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School of Computing, Engineering and Mathematics

Tutorial Workbook

CI102 Introduction to Databases

**Permitted exam material**

Semester 1 Examination 2016/2017

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| **Guidelines:**   1. You can order a printed version of the workbook for completion by hand *or* download the workbook and complete it on a computer. You will then be responsible for printing it out before the exam. 2. You must not add any pages to the workbook, or change the page numbers (1-22). You may delete material, apart from this first page. 3. The workbook must be **printed on paper** before it is bought to the exam    * **Only hard copies of the workbook are permitted in the exam** 4. Workbooks will be collected at the end of the exam before students leave the exam room |

CI102/CI102H/CI112 Week 1 – Lab: Intro to SQL Server Management Studio

Please do not panic if these tasks do not work first time. That’s normal.

Keep Calm and Ask for Help!

**Tasks**

1. Download week1.zip from student central [module: introduction to database] – save on USB stick.
2. Open *SQL Server Management Studio* on your PC and connect to the server CSSQL. [see lec slide 24]

1. Create your own database on CSSQL. [see lec slides 25,26]. Name it with your University userid. [e.g. you will copy from dc143]
2. Open a new query window in Studio [*SQL Server Management Studio*] and open the file *import.sql* from the week1.zip file.
3. Run the SQL in your query window by pressing <F5> or clicking <Execute>. This should import four tables into your new database:

tProduct

tOrder

tOrderDetail

tCust

1. Run select statements against these tables
2. Investigate the features offered by Studio in particular *Object Explorer* Look at the *tables* tab.
3. Check out the *Studio* *help/search* feature … frighten yourself and find the help for the SELECT statement.

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. – read chap 1 [pp.1-28]

Do not worry if you do not understand all of this chapter immediately, it will be a good introduction and will help you understand the lectures.

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley – read chap 6 “Using Management Studio”

This is a very detailed presentation of the features in Studio but you might want to dip into it! Kenneth Cukier : “Data, data everywhere” [Economist – 27/02/2010] Use the library’s online library.

CI102/CI112 Week 2 – Lab: eCommerce data and create table

**Tasks** [Download week2.zip and extract the files to USB stick or H: drive]

1. Open *SQL Server Management Studio* on your PC and connect to the server CSSQL and the database you created last week

1. Open a new query [click on NEW QUERY] and run select statements against tOrder, tOrderdetail, tCustomer, tProduct so you can study the data in these tables. [You copied these tables into your database last week]
2. Following the slides in the lecture create a tCategory table with categoryID VARCHAR (5) [primary key] and categoryDescription VARCHAR (200) – both these fields will be data type VARCHAR.
3. Think of another table e.g. employees and create a new table in your database with several fields … experiment with some data types … I will look at them in next week’s lecture
4. Work out how to insert data into your new tables using *Studio* and then insert about ten records into each new table.

**Further Tasks**

1. Try running the SQL to join your tCust and tOrder tables. The lecture suggests some SQL
2. Change your database so that you can assign one category to each customer. You might have three categories – gold, silver, bronze.

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. – read chap 2 [pp.29 - 78]

All of this chapter is important but pp29-31 supports the introduction to entity modelling, while pp31- 42 look at data types which we will be covering in more detail next week but worth looking at now.

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley – read chap 6 “Using Management Studio” pp 110 - 114 look at Object Explorer and how to create a new table. However all of this chapter is relevant.

CI102/CI112 Week 3 – Lab: Keys and Data Types

**[Remember to copy and paste your work into a word document to take into the practical exam]**

**Tasks**

1. Open *SQL Server Management Studio* on your PC and connect to the server CSSQL and your own database.
2. Ensure that your category table has a primary key.
3. Insert some duplicate data into your category primary key and note the error message.
4. Create a contacts table – tContact with the following fields:

ContactID int PK

ContactFirstName varchar(50)

ContactLastName varachar(100)

ContactBirthDay date

ContactEmail varchar(50)

ContactAddress1 varchar(50)

ContactAddress2 varchar(50)

ContactAddress3 varchar(50)

ContactCity varchar(100)

ContactPostCode varchar(50)

ContactComment varchar(MAX)

1. Insert five records into your new contacts table. Investigate the different date formats that SQL Server will accept for input. Try this format [dd mmm yyyy ] e.g. 15 JAN 2010.
2. Now create another couple of tables. Make up your own table and field names and the data types. Do not forget the primary key …. perhaps a composite key. Be adventurous with your data types … experiment with a range of them.
3. Change your database so that each order can have a contact assigned to it. This might be the contact responsible for placing the order.

**Further Work**

1. Look at the design and the data in the table adventureworks\_dc.tTestdefs.

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. Read pp.81-83 on primary keys

The rest of chap 3 looks at entity models so have a look!

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley. Read chap 20 pp 513-557 but in particular look at ‘Creating Tables’ pp526-532 and ‘Creating Keys’ pp532-537 and especially ‘Creating User-data Columns’ pp542-545 for data types.

CI102/CI112 Week 4 – Lab: SELECT

**Tasks**

The following tasks should be completed either on your own or with a partner. This is a learning exercise …. just getting the right solution is pointless unless you are learning why and how the SQL is working to achieve the results you are obtaining.

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Open SQL Management Studio and connect to the database server CSSQL, or use phpAdmin. Now run the SQL queries that were used during the lecture. You will have to ensure that you are using the AdventureWorks\_DC database. Remember to use the schema *david* when using tables and views in that schema.
2. Work on these queries by changing them so that similar queries run against other tables in the database. Save your new queries to an appropriate directory … possibly H:\ci102\week7 or onto your pen drive.
3. Now move to your own database on CSSQL that you created in previous weeks and run some SQL against your own tables. You may have to add some extra data to your tables. Save your queries in an appropriate directory as e.g. query1.sql etc. … you could use more useful names!
4. Read about the SELECT statement and write further queries with the extra SQL syntax that you discover. [See reading below]

You should now have SQL that projects columns with a SELECT and filters records with a WHERE clause and a LIKE keyword. You should also have an ORDER BY statement.

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. chap 2 pp 55-60 “Select Statement Revisited”

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE] or the 2005 edition – the SQL is identical.

[chap8: “Introducing Basic Query Flow”]

My page refs are for the 2008 edition: chap 8 pp167-195

[2005 edition will also be fine]

Connolly T and Begg C: Database Systems 4th ed – chap 5 “SQL: Data Manipulation”

[Not specific to SQL Server but a more generic approach – note other editions will be fine for the SQL material]

Please note there are many SQL books in the library and any chapter on the SELECT statement will do. That’s right you must go to the library and use a book!!

phpAdmin online documentation:

<http://www.phpmyadmin.net/home_page/docs.php>

**Further tasks**

Investigate the concept of an effective date. The table david.tPrices will support an effective date query.

Write the SQL that will retrieve the price for product 2 on March 3rd.

CI102/CI112 Week 5 – Lab: SELECT and VIEWS

**Tasks**

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Download the sql code used in the lecture. Queries that retrieve data will run on AdventureWorks\_DC. However sql code that creates or drops views will not run using your logon. You will have to use this code suitably modified in your own database on CSSQL or MySQL

2. Run the join sql in query3 using AdventureWorks\_DC.

3. Write your own sql to join david.tProduct with david.tOrderDetail on ProductID. Display the tOrderDetail fields plus ProductName. Save this sql as an sql file on your pen or H: drive.

4. Create a view in your own database over a single table but project a subset of the fields [i.e. only include some of the fields from the table!]

5. Create a view in your database that joins two tables. You will have to ensure that you have two tables where there is a primary key in one that is also held as a foreign key on the second table. The data must match in these two fields otherwise the join will not work.

6. Carry on writing your own queries against AdventureWorks\_DC and your own database. You must create and run at least 40-50 queries before it really becomes clear what is happening and what is possible. Read the books for details of more complex SQL.

**Further Work**

7. Study the tables in schemas HumanResources and Person in AdventireWorks\_DC. Write a join that will display an employee’s first and last names and their birthday. You will need to join two tables to achieve this.

8. Add the employees address to this join.

9. Why do you think the address is not held on the employee table?

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. chap 2 pp 55-60 “Select Statement Revisited”

Chap 7 pp 173-193 probably more on joins than you want to know …. Concentrate on pp 173-179.

Views - pp193-206 but again concentrate on pp 193-198

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE] or the 2005 edition – the SQL is identical.

chap10: “Merging Data with Joins and Unions”

My page refs are for the 2008 edition: chap 10 pp227-257

Chap 14: “Projecting Data Through Views” pp329-346

[2005 edition will also be fine]

Connolly T and Begg C: Database Systems 4th ed – pp83-85 then use the index.

[Not specific to SQL Server but a more generic approach – note other editions will be fine for the SQL material]

Check the naming convention page on the ITSuite web site:

<http://itsuite.it.brighton.ac.uk/cs-faq.php?topic=4#2>

Please note there are many SQL books in the library and any chapter on the SELECT statement will do

CI102/CI112 Week 6 – Lab: Complex queries using OR, AND, BETWEEN, IN

**Tasks**

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Download the sql code used in the lecture. Run the queries from the lecture against AdventureWorks\_DC.
2. Using AdventureWorks\_DC retrieve from the view *david.vorderdisplay* all the records where:
   1. customer is based in either *East Brisbane* or *Goulburn* .
   2. orders created from 1/1/2002 until 1/3/2002

You will need to join *david.vorderdisplay* with *david.torderdetail* for tasks c - f.

* 1. customer is based in *East Brisbane* and has bought productID *753*
  2. customer is based in either *East Brisbane* or *Goulburn* and has bought productID *753*
  3. orders for productIDs 751, 752 and 753 bought by customers living in the city of Bellingham. [You should rtv 9 records]
  4. productID 750 was bought during July 2001 [23 records]

1. Run several queries against tables in your own database using the operators OR, AND, BETWEEN, IN.
2. Use a subquery to return the orders records from *david.vorderdisplay* where the order’s *LineTotal* in *david.torderdetail* is greater than 3500. [1551 records].

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. chap 2 pp 68-76 ….. all about operators.

Chap 6 –sub-queries

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE] or the 2005 edition – the SQL is identical. My page refs are for the 2008 edition: chap 8 pp175-184

Connolly T and Begg C: Database Systems 5th ed – pp137-147

[Not specific to SQL Server but a more generic approach – note other editions will be fine for the SQL material]

Please note there are many SQL books in the library – use the index!

CI102/CI112

Week 7 – Lab: Aggregation and Totalling

**Tasks**

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Download the sql code used in the lecture. Run the queries from the lecture against AdventureWorks\_DC.
2. Use the table tOrder in your own database and display:
   1. The total number of records in this table
   2. The average value across all the orders
   3. The maximum value ordered.
   4. The minimum value ordered.
   5. Customerid and total value for each customer
3. Use your own database and torderdetail. Display productID and total quantity for each product. Now restrict the display to those products where the total quantity is over 30.

[9 rcds returned]

1. Run queries against your own tables that use GROUP BY and display totals, counts etc.
2. Display productID, productName from tProduct where the product’s total orderqty from the tOrderDetail table is greater than 25. [I get 12 rcds returned]. This involves use of a sub-query.

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. chap 5: Grouping and Aggregation pp137-153

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE] or the 2005 edition – the SQL is identical. My page refs are for the 2008 edition: chap 12: Aggregating Data pp289-317 …. especially pp289-299

Connolly T and Begg C: Database Systems 5th ed – chap 6: pp149-153 … although all of chap 6 is relevant.

[Not specific to SQL Server but a more generic approach – note other editions will be fine for the SQL material]

Please note there are many SQL books in the library – use the index!

CI102/CI112 Week 8 – Lab: Middleware

**Tasks**

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Look at the word document odbcGuide.doc and follow the instructions to create an ODBC link to your own database on CSSQL.
2. You can now link your CSSQL database tables into an Access database.
3. Now create some simple reports against your SQL Server tables.

**Reading**

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE]

Chap 38 “Access as a front end to SQL Server” pp 867-880

If you are interested in this area the whole of Part X pp1461-1612 provides great detail on reporting tools against SQL Server … something for the database specialist!!

Connolly and Begg: Database Systems 5th edition chap 30 especially pp1034-1035

Article from the MSDN site:

<http://support.microsoft.com/kb/110093>

Introduction to ODBC:

<http://msdn.microsoft.com/en-us/library/ms715408(VS.85).aspx>

[To follow the links hold <ctrl> and click the link]

CI102/CI112 Week 9 – Lab: Reporting Tools

**Tasks**

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Study week9.accdb and week9.xlsx
2. Create your own Access reports against views in your CSSQL database using the ODBC middleware you created last week
3. Create charts …. perhaps using my view db102.vcustvalue. To use my view you will need another ODBC file this time pointing at my database dc143. [Notice the power of retrieving data from a range of databases!]
4. Try to create a pivot table against some simple data … again perhaps use my db102.vCustProdOrder view from my dc143 database.
5. Try linking to adventureworks\_dc and link some of the data into your Access database. Then create a report.
6. If you study the data from my view db102.vCustProdOrder you will notice there is no value data for some of the orders e.g. salesorderid 10. Find out why this is the case. Is the data missing or is there a problem with the view?

**Reading**

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE]

Chap 38 “Access as a front end to SQL Server” pp 867-880

If you are interested in this area the whole of Part X pp1461-1612 provides great detail on reporting tools against SQL Server … something for the database specialist!!

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Introduction to ODBC:

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[To follow the links hold <ctrl> and click the link]

CI102/CI112 Week 10 – Lab: More on ERD, keys – primary and foreign.

**Tasks**

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Download the sql code used in the lecture. Run the queries from the lecture.
2. In your own database create tables for *Book, Author* and *Author\_Book.* Enter some data, you can copy my data from the lecture.
3. Write a join of the three tables created in task 2.
4. Paste some data from your *order, orderdetail* and *product* tables into your log document. Make some notes explaining how the orderDetail table resolves the many to many between *order* and *product*.

Further Work

1. Create an employee table with a *MgrEmpID* field. Enter appropriate data.
2. Write a recursive join to display employees with their managers.
3. Write a note in your Word log explaioning the data needed to support the extra requirement at the end of the lecture.

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. chap 3 pp 70-101 its all relevant but especially pp81-85

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE] or the 2005 edition – the SQL is identical. My page refs are for the 2008 edition: chap 3 pp43-65

Connolly T and Begg C: Database Systems 5th ed – chap 12: “Entity-Relationship Modelling” pp321-345. [Not specific to SQL Server but a more generic approach – note other editions will be fine for the SQL material]

Plenty of other books on database and SQL in the library – use the library catalogue.

CI102/CI112 Week 11 – Lab: Insert, update and delete including the virtual delete.

**Tasks**

Download the zip file from studentcentral for this lab and then extract the files to your pen drive or your H: drive.

1. Download the sql code used in the lecture. Run the queries from the lecture. Start with query1a which will create a copy of tcust on your database called dbo.tcust2. This table can be used to experiment with updates and deletes. If you wreck your table just drop [delete] the table and run query1a again to create a new one! You may haveto change some of the schema names to fit your database.
2. Use one of your own tables and make a copy with the *SELECT \* INTO* syntax.
3. Use this copy to experiment with inserts, updates and deletes.

Further Work

1. Add a delete flag to one of your tables and implement a virtual delete with an update.

**Reading**

Kriegel, A (2011). *Discovering SQL*. Wrox. INSERT pp 14-16, DELETE pp22-24, UPDATE pp25-28 and more on all these statements pp61-66

Nielsen, P (2009). *SQL Server 2008 Bible*. Wiley [005.7565/NIE] or the 2005 edition – the SQL is identical. My page refs are for the 2008 edition: chap 15 pp347-376 but especially pp347-368.

Connolly T and Begg C: Database Systems 5th ed – pp167-171 … in fact reading all of chap 6 would be a useful review of material covered in the module.

Plenty of other books on database and SQL in the library – use the library catalogue.