Lecture 2

- Relation Schema and Instance
  - Show a relation instance as a real table in MySQL
- Attributes
  - Domain is data type
  - "William"
  - 6
  - "2022-08-15 00:00:00"
  - Atomic. For example, "Bill Smith 100 Penny Lane Waterbury" can be broken into bill and smith
- Keys
  - For example, if A={1,3,5} and B={1,2,3,4,5} , then A is a subset of B , and we write $A \subseteq B$
  - SuperKey: a superkey is a set of attributes that uniquely identifies each tuple of a relation
  - Candidate Key: A Candidate key is a single key or a group of multiple keys that uniquely identify rows in a table.

    A Candidate key is a subset of Super keys and is devoid of any unnecessary attributes that are not important for uniquely identifying tuples.

Super Keys: Super Key stands for superset of a key. A Super Key is a set of one or more attributes that are taken collectively and can identify all other attributes uniquely.

For example, consider the table:

```
Book (BookId, BookName, Author)
```

So in this table we can have

```
- (BookId)
- (BookId, BookName)
- (BookId, BookName, Author)
- (BookId, Author)
- (BookName, Author)
```

As our Super Key. Each Super Key is able to uniquely identify each tuple (record).

Candidate Keys: Candidate keys are a Super Key which are not having any redundant attributes. In other words candidate keys are minimal Super Keys. For example, in the above illustration

```
- (BookId)
- (BookName,Author)
```

These two keys can be candidate keys, as remaining keys are having redundant attributes. Means in Super Key `(BookId, BookName)` record can be uniquely identify by just `BookId` and therefore `BookName` is redundant attribute.

Primary Key: It is a candidate key that is chosen by the database designer to identify entities with in an entity set. OR A key which is used to uniquely identify each record is known as primary key.

From above Candidate keys any one can be the primary key. And the another one which is not chosen as primary key will be know as **Alternate key**

- (BookId)
- (BookId, BookName)
- (BookId, BookName, Author)
- (BookId, Author)
- (BookName, Author)

```sql
- (BookId)
 - (BookName,Author)
```

```
Primary Key:  a key in a relational database that is unique for each record
Foreign Keys:
        Referencing: In our example, Instructor is REFERENCING the Department table via the dept_name field
```

Relational Algebra with MathJax

Notation

σ Selector

Π Projection

$\cap$ Intersection

$\cup$ Union

$\times$ Cross Product

$\bowtie$ Theta (Join)

$_{small}$ Subscript

$\leftarrow$ Assignment

^ And

v Or

$\neg$ Not

$\sigma_{(x.fieldName1=y.fieldName)}$ an example of a formula using a subscript

$\sigma^{(x.fieldName1=y.fieldName)}$ an example of a formula using superscript

- Selection Operation
  - Sometimes called a where clause, or a filter.
  - little sigma
- Projection
  - Capital Pi
- Set Difference
  - MINUS operator, not supported in MySQL