In [28]:
```
"""
Description: This program simulates the exercise given at page 730 of Intro to Python for Computer Science and Data Science book.
It will perform basic commands on how to perform the CRUD operations with a database using sqlite3.

Section 17.2 Chapter 17 Big Data (page 730-741)

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"""


import sqlite3


# Creating a connection with the database
connection = sqlite3.connect('books.db')
```

In [29]:
```
import pandas as pd


# Using SQL statements to retrieved DataFrame content
pd.options.display.max_columns = 10
pd.read_sql('SELECT * FROM authors', connection, index_col=['id'])
```

Out[29]:

id	first	last
1	Paul	Deitel
2	Harvey	Deitel
3	Abbey	Deitel
4	Dan	Quirk
5	Alexander	Wald

In [30]:
```
# Display the titles table's content
pd.read_sql('SELECT * FROM titles', connection)
```

Out[30]:

	isbn	title	edition	copyright
0	0135404673	Intro to Python for CS and DS	1	2020
1	0132151006	Internet & WWW How to Program	5	2012
2	0134743350	Java How to Program	11	2018
3	0133976890	C How to Program	8	2016
4	0133406954	Visual Basic 2012 How to Program	6	2014
5	0134601548	Visual C# How to Program	6	2017
6	0136151574	Visual C++ How to Program	2	2008
7	0134448235	C++ How to Program	10	2017
8	0134444302	Android How to Program	3	2017
9	0134289366	Android 6 for Programmers	3	2016

In [31]:
```
# Storing in a variable the DataFrame returned values requested with an SQL statement
df = pd.read_sql('SELECT * FROM author_ISBN', connection)


# Display top 5 elements
df.head()
```

Out[31]:

	id	isbn
0	1	0134289366
1	2	0134289366
2	5	0134289366
3	1	0135404673
4	2	0135404673

In [32]:
```
# Displaying first and last columns of authors table
pd.read_sql('SELECT first, last FROM authors', connection)
```

Out[32]:

	first	last
0	Paul	Deitel
1	Harvey	Deitel
2	Abbey	Deitel
3	Dan	Quirk
4	Alexander	Wald

In [33]:
```
# Delimiting and retrieving SQL selection criteria. Title Edition Copyright > 2016
pd.read_sql("""SELECT title, edition, copyright FROM titles WHERE copyright > '2016'""", connection)
```

Out[33]:

	title	edition	copyright
0	Intro to Python for CS and DS	1	2020
1	Java How to Program	11	2018
2	Visual C# How to Program	6	2017
3	C++ How to Program	10	2017
4	Android How to Program	3	2017

In [34]:
```
# Display all authors whose last name starts with letter D
pd.read_sql("""SELECT id, first, last FROM authors WHERE last LIKE 'D%'""", connection, index_col=['id'])
```

Out[34]:

id	first	last
1	Paul	Deitel
2	Harvey	Deitel
3	Abbey	Deitel

In [35]:
```
# Displaying all authors whose last name start with any character followed by the letter b
pd.read_sql("""SELECT id, first, last FROM authors WHERE first LIKE '_b%'""", connection, index_col=['id'])
```

Out[35]:

id	first	last
3	Abbey	Deitel

In [36]:
```
# Sorting titles in ascending order
pd.read_sql('SELECT title FROM titles ORDER BY title ASC', connection)
```

Out[36]:

	title
0	Android 6 for Programmers
1	Android How to Program
2	C How to Program
3	C++ How to Program
4	Internet & WWW How to Program
5	Intro to Python for CS and DS
6	Java How to Program
7	Visual Basic 2012 How to Program
8	Visual C# How to Program
9	Visual C++ How to Program

In [37]:
```
# Sorting authors' names by last name, then by first name for any authors who have the same last name
pd.read_sql("""SELECT id, first, last FROM authors ORDER BY last, first""", connection, index_col=['id'])
```

Out[37]:

id	first	last
3	Abbey	Deitel
2	Harvey	Deitel
1	Paul	Deitel
4	Dan	Quirk
5	Alexander	Wald

In [38]:
```
# Sorting the authors in descending order by last name and ascending order by first name for any authors who have the same last name
pd.read_sql("""SELECT id, first, last FROM authors ORDER BY last DESC, first ASC""", connection, index_col=['id'])
```

Out[38]:

id	first	last
5	Alexander	Wald
4	Dan	Quirk
3	Abbey	Deitel
2	Harvey	Deitel
1	Paul	Deitel

In [39]:
```
# Display isbn, title, edition and copyright of each boko in titles table with a title ending with 'How to Program'
pd.read_sql("""SELECT isbn, title, edition, copyright FROM titles WHERE title LIKE '%How to Program' ORDER BY title""", connection)
```

Out[39]:

	isbn	title	edition	copyright
0	0134444302	Android How to Program	3	2017
1	0133976890	C How to Program	8	2016
2	0134448235	C++ How to Program	10	2017
3	0132151006	Internet & WWW How to Program	5	2012
4	0134743350	Java How to Program	11	2018
5	0133406954	Visual Basic 2012 How to Program	6	2014
6	0134601548	Visual C# How to Program	6	2017
7	0136151574	Visual C++ How to Program	2	2008

In [40]:
```
# Display a list of authors with their isbn book
pd.read_sql("""SELECT first, last, isbn FROM authors INNER JOIN author_ISBN ON authors.id = author_ISBN.id ORDER BY last, first""", connection)
```

Out[40]:

	first	last	isbn
0	Abbey	Deitel	0132151006
1	Abbey	Deitel	0133406954
2	Harvey	Deitel	0134289366
3	Harvey	Deitel	0135404673
4	Harvey	Deitel	0132151006

In [41]:
```
# Adding a cursor to execute SQL statements that modify the database
cursor = connection.cursor()

# Inserting a ROW inside a table
cursor = cursor.execute("""INSERT INTO authors (first, last) VALUES ('Sue', 'Red')""")
```

In [42]:
```
pd.read_sql('SELECT id, first, last FROM authors', connection, index_col=['id'])
```

Out[42]:

id	first	last
1	Paul	Deitel
2	Harvey	Deitel
3	Abbey	Deitel
4	Dan	Quirk
5	Alexander	Wald
6	Sue	Red

In [43]:
```
# Modifying an existing value
cursor = cursor.execute("""UPDATE authors SET last='Black' WHERE last='Red' AND first='Sue'""")
```

In [44]:
```
# Check number of rows that were modified
cursor.rowcount
```

Out[44]:
```
1
```

In [45]:
```
# Check if the UPDATE of an existing value was made with success
pd.read_sql('SELECT id, first, last FROM authors', connection, index_col=['id'])
```

Out[45]:

id	first	last
1	Paul	Deitel
2	Harvey	Deitel
3	Abbey	Deitel
4	Dan	Quirk
5	Alexander	Wald
6	Sue	Black

In [20]:
```
# Removing rows from a table
cursor = cursor.execute('DELETE FROM authors WHERE id=6')

cursor.rowcount
```

Out[20]:
```
1
```

In [21]:
```
pd.read_sql('SELECT id, first, last FROM authors', connection, index_col=['id'])
```

Out[21]:

id	first	last
1	Paul	Deitel
2	Harvey	Deitel
3	Abbey	Deitel
4	Dan	Quirk
5	Alexander	Wald

In [46]:
```
pd.read_sql("""SELECT title, edition FROM titles ORDER BY edition DESC""", connection).head(3)
```

Out[46]:

	title	edition
0	Java How to Program	11
1	C++ How to Program	10
2	C How to Program	8

In [47]:
```
pd.read_sql("""SELECT * FROM authors WHERE first LIKE 'A%'""", connection)
```

Out[47]:

	id	first	last
0	3	Abbey	Deitel
1	5	Alexander	Wald

In [48]:
```
pd.read_sql("""SELECT isbn, title, edition, copyright FROM titles WHERE title NOT LIKE '%How to Program' ORDER BY title""", connection)
```

Out[48]:

	isbn	title	edition	copyright
0	0134289366	Android 6 for Programmers	3	2016
1	0135404673	Intro to Python for CS and DS	1	2020

In [49]:
```
# When we finished our taks, close the connection with the database :)
connection.close()
```