Programming 2

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Regular Expressions

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AGENDA

- Regex

Regex

- Definition
- Tips & Tricks
- Regex in other programming languages
- Examples

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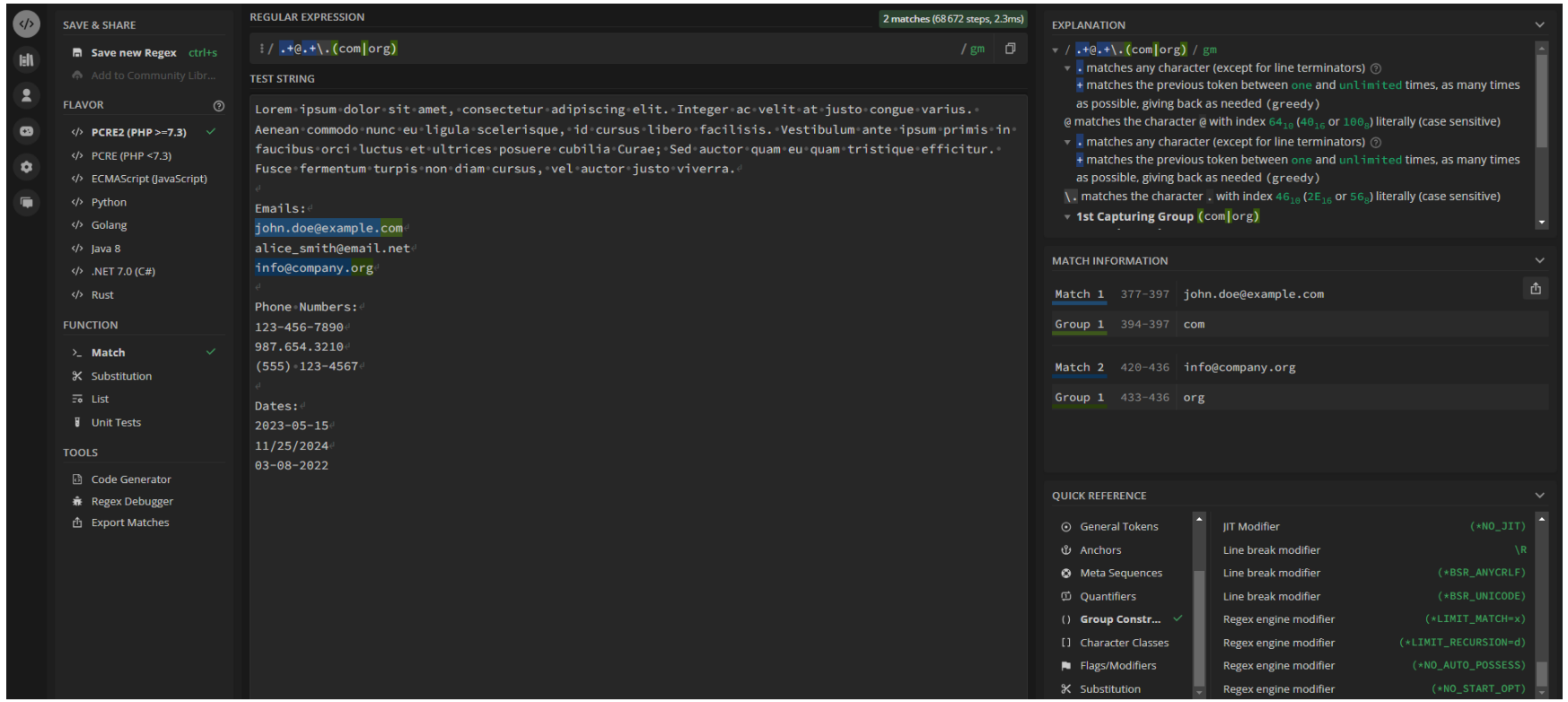
DEFINITION

- Regex (regular expressions) refers to a powerful and concise language for describing patterns in strings
- The **re** module in Python
- It's a versatile tool for tasks such as searching for specific patterns, extracting information from strings, or replacing text based on a given pattern

TIPS & TRICKS

- Python Docs (Manual)
- Regex101



REGEX IN OTHER PROGRAMMING LANGUAGES

Python

```python
import re

text = "Hello, my email is john.doe@example.com. Please contact me!"
pattern = r'\b[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Z|a-z]{2,}\b'

result = re.search(pattern, text)
if result:
    print("Email found:", result.group())
else:
    print("No email found.")
```

JavaScript

```javascript
const text = "Hello, my email is john.doe@example.com. Please contact me!";
const pattern = /\b[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Z|a-z]{2,}\b/;

const result = text.match(pattern);
if (result) {
    console.log("Email found:", result[0]);
} else {
    console.log("No email found.");
}
```

Java

```java
import java.util.regex.*;

public class RegexExample {
    public static void main(String[] args) {
        String text = "Hello, my email is john.doe@example.com.
Please contact me!";
        String pattern = "\\b[A-Za-z0-9._%+-]+@[A-Za-z0-9.-
]+\\.[A-Z|a-z]{2,}\\b";

        Pattern regex = Pattern.compile(pattern);
        Matcher matcher = regex.matcher(text);

        if (matcher.find()) {
            System.out.println("Email found: " +
matcher.group());
        } else {
            System.out.println("No email found.");
        }
    }
}
```

C#

```csharp
using System;
using System.Text.RegularExpressions;

class Program
{
    static void Main()
    {
        string text = "Hello, my email is john.doe@example.com. Please contact me!";
        string pattern = @"\b[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Z|a-z]{2,}\b";

        Regex regex = new Regex(pattern);
        Match match = regex.Match(text);

        if (match.Success)
        {
            Console.WriteLine("Email found: " + match.Value);
        }
        else
        {
            Console.WriteLine("No email found.");
        }
    }
}
```

RE MODULE PYTHON FUNCTIONS

- re.match(pattern, string, flags=0)
  - Return match for pattern with beginning of the string
- re.fullmatch(pattern, string, flags=0)
  - Return match for pattern with the whole string
- re.search(pattern, string, flags=0)
  - Return match for pattern anywhere in the string
- re.findall(pattern, string, flags=0)
  - Return all non-overlapping matches of the pattern in the string
- re.sub(pattern, repl, string, count = 0, flags=0)
  - Replace occurrences of the pattern in the string with the repl

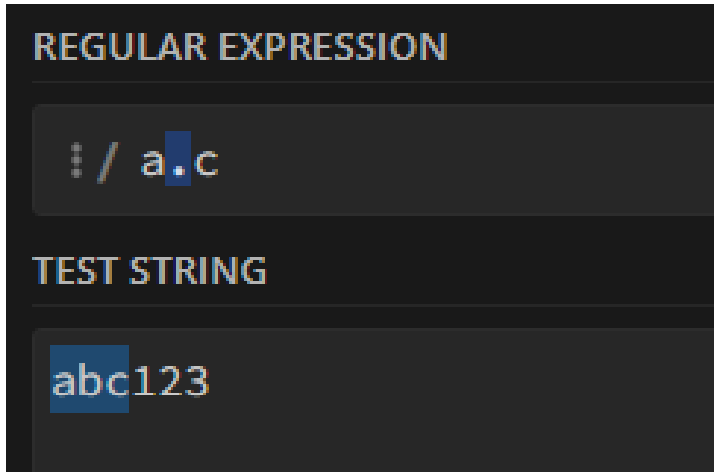
EXAMPLES

```python
import re

text = "abc123"

pattern_dot = r'a.c'
match_dot = re.search(pattern_dot, text)

if match_dot:
    print(f"Dot Match: {match_dot.group()}")
# Result: Dot Match: abc
```



- '.' Any character except a newline

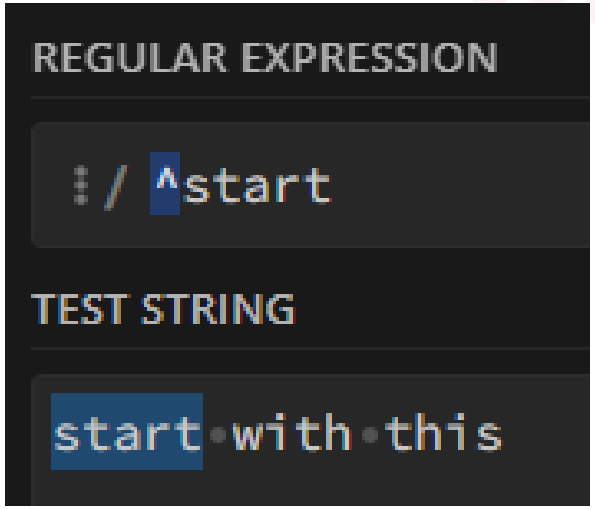
EXAMPLES

```python
import re

text = "start with this"

pattern_caret = r'^start'
match_caret = re.search(pattern_caret, text)

if match_caret:
    print(f"Caret Match: String starts with '{match_caret.group()}'")
# Result: String starts with 'start'
```



- **‘^’** Matches the start of the string

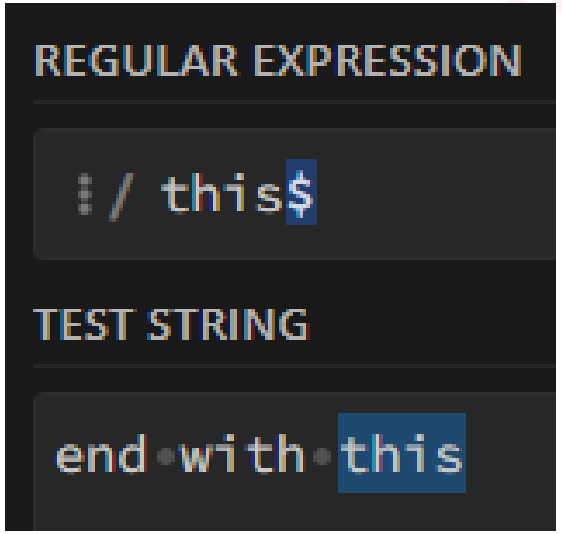
EXAMPLES

```python
import re

text = "end with this"

pattern_caret = r'this$'
match_caret = re.search(pattern_caret, text)

if match_caret:
    print(f"Caret Match: String ends with '{match_caret.group()}'")
# Result: String ends with 'this'
```



- **‘$’** Matches the end of the string

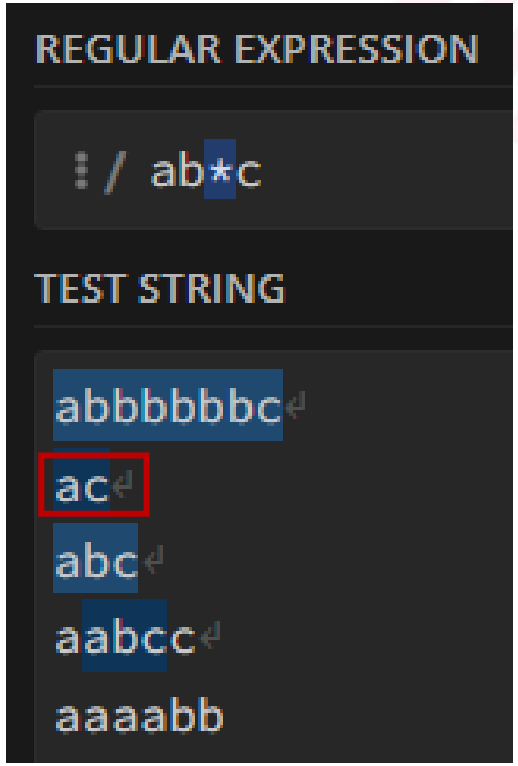
EXAMPLES

```python
import re

text = "abbbbbbc"

pattern_asterisk = r'ab*c'
match_asterisk = re.search(pattern_asterisk, text)

if match_asterisk:
    print(f"Asterisk Match: {match_asterisk.group()}")
# Result: Asterisk Match: abbbbbbc
```



- ‘*’ Matches zero or more occurrences, repetitions

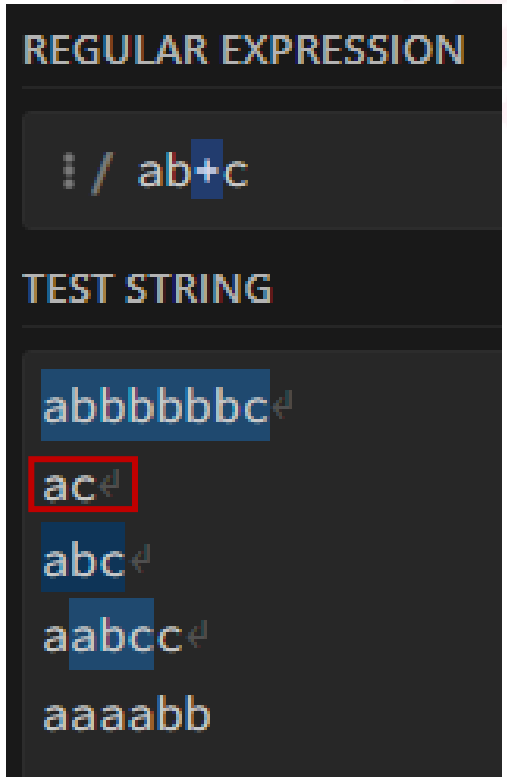
EXAMPLES

```python
import re

text = "abbbbbbc"

pattern_plus = r'ab+c'
match_plus = re.search(pattern_plus, text)

if match_plus:
    print(f"Plus Match: {match_plus.group()}")
# Result: Plus Match: abbbbbbc
```



- ‘+’ Matches one or more occurrences, repetitions

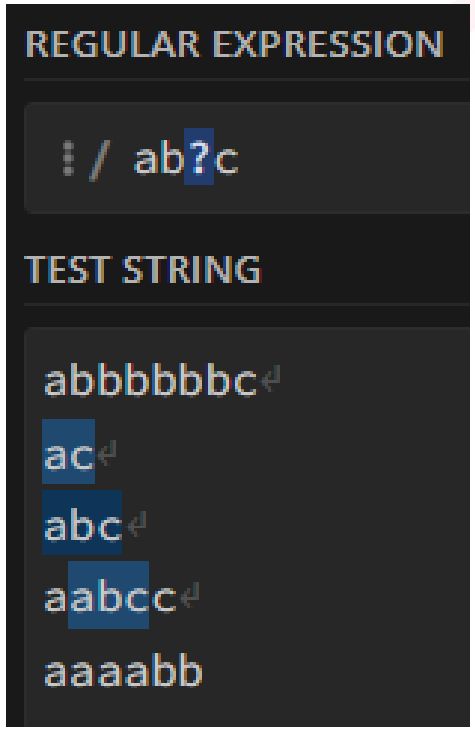
EXAMPLES

```python
import re

text = "abbbc"

pattern_question = r'ab?c'
match_question = re.search(pattern_question, text)

if match_question:
    print(f"Question Mark Match: {match_question.group()}")
# Result: Nothing gets printed
```



- **‘?’** Matches zero or one occurrence, repetition

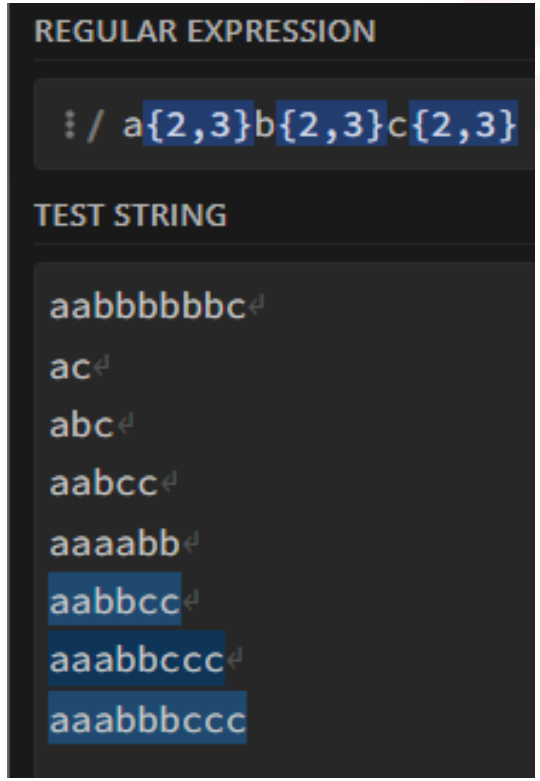
EXAMPLES

```python
import re

text = "aaabbbccc"

pattern_curly = r'a{2,3}b{2,3}c{2,3}'
match_curly = re.search(pattern_curly, text)

if match_curly:
    print(f"Curly Braces Match: {match_curly.group()}")
# Result: Curly Braces Match: aaabbbccc
```



- **‘{m}’** Specifies that exactly m copies of the previous RE should be matched

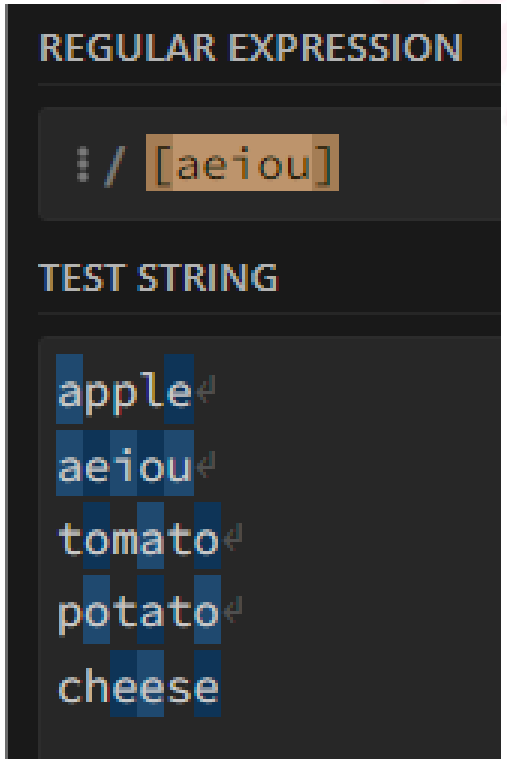
EXAMPLES

```python
import re

text = "apple"

pattern_square = r'[aeiou]'
match_square = re.search(pattern_square, text)

if match_square:
    print(f"Square Brackets Match: {match_square.group()}")
# Result: Square Brackets Match: a
```



- **‘[]’** Matches any one of the characters inside the brackets

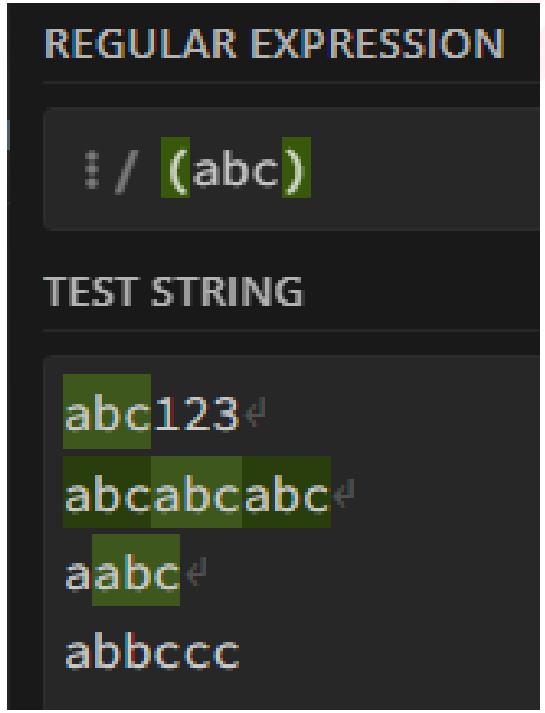
EXAMPLES

```python
import re

text = "abc123"

pattern_parentheses = r'(abc)'
match_parentheses = re.search(pattern_parentheses, text)

if match_parentheses:
    print(f"Parentheses Match: {match_parentheses.group(1)}")
# Result: Parentheses Match: abc
```



- **'()'** Matches whatever regular expression is inside the parentheses

EXAMPLES

```python
import re

text = "cat or dog"

pattern_pipe = r'cat|dog'
match_pipe = re.search(pattern_pipe, text)

if match_pipe:
    print(f"Pipe Match: {match_pipe.group()}")
# Result: Pipe Match: cat
```

- ‘|’ Matches either the pattern on its left or right

EXAMPLES

```python
import re

text = "The cat and the hat"

pattern_search = r'cat'
match_search = re.search(pattern_search, text)

if match_search:
    print(f"Search Result: {match_search.group()}")
# Result: Search Result: cat
```

- Scan through string looking for the first location where the regular expression pattern produces a match
- Return None if no position in the string matches the pattern

EXAMPLES

```python
import re

text = "cat and dog"

pattern_match = r'cat'
match_match = re.match(pattern_match, text)

if match_match:
    print(f"Match Result: {match_match.group()}")
else:
    print("No match at the beginning of the string.")
# Result: Match Result: cat
```

```python
import re

text = "dog and cat"

pattern_match = r'cat'
match_match = re.match(pattern_match, text)

if match_match:
    print(f"Match Result: {match_match.group()}")
else:
    print("No match at the beginning of the string.")
# Result: No match at the beginning of the string.
```

- If zero or more characters at the beginning of string match the regular expression pattern
- Return None if the string does not match the pattern

EXAMPLES

```python
import re

text = "cat"

pattern_fullmatch = r'cat'
match_fullmatch = re.fullmatch(pattern_fullmatch, text)

if match_fullmatch:
    print(f"Fullmatch Result: {match_fullmatch.group()}")
else:
    print("The entire string does not match the pattern.")
# Result: Fullmatch Result: cat
```

```python
import re

text = "cats"

pattern_fullmatch = r'cat'
match_fullmatch = re.fullmatch(pattern_fullmatch, text)

if match_fullmatch:
    print(f"Fullmatch Result: {match_fullmatch.group()}")
else:
    print("The entire string does not match the pattern.")
# Result: The entire string does not match the pattern.
```

- If the whole string matches the regular expression pattern
- Return None if the string does not match the pattern

EXAMPLES

```python
import re

text = "apple banana cherry"

pattern_findall = r'\b\w{5}\b'
# \b matches empty string
# \w matches unicode word characters
matches_findall = re.findall(pattern_findall, text)

print(f"Findall Result: {matches_findall}")
# Result: Findall Result: ['apple']
```

```python
import re

text = "apple banana cherry"

pattern_findall = r'\b\w{6}\b'
# \b matches empty string
# \w matches unicode word characters
matches_findall = re.findall(pattern_findall, text)

print(f"Findall Result: {matches_findall}")
# Result: Findall Result: ['banana', 'cherry']
```

- If the whole string matches the regular expression pattern
- Return None if the string does not match the pattern

EXAMPLES

```python
import re

text = "Hello, my name is John. John is 20 years old."

pattern_sub = r'John'
replacement = 'Alice'
modified_text = re.sub(pattern_sub, replacement, text)

print(f"Original Text: {text}")
print(f"Modified Text: {modified_text}")
# Result: Original Text: Hello, my name is John. John is 20 years old.
#         Modified Text: Hello, my name is Alice. Alice is 20 years old.
```

```python
import re

text = "aaa"

pattern_sub = r'aa'
replacement = 'b'
modified_text =
re.sub(pattern_sub, replacement,
text)

print(f"Original Text: {text}")
print(f"Modified Text:
{modified_text}")
# Result: Original Text: aaa
#         Modified Text: ba
```

- Return the string obtained by replacing the leftmost non-overlapping occurrences of pattern in string by the replacement
- If the pattern isn't found, string is returned unchanged

EXERCISE

- Try the following exercises

- 03-regex