At the end of this lecture, students should be able to:

• use dot notation (using string methods with string instances)
• use string methods: upper(), lower(), strip(), find(), rfind()
• use the inbuilt functions: min(), max(), round(), abs()

Learning outcomes

Recap

Every object type, as well as storing some data, has some defined methods which can be applied to that particular type of object. Variables which reference an object are called instances, e.g., in the following code, greeting is a string instance and number is an instance of type int.

```python
greeting = "Hello World"
number = 234
```

String instances have many methods which can be applied to them such as upper(), lower(), find(), strip(), isalpha(), isdigit(), rfind(), split() …. In this lecture we will look at a few of these methods.

In order to apply a method to an object we use dot notation, i.e., the variable name, followed by a dot, followed by the method name.

```
instance_name .method_name(...)  # Note that, methods (like functions) use parentheses (round brackets) after the method name.
```
String methods – upper(), lower()

The `upper()` method returns a new string object with all the characters converted to upper case. The `lower()` method returns a new string object with all the characters converted to lower case.

For example,

```python
greeting = "Hello World"
greeting_lower = greeting.lower()
greeting_upper = greeting.upper()
print(greeting, greeting_lower, greeting_upper)
```

`Hello World` `hello world` `HELLO WORLD`

Notice that there is a total of three string objects

String methods – find()

The `find()` method is used to look for the position (index number) of the first occurrence (from the left) of some characters. If the characters are found, the `find()` method returns the index number, otherwise the `find()` method returns -1.

For example,

```python
greeting = "Hello World"
position1 = greeting.find(" ")
position2 = greeting.find("z")
position3 = greeting.find("orl")
print(position1, position2, position3)
```

```
0 1 2
```

String methods – rfind()

The `rfind()` method is used to look for the index position of the last occurrence (from the left) of some characters. If the characters are found, the `rfind()` method returns the index number, otherwise the `rfind()` method returns -1.

For example,

```python
greeting = "Hello World"
position1 = greeting.find("o")
position2 = greeting.rfind("o")
position3 = greeting.rfind("orl")
position4 = greeting.rfind("lro")
print(position1, position2, position3, position4)
```

```
4 10 8 9
```

String methods – strip()

The `strip()` method returns a new string object with all white space from the beginning and end of the string removed. It does not remove spaces from inside the string.

For example,

```python
letters1 = "    H e l l o oooo   "
letters2 = letters1.strip()
length1 = len(letters1)
length2 = len(letters2)
letters1 = "***" + letters1 + "***"
letters2 = "***" + letters2 + "***"
print(length1, length2, letters1, letters2)
```

```
21 14 ***    H e l l o oooo *** ***H e l l o oooo***
```

Notice that there are two string objects
Exercise

Complete the following program so that it prints the initial from the first name followed by a full stop, a space and followed by the surname. Assume the full name is always two names separated by a single space.

```python
full_name = "Wystan Auden"

initialled_name = first_letter + ". " + last_name
print(initialled_name)
```

W. Auden

Funeral Blues: Stop all the clocks, cut off the telephone/ Prevent the dog from barking ...
Common Python inbuilt functions

The **inbuilt function**, `abs()`, is used to get the absolute value (the magnitude) of a number (int or float), e.g.,

```python
num1 = 32
num2 = -32
num3 = abs(16 - 23)
```

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>32</td>
</tr>
<tr>
<td>2.</td>
<td>32</td>
</tr>
<tr>
<td>3.</td>
<td>7</td>
</tr>
<tr>
<td>4.</td>
<td>16.78</td>
</tr>
</tbody>
</table>

```python
print("1.", abs(num1))
print("2.", abs(num2))
print("3.", num3)
print("4.", abs(-16.78))
```

1. 32
2. 32
3. 7
4. 16.78

**round() – unexpected result**

Sometimes the `round()` function seems to give an unexpected result e.g.,

```python
num1 = 1.5
num2 = 2.5
num3 = 3.5
code

print(round(num1))
print(round(num2)) # surprising result
print(round(num3))
```

This problem happens because floating point numbers are stored in a finite space, e.g., 0.1 has an infinite number of digits when converted to base 2 but, when stored in the computer memory, float numbers are assigned exactly 64 bits of space which means that some of the bits are cut off. If 2.5 is actually stored as 2.499999999999999999...99 then it is rounded to 2 (not the expected 3).

```python
round(4.235, 2) gives the number 4.24
round(4.265, 2) gives the number 4.26
```

Exercise

Complete the following program so that it prints the total tax and the net pay rounded to a whole number. The first $14000 is not taxed. The next amount up to $38500 is taxed at 24% and the rest is taxed at 34%.

```python
salary = 54000
no_tax_boundary = 14000
rate1_boundary = 38500
rate1 = 0.24
rate2 = 0.34

# Print the last lines of information
print("===============================")
print("Total tax: ", total_tax, sep = "")
print()print("Net pay: ", net_pay, sep = "")
print("===============================")
```

In Python:

- use dot notation when using string methods with string instances
- the string methods: `upper()`, `lower()`, `strip()`, `find()`, `rfind()` can be used with string instances
- Some Python inbuilt functions are: `min()`, `max()`, `round()`

Summary

In Python:

- use dot notation when using string methods with string instances
- the string methods: `upper()`, `lower()`, `strip()`, `find()`, `rfind()` can be used with string instances
- Some Python inbuilt functions are: `min()`, `max()`, `round()`
Examples of Python features used in this lecture

```python
greeting = "Hello World"
position1 = greeting.find("o")
position2 = greeting.rfind("o")
position3 = words.find("Z")
position4 = words.rfind("o W")

greeting_lower = greeting.lower()
greeting_upper = greeting.upper()

smallest = min(32.7, 56.4, 3, -1.1, 56.99, -1.2)
largest = max(32.7, 56.4, 3, -1.1, 56.99, -1.2)

num1 = 32.657123
print(round(num1))
print(round(num1, 2))

num2 = abs(20 - num1)
print(num2)
```