- When it comes to search algorithms, the baseline for efficiency is linear search, where one simply iterates through a list until they find the desired element.
- A record is a collection of values for attributes of a single entity instance. One example of a record is a row in a table.
- A collection is a set of records of the same entity type. One example of a collection is a table.
- A search key is a value for an attribute from the entity type. Search keys can be more than one attribute.
- A contiguously allocated list (also known as an array) is allocated as a single “chunk” of memory. Creating a contiguously allocated list of n elements which take up x bytes each requires n*x bytes.
- A linked list has each element allocated separately, in different “chunks” of memory. Elements are connected to each other in a chain by pointers. Creating a linked list of n elements which take up x bytes each requires more than n*x bytes, since you need to allow space for pointers to the next/previous node.
- Contiguous allocated lists are faster than linked lists for random access of elements, but they are slower for insertion anywhere but the end of the list.
- Linked lists are faster than contiguously allocated lists for insertion anywhere but the end, but slower for random access of elements.
- Binary search is a search algorithm that takes a sorted list as input. Binary search is faster than linear search, but it requires that the list is sorted beforehand.
- The best case scenario of linear search is that the element is found at the first position of the array, so there is only 1 comparison. The worst case scenario of linear search is that the element is not in the array, so there are n comparisons. Linear search is O(n) time complexity in the worst case
- The best case scenario of binary search is that the element is found in the middle of the array, so there is only 1 comparison. The worst case scenario of binary search is that the element is not found in the array, so there are log2n comparisons. Binary search is O(log2n) time complexity in the worst case.

- You cannot easily perform binary search on a linked list. Binary search on a list requires a contiguously allocated list also known as an array.
- Binary search trees are a data structure that combine the ability for binary search of contiguously allocated lists while retaining the insertion speeds of a linked list.
- Every node in the left subtree of a binary search tree has a value less than its parent. Every node in the right subtree of a binary search tree has a value greater than its parent.

- ACID stands for Atomicity, Consistency, Isolation, and Durability.
- DBMS stands for Database Management System
- Atomicity means that steps in a transaction are either all completed or the entire transaction is voided. Atomicity is all-or-nothing.
- Consistency means that all the data meets integrity constraints both before and after a transaction
- Isolation means that transactions can be performed simultaneously if they do not affect each other. If one transaction is reading data that another transaction is concurrently writing, it can result in a dirty read, non-repeatable read, or phantom read.
- A dirty read occurs when a row is being edited while it is being read by another transaction before the first transaction has COMMITTED.
- A non-repeatable read occurs when two reads in a single transaction produce different values because another transaction has changed data but hasn’t COMMITTED.
- A phantom read occurs when a row is added or deleted from a set of rows currently being read by another transaction.
- Durability means that any committed changes are permanent and will not be reverted in the case of a system failure.
- Docker compose up creates a container. Docker compose down deletes a container. Docker compose start unpauses a container. Docker compose down pauses a container.

- The CAP Theorem states that it is impossible for a distributed data store to simultaneously provide consistency, availability, and partition tolerance. Consistency in CAP means that every read receives the most recent write. Availability in CAP means that every request receives a response. Partition tolerance in CAP means that the system can continue to operate despite arbitrary network issues.

- Redis contains 16 databases, named by their number 0-15.
- The Redis Python client is imported by the line `import redis` and is initialized by the line `redis_client = redis.Redis(host='localhost', port=6379, db=0, decode_responses=True)`.
- The Redis Python client then uses the syntax `redis_client.set(key, value)` to set keys and `redis_client.get(key)` to get values. mset and mget are functions used to set and get multiple keys, with mget returning the values as a list.

- A document database is a type of NoSQL database that stores data as some form of structured document, usually in JSON format.
- Document databases are designed to be simple, flexible, and scalable.
- JSON stands for JavaScript Object Notation. JSON is a lightweight data-interchange format that is easy for both humans and computers to read and write.
- JSON is built on both collections of key/value pairs (also called dictionaries or hash tables) and ordered lists of values.
- BSON stands for Binary JSON and is a binary-encoded serialization of a JSON-like document structure. BSON supports extended types that JSON does not, like Dates and BinaryData. BSON is lightweight, traversable, and efficient in both encoding and decoding. BSON is supported by many modern programming languages.
- XML stands for eXtensible Markup Language and is the precursor to JSON as a data exchange format.

- XML and CSS produce web pages that separate content and formatting. XML shares similar syntax to XML but has an extensible tag set unlike HTML.
- Document databases were created to address impedance mismatch between object persistence in object-oriented systems and how relational databases structure data. This is because in order to save a complex object to a relational database, the object's attributes must be deconstructed first.
- Document databases are well-aligned with apps that use JSON and XML as a transport layer.

- In AVL trees, there are 4 different cases when rebalancing. Case 1 for AVL trees is LL. Case 2 for AVL trees is LR. Case 3 for AVL trees is RL. Case 4 for AVL trees is RR.

- Graph databases are schema-optional, although a schema can be imposed.
- Neo4j and MongoDB are both ACID compliant
- Cypher is the query language for Neo4j, a graph database.
- The syntax for creating a node in Cypher is `CREATE (name:type {key1:val1, key2:val2})`
- The syntax for creating an edge in Cypher is `CREATE (node1)-[name:type {key1:val1}]->(node2)`

- Single source shortest path is a graph algorithm for determining the shortest path from a given node to every other node in the graph.
- All-pairs shortest paths is a graph algorithm for determining the shortest path from every node to every other in a graph.
- Minimum spanning tree is a graph algorithm for determining the shortest length tree that covers all nodes in a graph.

- MongoDB Python code for counting the number of items that match a certain condition has the following syntax: `mydb.mycollection.count_documents({key: val})`
- MongoDB Python code for query pipelines follows the following syntax: `mydb.mycollection.aggregate([])`
- MongoDB Python code for initializing a connection is the following: `mydb = pymongo.MongoClient('mongodb://username:pw@localhost:27017')`

- There are 7 main different commands in a MongoDB pipeline for queries: match, project, sort, limit, unwind, group, lookup.
- The match operator in MongoDB selects only rows to fulfill a specific condition.
- The project operator in MongoDB selects only specific columns from a query. The project operator takes a dictionary of column names mapped to 0s and 1s, depending on whether or not to keep the column.
- The limit operator in MongoDB limits the number of rows in the query.
- The sort operator in MongoDB sorts the rows in a query. The sort operator takes a dictionary of column names and positive and negative 1s for ascending and descending order, respectively.
- The group operator in MongoDB aggregates all rows with a specific value for a row. The group operator uses a dictionary of all new column names and definitions as well as an "_id" column. This dictionary requires a "$" before the column name of the ID.
- Specific functions for aggregation within the group operator include "$avg".
- The lookup operator in MongoDB is the join operator. It takes a dictionary with 4 arguments: "from", "localField", "foreignField", and "as".

- A table/view in a relational database is called a collection in MongoDB.
- A column in a relational database is called a field in MongoDB.
- A row in a relational database is called a document in MongoDB.
- A join in a relational database is called an embedded document in MongoDB.
- A foreign key in a relational database is called a reference in MongoDB.