":

```
import re

txt = "The rain in Spain"
x = re.search(r"\bS\w+", txt)
print(x.group())
```

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**Note:** If there is no match, the value `None` will be returned, instead of the Match Object.

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