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Python

Slicing

Centre for Environmental Data Analysis
SCIENCE AND TECHNOLOGY FACILITIES COUNCIL
NATURAL ENVIRONMENT RESEARCH COUNCIL

software carpentry

National Centre for Atmospheric Science
NATURAL ENVIRONMENT RESEARCH COUNCIL

National Centre for Earth Observation
NATURAL ENVIRONMENT RESEARCH COUNCIL

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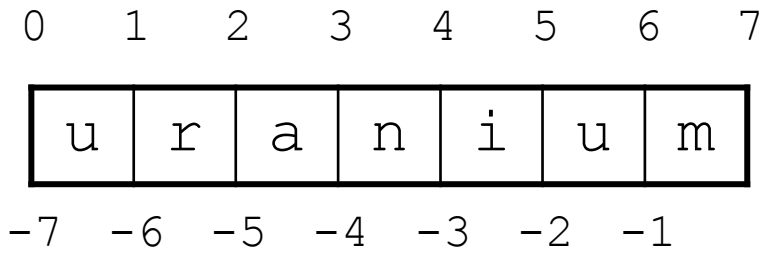
```
>>> element = 'uranium'
>>>
```



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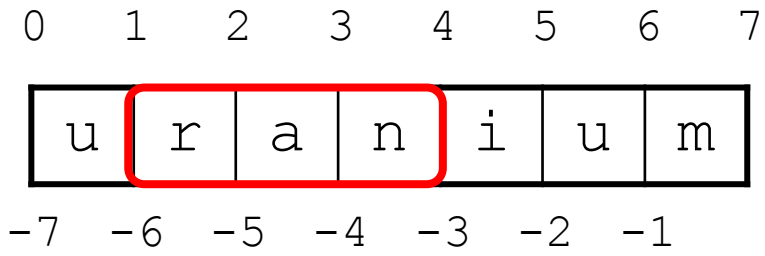
```
>>> element = 'uranium'
>>> print(element[1:4])
ran
>>>
```



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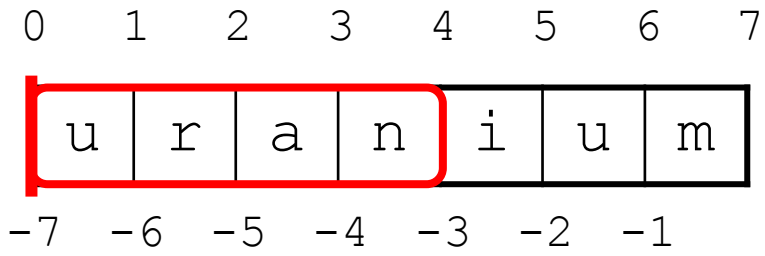
```
>>> element = 'uranium'
>>> print(element[1:4])
ran
>>> print(element[:4])
uran
>>>
```



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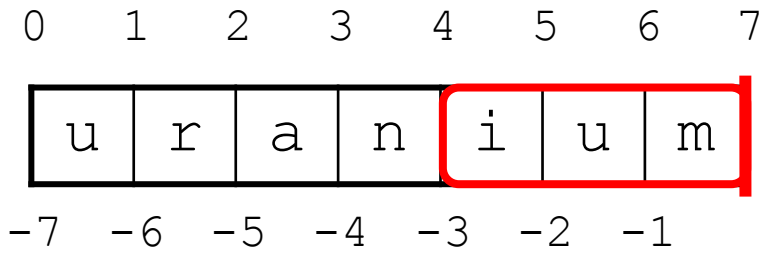
Can also be *sliced* using a range of indices

```
>>> element = 'uranium'
>>> print(element[1:4])
ran
>>> print(element[:4])
uran
>>> print(element[4:])
ium
>>>
```



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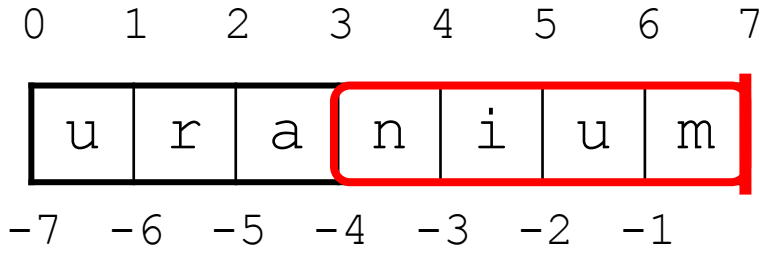
Can also be *sliced* using a range of indices

```
>>> element = 'uranium'
>>> print(element[1:4])
ran
>>> print(element[:4])
uran
>>> print(element[4:])
ium
>>> print(element[-4:])
nium
>>>
```



Python checks bounds when indexing

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But truncates when slicing

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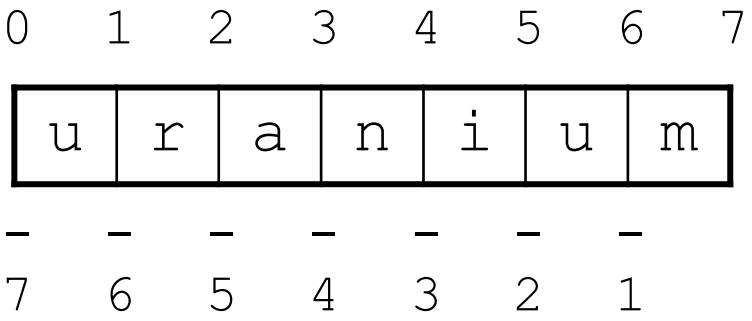
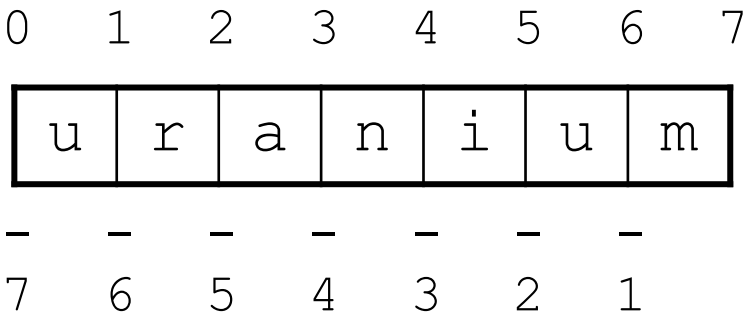
>>> element = 'uranium'
>>>
```



Python checks bounds when indexing

But truncates when slicing

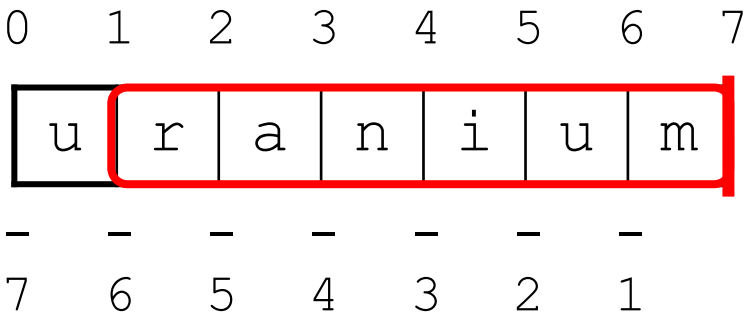
```
>>> element = 'uranium'
>>> print(element[400])
IndexError: string index out of range
>>>
```



Python checks bounds when indexing

But truncates when slicing

```
>>> element = 'uranium'
>>> print(element[400])
IndexError: string index out of range
>>> print(element[1:400])
ranium
>>>
```



So `text[1:3]` is 0, 1, or 2 characters long

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```
''          ''
'a'         ''
'ab'        'b'
'abc'       'bc'
'abcdef'    'bc'
```

Slicing always creates a new collection

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Beware of aliasing

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```
>>> points = [[10, 10], [20, 20], [30, 30], [40, 40]]
>>>
```

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```
>>> points = [[10, 10], [20, 20], [30, 30], [40, 40]]
>>> middle = points[1:-1]
>>>
```

Slicing always creates a new collection

Beware of aliasing

```
>>> points = [[10, 10], [20, 20], [30, 30], [40, 40]]
>>> middle = points[1:-1]
>>> middle[0][0] = 'whoops'
>>>
```

Slicing always creates a new collection

Beware of aliasing

```
>>> points = [[10, 10], [20, 20], [30, 30], [40, 40]]
>>> middle = points[1:-1]
>>> middle[0][0] = 'whoops'
>>> middle[1][0] = 'aliasing'
>>>
```

Slicing always creates a new collection

Beware of aliasing

```
>>> points = [[10, 10], [20, 20], [30, 30], [40, 40]]
>>> middle = points[1:-1]
>>> middle[0][0] = 'whoops'
>>> middle[1][0] = 'aliasing'
>>> print(middle)
[['whoops', 20], ['aliasing', 30]]
>>>
```

Slicing always creates a new collection

Beware of aliasing

```
>>> points = [[10, 10], [20, 20], [30, 30], [40, 40]]
>>> middle = points[1:-1]
>>> middle[0][0] = 'whoops'
>>> middle[1][0] = 'aliasing'
>>> print(middle)
[['whoops', 20], ['aliasing', 30]]
>>> print(points)
[[10, 10], ['whoops', 20], ['aliasing', 30], [40, 40]]
>>>
```

Python

List comprehensions - what are they? They are useful!

List Comprehensions

Python supports a concept called "List Comprehensions". Imagine you want to create a list of square numbers from the list of numbers from 0 to 9. You would type:

```
>>> S = []
>>> for x in range(10):
...     S.append(x**2)

>>> print(S)
[0, 1, 4, 9, 16, 25, 36, 49, 64, 81]
```

Saving on lines of code

List Comprehensions allow you to do it on **one line**:

```
>>> S = [x**2 for x in range(10)]
>>> print(S)
[0, 1, 4, 9, 16, 25, 36, 49, 64, 81]
```

These can be used to construct lists in a natural and easy way.

It gets better - include conditions

Imagine our previous example - but you only want to include values in the list where the result is an even number:

```
>>> S = []
>>> for x in range(10):
...     res = x**2
...     if res % 2 == 0:
...         S.append(res)
>>> print(S)
[0, 4, 16, 36, 64]
```

Can be simplified to…

All one line

```
>>> S =
[x**2 for x in range(10) if x**2 % 2 == 0]

>>> print(S)
[0, 4, 16, 36, 64]
```

See more info at:
https://www.python.org/dev/peps/pep-0202/#examples

created by

Greg Wilson

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