

# Python API

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## Textbook

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## Python API



Imagine you're building with LEGOs. The **standard library** is like the basic set of common, essential LEGO bricks that come with almost every LEGO kit. These are the pieces you'll use most often:

- **Basic shapes:** Squares, rectangles, circles.
- **Common connectors:** Pins, axles.

In programming, the standard library is a collection of pre-written code that comes built-in with the programming language itself. It provides fundamental tools and functions that programmers frequently need. Think of it as a toolbox with common tools.

Here are some examples of what a standard library typically provides:

- **Math functions:** Calculating square roots, absolute values, or random numbers.
- **String manipulation:** Changing text to uppercase, finding a character, or splitting a sentence.
- **File operations:** Reading from or writing to files on your computer.
- **Basic data structures:** Ways to organize data like lists or arrays.

**Why is it useful?** It saves programmers time and effort. Instead of writing code from scratch to, say, calculate a square root every single time, you can just use the function provided by the standard library. It's like having a calculator built into your programming language.

## Application Programming Interface (API)

Now, let's go back to our LEGO analogy. An **API** is like the instruction manual and the specific connection points that allow your LEGO creation to interact with *other, specialized LEGO sets* or even non-LEGO toys. It defines *how* different pieces of software can connect and work together.

In programming, an API is a set of rules, protocols, and tools that allows different software applications to communicate with each other. It specifies *how* you can request services from another piece of software and *what kind of response* you'll get back.

Think of an API as a waiter in a restaurant:

1. You (your program) want to order food (a service from another application).
2. You don't go into the kitchen (the internal workings of the other application).
3. You tell the waiter (the API) what you want from the menu (the API's defined functions).
4. The waiter takes your order to the kitchen.
5. The waiter brings back your food (the response from the other application).

You don't need to know *how* the kitchen prepares the food, just *how to order it* using the waiter. Similarly, with an API, you don't need to know the inner workings of an application to use its services.

## Role of an API in Application Development

APIs are essential for modern application development because they:

- **Enable integration:** They allow different software systems to talk to each other. For example, when you see a Google Map embedded on a website, that website is using Google Maps' API to display the map.
- **Promote reusability:** Developers can build specialized services and offer them via an API, so other developers don't have to reinvent the wheel. Why build your own weather forecasting system when you can use a weather API?
- **Foster innovation:** By providing access to data and functionalities, APIs allow developers to create new and exciting applications that combine services from multiple sources. Think of apps that combine ride-sharing, food delivery, and payment processing – all powered by various APIs working together.
- **Simplify development:** Instead of understanding complex underlying systems, developers just need to understand the API's instructions.

## Facilitating Programming Solutions: API vs. Libraries

Both standard libraries and APIs help you write programs by providing pre-built functionalities, but they do so in different ways:

- **Standard Library:** Provides the **fundamental building blocks** and general-purpose tools *within* your programming language. You directly call functions or use classes that are part of the language's core offering. It's usually installed with the language itself.
  - **Example:** Using Python's `math.sqrt()` function to calculate a square root. You're using a tool

directly from Python's standard kit.

- **API:** Provides a **way to interact with *external* services or applications**. You're often making requests over a network to a server that runs the application providing the API.
  - **Example:** Using a weather API to get the current temperature in your city. Your program sends a request to the weather service's server, and the server sends back the temperature data. You're connecting your LEGO creation to another, separate, specialized LEGO set.

In short, the **standard library** is your language's built-in toolbox, while an **API** is a set of instructions for how your program can interact with *other* programs or services. Both are crucial for efficient and powerful software development.

## Exercise: Get a Random Fact Using an API

This exercise will show you how to use a very simple web API to fetch a random fact.

### Step 1: Understand the API We'll Use

We're going to use the **Numbers API**. It's incredibly simple and provides facts about numbers.

- **Base URL:** `http://numbersapi.com/random/trivia`
  - `random` : Asks for a random number.
  - `trivia` : Asks for a trivia fact about that random number.
- **Example full API request URL:** `http://numbersapi.com/random/trivia`

### Step 2: Test the API in Your Web Browser

Before coding, let's see what the API returns.

1. Open your web browser.
2. Copy and paste the example URL into the address bar: `http://numbersapi.com/random/trivia`
3. Press Enter.

You should see a single line of plain text, like:

```
1776 is the year the United States Declaration of Independence was signed.
```

Or:

```
28 is the number of days in February in a common year.
```

### Step 3: Write the Python Program

Now, let's write a Python script to do this automatically.

Python

```
1 import requests # This library helps us make web requests
2
3 # --- Define the API endpoint ---
4 API_URL = "http://numbersapi.com/random/trivia"
5
6 # --- Make the API request ---
7 print("Fetching a random fact...")
```

```

8 response = requests.get(API_URL)
9
10 # --- Check if the request was successful ---
11 # A status code of 200 means "OK"
12 if response.status_code == 200:
13     # The API returns the fact as plain text directly
14     fact = response.text
15     print("\n--- Here's your random fact! ---")
16     print(fact)
17 else:
18     print(f"Error fetching data. Status code: {response.status_code}")
19     print(response.text) # Print any error message from the API
20

```

#### Instructions to run the Python code:

1. Install requests library: If you haven't already, open your computer's terminal or command prompt and type:

```
pip install requests
```

2. **Save the code:** Copy the Python code above and paste it into a text editor. Save the file as `fact_app.py` (or any other name ending in `.py`).
3. Run the code: Open your terminal or command prompt, navigate to the directory where you saved `fact_app.py`, and run the script using:

```
python fact_app.py
```

#### Step 4: Analyze the Results and Discuss

- **What fact did your program output?** Did it work as expected?
- **How is this API different from the weather API we discussed?** (Hint: Look at the type of data it returned).
- **Why didn't we need `json` in this program?**
- **What was the role of the `requests` library here?** It handled making the web request and getting the text back.
- **How do APIs, even simple ones like this, make programming easier?** Imagine if you had to store millions of facts yourself!

This exercise highlights how APIs provide access to data and services, making your programs more powerful and dynamic without you having to build everything from scratch. 🚀

## Questions (5)

**1. A programmer uses a function from a separate, specialized library to analyze an image. This is an example of a programmer using a(n)**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. Standard library
- B. API
- C. Basic data structure
- D. String manipulation

**2. Your program needs real-time stock prices from a financial service. The program must follow a specific set of rules to get this data. This is an example of using a(n)**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. Standard library
- B. API
- C. File operation
- D. Data structure

**3. A developer uses a language's built-in `math.sqrt()` function to calculate a square root. This is an example of**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. Using an API
- B. Using the standard library
- C. Making a web request
- D. Connecting two separate applications

**4. A social media app lets users sign in with their Google accounts by following specific instructions from Google. This is how an API can**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. Simplify development by requiring a network request
- B. Promote code reusability by installing a new library.
- C. Enable integration between different software systems.
- D. Provide a built-in toolbox for a single language.

**5. A programmer uses a built-in `split()` function to divide a sentence into a list of words. This is an example of using a(n)**

MULTIPLE CHOICE

**Choose the correct answer:**

- A. File operation
- B. Web request
- C. API
- D. Standard library function

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## Answer Keys & Solutions

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### Questions

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1. A programmer uses a function from a separate, specialized library to analyze an image. This is an example of a programmer using a(n)

MULTIPLE CHOICE

Correct Answer:

- |                         |             |
|-------------------------|-------------|
| A. Standard library     | ✗ Incorrect |
| B. API                  | ✓ Correct   |
| C. Basic data structure | ✗ Incorrect |
| D. String manipulation  | ✗ Incorrect |

**Explanation:**

The passage describes an API as a way to connect and work with other, specialized pieces of software.

2. Your program needs real-time stock prices from a financial service. The program must follow a specific set of rules to get this data. This is an example of using a(n)

MULTIPLE CHOICE

Correct Answer:

- |                     |             |
|---------------------|-------------|
| A. Standard library | ✗ Incorrect |
| B. API              | ✓ Correct   |
| C. File operation   | ✗ Incorrect |
| D. Data structure   | ✗ Incorrect |

**Explanation:**

The passage defines an API as a set of rules and tools that lets software applications talk to each other.

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3. A developer uses a language's built-in `math.sqrt()` function to calculate a square root. This is an example of

MULTIPLE CHOICE

Correct Answer:

- A. Using an API ✗ Incorrect
- B. Using the standard library ✓ Correct
- C. Making a web request ✗ Incorrect
- D. Connecting two separate applications ✗ Incorrect

**Explanation:**

Using the standard library. Hint: The passage explains that the standard library provides fundamental tools that are built-in wi

4. A social media app lets users sign in with their Google accounts by following specific instructions from Google. This is how an API can

MULTIPLE CHOICE

Correct Answer:

- A. Simplify development by requiring a network request ✗ Incorrect
- B. Promote code reusability by installing a new library. ✗ Incorrect
- C. Enable integration between different software systems. ✓ Correct
- D. Provide a built-in toolbox for a single language. ✗ Incorrect

**Explanation:**

Enable integration between different software systems. Hint: The passage states that APIs are essential because they allow diffe

5. A programmer uses a built-in `split()` function to divide a sentence into a list of words. This is an example of using a(n)

MULTIPLE CHOICE

Correct Answer:

- A. File operation ✗ Incorrect
- B. Web request ✗ Incorrect



C. API

✗ Incorrect

D. Standard library function

✓ Correct

**Explanation:**

The passage identifies string manipulation, like splitting a sentence, as a typical function of the standard library.