Component 4/Unit 6f
Topic VI: Create simple querying statements for the database

- The SELECT statement
- Clauses
- Functions
- Joins
- Subqueries
- Data manipulation

Getting Data Out of the DB

- The SQL SELECT statement is the common way to retrieve data from the DB
- Statements that are invoked to retrieve data are called queries
- The general form of the basic standard for the SELECT statement:

```
SELECT attributename1, attributename2, . . .
    FROM tablename;
```


Example SELECT Statement

```
SELECT InstName, InstContact
    From ClinicalTrialTestingInstitution;
```

The above statement returns all the InstName values and associated InstContact values from the table.

The WHERE Clause

```
SELECT InstName, InstContact
    FROM ClinicalTrialTestingInstitution
    WHERE InstContact = '7218823843';
```

The above statement returns the InstName and InstContact for only those rows where the contact is "7218823843"

The ORDER BY Clause

```
SELECT InstName, InstContact
    FROM ClinicalTrialTestingInstitution
    WHERE InstContact = '7218823843'
    ORDER BY InstName
```

The above statement will output the values for InstName and InstContact for rows with an institution contact of "7218823843" in alphabetical order on InstName

Many More Clauses and Operators (these are for SQL Server)

Distinct	Arithmetic (+, -, *, /, %/Modulo)
Like	Sign
Union	NULL and IS NULL
Intersect	=, <, <=, >=, >, <> or !=
Having	Underscore and % wildcards
Top	Concatenation (+)
Group By	AND and OR
NOT	In and Between (and more)

Functions

SELECT COUNT(*)
From ClinicalTrialTestingInstitution

The above statement returns a count of all the rows in the table (Since the primary key is InstName, this is the count of how many different institutions are in the table)

There Are Many Different Functions (these are for SQL Server)

Convert	Months Between
Cast	DateName
Sum	ABS
Avg	Ceiling/Ceil and Floor
Max, Min	Trig functions
Variance or Varp	Exp
Stddev or stdev	Log, Log10 and LN
Date and Time	Power (and many more)

Getting Data From More Than One Table

- Joining two or more tables together by using the primary-to-foreign keys relationship allows a query to get data from all tables that have been joined.
- Inner Joins
- Outer Joins
- Equi-Join
- Natural Join

Inner Join

```
SELECT T.TrialCode, T.DrugNameFK,
  C.InstName, C.InstContact
  FROM ClinicalTrialTestingInstitution C, Trial T
  WHERE C.InstName = T.InstNameFK
  AND T.TrialCode < 4000
```


Subqueries

- One query's results can be the input to another query.
- A query is nested within another query
- More than two levels of nesting are allowed

Example Subquery

- Let's say that we need to find the names of institutions in Denver, Colorado that have a trial cost resource of "NSF"
- We could write two separate SELECT statements and then manually compare the two outputs (projections)
- If you combine the two queries into a subquery the output should be just what we are looking for (nothing more and nothing less)

The Subquery

```
SELECT C.InstName
        FROM ClinicalTrialTestingInstitution C
        WHERE C.City = 'Denver' AND C.State  = 'CO' AND
          C.InstName IN (
                SELECT T.InstNameFK
                        FROM Trial T
                        WHERE T.TrialCostResource = 'NSF');
```


Manipulation of Data Within the Database

- INSERT

```
INSERT INTO Trial(TrialCode, TrialStartDate, DrugNameFK, InstNameFK)
        Values(39984, 09/20/2010, 'Alaxamine', 'Acme Pharmaceuticals');
```

- UPDATE

```
UPDATE Trial
   SET TrialCostResource = 'NSF'
   WHERE TrialCode = 43895;
```

- DELETE

```
DELETE FROM Trial
   WHERE TrialCode = 58340;
```


Transaction Processing

- Multiple SQL statements executed as a unit
- Ability to back out changes within a transaction process (ROLLBACK and COMMIT)

Summary

- A database has significant storage, efficiency and security advantages over other forms of storage.
- Data in a database is received, stored and retrieved via a Structured Query Language (SQL) also called a data sublanguage
- The database, tables, attributes, keys and relationships are created with SQL
- SQL can be placed in a transaction process and stored to be executed whenever appropriate

Summary Continued

- Various problem anomalies are addressed in a database by splitting data into multiple tables.
- Primary and foreign keys are used to connect database tables together making retrieval of data from multiple tables possible
- Data modeling is used as a process in the development of a database design

Summary Continued

- The entity relationship model shows entities, attributes and relationships.
- There are many normal forms that can be used in the normalization of a database, but typically only the first three are used.

Summary Continued

- The database management system (DBMS) is responsible for maintaining the database and carrying out SQL statements
- There are 6 phases of database development: Specification gathering, testing, implementation, maintenance and modification