Web Application Development : MySQL and Manipulating MySQL with PHP

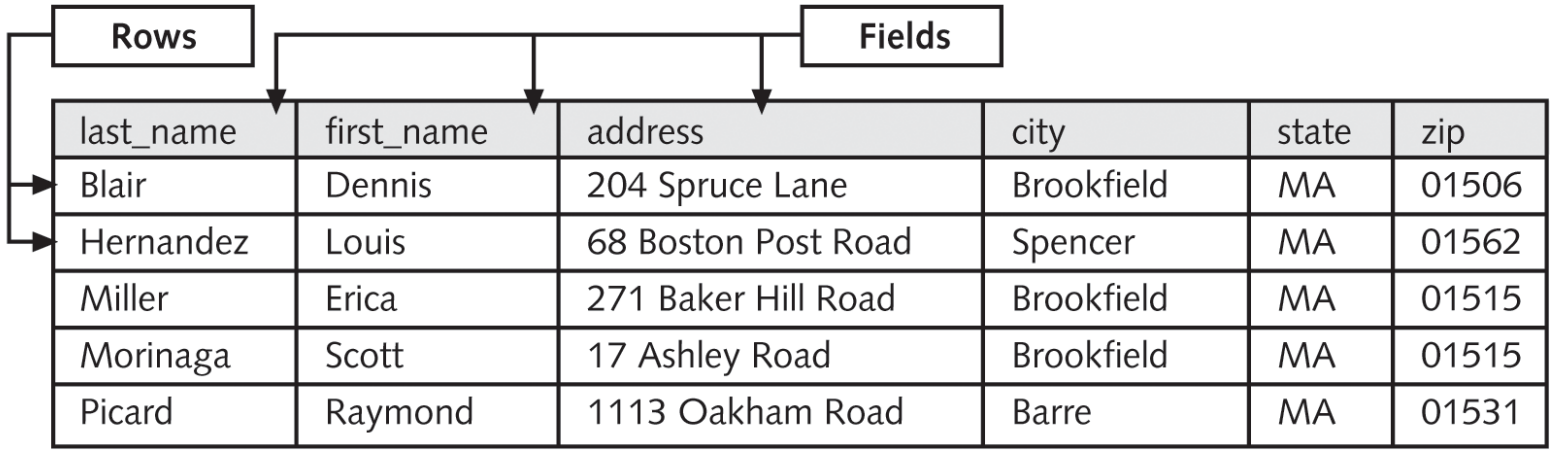
Week 4

Content of this Lecture

- Basics of databases
- Working with MySQL databases
- Managing user accounts, databases and tables
- Working with data records
- Accessing MySQL database with PHP
- Creating and deleting databases and tables
- Creating, updating, selecting and deleting records

Introduction to Databases

- A **database** is an ordered collection of information from which a computer program can quickly access information
- Each **row** in a database **table** is called a **record (tuple)**
- A **record** in a database is a single complete set of related information
- Each column in a database table is called a **field (attribute)**
- **Fields** are the individual categories of information stored in a record



last_name	first_name	address	city	state	zip
Blair	Dennis	204 Spruce Lane	Brookfield	MA	01506
Hernandez	Louis	68 Boston Post Road	Spencer	MA	01562
Miller	Erica	271 Baker Hill Road	Brookfield	MA	01515
Morinaga	Scott	17 Ashley Road	Brookfield	MA	01515
Picard	Raymond	1113 Oakham Road	Barre	MA	01531

Employee directory database

Relational Databases

- A **relational database** consists of one or more related tables, where relationships between tables are implemented by primary/foreign keys
- A **primary key** is a field that contains a unique identifier for each record in a primary table
- A **primary key** is a type of index, which identifies records in a database to make retrievals and sorting faster
- A **foreign key** is a field in a related table that refers to the primary key in a primary table

One-to-One Relationships

- A **one-to-one relationship** exists between two tables when a related table contains exactly one record for each record in the primary table
- Create one-to-one relationships to break information into multiple, logical sets
- Information in the tables in a one-to-one relationship can be placed within a single table
- Make the information in one of the tables confidential and accessible only by certain individuals
- Alternatively, create a base table including all information about an object, and then create views for different people to access

One-to-One Relationships (continued)

`Employees` table

employee_id	last_name	first_name	address	city	state	zip
101	Blair	Dennis	204 Spruce Lane	Brookfield	MA	01506
102	Hernandez	Louis	68 Boston Post Road	Spencer	MA	01562
103	Miller	Erica	271 Baker Hill Road	Brookfield	MA	01515
104	Morinaga	Scott	17 Ashley Road	Brookfield	MA	01515
105	Picard	Raymond	1113 Oakham Road	Barre	MA	01531

`Payroll` table

employee_id	start_date	pay_rate	health_coverage	year_vested	401k
101	2002	$21.25	none	na	no
102	1999	$28.00	Family Plan	2001	yes
103	1997	$24.50	Individual	na	yes
104	1994	$36.00	Family Plan	1996	yes
105	1995	$31.00	Individual	1997	yes

One-to-one relationship

One-to-Many Relationship

- A **one-to-many relationship** exists in a relational database when one record in a primary table has many related records in a related table
- Breaking tables into multiple related tables to reduce redundant information is called **normalization**
- Provides a more efficient and less redundant method of storing this information in a database

One-to-Many Relationship (continued)

employee_id	last_name	first_name	language
101	Blair	Dennis	JavaScript
101	Blair	Dennis	ASP.NET
102	Hernandez	Louis	JavaScript
102	Hernandez	Louis	ASP.NET
102	Hernandez	Louis	Java
103	Miller	Erica	JavaScript
103	Miller	Erica	ASP.NET
103	Miller	Erica	Java
103	Miller	Erica	C++
104	Morinaga	Scott	JavaScript
104	Morinaga	Scott	ASP.NET
104	Morinaga	Scott	Java
105	Picard	Raymond	JavaScript
105	Picard	Raymond	ASP.NET

Table with redundant information

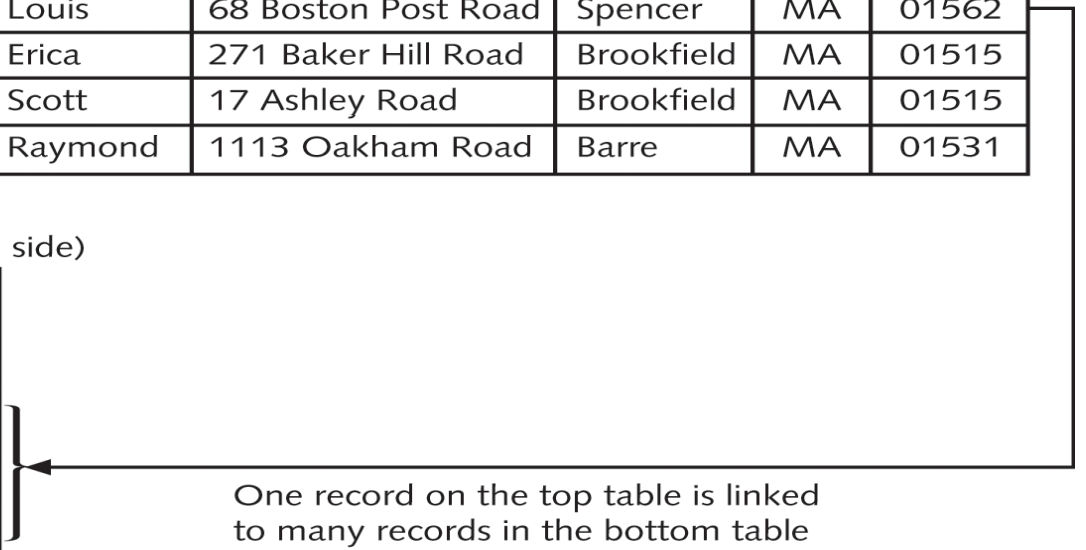
One-to-Many Relationship (continued)

`Employees` table

employee_id	last_name	first_name	address	city	state	zip
101	Blair	Dennis	204 Spruce Lane	Brookfield	MA	01506
102	Hernandez	Louis	68 Boston Post Road	Spencer	MA	01562
103	Miller	Erica	271 Baker Hill Road	Brookfield	MA	01515
104	Morinaga	Scott	17 Ashley Road	Brookfield	MA	01515
105	Picard	Raymond	1113 Oakham Road	Barre	MA	01531

`Languages` table ("many" side)

employee_id	language
101	JavaScript
101	ASP.NET
102	JavaScript
102	ASP.NET
102	Java
103	JavaScript
103	ASP.NET
103	Java
103	C++
104	JavaScript
104	ASP.NET
104	Java
105	JavaScript
105	ASP.NET



Many-to-Many Relationship

- A **many-to-many relationship** exists in a relational database when many records in one table are related to many records in another table
  e.g. relationship between programmers and languages
- Must use a **junction table** which creates a one-to-many relationship for each of the two tables in a many-to-many relationship
- A junction table contains foreign keys from the two tables

Many-to-Many Relationship (continued)

`Employees` table

employee_id	last_name	first_name	address	city	state	zip
101	Blair	Dennis	204 Spruce Lane	Brookfield	MA	01506
102	Hernandez	Louis	68 Boston Post Road	Spencer	MA	01562
103	Miller	Erica	271 Baker Hill Road	Brookfield	MA	01515
104	Morinaga	Scott	17 Ashley Road	Brookfield	MA	01515
105	Picard	Raymond	1113 Oakham Road	Barre	MA	01531

`Languages` table

language_id	language
10	JavaScript
11	ASP.NET
12	Java
13	C++

Many-to-many relationship

`Experience` junction table

employee_id	language_id	years
101	10	5
101	11	4
102	10	3
102	11	2
102	12	3
103	10	2
103	11	3
103	12	6
103	13	3
104	10	7
104	11	5
104	12	8
105	10	4
105	11	2

Working with Database Management Systems

- A **relational database management system** (or RDBMS) is a system that stores and manages data in a relational format
- A **schema** is the structure of a database including its tables, fields, and relationships
- A **query** is a structured set of instructions and criteria for retrieving, adding, modifying, and deleting database information
- **Structured query language** (or SQL – pronounced as sequel) is a standard data manipulation language used among many database management systems
- **Open database connectivity** (or ODBC) allows ODBC-compliant applications to access any data source for which there is an ODBC driver

Getting Started with MySQL

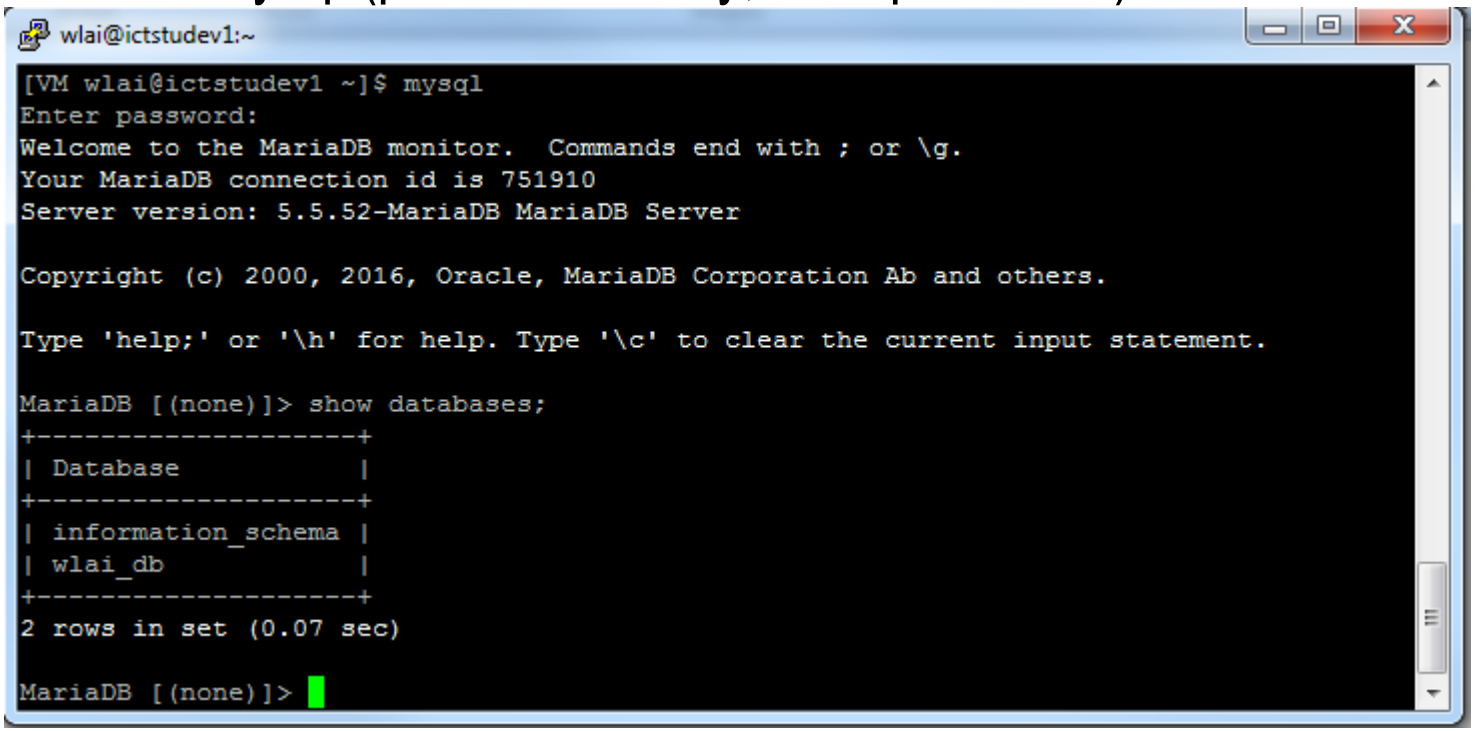
- MySQL is an open source database server, and it is fast and reliable.
- There are several ways to interface with a MySQL database server:
  - Using **MySQL Monitor**, a command-line program
  - Using **phpMyAdmin**, a web interface program

    https://feenix-mariadb-web.swin.edu.au/ **- in new server**
  - Using **PHP database functions** within PHP scripts

Logging in to MySQL Monitor

- *We will be accessing the MySQL database server after you login to mercury. Your account and database have been created.*
  - ☐ Login to the mercury.swin.edu.au server using ‘putty’ client.
  - ☐ To access your MySQL (MariaDB) account, type in:

    `mysql (press Enter key, then password)



Creating Users and Grant Privileges (root user)

- Use a `GRANT` statement to create user accounts and assign privileges
- **Privileges** are the operations that a user can perform with a database
- The `GRANT` statement creates the user account if it does not exist and assigns the specified privileges

```
GRANT privilege [(column)][, privilege [(columns)]]...
      ON {table | * | *.* | database.*}
      TO user [IDENTIFIED BY 'password'];
```

- If the user account already exists, the `GRANT` statement just updates the privileges

```
mysql> GRANT ALL ON wlai_db.*  TO 'wlai'@'localhost'  IDENTIFIED BY 'wlai123';
```

Common MySQL Database Privileges

```
mysql> GRANT SELECT,INSERT,UPDATE,DELETE,CREATE,DROP
    -> ON TUTORIALS.*
    -> TO 'zara'@'localhost'
    -> IDENTIFIED BY 'zara123';
```

will add user **zara** with password **zara123** for a particular database, which is named as **TUTORIALS**.

Privilege	Description
ALL	Assigns all privileges to the user
CREATE	Allows the user to create databases, tables, and indexes
DROP	Allows the user to delete databases and tables
ALTER	Allows the user to modify table structure
DELETE	Allows the user to delete records
INDEX	Allows the user to create and delete indexes
INSERT	Allows the user to add records
SELECT	Allows the user to select records
UPDATE	Allows the user to modify records
USAGE	Creates a user with no privileges

(root) Revoking Privileges and Deleting Users

- You must be logged in with the root account or have sufficient privileges to revoke privileges from another user account

```
REVOKE privilege [(column)][, privilege [(columns)]]...
    ON {table | * | *.* | database.*}
    FROM user;
```

- The REVOKE ALL PRIVILEGES statement removes all privileges from a user account for a specified table or database
- Before deleting a user, you must first revoke all privileges assigned to the user account for all databases
  - Use the `REVOKE ALL PRIVILEGES` statement
  - View the privileges assigned to a user account with the `SHOW GRANTS FOR user` statement
- To delete an existing user, use the `DROP USER user` statement to delete the account from the user table in the `mysql` database

Creating and Deleting Databases

- Use the `CREATE DATABASE` statement to create a new database:

```
mysql> CREATE DATABASE guitars;
Query OK, 1 row affected (0.02 sec)
```

- To use a new database, select it by executing the `use` *`database`* statement
- Before adding records to a new database, first define the tables and fields that will store the data
- Use the `DROP DATABASE` statement to remove all tables from the database and to delete the database

```
DROP DATABASE database;
```

- You must be logged in as the **root user** or have privileges to delete a database

Selecting Databases (users)

- Use the `SHOW DATABASES` statement to view the databases that are available
- Use the `USE DATABASE` statement to select the database to work with
- Use the `SELECT DATABASE()` statement to display the name of the currently selected database
- The `mysql` database is installed to contain user accounts and information that is required for installation of the MySQL database server

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| wlai_db            |
+--------------------+
```

Examples

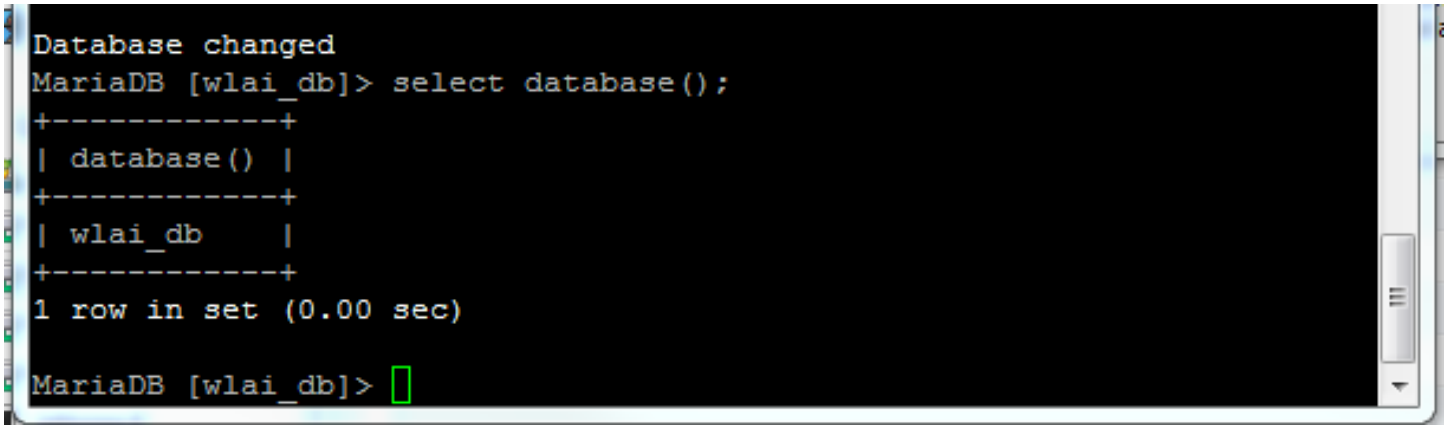
```
SELECT database();
```

Your result may be similar to this:

```
mysql> SELECT database();
+------------+
| database() |
+------------+
| NULL       |
+------------+
1 row in set (0.00 sec)
```

The result is **null**, meaning a database is not currently selected.

After use the command:
> use wlai_db;



Working with the MySQL Monitor

- At the `mysql>` command prompt terminate the command with a semicolon

```
mysql> SELECT * FROM inventory;
```

```
mysql> select * from inventory;
+-------------+--------+--------+---------+----------+
| item_number | make   | model  | price   | quantity |
+-------------+--------+--------+---------+----------+
|           1 | Yamaha | FG7205 |  279.99 |       12 |
|           2 | Toyato | TG     | 3000.66 |        3 |
+-------------+--------+--------+---------+----------+
2 rows in set (0.01 sec)
```

- Without a semicolon, the MySQL Monitor enters a multiple-line command and changes the prompt to ->

```
mysql> SELECT * FROM inventory
    -> WHERE make = "Toyato";
```

- The SQL keywords entered in the MySQL Monitor are *not* case sensitive

Understanding MySQL Identifiers

- Identifiers for databases, tables, fields, indexes, and aliases
- An **alias** is an alternate name used to refer to a table or field in SQL statements
- The case sensitivity of database and table identifiers depends on the operating system
  - Not case sensitive on Windows platforms
  - Case sensitive on UNIX/Linux systems
- MySQL stores each database in a directory of the same name as the database identifier
- Field and index identifiers are case insensitive on all platforms

Creating and Deleting Tables

- The `CREATE TABLE` statement specifies the table and column names and the data type for each column

```
CREATE TABLE table_name (column_name TYPE, ...);
```

- Execute the `USE` statement to select a database before executing the `CREATE TABLE` statement
- The `DROP TABLE` statement removes all data and the table definition

```
DROP TABLE table;
```

- You must be logged in as the `root` user or have `DROP` privileges to delete a table

Example - Creating Table

```
mysql> CREATE TABLE inventory (
        item_number int NOT NULL AUTO_INCREMENT,
        make varchar(30) NOT NULL,
        model varchar(30) NOT NULL,
        price double NOT NULL,
        quantity int NOT NULL,
        PRIMARY KEY (item_number)
        );
```

AUTO_INCREMENT tells MySQL to go ahead and add the next available number to the `item_number` field.

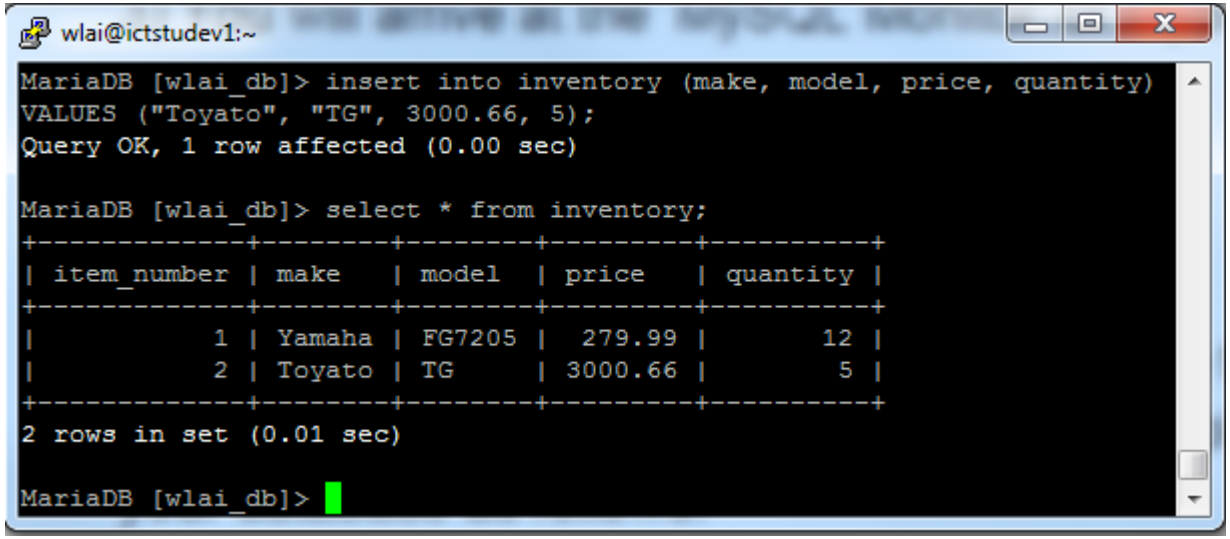
NOT NULL - we do not want this field to be NULL. So, if a user will try to create a record with a NULL value, then MySQL will raise an error.

Adding Records

- Use the `INSERT` statement to add individual records to a table

```
INSERT INTO table_name (column1, column2, ...)
        VALUES(value1, value2, ...);
```

- The values entered in the `VALUES` list must be in the same order in which you defined the table fields
- Specify `NULL` in any fields for which you do not have a value



Updating Records

- To update records in a table, use the `UPDATE` statement
- The syntax for the `UPDATE` statement is:

```
UPDATE table_name
SET column_name=value
WHERE condition;
```

  - The `UPDATE` keyword specifies the name of the table to update
  - The `SET` keyword specifies the value to assign to the fields in the records that match the condition in the `WHERE` keyword

```
MariaDB [wlai_db]> update inventory set quantity=3 where item_number=2;
Query OK, 1 row affected (0.00 sec)
Rows matched: 1  Changed: 1  Warnings: 0

MariaDB [wlai_db]> select * from inventory;
+-------------+--------+--------+---------+----------+
| item_number | make   | model  | price   | quantity |
+-------------+--------+--------+---------+----------+
|           1 | Yamaha | FG7205 |  279.99 |       12 |
|           2 | Toyato | TG     | 3000.66 |        3 |
+-------------+--------+--------+---------+----------+
```

Deleting Records

- Use the `DELETE` statement to delete records in a table
- The syntax for the `DELETE` statement is:

```
DELETE FROM table_name
WHERE condition;
```

- The `DELETE` statement deletes all records that match the condition
- To delete all the records in a table, leave off the `WHERE` keyword

Retrieving Records

- Use the `SELECT` statement to retrieve records from a table:

```
mysql> SELECT model, quantity FROM inventory;
```

- Use the asterisk (*) wildcard with the `SELECT` statement to retrieve all fields from a table
- You can also specify which records to return by using the `WHERE` keyword

```
mysql> SELECT * FROM inventory WHERE make='Martin';
```

- Use the keywords `AND` and `OR` to specify more detailed conditions about the records you want to return

```
mysql> SELECT * FROM inventory WHERE make='Washburn'
    -> AND price<400;
```

Retrieving Records – Sorting

- Use the `ORDER BY` keyword with the `SELECT` statement to perform an alphanumeric sort of the results returned from a query

```
mysql> SELECT make, model FROM inventory
    -> ORDER BY make, model;
```

- To perform a reverse sort, add the `DESC` keyword after the name of the field by which you want to perform the sort

```
mysql> SELECT make, model FROM inventory
    -> ORDER BY make DESC, model;
```

Accessing Databases from PHP

- There are three main options when considering connecting to a MySQL database server using PHP:
  - PHP's MySQL Extension
  - PHP's mysqli Extension
  - PHP Data Objects (PDO)

- The mysqli extension features a dual interface, supporting both procedural (functions) and object-oriented interfaces.
- These notes and examples use the ***procedural interface***.

http://www.php.net/manual/en/book.mysqli.php

Connecting to MySQL

- Open a connection to a MySQL database server with the `mysqli_connect()` function
- The `mysqli_connect()` function returns a *positive integer* if it connects to the database successfully or `false` if it does not
- Assign the return value from the `mysqli_connect()` function to a variable that you can use to access the database in your script

```
$connection = mysqli_connect("host"["user",
"password","database"])
```

  - The *host* argument specifies the host name where your MySQL database server is installed e.g. **feenix-mariadb.swin.edu.au**
  - The *user* and *password* arguments specify a MySQL account name and password e.g. **s1234567 yourMySQLpassword**
  - The *database* argument specifies a database e.g. **s1234567_db**

Selecting a Database

- The function for selecting a database is

  `mysqli_select_db(`*`connection`*`, `*`database`*`)`

- The function returns a value of `true` if it successfully selects a database or `false` if it does not
- Note, the statement for selecting a database with the MySQL Monitor, is the `use` *`database`* statement
- The mysqli_connect also allows one to connect and select the database at once.

```
$connection = mysqli_connect( “feenix-
mariadb.swin.edu.au", "s1234567", "ddmmyy",
"s1234567_db")
```

Handling MySQL Errors

- Reasons for not connecting to a database server include:
  - The database server is not running
  - Insufficient privileges to access the data source
  - Invalid username and/or password
- Writing code that anticipates and handles potential problems is often called **bulletproofing**. Bulletproofing techniques include:
  - Validating submitted form data, e.g.

```
if (isset($_GET['height']) ...
```

  - Using the **error control operator (@)** to suppress error messages, e.g.

```
$dbConnect = @mysqli_connect(...);
if (!$dbConnect) ...
```

Terminating Script Execution

- The `die()` and `exit()` functions ***terminate*** script execution
- The `die()` version is usually used when attempting to access a data source
- Both functions accept a single string argument
- Call the `die()` and `exit()` functions as separate statements or by appending either function to an expression with the `or` operator

Note: When script is terminated, an *incomplete* html page is sent to the client. This is useful for error diagnostics, but poor in a production application.

Handling MySQL Errors (continued)

```
$dbConnect = @mysqli_connect("localhost", "root", "paris");
if (!$dbConnect)
      die("<p>The database server is not available.</p>");
echo "<p>Successfully connected to the database server.</p>";
$dbSelect = @mysqli_select_db($dbConnect, "flightlog");
if (!$dbSelect)
      die("<p>The database is not available.</p>");
echo "<p>Successfully opened the database.</p>";
// additional statements that access the database
mysqli_close($dbConnect);
```

Handling MySQL Errors(continued)

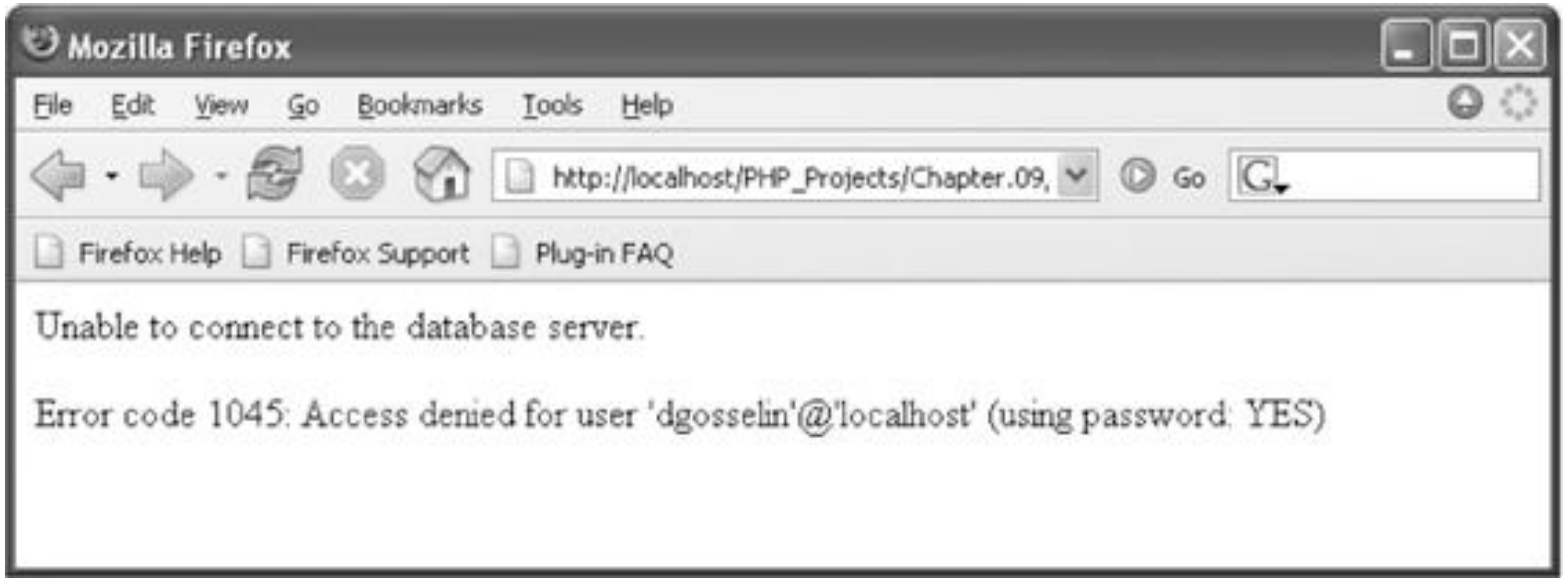
MySQL error reporting functions

Function	Description
`mysqli_connect_errno()`	Returns the error code from the last database connection attempt or zero if no error occurred
`mysqli_connect_error()`	Returns the error message from the last database connection attempt or an empty string if no error occurred
`mysqli_errno(`*`connection`*`)`	Returns the error code from the last attempted MySQL function call or zero if no error occurred
`mysqli_error(`*`connection`*`)`	Returns the error message from the last attempted MySQL function call or an empty string if no error occurred
`mysqli_sqlstate(`*`connection`*`)`	Returns a string of five characters representing an error code from the last MySQL operation or 00000 if no error occurred

Handling MySQL Errors(continued)

```
$user = $_GET['username'];
$password = $_GET['password'];
$dbConnect = @mysqli_connect("localhost", $user, $password)
   or die("<p>Unable to connect to the database server.</p>"
   . "<p>Error code " . mysqli_connect_errno()
   . ": " . mysqli_connect_error() . "</p>");
echo "<p>Successfully connected to the database server.</p>";
@mysqli_select_db($dbConnect, "flightlog")
   or die("<p>The database is not available.</p>");
echo "<p>Successfully opened the database.</p>";
// additional statements that access the database
mysqli_close($dbConnect);
```

Handling MySQL Errors(continued)



Error number and message generated by an invalid username and password

Handling MySQL Errors(continued)

```
... ...
@mysqli_select_db($dbConnect, "flightplan")
      or die("<p>Unable to select the database.</p>"
      . "<p>Error code " . mysqli_errno($dbConnect)
      . ": " . mysqli_error($dbConnect) . "</p>");
echo "<p>Successfully opened the database.</p>";
// additional statements that access the database
mysqli_close($dbConnect);
```

Error code and message generated when attempting to select a database that does not exist

Executing SQL Statements

The `mysqli_query()` function returns one of three values:

- For SQL statements that do not return results (`CREATE DATABASE` and `CREATE TABLE` statements) they return a value of `true` if the statement executes successfully
- For SQL statements that return results (`SELECT` and `SHOW` statements) they return a *result pointer* that represents the query results
  - A **result pointer** is a special type of variable that refers to the currently selected row in a resultset
- For SQL statements that fail, `mysqli_query()` function returns a value of `false`, regardless of whether they return results

Cleaning Up and Closing Connection

- When you are finished working with query results retrieved with the `mysqli_query()` function, use the `mysqli_free_result()` function to close the result set
- To close the resultset, pass to the `mysqli_free_result()` function the variable containing the result pointer from the `mysqli_query()` function, e.g.

```
mysqli_free_result($QueryResult);
```

- Close a connection to a MySQL database server with the `mysqli_close()` function, e.g.

```
mysqli_close($connection);
```

Accessing database with PHP

- Step 1 – **Open** a connection:
  - Connect to the Database Server, and select the Database,
- Step 2 – **Manipulate** the database:
  - Prepare SQL strings
  - Talk to the Database and executes SQL string
- Step 3 – **Close** the connection:
  - Clean-up, discard the “query” result objects, or other related objects (if any)
  - Close the connection to the Database and the Database Server

Accessing database with PHP

Open

```php
// ## 1. open the connection
// Connect to mysql server
$conn = @mysqli_connect('sqlserver','user_name','password')
   or die('Failed to connect to server');
// Use database
@mysqli_select_db($conn, 'my_database')
   or die('Database not available');
```

Manipulate

```php
// ## 2. set up SQL string and execute
// get data from user, escape it, trust no-one. :)
$pcode = mysqli_escape_string($_GET['pcode']);

$query = "SELECT * FROM postcode WHERE pcode='$pcode'";

$results = mysqli_query($conn, $query);
// … Now use data however we want …
```

Close

```php
// ## 3. close the connection
mysqli_free_result($results);
mysqli_close($conn);
```

Creating Databases

- Use the `CREATE DATABASE` statement with the `mysqli_query()` function to create a new database

```
$sqlString = "CREATE DATABASE real_estate";
$queryResult = @mysqli_query($dbConnect, $sqlString)
      or die("<p>Unable to execute the query.</p>"
      . "<p>Error code " . mysqli_errno($dbConnect)
      . ": " . mysqli_error($dbConnect)) . "</p>";
echo "<p>Successfully executed the query.</p>";
mysqli_close($dbConnect);
```

Deleting Databases

- Use the `DROP DATABASE` statement with the `mysqli_query()` function
- Make sure the database does exist by executing the `mysqli_select_db()` function

```
$dbName = "real_estate";
...
if (@!mysqli_select_db($dbConnect, $dbName))
     echo "<p>The $dbName database does not exist!</p>";
else {
     $sqlString = "DROP DATABASE $dbName";
     $queryResult = @mysqli_query($dbConnect, $sqlString)
          or die("<p>Unable to execute the query.</p>"
          . "<p>Error code " . mysqli_errno($dbConnect)
          . ": " . mysqli_error($dbonnect)) . "</p>";
     echo "<p>Successfully deleted the database.</p>";
}
mysqli_close($dbConnect);
```

Creating and Deleting Tables

- To create a table, use the `CREATE TABLE` statement with the `mysqli_query()` function
- Execute the `mysqli_select_db()` function before executing the `CREATE TABLE` statement or the new table might be created in the wrong database
- To delete a table, use the `DROP TABLE` statement with the `mysqli_query()` function
- To prevent code from attempting to create a table that already exists or to delete a table that does not exist, use a `mysqli_query()` function that either attempts to `SELECT` records from the table, or attempts to '`SHOW TABLES LIKE`'

Creating and Deleting Tables (continued)

```
$dbName = "real_estate";
...
$sqlString = "CREATE TABLE commercial (
   city VARCHAR(25), state VARCHAR(25),
   sale_or_lease VARCHAR(25),
   type_of_use VARCHAR(40), Price INT, size INT)";
$queryResult = @mysqli_query($dbConnect, $sqlString)
     or die("<p>Unable to execute the query.</p>"
     . "<p>Error code " . mysqli_errno($dbConnect)
     . ": " . mysqli_error($dbConnect)) . "</p>";
echo "<p>Successfully created the table.</p>";
mysqli_close($dbConnect);
```

Adding Records

Note: Refer to previous notes on SQL

To Add records to a table:

- Use the `INSERT` and `VALUES` keywords with the `mysqli_query()` function
- The values entered in the `VALUES` list must be in the same order that defined in the table fields
- Specify `NULL` in any fields that do not have a value
- To Add multiple records to a table: Use the `LOAD DATA` statement and the `mysqli_query()` function with a local text file containing the records to be added.

Updating and Deleting Records

To Update records in a table:

- Use the `UPDATE`, `SET`, and `WHERE` keywords with the `mysqli_query()` function
- The `UPDATE` keyword specifies the name of the table to update
- The `SET` keyword specifies the value to assign to the fields in the records that match the condition in the `WHERE` keyword

To Delete records from a table:

- Use the `DELETE` and `WHERE` keywords with the `mysqli_query()` function
- The `WHERE` keyword determines which records to delete in the table
- Be careful, if no `WHERE` keyword, all records are deleted !!

mysqli_affected_rows()

With queries that modify tables but do not return results (`INSERT`, `UPDATE`, and `DELETE` queries), use the `mysqli_affected_rows()` function to determine the number of affected rows by the query

```
$sqlString = "UPDATE inventory SET price=368.20
      WHERE make='Fender' AND model='DG7'";
$queryResult = @mysqli_query($dbConnect, $sqlString)
      or die("<p>Unable to execute the query.</p>"
      . "<p>Error code " . mysqli_errno($dbConnect)
      . ": " . mysqli_error($dbConnect) . "</p>");
echo "<p>Successfully updated "
      . mysqli_affected_rows($dbConnect) . " record(s).</p>";
// print “Successfully updated 1 record(s)” if 1 record satisfies the condition.
```

Selecting Records

- Use the `SELECT` and `WHERE` keywords with the `mysqli_query()` function

```
mysqli_query(connection, query)
```

- The `WHERE` keyword determines which records to select in the table. If no `WHERE` keyword, all records are selected

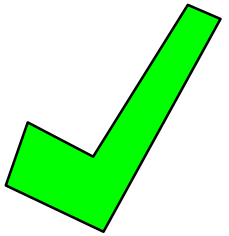
Be careful when constructing query:

```
$make = "Holden";

$sqlString = "SELECT model, quantity FROM
    $dbTable WHERE model = $make";
```

Use:

```
$sqlString = "SELECT model, quantity FROM
    $dbTable WHERE model = '$make' ";
```



Selecting Records (continued)

Retrieving Records into an Indexed Array

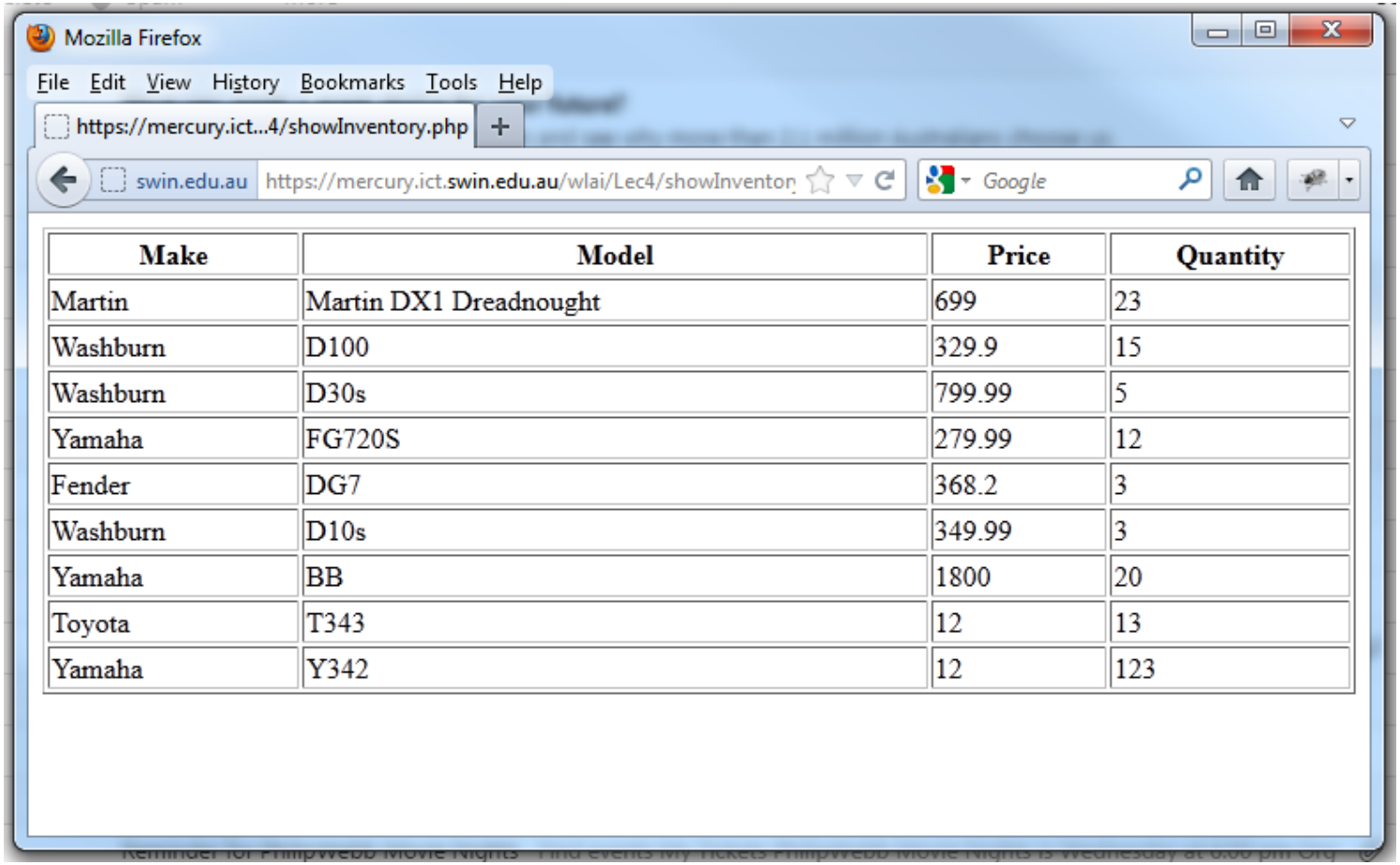
- The `mysqli_fetch_row($queryResult)` function returns the fields in the current row of a result set into an indexed array and moves the result pointer to the next row

$SQLstring = "select * from inventory";
$queryResult = @mysqli_query($DBConnect, $SQLstring)

```
echo "<table width='100%' border='1'>";
echo "<tr><th>Make</th><th>Model</th>
      <th>Price</th><th>Quantity</th></tr>";
$row = mysqli_fetch_row($queryResult);
while ($row) {
      echo "<tr><td>{$row[1]}</td>";
      echo "<td>{$row[2]}</td>";
      echo "<td>{$row[3]}</td>";
      echo "<td>{$row[4]}</td></tr>";
      $row = mysqli_fetch_row($queryResult);
}
echo "</table>";
```

Note: `item_number` in `$row[0]` is not displayed

Output of the Inventory Table



Make	Model	Price	Quantity
Martin	Martin DX1 Dreadnought	699	23
Washburn	D100	329.9	15
Washburn	D30s	799.99	5
Yamaha	FG720S	279.99	12
Fender	DG7	368.2	3
Washburn	D10s	349.99	3
Yamaha	BB	1800	20
Toyota	T343	12	13
Yamaha	Y342	12	123

https://mercury.swin.edu.au/wlai/Lec4/showInventory.php

Selecting Records (continued)

Retrieving Records into an Associative Array

- The `mysqli_fetch_assoc()` function returns the fields in the current row of a resultset into an associative array and moves the result pointer to the next row
- The difference between `mysqli_fetch_assoc()` and `mysqli_fetch_row()` is that instead of returning the fields into an indexed array, `mysqli_fetch_assoc()` function returns the fields into an associate array and uses each field name as the array key

Selecting Records (continued)

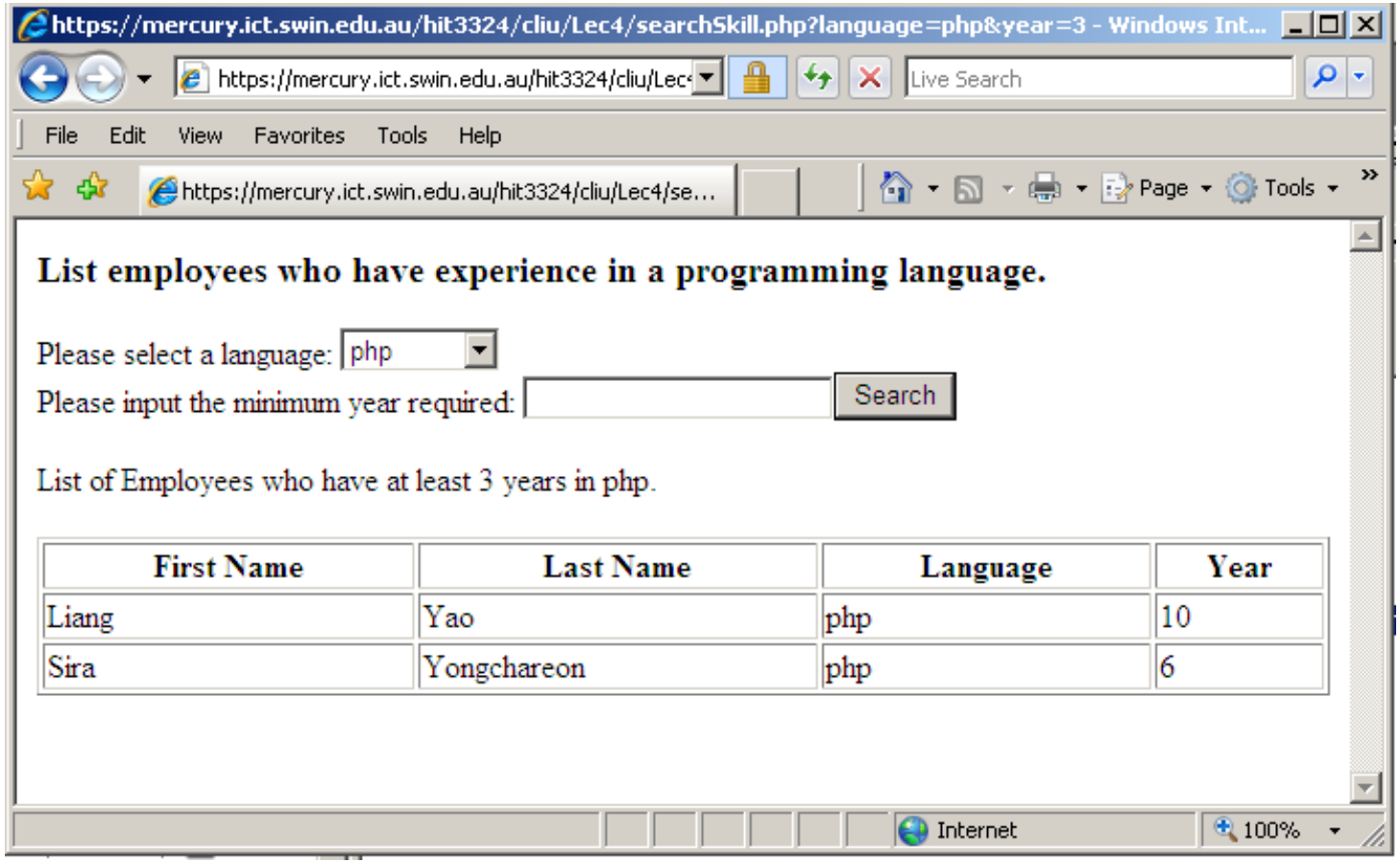
Accessing Query Result Information

- The `mysqli_num_rows()` function returns the number of rows in a query result
- The `mysqli_num_fields()` function returns the number of fields in a query result
- Both functions accept a database result variable, eg. a query result, as an argument

Selecting Records (continued)

```
$sqlString = "SELECT * FROM inventory";
$queryResult = @mysqli_query($dbConnect, $sqlString)
     or die("<p>Unable to execute the query.</p>"
     . "<p>Error code " . mysqli_errno($dbConnect)
     . ": " . mysqli_error($dbConnect) . "</p>");
echo "<p>Successfully executed the query.</p>";
$numRows = mysqli_num_rows($queryResult);
$numFields = mysqli_num_fields($queryResult);
if ($numRows != 0 && $numFields != 0) {
     echo "<p>Your query returned " , $numRows ,
               " rows and ", $numFields , " fields.</p>";
} else {
     echo "<p>Your query returned no results.</p>";
}
mysqli_close($dbConnect);
//  print "Your query returned 6 rows and 5 fields"
```

Example – Searching Skillful People



Generating User Interface

```
<html>
<body>
<H3>List employees who have experience in a programming language.<br/></H3>
<?php
$DBConnect = @mysqli_connect("feenix-mariadb.swin.edu.au", "<user>","<pwd>",
"<user>_db")
   Or die ("<p>Unable to connect to the database server.</p>". "<p>Error code ".
            mysqli_connect_errno().": ". mysqli_connect_error()). "</p>";
// get language names from db
$SQLstring = "select language from Languages";
$queryResult = @mysqli_query($DBConnect, $SQLstring)
    Or die ("<p>Unable to query the table.</p>"."<p>Error code ".
             mysqli_errno($DBConnect). ": ".mysqli_error($DBConnect)). "</p>";
echo "<form>Please select a language: <select name='language'>";
$row = mysqli_fetch_row($queryResult);
while ($row) {
     echo "<option value='".$row[0]."'>".$row[0]."</option>";
     $row = mysqli_fetch_row($queryResult);
}
echo "</select><br/>Please input the minimum year required: <input type='text'
name='year'/><input type='submit' value='Search'/></form>";
mysqli_close($DBConnect);
```

Searching and Listing the Result

```
If (isset($_GET['language']) && isset($_GET['year'])) {
  $DBConnect = @mysqli_connect("feenix-mariadb.swin.edu.au", "<user>",“<pwd>", "<user>_db")
    Or die ("<p>Unable to connect to the database server.</p>". "<p>Error code ".
            mysqli_connect_errno().": ". mysqli_connect_error()). "</p>";
  $SQLstring = "select e.first_name,e.last_name,l.language,x.years FROM Employees e,
      Experience x,Languages l where e.employee_id=x.employee_id and x.language_id =
      l.language_id and l.language='".$_GET['language']."' and x.years>=".$_GET['year'];
  $queryResult = @mysqli_query($DBConnect, $SQLstring)
    Or die ("<p>Unable to query the $TableName table.</p>"."<p>Error code ".
            mysqli_errno($DBConnect). ": ".mysqli_error($DBConnect)). "</p>";
  echo "<p>List of Employees who have at least ", $_GET['year'], " years in ", $_GET['language'], ".</p>";
  echo "<table width='100%' border='1'>";
  echo "<th>First Name</th><th>Last Name</th><th>Language</th><th>Year</th>";
  $row = mysqli_fetch_row($queryResult);
  while ($row) { echo "<tr><td>{$row[0]}</td>"; echo "<td>{$row[1]}</td>"; echo "<td>{$row[2]}</td>";
                 echo "<td>{$row[3]}</td></tr>"; $row = mysqli_fetch_row($queryResult);
  }
  echo "</table>"; mysqli_close($DBConnect);
}
?>
</body>
</html>
```

Many-to-Many Relationship (continued)

`Employees` table

employee_id	last_name	first_name	address	city	state	zip
101	Blair	Dennis	204 Spruce Lane	Brookfield	MA	01506
102	Hernandez	Louis	68 Boston Post Road	Spencer	MA	01562
103	Miller	Erica	271 Baker Hill Road	Brookfield	MA	01515
104	Morinaga	Scott	17 Ashley Road	Brookfield	MA	01515
105	Picard	Raymond	1113 Oakham Road	Barre	MA	01531

`Languages` table

language_id	language
10	JavaScript
11	ASP.NET
12	Java
13	C++

Many-to-many relationship

`Experience` junction table

employee_id	language_id	years
101	10	5
101	11	4
102	10	3
102	11	2
102	12	3
103	10	2
103	11	3
103	12	6
103	13	3
104	10	7
104	11	5
104	12	8
105	10	4
105	11	2

SQL query string

```
$SQLstring = "select e.first_name, e.last_name, l.language, x.years
    FROM Employees e,  Experience x,Languages l
    where e.employee_id=x.employee_id and x.language_id =
       l.language_id and l.language='" .$_GET['language']. "' and
       x.years>=".$_GET['year'];
```

SQL query string

```
$SQLstring = "select e.first_name, e.last_name, l.language, x.years FROM Employees e,
        Experience x,Languages l where e.employee_id=x.employee_id and x.language_id =
        l.language_id and l.language='".$_GET['language']."' and x.years>=".$_GET['year'];

Or:
$SQLstring = "SELECT first_name, last_name, language, years FROM Employees, Experience,
Languages where Employees.employee_id= Experience.employee_id and Experience.language_id =
Languages.language_id and Languages.language='".$_GET['language']."' and
Experience.years>=".$_GET['year'];

Or:
$SQLstring = "SELECT first_name, last_name, language, years FROM Employees
INNER JOIN Experience on Employees.employee_id= Experience.employee_id
INNER JOIN Languages on Experience.language_id = Languages.language_id where
Languages.language='".$_GET['language ']." ' and Experience.years>=".$_GET['year'];
```

Thank you!