

# Grouping and capturing

REGULAR EXPRESSIONS IN PYTHON



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# Group characters

Clary has 2 friends who she spends a lot of time with. Susan has 3 brothers while John has 4 sisters.

# Group characters

Clary has 2 friends who she spends a lot  
time with. Susan has 3 brothers while  
John has 4 sisters.

```
re.findall(r'[A-Za-z]+\s\d+\s\w+', text)
```

```
['Clary has 2 friends', 'Susan has 3 brothers', 'John has 4 sisters']
```

# Capturing groups

Clary has 2 friends who she spends a lot of time with. Susan has 3 brothers while John has 4 sisters.

- Use parentheses to **group** and **capture** characters together

`([A-Za-z]+)\s\w+\s\d+\s\w+`  
Group

# Capturing groups

Clary has 2 friends who she spends a lot of time with. Susan has 3 brothers while John has 4 sisters.

- Use parentheses to group and capture characters together

```
re.findall(r'([A-Za-z]+)\s\w+\s\d+\s\w+', text)
```

```
['Clary', 'Susan', 'John']
```

# Capturing groups

Clary has 2 friends who she spends a lot  
time with. Susan has 3 brothers while  
John has 4 sisters.

Group 0

`([A-Za-z]+\s\w+\s(\d+)\s(\w+))`

Group1      Group2      Group3

# Capturing groups

Clary has 2 friends who she spends a lot  
time with. Susan has 3 brothers while  
John has 4 sisters.

```
re.findall(r'([A-Za-z]+)\s\w+\s(\d+)\s(\w+)', text)
```

```
[('Clary', '2', 'friends'),  
 ('Susan', '3', 'brothers'),  
 ('John', '4', 'sisters')]
```

# Capturing groups

- Match a specific subpattern in a pattern
- Use it for further processing



# Capturing groups

- Organize the data

```
pets = re.findall(r'([A-Za-z]+\s\w+\s(\d+)\s(\w+))', "Clary has 2 dogs but John has 3 cats")  
pets[0][0]
```

```
'Clary'
```

# Capturing groups

- *Immediately to the left*
  - `r"apple+"` : `+` applies to `e` and not to `apple`
- Apply a quantifier to the entire group

```
re.search(r"(\d[A-Za-z])+", "My user name is 3e4r5fg")
```

```
<_sre.SRE_Match object; span=(16, 22), match='3e4r5f'>
```

# Capturing groups

- Capture a repeated group `(\d+)` vs. repeat a capturing group `(\d)+`

```
my_string = "My lucky numbers are 8755 and 33"  
re.findall(r"(\d)+", my_string)
```

```
['5', '3']
```

```
re.findall(r"(\d+)", my_string)
```

```
['8755', '33']
```

# Let's practice!

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# Alternation and non-capturing groups

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# Pipe

- Vertical bar or pipe: |

```
my_string = "I want to have a pet. But I don't know if I want a cat, a dog or a bird."  
re.findall(r"cat|dog|bird", my_string)
```

```
['cat', 'dog', 'bird']
```

# Pipe

- Vertical bar or pipe: |

```
my_string = "I want to have a pet. But I don't know if I want 2 cats, 1 dog or a bird."  
re.findall(r"\d+\scat|dog|bird", my_string)
```

```
['2 cat', 'dog', 'bird']
```

OR OR

**\d+\scat|dog|bird**

# Alternation

- Use groups to choose between optional patterns

`\d+\s(cat|dog|bird)`

```
my_string = "I want to have a pet. But I don't know if I want 2 cats, 1 dog or a bird."  
re.findall(r"\d+\s(cat|dog|bird)", my_string)
```

```
['cat', 'dog']
```



# Alternation

- Use groups to choose between optional patterns

`(\d+)\s(cat|dog|bird)`

```
my_string = "I want to have a pet. But I don't know if I want 2 cats, 1 dog or a bird."  
re.findall(r"(\d+)\s(cat|dog|bird)", my_string)
```

```
[('2', 'cat'), ('1', 'dog')]
```

# Non-capturing groups

- Match but **not capture** a group
  - When group is not backreferenced
  - Add `?:` : `(?:regex)`

# Non-capturing groups

- Match but **not capture** a group

`(?:\d{2}-){3}(\d{3}-\d{3})`  
Group1

```
my_string = "John Smith: 34-34-34-042-980, Rebeca Smith: 10-10-10-434-425"  
re.findall(r"(?:\d{2}-){3}(\d{3}-\d{3})", my_string)
```

```
['042-980', '434-425']
```

# Alternation

- Use non-capturing groups for alternation

```
my_date = "Today is 23rd May 2019. Tomorrow is 24th May 19."  
re.findall(r"(\d+)(?:th|rd)", my_date)
```

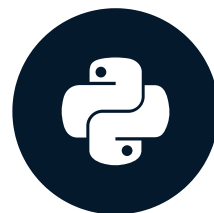
```
['23', '24']
```

# Let's practice!

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# Backreferences

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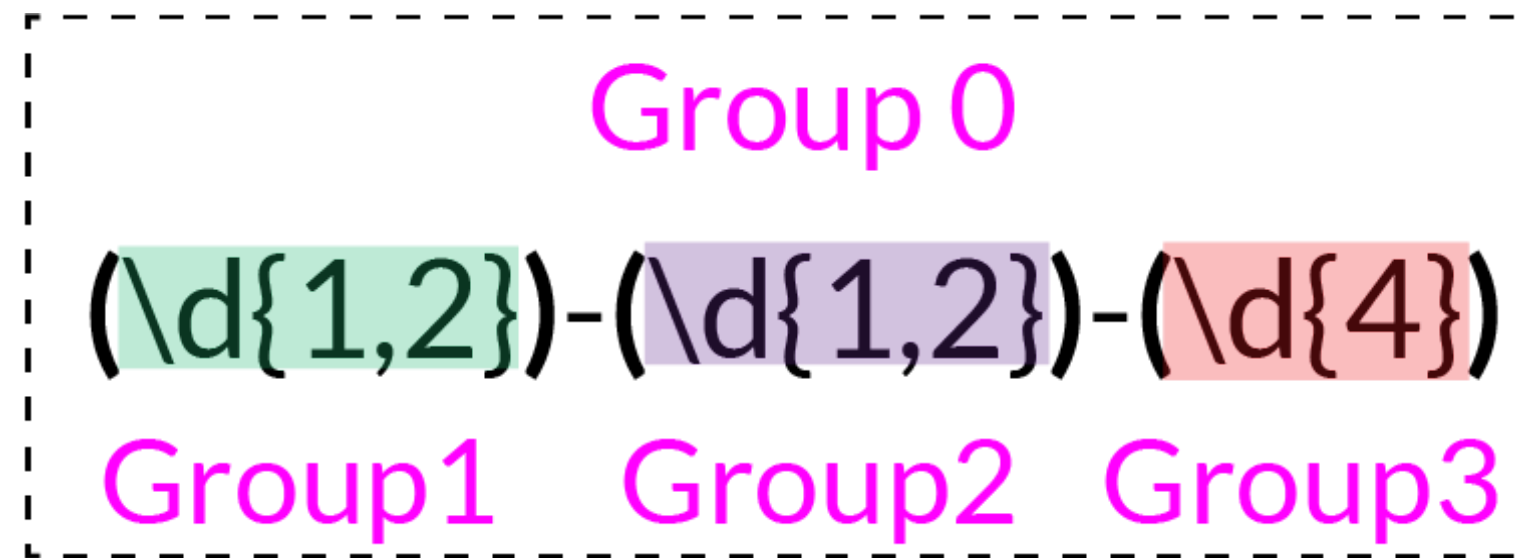
# Numbered groups

Python 3.0 was released on 12-03-2008. It was a major revision of the language. Many of its major features were backported to Python 2.6.x and 2.7.x version series.

`(\d{1,2})-(\d{1,2})-(\d{4})`

# Numbered groups

Python 3.0 was released on 12-03-2008. It was a major revision of the language. Many of its major features were backported to Python 2.6.x and 2.7.x version series.





# Numbered groups

```
text = "Python 3.0 was released on 12-03-2008."
```

```
information = re.search('(\d{1,2})-(\d{2})-(\d{4})', text)
information.group(3)
```

```
'2008'
```

```
information.group(0)
```

```
'12-03-2008'
```

# Named groups

- Give a name to groups

`(?P<name>regex)`

# Named groups

- Give a name to groups

```
text = "Austin, 78701"  
cities = re.search(r"(?P<city>[A-Za-z]+).*?(?P<zipcode>\d{5})", text)  
cities.group("city")
```

```
'Austin'
```

```
cities.group("zipcode")
```

```
'78701'
```

# Backreferences

- Using capturing groups to reference back to a group

`(\d{1,2})-(\d{1,2})-(\d{4})`

`\1` `\2` `\3`

# Backreferences

- Using numbered capturing groups to reference back

```
sentence = "I wish you a happy happy birthday!"  
re.findall(r"(\w+)\s ", sentence)
```

# Backreferences

- Using numbered capturing groups to reference back

```
sentence = "I wish you a happy happy birthday!"  
re.findall(r"(\w+)\s\1", sentence)
```

```
['happy']
```

# Backreferences

- Using numbered capturing groups to reference back

```
sentence = "I wish you a happy happy birthday!"  
re.sub(r"(\w+)\s\1", r"\1", sentence)
```

```
'I wish you a happy birthday!'
```

# Backreferences

- Using named capturing groups to reference back

`(?P<name>regex)`

`?P=name`

```
sentence = "Your new code number is 23434. Please, enter 23434 to open the door."  
re.findall(r"(?P<code>\d{5}).*?(?P=code)", sentence)
```

```
['23434']
```



# Backreferences

- Using named capturing groups to reference back

**(?P<name>regex)**

**\g<name>**

```
sentence = "This app is not working! It's repeating the last word word."  
re.sub(r"(?P<word>\w+)\s(?P=word)", r"\g<word>", sentence)
```

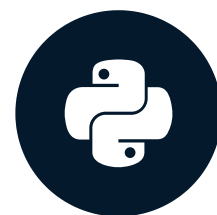
```
'This app is not working! It's repeating the last word.'
```

# Let's practice!

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# Lookaround

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# Looking around

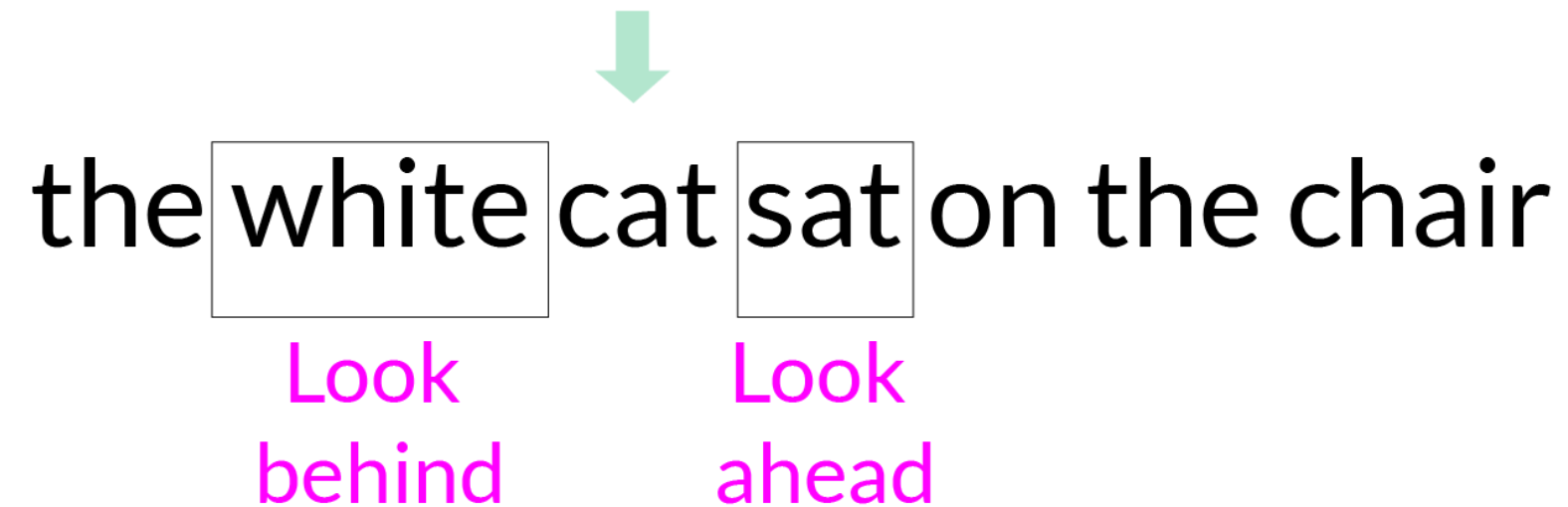
- Allow us to confirm that sub-pattern is ahead or behind main pattern

the white cat sat on the chair

# Looking around

- Allow us to confirm that sub-pattern is ahead or behind main pattern

the white cat sat on the chair



The diagram shows the sentence "the white cat sat on the chair". A green arrow points down to the word "cat". Below the word "white" is the text "Look behind" in magenta. Below the word "sat" is the text "Look ahead" in magenta. The words "white" and "sat" are each enclosed in a light gray box.

At my current position in the matching process, look ahead or behind and examine whether some pattern matches or not match before continuing.

# Look-ahead

- Non-capturing group
- Checks that the first part of the expression is followed or not by the lookahead expression
- Return only the first part of the expression



the white cat sat on the chair

Look  
ahead

positive `(?=sat)`

negative `(?!run)`

# Positive look-ahead

- Non-capturing group
- Checks that the first part of the expression is followed by the lookahead expression
- Return only the first part of the expression

```
my_text = "tweets.txt transferred, mypass.txt transferred, keywords.txt error"  
re.findall(r"\w+\.txt", my_text)
```

# Positive look-ahead

- Non-capturing group
- Checks that the first part of the expression is followed by the lookahead expression
- Return only the first part of the expression

```
my_text = "tweets.txt transferred, mypass.txt transferred, keywords.txt error"  
re.findall(r"\w+\.txt(?=\stransferred)", my_text)
```

```
['tweets.txt', 'mypass.txt']
```



# Negative look-ahead

- Non-capturing group
- Checks that the first part of the expression is **not** followed by the lookahead expression
- Return only the first part of the expression

```
my_text = "tweets.txt transferred, mypass.txt transferred, keywords.txt error"  
re.findall(r"\w+\.txt", my_text)
```

# Negative look-ahead

- Non-capturing group
- Checks that the first part of the expression is **not** followed by the lookahead expression
- Return only the first part of the expression

```
my_text = "tweets.txt transferred, mypass.txt transferred, keywords.txt error"  
re.findall(r"\w+\.txt(?!\stransferred)", my_text)
```

```
['keywords.txt']
```

# Look-behind

- Non-capturing group
- Get all the matches that are preceded or not by a specific pattern.
- Return pattern after look-behind expression

  
the white cat sat on the chair  
Look  
behind

positive (?<=white)

negative (?<!brown)

# Positive look-behind

- Non-capturing group
- Get all the matches that are preceded by a specific pattern.
- Return pattern after look-behind expression

```
my_text = "Member: Angus Young, Member: Chris Slade, Past: Malcolm Young, Past: Cliff Williams."  
re.findall(r"(?<(?!\s)\w+)\s\w+", my_text)
```

# Positive look-behind

- Non-capturing group
- Get all the matches that are preceded by a specific pattern.
- Return pattern after look-behind expression

```
my_text = "Member: Angus Young, Member: Chris Slade, Past: Malcolm Young, Past: Cliff Williams."  
re.findall(r"(?<=Member:\s)\w+\s\w+", my_text)
```

```
['Angus Young', 'Chris Slade']
```

# Negative look-behind

- Non-capturing group
- Get all the matches that are **not** preceded by a specific pattern.
- Return pattern after look-behind expression

```
my_text = "My white cat sat at the table. However, my brown dog was lying on the couch."  
re.findall(r"(?<!brown\s)(cat|dog)", my_text)
```

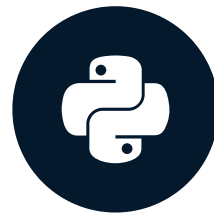
```
['cat']
```

# Let's practice!

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# Finishing line

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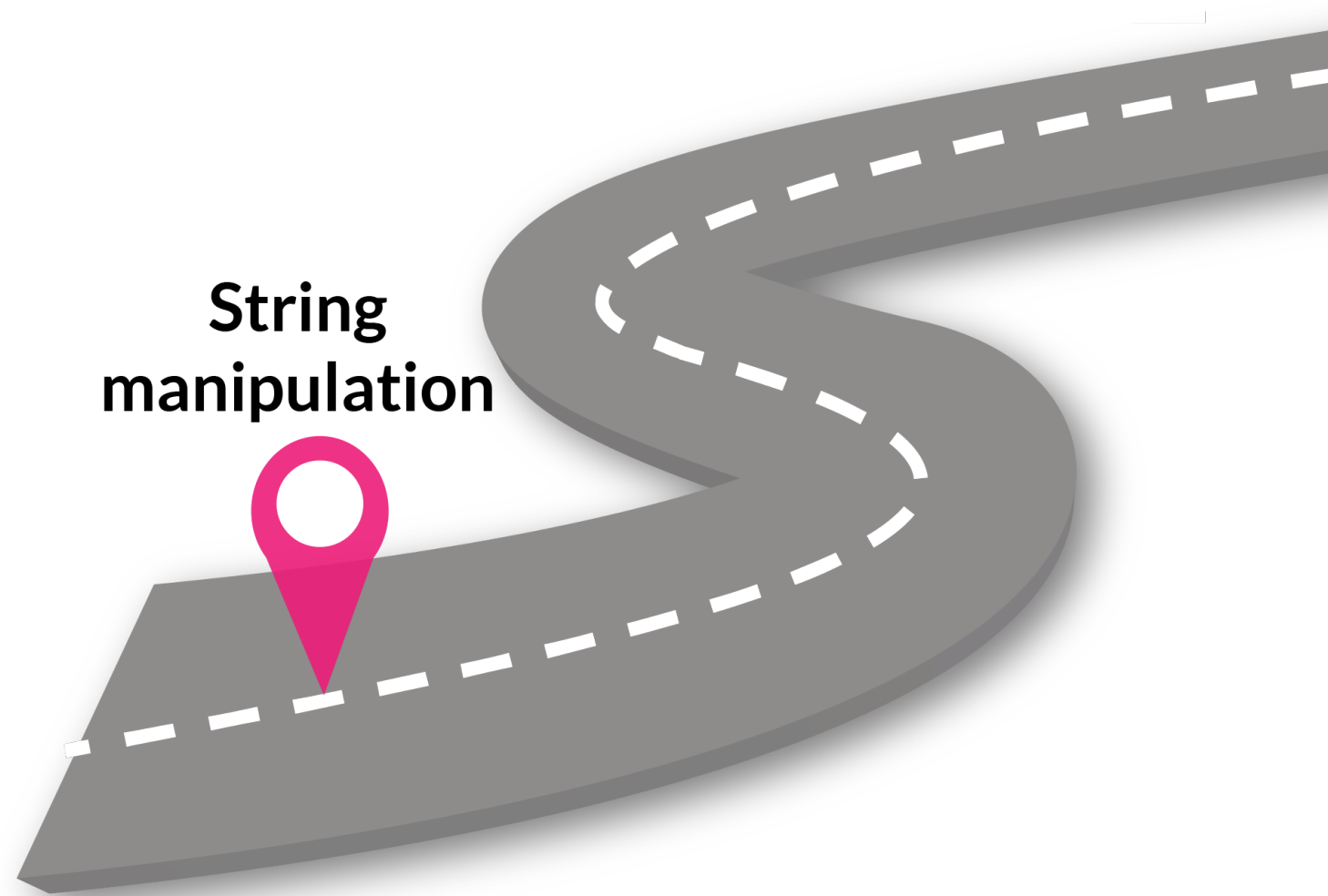


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`r"(Congratulations!)+"`

# Our journey



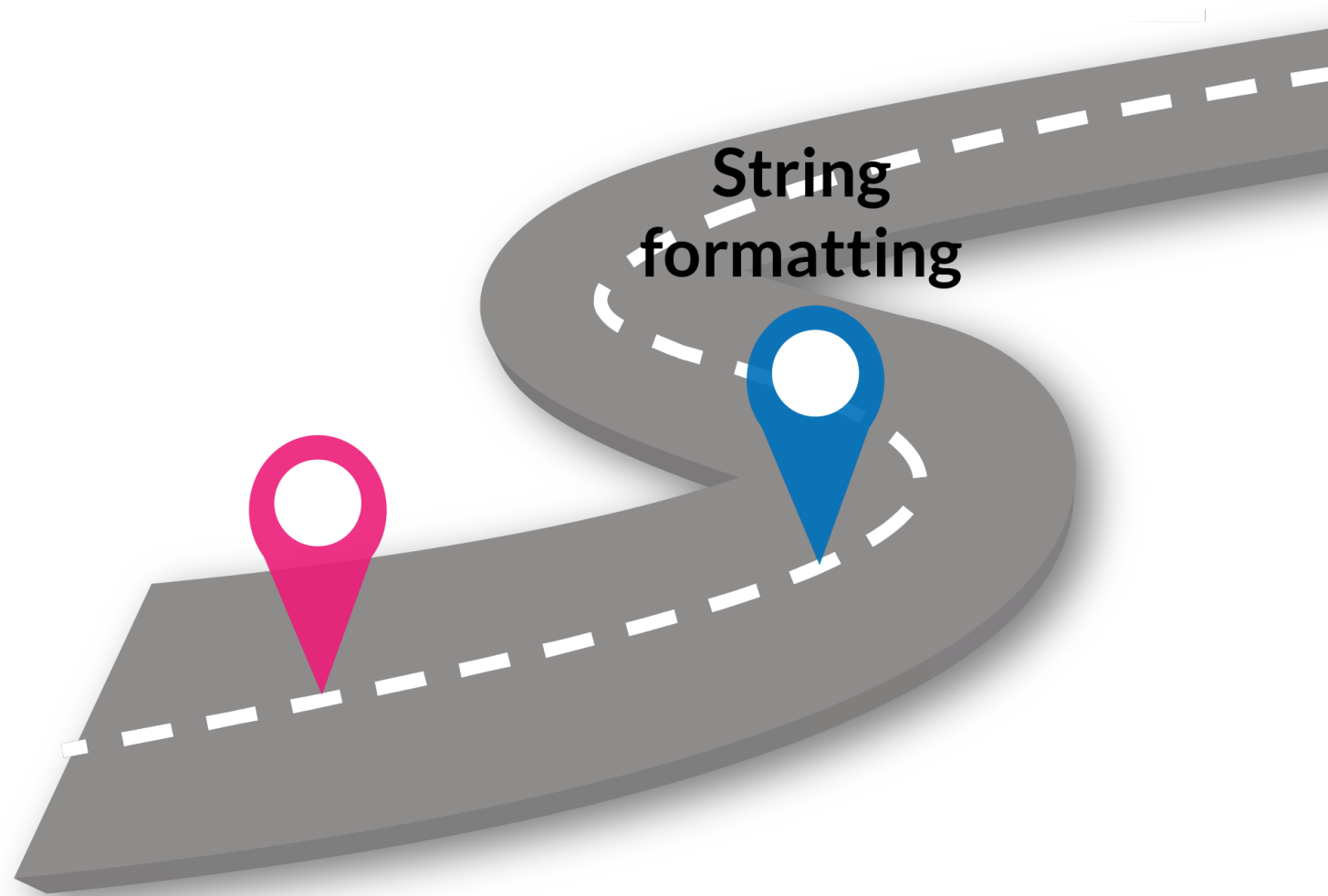
**Key concepts**

**Concatenate and split**

**Index and slice strings**

**Replace and remove characters**

# Our journey



**Insert custom strings into a predefined text**

**Three string formatting methods**

**Best approach according to situation**

# Our journey

Basic concepts  
RegEx



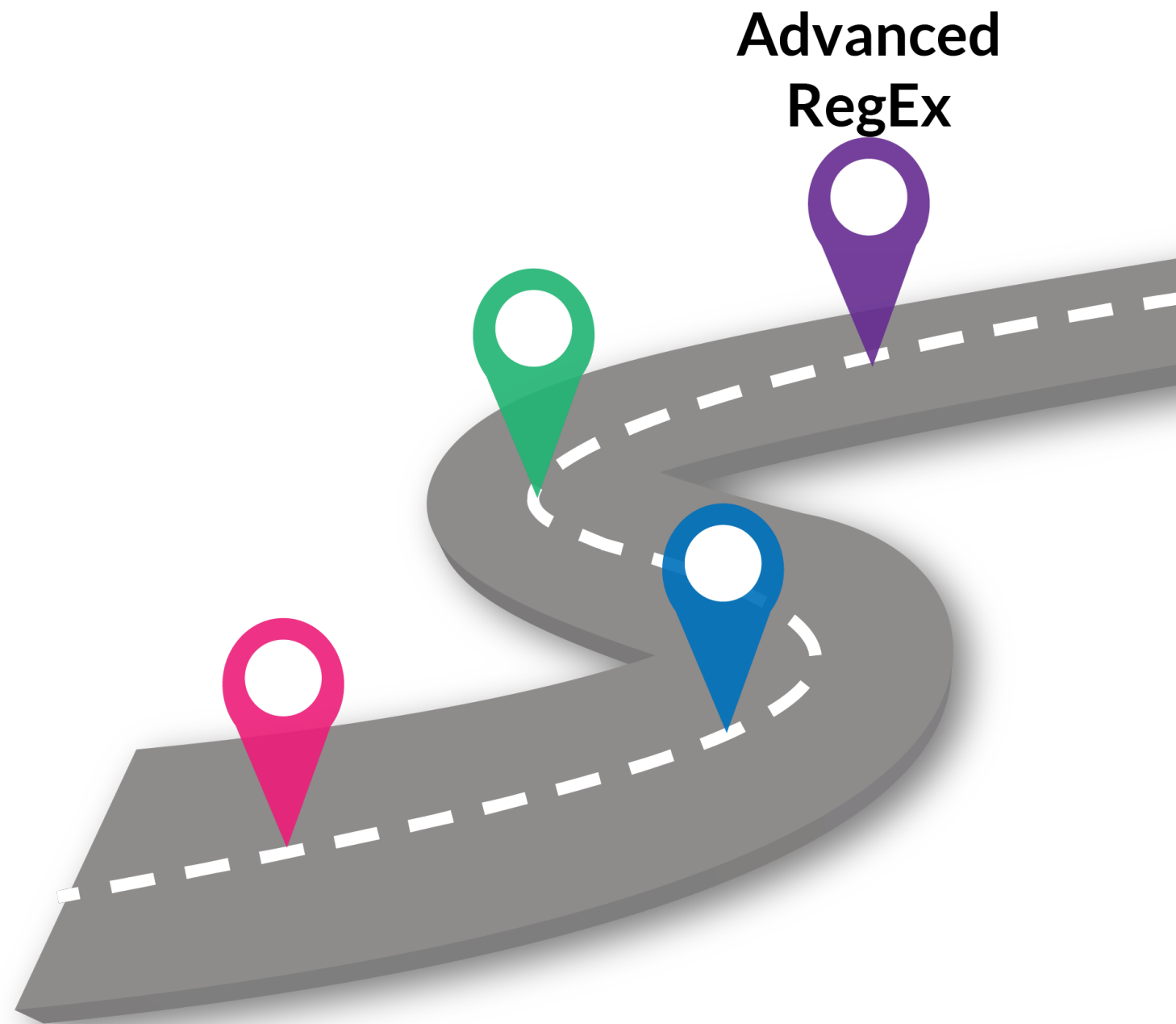
Basic syntax

Normal characters

Metacharacters

Greedy and non-greedy quantifiers

# Our journey



**Capturing and non-capturing groups**

**Backreference a pattern**

**Lookaround an expression**

# Last tips

✓ Practice

✓ Apply

✓ Have fun

# Thank you!

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