



What is Code?

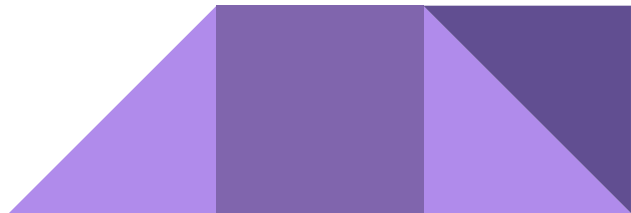
What do **you** think code is?

We're gonna start with a Breakout Room discussion!

First, come up with your own definition for code. What is the simplest way you can describe it?

Then we'll hop into breakout rooms, where you'll confer with a few classmates and form a mutual definition.

Finally, we'll have each group discuss their definition.



What is Code?

A way of conveying *information* as *symbols*.

Code is just symbols that have meaning when read in a predefined way.



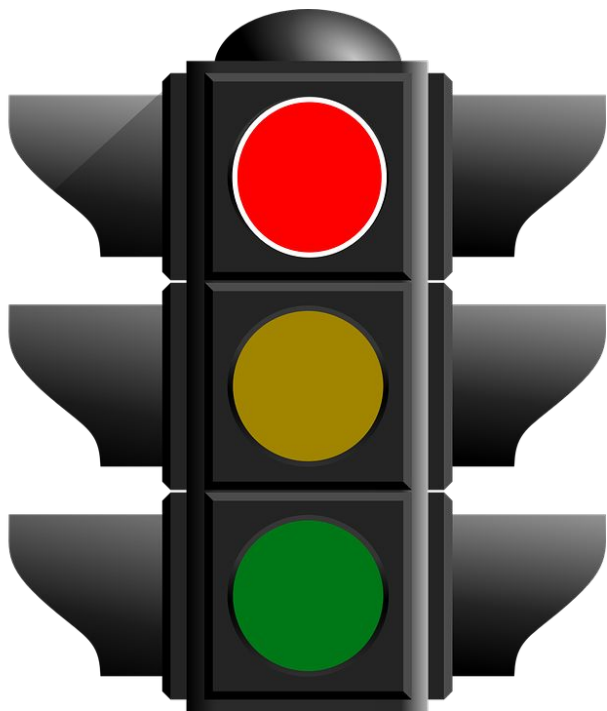
What is Code?

Some types of code are readable by computers - these are called **programs**, or **software**.

Many other types of code exist in the world, though!



Color Codes



More Color Codes



Genetic Code

		Second letter				
		U	C	A	G	
First letter	U	UUU Phe UUC UUA Leu UUG	UCU UCC Ser UCA UCG	UAU Tyr UAC UAA STOP UAG STOP	UGU Cys UGC UGA STOP UGG Trp	U C A G
	C	CUU CUC Leu CUA CUG	CCU CCC Pro CCA CCG	CAU His CAC CAA Gln CAG	CGU CGC Arg CGA CGG	U C A G
	A	AUU Ile AUC AUA AUG Met	ACU ACC Thr ACA ACG	AAU Asn AAC AAA Lys AAG	AGU Ser AGC AGA Arg AGG	U C A G
	G	GUU GUC Val GUA GUG	GCU GCC Ala GCA GCG	GAU Asp GAC GAA Glu GAG	GGU GGC Gly GGA GGG	U C A G



Morse Code

A ● —	J ● — — —	S ● ● ●
B — ● ● ●	K — ● —	T —
C — ● — ●	L ● — ● ●	U ● ● —
D — ● ●	M — —	V ● ● ● —
E ●	N — ●	W ● — —
F ● ● — ●	O — — —	X — ● ● —
G — — ●	P ● — — ●	Y — ● — —
H ● ● ● ●	Q — — ● —	Z — — ● ●
I ● ●	R ● — ●	

... — — — ...

SOS



Natural Language

To get to the store you need to head straight for 10 miles, then turn right, and then head straight for 2 miles, and then turn left.



Computers and Natural Language

Unfortunately, we cannot use our natural spoken language to interface with computers - they are not built to understand those kinds of languages.

If we want to give instructions to a computer, we need to provide them in a language that the computer can understand - a **programming** language.

There's bazillions of choices for programming languages, and each one of them has its own upsides and downsides.



Abstraction

According to the *Oxford English Dictionary*:

"the quality of dealing with ideas rather than events"

According to [WhatIs.com](https://www.whatis.com/):

"the process of taking away or removing characteristics from something in order to reduce it to a set of essential characteristics."



Abstraction (in plain English)

Abstraction is the act of **removing (or hiding) complexity** from a system to make it easier to use or interface with.

Programming languages inherently do a lot of abstraction - computers don't think in Python or Java or C++, computers think in **1**s and **0**s.

Whenever we write a program in a programming language, another program (a compiler or interpreter) reads our code, and translates it into **machine code** - that's code in actual **1**s and **0**s.



Numbers all the way down

Machine code is stored in structures called **bits** and **bytes**.

A **bit** is a single digit, either 0 or 1. A byte is a collection of 8 **bits**.

You might be familiar with the term **bytes** - we use it when we're talking about storage for our computers! We have hard drives and SSDs that can store multiple **gigabytes** or **terabytes** - millions or trillions of bytes, respectively.

Just like genetic code, computers recognize certain sequences of **bytes** as representing specific instructions!



3 Parts of a Program

1. Input

- Each key and mouse click generates a unique number that gets sent to the computer

2. Processing

- A program then processes the numbers to figure out what to do with them

3. Output

- The program then outputs more numbers that tell the computer to do certain things, like display a certain color or play a certain sound



Numbers Forever

At every step in the process of a program running, the numbers are converted to 1s and 0s.

We'll learn more about how this works later, but for now it's important just to know.



Programming Languages

Luckily for us programmers, we don't have to worry about what the numbers lying underneath all of our programs are. That's all taken care of by the **abstraction** built into the programming language.

We get to write code that reads *somewhat* similarly to our own native language, and all of the conversion to machine code happens outside of our view.

