



Introduction to Database Systems: CS312

Foreign Keys and Query Structure

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Quiz 1

Keys

Primary Keys

Foreign Keys

Examples and Code



- Given on Friday 8th during LAB time (2:30pm)
- Online format (Sakai)
- Two hours to complete
- Ten questions: Multi-choice, True/False, Matching and Short Essay

What to study

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Foreign Keys

Examples and Code

- **Covering all Slides so far:** Use book chapters to add detail to class material
- Uses of databases: What are they supposed to do?
- SQL basics
 - Building tables
 - Adding Data with INSERT
 - Building a database with the `.separator` and `.import` commands
 - Constraints
- Primary and foreign key concepts
- Queries:

```
SELECT attrib1, attrib2  
FROM table1, table2  
WHERE conditions;
```
- Picking out bugs in code or determining output

What are the types of keys in databases?

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- **Primary Keys:**
 - Ensures *uniqueness* in a table.
 - All entries in an attribute-primary never repeat
 - Is a unique identifier (i.e., social security number, telephone number, etc)

What are the types of keys in databases?

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- **Foreign Keys:**

- A constraint to *enforce* the relationships between correlated tables.
- Allow to create a reference to some piece of information in another table.
- Foreign key constraints allow checking the referential integrity between tables.
- Only values that are *supposed* to appear in a particular table are permitted

Primary and Foreign Keys in Two Tables

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EMPLOYEES

Primary Key

"Employee No"

Unique Column Acting as a Foreign Key In "Orders"

SSecurityNo	Employee No	First Name	Last Name	DateOfBirth	Date Employed
AF-23432334	1	Manny	Tomanny	12 Apr 1966	01 May 1999
DQ-65444444	2	Rosanne	Kolumns	21 Mar 1977	01 Jan 2000
GF-54354543	3	Cas	Kade	01 May 1977	01 Apr 2002
JK-34333432	4	Norma	Lyzation	03 Apr 1966	01 Apr 2002
VB-48565444	5	Juan	Tomani	12 Apr 1966	01 Apr 2002
FG-23566553	6	Del	Eats	01 May 1967	01 May 2004

Foreign Key

ORDERS

Primary Key

OrderNo	EmployeeNo	CustomerNo	Supplier	Price	Item
1	1	42	Harrison	\$235	Desk
2	4	1	Ford	\$234	Chair
3	1	68	Harrison	\$415	Table
4	2	112	Ford	\$350	Lamp
5	3	42	Ford	\$234	Chair
6	2	112	Ford	\$350	Lamp
7	2	42	Harrison	\$235	Desk

Another Example of the Keys

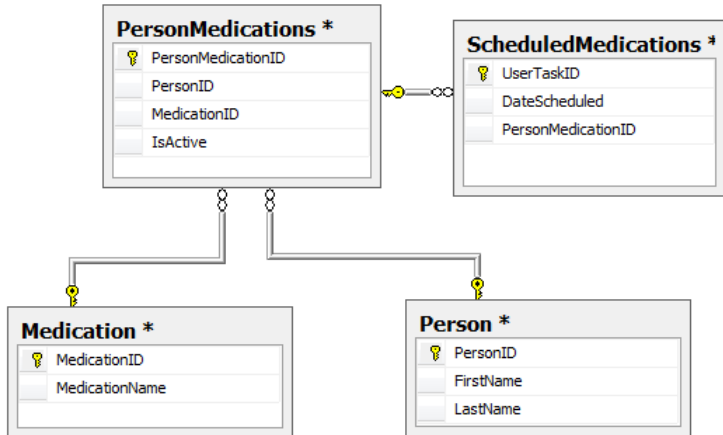
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- Primary keys indicated by a key icon

Primary Keys

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Consider these two tables

```
DROP TABLE Residence;  
CREATE TABLE Residence (  
    id INT PRIMARY KEY,  
    room VARCHAR,  
    name VARCHAR  
);
```

```
DROP TABLE Student;  
CREATE TABLE Student (  
    id INT PRIMARY KEY,  
    firstName VARCHAR,  
    lastName VARCHAR,  
    residence VARCHAR  
);
```

- How are these tables linked together?

Foreign Keys

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Add the foreign key code

```
/* Enable foreign keys: automatically check any foreign key constraints */
```

```
PRAGMA foreign_keys = ON;
```

```
DROP TABLE Car;  
CREATE TABLE Car (  
  name VARCHAR PRIMARY KEY,  
  registration VARCHAR,  
  capacity INT,  
  topSpeed INT  
);
```

```
DROP TABLE Agent;  
CREATE TABLE Agent (  
  id INT PRIMARY KEY,  
  lastName VARCHAR,  
  registration VARCHAR,  
  worksFor VARCHAR,  
  FOREIGN KEY(registration) REFERENCES car(name));
```

- Foreign key constraints are used to check referential integrity between tables in a database.

Setting up Foreign Keys

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Add the foreign key code

```
INSERT INTO Car values ('AstonMartin', 'MI6', 2, 130);
INSERT INTO Agent values (007, 'Bond', 'AstonMartin', 'MI6');

/* Try adding this! Explain the error. */
INSERT INTO Agent values (0070, 'Bond', 'Buick', 'MI6');

/* Now add this */
INSERT INTO Car values ('Buick', 'MI6', 5, 60);
```

- The foreign keys have to be established before they can be used.
- Try entering both INSERT INTO statements commands in the above orders. Explain any errors you may get. How do we fix these errors?

- Add some data into both tables at the same time.

Add the foreign key code

```
/* more data */  
INSERT INTO Agent values (008, 'Bennet', 'AstonMartin', 'MI6');  
INSERT INTO Agent values (009, 'McBain', 'AstonMartin', 'MI6');  
  
/* correct order: establish the Car table data and then the Agent data */  
INSERT INTO Car values ('RustyTruck', 'MI7', 10, 30);  
INSERT INTO Agent values (008, 'Rufus', 'RustyTruck', 'MI7');
```

How is the database set up?

- .tables (The tables are of the DB)
- .schema (How the data is stored in the tables)

What data is stored in each table?

- `SELECT * FROM Agent;`
- `SELECT * FROM Car;`
- (note the '*' for the column wildcard)

Part 2

Please see the *sandbox* file for code.

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just
another
example

Another example of foreign keys and code:
`09_6Feb2019_coloursOfCars.txt`

Consider this...

Please see the *sandbox* file for helpful code

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THINK

- Can you create a similar base where a foreign key has been established?
- Can you write a query to show how the foreign key works?