Announcements
● Quiz 5 open today & due Tues 10/17 (extended because of midterm)

Notes
● SQL: Structured Query Language
  ○ Standardized language to define, manipulate, and query data in relational databases
● Views - derived from table, subset of rows or columns depending on what information is desired/purpose of the view
  ○ A snapshot of a table at a given point in time
  ○ i.e. salary of employees hidden from managers
  ○ i.e. manufacturing manager can only view manufacturing employees
  ○ Permissions can be assigned to specific views rather than the entire table
    ■ i.e. Select access could be granted to a view that only shows employees with a salary of < $15,000. Even though the table contains all salaries, this view would only show results where the salary is < $15,000
● Database Access Control - policies can be:
  ○ Centralized - organization makes policies
  ○ Owner-based - create a file and control who gets access
  ○ Decentralized - usually done using ABAC
● SQL Access Control
  ○ GRANT - grants permissions as to who can do what on a database (selection, modification, insertion, deletion); deletion is a big concern in security
  ○ REVOKE - opposite of GRANT; take away permissions
  ○ REFERENCES - i.e. foreign keys (information in a table that refers to another table)
  ○ Typical access rights are:
    ■ Select - Read data from a database or view
    ■ Insert - Add new data to a database or view
    ■ Update - Change data
    ■ Delete - Remove data
    ■ References - Only allow references from another table to be inserted
● Database Inference Problem
  ○ Combining tables into views can allow someone to infer sensitive, unauthorized information
  ○ Research is being done to avoid; it’s an ongoing issue
  ○ Could monitor queries (disallow certain combinations of tables at same time)
  ○ Countermeasures could be in opposition of usability
● **Statistical Databases**
  ○ Provides statistical data results from running functions on a table containing raw data.
  ○ If running an average-GPA query on a statistical database for one student, that reveals their GPA
  ○ Can combat this by requiring that a query includes at least two individuals
  ○ Tried restricting large query overlaps; doesn’t help very much

● **Database Encryption**
  ○ Need different key for different rows or someone can find all information on a person in a table if encrypted ID is discovered
  ○ Databases are a typical vulnerable information resource
    ■ Firewalls, AC
  ○ Databases can encrypt the entire database or individual fields

**Socratic Questions**

● What makes SQL so powerful that it's still a dominant language for database queries 40 years later?
  ○ Completeness; can do anything & everything with SQL for relational databases. Problems with relational databases were discovered over time, so new styles of databases are being made (graph, statistical), but SQL is really good for relational databases

● What are the most common attacks on databases?
  ○ Inference
  ○ Usernames and passwords being written into code surrounding database

● How does the query overlap control check if the overlap is big or small? Does it check if the result size is greater than a certain number?
  ○ Yes, checks if greater or smaller than certain number, but what constitutes a “big” or “small” overlap is subjective