MS SQL Server 2012 for BI – Database Development

Lab Book

Document Revision History

Date	Revision No.	Author	Summary of Changes
25th July 2011	2.0	Latha S.	Changes in Material made based on integration process
3rd April, 2012	3.0	Shilpa Bhosle	Changes in Lab Book are made as an upgrade to SQL Server 2008
21st Aug 2013	4.0	Shashank Saudagar	Changes in Lab Book are made as an upgrade to SQL Server 2012
14th May 2015	5.0	Vaishali Kasture	Changes in Lab Book as per new curriculum of SQL Server 2012

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Getting Started

Overview

This Lab book is a guided tour for Learning SQL server 2008

Each section contains some examples and assignments. Follow the steps provided in the solved examples and then work out the Assignments given.

Setup Checklist for SQL Server 2012

Here is what is expected on your machine in order for the lab to work.

Minimum System Requirements

Processor, HDD & RAM

- Processor - Minimum: AMD Opteron, AMD Athlon 64, Intel Xeon with Intel EM64T support, Intel Pentium IV with EM64T support
- Processor speed: Minimum: 1.4 GHz
- Recommended: 2.0 GHz or faster
- RAM - Minimum:512 MB, Recommended: 2.048 GB or more
- HDD – 150 GB

Operating System

- Windows XP Professional x64
- Windows 7 Professional 64 bit

SQL Server 2012 Developer Edition

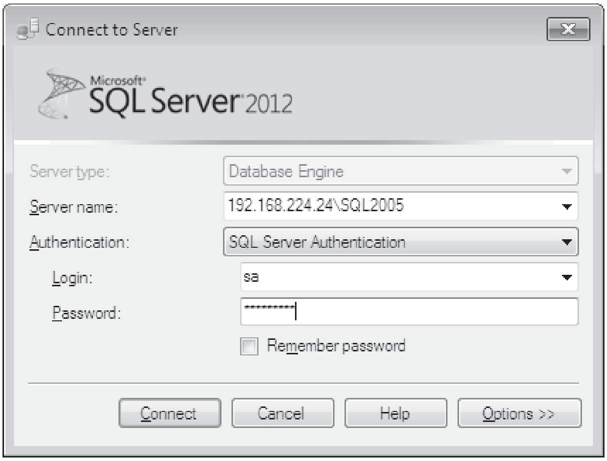
- SQL server 2012 client and a SQL server 2012 Server instance running on the Server.

A database called training will be available; all objects for the lab session would be stored in that database alone

Lab 1. Getting connected to the SQL Server 2012 Server

1.1: Steps to connect to the SQL Server 2012 Server

Step 1: Click **Start, Programs, Microsoft SQL Server 2012, SQL Server Management Studio.**



Connect to Server

Server type: Database Engine

Server name: 192.168.224.24\SQL2005

Authentication: SQL Server Authentication

Login: sa

Password: **********

□ Remember password

Figure 1: Connecting to SQL Server 2012

Step 2:

Enter the Login, Password and the Server name provided to you.

Login: <loginid>Passwd: <password>

Step 3: Click on New Query.

1.2: Getting Familiar with SQL Server

1. Identify all the system and user defined database in your system.

2. Make master database as your current database , by using the command

```
Use <databasename>
```

3. Find out if your active database is master ,by giving the command

```
Select db_name()

go
```

4. Now make Training database as your active database

5. Find out the content of the database by giving the following command. Observe the output

```
Sp_help

go
```

6. Repeat the above steps for master database and Northwind database

7. Find out the version of your SQL Server by giving the following command

```
Select @@version

go
```

8. Find out the server date by giving the following commands

```
Select getdate()

go
```

9. Make Northwind as your current database , find out information about tables using the command - Categories ,Products , Orders, Order Details , Employees

```
Sp_help<tablename>

go
```

10. Make a note of all related tables and foreign key columns

11. Repeat the above operation of Training database tables as well

1.3: SQL Languages – DDL- Creating Tables, Alias Data Type and Constraints

The following questions will be solved using the Training database only

12. Create a Table called Customer_<empid> with the following Columns

Customerid	Int	Unique NOT NULL
CustomerName	varchar(20)	Not Null
Addressl	varchar(30)	
Address2	varchar(30)	
Contact Number	varchar(12)	Not Null
Postal Code	Varchar(10)	

1. Create a user defined data type called Region, which would store a character string of size 15.

Hint: Use Create Type Statement

2. Create a Default which would store the value ‘NA’ (North America’)

Hint: create default

3. Bind the default to the Alias Data Type of Q13 i.e. region

Hint: use sp_bindefault

Syntax - EXEC sp_bindefault<DefaultName>, '<AliasName>'

4. Modify the table Customers to add the a column called Customer_Region which would be of data type:
   Region

5. Add the column to the Customer Table.
   Gender char (1)

6. Using alter table statement add a constraint to the Gender column such that it would not accept any other values except ‘M’,’F’ and ‘T’’.

7. Create the Table Orders with the following Columns:

OrdersID	Int	NOT NULL IDENTITY with starting values 1000
CustomerId	Int	Not Null
OrdersDate	Datetime	
Order_State	char(1)	can be only ‘P’ or ‘C’

8. Add referential integrity constraint for Orders & Customer tables through CustomerId with the name fk_CustOrders.

Using sp_help check if the constraints have been added properly.

1.4: Simple Queries& Merge Statement

For these questions, you will be using the University Schema , The table structure has been given in the appendix. These tables would be available in the Training database

1. List out Student_Code, Student_Name and Department_Code of every Student

2. Do the same for all the staff's

3. Retrieve the details (Name, Salary and dept code) of the employees who are working in department 20, 30 and 40.

4. Display Student_Code, Subjects and Total_Marks for every student. Total_Marks will calculate as Subject1 + Subject2 + Subject3 from Student_Marks. The records should be displayed in the descending order of Total Score

5. List out all the books which starts with 'An', along with price

6. List out all the department codes in which students have joined this year

7. List out a report like this
   StaffCodeStaffName Dept Code Date of Joining No of years in the Company

8. List out all staff's who have joined before Jan 2000

9. Write a query which will display Student_Name, Departmnet_Code and DOB of all students who born between January 1, 1981 and March 31, 1983.

10. List out all student codes who did not appear in the exam subject2

11. List the empno, name and Department No of the employees who have got experience of more than 18 years.

12. List out all the book code and library member codes whose return is still pending

13. Display the name and salary of the staff. Salary should be represented as X. Each X represents a 1000 in salary. It is assumed that a staff's salary to be multiples of 1000 , for example a salary of 5000 is represented as XXXXX

    Sample Output

```
JOHN          10000          XXXXXXXXXX
ALLEN         12000          XXXXXXXXXXXX
```

14. Display name and date of birth of students where date of birth must be displayed in the format similar to “January, 12 1981” for those who were born on Saturday or Sunday.

Hint: Use datename or datepart function

15. List all the staff’s whose birthday falls on the current month

16. How many books are stocked in the library?

17. How many books are there for topics Physics and Chemistry?

18. How many members are expected to return their books today?

19. Display the Highest, Lowest, Total & Average salary of all staff. Label the columns Maximum, Minimum, Total and Average respectively. Round the result to nearest whole number

20. How many staffs are managers”?

Stretched Assignments

21. List out year wise total students passed. The report should be as given below. A student is considered to be passed only when he scores 60 and above in all 3 subjects individually

Year No of students passed

22. List out all the departments which is having a headcount of more than 10

23. List the total cost of library inventory (sum of prices of all books)

24. List out category wise count of books costing more than Rs 1000 /-

25. How many students have joined in Physics dept (dept code is 10) last year?

Working with Merge Statement

Case Study – The Countryside Confectioneries is one of the well-known names in the brands of confectioneries in Switzerland. The company Database Administrator John & his team, maintains the entire business data in SQL Server 2008. As a database administrator, John, need to perform the ETL (Extract, Transform & Load) on database quite often, wherein he needs to execute multiple INSERT, UPDATE & DELETE Operations on database target table by matching the records from the source table. For example, a products dimension table has information about the products; you need to sync-up this table with the latest information about the products from the source table.

To simplify above task John & his team uses SQL Server 2008's one of the remarkable programming enhancement called MERGE statement as MERGE SQL command to perform these operations in a single statement. He uses MERGE statement to so that he can eliminate the need of writing multiple and separate DML statements to refresh the target table with an updated product list or do lookups.

The following example demonstrates the use of MERGE statement in above given case study.

A. Execute the following SQL queries in SQL Server 2008 SSMS as instructed & observe the output

1. Create following tables in SQL Server 2008 – In this demo you will be creating Products table as Target table &UpdateProducts as Source Table. You will also populate these tables with some sample data

```
CREATE TABLE Products

(

       ProductID INT PRIMARY KEY,

       ProductNameVARCHAR(100),

       Rate MONEY

)

--Insert records into target
table
```

```
CREATE TABLE UpdatedProducts

(

       ProductID INT PRIMARY KEY,

       ProductNameVARCHAR(100),

       Rate MONEY

)
```

MERGE Statement

```
--Synchronize the target table with
--refreshed data from source table
MERGE Products AS TARGET
USING UpdatedProducts AS SOURCE
ON (TARGET.ProductID = SOURCE.ProductID)
--When records are matched, update
--the records if there is any change
WHEN MATCHED AND TARGET.ProductName<>SOURCE.ProductName
OR TARGET.Rate<>SOURCE.Rate THEN
UPDATE SET TARGET.ProductName = SOURCE.ProductName,
TARGET.Rate = SOURCE.Rate
--When no records are matched, insert
--the incoming records from source
--table to target table
WHEN NOT MATCHED BY TARGET THEN
INSERT (ProductID, ProductName, Rate)
VALUES (SOURCE.ProductID, SOURCE.ProductName, SOURCE.Rate)
--When there is a row that exists in target table and
--same record does not exist in source table
--then delete this record from target table
WHEN NOT MATCHED BY SOURCE THEN
DELETE
--$action specifies a column of type nvarchar(10)
--in the OUTPUT clause that returns one of three
--values for each row: 'INSERT', 'UPDATE', or 'DELETE',
--according to the action that was performed on that row
OUTPUT $action,
DELETED.ProductID AS TargetProductID,
DELETED.ProductName AS TargetProductName,
```

Create two tables (Target & Source) with a structure given below. Also, insert some sample data into both tables.

```
Target Table


CREATE TABLE EmployeeTarget

(

EmpID INT NOT NULL,

     Designation VARCHAR (25)

     NOT NULL,

     Phone VARCHAR (20) NOT
```

```
Source Table


CREATE TABLE EmployeeSource

(

EmpID INT NOT NULL,

    Designation VARCHAR (25)

    NOTNULL,

    Phone VARCHAR (20) NOT NULL,
```

TODO – Write a MERGE Statement, that matches the EmpID attribute in the Source with the EmpID attribute of target. When a match is found in the target, the target Employee's attributes should overwrite with the source Employee attributes. When a match is not found in the target, a new row should be inserted into the target, using the source Employee attributes. When a match is not found in the source, the target Employee row should be deleted:

Working with Grouping Set

A. Create the following table & populate with some sample data.
B. Write following query which uses Grouping Set in the query window.

```
Employee Table

CREATE TABLE Employee

(

Employee_Numberint NOT NULL

  PRIMARY KEY,

Employee_Namevarchar (30)

  NULL,

  Salary float NULL,

Department_NumberintNULL,
```

```
SELECT Region, Department_number, avg (salary)
Average_Salary

From Employee

Group BY   GROUPING SETS

               (             (Region, Department_number),

                             (Region),

                             (Department_number)

               )
```

C. Execute above query & observer the output.

D. The query performs following :

   a. It generates result set grouped by each set mentioned in the Grouping Sets.

   b. It also calculates average salary of every employee for each region and department.

Optional - One can get the same result achieved in SQL Server 2005 using the following

query:**(NOTE – This part of Lab is not compulsory to perform)**

```
SELECT Region, Department_number, avg (salary) Average_Salary

From Employee

Group BY (Region, Department_number)

UNION

SELECT Region, Department_number, avg (salary) Average_Salary

From Employee

Group BY (Region)

UNION

SELECT Region, Department_number, avg (salary) Average_Salary

From Employee

Group BY (Department_number)
```

1.5: Data Retrieval - Joins , Subqueries , SET Operators and DML

1. Write a query which displays Staff Name, Department Code, Department Name, and Salary for all staff who earns more than 20000.
2. Write a query to display Staff Name, Department Code, and Department Name for all staff who do not work in Department code 10
3. Print out a report like this
   Book Name No of times issued
   Let us C 12
   Linux Internals 9
4. List out number of students joined each department last year. The report should be displayed like this
   Physics 12
   Chemistry 40
5. Write a query that displays Staff Name, Salary, and Grade of all staff. Grade depends on the following table.

Salary	Grade
Salary >=50000	A
Salary >= 25000 < 50000	B
Salary>=10000 < 25000	C

6. Display the Staff Name, Hire date and day of the week on which staff was hired. Label the column as DAY. Order the result by the day of the week starting with Monday.
7. Generate a report which contains the following information.
   Staff Code, Staff Name, Designation, Department, Book Code, Book Name, Author, Fine
   For the staff who have not return the book. Fine will be calculated as Rs. 5 per day.
   Fine = 5 * (No. of days = Current Date – Expected return date),for others it should be displayed as –

8. List out a report like this
   Staff Code Staff Name Manager Code Manager Name

Hint: Use Self Join

9. Display Staff Code, Staff Name, and Department Name for those who have taken more than one book.
10. List out the names of all student code whose score in subject1 is equal to the highest score
11. Modify the above query to display student names along with the codes.

Stretched Assignments

12. List out all the staffs who are reporting to the same manager to whom staff 100060 reports to.
13. List out all the students along with the department who reads the same books which the professors read
14. List out all the authors who have written books on same category as written by Author David Gladstone.
15. Display the Student report Card for this year. The report Card should contain the following information.

Student Code Student Name Department Name Total Marks Grade
Grade is calculated as follows. If a student has scored < 60 or has not attempted an exam he is considered to an F
>80 - E
70-80 - A
60- 69 - B
<60 – F

Stretched Assignments

16. Display the Student Code, Student Name, and Department Name for that department in which maximum number of student are studying.

17. List out all the students along with the department who reads the same books which the professors of their respective department read.

Hint: Use co-related sub query

18. List out the names of all the books along with the author name, book code and category which have not been issued at all. Try solving this question using EXISTS.

19. List out the code and names of all staff and students belonging to department 20.

Hint: Use UNION

20. List out all the students who have not appeared for exams this year.

CustomerID	**CustomerName**	**Address1**	**Address2**	**Contact**	**PostalCode**	**Region**	**Gender**
ALFKI	AlfredsFutterkiste	Obere Str. 57	Berlin,Germany	030-0074321	12209	NULL	NULL
ANATR	Ana Trujillo Emparedados y helados	Avda. de la Constitución 2222	México D.F.,Mexico	(5) 555-4729	5021	NA	NULL
ANTON	Antonio Moreno Taquería	Mataderos 2312	México D.F.,Mexico	(5) 555-3932	5023	NULL	NULL
AROUT	Around the Horn	120 Hanover Sq.	London,UK	(171) 555-7788	WA1 1DP	NULL	NULL
BERGS	Berglundssnabbköp	Berguvsvägen 8	Luleå,Sweden	0921-12 34 65	S-958 22	NULL	NULL
BLAUS	Blauer See Delikatessen	Forsterstr. 57	Mannheim,Germany	0621-08460	68306	NA	NULL
BLONP	Blondesddslpère et fils	24, place Kléber	Strasbourg,France	88.60.15.31	67000	NULL	NULL
BOLID	BólidoComidaspreparadas	C/ Araquil, 67	Madrid,Spain	(91) 555 22 82	28023	EU	NULL

BONAP	Bon app'	12, rue des Bouchers	Marseille,France	91.24.45.40	13008	NULL	NULL
BOTTM	Bottom-Dollar Markets	23 Tsawassen Blvd.	Tsawassen,Canada	(604) 555-4729	T2F 8M4	BC	

21. List out all the student codes who have never taken books
22. Add the following records to the Customers Table , created in our earlier exercises

23. Replace the contact number of Customer id ANATR to (604) 3332345 .

24. Update the Address and Region of Customer BOTTM to the following
19/2 12th Block , Spring Fields .
Ireland - UK
Region - EU

25. Insert the following records in the Orders table. The Order id should be automatically generated
Save the commands in a script file (Script file has a .sql extension)

Customer ID	**OrderDate**	**Order State**
AROUT	4-Jul-96	P
ALFKI	5-Jul-96	C
BLONP	8-Jul-96	P
ANTON	8-Jul-96	P
ANTON	9-Jul-96	P
BOTTM	10-Jul-96	C
BONAP	11-Jul-96	P
ANATR	12-Jul-96	P
BLAUS	15-Jul-96	C
HILAA	16-Jul-96	P

26. Delete all the Customers whose Orders have been cleared .

27. Remove all the records from the table using the truncate command. Rerun the script to populate the records once again
28. Change the order status to C, for all orders before `15th July.

1.6: Procedures and Function and Exception Handling in SQL server

1. Write a function to compute age. The function should accept a date of birth and return age in years.

2. Write a function which will find if a book is available or not. The function should take a book code as a parameter and return one of the following values
"Not In stock" if the book does not exist in library.
"On Issue" if the book is available but is on issue (that means has not been returned yet)
"Available" if the book is available.

3. Write a procedure that accept Staff_Code and updates the salary and store the old salary details in Staff_Master_Back (Staff_Master_Back has the same structure without any constraint) table. The procedure should return the updated salary as the return value
Exp< 2 then no Update
Exp>= 2 and <= 5 then 20% of salary
Exp> 5 then 25% of salary

4. Write a procedure to update the marks details in the Student_marks table. The following is the logic.
    - The procedure should accept student code , and marks as input parameter
    - Year should be the current year.
    - Student code cannot be null, but marks can be null.
    - Student code should exist in the student master.
    - The entering record should be unique ,I,e no previous record should exist
    - Suitable exceptions should be raised and procedure should return -1.
    - IF the data is correct, it should be added in the Student marks table and a success value of 0 should be returned.

5. Create a procedure that accepts the book code as parameter from the user. Display the details of the students/staff that have borrowed that book and has not returned the same. The following details should be displayed

Student/Staff Code Student/Staff Name Issue Date Designation Expected Ret_Date

6. Write a procedure to insert details into Book_Transaction table. Procedure should accept the book code and staff/student code. Date of issue is current date and the expected return date should be 10 days from the current date. If the expected return date falls on Saturday or Sunday, then it should be the next working day. Suitable exceptions should be handled.

7. Write a function to compute the following. Function should take Staff_Code and return the cost to company.
DA = 15% Salary, HRA= 20% of Salary, TA= 8% of Salary.
Special Allowance will be decided based on the service in the company.

< 1 Year	Nil
>=1 Year< 2 Year	10% of Salary
>=2 Year< 4 Year	20% of Salary
>4 Year	30% of Salary

8. Write a T-SQL block, which will print this report for the entire Staff's.
Staff Code Staff Name department Date of Joining Cost to the Company

Hint: Use the above written function

Stretched Assignment

9. Write a Procedure and a function which would do the following

Function: This function will return years of experience for a staff. This function will take the hiredate of the staff as an input parameter. The output will be rounded to the nearest year (1.4 year will be considered as 1 year and 1.5 year will be considered as 2 year).

Procedure: Use the function to calculate the additional allowance for the staff based on the experience.

Additional Allowance = Year of experience x 3000
Calculate the additional allowance and return the value as an output parameter.

Appendices

Appendix A: Table Structure

Desig_Master

Name	Null?	Type
Design_code	Not Null	int
Design_name		Varchar(50)

Department_Master

Name	Null?	Type
Dept_Code	Not Null	int
Dept_name		Varchar(50)

Student_Master Table

Name	Null?	Type	
Student_Code	Not Null	int	
Student_name	Not Null	Varchar2(50)	
Dept_Code		int	FK ->Dept_Master
Student_dob		Datetime	
Student_Address		Varchar(240)	

Student_Marks

Name	Null?	Type	
Student_Code		int	FK->Student_master
Student_Year	Not Null	int	
Subject1		int	

Subject2		int	
Subject3		int	

Staff_Master

Name	Null?	Type	
Staff_code	Not Null	int	
Staff_Name	Not Null	Varchar(50)	
Design_code		int	FK->Design_master
Dept_code		int	FK->Dept_Master
HireDate		Datetime	
Staff_dob		Datetime	
Staff_address		Varchar(240)	
Mgr_code		int	
Staff_sal		decimal (10,2)	

Book_Master

Name	Null?	Type
Book_Code	Not Null	int
Book_Name	Not Null	Varchar(50)
Book_pub_year		int
Book_pub_author	Not Null	Varchar(50)
Book_category	Not null	Varchar(10)

Book_Transaction

Name	Null?	Type	
Book_Code		int	Fk ->Book_master
Student_code	Null	int	FK->Student_master
Staff_code	Null	int	FK->Staff_master
Book_Issue_date	Not Null	Datetime	
Book_expected_return_date	Not Null	Datetime	
Book_actual_return_date	Null	Datetime	

Appendix B: Table of Figures