

SQL Terminology

① SQL helps _____ efficiently
 1. query data
 2. update data
 3. manipulate data

② Python works with SQL to _____.
 1. connect databases together
 2. execute SQL queries

③ SQL is _____
 a language used for relational databases

④ SQL is used for _____
 querying data

Data Terminology

① data is _____

a collection of facts (words, numbers) and/or pictures

② data is a critical asset for _____ business

③ data needs to be _____ because it is important.
 1. secured
 2. stored
 3. access quickly

Database Terminology

① database is _____
 1. a repository of data
 2. a program that stores data

② database provides functionality for _____ data.
 1. adding
 2. modifying
 3. querying

③ relational database is _____
 data stored in tabular form — columns and rows

④ columns contain _____
 properties of an item

⑤ An example of a property of an item could be _____
 1. last name
 2. first name

⑥ table is _____
 a collection of related things

⑦ T/F Relations between tables can exist.
 True

⑧ DBMS (Database Management System) is a _____
 software used to manage databases

⑨ Other words that can be used interchangeably for databases are _____
 1. database server
 2. database system
 3. data server
 4. DBMS

RDBMS (Relational DBMS) Terminology

① RDBMS is _____

a set of software tools that controls the data

② Data in RDBMS can be controlled by actions like _____

1. accessibility
2. organization
3. storage

③ Examples of RDBMS _____

1. MySQL
2. Oracle Database
3. Db2

④ Basic SQL Commands are _____

1. Create a table
2. Insert
3. Select
4. Update
5. Delete

SELECT Statement

① A SELECT statement is _____

a Data Manipulation Language (DML)

② A DML will _____

1. read data
2. Modify data

③ The syntax for SELECT is _____

Select * from tablename;

④ The diagram between tablename and properties of an item (column) is _____



⑤ The syntax for selecting specific properties from a table is _____

Select column_a, column_b, ..., column_n from tablename;

⑥ T/F The order of your columns displayed will always match the order in the SELECT statement.

True

WHERE Clause

① The WHERE clause can restrict the _____ result set

② T/F The WHERE clause always requires a predicate.
 True

③ T/F The predicate always evaluates to True, False, or Unknown.

True

④ The syntax for using WHERE clause is _____

Select column_a, column_b, ..., column_n from tablename;
 where predicate;

⑤ An example of using the WHERE clause is _____

Select book_id, title from Book WHERE book_id='B1';

⑥ The 6 comparison operators are _____

1. =
2. >
3. <
4. >=
5. <=
6. <> (not equal to)

⑦ The predicate is also known as _____ condition

COUNT

① Count is a _____ built-in database function

② Count retrieves the number of _____ rows

③ The syntax for querying the total rows of a given table is _____

SELECT COUNT(*) FROM tablename;

④ The syntax for querying the total rows of a given column equaling x is _____

SELECT COUNT(column_name) FROM tablename
 WHERE column_name='x';

⑤ The syntax for retrieving unique values in a column is _____

SELECT DISTINCT column_name FROM tablename;

⑥ The output of this syntax:

Select DISTINCT COUNTRY FROM MEDALS
 WHERE MEDALTYPE = 'GOLD';
 is _____.

a list of unique countries that received gold medals.

Limit clause

① Limit restricts the number of _____ retrieved from the database

rows

② The Syntax:

SELECT * FROM tablename LIMIT 10;
 will result in _____.
 the first 10 rows in a table

③ The Syntax:

Select * from MEDALS
 where YEAR = 2018 LIMIT 5;
 will result in _____.

five rows or less of the year 2018

Insert Statement

① The INSERT statement is used to add _____ to a table.
 new rows

② T/F the INSERT statement is DML statement.

True

③ The syntax of the INSERT statement is _____

INSERT INTO tablename
 (column_1, column_2, ..., column_n)
 VALUES (value_r1, value_r2, ..., value_rn);
 :
 (value_rn1, value_rn2, ..., value_rnn);

Update Statement

① T/F UPDATE statement is a DML Statement.
True

② UPDATE statement is used to _____ alter or modify the data.

③ The syntax for UPDATE Statement is _____.

```
UPDATE tablename SET column_a = 'new_a', Column_b = 'new_b',
... column_n = 'new_n' where predicate;
          Optional for specificity
```

④ The syntax to change first name and last name to Lakshmi Katta where AUTHOR-ID = A2 is _____.

```
UPDATE AUTHOR set LASTNAME = 'KATTA', FIRSTNAME = 'LAKSHMI'
  where AUTHOR-ID = 'A2';
```

DELETE Statement

① T/F DELETE statement is DML Statement.
True

② The syntax for DELETE statement by a column_name is _____.

```
DELETE FROM tablename
  where column_name in ('property_a', 'property_b', ...
    'property_n');
```

③ The result of the code

```
DELETE FROM AUTHOR where AUTHOR-ID in('A2', 'A3');
is _____.
```

Deletes a row where AUTHOR-ID is either A2 or A3.

④ T/F If you do not specify a where clause, all the rows will be deleted.
True

⑤ T/F You do not use DELETE to delete columns.
True

⑥ The general syntax for deleting columns is _____

```
ALTER TABLE tablename DROP COLUMN column_name;
```

⑦ T/F MySQL, PostgreSQL have the same syntax for dropping multiple columns but SQL Server and Oracle database each have their own syntaxes.
True.

Relational Model

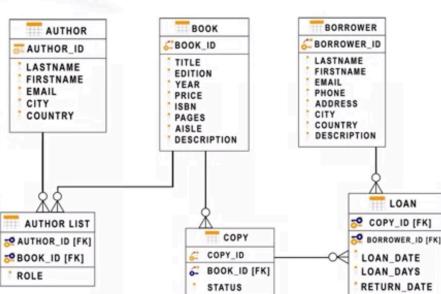
① The relational model is the most used data model because it allows for _____ data independence

② The three types of independence preserved are _____

1. logical independence
2. physical data independence
3. physical storage independence

③ An entity relationship (ER) data model is _____ an alternative to relational data model

④ This is an example of an ER (entity relationship diagram):



⑤ ERD is used to represent _____ entities called table and their relationships.

⑥ T/F The ER model is used as a tool to design relational databases.
True

⑦ In an ER model, an entity is an _____ object

⑧ T/F Entities in an ER model exists independently of any entities in the database.

⑨ The building blocks of an ER diagram are _____.

(2)

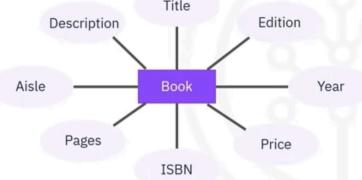
1. entities
2. attributes

ER Diagram

① An Entity can be _____.

noun : person, place, or thing

(2)



In this diagram, the entity is _____

Book

(2b) In this diagram, the attributes are _____

Title, Edition, etc

③ Attributes are _____

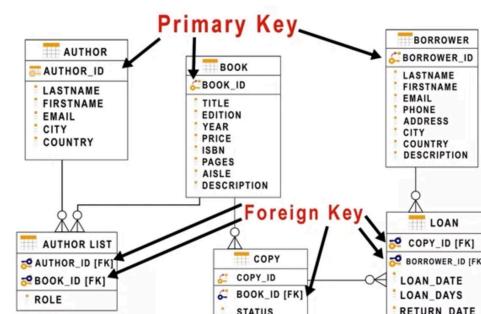
data elements that characterize the entity

Entity-Relationship Model

① Entity becomes a _____ in the database.
table

② Attributes become the _____ in a table.
Columns

Primary keys and foreign keys



① T/F Each table is assigned a primary key.
True.

② The primary key uniquely identifies each _____ of a table.
tuple or row

③ The primary key prevents _____.

duplication of data

④ Foreign keys are _____ primary keys defined in other tables

⑤ The foreign key helps create a _____ link between tables

DDL vs DML

① You can interchange row with _____ tuple

② You can interchange column with _____ attribute

③ DDL stands for _____ data definition language

④ DML stands for _____ data manipulation language

⑤ DDL statements are used to _____ database objects (such as tables).

1. define
2. change
3. drop

⑥ Common DDL statement types are _____.

1. CREATE
2. ALTER
3. TRUNCATE
4. DROP

Common DDL statements

① CREATE is used for _____

1. creating tables
2. defining its columns

② ALTER is used for _____

1. Adding / dropping columns
2. modifying their datatypes

③ TRUNCATE is used for _____

deleting data in a table but not the table itself

④ DROP is used for _____ deleting tables

column
DDL: Create Drop Alter Truncate
(Confidential DDL Create DDL 9 Queen)

DML: Insert Select Delete Update
(Red DML is due)

DML statements

① DML statements are used to _____.

read and modify data

② Read and modify data with _____.
CRUD operations

③ CRUD stands for _____.

Create, Read, Update & Delete rows

Common DML statements

① Common DML statements are _____.

1. INSERT
2. SELECT
3. UPDATE
4. DELETE

② INSERT is used for _____.

Inserting a row or several rows of data into a table.

③ SELECT is used for selecting data in a _____.

row(s)

④ UPDATE is used for editing _____.

row(s)

⑤ DELETE is used for deleting data in a _____.

row(s)

CREATE TABLE Statement

① The syntax for CREATE TABLE is _____.

```
CREATE TABLE tablename (
    column_1 datatype optional parameters,
    column_2 datatype,
    ...
    column_n datatype
);
```

② A sample code:

```
CREATE TABLE provinces(
    id CHAR(2) PRIMARY KEY NOT NULL,
    name VARCHAR(24) NOT NULL,
    population BIGINT
);
```

③ The CHAR(2) tells us the datatype is character string for id and has a _____ fixed length of 2.

④ The varchar is a character string of a _____ variable length.

⑤ VARCHAR(24) means the variable character length can be _____ up to 24.

ALTER TABLE Statement

① The syntax for ALTER TABLE is _____.

ALTER TABLE tablename

```
ADD COLUMN column_1 datatype,
...
ADD COLUMN column_n
);
```

② T/F The ALTER TABLE does not allow you to perform multiple operations (e.g. adding and modifying columns) in a single statement.

True.

③ The actions you can perform with ALTER TABLE _____.

1. Add or remove columns
2. Modify the data types of columns
3. Add or remove keys
4. Add or remove constraints

④ The syntax for modifying the datatype is _____.

ALTER TABLE tablename

MODIFY column-name datatype;

⑤ T/F The CHAR datatype does not include '(', '+', '*' .

True

⑥ To delete a column, the syntax is _____.

ALTER TABLE tablename

DROP COLUMN column-name;

⑦ The DROP COLUMN is known as a _____ clause.

⑧ The code for deleting a table is _____.

DROP TABLE tablename;

⑨ The code for deleting the data and not the table itself is _____.

TRUNCATE TABLE tablename

IMMEDIATE;

⑩ If IMMEDIATE is used to process the statement immediately and the action cannot be undone.

Retrieving Rows of Data: String Patterns

① If you don't know which value to specify in the predicate, (e.g. not knowing the exact value to search for), we can do _____.

String patterns

② Suppose we know the first name of the author begins with 'R'. The code for using string pattern is _____.

```
SELECT * FROM tablename
WHERE column LIKE 'R%';
```

③ The '%' serves as a _____ placeholder for other characters.

④ T/F You can put '%' before, middle, and after characters.

True

Range

① For numbers, you can use the operators _____.

1. '>=' ... '<='
2. 'BETWEEN' ... 'AND'

② The syntax to use range are _____.

```
1. SELECT column_name(s) FROM tablename
   WHERE column_name BETWEEN X AND Y;
      (X,Y ∈ R);
```

2. SELECT column_name(s) FROM tablename

WHERE column_name >= X AND column_name <= Y;
(X,Y ∈ R).

③ T/F Most prefer the first approach because it is easier and quicker to write.

True

A Set of Values

① If you cannot group numbers into a range, you can use _____ in operator

② The syntax for in operator is _____.

SELECT column_name(s) FROM tablename
WHERE column_name IN (value_1, value_2, ..., value_n);

③ The in operator takes a list of expressions to _____ compare against

Sorting Results Set: ORDER BY Clause

① The ORDER BY clause is used in a query to sort the result set by _____.

a specified column

② The syntax for ORDER BY is _____.

SELECT column_name(s) FROM tablename
ORDER BY Column-name;

③ By default, the result set is sorted in _____ order.

ascending

④ The syntax for sorting the result set in descending order is _____.

SELECT column_name(s) FROM tablename
ORDER BY Column-name DESC;

Column Sequence Number

① Another way to specify sort column is to indicate the _____ column sequence number

② Suppose the second column in the table was named pages. The code to sort the result set using column sequence number for pages is _____.

SELECT column_name(s) FROM tablename
ORDER BY 2;

Grouping Result Sets: Eliminating Duplicates, DISTINCT Clause

Grouping Result Sets:

Eliminating Duplicates, DISTINCT Clause

① The DISTINCT clause removes duplicates within a _____ column

② The syntax for using the DISTINCT clause is _____.

SELECT DISTINCT (Column-name)
FROM tablename;

- ③ To count the number of unique values of a column, use _____.
COUNT function & GROUP BY clause
- ④ The syntax for GROUP BY clause is _____.
- SELECT column_name, COUNT(column_name)
FROM tablename GROUP BY column_name;
- ⑤ The GROUP BY clause groups a result into _____ subsets that has matching values for one or more columns
- ⑥ Example of the code and output using GROUP BY:


```
db2 => select country, count(country)
      from Author GROUP BY country
      Country    2
      AU          1
      BR          1
      CA          3
      CN          6
      IN          6
      RO          3
      6 record(s) selected.
```
- ⑦ T/F First the 'country' is grouped. Then they are counted.
True
- ⑧ The number '2' is displayed as a column name because the column name is _____ not directly available in the table
- ⑨ The second column in the result set was calculated by the _____ count function
- ⑩ We can assign a column name to the result set with this code _____.
- SELECT column_name, COUNT(column-name)
AS Column-name_1 FROM tablename
GROUP BY column_name;
- ⑪ AS is a _____ keyword

Condition on GROUP BY Clause: HAVING Clause

- ⑫ T/F The WHERE clause works with the entire result set, but the HAVING clause only works with GROUP BY clause.

True

- ⑬ The syntax for using HAVING clause is _____.
- SELECT column_name, COUNT(column-name)
AS Column-name_1 FROM tablename
GROUP BY column_name HAVING predicate;

Built-In Database Functions

- ⑭ Built-in functions allows you to perform operations on data right within _____ the database itself
- ⑮ T/F Using database functions reduces the amount of data that needs to be retrieved from the database.

True

- ⑯ T/F Database functions can significantly reduce network traffic and use of bandwidth.
True
- ⑰ T/F Database functions can speed up data processing because rather than first retrieving the data into your app and then executing functions on retrieved data.
True
- ⑱ T/F You can create your own functions called user-defined functions in the database.
True
- ⑲ Suppose we have the COST, QUANTITY, and ANIMAL column. We can calculate the average cost per dog by doing _____.
SELECT AVG(COST / QUANTITY) FROM tablename
WHERE ANIMAL = 'Dog';

Aggregate or Column Functions

- ⑳ Some examples of aggregate or column functions are _____.

1. SUM() 3. MAX()
2. MIN() 4. AVG()

- ㉑ The sum function adds up all the values in a _____ column

- ㉒ Suppose the tablename was PETRESCUE. The syntax to use SUM() is _____.

SELECT SUM(column-name) FROM tablename;

- ㉓ T/F When you use an aggregate function, the column in the result set is given a number by default.

True

Column Alias

- ㉔ T/F It is possible to explicitly name the resulting column.

True

- ㉕ Suppose we want to call the output column SUM_OF_COST. The code for this is _____.

SELECT SUM(COST) AS SUM_OF_COST
FROM PETRESCUE;

- ㉖ The SUM_OF_COST becomes a _____ in the result set.

the column-name (instead of the default number)

MAX & MIN

- ㉗ The MAX and min returns the max and min value of the _____, respectively.

column

- ㉘ The syntax for MAX function is _____.

SELECT MAX(column-name) FROM PETRESCUE;

- ㉙ T/F Aggregate functions can be applied on a subset of data instead of an entire column.
True

- ㉚ Suppose we want to get the minimum value of a column with a condition within a table. The syntax is _____.

SELECT MIN(column-name) FROM tablename
WHERE <Condition>;

Average

- ㉛ T/F You can calculate the mean of a column using the average function.

True

- ㉜ The syntax for using the average function is _____.

SELECT AVG(column-name) FROM tablename;

- ㉝ T/F You can perform mathematical operations between columns and apply aggregate functions on them.
True

- ㉞ Suppose we have the COST, QUANTITY, and ANIMAL column. We can calculate the average cost per dog by doing _____.
SELECT AVG(COST / QUANTITY) FROM tablename
WHERE ANIMAL = 'Dog';

Scalar and String Functions

- ㉟ Scalar functions perform operations on _____ every input value

- ㉟ Some examples of scalar and string functions are _____.

1. ROUND() 3. UCASE
2. LENGTH() 4. LCASE

- ㉟ The following syntax

SELECT ROUND(column-name)
FROM tablename;

will round every value of the column to the nearest _____ integer

- ㉟ The string functions apply to _____.

1. Char
2. Varchar

- ㉟ The syntax

SELECT LENGTH(ANIMAL)
FROM tablename;
will retrieve the length of _____ each char/varchar in ANIMAL

UCASE, LCASE

- ㉟ The syntax to capitalize every value in a column is _____.

SELECT UCASE(column-name)
FROM tablename;

- ㉟ T/F You can use the UCASE/LCASE function in a WHERE clause.
True

- ㉟ Suppose you want to find all cat items. You are unsure that the ANIMAL column stores this value as . A solution is to _____.

SELECT * FROM tablename
WHERE LCASE(column-name) = 'cat';

- ㉟ T/F You can have one function operate on the output of another function.
True

- ㉟ Suppose you want the unique values from a column, regardless of their cases. One solution is _____.

SELECT DISTINCT UCASE(column-name)
FROM tablename;

③ An example code for a derived table is _____.

```
SELECT * FROM
  (SELECT column_1, column_2, column_3
   FROM tablename) AS derived_table_name;
```

④ Derived tables can be useful for _____.

1. Working with multiple tables
2. Doing joins

Multiple Tables

Given these tables:

EMPLOYEES:										
EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, OakPark,IL	100	100000	30001	2
E1002	Alice	James	123457	1972-07-31	F	980 Berry Ln, Elgin,IL	200	80000	30002	5
E1003	Steve	Wells	123458	1980-08-10	M	291 Springs, Gary,IL	300	50000	30002	5

DEPARTMENTS:			
DEPT_ID_DEP	DEP_NAME	MANAGER_ID	LOC_ID
5	Software Development	30002	L0002
7	Design Team	30003	L0003

① Suppose we want to retrieve only the employee records from the Employees for which a Department ID exists. We can use a _____.

1. multiple tables
2. IN operator
3. sub-query

② The code retrieve employees from the Employees for which a department ID exists is _____.

```
SELECT * FROM employees
WHERE DEP_ID IN
  (SELECT DEPT_ID_DEP FROM departments);
```

③ Suppose we want to retrieve only the list of employees from a specific location. Assume the employees table does not have location info, but the departments table has a column called Location-ID. A sample syntax would be _____.

```
SELECT * FROM tablename1 WHERE
  column_1 IN
    ( SELECT column_1-table2 FROM tablename2
      WHERE predicate);
```

④ A sample code and the results for using two tables to refine a search using sub-queries is _____.

Query:
`select * from employees where DEP_ID IN
 (select DEPT_ID_DEP from departments where LOC_ID = 'L0002');`

Result:

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
E1002	Alice	James	123457	7/31/1977	F	980 Berry Ln, Elgin,IL	200	80000	30002	5
E1003	Steve	Wells	123458	8/10/1998	M	291 Springs, Gary,IL	300	50000	30002	5
E1004	Santosh	Kumar	123459	5/20/1998	M	511 Aurora Av, Aurora,IL	400	60000	30004	5
E1010	Ann	Jacob	123415	3/30/1992	F	111 Britany Springs,Elgin,220	70000	30004	5	

⑤ A sample code for retrieving department ID and department name for employees who earn more than \$70k. We can get _____.

1. A sub-query on the Employees table to satisfy salary criteria
2. A matching department info by feeding 1. as input to an outer query on Departments table

⑥ A sample code for retrieving department ID and department name for employees who earned more than \$70k is _____.

```
SELECT DEPT_ID_DEP, DEP_NAME FROM departments
WHERE DEPT_ID_DEP IN
  (SELECT DEP_ID FROM employees
   WHERE SALARY > 70000);
```

Access Multiple Tables with Implicit Joins

① T/F An Implicit Join is done by specifying 2 tables in the FROM clause.
True

② The syntax for implicit join is _____.

```
SELECT * FROM
  tablename1,tablename2;
```

③ T/F The result of an implicit join is a full join.
True

④ A full join is when _____ is joined with _____.

every row in the first table
every row in the second table

Operands to limit Implicit Join

① Suppose we want the result set with matching department ID. A sample code is _____.

```
SELECT * FROM employees,departments
WHERE employees.DEP_ID = departments.DEPT_ID_DEP;
```

Qualify Column Name

② To fully qualify the column name, we prefix the name of the column with the name of the _____ table.

③ T/F It is possible that different tables can have same column names that are exactly the same.
True

④ For table names that are long, you can use shorter _____ alias

⑤ An example code for shorter alias is _____.

```
SELECT * FROM employees E, departments D
WHERE E.DEP_ID = D.DEPT_ID_DEP;
```

⑥ We can access multiple table name in these ways _____.

1. `SELECT EMP_ID, DEP_NAME`
FROM employees E, departments D
WHERE E.DEP_ID = D.DEPT_ID_DEP;
2. `SELECT E.EMP_ID, D.DEP_NAME`
FROM employees E, departments D
WHERE E.DEP_ID = D.DEPT_ID_DEP;

Accessing databases using Python

① The Python code connects to the database using _____ API calls.

SQL API

① API stands for _____.

② API is a _____ set of functions

③ You call API so that you can get _____ access to some type of service

④ SQL API consists of _____ library function calls as an API for DBMS

⑤ An application program calls functions in API to pass SQL statements to DBMS

APIs used in SQL-based DBMS

① The applications or database and their respective SQL API are _____.

⑥ MySQL : _____ MySQL C API / Python

⑦ PostgreSQL : _____ psycopg2

⑧ IBM DB2 : _____ ibm-db

⑨ SQL Server : _____ dblib API

⑩ Database access for Microsoft Windows OS : _____ ODBC

⑪ Oracle : _____ OCI

⑫ Java : _____ JDBC

⑬ MongoDB : _____ PyMongo

Why Code with DB-API?

① DB-API is _____.

Python's standard API for accessing relational databases

② DB-API allows a _____ single program that works with multiple databases

③ DB-API allows for _____ (5)

1. Easy implementation and understanding
2. Similarity between Python modules used to access databases
3. Consistency
4. Portability across databases
5. Broad reach of database connectivity from Python

Python DB API : 2 Objects

Connection & Cursor Objects

① Connection objects are used to _____ (2)

1. Connect to a database
2. Manage your transactions.

② Cursor objects are used to _____ (3)

1. Run queries
2. Scroll/Scan through result set.
3. Retrieve results

③ The DB-API includes a _____.

Connect constructor.

④ The connect constructor is used for creating a connection to the _____ database.

⑤ The connect constructor returns a _____.

Connection object

⑥ A connection object is then used by the _____ various connection methods

Connection Methods

① The connection methods used are _____ (4)

1. cursor method
2. commit method
3. rollback method
4. close method

② The cursor method, .cursor(), returns a _____.

New cursor object using the connection

③ The commit method, .commit(), is used to commit _____.

any pending transaction to the database.

④ The rollback method, .rollback(), is used to roll back to _____.

the start of any pending transaction

⑤ The close method, .close(), is used to close _____ a database connection.

Cursor Methods

① The cursor methods used are _____.

1. Callproc method .callproc()
2. execute method .execute()
3. executemany " " .executemany()
4. fetchone " " .fetchone()
5. fetchmany " " .fetchmany()
6. fetchall " " .fetchall()
7. nextset " " .nextset()
8. arraysizel " " .arraysizel()
9. close " " .close()

② An object is an instance of a _____ class

③ A method is a _____ associated with a class or object.

function

④ T/F All methods are objects, but not all objects are methods.

True

⑤ The cursor methods are used to _____ manage the content of a fetch operation

⑥ Cursors created from the same connection are _____.

linked.

⑦ T/F Any changes done to the database by a cursor are immediately visible by the other cursor.

True

⑧ A database cursor is a _____ control structure.

⑨ A database cursor enables _____ traversing over records in a database

⑩ A database cursor behaves like a _____.
1. file name
2. file handle in a programming language

⑪ A program opens a file to access its contents. It opens a cursor to gain _____ access to the query results

⑫ A program closes a file to end its access. It closes a cursor to end access to the _____ query result

⑬ A file handle keeps track of the program's current position. A cursor keeps track of the program's _____ within the query results.

Current position

Syntax for using DB-API in Python

① You import the database module by using the _____ - Connect API from that module

⑭ The syntax is _____.
from dbmodule import connect

⑮ You open up the connection to the database by _____ (2)

1. Using the connect constructor
2. pass in parameters
3. The connect constructor returns a connection object

③ The full cycle of writing code using DB-API is _____ (5, in order)

1. Importing database module
2. Create Connection object
3. Create Cursor object
4. run queries
5. free resources

④ The syntax for importing then creating connection object is _____.

from dbmodule import connect

connection = connect(

 database="databaseName",
 user="username",
 password="password")

⑤ You create the cursor object on the _____ object.

connection

⑥ The cursor object is used to _____ (2, in order)

1. run queries
2. fetch results

⑦ The syntax for running and fetching queries is _____.

cursor.execute(

 SELECT * FROM tablename
 results = cursor.fetchall())

⑧ After the system is done running the queries, apply the _____

close method

⑨ The close method is used to _____

free all resources

⑩ The syntax to avoid unused cursor and connection from taking up resources is _____.

cursor.close()
connection.close()

Analyzing Data with Python

① Suppose we want to create a database table on an SQL server.

T/F We can use sqlite3.

True

② SQLite3 is an _____ in process Python library

③ SQLite3 implements a _____.

1. self-contained
 2. serverless
 3. zero configuration
- transactional SQL database engine

Load CSV to SQLite3 with Pandas

① The syntax for loading CSV to SQLite3 is _____.

import pandas as pd

import sqlite3

data = pd.read_csv('file-path.csv')

conn = sqlite3.connect('databaseName.db')

e.g. conn = sqlite3.connect('McDonalds.db')

data.to_sql('tablename', conn)

e.g. data.to_sql('MCDONALDS_NUTRITION', conn)

Using Pandas to Retrieve Data from Database Tables

① T/F To load a table into a dataframe, you use the function `pd.read_sql()`.
True

② The syntax for loading a table into a dataframe is _____.

```
df = pd.read_sql(  
    "SELECT * FROM tablename",  
    conn)  
print(df)
```

Learn About Data using Pandas:

Using Categorical Scatter Plots

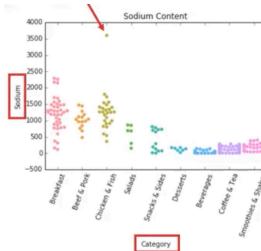
① T/F `df.head()` returns the first few rows of the dataframe.

② The `df.describe(include='all')` allows you to see statistics about each _____ of the table. column

Category	Name	Item Name	Calories	Calories From Fat	Total Fat	Total Fat (% Daily Value)	Saturated Fat	Saturated Fat (% Daily Value)	Trans Fat	Carbohydrates	Cholesterol	Sodium	Protein
Count	260	260	260.000000	260.000000	260.000000	260.000000	260.000000	260.000000	260.000000	260.000000	260.000000	260.000000	260.000000
unique	9	9	9	9	9	9	9	9	9	9	9	9	9
top	Coffee & Tea	Coffee & Tea	100	100	100	100	100	100	100	100	100	100	100
freq	10	10	10	10	10	10	10	10	10	10	10	10	10
mean	Nan	Nan	365.203273	127.095186	14.165388	21.815388	0.000000	0.000000	0.000000	47.348154	15	1000.000000	10.000000
std	Nan	Nan	300.000000	300.000000	300.000000	300.000000	300.000000	300.000000	300.000000	300.000000	300.000000	300.000000	300.000000
25%	Nan	Nan	210.000000	20.000000	2.750000	3.750000	0.000000	0.000000	0.000000	10.750000	10	1000.000000	10.000000
50%	Nan	Nan	360.000000	200.000000	22.000000	48.000000	10.000000	10.000000	0.000000	40.000000	10	1000.000000	10.000000
75%	Nan	Nan	600.000000	200.000000	22.000000	48.000000	10.000000	10.000000	0.000000	40.000000	10	1000.000000	10.000000
max	Nan	Nan	1880.000000	1080.000000	118.000000	162.000000	20.000000	20.000000	0.000000	141.000000	47	1000.000000	10.000000

③ A categorical scatterplot shows _____ for different items by category. the values

④ An example of a categorical scatterplot is _____.



⑤ A code for creating categorical scatterplots is _____.

```
1 import matplotlib.pyplot as plt  
%matplotlib inline  
import seaborn as sns  
  
2 plot = sns.swarmplot(x="Category",  
                      y="Sodium", data=df)  
plt.setp(plot.get_xticklabels(), rotation=90)  
plt.title("Sodium Content")  
plt.show()
```

Basic Data Analysis

① To get the count, mean, std, min, quartile in the 25%, 50%, 75%, and max, we use the function _____.

`describe()`

② An example of using `describe` is _____.

```
In [17]: df['Sodium'].describe()  
Out[17]: count    260.000000  
mean     495.750000  
std      577.026323  
min      0.000000  
25%    107.500000  
50%    190.000000  
75%    865.000000  
max    3600.000000  
Name: Sodium, dtype: float64
```

③ T/F The results shown from applying the `describe()` function is known as a summary of statistics.
True.

Finding the Row of the Max Value

① To find the row of the max value of a column, we can use the function _____.
`.idxmax()`

② A code for finding the row with max value of a column is _____.
`df['column_name'].idxmax()`.

③ T/F A way to find the item with the maximum value is through the `at` function.
True

④ A code to find an associated column of the maximum value is _____.
`row_max_value = df['column_name'].idxmax()`

⑤ An example code of the routine above is _____.

```
1 df['Sodium'].idxmax()  
out 82  
2 df.at[82, 'Item']  
out 'Chicken McNuggets (40 pieces)'
```

Data Exploration

① For initial data exploration, _____ is very useful.
Visualization

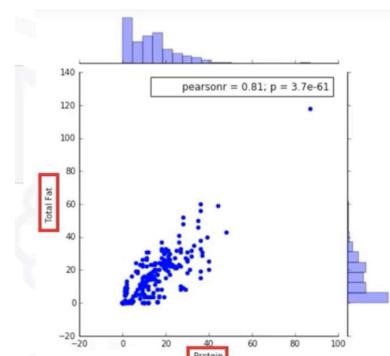
② Visualizations are useful for _____ understanding.
1. relationships
2. patterns, and
3. outliers
in the data.

Making Scatter plots (with Seaborn)

① To make a scatter plot using seaborn, we can use the _____ function.
`joinplot`

② A code for scatterplot is _____.

```
1 import matplotlib.pyplot as plt  
%matplotlib inline  
import seaborn as sns  
  
2 plot = sns.joinplot(x="Protein", y="Total Fat", data=df)  
plot.show()
```



③ A correlation is _____.

a measure

Correlation measures the association between two variables.

④ T/F Correlation has a value between -1 and 1.
True

⑤ On the top and to the right are _____.

histograms

⑥ The top represents _____.

⑦ The right represents _____.

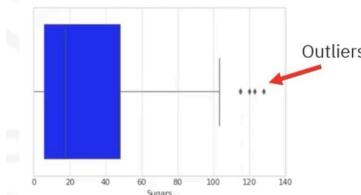
Total fat

Box Plots

① To indicate the distribution of one or more variable, we can use _____ box plots

② A sample code for boxplot is _____.

```
1: import matplotlib.pyplot as plt  
%matplotlib inline  
import seaborn as sns  
  
2: plot=sns.set_style("whitegrid")  
ax=sns.boxplot(x=df["Sugars"])  
plot.show()
```



Seaborn and Matplotlib

① Seaborn is _____.
a python library

② Seaborn is used for _____ data visualization

③ Seaborn is built on top of _____.

④ Matplotlib is a _____ Python visualization library

CSV files

① T/F Many real data set are CSV files.
True

② CSV stands for _____.

comma separated values

③ T/F CSV files are text files separated by a separator. That separator can be a semicolon too.
True

④ T/F In many cases, the first row in the table contains attribute labels.

True

⑤ The attribute labels map to _____.

column names in a table

⑥ An example of the first row of csv file is _____.
Id,Name of Dog, Breed (dominant breed if not pure breed)
1,Wolfie,German Shepherd
2,Fluffy,Pomeranian

CSV Row Header

- ① T/F The header row contains the names of the attributes.
True

- ② Suppose you are using phpMyAdmin tool to load the data into database. The steps to import into the database are _____.
1. Browse file to import.
 2. Select CSV from drop down for the format.

- ③ If the CSV has header, select the format to indicate that the first line contains the _____ take column name

Indicating Column Names

- ④ T/F To indicate a column name in SQL, it is often an accepted practice to use backticks around column name.
True

- ⑤ T/F To indicate a column name in SQL, single and double quotes will not work.
True

Splitting queries to Multiple Lines (in Jupyter)

- ① To split the query into multiple lines, use the _____ backslash "\\"

- ② An example of splitting the query is _____.
- ```
%sql SELECT Id, 'Name of Dog', \
 FROM dogs \
 WHERE 'Name of Dog' = 'Huggy';
```

- ③ T/F If you do not use backslash in python to split queries into multiple lines, you may get an error.  
True

- ④ T/F %sql enables the content of the cell to be interpreted as SQL code.  
True

- ⑤ T/F You do not need backslashes to split queries in SQL code.  
True

- ⑥ An example of splitting queries using SQL code is \_\_\_\_\_.

```
%sql
SELECT Id, 'Name of Dog', \
 FROM dogs \
 WHERE Name of Dog = 'Huggy';
```

## Using Pandas to Query

- ① The steps to use pandas to execute SQL code are \_\_\_\_\_.

1. Create query statement variable
2. Create connection variable
3. Apply read-sql

- ② An example of using pandas to query is \_\_\_\_\_.

```
query_statement = 'SELECT "Name of Dog" FROM dogs'
data = pandas.read_sql(query_statement, \
 connection_variable)
```

- ③ In the case that the query already has a single quote, use \_\_\_\_\_ the backslash

- ④ An example of correctly using backslash for query statement is \_\_\_\_\_.  
query\_statement = 'SELECT \* FROM dogs WHERE "Name of Dog" = "Huggy"'

- ⑤ Long queries include \_\_\_\_\_ (2).
1. Join query
  2. Sub queries

## List the Tables in a Database

- ① T/F Database systems typically contain system or catalog tables from where you can query the list of tables and get their properties.

True

- ② A chart of DBMS and their catalog:

| DBMS       | Catalog                   |
|------------|---------------------------|
| DB2        | SYSCAT_TABLES             |
| SQL Server | information_schema.tables |
| SQLite3    | sqlite_master             |
| MySQL      | SHOW TABLES               |

- ③ The query to get a list of tables and their properties in SQLite3 is \_\_\_\_\_.

```
SELECT name FROM sqlite_master
WHERE type = "table"
```

## Getting Table Attributes

- ① Table attributes include \_\_\_\_\_ column headers

- ② In SQLite3, you can get table attribute with \_\_\_\_\_.

```
PRAGMA table_info (tablename)
```

- ③ In MySQL, you can get table attribute with \_\_\_\_\_.

```
DESCRIBE table_name
```

## View

- ① A view is an alternative way of representing \_\_\_\_\_ data that exists in one or more tables or views.

- ② A view can include all or some of the \_\_\_\_\_ from one or more base tables or existing views.

- ③ Creating a view creates a \_\_\_\_\_ of a result table. named specification

- ④ The name specification from a view can be \_\_\_\_\_ queried in the same way as

a table

- ⑤ T/F You can change the data in the base table with insert, update, and delete queries against the view.

True

- ⑥ T/F Views are virtual tables and do not store data physically. Base table stores actual data physically in the database.  
True

- ⑦ T/F The definition of the view is stored not the data.  
True

## When to Use View

- ① Views can \_\_\_\_\_.

1. Show a selection of data for a given table
2. Combine two or more tables in meaningful ways
3. Simplify access to data

## CREATE VIEW statement

- ① The syntax for using the CREATE VIEW statement is \_\_\_\_\_.

```
CREATE VIEW viewname column_alias_1, \
 column_alias_2, ..., column_alias_n
AS SELECT column_1, column_2, ..., column_n
FROM tablename
WHERE predicate;
```

- ② T/F Viewname can be up to 128 characters long.  
True

- ③ column\_alias\_1, column\_alias\_2, ..., column\_alias\_n are the columns you \_\_\_\_\_ want to include

- ④ column\_1, column\_2, ..., column\_n to specify the columns in the \_\_\_\_\_ view

- ⑤ The tablename represents the \_\_\_\_\_ base table name

- ⑥ The WHERE clause refines the \_\_\_\_\_ rows in the view

- ⑦ An example of using CREATE VIEW is \_\_\_\_\_.

```
CREATE VIEW EMPINFO(EMP_ID, FIRSTNAME,
 LASTNAME, ADDRESS, JOB_ID, MANAGER_ID, DEP_ID)
AS SELECT EMP_ID, F_NAME, L_NAME, ADDRESS,
 JOB_ID, MANAGER_ID, DEP_ID
FROM EMPLOYEES;
```

- ⑧ To get the view, the code is \_\_\_\_\_.

```
SELECT * FROM EMPINFO
```

- ⑨ An example of a code for view is \_\_\_\_\_.

```
CREATE VIEW EMPINFO(EMP_ID, FIRSTNAME,
 LASTNAME, ADDRESS, JOB_ID, MANAGER_ID,
 DEP_ID)
AS SELECT EMP_ID, F_NAME, L_NAME, ADDRESS,
 JOB_ID, MANAGER_ID, DEP_ID
FROM EMPLOYEES
WHERE MANAGER_ID = '30002'
```

- ⑩ T/F The SELECT statement that is used to create the view can name other views and tables.  
True

- ⑪ T/F The SELECT statement that is used to create the view can use the WHERE, GROUP BY, and HAVING clause.  
True

- ⑫ T/F The SELECT statement that is used to create the view can not use ORDER BY or name a host variable.  
True

④ To remove a view completely, you can use \_\_\_\_\_.

DROP VIEW Viewname;

## Stored Procedure

① A stored procedure is a \_\_\_\_\_ set of SQL statements.

② A stored procedure is \_\_\_\_\_ stored and executed on the database server.

③ T/F Instead of sending multiple SQL statements from the client to server, the stored procedure on the server can send one statement from the client to execute them.

True

④ T/F You can write stored procedures in many different languages.

True (e.g. PL, PL/SQL, Java, C, ...)

⑤ Stored procedures can accept information in the form of \_\_\_\_\_ parameters.

⑥ T/F Stored procedures can also perform, create, read, update and delete i.e. CRUD operations.

True

⑦ Stored procedures return results to the client.

## Benefits of Stored Procedures

① There is reduction in network traffic because \_\_\_\_\_.

only one call is needed to execute multiple statements

② There is improvement in performance because \_\_\_\_\_.

the processing happens on the server

③ The server is where the \_\_\_\_\_ is stored.

data

④ Only the final \_\_\_\_\_ is passed back to the client.

result

⑤ There is reuse of code and this is good because \_\_\_\_\_.

multiple applications can use the same stored procedure for the same job

⑥ There is increase in security because \_\_\_\_\_.

1. You do not need to expose all of your table and column info to client side developers
2. You can use server-side logic to validate data before accepting it into the system.

⑦ The syntax for creating stored procedure in SQL is \_\_\_\_\_.

DELIMITER \$\$

```
CREATE PROCEDURE procedure_name(
param_1, param_2, ..., param_n)
BEGIN
```

SQL statement(s)

END

\$\$

DELIMITER ;

⑧ T/F The default delimiter to end the code for stored procedure is \$\$.

True

⑨ If you want to change back to SQL's default delimiter, you can write \_\_\_\_\_.

DELIMITER ;

⑩ T/F To write the stored procedure in a different language, you can \_\_\_\_\_ declare it.

LANGUAGE plpgsql;

⑪ PL/pgSQL is the native procedural language for \_\_\_\_\_.

PostgreSQL

⑫ To write stored procedure, you can use the \_\_\_\_\_.

1. CALL statement
2. pass the required parameters

## Transaction

① A transaction is a \_\_\_\_\_ indivisible unit of work.

② T/F A transaction can consist of one or more SQL statements.

True

③ A successful transaction means \_\_\_\_\_.

1. All SQL statements are completed successfully leaving database in new stable state, or
2. None must complete leaving the database as it was before the transaction

## ACID Transactions

① ACID stands for \_\_\_\_\_.

Atomic  
Consistent  
Isolated  
Durable

② Transactions are atomic because \_\_\_\_\_.

either all statements are successful or none are.

③ Transactions are consistent because \_\_\_\_\_.

data is consistently the same

④ Transactions are isolated because \_\_\_\_\_.

While the transaction is running, the data remains unchanged

⑤ Transactions are durable because \_\_\_\_\_.

Once a change occurs by the transaction, they persist.

## ACID Commands

① To start an ACID transaction, you can use \_\_\_\_\_.

BEGIN command

② T/F The BEGIN command is implicit, so you do not need to call it out explicitly.

True

③ T/F The BEGIN command will persist until it hits a COMMIT or ROLLBACK command.

True

④ If all the statements are completed successfully, you can use the \_\_\_\_\_.

COMMIT command

⑤ The commit command lets you \_\_\_\_\_.

save everything in the database to a consistent stable state

⑥ If any of the commands fail, you can issue a \_\_\_\_\_.

ROLLBACK command

⑦ The ROLLBACK command lets you \_\_\_\_\_.

undo all the changes and leave the database in its previously consistent stable state.

## Calling ACID commands

① T/F ACID commands can be called by Java, C, R, and Python.

True

② If you call ACID commands by Java, C, R, or Python, you are required to use \_\_\_\_\_ database specific APIs or connectors

③ Examples of database specific APIs or connectors are \_\_\_\_\_.

1. JDBC (Java Database Connectivity) for Java
2. (specific connector) ibm\_db for Python

## EXEC SQL

① Most languages use the EXEC SQL commands to initiate a \_\_\_\_\_.

SQL command

② Some SQL commands include \_\_\_\_\_.

1. COMMIT
2. ROLLBACK

## ERROR checking

① An example of incorporating error checking is \_\_\_\_\_.

Void main()

{

EXEC SQL UPDATE ...;

EXEC SQL UPDATE ...;

FINISHED :

EXEC SQL COMMIT WORK;

return;

SQLERR :

EXEC SQL WHENEVER SQLERROR CONTINUE;

EXEC SQL ROLLBACK WORK;

return;