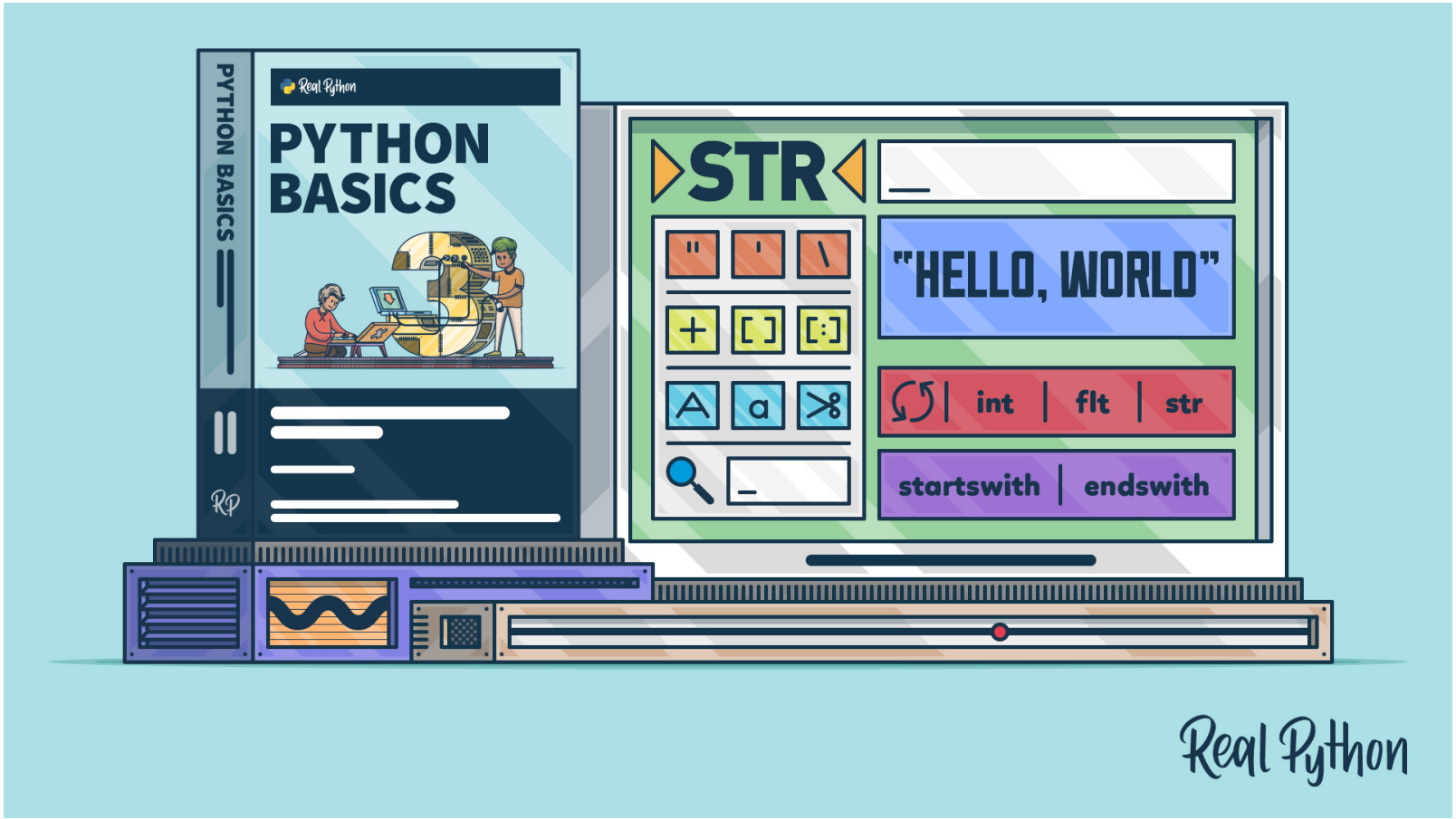
Python Basics - Strings and String Methods



Python Basics - Strings and String Methods

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In this course you'll:

- Manipulate strings with string methods
- Work with user input
- Deal with strings of numbers
- Format strings for printing

Python Basics - Strings and String Methods

Along the way you'll also learn about:

- f-Strings
- Multiline strings
- String indexing and slicing
- String immutablility
- Discovering additional methods

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What is a String?

Strings are one of the *fundamental* Python data types

- An example string
  ```
  my_string = "Hello, World"
  ```
- Data Types: What kind of data a value represents
  - Strings are used to represent text
- Other types:
  - Numeric types - int (integers), float (floating point numbers)
  - Booleans (True, False)
  - Sequence types - list, tuple, string

What is a String?

Strings are a **fundamental data type**

- Can’t be broken into smaller values of a different type
- Unlike a **compound data type**, which are known as data structures

What is a String?

The string data type has a special abbreviated name in Python: `str`

- `type()` shows the data type of a given value

What is a String?

Strings have three important properties:

1. Contain individual letters or symbols called **characters**
2. Have a **length**, defined as the number of characters contained
3. Characters in a string appear in a sequence, each character has a numbered position

What is a String?

- Either single quotes or double quotes can be used
- As long as the same type is used at the beginning and end of the string

```
string1 = 'Hello, World'
string2 = "1234"
```

- Text surrounded by quotation marks creates a **string literal**
  - The name indicates a string literally written into your code

What is a String?

String literals are written in a variety of ways:

- Single quotes: `'allows embedded "double" quotes'`
- Double quotes: `"allows embedded 'single' quotes"`
- Triple quoted:
  - `'''Three single quotes'''`
  - `"""Three double quotes"""`

What is a String?

Strings can contain any valid Unicode character

```
"We're #1!"
"1234"
"×Pýŧħøŋ×"
"🐶😎💻"
```

What is a String?

Determine the Length of a String

- The built-in `len()` function
- Returns the number of characters contained in a string, including spaces

What is a String?

Multiline Strings

- PEP 8 recommends each line of Python code contain no more than 79 characters – including spaces
- Two techniques to break a string across multiple lines
  - Add a backslash (`\`) at the end of all but the last line
  - Use triple quotes as delimiters (`""" or '''`)

What is a String?

Practice what you've learned with these exercises:

1. Print a string that uses double quotation marks inside the string
2. Print a string that uses an apostrophe inside the string
3. Print a string that spans multiple lines with whitespace preserved
4. Print a string that is coded on multiple lines but gets printed on a single line

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Concatenation, Indexing, and Slicing

- Concatenation: Joins two strings together
- Indexing: Gets a single character from a string
- Slicing: Gets several characters from a string at once

Concatenation, Indexing, and Slicing

To combine or **concatenate** strings

- Use the `+` operator
- `string + string`

Concatenation, Indexing, and Slicing

To combine or **concatenate** strings

- Use the `+` operator
- `string + string`

```
>>> string1 = "abra"
>>> string2 = "cadabra"
>>> magic_string = string1 + string2
>>> magic_string
'abracadabra'
```

Concatenation, Indexing, and Slicing

String Indexing

Each character in a string has a numbered position called an **index**

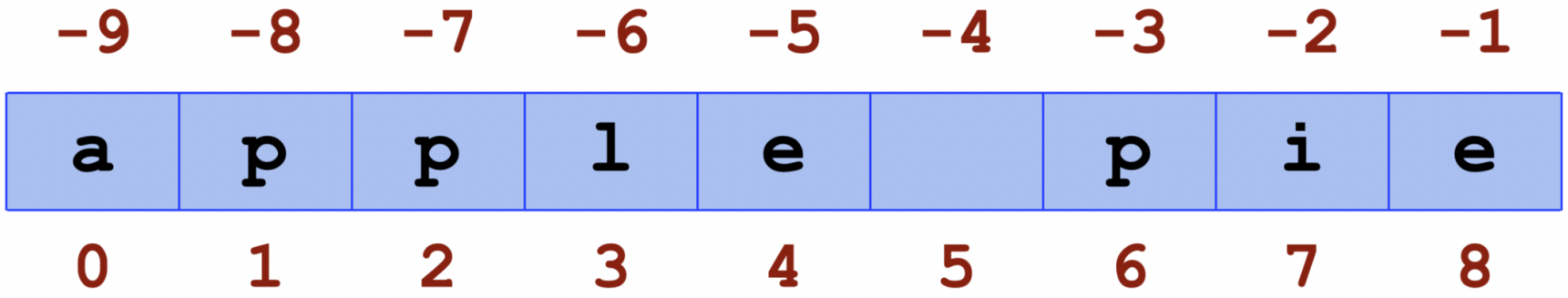
- Individual characters can be accessed by using the index
- Place the **index** number inside a pair of square brackets after the string
  - `my_string[3]`
- The index count starts with zero
  - Most programming languages do this
  - Be careful of **off-by-one errors**

Concatenation, Indexing, and Slicing

String Indexing

Concatenation, Indexing, and Slicing

Negative Indexing



Concatenation, Indexing, and Slicing

String Slicing

- To extract a portion of a string, called a **substring**
- Insert a colon between two index numbers `[0:4]`

Concatenation, Indexing, and Slicing

String Slicing

- To extract a portion of a string, called a **substring**
- Insert a colon between two index numbers `[0:5]`

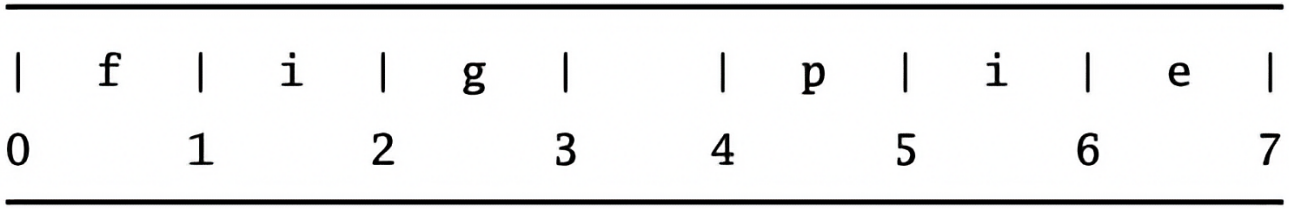
```
>>> dessert = "apple pie"
>>> dessert[0:5]
'apple'
```

- A slice of `[x:y]` starts from the character at index `x`, and goes up to, but does not include the character at the index `y`.

Concatenation, Indexing, and Slicing

String Slicing

For slicing, indicies behave more like boundaries around characters



Concatenation, Indexing, and Slicing

String Slicing

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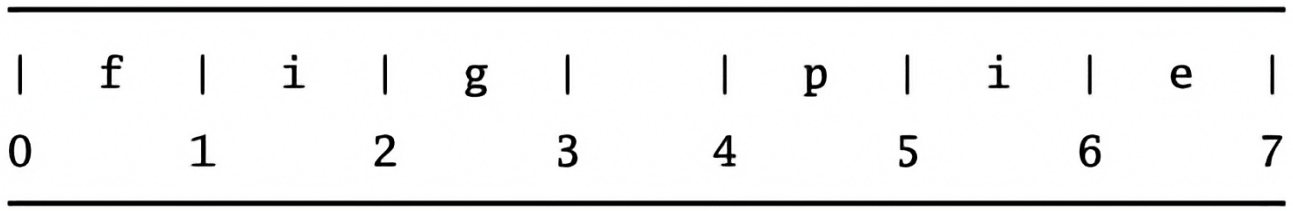



```
>>> new_dessert = "fig pie"
>>> new_dessert[0:3]
'fig'
>>> new_dessert[3:7]
' pie'
```

Concatenation, Indexing, and Slicing

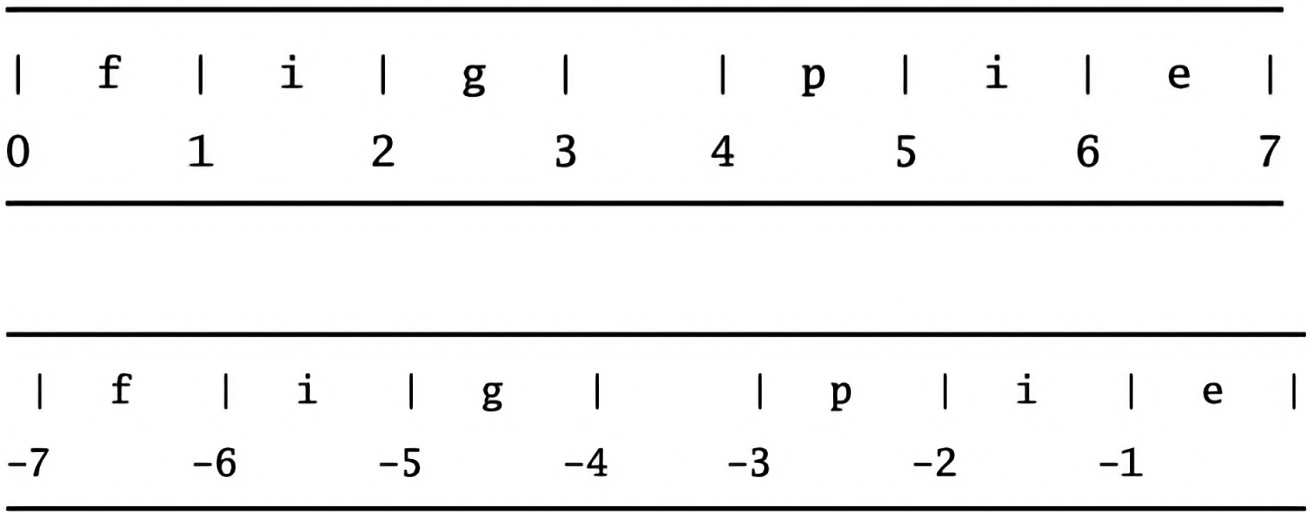
String Slicing

- Negative slicing works by the same rules
- A slice of `[x:y]` starts from the character at index `x`, and goes up to, but does not include the character at the index `y`.

Concatenation, Indexing, and Slicing

String Slicing

- Negative slicing works by the same rules
- A slice of `[x:y]` starts from the character at index `x`, and goes up to, but does not include the character at the index `y`.



Concatenation, Indexing, and Slicing

- Omitting the index before the colon, starts with first character

Concatenation, Indexing, and Slicing

- Omitting the index before the colon, starts with first character

```
>>> dessert = "apple pie"
>>> dessert[:5]
'apple'
```

Concatenation, Indexing, and Slicing

- Omitting the index before the colon, starts with first character
- Omitting the index after the colon, ends with the last character

Concatenation, Indexing, and Slicing

- Omitting the index before the colon, starts with first character
- Omitting the index after the colon, ends with the last character

```
>>> dessert = "apple pie"
>>> dessert[:5]
'apple'
>>> dessert[6:]
'pie'
```

Concatenation, Indexing, and Slicing

- Omitting the index before the colon, starts with first character
- Omitting the index after the colon, ends with the last character
- Omitting both indexes returns the whole string

Concatenation, Indexing, and Slicing

- Omitting the index before the colon, starts with first character
- Omitting the index after the colon, ends with the last character
- Omitting both indexes returns the whole string

```
>>> dessert = "apple pie"
>>> dessert[:5]
'apple'
>>> dessert[6:]
'pie'
>>> dessert[:]
'apple pie'
```

Concatenation, Indexing, and Slicing

Strings are immutable

- Immutable objects can’t be changed

Concatenation, Indexing, and Slicing

Strings are immutable

- Immutable objects can’t be changed

```
>>> word = "boil"
>>> word[0] = "f"
Traceback (most recent call last):
  File "<pyshell#16>", line 1, in <module>
    word[0] = "f"
TypeError: 'str' object does not support item assignment
```

Concatenation, Indexing, and Slicing

Strings are immutable

- To alter a string, you must create a new one
- This creates a new string object through assignment

Concatenation, Indexing, and Slicing

Strings are immutable

- To alter a string, you must create a new one
- This creates a new string object through assignment

```
>>> word = "boil"
>>> word = "f" + word[1:]
'foil'
```

Concatenation, Indexing, and Slicing

Review Exercise:

1. Create a string and print its length using len().
2. Create two strings, concatenate them, and print the resulting string.
3. Create two strings, use concatenation to add a space between them, and print the result.
4. Print the string “zing” by using slice notation to specify the correct range of characters in the string “bazinga”.

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Manipulate Strings With Methods

In this lesson you'll learn:

- Convert a string to uppercase or lowercase
- Remove whitespace from a string
- Determine if a string begins or ends with certain characters

Manipulate Strings With Methods

Converting String Case

`.lower()` - Converts a string to all lowercase letters

Manipulate Strings With Methods

Converting String Case

`.lower()` - Converts a string to all lowercase letters

```
>>> "Jean-Luc Picard".lower()
'jean-luc picard'
```

Manipulate Strings With Methods

Converting String Case

`.upper()` - Converts a string to all uppercase letters

Manipulate Strings With Methods

Converting String Case

`.upper()` - Converts a string to all uppercase letters

```
>>> "Jean-Luc Picard".upper()
'JEAN-LUC PICARD'
```

Manipulate Strings With Methods

Removing whitespace from a string

- `.rstrip()` - Removes trailing spaces from right side of string
- `.lstrip()` - Removes preceding spaces from left side of string
- `.strip()` - Removes whitespaces from both left and right sides

Manipulate Strings With Methods

Determining if a string starts or ends with a particular string

- `.startswith()`
- `.endswith()`

Manipulate Strings With Methods

Using IDLE to discover additional string methods

- Type the name of a variable that is assigned a string.
  - `>>> starship = "Enterprise"`
  - `>>> starship`
- Add a period (often spoken as “dot”) and wait
  - `>>> starship.`
- Typing in a letter will narrow the results
  - `>>> starship.u`
- Pressing the `Tab` key will automatically fill in the method name
  - `>>> starship.upper()`

Review What You've Learned

1. Write a program that converts the following strings to lowercase: "Animals", "Badger", "Honey Bee", "Honey Badger". Print each lower- case string on a separate line.
2. Repeat exercise 1, but convert each string to uppercase instead of lowercase.
3. Write a program that removes whitespace from the following strings, then print out the strings with the whitespace removed:

Review What You've Learned

1. Write a program that converts the following strings to lowercase: "Animals", "Badger", "Honey Bee", "Honey Badger". Print each lower- case string on a separate line.
2. Repeat exercise 1, but convert each string to uppercase instead of lowercase.
3. Write a program that removes whitespace from the following strings, then print out the strings with the whitespace removed:

```
string1 = " Filet Mignon"
string2 = "Brisket "
string3 = " Cheeseburger "
```

Review What You've Learned

4. Write a program that prints out the result of .startswith("be") on each of the following strings:

Review What You've Learned

4. Write a program that prints out the result of .startswith("be") on each of the following strings:

```
string1 = "Becomes"
string2 = "becomes"
string3 = "BEAR"
string4 = " bEautiful"
```

5. Using the same four strings from exercise 4, write a program that uses string methods to alter each string so that .startswith("be") returns True for all of them.

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Interact With User Input

Making things interactive with `input()`

Interact With User Input

Making things interactive with `input()`

```
prompt = "Hey, what's up? "
user_input = input(prompt)
print("You said: " + user_input)
```

Review What You've Learned

Write a few programs that take input from the user and:

1. Have the program display that input back.
2. Have the program display the input in lowercase.
3. Have the program display the number of characters in the input.

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Working With Strings and Numbers

Using Strings With Arithmetic Operators

- The `+` operator concatenates two strings together
- The `*` operator concatenates **multiple** copies of a string

Working With Strings and Numbers

Converting Strings to Numbers

- `int()` - converts objects into whole numbers
- `float()` - converts objects into numbers with decimal points

Working With Strings and Numbers

Converting Numbers to Strings

- `str()` - returns a string version of an object

Review What You've Learned

1. Create a string containing an integer, then convert that string into an actual integer object using `int()`.
    - Test that your new object is a number by multiplying it by another number and displaying the result.
2. Repeat the previous exercise, but use a floating-point number and `float()`.
3. Create a string object and an integer object, then display them side by side with a single print using `str()`.
4. Write a program that uses `input()` twice to get two numbers from the user, multiplies the numbers together, and displays the result.
    - `The product of 2 and 4 is 8.0`

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Streamline Your Print

Formatted String Literals - More commonly known as **f-strings**

Streamline Your Print

Formatted String Literals - More commonly known as **f-strings**

```
>>> day = "Tuesday"
>>> eggs = 2
>>> bacon = 3
>>> f"{day}'s breakfast is {eggs} eggs and {bacon} pieces of bacon"
"Tuesday's breakfast is 2 eggs and 3 pieces of bacon"
```

1. A string literal starts with the letter `f` before the opening quotation mark
2. Variable names surrounded by curly braces (`{}`) are replaced by their corresponding values without using `str()`
    - Python expressions between the braces are replaced with their result

Streamline Your Print

f-strings are available only in Python version 3.6 and above

In earlier versions of Python you could use `.format()`

```
>>> day = "Tuesday"
>>> eggs = 2
>>> bacon = 3
>>> "{}'s breakfast is {} eggs and {} pieces of bacon".format(day, eggs, bacon)
"Tuesday's breakfast is 2 eggs and 3 pieces of bacon"
```

Review What You've Learned

1. Create a float object named weight with the value `0.2`, and create a string object named animal with the value `"newt"`.
    - Then use these objects to print the following string using only string concatenation:
    - `0.2 kg is the weight of the newt`
2. Display the same string by using `.format()` and empty `{}` placeholders.
3. Display the same string using an f-string.

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Find a String in a String

- `.find()` - finds the location of one string within another string (a substring)
  - `.find(<sub>)`
  - Returns the index of the fist occurence of the string passed to it
  - Case-sensitive

Find a String in a String

- `.replace()` - replaces each instance of a substring with another string
  - `.replace(<old>, <new>)`

Review What You've Learned

1. In one line of code, display the result of trying to `.find()` the sub-string `"a"` in the string `"AAA"`.
    - The result should be `-1`.
2. Replace every occurrence of the character `"s"` with `"x"` in the string `"Somebody said something to Samantha"`.
3. Write a program that accepts user input with `input()` and displays the result of trying to `.find()` a particular letter in that input.

Challenge: Turn Your User Into a L33t H4x0r

- Write a program called `translate.py` that asks the user for some input with the following prompt: `Enter some text:`
- Use `.replace()` to convert the text entered by the user into leetspeak by making the following changes to lowercase letters:
  - The letter `a` becomes `4`
  - The letter `b` becomes `8`
  - The letter `e` becomes `3`
  - The letter `l` becomes `1`
  - The letter `o` becomes `0`
  - The letter `s` becomes `5`
  - The letter `t` becomes `7`

Challenge: Turn Your User Into a L33t H4x0r

Your program should then display the resulting string as output. Below is a sample run of the program:

```
Enter some text: I like to eat eggs and spam.
I 1ik3 70 347 3gg5 4nd 5p4m.
```

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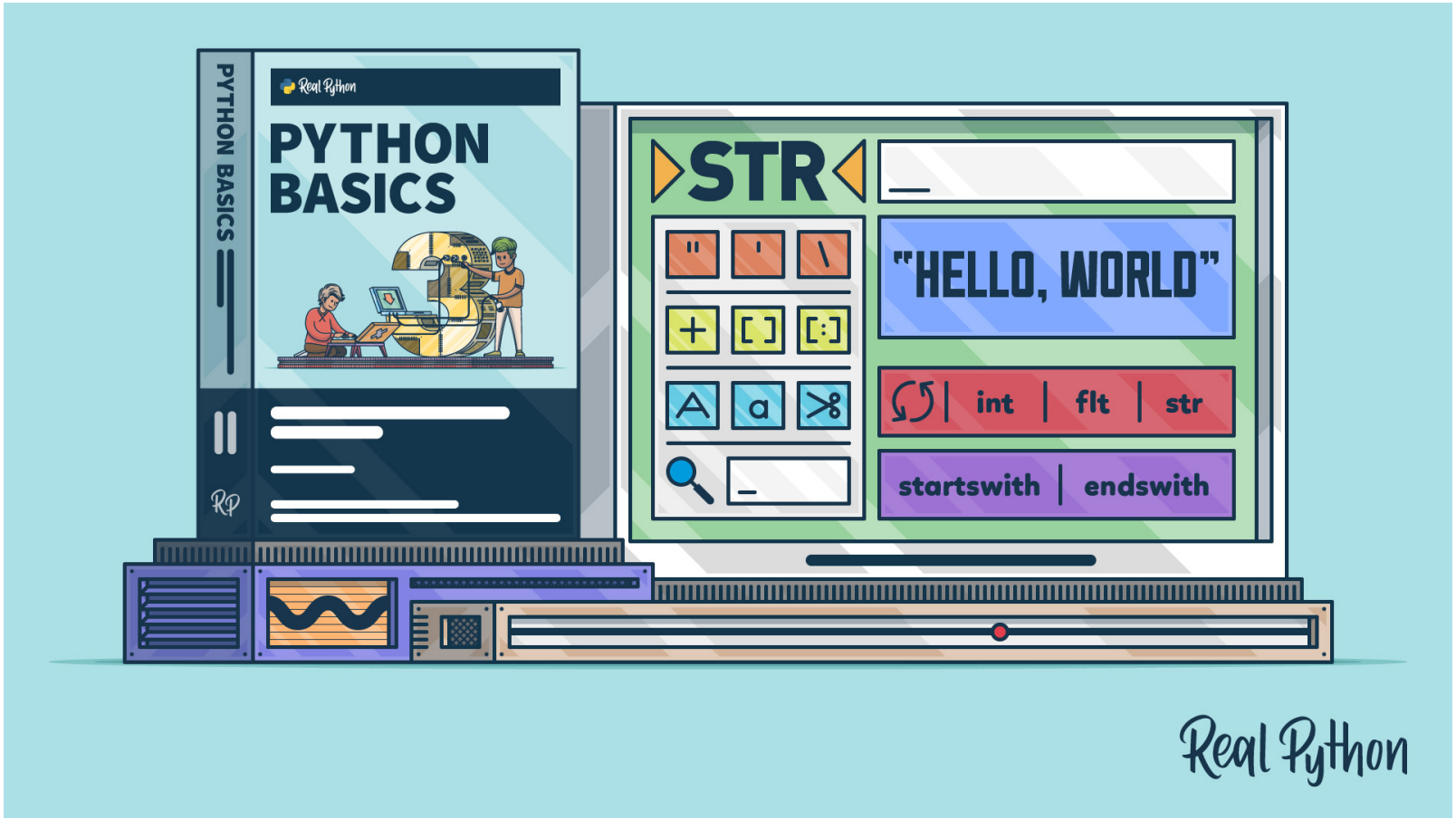
Summary and Additional Resources



Summary and Additional Resources

In this course you learned how to:

- Manipulate strings with string methods
- Work with user input
- Deal with strings of numbers
- Format strings for printing

Summary and Additional Resources

Along the way you also learned about:

- f-Strings
- Multiline strings
- String indexing and slicing
- String immutablility
- Discovering additional methods

More Video Courses:

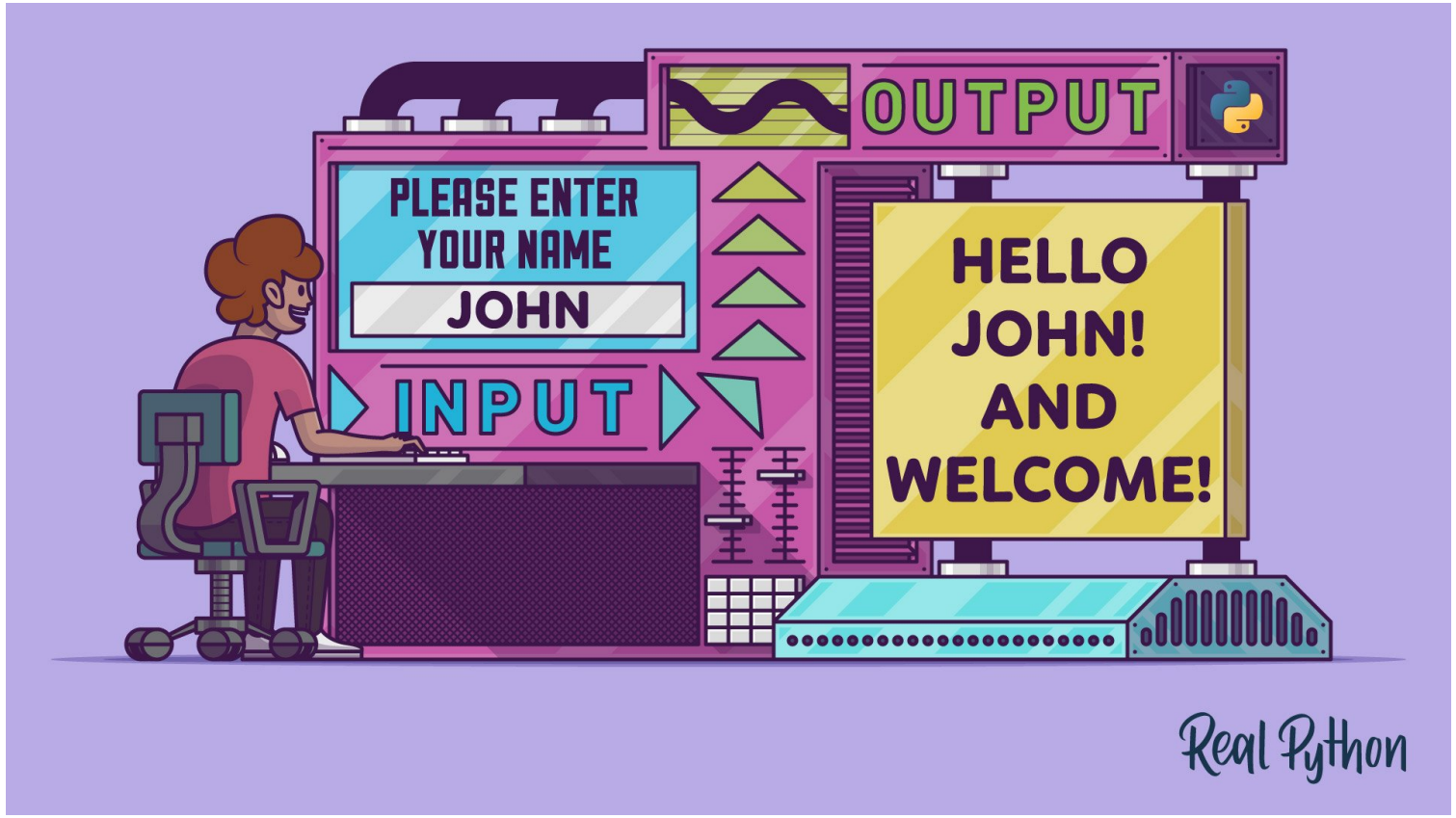
Python 3's f-Strings: An Improved String Formatting Syntax

More Video Courses:

Splitting, Concatenating, and Joining Strings in Python

More Video Courses:

Reading Input and Writing Output in Python



Congratulations and Thanks!