Coding Workbook

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INTRODUCTION

WHAT IS CODING?

Giving instructions to a computer to perform specific tasks using programming languages. It involves using simple commands and logic to create programs that can make games, animations, stories, or control robots. The goal is to develop problem-solving skills, creativity, and computational thinking.

Coding is also a really useful skill to have and can open the doors to many careers! And, it's super fun!

Algorithms

An algorithm is a set of steps or actions to complete a certain task. So, in computer science, we are talking about **giving the computer exact instructions on how to do a task**. Algorithms allow us to solve problems and create computer-generated material by **breaking down enormous jobs into smaller, more manageable steps!** As a result, with the right algorithm, they can accomplish a variety of activities, like playing games, making artwork, and even assisting scientists in solving complex problems.

Algorithm Practice

Write your own algorithm for making a sandwich:

WHAT ARE BINARY NUMBERS?

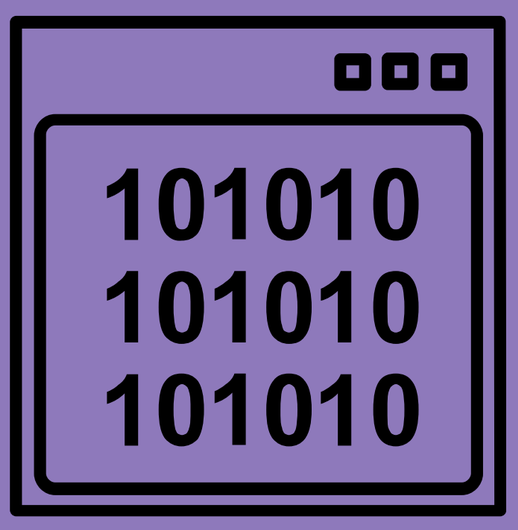
Binary numbers are a way of representing numbers using only two digits: 0 and 1. Unlike our familiar decimal system (which uses 10 digits from 0 to 9), **binary uses a base-2 system**, meaning each place value represents a power of 2.

EXAMPLE

- The rightmost digit represents 2^0 (which is 1).
- The next digit to the left represents 2^1 (which is 2).
- The next digit represents 2^2 (which is 4).
- And so on
- So, the binary number 1011 would represent:

$(1*2^3) + (0*2^2) + (1*2^1) + (1*2^0) = 8 + 0 + 2 + 1 = 11$

BINARY NUMBERS PRACTICE



1. Represent the number 420 in binary form:_____

2. Represent the number 1011 in binary form: _____

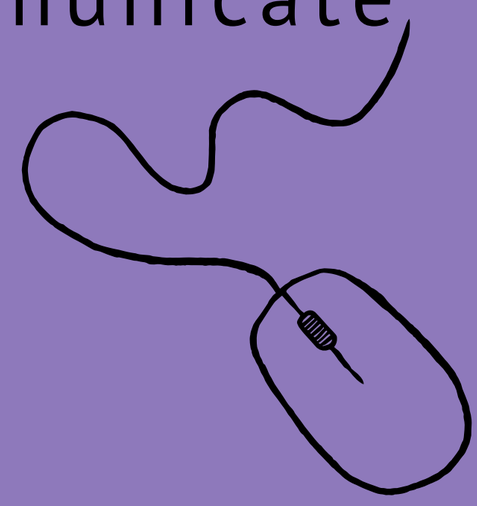
3. Represent the number 2465 in binary form:_____

STRINGS

WHAT ARE THEY?

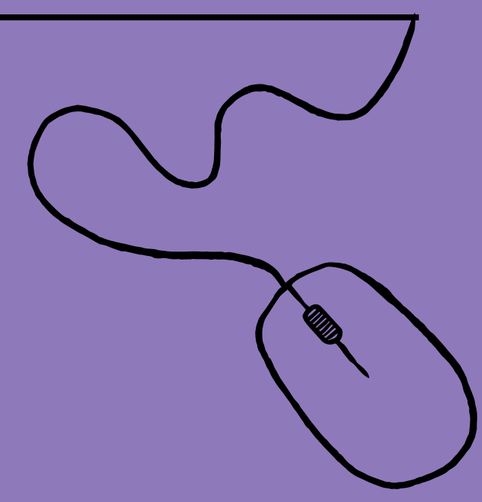
- A sequence of characters (letters, numbers, punctuation marks, or even special symbols)
- Fundamental data types used in programming languages to represent and manipulate text-based data.

- Strings are encoded using quotes. For example, "hello" and '123abc' are both strings.
- Concatenation is the process of joining strings together. For example, "hello" concatenated with "world" would get "helloworld".
- Indexes allow you to access individual characters within a string.
- Length of a string = Amount of characters it contains.
- Understanding strings is critical in many areas of computer science and programming. They are commonly used to create software applications, handle user input, process files, and communicate with other computers.



STRINGS ACTIVITY

Write your own definition of a string and give your own example of one type of string:



VARIABLES

WHAT ARE THEY?

- Variables and data types are used to store and manipulate data in a program. A variable has a value, which can change over time. For example, you have a variable that has the value 10, but you can modify it to 11.

COMMON TYPES

- **Integers** represent full numbers.
- **Floats** represent numbers with decimal points.
- **Strings**
- **Boolean** represents true/false values.
- **Array/List** represents a collection of values of the same type.
- Different programming languages provide different data types, each with its own set of operations.
- In summary, variables hold data, while data types specify what form of data can be stored in a variable. Together, they constitute the foundation of programming, allowing for sophisticated and adaptable software applications.

VARIABLES ACTIVITY

What are the 5 main types of variables?

What is the difference between a variables and data types?

LOOPS

WHAT ARE THEY?

- In computer science, loops are control structures used to repeat a block of code until a certain condition is met
- They allow for efficient repetition of tasks, which is essential for automating processes and solving various computational problems

IF STATEMENTS

WHAT ARE THEY?

- A condition is like a question that can be answered with either a "yes" or a "no." For example, "Is it raining outside?" The answer could be "yes" or "no."
- An "if" statement checks if a condition is true, and if it is, it makes something happen. If the condition is not true, it can do something else.

LOOPS ACTIVITY

What is the main difference between loops and if statements?