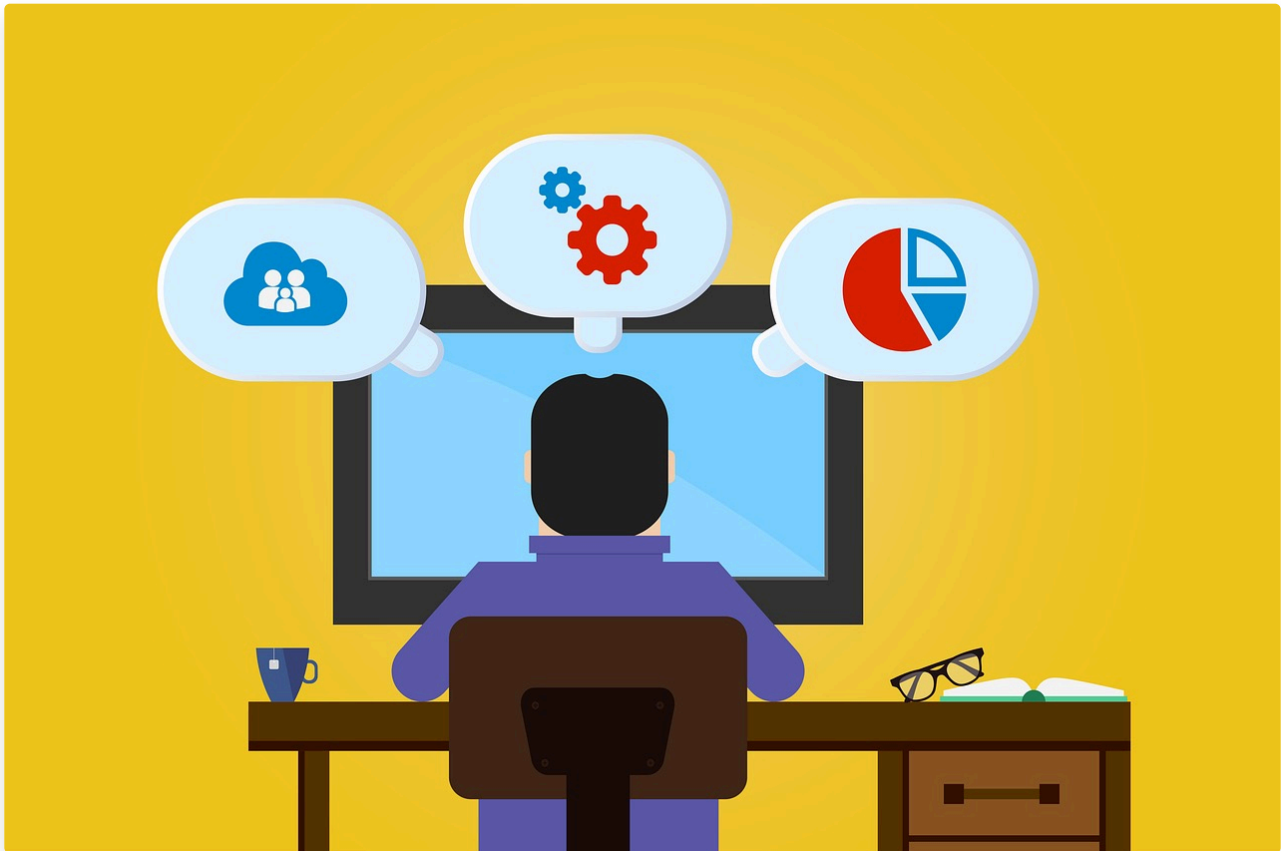


Programming Languages

Textbook

Programming Languages





Computer scientists use many different kinds of languages to create computer programs, apps, websites, games, and software. These computer languages are a lot like spoken languages like Korean or Swahili. These languages have particular rules, patterns, and organization that make them understandable and useful.

Learning spoken languages takes lots of time and practice. Let's say you were learning Korean, you would learn quicker if you were willing to practice using the language. You would be better at Korean if you weren't afraid to be corrected by people who were fluent. The more interactions you had in Korean, the better you would be.

Learning programming languages is a similar process. Use the language as much as you can. Interact with people who know more than you do and don't be afraid to get corrections on your code. Be patient with yourself! Learning languages takes time and practice.

Which Language is the Most Useful?

Korean is most useful when visiting Korea and Swahili is most useful when visiting countries like Kenya. Programming languages are similar. Certain programming languages are more useful than others, depending on the situation. We will explore 4 different languages in this lesson, although in reality there are over 700 programming languages.

Which Language Should I Learn?

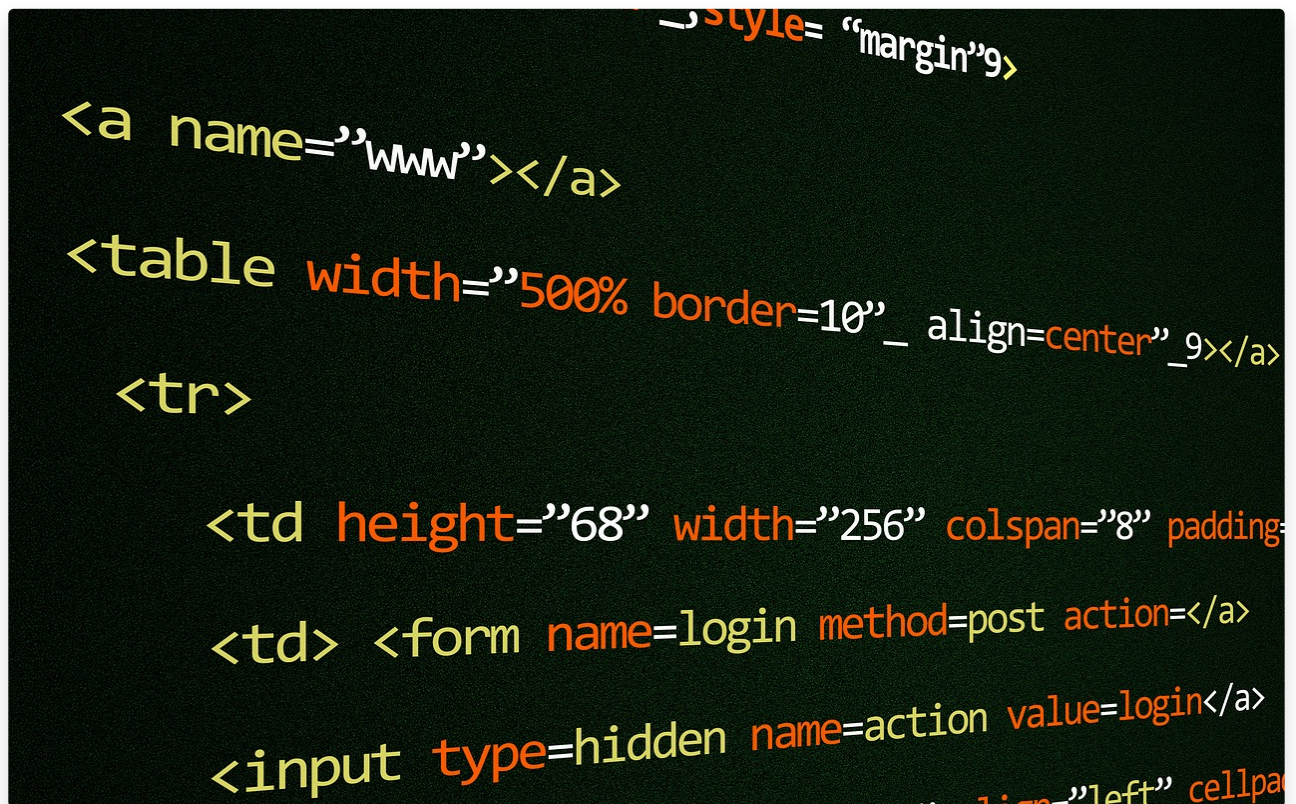
The language you should learn depends on what you want to do with it. Certain languages are better than others at building websites, while others still are better for building games. The truth is that it doesn't really matter what language you learn. The important thing is to learn the logic of programming languages. Most languages operate in similar ways, so if you learn one language, it will be easy to tweak some of the syntax to use another language.

So don't stress about any particular language, just enjoy learning how one language works and others will come more easily.

Other Languages used in Building Websites

Many websites use several languages in order to work the way we want them to. Some of the more common languages are [HTML](#), [CSS](#), [JavaScript](#), and [Python](#). We will explore these languages in this lesson.

What is HTML?



HTML stands for Hyper Text Markup Language and is the standard language used to build websites. A markup language is used to format content into a visual page. Almost every website is built using HTML.

HTML is considered a foundation language for all who want to learn computer programming. No matter what field of computer science you are interested in, learning HTML is an important step. The concepts learned in HTML help set you up for success in your computer science journey.

HTML & CSS

[HTML](#) -- Hyper Text Markup Language creates the content of a website.

[CSS](#) -- Cascading Style Sheets gives the content styling.

HTML & CSS are languages used together to create and style content on a website. The actual material you see on the webpage is created using HTML. The way the material looks is determined by CSS.

Websites almost always use both HTML and CSS languages.

Let's say you are adding a button to a website. HTML will place the button on the page and determine what the button says. CSS will determine the color and shape of the button. Without CSS, websites would just be black and white without any font or styling. Websites without CSS are difficult to navigate.

JavaScript & Python in Websites



[JavaScript](#) and [Python](#) are common languages used to make websites work. While HTML and CSS are used to create something like a button on the page, JavaScript and Python are used to make the button work.

JavaScript and Python establish website functionality. Websites usually use either JavaScript or Python, but not necessarily both.

JavaScript

[JavaScript](#) is commonly used for the functionality of webpages. JavaScript can update and change HTML & CSS content and styling. As the user clicks on various parts of a website, JavaScript determines what will happen and what will display next. Some examples of JavaScript are using a search bar, watching a video, or following a link on a page. Companies such as Paypal, Netflix, Groupon, Uber, Facebook, and Google are built using JavaScript.

Note--JavaScript is a different language from Java. Both languages are used for a variety of programs, but are completely different languages.

Discussion Question: If JavaScript is better at giving websites functionality, what kinds of apps or programs would be built easier with JavaScript?

Python

[Python](#) is a newer language that is growing in popularity and is widely used in the industry. Companies such as Google, YouTube, Reddit, Dropbox, Instagram, and Spotify are built using the Python language. It is popular because of its straightforward, readable syntax. It also has extensive accessibility to outside libraries which saves time. It's a popular language among beginners and experts alike. Python is used for other software more commonly than JavaScript and is generally good at dealing with large data sets.

Python is also popular because its syntax is similar to spoken English. English speakers tend to quickly understand the flow of Python.

Discussion Question: If Python is better at dealing with large sets of numbers, what kinds of apps or programs would be built easier with Python?

Upper Level vs Lower Level Languages

HTML, CSS, JavaScript, and Python are all considered [upper level languages](#). [Lower level languages](#) work closer with binary values and are harder for the programmer to read. Upper level languages use abstraction to represent binary exchanges with words or symbols that are easier to read.

Examples of lower level languages include **C and C++**. These languages make up most of Microsoft software.

Interpreted Language vs Compiled Languages

Let's explore these two types of languages for a moment

In a [compiled language](#), the computer understands the exact code. Examples of compiled languages: C, C++, Rust, Go

In an [interpreted language](#), the code needs to be translated into something the computer can understand. Interpreted languages need to be translated. Examples of interpreted languages: Python, JavaScript, Ruby

For example—let's say you were trying to make curry, but the recipe was in Thai and looked like this: สูตรแกงที่ฉันชอบที่สุดในโลก. You would need to translate the recipe before you could use it, just like interpreted coding languages.

Advantages and Disadvantages of Each

Advantages of a compiled language:

- Faster

Disadvantages of a compiled language:

- Additional time needed to complete the entire compilation step before testing
- Platform dependence of the generated binary code

Advantages of an interpreted language:

- More Flexible

Disadvantages of an interpreted language:

- Slower

Typed Vs. Untyped Languages

Untyped languages are programming languages that do not make you define the type of a variable.

JavaScript and Python are untyped language. This means that the variable can hold a value of any data type.

Java, C, and C++ are example of typed programming languages. This means that a variable type is declared when the variable is created.

Innovations

The purpose of computing innovations is to solve problems or to pursue interests through creative expression. An understanding of the purpose of a computing innovation provides developers with an improved ability to develop that computing innovation. HTML, CSS, JavaScript and Python are used to create computer innovations that improve lives.

Converting into Machine Language

Different programming languages are converted into machine language, the binary code computers understand, in various ways.

- Python is an **interpreted** language; its code is read and executed line by line by an interpreter program at runtime.
- JavaScript, commonly used for web browsers, is also typically **interpreted** by the browser's JavaScript engine, though modern engines use "Just-In-Time" (JIT) compilation to convert parts of the code into faster machine code as needed.
- Java, on the other hand, is a **compiled** language; its code is first translated by a compiler into an intermediate format called "bytecode." This bytecode is then run by a Java Virtual Machine (JVM), which can either interpret the bytecode or use a JIT compiler to convert it to machine code for better performance on the specific computer.

Classifying Programming Languages

Programming languages can be grouped by their design style (paradigm) and what they're best used for (application domain).

One way to group them is by **programming paradigm**:

- **Procedural programming** focuses on a series of steps or instructions that act on data. Think of it like a step-by-step recipe. Languages like C are examples, telling the computer exactly how to do a task.
- **Object-oriented programming (OOP)** organizes code around "objects" that combine data and actions. Languages like Python and Java use this. It focuses on *what* things are and how they interact, making complex programs easier to manage by mirroring real-world items.

Another way is by **application domain**:

- **Scientific applications** involve complex math, data analysis, and simulations. Fortran was designed for this, and Python is also heavily used in scientific research.
- **Commercial applications** deal with business tasks like databases, online shopping, or financial transactions. Historically, COBOL was strong here. Today, Java, C#, and Python are widely used for business software due to their flexibility and ability to handle large systems.

Knowing these groups helps programmers pick the right language for their specific project.

Critical Thinking Questions

1. **Choosing a Programming Language:** Discuss the factors that might influence someone's choice of programming language to learn. Consider the importance of the language's application, ease of learning, and career opportunities.
2. **Impact of Programming Languages:** Explore the role of programming languages in building various types of applications. Discuss how different languages like JavaScript and Python are used to develop different functionalities in websites and software.

Summary

Learning programming languages is similar to learning spoken languages. There are hundreds of different kinds of programming languages and each has a time and a place where they are best used. It doesn't matter which programming language you choose to learn, as the principles apply across languages. [HTML](#)

is the language that puts content on a website. [CSS](#) is the language that styles websites. [JavaScript](#) is the language commonly used to make websites functional. [Python](#) is a language commonly used for other software.

Questions (3)

1. True or False: Java is an abbreviation for JavaScript. They are the same language.

MULTIPLE CHOICE

Choose the correct answer:

- A. True
- B. False

2. Which of the following is considered a lower level language?

MULTIPLE CHOICE

Choose the correct answer:

- A. HTML
- B. JavaScript
- C. Python
- D. C++

3. In which kind of language does the code needs to be translated into something the computer can understand?

MULTIPLE CHOICE

Choose the correct answer:

- A. compiled language
- B. interpreted language

Answer Keys & Solutions

Questions

1. True or False: Java is an abbreviation for JavaScript. They are the same language.

MULTIPLE CHOICE

Correct Answer:

A. True

✗ Incorrect

B. False

✓ Correct

Explanation:

Java and JavaScript are completely different languages.

2. Which of the following is considered a lower level language?

MULTIPLE CHOICE

Correct Answer:

A. HTML

✗ Incorrect

B. JavaScript

✗ Incorrect

C. Python

✗ Incorrect

D. C++

✓ Correct

Explanation:

The languages that Skill Struck teaches are considered High Level Languages.

3. In which kind of language does the code needs to be translated into something the computer can understand?

MULTIPLE CHOICE

Correct Answer:

A. compiled language

✗ Incorrect

B. interpreted language

✓ Correct

Explanation:

These languages need to be translated for the computer to understand.