00 What are Data Structures?

## What are Data Structures?

1. Data Structures in a Nutshell
   1. They are the containers which our data is stored in
   2. They are NOT databases

## How to set up your computer for this class

1. If you’re planning on using C++,
   1. Make sure your computer contains the GCC/GPP GNU C++/C compilers so that it can run the code
   2. If it doesn’t, here are the steps to install [WINDOWS]
      1. Download [MSYS2](https://github.com/msys2/msys2-installer/releases/download/2024-01-13/msys2-x86_64-20240113.exe) (or MinGW-64) which is what enables your computer to set up a development environment to build and compile programs on Windows
      2. Run the Installation Wizard
      3. Once complete, make sure the RUN MSYS2 now box is checked and select Finish.
      4. A terminal window will appear so you must enter this command  
         pacman -S --needed base-devel mingw-w64-ucrt-x86\_64-toolchain
      5. Accept everything by pressed ENTER
      6. Enter Y to proceed with Installation
      7. Add the MinGW-w64 bin folder to the Path Environmental Variable.
      8. To Check if the MinGW installation has worked, enter these commands in a completely new terminal   
         gcc --versiong++ --versiongdb --version  
         g++ --version  
         gdb --version
      9. If it all goes to plan, it should be working.
   3. If it doesn’t, here are the steps to install [MAC]
      1. TODO: find steps to install C++ on a MAC
   4. If it doesnt, here are the steps to install [LINUX]
      1. TODO: find steps to install C++ on Linux (should be much easier than MAC bc it’s usually just going sudo apt install gcc)
2. If you’re planning on using Python,
   1. TODO: write instructions on how to install Python on Windows, MAC, Python
3. Honestly, I’m only going to cover C++ and python because both are the most common languages used for Programming nowadays.

## What sort of Data Structures will we be looking at?

1. Arrays
2. Dictionarys
3. Hash Stables
4. Vectors
5. Trees
6. Graphs
7. Lists
8. Stacks
9. Queues

## Pointers and references

1. TODO: write what are pointers and references
2. TODO: Write what exactly is memory management and why is this so important in C++ and data structures

## Dynamic vs Static Memory

1. TODO: write what is the difference between the two
2. TODO: elaborate more on memory managment

## Big-O Notation: How we measure how quickly a code compiles

1. VERY IMPORTANT
2. TODO: Write what is BIG-O notation
3. TODO: Write list of diferent BIG-O Notations
4. Come to think of it, this should be its own document