

Individual Project

Job-Shop Accounting Database Implementation

Database Management Systems (DSA 4513-995)

Fall 2021

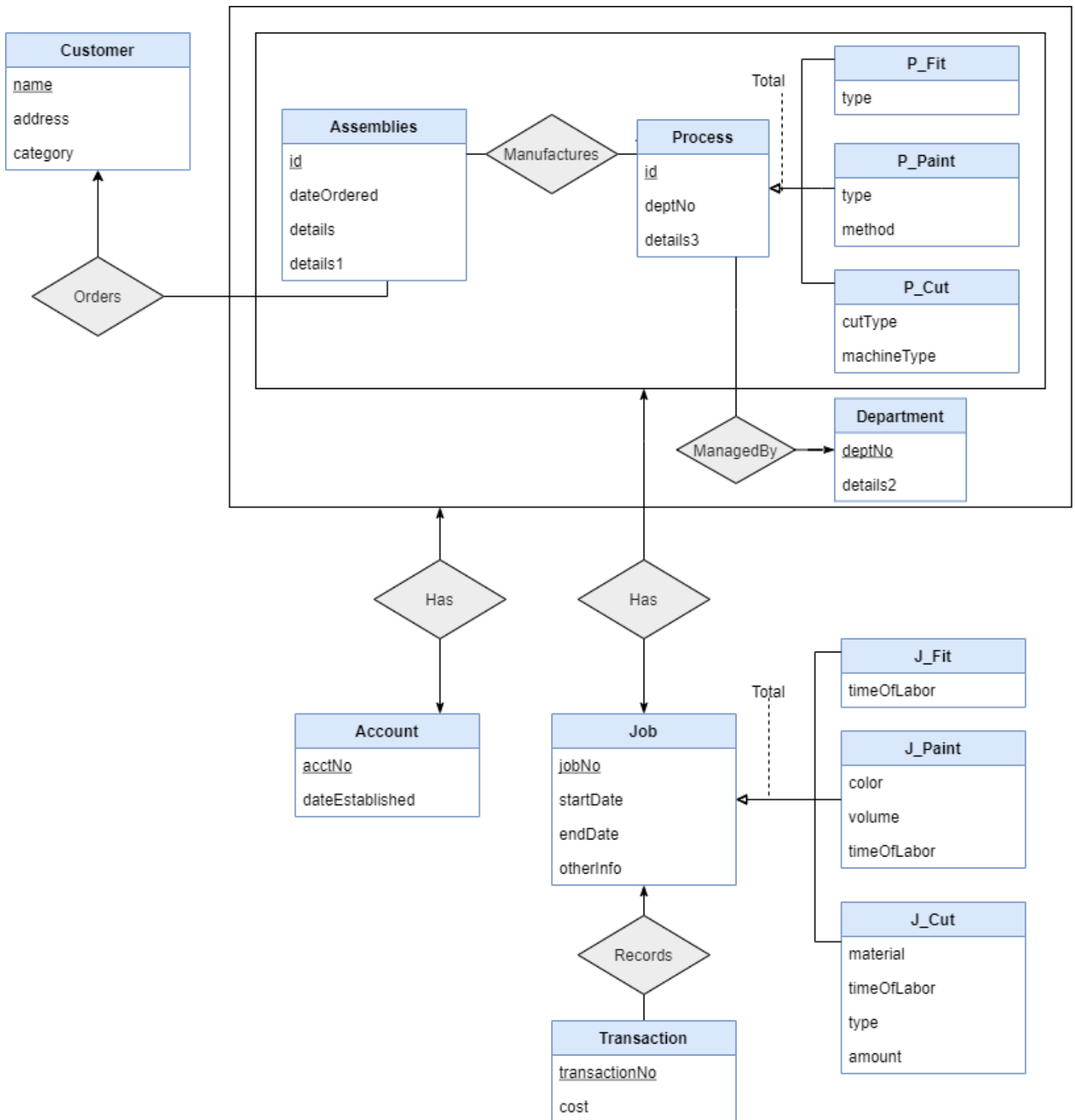
Instructor Dr. Le Gruenwald

Daniel Carpenter
dbry1024@gmail.com

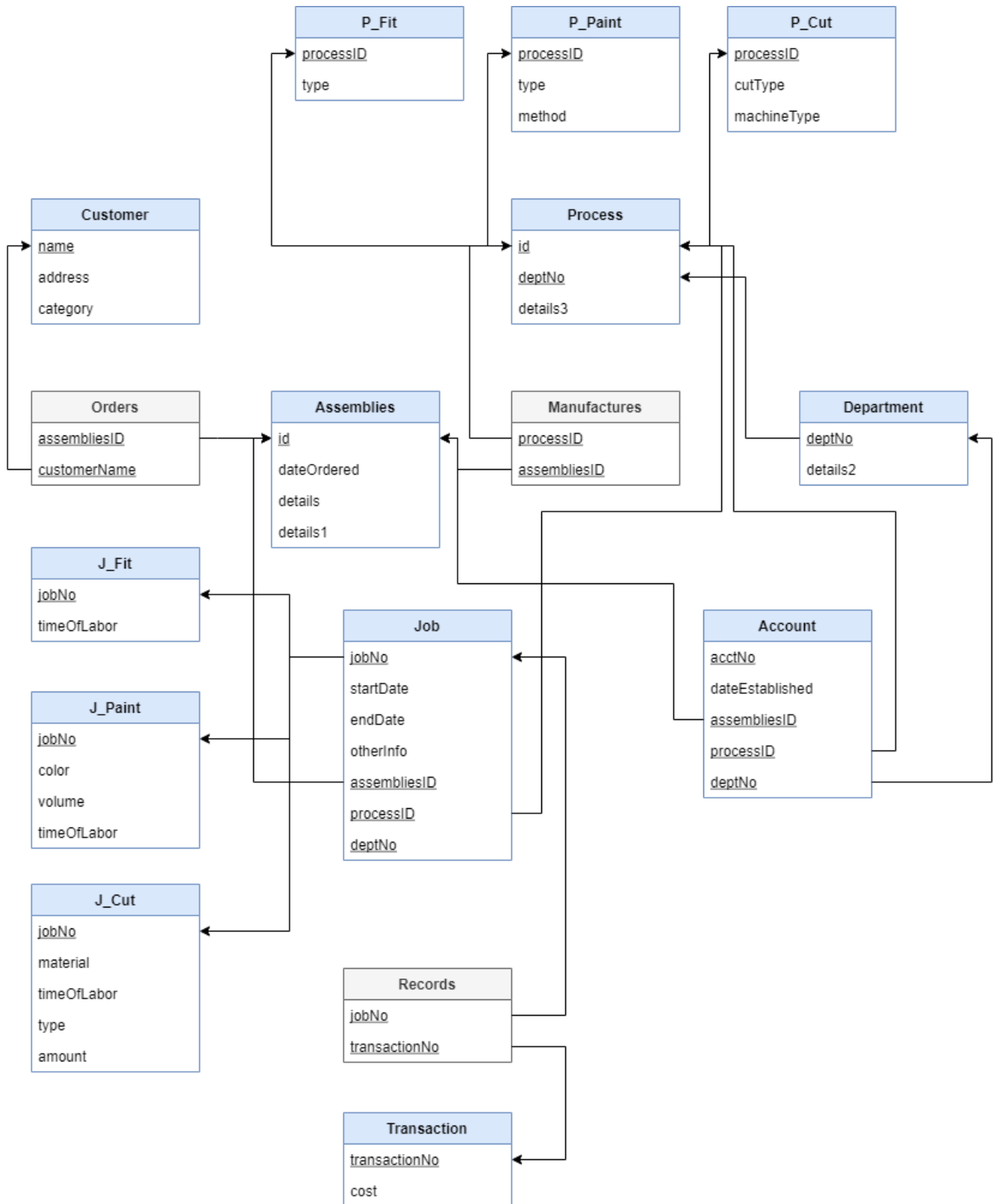
Table of Contents

Tasks Performed	Page Number
<i>Task 1.</i>	<i>2-3</i>
1.1. Entity Relation Diagram (ERD)	2-2
1.2. Relational Database Schema	3-3
<i>Task 2. Data Dictionary</i>	<i>4-5</i>
<i>Task 3.</i>	<i>6-10</i>
3.1. Storage Structures for Tables	6-9
3.2. Storage Structures for Tables in Azure SQL Database	10-10
<i>Task 4. SQL Statements for Creation of Tables in Azure SQL Database</i>	<i>11-17</i>
<i>Task 5.</i>	<i>18-51</i>
5.1. SQL Statements and Associated Stored Procedures Implementing All Queries (1-15 and Error Checking)	18-30
5.2. Java Source Program and Associated Screenshots of Successful Compilation	31-51
<i>Task 6. Java Program Execution</i>	<i>52-79</i>
6.1. Screenshots showing the testing of Query 1	52-52
6.2. Screenshots showing the testing of Query 2	53-53
6.3. Screenshots showing the testing of Query 3	54-55
6.4. Screenshots showing the testing of Query 4	56-56
6.5. Screenshots showing the testing of Query 5	57-57
6.6. Screenshots showing the testing of Query 6	58-59
6.7. Screenshots showing the testing of Query 7	60-60
6.8. Screenshots showing the testing of Query 8	61-61
6.9. Screenshots showing the testing of Query 9	62-62
6.10. Screenshots showing the testing of Query 10	63-63
6.11. Screenshots showing the testing of Query 11	64-64
6.12. Screenshots showing the testing of Query 12	65-65
6.13. Screenshots showing the testing of Query 13	66-66
6.14. Screenshots showing the testing of Query 14	67-69
6.15. Screenshots showing the testing of Query 15	70-72
6.16. Screenshots showing the testing of the import and export options	73-75
6.17. Screenshots showing the testing of three types of errors	76-78
6.18. Screenshots showing the testing of the quit option	79-79
<i>Task 7. Web database application and its execution</i>	<i>80-95</i>
7.1. Web Database Application Source Program and Associated Screenshots of Successful Compilation	80-90
7.2. Screenshots Showing the Testing of the Web Database Application	91-96

1.1. Entity Relation Diagram (ERD)



1.2. Relational Database Schema



Task 2. Data Dictionary

Table Name	Attribute Name	Attribute Type	Attribute Sizes (bytes)	Constraint
Customer	<u>name</u>	VARCHAR(255)	1 byte	Primary Key
Customer	address	VARCHAR(255)	1 byte	
Customer	category	INT	4 bytes	from 1 to 10
Orders	<u>customerName</u>	VARCHAR(255)	1 byte	Foreign Key
Orders	<u>assembliesID</u>	INT	4 bytes	Foreign Key
Assemblies	<u>id</u>	INT	4 bytes	Primary Key
Assemblies	dateOrdered	DATE	3 bytes	
Assemblies	details	VARCHAR(255)	1 byte	
Assemblies	details1	REAL	4 - 8 bytes	
Manufactures	<u>assembliesID</u>	INT	4 bytes	Foreign Key
Manufactures	<u>processID</u>	INT	4 bytes	Foreign Key
Process	<u>id</u>	INT	4 bytes	Primary Key
Process	<u>deptNo</u>	INT	4 bytes	Foreign Key
Process	details3	REAL	4 - 8 bytes	
P_Fit	<u>processID</u>	INT	4 bytes	Foreign Key
P_Fit	type	VARCHAR(255)	1 byte	
P_Paint	<u>processID</u>	INT	4 bytes	Foreign Key
P_Paint	type	VARCHAR(255)	1 byte	
P_Paint	method	VARCHAR(255)	1 byte	
P_Cut	<u>processID</u>	INT	4 bytes	Foreign Key
P_Cut	cutType	VARCHAR(255)	1 byte	
P_Cut	machineType	VARCHAR(255)	1 byte	
Department	<u>deptNo</u>	INT	4 bytes	Primary Key
Department	details2	REAL	4 - 8 bytes	

Task 2. Data Dictionary (*Continued*)

Table Name	Attribute Name	Attribute Type	Attribute Sizes (bytes)	Constraint
Job	<u>JobNo</u>	INT	4 bytes	Primary Key
Job	startDate	DATE	3 bytes	
Job	endDate	DATE	3 bytes	
Job	otherInfo	VARCHAR(255)	1 byte	
Job	<u>assembliesID</u>	INT	4 bytes	Foreign Key
Job	<u>processID</u>	INT	4 bytes	Foreign Key
Job	<u>deptNo</u>	INT	4 bytes	Foreign Key
J_Fit	<u>JobNo</u>	INT	4 bytes	Foreign Key
J_Fit	timeOfLabor	INT	4 bytes	
J_Paint	<u>JobNo</u>	INT	4 bytes	Foreign Key
J_Paint	color	VARCHAR(255)	1 byte	
J_Paint	volume	REAL	4 - 8 bytes	
J_Paint	timeOfLabor	INT	4 bytes	
J_Cut	<u>JobNo</u>	INT	4 bytes	Foreign Key
J_Cut	material	VARCHAR(255)	1 byte	
J_Cut	timeOfLabor	INT	4 bytes	
J_Cut	type	VARCHAR(255)	1 byte	
J_Cut	amount	REAL	4 - 8 bytes	
Records	<u>jobNo</u>	INT	4 bytes	Foreign Key
Records	<u>transactionNo</u>	INT	4 bytes	Foreign Key
Transaction	<u>transactionNo</u>	INT	4 bytes	Primary Key
Transaction	cost	REAL	4 - 8 bytes	
Account	<u>acctNo</u>	INT	4 bytes	Primary Key
Account	dateEstablished	DATE	3 bytes	
Account	<u>assembliesID</u>	INT	4 bytes	Foreign Key
Account	<u>processID</u>	INT	4 bytes	Foreign Key
Account	<u>deptNo</u>	INT	4 bytes	Foreign Key

3.1. Storage Structures for Tables

Table Name	Query #	Query Type	Search Key	Query Frequency Per Day	Query Frequency Per Month	Selected File Organization	Justification
Account	5	Insertion	acctNo	10	310	B+ Tree on search key: acctNo	Since both range and random searches total to be the most frequent query, ordered indices are to be preferred. B+ Trees will efficiently handle both of these search types. Additionally, since insertion makes up the remaining queries, B+ Trees fortunately will be preferred over B Trees.
Account	8	Random Search	acctNo	50	1,550		
Account	9	Random Search	acctNo	200	6,200		
Account	10	Random Search	acctNo	20	620		
Account	11	Range Search	acctNo	100	3,100		
Account	12	Range Search	acctNo	20	620		
Assemblies	4	Insertion	id	40	1,240	B+ Tree on search key: id	Since range searches are the most common query, ordered indices are to be preferred. Also, B+ Trees efficiently handle range searches.
Assemblies	5	Random Search	id	10	310		
Assemblies	11	Range Search	id	100	3,100		
Assemblies	8	Insertion	details1	50	1,550	Heap on search key details1	Since heaps handle insertion very well, use heap index on search key
Customer	1	Insertion	name	30	930	B+ Tree on search key: name	Since range searches are the most common query, ordered indices are to be preferred. Also, B+ Trees efficiently handle range searches.
Customer	4	Insertion	name	40	1,240		
Customer	13	Range Search	name	100	3,100		
Department	2	Insertion	deptNo	Infrequent	Infrequent	B+ Tree on search key: deptNo	Since range searches are the most common query, ordered indices are to be preferred. Also, B+ Trees efficiently handle range searches.
Department	3	Insertion	deptNo	Infrequent	Infrequent		
Department	5	Random Search	deptNo	10	310		
Department	10	Random Search	deptNo	20	620		
Department	11	Range Search	deptNo	100	3,100		
Department	12	Range Search	deptNo	20	620		
Department	8	Insertion	details2	50	1,550	Heap on search key details2	Since heaps handle insertion very well, use heap index on search key

3.1. Storage Structures for Tables (Continued)

Table Nam	Query #	Query Type	Search Key	Query Frequency Per Day	Query Frequency Per Month	Selected File Organization	Justification
J_Cut	10	Random Search	jobNo	20	620	Static Hash Table on search key: JobNo	Since only random search, and the table stores attributes of the main table, a hash table would work well for retrieving the search key. Since no insertion anticipated, a static hash function will work.
J_Fit	10	Random Search	jobNo	20	620	Static Hash Table on search key: JobNo	Since only random search, and the table stores attributes of the main table, a hash table would work well for retrieving the search key. Since no insertion anticipated, a static hash function will work.
J_Paint	10	Random Search	jobNo	20	620	Dynamic Hash Table on search key: JobNo	Since only random search, and the table stores attributes of the main table, a hash table would work well for retrieving the search key. Since no insertion anticipated, a static hash function will work.
J_Paint	15	Insertion/Deletion	color	1/7	4	B+ Tree on search key: color	Since B+ Trees can handle insertion and deletion well, we will index using a B+ Tree on the effected attributed, color.
Job	7	Insertion	dateCompleted, otherInfo	50	1,550	Heap on search key: dateCompleted, otherInfo	Since heaps handle insertion very well, use heap index on search key
Job	6	Insertion	JobNo	50	1,550	B+ Tree on search key: JobNo	Since range searches are the most common query, ordered indices are to be preferred. Also, B+ Trees efficiently handle range searches.
Job	8	Random Search	JobNo	50	1,550		
Job	9	Random Search	JobNo	200	6,200		
Job	10	Random Search	JobNo	20	620		
Job	11	Range Search	JobNo	100	3,100		
Job	12	Range Search	JobNo	20	620		
Job	14	Deletion	JobNo	1/31	1		

3.1. Storage Structures for Tables (Continued)

Table Name	Query #	Query Type	Search Key	Query Frequency Per Day	Query Frequency Per Month	Selected File Organization	Justification
Manufactures	4	Random Search	assembliesID	40	1,240	B+ Tree on search key: assembliesID	Since range searches are the most common query, ordered indices are to be preferred. Also, B+ Trees efficiently handle range searches.
Manufactures	11	Range Search	assembliesID	100	3,100		
Orders	4	Insertion	customerName	40	1,240	Heap on search key: customerName	Since insertion is the only query type, Heaps offer fast processing since no searching happens before inserting.
Process	3	Insertion	id	Infrequent	Infrequent	B+ Tree on search key: id	Since range searches are the most common query, ordered indices are to be preferred. Also, B+ Trees efficiently handle range searches.
Process	4	Random Search	id	40	1,240		
Process	5	Random Search	id	10	310		
Process	11	Range Search	id	100	3,100		
Process	8	Insertion	details3	50	1,550	Heap on search key details3	Since heaps handle insertion very well, use heap index on search key
P_Cut	3	Insertion	processID	Infrequent	Infrequent	Heap on search key: processID	Since insertion is the only query type, Heaps offer fast processing since no searching happens before inserting.
P_Fit	3	Insertion	processID	Infrequent	Infrequent	Heap on search key: processID	Since insertion is the only query type, Heaps offer fast processing since no searching happens before inserting.
P_Paint	3	Insertion	processID	Infrequent	Infrequent	Heap on search key: processID	Since insertion is the only query type, Heaps offer fast processing since no searching happens before inserting.
Records	8	Random Search	jobNo	50	1,550	Hash Table on search key: jobNo	Since random search occurs 250 times per day, a hash table would work well for retrieving the search key.
Records	9	Random Search	jobNo	200	6,200		

3.1. Storage Structures for Tables (*Continued*)

Table Nam <input type="text"/>	Query # <input type="text"/>	Query Type <input type="text"/>	Search Key <input type="text"/>	Query Frequency Per Day <input type="text"/>	Query Frequency Per Month <input type="text"/>	Selected File Organization <input type="text"/>	Justification <input type="text"/>
Transaction	8	Insertion	transactionNo	50	1,550	Dynamic Hash Table on search key: transactionNo	Since random search occurs 200 times per day (versus insertion in query number 8 of 50 times per day), a hash table would work well for retrieving the search key. Since insertions occur often though, a dynamic hash function is likely necessary.
Transaction	9	Random Search	transactionNo	200	6,200		

3.2. Storage Structures for Table (Azure SQL Database)

B+ Tree Data Structure

In order to implement a B+ Tree, basic index creation in SQL Server are B+ Trees. Therefore, for all recommended indices with B+ Tree implementations use a simple index on the attribute.

Source: <https://sqlity.net/en/2445/b-plus-tree/>

Heap Data Structure

By default, a table is a Heap when created.

Source: <https://docs.microsoft.com/en-us/sql/relational-databases/indexes/heaps-tables-without-clustered-indexes?view=sql-server-ver15>

Static Hash Table Data Structure

It is possible to create Hash tables for memory optimized tables. To implement this hash index, you would alter (either immediately after creation of the table, or at some future point) the table and specify the number of buckets for each bin. However, I am unaware of how to create this memory optimized table; per recommendations of Microsoft for an alternative, I have instead created a non-clustered index on the specified attribute(s).

Source: https://docs.microsoft.com/en-us/sql/relational-databases/sql-server-index-design-guide?view=sql-server-ver15#hash_index

Dynamic Hash Table Data Structure

The process is the same as creating a static hash index, but you would dynamically set the number of buckets (or bins). Note that you would need to somehow schedule some update of these bins, which I theorize could be possible with a scheduled stored procedure. If I were to implement it, I would use some hash function based on the number of bins (e.g. using a modulo function) for the table at that point in time. Due to the issues stated in the Static Hash section, I have chosen to use a non-clustered index for each specified attribute.

Task 4. SQL Statements to Create Tables in Azure SQL Database

```
-- =====
-- @class: DSA 4513
-- @asmt: Class Project
-- @task: 4
-- @author: Daniel Carpenter, ID: 113009743
-- @description:
--     Queries to create tables, constraints, and indiceds of the job-shop
--     accounting system database
-- =====

-- Use Daniel Carpenter's Azure Database for all queries
USE [cs-dsa-4513-sql-db]

-- =====
-- DROP TABLES IF ALREADY EXISTING
-- Note: Using schema named 'Project' for this Project's Tables
-- =====

-- Tables -----
DROP TABLE IF EXISTS [Project].[P_Fit];
DROP TABLE IF EXISTS [Project].[P_Paint];
DROP TABLE IF EXISTS [Project].[P_Cut];
DROP TABLE IF EXISTS [Project].[J_Fit];
DROP TABLE IF EXISTS [Project].[J_Paint];
DROP TABLE IF EXISTS [Project].[J_Cut];
DROP TABLE IF EXISTS [Project].[Orders];
DROP TABLE IF EXISTS [Project].[Manufactures];
DROP TABLE IF EXISTS [Project].[ManagedBy];
DROP TABLE IF EXISTS [Project].[Records];
DROP TABLE IF EXISTS [Project].[Customer];
DROP TABLE IF EXISTS [Project].[Job];
DROP TABLE IF EXISTS [Project].[Transaction];
DROP TABLE IF EXISTS [Project].[Account];
```

```

DROP TABLE IF EXISTS [Project].[Assemblies];
DROP TABLE IF EXISTS [Project].[Process];
DROP TABLE IF EXISTS [Project].[Department];

-- =====
-- CREATE TABLES, INDICES, AND CONSTRAINTS FOR JOB-SHOP DATABASE
-- =====

-- Create the Customer Table -----
CREATE TABLE [Project].Customer (
    [name]          VARCHAR(255) PRIMARY KEY,
    [address]       VARCHAR(255) NOT NULL,
    [category]      INT NOT NULL,
    CONSTRAINT      CTGRY_RANGE CHECK(category >= 1 AND category <= 10)
)
-- Create B+ Tree Index on name of Customer table
CREATE INDEX [IDX_Customer_ON_name] ON [Project].Customer([name]);

-- Create the Assemblies Table -----
CREATE TABLE [Project].Assemblies (
    [id]            INT PRIMARY KEY,
    [dateOrdered]   DATE NOT NULL,
    [details]       VARCHAR(255) DEFAULT NULL,
    [details1]      REAL DEFAULT 0,
    CONSTRAINT      [NON_NEG_id_Assemblies] CHECK(id > 0)
)
-- Create B+ Tree Index on id of Assemblies table
CREATE INDEX [IDX_Assemblies_ON_id] ON [Project].Assemblies(id);

-- Create the Orders Table -----
CREATE TABLE [Project].Orders (
    [customerName]  VARCHAR(255) FOREIGN KEY REFERENCES [Project].Customer,

```

```

    [assembliesID] INT NOT NULL FOREIGN KEY REFERENCES [Project].Assemblies
)

-- Create the Fit Table for Processes -----
CREATE TABLE [Project].P_Fit (
    [processID] INT PRIMARY KEY,
    [type] VARCHAR(255) DEFAULT NULL,
    CONSTRAINT [NON_NEG_id_P_Fit] CHECK(processID > 0)
)

-- Create the Paint Table for Processes -----
CREATE TABLE [Project].P_Paint (
    [processID] INT PRIMARY KEY,
    [type] VARCHAR(255) DEFAULT NULL,
    [method] VARCHAR(255) DEFAULT NULL,
    CONSTRAINT [NON_NEG_id_P_Paint] CHECK(processID > 0)
)

-- Create the Cut Table for Processes -----
CREATE TABLE [Project].P_Cut (
    [processID] INT PRIMARY KEY,
    [cutType] VARCHAR(255) DEFAULT NULL,
    [machineType] VARCHAR(255) DEFAULT NULL,
    CONSTRAINT [NON_NEG_id_P_Cut] CHECK(processID > 0)
)

-- Create the Table for Departments-----
CREATE TABLE [Project].Department (
    [deptNo] INT PRIMARY KEY,
    [details2] REAL DEFAULT 0,
    CONSTRAINT [NON_NEG_deptNo_Department] CHECK(deptNo > 0)
)

```

```

-- Create B+ Tree Index on deptNo of the Department table
CREATE INDEX [IDX_Department_ON_deptNo] ON [Project].Department(deptNo);

-- Create the Table for Processes -----
CREATE TABLE [Project].Process (
    [id]          INT PRIMARY KEY,
    [deptNo]      INT FOREIGN KEY REFERENCES [Project].Department,
    [details3]    REAL DEFAULT 0,
    CONSTRAINT    [NON_NEG_id_Process] CHECK(id > 0)
)

-- Create the Relation Table between the Process and Assemblies tables -----
CREATE TABLE [Project].Manufactures (
    [assembliesID] INT NOT NULL FOREIGN KEY REFERENCES [Project].Assemblies,
    [processID]    INT NOT NULL FOREIGN KEY REFERENCES [Project].Process
)

--Create B+ Tree Index on deptNo of the Manufactures table
CREATE INDEX [IDX_Manufactures_ON_assembliesID] ON [Project].Manufactures(assembliesID);

-- Create the Table for Jobs -----
CREATE TABLE [Project].Job (
    [jobNo]       INT PRIMARY KEY,
    [startDate]   DATE NOT NULL,
    [endDate]     DATE DEFAULT NULL,
    [otherInfo]   VARCHAR(255) DEFAULT NULL,
    [assembliesID] INT NOT NULL FOREIGN KEY REFERENCES [Project].Assemblies,
    [processID]   INT NOT NULL FOREIGN KEY REFERENCES [Project].Process,
    [deptNo]      INT NOT NULL FOREIGN KEY REFERENCES [Project].Department,
    CONSTRAINT    [NON_NEG_JobNo_Job] CHECK(JobNo > 0),
    CONSTRAINT    [POS_VAR_DATES_Job] CHECK(endDate >= startDate)
)

-- Create B+ Tree Index on id of Job table

```

```

CREATE INDEX [IDX_Job_ON_JobNo] ON [Project].Job(JobNo);

-- Create the Fit Table for Jobs -----
CREATE TABLE [Project].J_Fit (
    [jobNo]          INT FOREIGN KEY REFERENCES [Project].Job,
    [timeOfLabor]    INT DEFAULT 0,
    CONSTRAINT       [NON_NEG_id_J_Fit] CHECK(jobNo > 0),
    CONSTRAINT       [NON_NEG_timeOfLabor_J_Fit] CHECK([timeOfLabor] >= 0)
)
-- Create non-clustered index in place of ideal static hash table
CREATE NONCLUSTERED INDEX [IDX_J_Fit_ON_id] ON [Project].J_Fit(jobNo);

-- Create the Paint Table for Jobs -----
CREATE TABLE [Project].J_Paint (
    [jobNo]          INT FOREIGN KEY REFERENCES [Project].Job,
    [color]           VARCHAR(255) DEFAULT NULL,
    [volume]          REAL DEFAULT 0 NOT NULL,
    [timeOfLabor]     INT DEFAULT 0 NOT NULL,
    CONSTRAINT       [NON_NEG_id_J_Paint] CHECK(jobNo > 0),
    CONSTRAINT       [NON_NEG_timeOfLabor_J_Paint] CHECK([timeOfLabor] >= 0)
)
-- Create non-clustered index in place of dynamic hash table on id
CREATE NONCLUSTERED INDEX [IDX_J_Paint_ON_id] ON [Project].J_Paint(jobNo);

-- Create B+ tree index for color
CREATE INDEX [IDX_J_Paint_ON_color] ON [Project].J_Paint(color);

-- Create the Cut Table for Jobs -----
CREATE TABLE [Project].J_Cut (
    [jobNo]          INT FOREIGN KEY REFERENCES [Project].Job,
    [material]        VARCHAR(255) DEFAULT NULL,
    [timeOfLabor]     INT DEFAULT 0 NOT NULL,
    [type]            VARCHAR(255) DEFAULT NULL,

```



```

[amount]          REAL DEFAULT 0 NOT NULL,
CONSTRAINT        [NON_NEG_id_J_Cut]          CHECK(jobNo > 0),
CONSTRAINT        [NON_NEG_timeOfLabor_J_Cut] CHECK([timeOfLabor] >= 0)
)
-- Create non-clustered index in place of ideal static hash table
CREATE NONCLUSTERED INDEX [IDX_J_Cut_ON_id] ON [Project].J_Cut(jobNo);

-- Create the Table for Transactions -----
CREATE TABLE [Project].[Transaction] (
    [transactionNo] INT PRIMARY KEY,
    [cost]          REAL DEFAULT 0 NOT NULL,
    CONSTRAINT      [NON_NEG_transactionNo_Transaction] CHECK(transactionNo > 0),
    CONSTRAINT      [NON_NEG_cost_Transaction]           CHECK(cost >= 0)
)
-- Create non-clustered index in place of ideal dynamic hash table
CREATE NONCLUSTERED INDEX [IDX_Transaction_ON_transactionNo] ON [Project].[Transaction](transactionNo);

-- Create the Relation Table for the Job and Transactions tables -----
CREATE TABLE [Project].Records (
    [jobNo]          INT NOT NULL FOREIGN KEY REFERENCES [Project].Job,
    [transactionNo] INT NOT NULL FOREIGN KEY REFERENCES [Project].[Transaction]
)
-- Create non-clustered index in place of ideal dynamic hash table
CREATE NONCLUSTERED INDEX [IDX_Records_ON_jobNo] ON [Project].Records(jobNo);

-- Create the Table for Accounts -----
CREATE TABLE [Project].Account (
    [acctNo]          INT PRIMARY KEY,
    [dateEstablished] DATE NOT NULL,
    [assembliesID]    INT NOT NULL FOREIGN KEY REFERENCES [Project].Assemblies,
    [processID]       INT NOT NULL FOREIGN KEY REFERENCES [Project].Process,
    [deptNo]          INT NOT NULL FOREIGN KEY REFERENCES [Project].Department,
    CONSTRAINT        [NON_NEG_acctNo_Account] CHECK(acctNo > 0)
)

```

```
)  
-- Create B+ Tree Index on id of Accounts table  
CREATE INDEX [IDX_Account_ON_acctNo] ON [Project].Account(acctNo);
```

5.1. SQL Statements and Stored Procedures Implementing Queries 1 – 15

```
-- =====
-- @class: DSA 4513
-- @asmt: Class Project
-- @task: 5 (a)
-- @author: Daniel Carpenter, ID: 113009743
-- @description:
--     Queries to create procedures for queries 1 - 15 and 17 of the
--     job-shop accounting system database
-- =====

-- Use Daniel Carpenter's Azure Database for all queries
USE [cs-dsa-4513-sql-db]

-- =====
-- DROP PROCEDURES IF ALREADY EXISTING
-- Note: Using schema named 'Project' for this Project's Tables
-- =====

-- Drop Procedures -----
DROP PROCEDURE IF EXISTS [Project].addCustomer;      -- 1
DROP PROCEDURE IF EXISTS [Project].addDepartment;   -- 2
DROP PROCEDURE IF EXISTS [Project].addProcess;       -- 3
DROP PROCEDURE IF EXISTS [Project].addAssembly;      -- 4
DROP PROCEDURE IF EXISTS [Project].addAccount;       -- 5
DROP PROCEDURE IF EXISTS [Project].addJob;           -- 6
DROP PROCEDURE IF EXISTS [Project].setJobAsCompleted; -- 7
DROP PROCEDURE IF EXISTS [Project].addTransaction;   -- 8
DROP PROCEDURE IF EXISTS [Project].getTotalCosts;    -- 9
DROP PROCEDURE IF EXISTS [Project].getTotalLaborTime; -- 10
DROP PROCEDURE IF EXISTS [Project].getProcessUpdate; -- 11
DROP PROCEDURE IF EXISTS [Project].getJobs;          -- 12
DROP PROCEDURE IF EXISTS [Project].getCustomers;     -- 13
DROP PROCEDURE IF EXISTS [Project].deleteJobs;       -- 14
```

```
DROP PROCEDURE IF EXISTS [Project].setPaintJob;          -- 15
DROP PROCEDURE IF EXISTS [Project].getCustomersInRange; -- 17
```

```
-- =====
-- CREATE PROCEDURES USED IN JAVA
-- =====
```

```
-----
-- 1. Enter a new customer
-----
```

```
GO
CREATE PROCEDURE [Project].addCustomer
    @name      VARCHAR(255),
    @address   VARCHAR(255),
    @category  INT

AS
BEGIN
    INSERT INTO [Project].Customer VALUES (@name, @address, @category)
END

GO
```

```
-----
-- 2. Enter a new department
-----
```

```
GO
CREATE PROCEDURE [Project].addDepartment
    @deptNo INT
```

```

AS
BEGIN
    INSERT INTO [Project].Department VALUES (@deptNo, 0)
END
GO

```

```

-----
-- 3. Enter a new process-id and its department together with its type and information
-- relevant to the type
-----

```

```

GO
CREATE PROCEDURE [Project].addProcess
    @id          INT,
    @deptNo      INT

AS
BEGIN
    -- Update the process table
    INSERT INTO [Project].Process VALUES (@id, @deptNo, 0) -- assumes that the department already exists

    -- Insert the Process into Job Cut, Fit, and Paint table
    -- with other attributes assumed null or 0 where applicable
    INSERT INTO [Project].[P_Cut]    (processID) VALUES (@id)
    INSERT INTO [Project].[P_Fit]    (processID) VALUES (@id)
    INSERT INTO [Project].[P_Paint]  (processID) VALUES (@id)
END
GO

```

```

-----
-- 4. Enter a new assembly with its customer-name, assembly-details, assembly-id,
-- and dateordered and associate it with one or more processes
-----

```

```

GO
CREATE PROCEDURE [Project].addAssembly
    @assID          INT,
    @dateOrdered    DATE,
    @details        VARCHAR(255),
    @customerName   VARCHAR(255),
    @processID      INT

AS
BEGIN
    -- Add the assembly
    INSERT INTO [Project].Assemblies VALUES (@assID, @dateOrdered, @details, 0)

    -- Add assembly id and customer name to the relation table 'Orders'
    INSERT INTO [Project].Orders      VALUES (@customerName, @assID)

    -- Update into the Relation table manufactures
    INSERT INTO [Project].Manufactures VALUES (@assID, @processID)
END
GO

```

```

-----
-- 5. Create a new account and associate it with the process, assembly, or department
-- to which it is applicable
-----

```

```

GO
CREATE PROCEDURE [Project].addAccount
    @acctNo          INT,
    @dateEstablished  DATE,
    @assembliesID     INT,
    @processID        INT,
    @deptNo           INT

```

```

AS
BEGIN
    -- Add an account to the 'Account' table
    INSERT INTO [Project].Account VALUES (@acctNo, @dateEstablished, @assembliesID, @processID, @deptNo)

END
GO

```

```

-----
-- 6. Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
-----

```

```

GO
CREATE PROCEDURE [Project].addJob
    @jobNo          INT,
    @startDate       DATE,
    @assembliesID    INT,
    @processID       INT,
    @deptNo          INT

AS
BEGIN
    -- Insert only releveant values into Job table,
    -- intentionally omitting end date and other info attributes
    INSERT INTO [Project].Job (jobNo, startDate, assembliesID, processID, deptNo)
    VALUES
        (@jobNo, @startDate, @assembliesID, @processID, @deptNo)

    -- Insert the job into Job Cut, Fit, and Paint table
    -- with other attributes assumed null or 0 where applicable
    INSERT INTO [Project].[J_Cut] (jobNo) VALUES (@jobNo)
    INSERT INTO [Project].[J_Fit] (jobNo) VALUES (@jobNo)
    INSERT INTO [Project].[J_Paint] (jobNo) VALUES (@jobNo)

END

```

GO

```
-----  
-- 7. At the completion of a job, enter the date it completed and the information  
-- relevant to the type of job  
-----
```

GO

CREATE PROCEDURE [Project].setJobAsCompleted

 @jobNo INT,
 @endDate DATE,
 @otherInfo VARCHAR(255)

AS

BEGIN

 -- Update existing job's end date and other info

 UPDATE [Project].Job

 SET [Project].Job.endDate = @endDate,
 [Project].Job.otherInfo = @otherInfo

 -- only show selected values for a given job number

 WHERE [Project].Job.jobNo = @jobNo

END

GO

```
-----  
-- 8. Enter a transaction-no and its sup-cost and update all the costs (details) of the  
-- affected accounts by adding sup-cost to their current values of details  
-----
```

GO

CREATE PROCEDURE [Project].addTransaction

 @transactionNo INT,
 @cost REAL,


```
@deptNo      INT,  
@assembliesID INT,  
@processID   INT,  
@jobNo       INT
```

```
AS
```

```
BEGIN
```

```
-- Update the transaction table
```

```
INSERT INTO [Project].[Transaction] VALUES (@transactionNo, @cost)
```

```
-- Update the Relation table Records to associate with a job
```

```
INSERT INTO [Project].[Records] VALUES (@jobNo, @transactionNo)
```

```
UPDATE [Project].Assemblies
```

```
SET [Project].Assemblies.details1 += @cost -- Adds to the existing values in field
```

```
WHERE [Project].Assemblies.id = @assembliesID
```

```
-- Update the Department Table for the given department
```

```
UPDATE [Project].Department
```

```
SET [Project].Department.details2 += @cost -- Adds to the existing values in field
```

```
WHERE [Project].Department.deptNo = @deptNo
```

```
-- Update the Process table for the given Process
```

```
UPDATE [Project].Process
```

```
SET [Project].Process.details3 += @cost -- Adds to the existing values in field
```

```
WHERE [Project].Process.id = @processID
```

```
END
```

```
GO
```

```
-----  
-- 9. Retrieve the total cost incurred on an assembly-id  
-----
```

```
GO
```

```
CREATE PROCEDURE [Project].getTotalCosts
```

```

    @id INT

AS
BEGIN
    SELECT details1 AS TOTAL_COST
    FROM [Project].Assemblies

    -- Only show the selected assemblies ID
    WHERE id = @id
END
GO

```

```

-----
-- 10. Retrieve the total labor time within a department for jobs completed in the
-- department during a given date
-----

```

```

GO
CREATE PROCEDURE [Project].getTotalLaborTime
    @deptNo INT,
    @endDate DATE

AS
BEGIN
    SELECT
        deptNo,
        fit.timeOfLabor + cut.timeOfLabor + paint.timeOfLabor AS totalTimeOfLabor

    FROM [Project].Job job
        -- Join job cut table
    LEFT JOIN [Project].J_Cut cut
        ON job.jobNo = cut.jobNo

        -- Join job fit table
    LEFT JOIN [Project].J_Fit fit

```

```

        ON job.jobNo = fit.jobNo

        -- Join job paint table
        LEFT JOIN [Project].J_Paint paint
            ON job.jobNo = paint.jobNo

        -- Only show the selected deptNo and end date
        WHERE
            deptNo = @deptNo
            AND endDate = @endDate
    END
GO

-----
-- 11. Retrieve the processes through which a given assembly-id has passed so far
-- (in datecommenced order) and the department responsible for each process
-----

GO
CREATE PROCEDURE [Project].getProcessUpdate
    @assID INT

AS
BEGIN
    SELECT
        dateOrdered,
        processID,
        deptNo
    FROM [Project].Process [p]

        -- Relation table between manufactures and assemblies
        LEFT JOIN [Project].Manufactures [m]
            ON p.id = m.processID

        -- Join assemblies table

```

```
LEFT JOIN [Project].[Assemblies] [a]
ON m.assembliesID = a.id
```

```
-- Only show the given assemblies ID
```

```
WHERE a.id = @assID
```

```
ORDER BY dateOrdered
```

```
END
```

```
GO
```

```
-----
-- 12. Retrieve the jobs (together with their type information and assembly-id)
-- completed during a given date in a given department
-----
```

```
GO
```

```
CREATE PROCEDURE [Project].getJobs
```

```
    @deptNo INT,
```

```
    @endDate DATE
```

```
AS
```

```
BEGIN
```

```
    SELECT
```

```
        job.jobNo,
```

```
        otherInfo,
```

```
        assembliesID
```

```
FROM [Project].Job job
```

```
-- Join job cut table
```

```
LEFT JOIN [Project].J_Cut cut
```

```
    ON job.jobNo = cut.jobNo
```

```
-- Join job fit table
```

```
LEFT JOIN [Project].J_Fit fit
```

```

        ON job.jobNo = fit.jobNo

        -- Join job paint table
        LEFT JOIN [Project].J_Paint paint
            ON job.jobNo = paint.jobNo
    WHERE

        -- Conditional upon selected dept and date
        deptNo = @deptNo
        AND endDate = @endDate
    END
GO

```

```

-----
-- 13. Retrieve the customers (in name order) whose category is in a given range
-----

```

```

GO
CREATE PROCEDURE [Project].getCustomers
    @min INT,
    @max INT
AS
BEGIN
    SELECT [name]
    FROM [Project].Customer

    -- Get the customers with category between min and max range
    WHERE category BETWEEN @min AND @max
    ORDER BY [name]
END
GO

```

```

-----
-- 14. Delete all cut-jobs whose job-no is in a given range

```

```

GO
CREATE PROCEDURE [Project].deleteJobs
    @min INT,
    @max INT

AS
BEGIN
    DELETE FROM [Project].J_Cut

    -- Delete cuts between min and max job number range
    -- (with data related to a cut job)
    WHERE
        jobNo BETWEEN @min AND @max
        AND material IS NOT NULL
END
GO

```

-- 15. Change the color of a given paint job

```

GO
CREATE PROCEDURE [Project].setPaintJob
    @newColor VARCHAR(255),
    @jobNo INT

AS
BEGIN
    UPDATE [Project].J_Paint
    SET [Project].J_Paint.color = @newColor
    WHERE [Project].J_Paint.jobNo = @jobNo
END
GO

```

```
-----  
-- 17. Retrieve the customers (in name order) whose category is in a given range  
-----
```

```
GO  
CREATE PROCEDURE [Project].getCustomersInRange  
    @min INT,  
    @max INT  
  
AS  
    BEGIN  
        SELECT *  
        FROM [Project].Customer  
  
        -- Only within the min and max range  
        WHERE category BETWEEN @min AND @max  
        ORDER BY [name]  
    END  
GO
```

5.2. Java Source Code

```
import java.sql.CallableStatement;
import java.sql.Connection;
import java.util.Scanner;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.DriverManager;
import java.sql.PreparedStatement;
import java.io.*;
import java.io.FileWriter;

// =====
// @class: DSA 4513
// @asnmt: Class Project
// @task: 5 (b)
// @author: Daniel Carpenter, ID: 113009743
// @description:
//      Program to implement job-shop accounting system queries
// =====

public class Carpenter_Daniel_IP_Task5b {

    // Database credentials
    final static String HOSTNAME = "carp9743.database.windows.net";
    final static String DBNAME = "cs-dsa-4513-sql-db";
    final static String USERNAME = "carp9743";
    final static String PASSWORD = "tacoBout$97315!";

    // Database connection string
    final static String URL =
String.format("jdbc:sqlserver://%s:1433;database=%s;user=%s;password=%s;encrypt=true;trustServerCertificate=false;hostNameInCertificate="
        HOSTNAME, DBNAME, USERNAME, PASSWORD);

    // Selected integer that quits application
    final static int QUIT_APPLICATION = 18;

    // Create Template Queries to Execute stored procedures
    final static String QUERY_1 = "EXEC [Project].addCustomer @name = ?, @address = ?, @category = ?";
    final static String QUERY_2 = "EXEC [Project].addDepartment @deptNo = ?";
    final static String QUERY_3 = "EXEC [Project].addProcess @id = ?, @deptNo = ?";
    final static String QUERY_4 = "EXEC [Project].addAssembly @assID = ?, @dateOrdered = ?, @details = ?, @customerName = ?, @processID = ?";
```



```

final static String QUERY_5 = "EXEC [Project].addAccount @acctNo = ?, @dateEstablished = ?, @assembliesID = ?, @processID = ?, @dept
final static String QUERY_6 = "EXEC [Project].addJob @jobNo = ?, @startDate = ?, @assembliesID = ?, @processID = ?, @deptNo = ?";
final static String QUERY_7 = "EXEC [Project].setJobAsCompleted @jobNo = ?, @endDate = ?, @otherInfo = ?";
    final static String QUERY_8 = "EXEC [Project].addTransaction @transactionNo = ?, @cost = ?, @deptNo = ?, @assembliesID = ?, @proc
    final static String QUERY_9 = "{CALL [Project].getTotalCosts(?)}" ;
    final static String QUERY_10 = "{CALL [Project].getTotalLaborTime(?, ?)}";
    final static String QUERY_11 = "{CALL [Project].getProcessUpdate(?)}" ;
    final static String QUERY_12 = "{CALL [Project].getJobs(?, ?)}";
    final static String QUERY_13 = "{CALL [Project].getCustomers(?, ?)}";
    final static String QUERY_14 = "EXEC [Project].deleteJobs @min = ?, @max = ?";
    final static String QUERY_15 = "EXEC [Project].setPaintJob @newColor = ?, @jobNo = ?";
    final static String QUERY_17 = "{CALL [Project].getCustomersInRange(?, ?)}";

// User input prompt
final static String PROMPT =
    "\nPlease select one of the options below: \n" +
        "(1) Enter a new customer \n" +
        "(2) Enter a new department \n" +
        "(3) Enter a new process-id and its department together with its type and information \n" +
        "\trelevant to the type\n" +
        "(4) Enter a new assembly with its customer-name, assembly-details, assembly-id, \n" +
        "\tand dateordered and associate it with one or more processes\n" +
        "(5) Create a new account and associate it with the process, assembly, or department \n" +
        "\tto which it is applicable\n" +
        "(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced\n" +
        "(7) At the completion of a job, enter the date it completed and the information \n" +
        "\trelevant to the type of job \n" +
        "(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the \n" +
        "\taffected accounts by adding sup-cost to their current values of details \n" +
        "(9) Retrieve the total cost incurred on an assembly-id \n" +
        "(10) Retrieve the total labor time within a department for jobs completed in the \n" +
        "\tdepartment during a given date\n" +
        "(11) Retrieve the processes through which a given assembly-id has passed so far \n" +
        "\t(in datecommenced order) and the department responsible for each process\n" +
        "(12) Retrieve the jobs (together with their type information and assembly-id) \n" +
        "\tcompleted during a given date in a given department\n" +
        "(13) Retrieve the customers (in name order) whose category is in a given range\n" +
        "(14) Delete all cut-jobs whose job-no is in a given range\n" +
        "(15) Change the color of a given paint job\n" +
        "(16) Import: enter new customers from a data file until the file is empty \n" +
        "\t(the user must be asked to enter the input file name). \n" +
        "(17) Export: Retrieve the customers (in name order) whose category is in a given range \n" +

```

```
"\tand output them to a data file instead of screen (the user must be asked to enter the output file name).\n" +  
"(18) Quit\n";
```

```
// Function to read in a csv file and return a concatenated into an insert statement  
public static String readCSV(String filename) throws IOException, SQLException {
```

```
    // Number of columns in the customer table (3)
```

```
    final int NUM_CUST_COLS = 3;
```

```
    // string that will hold the insert statement
```

```
    String insertStatement = "INSERT INTO [Project].Customer VALUES (";
```

```
    // Create input reader
```

```
    BufferedReader input = new BufferedReader(new FileReader(filename));
```

```
    String line = "";
```

```
    int iterCount = 0; // keep track of iterations
```

```
    final int FIRST_ITER = 0;
```

```
    // Iterate through each 'row' of the csv
```

```
    while ((line = input.readLine()) != null) {
```

```
        // IF the first iteration, then do nothing. else concatenate parenthesis
```

```
        if (iterCount != FIRST_ITER) {
```

```
            insertStatement += ", (";
```

```
        } else {
```

```
            ++iterCount;
```

```
        }
```

```
    // Iterate through each 'column' of the csv file
```

```
    for (int col = 0; col < NUM_CUST_COLS; ++col) {
```

```
        // Add a ' ' in front of the string vars
```

```
        if (col != NUM_CUST_COLS - 1) {
```

```
            insertStatement += " ";
```

```
        }
```

```
    // return the value of the row for each column index (1 through 3)
```

```
    insertStatement += line.split(",")[col];
```

```
    // If not at last column, add comma to the string
```

```

        // Add a ' at end of the string vars
        if (col != NUM_CUST_COLS - 1) {
            insertStatement += "', ";
        }

        // End the values insert
        else {
            insertStatement += ")";
        }
    }
}

// close the input method
input.close();

// return the insert statement
return (insertStatement);
}

public static void main(String[] args) throws SQLException, IOException {

    System.out.println("Update Job-Shop Accounting Database:");

    // CREATE INPUT SCANNER -----
    final Scanner sc = new Scanner(System.in); // Scanner is used to collect thes user input
    String option = ""; // Initialize user option selection as nothing
    while (!option.equals(Integer.toString(QUIT_APPLICATION))) { // As user for options until quit option is selected
        System.out.println(PROMPT); // Print the available options

        option = sc.next(); // Read in the user option selection

        // BEGIN SWITCH STATEMENTS =====
        switch (option) { // Switch between different options

            // (1) Enter a new customer
            case "1":

                // Set the query
                String query = QUERY_1;

                System.out.println("Please enter customer name:");

```

```

sc.nextLine();
String cName = sc.nextLine();

System.out.println("Please enter customer address in single line:");
String address = sc.nextLine();

System.out.println("Please enter integer customer category between 1 and 10:");
int category = sc.nextInt();

// Get a database connection and prepare a query statement
try (final Connection connection = DriverManager.getConnection(URL)) {

    // Activate stored procedure to enter above data in database
    // Insert new performer record into database
    try {
        final PreparedStatement statement = connection.prepareStatement(query) {
            // Populate the query template with the data collected from the user
            statement.setString(1, cName);
            statement.setString(2, address);
            statement.setInt(3, category);

            System.out.println("Dispatching the query...");
            // Actually execute the populated query
            final int rows_inserted = statement.executeUpdate();
            System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
        }
    }
}
break;

// (2) Enter a new department
case "2":

    // Set the query
    query = QUERY_2;

    System.out.println("Please enter a new department number:");
    int deptNo = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Activate stored procedure to enter above data in database

```

```

        // Insert new performer record into database
        try (
            final PreparedStatement statement = connection.prepareStatement(query)) {
            // Populate the query template with the data collected from the user
            statement.setInt(1, deptNo);

            System.out.println("Dispatching the query...");
            // Actually execute the populated query
            final int rows_inserted = statement.executeUpdate();
            System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
        }
    }
    break;

// (3) Enter a new process-id and its department together with its type and information
// relevant to the type
case "3":

    // Set the query
    query = QUERY_3;

    System.out.println("Please enter a new process id (integer):");
    int processID = sc.nextInt();

    System.out.println("Please enter its existing department number:");
    deptNo = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Activate stored procedure to enter above data in database
        // Insert new performer record into database
        try (
            final PreparedStatement statement = connection.prepareStatement(query)) {
            // Populate the query template with the data collected from the user
            statement.setInt(1, processID);
            statement.setInt(2, deptNo);

            System.out.println("Dispatching the query...");
            // Actually execute the populated query
            final int rows_inserted = statement.executeUpdate();
            System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
        }
    }
}

```

```

        }
    }
    break;

// (4) Enter a new assembly with its customer-name, assembly-details, assembly-id,
// and dateordered and associate it with one or more processes
case "4":

    // Set the query
    query = QUERY_4;

    System.out.println("Please enter a new assembly id (integer):");
    int assID = sc.nextInt();

    System.out.println("Please enter the date commenced in 'YYYY-MM-DD' format, e.g. 2020-11-30:");
    sc.nextLine();
    String dateOrdered = sc.nextLine();

    System.out.println("Please enter the details of the order in text");
    String details = sc.nextLine();

    System.out.println("Please enter the existing customer name associated with the assembly");
    cName = sc.nextLine();

    System.out.println("Please enter the existing process ID (integer) associated with the assembly");
    processID = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Activate stored procedure to enter above data in database
        // Insert new performer record into database
        try {
            final PreparedStatement statement = connection.prepareStatement(query) {
                // Populate the query template with the data collected from the user
                statement.setInt(1, assID);
                statement.setString(2, dateOrdered);
                statement.setString(3, details);
                statement.setString(4, cName);
                statement.setInt(5, processID);

                System.out.println("Dispatching the query...");
            }
        }
    }
}

```

```

        // Actually execute the populated query
        final int rows_inserted = statement.executeUpdate();
        System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
    }
}
break;

// (5) Create a new account and associate it with the process, assembly, or department
// to which it is applicable
case "5":

    // Set the query
    query = QUERY_5;

    System.out.println("Please enter a new account id (integer):");
    int acctNo = sc.nextInt();

    System.out.println("Please enter the date established in 'YYYY-MM-DD' format, e.g. 2020-11-30:");
    sc.nextLine();
    String dateEst = sc.nextLine();

    System.out.println("Please enter the associated assembly id (integer)");
    assID = sc.nextInt();

    System.out.println("Please enter the associated process id (integer)");
    processID = sc.nextInt();

    System.out.println("Please enter the associated department number");
    deptNo = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Activate stored procedure to enter above data in database
        // Insert new performer record into database
        try (
            final PreparedStatement statement = connection.prepareStatement(query)) {
            // Populate the query template with the data collected from the user
            statement.setInt(1, acctNo);
            statement.setString(2, dateEst);
            statement.setInt(3, assID);
            statement.setInt(4, processID);

```

```

        statement.setInt(5, deptNo);

        System.out.println("Dispatching the query...");
        // Actually execute the populated query
        final int rows_inserted = statement.executeUpdate();
        System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
    }
}
break;

// (6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
case "6":

    // Set the query
    query = QUERY_6;

    System.out.println("Please enter a new job number:");
    int jobNo = sc.nextInt();

    System.out.println("Please enter the start date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:");
    sc.nextLine();
    String startDate = sc.nextLine();

    System.out.println("Please enter the associated assembly id (integer)");
    assID = sc.nextInt();

    System.out.println("Please enter the associated process id (integer)");
    processID = sc.nextInt();

    System.out.println("Please enter the associated department number");
    deptNo = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Activate stored procedure to enter above data in database
        // Insert new performer record into database
        try (
            final PreparedStatement statement = connection.prepareStatement(query)) {
            // Populate the query template with the data collected from the user
            statement.setInt(1, jobNo);
            statement.setString(2, startDate);

```



```

        statement.setInt(3,      assID);
        statement.setInt(4,      processID);
        statement.setInt(5,      deptNo);

        System.out.println("Dispatching the query...");
        // Actually execute the populated query
        final int rows_inserted = statement.executeUpdate();
        System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
    }
}
break;

// (7) At the completion of a job, enter the date it completed and the information
// relevant to the type of job
case "7":

    // Set the query
    query = QUERY_7;

    System.out.println("Please enter the existing job number:");
    jobNo = sc.nextInt();

    System.out.println("Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:");
    sc.nextLine();
    String endDate = sc.nextLine();

    System.out.println("Please enter any other info about the job (as text):");
    String otherInfo = sc.nextLine();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Activate stored procedure to enter above data in database
        // Insert new performer record into database
        try (
            final PreparedStatement statement = connection.prepareStatement(query)) {
            // Populate the query template with the data collected from the user
            statement.setInt(1,      jobNo);
            statement.setString(2,    endDate);
            statement.setString(3,    otherInfo);

            System.out.println("Dispatching the query...");

```

```

        // Actually execute the populated query
        final int rows_inserted = statement.executeUpdate();
        System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
    }
}
break;

// (8) Enter a transaction-no and its sup-cost and update all the costs (details) of the
// affected accounts by adding sup-cost to their current values of details
case "8":

    // Set the query
    query = QUERY_8;

    System.out.println("Please enter the new transaction number:");
    int transactionNo = sc.nextInt();

    System.out.println("Please enter the cost of the transaction (as decimal number):");
    double cost = sc.nextDouble();

    System.out.println("Please enter the associated assembly id (integer)");
    assID = sc.nextInt();

    System.out.println("Please enter the associated process id (integer)");
    processID = sc.nextInt();

    System.out.println("Please enter the associated department number");
    deptNo = sc.nextInt();

    System.out.println("Please enter the associated job number");
    jobNo = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Activate stored procedure to enter above data in database
        // Insert new performer record into database
        try (
            final PreparedStatement statement = connection.prepareStatement(query)) {
            // Populate the query template with the data collected from the user
            statement.setInt(1, transactionNo);
            statement.setDouble(2, cost);

```

```

        statement.setInt(3, deptNo);
        statement.setInt(4, assID);
        statement.setInt(5, processID);
        statement.setInt(6, jobNo);

        System.out.println("Dispatching the query...");
        // Actually execute the populated query
        final int rows_inserted = statement.executeUpdate();
        System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
    }
}
break;

// (9) Retrieve the total cost incurred on an assembly-id
case "9":

    // Set the query
    query = QUERY_9;

    System.out.println("Please enter the assembly id (integer):");
    assID = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        CallableStatement cs = connection.prepareCall(query);

        // Set the assigned value(s) to the procedures input
        cs.setInt("id", assID);

        // Run the stored procedure and store values in resultSet
        System.out.println("Dispatching the query...");
        ResultSet resultSet = cs.executeQuery();

        System.out.println("Done.");
        System.out.println("\nTotal cost incurred on assembly-id: " + assID);

        // Unpack the tuples returned by the database and print them out to the user
        while (resultSet.next()) {
            System.out.println(String.format("%s", resultSet.getString(1)));
        }
    }
}

```

```

    }

    break;

// (10) Retrieve the total labor time within a department for jobs completed in the
// department during a given date
case "10":

    // Set the query
    query = QUERY_10;

    System.out.println("Please enter the department number:");
    deptNo = sc.nextInt();

    System.out.println("Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:");
    sc.nextLine();
    endDate = sc.nextLine();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        CallableStatement cs = connection.prepareCall(query);

        // Set the assigned value(s) to the procedures input
        cs.setInt("deptNo", deptNo);
        cs.setString("endDate", endDate);

        // Run the stored procedure and store values in resultSet
        System.out.println("Dispatching the query...");
        ResultSet resultSet = cs.executeQuery();

        System.out.println("Done.");
        System.out.println("\nTotal labor time for department: " + deptNo +
                           " for date ending on: " + endDate);
        System.out.println("deptNo | timeOfLabor");

        // Unpack the tuples returned by the database and print them out to the user
        while (resultSet.next()) {
            System.out.println(String.format("%s | %s",
                resultSet.getString(1),
                resultSet.getString(2)));
        }
    }
}

```

```

    }
}

break;

// (11) Retrieve the processes through which a given assembly-id has passed so far
// (in datecommenced order) and the department responsible for each process
case "11":

    // Set the query
    query = QUERY_11;

    System.out.println("Please enter the assembly id (integer):");
    assID = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        CallableStatement cs = connection.prepareCall(query);

        // Set the assigned value(s) to the procedures input
        cs.setInt("assID", assID);

        // Run the stored procedure and store values in resultSet
        System.out.println("Dispatching the query...");
        ResultSet resultSet = cs.executeQuery();

        System.out.println("Done.");
        System.out.println("\nProcess for assembly-id: " + assID +
            ", and its departement number; Sorted by date commenced.");
        System.out.println("dateOrdered    | processID| deptNo");

        // Unpack the tuples returned by the database and print them out to the user
        while (resultSet.next()) {
            System.out.println(String.format("%s    | %s    | %s",
                resultSet.getString(1),
                resultSet.getString(2),
                resultSet.getString(3)));
        }
    }
}

```

```

        break;

// (12) Retrieve the jobs (together with their type information and assembly-id)
// completed during a given date in a given department
case "12":

    // Set the query
    query = QUERY_12;

    System.out.println("Please enter the department number:");
    deptNo = sc.nextInt();

    System.out.println("Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:");
    sc.nextLine();
    endDate = sc.nextLine();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        CallableStatement cs = connection.prepareCall(query);

        // Set the assigned value(s) to the procedures input
        cs.setInt("deptNo", deptNo);
        cs.setString("endDate", endDate);

        // Run the stored procedure and store values in resultSet
        System.out.println("Dispatching the query...");
        ResultSet resultSet = cs.executeQuery();

        System.out.println("Done.");
        System.out.println("\nJobs from department " + deptNo +
            " completed on: " + endDate);
        System.out.println("jobNo    | otherInfo | assembliesID ");

        // Unpack the tuples returned by the database and print them out to the user
        while (resultSet.next()) {
            System.out.println(String.format("%s    | %s | %s",
                resultSet.getString(1),
                resultSet.getString(2),
                resultSet.getString(3)));
        }
    }
}

```

```

    }
}

break;

// (13) Retrieve the customers (in name order) whose category is in a given range
case "13":

    // Set the query
    query = QUERY_13;

    System.out.println("Please enter MIN category number (integer from 1 - 10, inclusive:");
    int min = sc.nextInt();

    System.out.println("Please enter MAX category number (integer from 1 - 10, inclusive:");
    int max = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        CallableStatement cs = connection.prepareCall(query);

        // Set the assigned value(s) to the procedures input
        cs.setInt("min", min);
        cs.setInt("max", max);

        // Run the stored procedure and store values in resultSet
        System.out.println("Dispatching the query...");
        ResultSet resultSet = cs.executeQuery();

        System.out.println("Done.");
        System.out.println("\nCustomers with category from " + min + " to " + max);
        System.out.println("name"); //      | otherInfo | assembliesID ");

        // Unpack the tuples returned by the database and print them out to the user
        while (resultSet.next()) {
            System.out.println(String.format("%s", //      | %s | %s",
                resultSet.getString(1)));
        }
    }
}

```

```

        break;

// (14) Delete all cut-jobs whose job-no is in a given range
case "14":

    // Set the query
    query = QUERY_14;

    System.out.println("Please enter MIN category number (integer from 1 - 10, inclusive):");
    min = sc.nextInt();

    System.out.println("Please enter MAX category number (integer from 1 - 10, inclusive):");
    max = sc.nextInt();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        PreparedStatement ps = connection.prepareCall(query);

        // Set the assigned value(s) to the procedures input
        ps.setInt(1, min);
        ps.setInt(2, max);

        System.out.println("Dispatching the query...");
        // Actually execute the populated query
        final int rows_deleted = ps.executeUpdate();
        System.out.println(String.format("Done. %d rows deleted.", rows_deleted) +
                                   " from " + min + " to " + max);

    }

    break;

// (15) Change the color of a given paint job
case "15":

    // Set the query
    query = QUERY_15;

    System.out.println("Please enter the new color:");

```



```

sc.nextLine();
String newColor = sc.nextLine();

System.out.println("Please enter the job number associated:");
jobNo = sc.nextInt();

// Get a database connection and prepare a query statement
try (final Connection connection = DriverManager.getConnection(URL)) {

    // Prepare a call to the stored procedure
    PreparedStatement ps = connection.prepareCall(query);

    // Set the assigned value(s) to the procedures input
    ps.setString(1, newColor);
    ps.setInt(2, jobNo);

    System.out.println("Dispatching the query...");
    // Actually execute the populated query
    final int rows_changed = ps.executeUpdate();
    System.out.println(String.format("Done. %d rows changed.", rows_changed) +
        " for job number: " + jobNo);
}

break;

// (16) Import: enter new customers from a data file until the file is empty
// (the user must be asked to enter the input file name).

case "16":

    System.out.println("Please enter the location and name of a CSV file with customer data:" +
        "\n>> PLEASE DO NOT INCLUDE COMMAS EXCEPT FOR THE DELIMITER <<");
    sc.nextLine();
    String filename = sc.nextLine();

    // create insert statement with values from csv file
    query = readCSV(filename);

    // Get a database connection and prepare a query statement

```

```

    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        PreparedStatement ps = connection.prepareCall(query);

        System.out.println("Dispatching the query...");
        // Actually execute the populated query
        final int rows_inserted = ps.executeUpdate();
        System.out.println(String.format("Done. %d rows inserted.", rows_inserted));
    }
    break;

// (17) Export: Retrieve the customers (in name order) whose category is in a given range
// and output them to a data file instead of screen (the user must be asked to enter the output file name).

case "17":

    // Set the query
    query = QUERY_17;

    System.out.println("Please enter MIN category number (integer from 1 - 10, inclusive):");
    min = sc.nextInt();

    System.out.println("Please enter MAX category number (integer from 1 - 10, inclusive):");
    max = sc.nextInt();

    System.out.println("Please enter the file output name:");
    sc.nextLine();
    filename = sc.nextLine();

    // Get a database connection and prepare a query statement
    try (final Connection connection = DriverManager.getConnection(URL)) {

        // Prepare a call to the stored procedure
        CallableStatement cs = connection.prepareCall(query);

        // Set the assigned value(s) to the procedures input
        cs.setInt("min", min);
        cs.setInt("max", max);

        // Run the stored procedure and store values in resultSet

```

```

        System.out.println("Dispatching the query...");
        ResultSet resultSet = cs.executeQuery();

        try {
            FileWriter myWriter = new FileWriter(filename + ".csv");
            myWriter.write("name,address,category\n");

            // Unpack the tuples returned by the database and print them out to the user
            while (resultSet.next()) {
                myWriter.write(String.format("%s,%s,%s\n",
                    resultSet.getString(1),
                    resultSet.getString(2),
                    resultSet.getString(3)));
            }

            // close the writer
            myWriter.close();

        } catch (IOException e) {
            System.out.println("Error with file name.");
            e.printStackTrace();
        }

        System.out.println("Done. File Location here:");
        System.out.println(filename + ".csv");

        break;

        // (18) Quit
        case "18":
            System.out.println("Finished! Your work here is done.");
    }
}

sc.close(); // Close the scanner before exiting the application
}
}

```

5.2. Continued: Java Program Screenshot of Successful Compilation

```
Carpenter_Daniel_IP_Task5b.java X
1 import java.sql.CallableStatement;
10
11 // =====
12 // @class: DSA 4513
13 // @asmt: Class Project
14 // @task: 5 (b)
15 // @author: Daniel Carpenter, ID: 113009743
16 // @description:
17 // Program to implement job-shop accounting system queries
18 // =====
19
20 public class Carpenter_Daniel_IP_Task5b {
21
```

Problems Javadoc Declaration Search Console X

Carpenter_Daniel_IP_Task5b [Java Application] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 9, 2021, 10:12:06 AM)

Update Job-Shop Accounting Database:

Please select one of the options below:

- (1) Enter a new customer
- (2) Enter a new department
- (3) Enter a new process-id and its department together with its type and information relevant to the type
- (4) Enter a new assembly with its customer-name, assembly-details, assembly-id, and date ordered and associate it with one or more processes
- (5) Create a new account and associate it with the process, assembly, or department to which it is applicable
- (6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
- (7) At the completion of a job, enter the date it completed and the information relevant to the type of job
- (8) Enter a transaction-no and its sup-cost and update all the costs (details) of the affected accounts by adding sup-cost to their current values of details
- (9) Retrieve the total cost incurred on an assembly-id
- (10) Retrieve the total labor time within a department for jobs completed in the department during a given date
- (11) Retrieve the processes through which a given assembly-id has passed so far (in date commenced order) and the department responsible for each process
- (12) Retrieve the jobs (together with their type information and assembly-id) completed during a given date in a given department
- (13) Retrieve the customers (in name order) whose category is in a given range
- (14) Delete all cut-jobs whose job-no is in a given range
- (15) Change the color of a given paint job
- (16) Import: enter new customers from a data file until the file is empty (the user must be asked to enter the input file name).
- (17) Export: Retrieve the customers (in name order) whose category is in a given range and output them to a data file instead of screen (the user must be asked to enter the output file name).
- (18) Quit

6.1. Screenshots showing the testing of Query 1

The screenshot displays an IDE with two main panels. The left panel shows a Java application window titled 'Carpenter_Daniel_IP_Task5b [Java Application]'. The console output shows the application running and inserting data into a database. The right panel shows a SQL query editor with a query to select all data from the 'Customer' table. Below the query editor, the 'Results' tab is active, displaying a table with 5 rows of customer data.

Console Output:

```
Carpenter_Daniel_IP_Task5b [Java Application] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 9, 2021, 10:12:06 AM)
456 Dog Bed Blvd Norman OK
Please enter integer customer category between 1 and 10:
4
Dispatching the query...
Done. 1 rows inserted.

Please select one of the options below:
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process-id and its department together with its type and information relevant to the type
(4) Enter a new assembly with its customer-name, assembly-details, assembly-id, and dateordered and associate it with one or more processes
(5) Create a new account and associate it with the process, assembly, or department to which it is applicable
(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
(7) At the completion of a job, enter the date it completed and the information relevant to the type of job
(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the affected accounts by adding sup-cost to their current values of details
(9) Retrieve the total cost incurred on an assembly-id
(10) Retrieve the total labor time within a department for jobs completed in the department during a given date
(11) Retrieve the processes through which a given assembly-id has passed so far (in datecommenced order) and the department responsible for each process
(12) Retrieve the jobs (together with their type information and assembly-id) completed during a given date in a given department
(13) Retrieve the customers (in name order) whose category is in a given range
(14) Delete all cut-jobs whose job-no is in a given range
(15) Change the color of a given paint job
(16) Import: enter new customers from a data file until the file is empty (the user must be asked to enter the input file name).
(17) Export: Retrieve the customers (in name order) whose category is in a given range and output them to a data file instead of screen (the user must be asked to enter the output file name)
(18) Quit

1
Please enter customer name:
Sir Jorah
Please enter customer address in single line:
Westeros
Please enter integer customer category between 1 and 10:
5
Dispatching the query...
Done. 1 rows inserted.
```

SQL Query:

```
1 -- Customer Table after Java Program's Insertions
2 SELECT * FROM [Project].Customer
```

Results:

	name	address	category
1	Daniel	101 Java St Norman OK	1
2	Kenny	101 R St Norman OK	2
3	Maeve	123 Dog House Ln Norman OK	3
4	Sir Jorah	Westeros	5
5	Teddy	456 Dog Bed Blvd Norman OK	4

6.2. Screenshots showing the testing of Query 2

The screenshot displays an IDE with two main panels. The left panel shows a Java application window titled 'Carpenter_Daniel_IP_Task5b [Java Application]'. The console output shows the application running and displaying a menu of options. The right panel shows a SQL query runner window titled 'SQLQuery_1 - carp97...rp9743)'. It displays a query and its results.

Java Application Console Output:

```
(18) Quit

2
Please enter a new department number:
4
Dispatching the query...
Done. 1 rows inserted.

Please select one of the options below:
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process-id and its department together with its type and information
    relevant to the type
(4) Enter a new assembly with its customer-name, assembly-details, assembly-id,
    and dateordered and associate it with one or more processes
(5) Create a new account and associate it with the process, assembly, or department
    to which it is applicable
(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
(7) At the completion of a job, enter the date it completed and the information
    relevant to the type of job
(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the
    affected accounts by adding sup-cost to their current values of details
(9) Retrieve the total cost incurred on an assembly-id
(10) Retrieve the total labor time within a department for jobs completed in the
    department during a given date
(11) Retrieve the processes through which a given assembly-id has passed so far
    (in datecommenced order) and the department responsible for each process
(12) Retrieve the jobs (together with their type information and assembly-id)
    completed during a given date in a given department
(13) Retrieve the customers (in name order) whose category is in a given range
(14) Delete all cut-jobs whose job-no is in a given range
(15) Change the color of a given paint job
(16) Import: enter new customers from a data file until the file is empty
    (the user must be asked to enter the input file name).
(17) Export: Retrieve the customers (in name order) whose category is in a given range
    and output them to a data file instead of screen (the user must be asked to enter the output
    file name).
(18) Quit

2
Please enter a new department number:
5
Dispatching the query...
Done. 1 rows inserted.

Please select one of the options below:
..
```

SQL Query Runner:

Run Cancel | Disconnect Change Connection cs-dsa-4513-sql-db

1 -- Table after Java Program's Insertions
2 **SELECT * FROM [Project].[Department]**

Results Messages

	deptNo	details2
1	1	0
2	2	0
3	3	0
4	4	0
5	5	0

6.3. Screenshots showing the testing of Query 3

The screenshot displays an IDE with two main panels. The left panel shows the console output of a Java application, and the right panel shows a SQL query editor with its results.

Console Output:

```
Carpenter_Daniel_IP_Task5b [Java Application] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 9, 2021, 10:12:06 AM)
9
Please enter its existing department number:
4
Dispatching the query...
Done. 1 rows inserted.

Please select one of the options below:
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process-id and its department together with its type and information relevant to the type
(4) Enter a new assembly with its customer-name, assembly-details, assembly-id, and dateordered and associate it with one or more processes
(5) Create a new account and associate it with the process, assembly, or department to which it is applicable
(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
(7) At the completion of a job, enter the date it completed and the information relevant to the type of job
(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the affected accounts by adding sup-cost to their current values of details
(9) Retrieve the total cost incurred on an assembly-id
(10) Retrieve the total labor time within a department for jobs completed in the department during a given date
(11) Retrieve the processes through which a given assembly-id has passed so far (in datecommenced order) and the department responsible for each process
(12) Retrieve the jobs (together with their type information and assembly-id) completed during a given date in a given department
(13) Retrieve the customers (in name order) whose category is in a given range
(14) Delete all cut-jobs whose job-no is in a given range
(15) Change the color of a given paint job
(16) Import: enter new customers from a data file until the file is empty (the user must be asked to enter the input file name).
(17) Export: Retrieve the customers (in name order) whose category is in a given range and output them to a data file instead of screen (the user must be asked to enter the output file name)
(18) Quit

3
Please enter a new process id (integer):
10
Please enter its existing department number:
5
Dispatching the query...
Done. 1 rows inserted.

Please select one of the options below:
```

SQL Query Editor:

SQLQuery_1 - carp97...rp9743)

Run Cancel Disconnect Change Connection cs-dsa-4513-sql-db

1 -- Table after Java Program's Insertions

2 SELECT * FROM [Project].[Process]

Results Messages

	id	deptNo	details3
1	1	1	0
2	2	2	0
3	3	3	0
4	4	4	0
5	5	5	0
6	6	1	0
7	7	2	0
8	8	3	0
9	9	4	0
10	10	5	0

6.3. Screenshots showing the testing of Query 3 (Continued)

```
1 SELECT * FROM [Project].[P_Cut]
2 SELECT * FROM [Project].[P_Fit]
3 SELECT * FROM [Project].[P_Paint]
```

Results Messages

	processID ▾	cutType ▾	machineType ▾
1	1	NULL	NULL
2	2	NULL	NULL
3	3	NULL	NULL
4	4	NULL	NULL
5	5	NULL	NULL
6	6	NULL	NULL
7	7	NULL	NULL
8	8	NULL	NULL
9	9	NULL	NULL
10	10	NULL	NULL

	processID ▾	type ▾
1	1	NULL
2	2	NULL
3	3	NULL
4	4	NULL
5	5	NULL
6	6	NULL
7	7	NULL
8	8	NULL
9	9	NULL
10	10	NULL

	processID ▾	type ▾	method ▾
1	1	NULL	NULL
2	2	NULL	NULL
3	3	NULL	NULL
4	4	NULL	NULL
5	5	NULL	NULL
6	6	NULL	NULL
7	7	NULL	NULL
8	8	NULL	NULL
9	9	NULL	NULL
10	10	NULL	NULL

6.4. Screenshots showing the testing of Query 4

The screenshot shows an IDE with two main windows. The left window is a Java application titled 'Carpenter_Daniel_IP_Task5b [Java Application]'. It displays a list of 18 options for interacting with a 'Job-Shop Accounting Database'. Option 4 is selected, and the user is prompted to enter a new assembly ID. The user enters '11', then the date '2021-11-11', and the details 'No details yet'. The application then prompts for an existing customer name, where 'Sir Jorah' is entered, and an existing process ID, where '1' is entered. Finally, it displays 'Dispatching the query...' and 'Done. 1 rows inserted.'

The right window is a SQL query runner titled 'SQLQuery_1 - carp97...rp9743'. It shows three SQL queries:
1. `SELECT * FROM Project.Assemblies`
2. `SELECT * FROM Project.Orders`
3. `SELECT * FROM Project.Manufactures`
The 'Results' tab is active, showing a table with 11 rows and 5 columns: `id`, `dateOrdered`, `details`, and `details1`. The data is as follows:

	id	dateOrdered	details	details1
1	1	2021-01-15	This might take awhile	123
2	2	2021-02-15	The car is in BAD shape	456
3	3	2021-03-15	Not sure how this dog pulled..	789
4	4	2021-04-15	Jet black paint job will loo..	741
5	5	2021-05-15	This car is STINKY. Better g..	852
6	6	2021-06-15	Clean	10000
7	7	2021-07-15	New tires	20000
8	8	2021-08-15	New coat	30000
9	9	2021-09-15	Demolish	40000
10	10	2021-10-15	Hail damage	50000
11	11	2021-11-11	No details yet	0

Below this table, there are two more tables. The first has columns `customerName` and `assembliesID` with 12 rows of data. The second has columns `assembliesID` and `processID` with 12 rows of data.

	customerName	assembliesID
1	Daniel	1
2	Kenny	2
3	Maeve	3
4	Sir Jorah	4
5	Teddy	5
6	Daniel	6
7	Kenny	7
8	Maeve	8
9	Sir Jorah	9
10	Teddy	10
11	Teddy	10
12	Sir Jorah	11

	assembliesID	processID
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	10	10
12	11	1

6.5. Screenshots showing the testing of Query 5

The screenshot displays an IDE with two main panels. The left panel shows a Java application window titled 'Carpenter_Daniel_IP_Task5b [Java Application]'. It contains a list of 18 options for a menu, with option (1) 'Enter a new customer' selected. The application is running, and the console shows the following output:

```
Please select one of the options below:
5
Please enter a new account id (integer):
10
Please enter the date established in 'YYYY-MM-DD' format, e.g. 2020-11-30:
2021-10-01
Please enter the associated assembly id (integer)
10
Please enter the associated process id (integer)
10
Please enter the associated department number
5
Dispatching the query...
Done. 1 rows inserted.

Please select one of the options below:
.
```

The right panel shows a SQL query runner window titled 'SQLQuery_1 - carp97...rp9743'. It contains a single query:

```
1 -- Table after Java Program's Insertions
2 SELECT * FROM [Project].[Account]
```

The query has been executed, and the results are displayed in a table with 10 rows and 6 columns. The columns are 'acctNo', 'dateEstablished', 'assembliesID', 'processID', and 'deptNo'. The results are as follows:

	acctNo	dateEstablished	assembliesID	processID	deptNo
1	1	2021-01-01	1	1	1
2	2	2021-02-01	2	2	2
3	3	2021-03-01	3	3	3
4	4	2021-04-01	4	4	4
5	5	2021-05-01	5	5	5
6	6	2021-06-01	6	6	1
7	7	2021-07-01	7	7	2
8	8	2021-08-01	8	8	3
9	9	2021-09-01	9	9	4
10	10	2021-10-01	10	10	5

6.6. Screenshots showing the testing of Query 6

The screenshot displays an IDE with two main panels. The left panel shows a Java application window titled 'Carpenter_Daniel_IP_Task5b [Java Application]'. It contains a list of 18 options for user interaction, with option (6) selected. The right panel shows the 'SQLQuery_1 - carp97...rp9743)' window, which displays the SQL query 'SELECT * FROM [Project].[Job]' and its results in a table.

Java Application Console Output:

```
Please select one of the options below:  
(1) Enter a new customer  
(2) Enter a new department  
(3) Enter a new process-id and its department together with its type and information relevant to the type  
(4) Enter a new assembly with its customer-name, assembly-details, assembly-id, and dateordered and associate it with one or more processes  
(5) Create a new account and associate it with the process, assembly, or department to which it is applicable  
(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced  
(7) At the completion of a job, enter the date it completed and the information relevant to the type of job  
(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the affected accounts by adding sup-cost to their current values of details  
(9) Retrieve the total cost incurred on an assembly-id  
(10) Retrieve the total labor time within a department for jobs completed in the department during a given date  
(11) Retrieve the processes through which a given assembly-id has passed so far (in datecommenced order) and the department responsible for each process  
(12) Retrieve the jobs (together with their type information and assembly-id) completed during a given date in a given department  
(13) Retrieve the customers (in name order) whose category is in a given range  
(14) Delete all cut-jobs whose job-no is in a given range  
(15) Change the color of a given paint job  
(16) Import: enter new customers from a data file until the file is empty (the user must be asked to enter the input file name).  
(17) Export: Retrieve the customers (in name order) whose category is in a given range and output them to a data file instead of screen (the user must be asked to enter the output  
(18) Quit  
6  
Please enter a new job number:  
10  
Please enter the start date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:  
2021-11-10  
Please enter the associated assembly id (integer)  
10  
Please enter the associated process id (integer)  
10  
Please enter the associated department number  
5  
Dispatching the query...  
Done. 1 rows inserted.  
Please select one of the options below:
```

SQL Query Results:

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	deptNo
1	1	2021-11-01	NULL	NULL	1	1	1
2	2	2021-11-02	NULL	NULL	2	2	2
3	3	2021-11-03	NULL	NULL	3	3	3
4	4	2021-11-04	NULL	NULL	4	4	4
5	5	2021-11-05	NULL	NULL	5	5	5
6	6	2021-11-06	NULL	NULL	6	6	1
7	7	2021-11-07	NULL	NULL	7	7	2
8	8	2021-11-08	NULL	NULL	8	8	3
9	9	2021-11-09	NULL	NULL	9	9	4
10	10	2021-11-10	NULL	NULL	10	10	5

6.6. Screenshots showing the testing of Query 6 (Continued)

1

SELECT * FROM [Project].[J_Cut]

2

SELECT * FROM [Project].[J_Fit]

3

SELECT * FROM [Project].[J_Paint]

Results

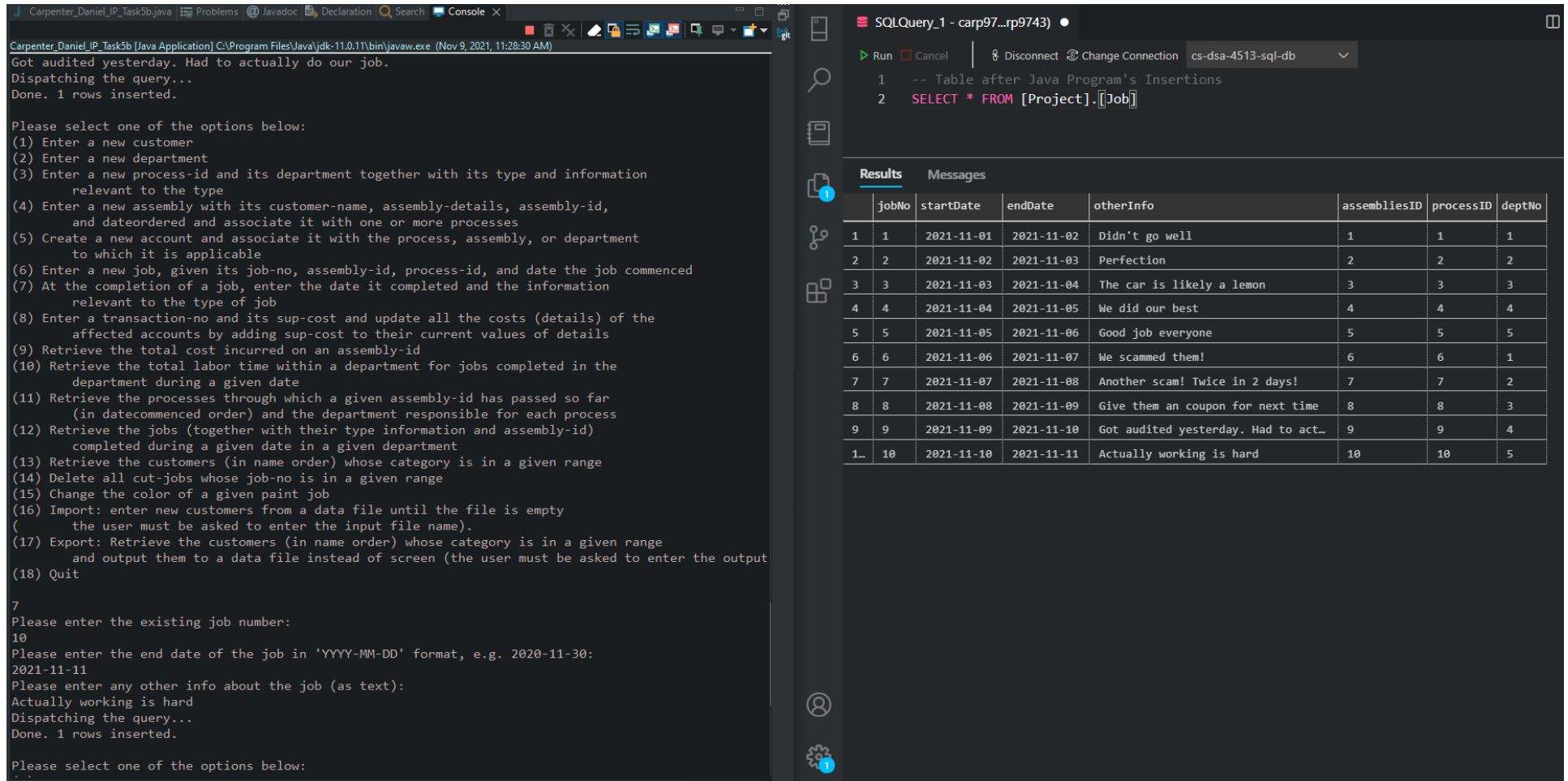
Messages

	jobNo	material	timeOfLabor	type	amount
1	1	NULL	0	NULL	0
2	2	NULL	0	NULL	0
3	3	NULL	0	NULL	0
4	4	NULL	0	NULL	0
5	5	NULL	0	NULL	0
6	6	NULL	0	NULL	0
7	7	NULL	0	NULL	0
8	8	NULL	0	NULL	0
9	9	NULL	0	NULL	0
10	10	NULL	0	NULL	0

	jobNo	timeOfLabor
1	1	0
2	2	0
3	3	0
4	4	0
5	5	0
6	6	0
7	7	0
8	8	0
9	9	0
10	10	0

	jobNo	color	volume	timeOfLabor
1	1	NULL	0	0
2	2	NULL	0	0
3	3	NULL	0	0
4	4	NULL	0	0
5	5	NULL	0	0
6	6	NULL	0	0
7	7	NULL	0	0
8	8	NULL	0	0
9	9	NULL	0	0
10	10	NULL	0	0

6.7. Screenshots showing the testing of Query 7



The screenshot shows an IDE with two main panels. The left panel is a Java application console for 'Carpenter_Daniel_IP_Task5b.java'. It shows the execution of a Java program that inserts data into a database. The console output includes a list of 18 options for the user to select from, followed by the user's input '7'. The program then prompts for an existing job number, an end date, and other information. The final output is 'Done. 1 rows inserted.'.

The right panel is an SQL query editor for 'SQLQuery_1 - carp97...rp9743'. It shows a query to select all data from the [Project].[Job] table. The query is executed, and the results are displayed in a table.

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	deptNo
1	1	2021-11-01	2021-11-02	Didn't go well	1	1	1
2	2	2021-11-02	2021-11-03	Perfection	2	2	2
3	3	2021-11-03	2021-11-04	The car is likely a lemon	3	3	3
4	4	2021-11-04	2021-11-05	We did our best	4	4	4
5	5	2021-11-05	2021-11-06	Good job everyone	5	5	5
6	6	2021-11-06	2021-11-07	We scammed them!	6	6	1
7	7	2021-11-07	2021-11-08	Another scam! Twice in 2 days!	7	7	2
8	8	2021-11-08	2021-11-09	Give them an coupon for next time	8	8	3
9	9	2021-11-09	2021-11-10	Got audited yesterday. Had to act...	9	9	4
10	10	2021-11-10	2021-11-11	Actually working is hard	10	10	5

6.8. Screenshots showing the testing of Query 8

Carpenter_Daniel_IP_Task5b.java

Problems

Javadoc

Declaration

Search

Console

Carpenter_Daniel_IP_Task5b [Java Application] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 13, 2021, 4:34:09 PM)

Please select one of the options below:

(1) Enter a new customer

(2) Enter a new department

(3) Enter a new process-id and its department together with its type and information relevant to the type

(4) Enter a new assembly with its customer-name, assembly-details, assembly-id, and dateordered and associate it with one or more processes

(5) Create a new account and associate it with the process, assembly, or department to which it is applicable

(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced

(7) At the completion of a job, enter the date it completed and the information relevant to the type of job

(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the affected accounts by adding sup-cost to their current values of details

(9) Retrieve the total cost incurred on an assembly-id

(10) Retrieve the total labor time within a department for jobs completed in the department during a given date

(11) Retrieve the processes through which a given assembly-id has passed so far (in datecommenced order) and the department responsible for each process

(12) Retrieve the jobs (together with their type information and assembly-id) completed during a given date in a given department

(13) Retrieve the customers (in name order) whose category is in a given range

(14) Delete all cut-jobs whose job-no is in a given range

(15) Change the color of a given paint job

(16) Import: enter new customers from a data file until the file is empty (the user must be asked to enter the input file name).

(17) Export: Retrieve the customers (in name order) whose category is in a given range and output them to a data file instead of screen (the user must be asked to enter the output file name).

(18) Quit

8

Please enter the new transaction number:

12

Please enter the cost of the transaction (as decimal number):

88888.88

Please enter the associated assembly id (integer)

3

Please enter the associated process id (integer)

3

Please enter the associated department number

3

Please enter the associated job number

3

Dispatching the query...

Done. 1 rows inserted.

es.sql - carp97...rp9743)

SQLQuery_1 - carp97...rp9743)

SQLQuery_2 - carp97...rp9743)

Run

Cancel

Disconnect

Change Connection

cs-dsa-4513-sql-db

1 SELECT * FROM Project.[Transaction]

2 SELECT * FROM [Project].[Records]

3

Results Messages

	transactionNo	cost
1	1	123
2	2	456
3	3	789
4	4	741
5	5	852
6	6	10000
7	7	20000
8	8	30000
9	9	40000
10	10	50000
11	11	60000.6
12	12	88888.88

	jobNo	transactionNo
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
10	10	10
11	3	12
12	2	11

Results Messages

	id	deptNo	details3
1	1	1	60123.6
2	2	2	75456.75
3	3	3	89677.88
4	4	4	741
5	5	5	852
6	6	1	10000
7	7	2	20000
8	8	3	30000
9	9	4	40000
10	10	5	50000

	deptNo	details2
1	1	70123.6
2	2	95456.75
3	3	119677.88
4	4	40741
5	5	50852

	id	deptNo	details3
1	1	1	60123.6
2	2	2	75456.75
3	3	3	89677.88
4	4	4	741
5	5	5	852
6	6	1	10000
7	7	2	20000
8	8	3	30000
9	9	4	40000
10	10	5	50000

6.9. Screenshots showing the testing of Query 9

Example 1

```
(18) Quit  
  
9  
Please enter the assembly id (integer):  
1  
Dispatching the query...  
Done.  
  
Total cost incurred on assembly-id: 1  
123.0
```

Example 2

```
(18) Quit  
  
9  
Please enter the assembly id (integer):  
2  
Dispatching the query...  
Done.  
  
Total cost incurred on assembly-id: 2  
456.0
```

Example 3

```
and output them to a data file instead.  
(18) Quit  
  
9  
Please enter the assembly id (integer):  
3  
Dispatching the query...  
Done.  
  
Total cost incurred on assembly-id: 3  
789.0
```

6.10. Screenshots showing the testing of Query 10

Please note that these values are 0 since no values of `timeOfLabor` have been supplied in the database yet.

Example 1

```
(18) Quit
10
Please enter the department number:
1
Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:
2021-11-02
Dispatching the query...
Done.

Total labor time for department: 1 for date ending on: 2021-11-02
deptNo | timeOfLabor
1      | 0
```

Example 2

```
(18) Quit
10
Please enter the department number:
2
Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:
2021-11-03
Dispatching the query...
Done.

Total labor time for department: 2 for date ending on: 2021-11-03
deptNo | timeOfLabor
2      | 0
```

Example 3

```
(18) Quit
10
Please enter the department number:
3
Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:
2021-11-04
Dispatching the query...
Done.

Total labor time for department: 3 for date ending on: 2021-11-04
deptNo | timeOfLabor
3      | 0
```


6.11. Screenshots showing the testing of Query 11

Example 1

```
(18) Quit

11
Please enter the assembly id (integer):
1
Dispatching the query...
Done.

Process for assembly-id: 1, and its departement number; Sorted by date commenced.
dateOrdered      | processID | deptNo
2021-01-15       | 1         | 1
```

Example 2

```
(18) Quit

11
Please enter the assembly id (integer):
2
Dispatching the query...
Done.

Process for assembly-id: 2, and its departement number; Sorted by date commenced.
dateOrdered      | processID | deptNo
2021-02-15       | 2         | 2
```

Example 3

```
(18) Quit

11
Please enter the assembly id (integer):
3
Dispatching the query...
Done.

Process for assembly-id: 3, and its departement number; Sorted by date commenced.
dateOrdered      | processID | deptNo
2021-03-15       | 3         | 3
```

6.12. Screenshots showing the testing of Query 12

Example 1

```
(18) Quit

12
Please enter the department number:
1
Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:
2021-11-02
Dispatching the query...
Done.

Jobs from department 1 completed on: 2021-11-02
jobNo      | otherInfo    | assembliesID
1          | Didn't go well | 1
```

Example 2

```
(18) Quit

12
Please enter the department number:
2
Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:
2021-11-03
Dispatching the query...
Done.

Jobs from department 2 completed on: 2021-11-03
jobNo      | otherInfo    | assembliesID
2          | Perfection   | 2
```

Example 3

```
(18) Quit

12
Please enter the department number:
4
Please enter the end date of the job in 'YYYY-MM-DD' format, e.g. 2020-11-30:
2021-11-10
Dispatching the query...
Done.

Jobs from department 4 completed on: 2021-11-10
jobNo      | otherInfo    | assembliesID
9          | Got audited yesterday. Had to actually do our job. | 9
```

6.13. Screenshots showing the testing of Query 13

Example 1

```
(18) Quit

13
Please enter MIN category number (integer from 1 - 10, inclusive):
1
Please enter MAX category number (integer from 1 - 10, inclusive):
3
Dispatching the query...
Done.

Customers with category from 1 to 3
name
Daniel
Kenny
Maeve
```

Example 2

```
(18) Quit

13
Please enter MIN category number (integer from 1 - 10, inclusive):
3
Please enter MAX category number (integer from 1 - 10, inclusive):
5
Dispatching the query...
Done.

Customers with category from 3 to 5
name
Maeve
Sir Jorah
Teddy
```

Example 3

```
(18) Quit

13
Please enter MIN category number (integer from 1 - 10, inclusive):
1
Please enter MAX category number (integer from 1 - 10, inclusive):
10
Dispatching the query...
Done.

Customers with category from 1 to 10
name
Daniel
Kenny
Maeve
Sir Jorah
Teddy
```

6.14. Screenshots showing the testing of Query 14

None deleted since no values of J_Cut have been supplied that specify if the job will be cut. I created the procedure this way to avoid deleting rows when not needed. If another procedure were to specify that the job was a cut job, then it would make more sense.

Example 1

```
(18) Quit

14
Please enter MIN category number (integer from 1 - 10, inclusive):
1
Please enter MAX category number (integer from 1 - 10, inclusive):
3
Dispatching the query...
Done. 0 rows deleted. from 1 to 3
```

Run

Cancel

Disconnect

Change Connection

cs-dsa-4513-sql-db

1

SELECT * FROM Project.Job

2

SELECT * FROM Project.J_Cut

3

Results

Messages

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	deptNo
1	1	2021-11-01	2021-11-02	Didn't go well	1	1	1
2	2	2021-11-02	2021-11-03	Perfection	2	2	2
3	3	2021-11-03	2021-11-04	The car is likely a lemon	3	3	3
4	4	2021-11-04	2021-11-05	We did our best	4	4	4
5	5	2021-11-05	2021-11-06	Good job everyone	5	5	5
6	6	2021-11-06	2021-11-07	We scammed them!	6	6	1
7	7	2021-11-07	2021-11-08	Another scam! Twice in 2 day..	7	7	2
8	8	2021-11-08	2021-11-09	Give them an coupon for next..	8	8	3
9	9	2021-11-09	2021-11-10	Got audited yesterday. Had t..	9	9	4
10	10	2021-11-10	2021-11-11	Actually working is hard	10	10	5

	jobNo	material	timeOfLabor	type	amount
1	1	NULL	0	NULL	0
2	2	NULL	0	NULL	0
3	3	NULL	0	NULL	0
4	4	NULL	0	NULL	0
5	5	NULL	0	NULL	0
6	6	NULL	0	NULL	0
7	7	NULL	0	NULL	0
8	8	NULL	0	NULL	0
9	9	NULL	0	NULL	0
10	10	NULL	0	NULL	0

6.14. Screenshots showing the testing of Query 14 (Continued)

Example 2

```
(18) Quit

14
Please enter MIN category number (integer from 1 - 10, inclusive):
5
Please enter MAX category number (integer from 1 - 10, inclusive):
10
Dispatching the query...
Done. 0 rows deleted. from 5 to 10
```

Run

Cancel

Disconnect

Change Connection

cs-dsa-4513-sql-db

1

SELECT * FROM Project.Job

2

SELECT * FROM Project.J_Cut

3

Results

Messages

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	depthNo
1	1	2021-11-01	2021-11-02	Didn't go well	1	1	1
2	2	2021-11-02	2021-11-03	Perfection	2	2	2
3	3	2021-11-03	2021-11-04	The car is likely a lemon	3	3	3
4	4	2021-11-04	2021-11-05	We did our best	4	4	4
5	5	2021-11-05	2021-11-06	Good job everyone	5	5	5
6	6	2021-11-06	2021-11-07	We scammed them!	6	6	1
7	7	2021-11-07	2021-11-08	Another scam! Twice in 2 day_	7	7	2
8	8	2021-11-08	2021-11-09	Give them an coupon for next_	8	8	3
9	9	2021-11-09	2021-11-10	Got audited yesterday. Had t_	9	9	4
10	10	2021-11-10	2021-11-11	Actually working is hard	10	10	5

	jobNo	material	timeOfLabor	type	amount
1	1	NULL	0	NULL	0
2	2	NULL	0	NULL	0
3	3	NULL	0	NULL	0
4	4	NULL	0	NULL	0
5	5	NULL	0	NULL	0
6	6	NULL	0	NULL	0
7	7	NULL	0	NULL	0
8	8	NULL	0	NULL	0
9	9	NULL	0	NULL	0
10	10	NULL	0	NULL	0

6.14. Screenshots showing the testing of Query 14 (Continued)

Example 3

```
(18) Quit

14
Please enter MIN category number (integer from 1 - 10, inclusive):
1
Please enter MAX category number (integer from 1 - 10, inclusive):
10
Dispatching the query...
Done. 0 rows deleted. from 1 to 10
```

Run

Cancel

Disconnect

Change Connection

cs-dsa-4513-sql-db

1

SELECT * FROM Project.Job

2

SELECT * FROM Project.J_Cut

3

Results

Messages

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	depthNo
1	1	2021-11-01	2021-11-02	Didn't go well	1	1	1
2	2	2021-11-02	2021-11-03	Perfection	2	2	2
3	3	2021-11-03	2021-11-04	The car is likely a lemon	3	3	3
4	4	2021-11-04	2021-11-05	We did our best	4	4	4
5	5	2021-11-05	2021-11-06	Good job everyone	5	5	5
6	6	2021-11-06	2021-11-07	We scammed them!	6	6	1
7	7	2021-11-07	2021-11-08	Another scam! Twice in 2 day..	7	7	2
8	8	2021-11-08	2021-11-09	Give them an coupon for next..	8	8	3
9	9	2021-11-09	2021-11-10	Got audited yesterday. Had t..	9	9	4
10	10	2021-11-10	2021-11-11	Actually working is hard	10	10	5

	jobNo	material	timeOfLabor	type	amount
1	1	NULL	0	NULL	0
2	2	NULL	0	NULL	0
3	3	NULL	0	NULL	0
4	4	NULL	0	NULL	0
5	5	NULL	0	NULL	0
6	6	NULL	0	NULL	0
7	7	NULL	0	NULL	0
8	8	NULL	0	NULL	0
9	9	NULL	0	NULL	0
10	10	NULL	0	NULL	0

6.15. Screenshots showing the testing of Query 15

Example 1

```
(18) Quit
```

```
15
```

```
Please enter the new color:
```

```
Black
```

```
Please enter the job number associated:
```

```
1
```

```
Dispatching the query...
```

```
Done. 1 rows changed. for job number: 1
```

Run Cancel Disconnect Change Connection cs-dsa-4513-sql-db

```
1 SELECT * FROM Project.J_Paint
2 SELECT * FROM Project.Job
3
```

Results Messages

	jobNo	color	volume	timeOfLabor
1	1	Black	0	0
2	2	NULL	0	0
3	3	NULL	0	0
4	4	NULL	0	0
5	5	NULL	0	0
6	6	NULL	0	0
7	7	NULL	0	0
8	8	NULL	0	0
9	9	NULL	0	0
10	10	NULL	0	0

Results grid

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	deptNo
1	1	2021-11-01	2021-11-02	Didn't go well	1	1	1
2	2	2021-11-02	2021-11-03	Perfection	2	2	2
3	3	2021-11-03	2021-11-04	The car is likely a lemon	3	3	3
4	4	2021-11-04	2021-11-05	We did our best	4	4	4
5	5	2021-11-05	2021-11-06	Good job everyone	5	5	5
6	6	2021-11-06	2021-11-07	We scammed them!	6	6	1
7	7	2021-11-07	2021-11-08	Another scam! Twice in 2 day..	7	7	2
8	8	2021-11-08	2021-11-09	Give them an coupon for next..	8	8	3
9	9	2021-11-09	2021-11-10	Got audited yesterday. Had t..	9	9	4
10	10	2021-11-10	2021-11-11	Actually working is hard	10	10	5

6.15. Screenshots showing the testing of Query 15 (Continued)

Example 2

```
and output them to a data file inst  
(18) Quit  
  
15  
Please enter the new color:  
Red  
Please enter the job number associated:  
2  
Dispatching the query...  
Done. 1 rows changed. for job number: 2
```

Run

Cancel

Disconnect

Change Connection

cs-dsa-4513-sql-db

1

SELECT * FROM Project.J_Paint

2

SELECT * FROM Project.Job

3

Results

Messages

	jobNo	color	volume	timeOfLabor
1	1	Black	0	0
2	2	Red	0	0
3	3	NULL	0	0
4	4	NULL	0	0
5	5	NULL	0	0
6	6	NULL	0	0
7	7	NULL	0	0
8	8	NULL	0	0
9	9	NULL	0	0
10	10	NULL	0	0

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	deptNo
1	1	2021-11-01	2021-11-02	Didn't go well	1	1	1
2	2	2021-11-02	2021-11-03	Perfection	2	2	2
3	3	2021-11-03	2021-11-04	The car is likely a lemon	3	3	3
4	4	2021-11-04	2021-11-05	We did our best	4	4	4
5	5	2021-11-05	2021-11-06	Good job everyone	5	5	5
6	6	2021-11-06	2021-11-07	We scammed them!	6	6	1
7	7	2021-11-07	2021-11-08	Another scam! Twice in 2 day...	7	7	2
8	8	2021-11-08	2021-11-09	Give them an coupon for next...	8	8	3
9	9	2021-11-09	2021-11-10	Got audited yesterday. Had t...	9	9	4
10	10	2021-11-10	2021-11-11	Actually working is hard	10	10	5

6.15. Screenshots showing the testing of Query 15 (Continued)

Example 3

(18) Quit

15

Please enter the new color:

Hot-Rod Red

Please enter the job number associated:

3

Dispatching the query...

Done. 1 rows changed. for job number: 3

Run

Cancel

Disconnect

Change Connection

cs-dsa-4513-sql-db

1

SELECT * FROM Project.J_Paint

2

SELECT * FROM Project.Job

Results

Messages

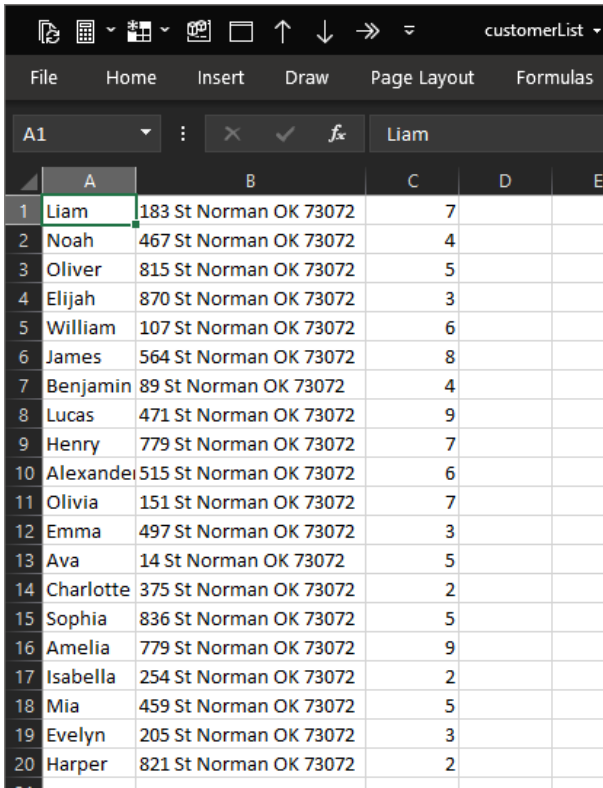
	jobNo	color	volume	timeOfLabor
1	1	Black	0	0
2	2	Red	0	0
3	3	Hot-Rod Red	0	0
4	4	NULL	0	0
5	5	NULL	0	0
6	6	NULL	0	0
7	7	NULL	0	0
8	8	NULL	0	0
9	9	NULL	0	0
10	10	NULL	0	0

	jobNo	startDate	endDate	otherInfo	assembliesID	processID	deptNo
1	1	2021-11-01	2021-11-02	Didn't go well	1	1	1
2	2	2021-11-02	2021-11-03	Perfection	2	2	2
3	3	2021-11-03	2021-11-04	The car is likely a lemon	3	3	3
4	4	2021-11-04	2021-11-05	We did our best	4	4	4
5	5	2021-11-05	2021-11-06	Good job everyone	5	5	5
6	6	2021-11-06	2021-11-07	We scammed them!	6	6	1
7	7	2021-11-07	2021-11-08	Another scam! Twice in 2 day...	7	7	2
8	8	2021-11-08	2021-11-09	Give them an coupon for next...	8	8	3
9	9	2021-11-09	2021-11-10	Got audited yesterday. Had t...	9	9	4
10	10	2021-11-10	2021-11-11	Actually working is hard	10	10	5

6.16. Screenshots Showing the Testing of the Import and Export Options

Import Option (16):

customerList.csv contents:



	A	B	C	D	E
1	Liam	183 St Norman OK 73072	7		
2	Noah	467 St Norman OK 73072	4		
3	Oliver	815 St Norman OK 73072	5		
4	Elijah	870 St Norman OK 73072	3		
5	William	107 St Norman OK 73072	6		
6	James	564 St Norman OK 73072	8		
7	Benjamin	89 St Norman OK 73072	4		
8	Lucas	471 St Norman OK 73072	9		
9	Henry	779 St Norman OK 73072	7		
10	Alexander	515 St Norman OK 73072	6		
11	Olivia	151 St Norman OK 73072	7		
12	Emma	497 St Norman OK 73072	3		
13	Ava	14 St Norman OK 73072	5		
14	Charlotte	375 St Norman OK 73072	2		
15	Sophia	836 St Norman OK 73072	5		
16	Amelia	779 St Norman OK 73072	9		
17	Isabella	254 St Norman OK 73072	2		
18	Mia	459 St Norman OK 73072	5		
19	Evelyn	205 St Norman OK 73072	3		
20	Harper	821 St Norman OK 73072	2		

Input file name and path to upload to database:

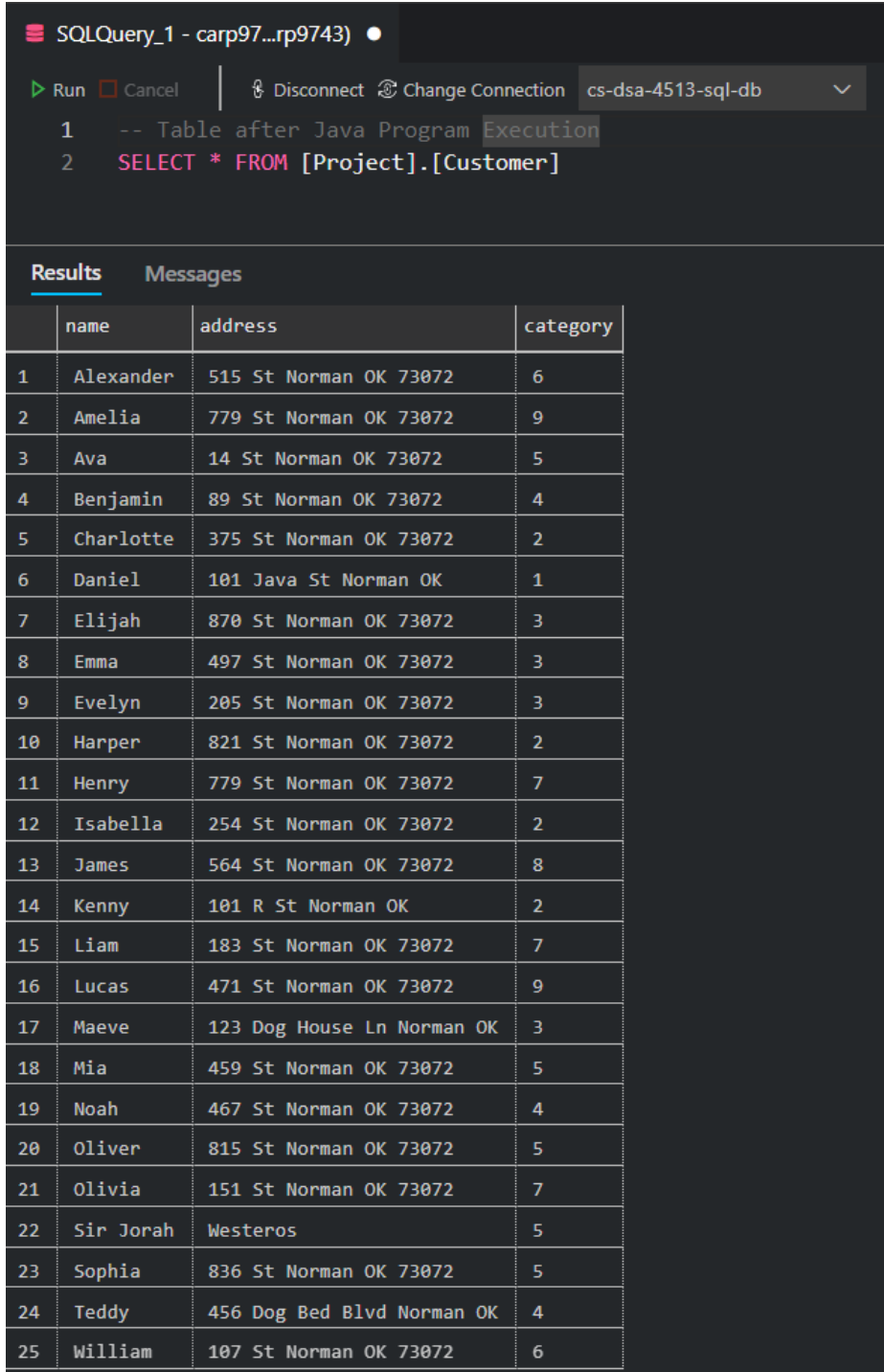
```
(18) Quit

16
Please enter the location and name of a CSV file with customer data:
>> PLEASE DO NOT INCLUDE COMMAS EXCEPT FOR THE DELIMITER <<
C:\\Users\\daniel.carpenter\\OneDrive - the Chickasaw Nation\\Documents\\GitHub\\OU-DSA\\db MG
Dispatching the query...
Done. 20 rows inserted.
```

6.16. Screenshots showing the testing of the import and export options (*Continued*)

Import Option (16) (*Continued*):

Customer table after uploading file



The screenshot shows a SQL query editor window titled "SQLQuery_1 - carp97...rp9743)". The query is: `-- Table after Java Program Execution` followed by `SELECT * FROM [Project].[Customer]`. The results are displayed in a table with columns: name, address, and category. The table contains 25 rows of data.

	name	address	category
1	Alexander	515 St Norman OK 73072	6
2	Amelia	779 St Norman OK 73072	9
3	Ava	14 St Norman OK 73072	5
4	Benjamin	89 St Norman OK 73072	4
5	Charlotte	375 St Norman OK 73072	2
6	Daniel	101 Java St Norman OK	1
7	Elijah	870 St Norman OK 73072	3
8	Emma	497 St Norman OK 73072	3
9	Evelyn	205 St Norman OK 73072	3
10	Harper	821 St Norman OK 73072	2
11	Henry	779 St Norman OK 73072	7
12	Isabella	254 St Norman OK 73072	2
13	James	564 St Norman OK 73072	8
14	Kenny	101 R St Norman OK	2
15	Liam	183 St Norman OK 73072	7
16	Lucas	471 St Norman OK 73072	9
17	Maeve	123 Dog House Ln Norman OK	3
18	Mia	459 St Norman OK 73072	5
19	Noah	467 St Norman OK 73072	4
20	Oliver	815 St Norman OK 73072	5
21	Olivia	151 St Norman OK 73072	7
22	Sir Jorah	Westeros	5
23	Sophia	836 St Norman OK 73072	5
24	Teddy	456 Dog Bed Blvd Norman OK	4
25	William	107 St Norman OK 73072	6

6.16. Screenshots showing the testing of the import and export options (Continued)

Export Option (17):

The screenshot displays a Java application window with a console window on the left and a file explorer on the right. The console window shows the application's output, including a list of options and the execution of the export command. The file explorer shows the location of the exported file, ListOfCustomers.csv, in the project directory.

Console Output:

```
Carpenter_Daniel_IP_Task5b [Java Application] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 9, 2021, 12:46:34 PM)
C:\Users\daniel.carpenter\OneDrive - the Chickasaw Nation\Documents\GitHub\OU-DSA\db MGT Syst
Dispatching the query...
Done. 20 rows inserted.

Please select one of the options below:
(1) Enter a new customer
(2) Enter a new department
(3) Enter a new process-id and its department together with its type and information
    relevant to the type
(4) Enter a new assembly with its customer-name, assembly-details, assembly-id,
    and dateordered and associate it with one or more processes
(5) Create a new account and associate it with the process, assembly, or department
    to which it is applicable
(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
(7) At the completion of a job, enter the date it completed and the information
    relevant to the type of job
(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the
    affected accounts by adding sup-cost to their current values of details
(9) Retrieve the total cost incurred on an assembly-id
(10) Retrieve the total labor time within a department for jobs completed in the
    department during a given date
(11) Retrieve the processes through which a given assembly-id has passed so far
    (in datecommenced order) and the department responsible for each process
(12) Retrieve the jobs (together with their type information and assembly-id)
    completed during a given date in a given department
(13) Retrieve the customers (in name order) whose category is in a given range
(14) Delete all cut-jobs whose job-no is in a given range
(15) Change the color of a given paint job
(16) Import: enter new customers from a data file until the file is empty
    (the user must be asked to enter the input file name).
(17) Export: Retrieve the customers (in name order) whose category is in a given range
    and output them to a data file instead of screen (the user must be asked to enter the output
    file name)
(18) Quit

17
Please enter MIN category number (integer from 1 - 10, inclusive):
1
Please enter MAX category number (integer from 1 - 10, inclusive):
10
Please enter the file output name:
ListOfCustomers
Dispatching the query...
Done. File Location here:
ListOfCustomers.csv
Please select one of the options below:
```

File Explorer:

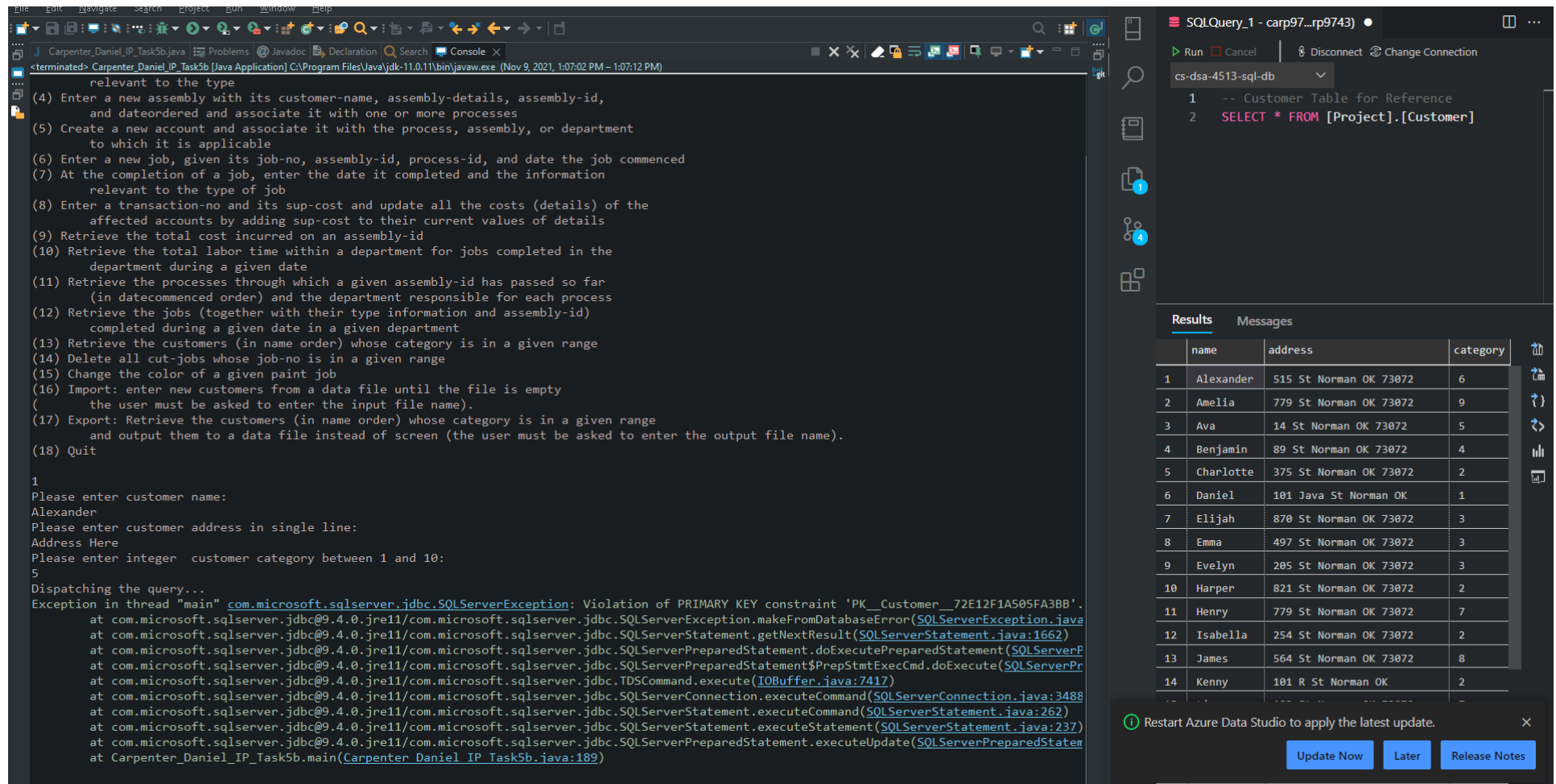
The file explorer shows the location of the exported file, ListOfCustomers.csv, in the project directory. The file is highlighted with a red circle and a red arrow pointing to it.

Excel Spreadsheet:

A1	name	address	category
1	name	address	category
2	Alexander	515 St Norman OK 73072	6
3	Amelia	779 St Norman OK 73072	9
4	Ava	14 St Norman OK 73072	5
5	Benjamin	89 St Norman OK 73072	4
6	Charlotte	375 St Norman OK 73072	2
7	Daniel	101 Java St Norman OK	1
8	Elijah	870 St Norman OK 73072	3
9	Emma	497 St Norman OK 73072	3
10	Evelyn	205 St Norman OK 73072	3
11	Harper	821 St Norman OK 73072	2
12	Henry	779 St Norman OK 73072	7
13	Isabella	254 St Norman OK 73072	2
14	James	564 St Norman OK 73072	8
15	Kenny	101 R St Norman OK	2
16	Liam	183 St Norman OK 73072	7
17	Lucas	471 St Norman OK 73072	9
18	Maeve	123 Dog House Ln Norman OK	3
19	Mia	459 St Norman OK 73072	5
20	Noah	467 St Norman OK 73072	4
21	Oliver	815 St Norman OK 73072	5
22	Olivia	151 St Norman OK 73072	7
23	Sir Jorah	Westeros	5
24	Sophia	836 St Norman OK 73072	5
25	Teddy	456 Dog Bed Blvd Norman OK	4
26	William	107 St Norman OK 73072	6

6.17. Screenshots showing the Testing of Three Types of Errors

Error Example 1 – Violating a Primary Key constraint on the Table ‘Customer’:



The screenshot displays an IDE with a Java application running in the background. The application is a console-based program that prompts the user to enter customer information and then displays a list of tasks. The tasks are as follows:

- relevant to the type
- Enter a new assembly with its customer-name, assembly-details, assembly-id, and dateordered and associate it with one or more processes
- Create a new account and associate it with the process, assembly, or department to which it is applicable
- Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
- At the completion of a job, enter the date it completed and the information relevant to the type of job
- Enter a transaction-no and its sup-cost and update all the costs (details) of the affected accounts by adding sup-cost to their current values of details
- Retrieve the total cost incurred on an assembly-id
- Retrieve the total labor time within a department for jobs completed in the department during a given date
- Retrieve the processes through which a given assembly-id has passed so far (in datecommenced order) and the department responsible for each process
- Retrieve the jobs (together with their type information and assembly-id) completed during a given date in a given department
- Retrieve the customers (in name order) whose category is in a given range
- Delete all cut-jobs whose job-no is in a given range
- Change the color of a given paint job
- Import: enter new customers from a data file until the file is empty (the user must be asked to enter the input file name).
- Export: Retrieve the customers (in name order) whose category is in a given range and output them to a data file instead of screen (the user must be asked to enter the output file name).
- Quit

The application is running and displaying the following output:

```
1
Please enter customer name:
Alexander
Please enter customer address in single line:
Address Here
Please enter integer customer category between 1 and 10:
5
Dispatching the query...
Exception in thread "main" com.microsoft.sqlserver.jdbc.SQLServerException: Violation of PRIMARY KEY constraint 'PK_Customer_72E12F1A505FA3BB'.
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerException.makeFromDatabaseError(SQLServerException.java:1662)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerStatement.getNextResult(SQLServerStatement.java:1662)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerPreparedStatement.doExecutePreparedStatement(SQLServerPreparedStatement.java:1662)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerPreparedStatement$PrepStmtExecCmd.doExecute(SQLServerPreparedStatement.java:1662)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.TDSCommand.execute(IOBuffer.java:7417)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerConnection.executeCommand(SQLServerConnection.java:3488)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerStatement.executeCommand(SQLServerStatement.java:262)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerStatement.executeStatement(SQLServerStatement.java:237)
    at com.microsoft.sqlserver.jdbc@9.4.0.jre11/com.microsoft.sqlserver.jdbc.SQLServerPreparedStatement.executeUpdate(SQLServerPreparedStatement.java:1662)
    at Carpenter_Daniel_IP_Task5b.main(Carpenter_Daniel_IP_Task5b.java:189)
```

The SQL query window shows a query that results in a primary key constraint violation error. The query is as follows:

```
1 -- Customer Table for Reference
2 SELECT * FROM [Project].[Customer]
```

The results of the query are displayed in a table with the following columns: name, address, and category. The results are as follows:

	name	address	category
1	Alexander	515 St Norman OK 73072	6
2	Amelia	779 St Norman OK 73072	9
3	Ava	14 St Norman OK 73072	5
4	Benjamin	89 St Norman OK 73072	4
5	Charlotte	375 St Norman OK 73072	2
6	Daniel	181 Java St Norman OK	1
7	Elijah	870 St Norman OK 73072	3
8	Emma	497 St Norman OK 73072	3
9	Evelyn	285 St Norman OK 73072	3
10	Harper	821 St Norman OK 73072	2
11	Henry	779 St Norman OK 73072	7
12	Isabella	254 St Norman OK 73072	2
13	James	564 St Norman OK 73072	8
14	Kenny	181 R St Norman OK	2

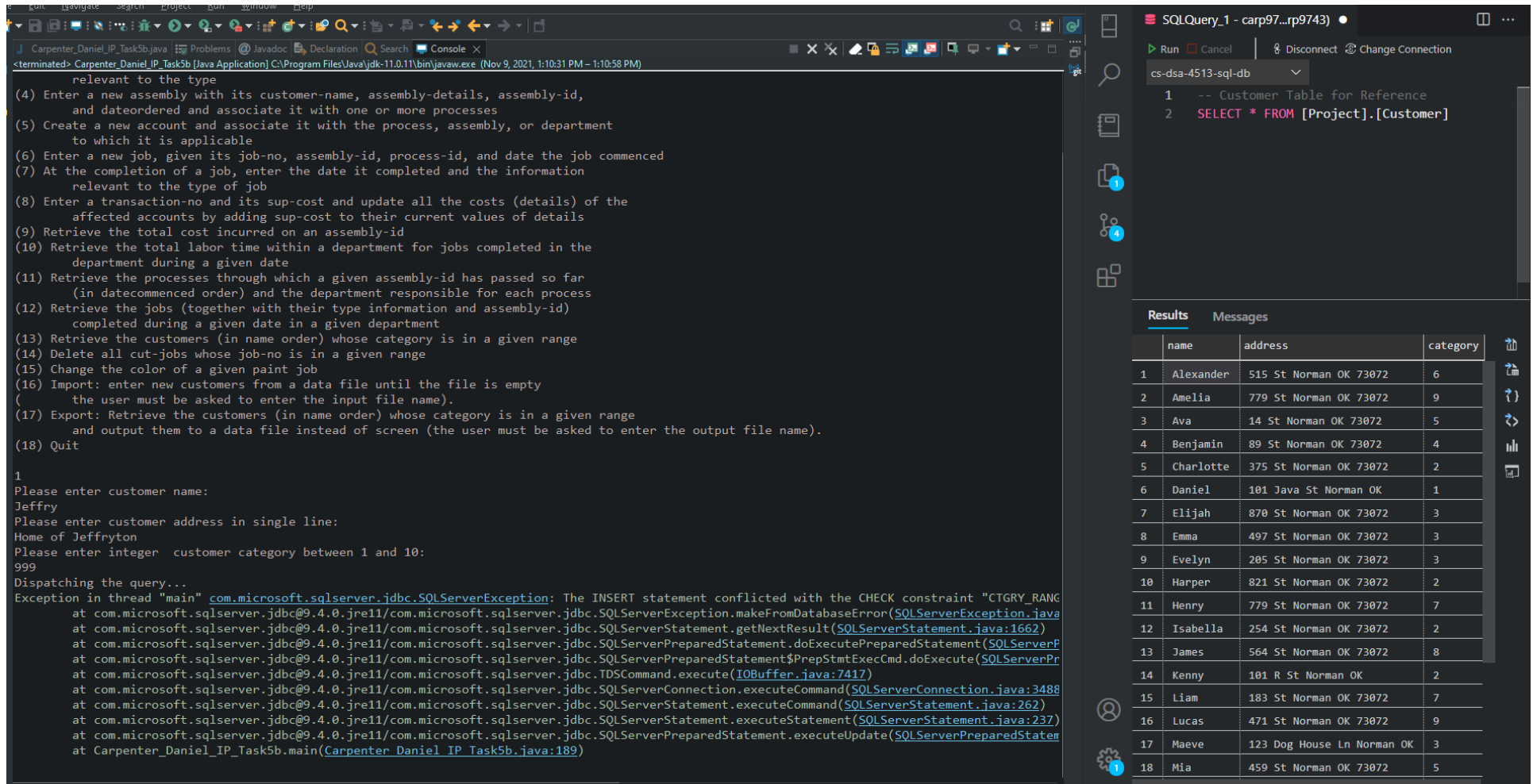
A notification at the bottom of the IDE indicates that the user should restart Azure Data Studio to apply the latest update.

Restart Azure Data Studio to apply the latest update.

Update Now Later Release Notes

6.17. Screenshots showing the Testing of Three Types of Errors (Continued)

Error Example 2: Entering data outside of constraint range of table 'Customer' on attribute 'category'. Expected values 1 through 10



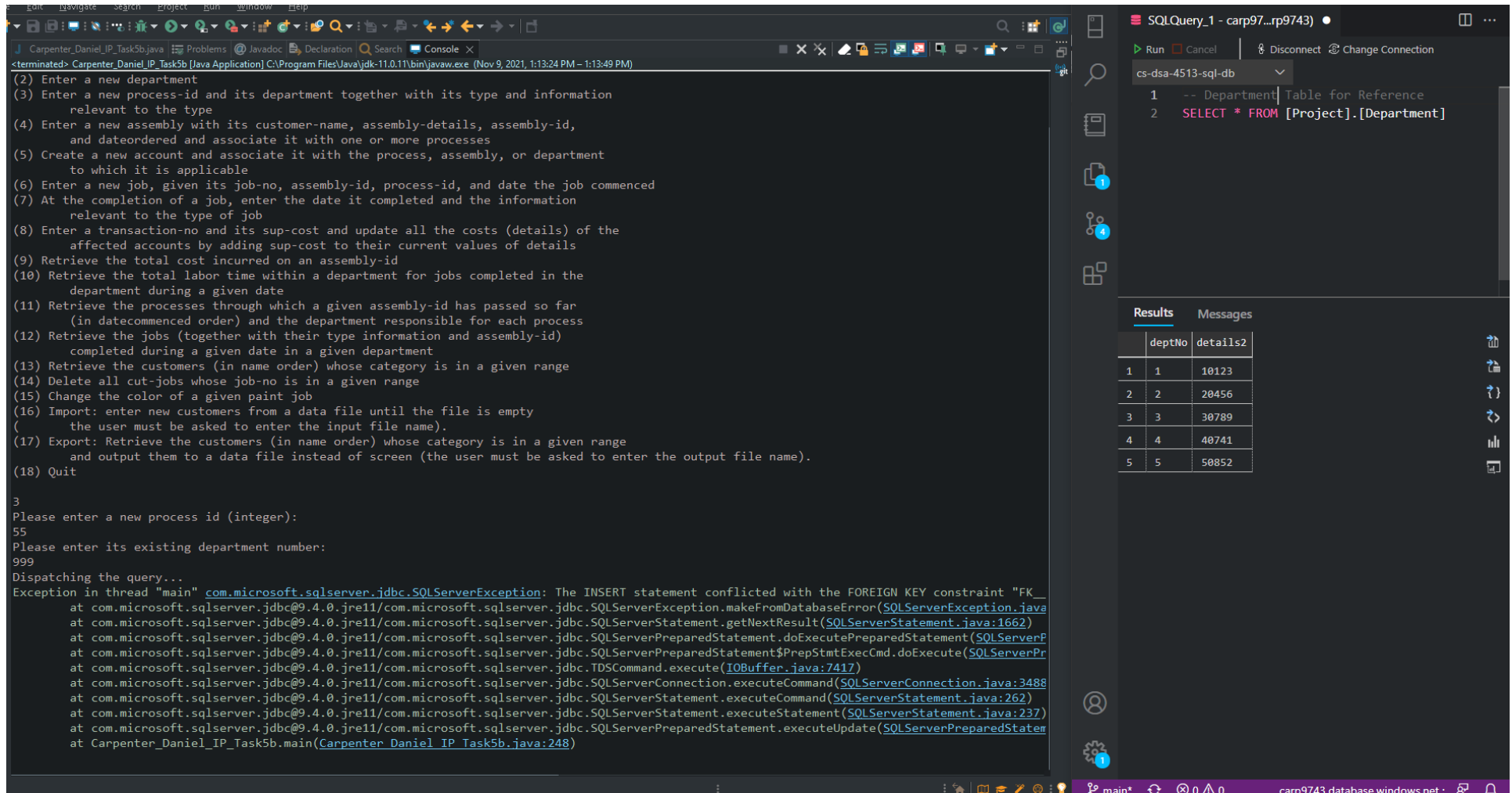
The screenshot shows an IDE with a Java application running. The application is displaying a list of tasks, including entering a new assembly, creating a new account, entering a new job, and retrieving the total cost. The application is also displaying a message about a SQLServerException: The INSERT statement conflicted with the CHECK constraint "CTGRY_RANG".

The SQL query window shows a query to select all data from the 'Customer' table. The results of the query are displayed in a table.

	name	address	category
1	Alexander	515 St Norman OK 73072	6
2	Amelia	779 St Norman OK 73072	9
3	Ava	14 St Norman OK 73072	5
4	Benjamin	89 St Norman OK 73072	4
5	Charlotte	375 St Norman OK 73072	2
6	Daniel	101 Java St Norman OK	1
7	Elijah	870 St Norman OK 73072	3
8	Emma	497 St Norman OK 73072	3
9	Evelyn	205 St Norman OK 73072	3
10	Harper	821 St Norman OK 73072	2
11	Henry	779 St Norman OK 73072	7
12	Isabella	254 St Norman OK 73072	2
13	James	564 St Norman OK 73072	8
14	Kenny	101 R St Norman OK	2
15	Liam	183 St Norman OK 73072	7
16	Lucas	471 St Norman OK 73072	9
17	Maeve	123 Dog House Ln Norman OK	3
18	Mia	459 St Norman OK 73072	5

6.17. Screenshots showing the Testing of Three Types of Errors (Continued)

Error Example 3: Violating foreign key constraint by adding new Assembly with a non-existing 'deptNo' (which is the foreign key)



The screenshot shows an IDE with a Java application running. The application is displaying a list of tasks. The SQL query window shows a query to select all data from the [Project].[Department] table. The results of the query are displayed in a table.

SQLQuery_1 - carp97...rp9743)

Run Cancel | Disconnect | Change Connection

cs-dsa-4513-sql-db

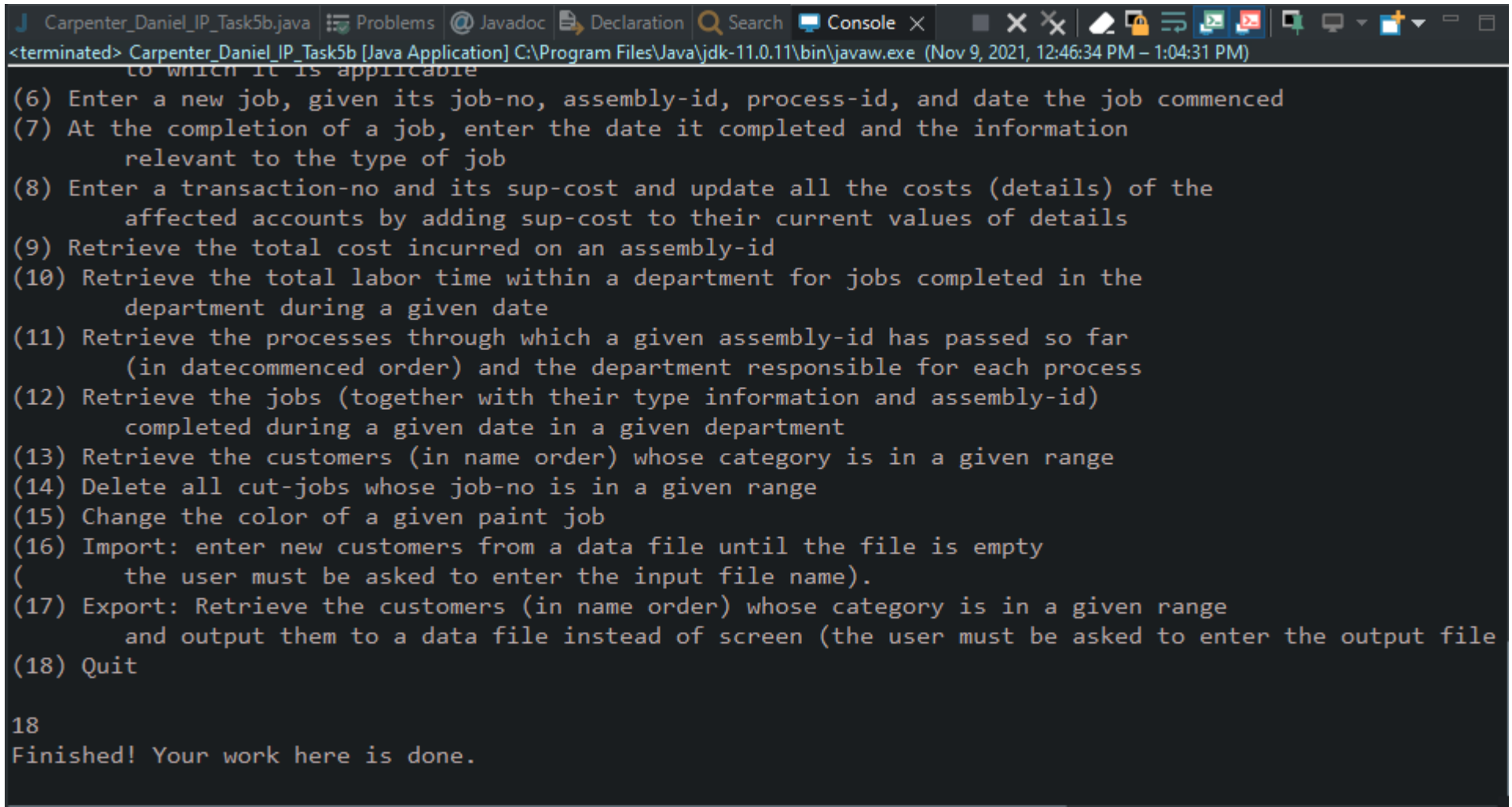
```
1 -- Department Table for Reference
2 SELECT * FROM [Project].[Department]
```

Results Messages

	deptNo	details2
1	1	10123
2	2	20456
3	3	30789
4	4	40741
5	5	50852

Exception in thread "main" com.microsoft.sqlserver.jdbc.SQLServerException: The INSERT statement conflicted with the FOREIGN KEY constraint "FK_...". The key values (deptNo) do not match the values (deptNo) specified in the foreign key.

6.18. Screenshots showing the Testing of the Quit Option



```
<terminated> Carpenter_Daniel_IP_Task5b [Java Application] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 9, 2021, 12:46:34 PM – 1:04:31 PM)
to which it is applicable
(6) Enter a new job, given its job-no, assembly-id, process-id, and date the job commenced
(7) At the completion of a job, enter the date it completed and the information
    relevant to the type of job
(8) Enter a transaction-no and its sup-cost and update all the costs (details) of the
    affected accounts by adding sup-cost to their current values of details
(9) Retrieve the total cost incurred on an assembly-id
(10) Retrieve the total labor time within a department for jobs completed in the
    department during a given date
(11) Retrieve the processes through which a given assembly-id has passed so far
    (in datecommenced order) and the department responsible for each process
(12) Retrieve the jobs (together with their type information and assembly-id)
    completed during a given date in a given department
(13) Retrieve the customers (in name order) whose category is in a given range
(14) Delete all cut-jobs whose job-no is in a given range
(15) Change the color of a given paint job
(16) Import: enter new customers from a data file until the file is empty
    (
        the user must be asked to enter the input file name).
(17) Export: Retrieve the customers (in name order) whose category is in a given range
    and output them to a data file instead of screen (the user must be asked to enter the output file
(18) Quit

18
Finished! Your work here is done.
```


7.1. Web Database Application Source Program and Associated Screenshots of Successful Compilation

Carpenter_Daniel_IP_Task7_DataHandler.java

```
package JobShopProject;

import java.sql.CallableStatement;
import java.sql.Connection;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.sql.DriverManager;
import java.sql.PreparedStatement;

//=====
//@class: DSA 4513
//@asmt: Class Project
//@task: 7
//@author: Daniel Carpenter, ID: 113009743
//@description:
// Program to implement job-shop accounting system query 1 and 13
//=====

public class Carpenter_Daniel_IP_Task7_DataHandler {

    private Connection conn;

    // Azure SQL connection credentials
    private String server = "carp9743.database.windows.net";
    private String database = "cs-dsa-4513-sql-db";
    private String username = "carp9743";
    private String password = "tacoBout$97315!";
```

```

// Resulting connection string
final private String url =
    String.format("jdbc:sqlserver://%s:1433;database=%s;user=%s;password=%s;encrypt=true;trustServerCertificate=false;host
        server, database, username, password);

// Initialize and save the database connection
private void getDBConnection() throws SQLException {
    if (conn != null) {
        return;
    }

    this.conn = DriverManager.getConnection(url);
}

// Adds a customer to the Customer table and returns true if executed correctly
public boolean addCustomer(String name, String address, int category) throws SQLException {
    getDBConnection();

    // Prepare the query
    final String sqlQuery = "EXEC [Project].addCustomer @name = ?, @address = ?, @category = ?;";

    // Replace the '?' in the above statement with the given attribute values
    final PreparedStatement statement = conn.prepareStatement(sqlQuery);
    statement.setString(1, name);
    statement.setString(2, address);
    statement.setInt(3, category);

    // Return true if successful
    return statement.executeUpdate() == 1;
}

// Inserts a record into the movie_night table with the given attribute values

```

```

public ResultSet getCustomersInRange(int min, int max) throws SQLException {

    getDBConnection(); // Prepare the database connection

    // Query
    String sqlQuery = "{CALL [Project].getCustomers(?, ?)}";

    // Prepare query call
    CallableStatement statement = conn.prepareCall(sqlQuery);

    // Set the assigned value(s) to the procedures input '?'
    statement.setInt("min", min);
    statement.setInt("max", max);

    // Execute the query
    return statement.executeQuery();
}
}

```

Carpenter_Daniel_IP_Task7_getCustomersInRange.jsp

```

<%@ page language="java" contentType="text/html; charset=UTF-8"
pageEncoding="UTF-8"%>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
<title>Query Result</title>
</head>
<body>

```

```

<%@page import="JobShopProject.Carpenter_Daniel_IP_Task7_DataHandler"%>
<%@page import="java.sql.ResultSet"%>
<%@page import="java.sql.Array"%>
<%
// The handler is the one in charge of establishing the connection.
Carpenter_Daniel_IP_Task7_DataHandler handler = new Carpenter_Daniel_IP_Task7_DataHandler();

// Get the attribute values passed from the input form.
String min  = request.getParameter("min");
String max  = request.getParameter("max");

// Assume all categories if query fails
int minAsInt = 1;
int maxAsInt = 10;
ResultSet customers;

// detect input
if (min.equals("") || max.equals("")) {
    response.sendRedirect("Carpenter_Daniel_IP_Task7_getCustomersInRange.jsp");
} else {
    // Get the actual input
    minAsInt = Integer.parseInt(min);
    maxAsInt = Integer.parseInt(max);

}
// Now perform the query with the data from the form.
customers = handler.getCustomersInRange(minAsInt, maxAsInt);

%>
<!-- The table for displaying all the customer records -->
<table cellpadding="2" cellspacing="2" border="1">
    <tr> <!-- The table headers row -->

```

```

        <td align="center">
            <h4>name</h4>
        </td>
    </tr>
<%
    while(customers.next()) { // For each Customer record returned...
        // Extract the attribute values for every row returned
        final String name      = customers.getString("name");

        out.println("<tr>"); // Start printing out the new table row
        out.println( // Print each attribute value
            "<td align=\"center\">" + name + "</td>");
        out.println("</tr>");
    }
%>
</table>
<a href="Carpenter_Daniel_IP_Task7_addCustomerForm.jsp">Add more customers.</a>

</body>
</html>

```

Carpenter_Daniel_IP_Task7_getCustomersInRangeForm.jsp

```

<!DOCTYPE html>
<html>
    <head>
        <meta charset="UTF-8">
        <title>Get customers whose category is in a given range </title>
    </head>
    <body>
        <h2>Get Customers</h2>
    </body>
</html>

```

```

<!--
    Form for collecting user input for the new Customer record.
    Upon form submission, addCustomer.jsp file will be invoked.
-->
<form action="Carpenter_Daniel_IP_Task7_getCustomersInRange.jsp">
    <!-- The form organized in an HTML table for better clarity. -->
    <table border=1>
        <tr>
            <th colspan="2">Retrieve the customers (in name order) whose category is in range 1 through 10
(integer):</th>
        </tr>
        <tr>
            <td>Min Value:</td>
            <td><div style="text-align: center;">
                <input type=text name=min>
            </div></td>
        </tr>
        <tr>
            <td>Max Value:</td>
            <td><div style="text-align: center;">
                <input type=text name=max>
            </div></td>
        </tr>
        <tr>
            <td><div style="text-align: center;">
                <input type=reset value=Clear>
            </div></td>
            <td><div style="text-align: center;">
                <input type=submit value=Submit>
            </div></td>
        </tr>
    </table>
</form>

```

```
</body>  
</html>
```

Carpenter_Daniel_IP_Task7_addCustomer.jsp

```
<%@ page language="java" contentType="text/html; charset=UTF-8"
pageEncoding="UTF-8"%>
<!DOCTYPE html PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
<title>Query Result</title>
</head>
<body>
<%@page import="JobShopProject.Carpenter_Daniel_IP_Task7_DataHandler"%>
<%@page import="java.sql.ResultSet"%>
<%@page import="java.sql.Array"%>
<%
// The handler is the one in charge of establishing the connection.
Carpenter_Daniel_IP_Task7_DataHandler handler = new Carpenter_Daniel_IP_Task7_DataHandler();

// Get the attribute values passed from the input form.
String name      = request.getParameter("name");
String address   = request.getParameter("address");
String category  = request.getParameter("category");

/*
 * If the user hasn't filled out all the fields. This is very simple checking.
 */
if (name.equals("") || address.equals("") || category.equals("")) {
    response.sendRedirect("Carpenter_Daniel_IP_Task7_addCustomerForm.jsp");
} else {
    int categoryAsInt = Integer.parseInt(category);

    // Now perform the query with the data from the form.
```



```

boolean success = handler.addCustomer(name, address, categoryAsInt);
if (!success) { // Something went wrong
    %>
    <h2>There was a problem inserting the course</h2>
    <%
} else { // Confirm success to the user
    %>
    <h2>The Customer:</h2>

    <ul>
        <li>Customer Name: <%=name%></li>
        <li>Address: <%=address%></li>
        <li>Category: <%=categoryAsInt%></li>
    </ul>

    <h2>Was successfully inserted.</h2>

    <a href="Carpenter_Daniel_IP_Task7_getCustomersInRangeForm.jsp">Retrieve list of customers.</a>
    <%
}
}
%>
</body>
</html>

```

Carpenter_Daniel_IP_Task7_addCustomerForm.jsp

```

<!DOCTYPE html>
<html>
    <head>
        <meta charset="UTF-8">

```

```

<title>Add Customer</title>
</head>
<body>
  <h2>Add Customer</h2>
  <!--
    Form for collecting user input for the new Customer record.
    Upon form submission, addCustomer.jsp file will be invoked.
  -->
  <form action="Carpenter_Daniel_IP_Task7_addCustomer.jsp">
    <!-- The form organized in an HTML table for better clarity. -->
    <table border=1>
      <tr>
        <th colspan="2">Enter the Customer data:</th>
      </tr>
      <tr>
        <td>Customer Name:</td>
        <td><div style="text-align: center;">
          <input type=text name=name>
        </div></td>
      </tr>
      <tr>
        <td>Address:</td>
        <td><div style="text-align: center;">
          <input type=text name=address>
        </div></td>
      </tr>
      <tr>
        <td>Category:</td>
        <td><div style="text-align: center;">
          <input type=text name=category>
        </div></td>
      </tr>
      <tr>

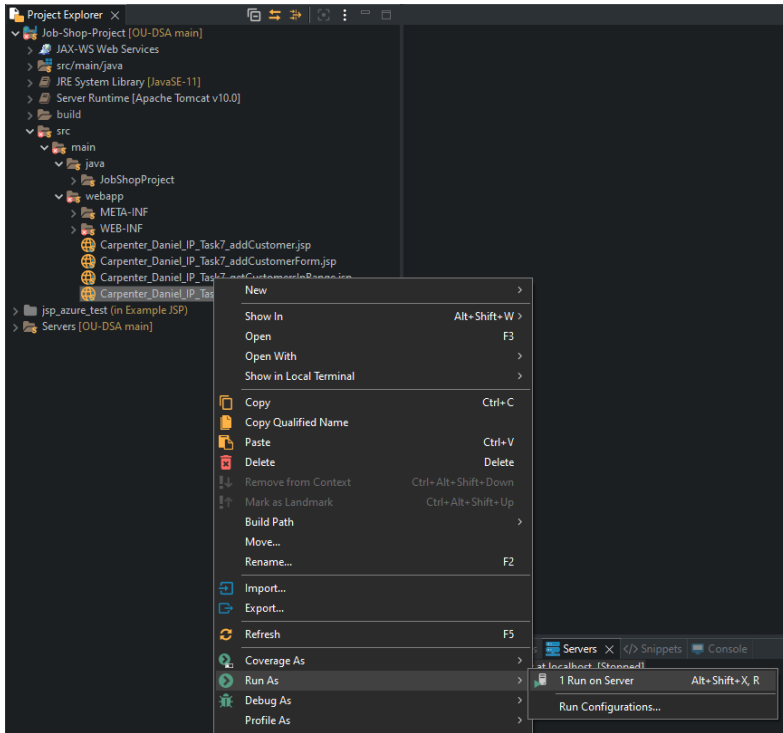
```

```
<td><div style="text-align: center;">
  <input type=reset value=Clear>
</div></td>
<td><div style="text-align: center;">
  <input type=submit value=Insert>
</div></td>
</tr>
</table>
</form>
</body>
</html>
```

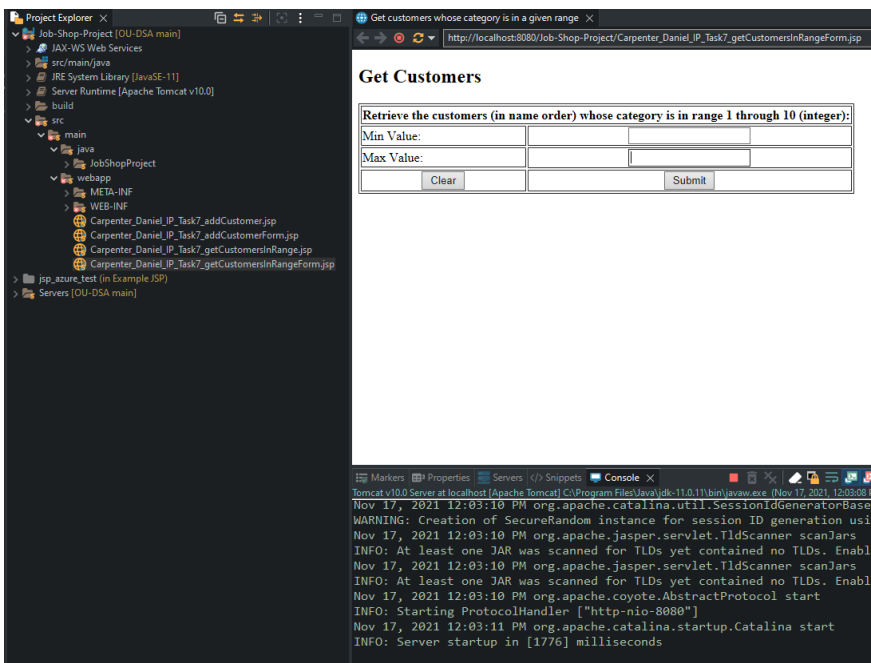
7.1. Web Database Application Source Program

and Associated Screenshots of Successful Compilation (*Continued*)

Prior to clicking Project



Upon Clicking “Run on Server”



7.2. Screenshots Showing the Testing of the Web Database Application

Screenshot 1: Application to get Customers, (with inputs range inputs from 1 to 5)

The screenshot displays an IDE with a Project Explorer on the left, a web browser window in the center, and a console window at the bottom.

Project Explorer: Shows the project structure for 'Job-Shop-Project [OU-DSA main]'. The 'src' directory is expanded, showing 'main' > 'java' > 'JobShopProject' > 'webapp'. The 'webapp' directory contains 'META-INF', 'WEB-INF', and several JSP files, including 'Carpenter_Daniel_IP_Task7_getCustomersInRangeForm.jsp'.

Web Browser: The address bar shows 'http://localhost:8080/Job-Shop-Project/Carpenter_Daniel_IP_Task7_getCustomersInRangeForm.jsp'. The page title is 'Get Customers'. The main content area displays a form titled 'Retrieve the customers (in name order) whose category is in range 1 through 10 (integer):'. The form has two input fields: 'Min Value:' with the value '1' and 'Max Value:' with the value '3'. Below the inputs are 'Clear' and 'Submit' buttons.

Console: The console shows the following output:

```
Tomcat v10.0 Server at localhost [Apache Tomcat] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 17, 2021, 12:03:08 PM)
Nov 17, 2021 12:03:10 PM org.apache.catalina.util.SessionIdGeneratorBase
WARNING: Creation of SecureRandom instance for session ID generation using
Nov 17, 2021 12:03:10 PM org.apache.jasper.servlet.TldScanner scanJars
INFO: At least one JAR was scanned for TLDs yet contained no TLDs. Enable
Nov 17, 2021 12:03:10 PM org.apache.jasper.servlet.TldScanner scanJars
INFO: At least one JAR was scanned for TLDs yet contained no TLDs. Enable
Nov 17, 2021 12:03:10 PM org.apache.coyote.AbstractProtocol start
INFO: Starting ProtocolHandler ["http-nio-8080"]
Nov 17, 2021 12:03:11 PM org.apache.catalina.startup.Catalina start
INFO: Server startup in [1776] milliseconds
```

Screenshot 2: Application after clicking “Submit” on the prior page



7.2. Screenshots Showing the Testing of the Web Database Application (*Continued*)

Screenshot 3: Application after clicking the “Add more customers” button on prior page
(with relevant inputs to the Customer table)

The screenshot displays an IDE environment with a project named "Job-Shop-Project [OU-DSA main]". The Project Explorer on the left shows the file structure, including a "webapp" directory containing several JSP files. The main window shows a web browser at the URL `http://localhost:8080/Job-Shop-Project/Carpenter_Daniel_IP_Task7_addCustomerForm.jsp`. The browser displays a form titled "Add Customer" with the following inputs:

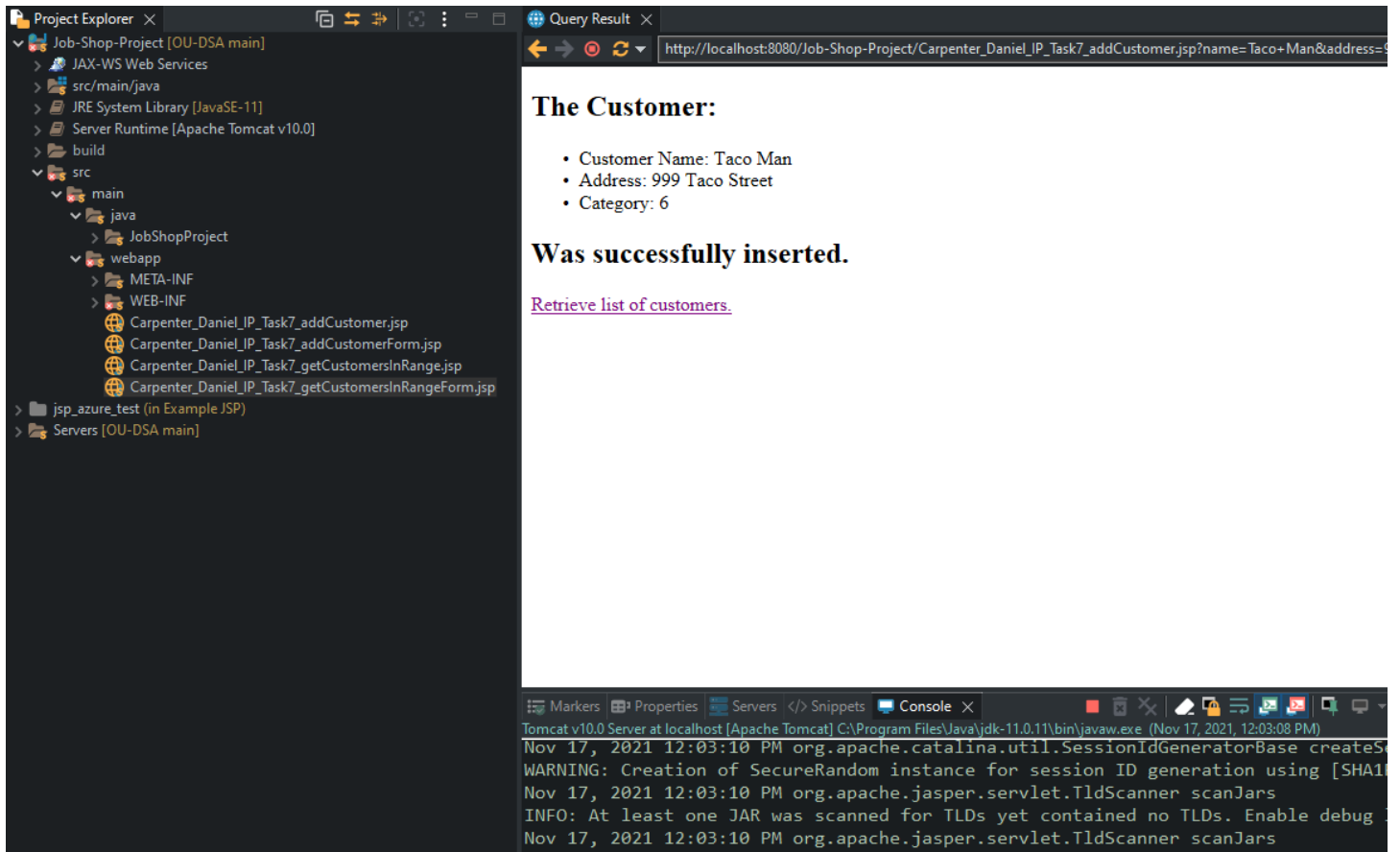
Enter the Customer data:	
Customer Name:	Taco Man
Address:	999 Taco Street
Category:	6
<input type="button" value="Clear"/> <input type="button" value="Insert"/>	

The bottom of the screenshot shows the IDE's console window with the following output:

```
Tomcat v10.0 Server at localhost [Apache Tomcat] C:\Program Files\Java\jdk-11.0.11\bin\javaw.exe (Nov 17, 2021, 12:03:08 PM)
Nov 17, 2021 12:03:10 PM org.apache.catalina.util.SessionIdGeneratorBase
WARNING: Creation of SecureRandom instance for session ID generation using
Nov 17, 2021 12:03:10 PM org.apache.jasper.servlet.TldScanner scanJars
INFO: At least one JAR was scanned for TLDs yet contained no TLDs. Enable
Nov 17, 2021 12:03:10 PM org.apache.jasper.servlet.TldScanner scanJars
INFO: At least one JAR was scanned for TLDs yet contained no TLDs. Enable
Nov 17, 2021 12:03:10 PM org.apache.coyote.AbstractProtocol start
INFO: Starting ProtocolHandler ["http-nio-8080"]
Nov 17, 2021 12:03:11 PM org.apache.catalina.startup.Catalina start
INFO: Server startup in [1776] milliseconds
```

7.2. Screenshots Showing the Testing of the Web Database Application (*Continued*)

Screenshot 4: Application after clicking the “Insert” button on prior page



7.2. Screenshots Showing the Testing of the Web Database Application (*Continued*)

Screenshot 5: Application after clicking the “Retrieve list of customers.” button on prior page

The screenshot displays an IDE environment with the following components:

- Project Explorer:** Shows the project structure for 'Job-Shop-Project [OU-DSA main]'. The 'src/main/webapp' directory contains several JSP files, including 'Carpenter_Daniel_IP_Task7_getCustomersInRange.jsp'.
- Browser Window:** Displays the 'Get Customers' form. The form title is 'Get Customers'. The instruction reads: 'Retrieve the customers (in name order) whose category is in range 1 through 10 (integer):'. There are two input fields for 'Min Value:' and 'Max Value:'. Below these fields are 'Clear' and 'Submit' buttons.
- Console Window:** Shows the server startup logs for 'Tomcat v10.0 Server at localhost [Apache Tomcat]'. The logs include the following messages:

```
Nov 17, 2021 12:03:10 PM org.apache.catalina.util.SessionIdGeneratorBase cr
WARNING: Creation of SecureRandom instance for session ID generation using
Nov 17, 2021 12:03:10 PM org.apache.jasper.servlet.TldScanner scanJars
INFO: At least one JAR was scanned for TLDs yet contained no TLDs. Enable d
Nov 17, 2021 12:03:10 PM org.apache.jasper.servlet.TldScanner scanJars
INFO: At least one JAR was scanned for TLDs yet contained no TLDs. Enable d
Nov 17, 2021 12:03:10 PM org.apache.coyote.AbstractProtocol start
INFO: Starting ProtocolHandler ["http-nio-8080"]
Nov 17, 2021 12:03:11 PM org.apache.catalina.startup.Catalina start
INFO: Server startup in [1776] milliseconds
```