School of Computing
ST1501 Data Engineering CA1
AY2023/2024 Semester 1

A. Instructions and Guidelines

1. This is an **INDIVIDUAL** assignment which requires the student to design and setup a database to support a business scenario and demonstrate the competency in writing SQL statement.

2. Submissions should be made via the ST1501 CA1 Assignment Submission link by the stated deadline in BrightSpace.

   Deliverable should be a zip file with the following file-naming convention: "**ST1501-YourClass-YourStudentID-YourName.zip**" e.g ST1501-DIT2B01-1234567-Albert Koh.zip
   - submission template fully entered
   - one SQL file to contain all create table statements
   - one SQL file to show all query statements

3. A compulsory demo/interview will be conducted. During the session, you may need to give a short demonstration of the database that you have created and the SQL statements that you have submitted. Your module tutor will ask questions related to database design, SQL statements.

4. This assignment will account for **35%** of the module grade.

5. No marks will be awarded, if the work is copied or you have allowed others to copy your work.

6. 50% of the marks will be deducted for assignments that are received within ONE (1) calendar day after the submission deadline. No marks will be given thereafter. Exceptions to this policy will be given to students with valid LOA on medical or compassionate grounds. Students in such cases will need to inform the module tutor as soon as reasonably possible. Students are not to assume on their own that their deadline has been extended.

ST1501 CA1

B. The Business Scenario

Background

We have all used grocery stores our entire life and this experience gives one a basic understanding of how the grocery system operates. This includes inventory, check-out, pricing, customer needs, etc.

Types of data needed to keep track of in this system will be the item information, checkout activity, inventory control, employee information, and customer activity. Item information is critical to a grocery store as a grocery store moves a tremendous amount of product each day. Item data that will need to be incorporated into the design include: UPC (manufacture's code), ID, brand, description, price, cost, weight, shape, size, and if it is taxable.

This assignment centres on a grocery model which will have multiple stores. Each store will have a record in the 'store' entity including a unique ID and address. Inventory will have a store ID component plus item information and its quantity. This will allow a manager to see what items a store has, the quantity, and the current dollar value of items in inventory.

Application

This project will focus on small aspect of the grocery enterprise , 'Grocery Store' simulating a customer buying items by selecting them on a form as if taking them from the shelves. They can then see their subtotal and tax and finish the transaction. They only are able to press 'buy' to finish, as there is no representation of money. Customers don't log into the system and only have one checkout UI to interact with. The project removes the items once purchased by updating the inventory.

A manager level user can view certain reports on inventory, customer activity and personal information using data stored in the tables. A manger will have to login into the system to use it. Employees will also have to log in to use the system. Their information will appear in reports that managers run.

Customer information is critical to any successful business and the grocery business is no exception. Each customer will have basic information stored and this will be linked to their purchases. Managers can run reports viewing which store they shopped at, what they bought, how many total transactions and how much money they spent.

Customers have to be able to select product for checkout. They also will need to have their purchases subtotaled and taxes added so they know what they will have to pay. After the transaction is complete, a receipt should be displayed. For this project, there will be a web form a user, customer, can choose items and add them to their checkout basket. Once the 'checkout' button is pressed, the items will be deducted from inventory.

Employees work at a store. Employees group contains cashiers and managers. Employees could have dependents. The employees will have a unique ID. Many employees can work for one store. Every employee must work for a store, but only one store.

Cashiers help checkout the customers. They work hourly and they each assigned one store. The cashiers log into the system with a password at the beginning of their shift. They have a unique ID, a hire date, and a password change date. In this project cashier information will be shown in certain management reports. The user entering the items into the checkout form will be both the customer and the cashier.

Managers are also employees and have a unique ID. Managers supervise other employees. They also work at specific stores. Managers have a higher security clearance that also them to run certain reports and adjust inventory. Managers many manage several stores as Director in addition to the one they are assigned to work from.

Management reports needed for management will have to answer questions including the current status of inventory quantity per store, price per item, customer activity, and sales totals. Managers can query employee information like wage information, store worked, dependents and manager. Inventory report(s) will include quantity in each store and the value of the current inventory.

Daily Activities of the User Group

Daily activities of the Grocery Store UI and the backend database can be broken into two functional areas. The first functional area fulfills the main point of the grocery business, customer's buying product and checking out.

The customer accesses the 'Customer' tab and then can select the store address to shop in. In this fictional program, the user also has to select the customer name and the employee that will check them out. These parameters are needed by the application later in the checkout section to properly insert the checkout record in to the database.

Once these are selected and the 'Shop' button is selected, the user can add items to the checkout cart and then proceed to checkout. The user can change the quantities and remove items from their basket. All these are the basic functions expected by a shopper at a grocery store.

The second part of the application allows the managers of the store to run reports and view the status of the store's sales, employee information, customer information & shopping history, and a store manager list. Managers will use a company's database for a variety of reports to get their job done. This application tries to realistically simulate a reporting interface for managers.

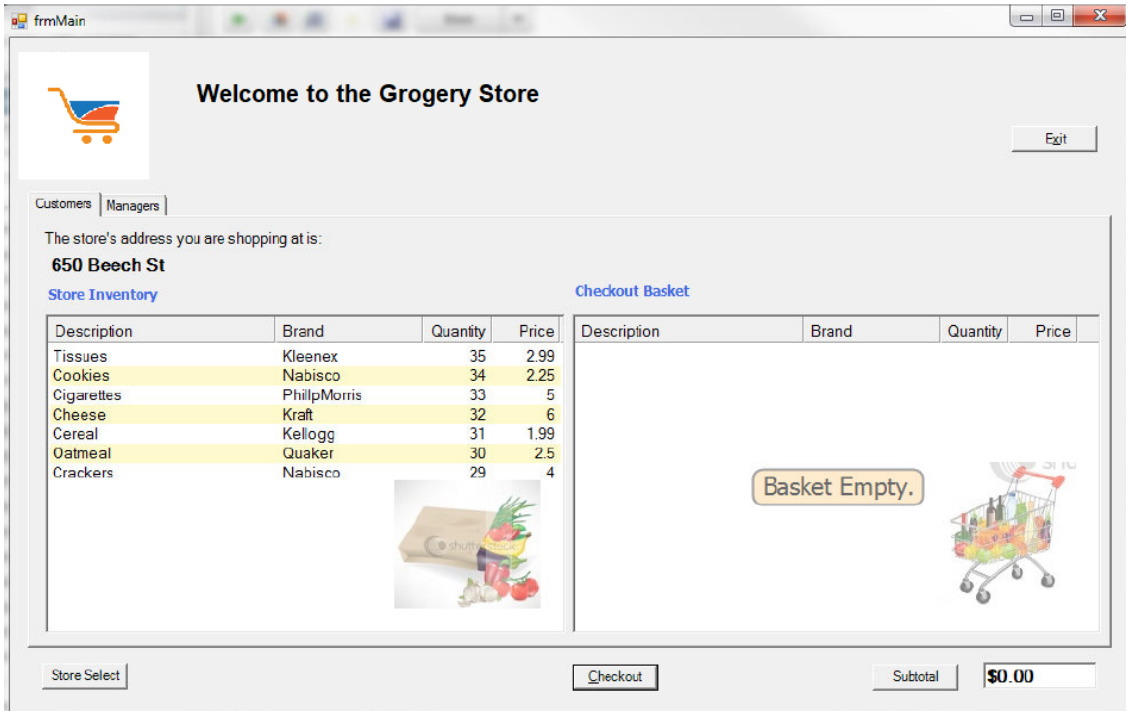
The system should not require much in the way of technical ability by the users to run the application or maintain it. We have used a simple tabbed interface. Customers can shop by simply dragging and dropping items into or out of their cart and modifying the quantity to purchase. When they checkout, they will be presented a list of purchased items and the total price in a separate form. In addition, the checkout action properly updates the database to allow the managers to review the checkout activity, store inventory and customer sales

history. This well designed application should increase sales and allow easier management of the stores.

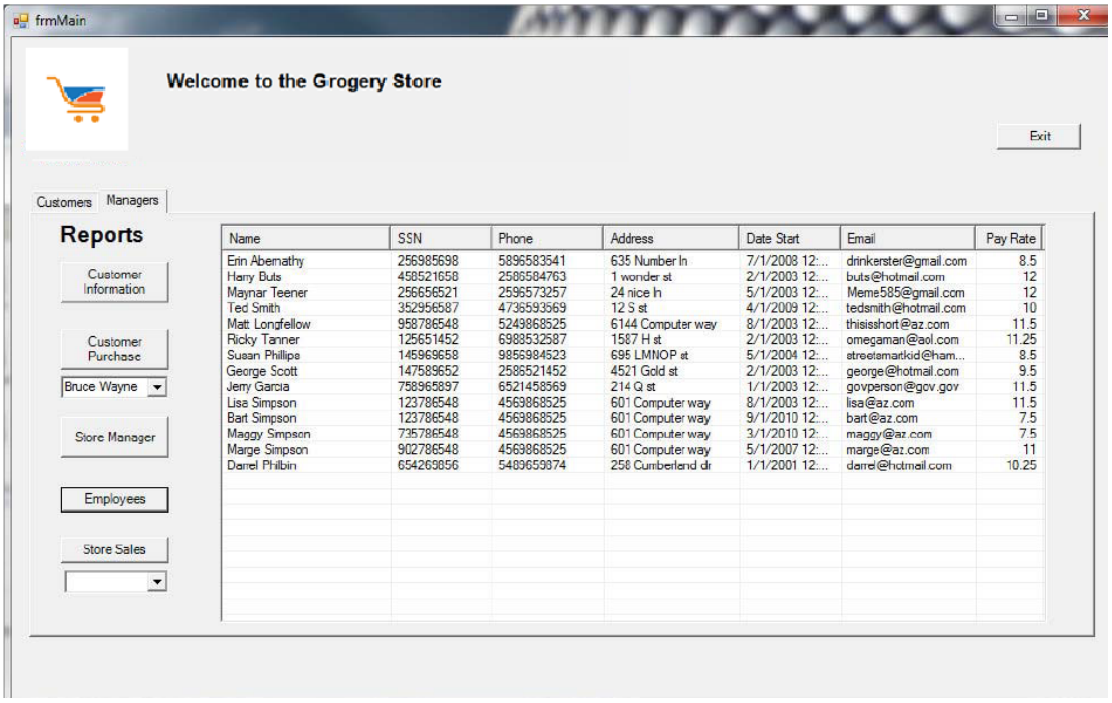
Graphical User Interface (GUI)

Samples of GUI for the application are appended below to aid your understanding.

Item selection screen for customers with the checkout basket.

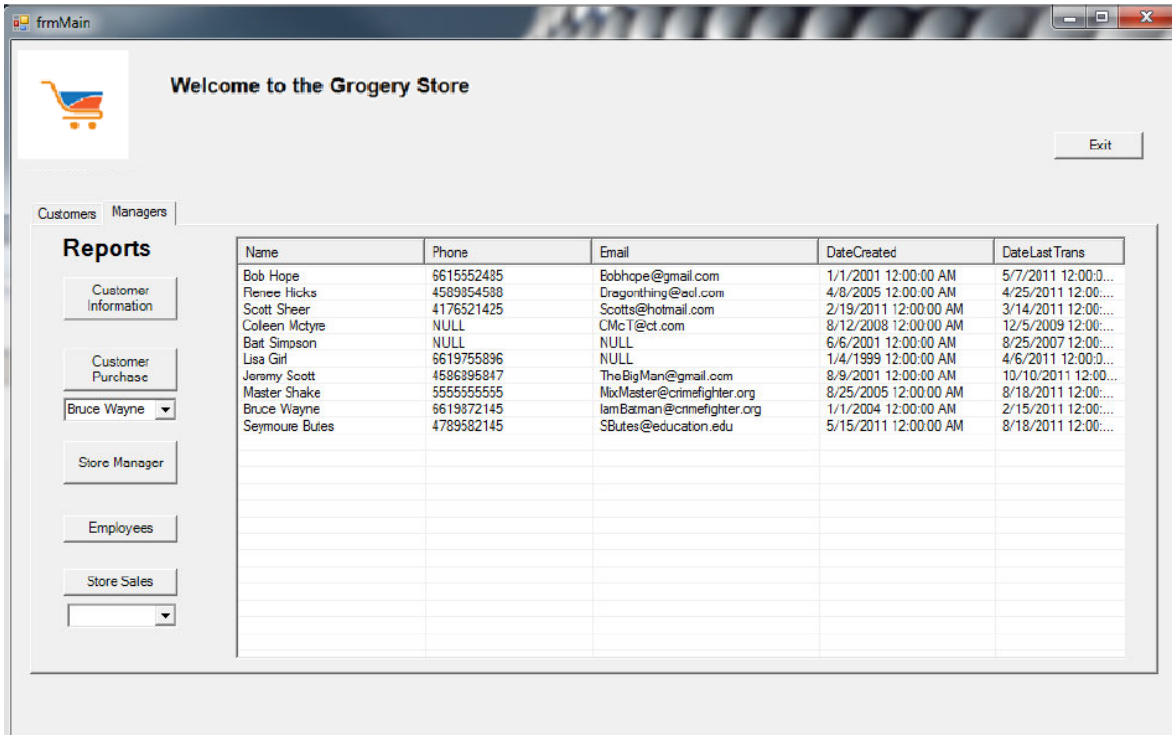


Employee report screenshot

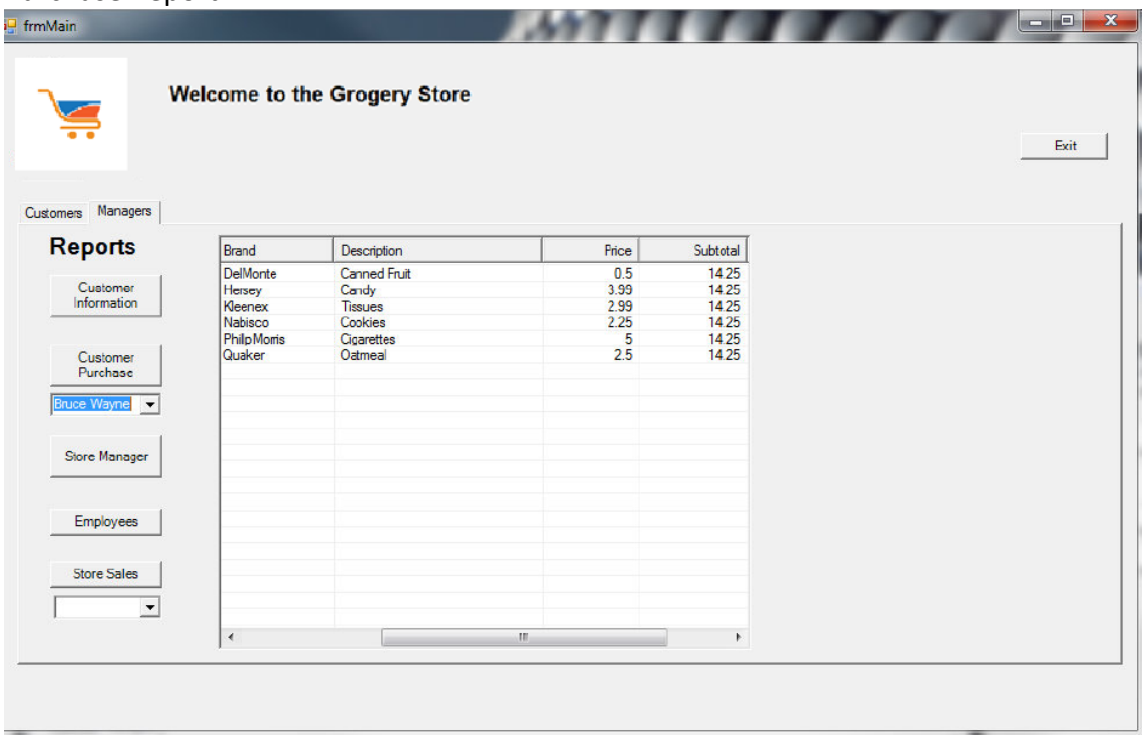


ST1501 CA1

Customer Report

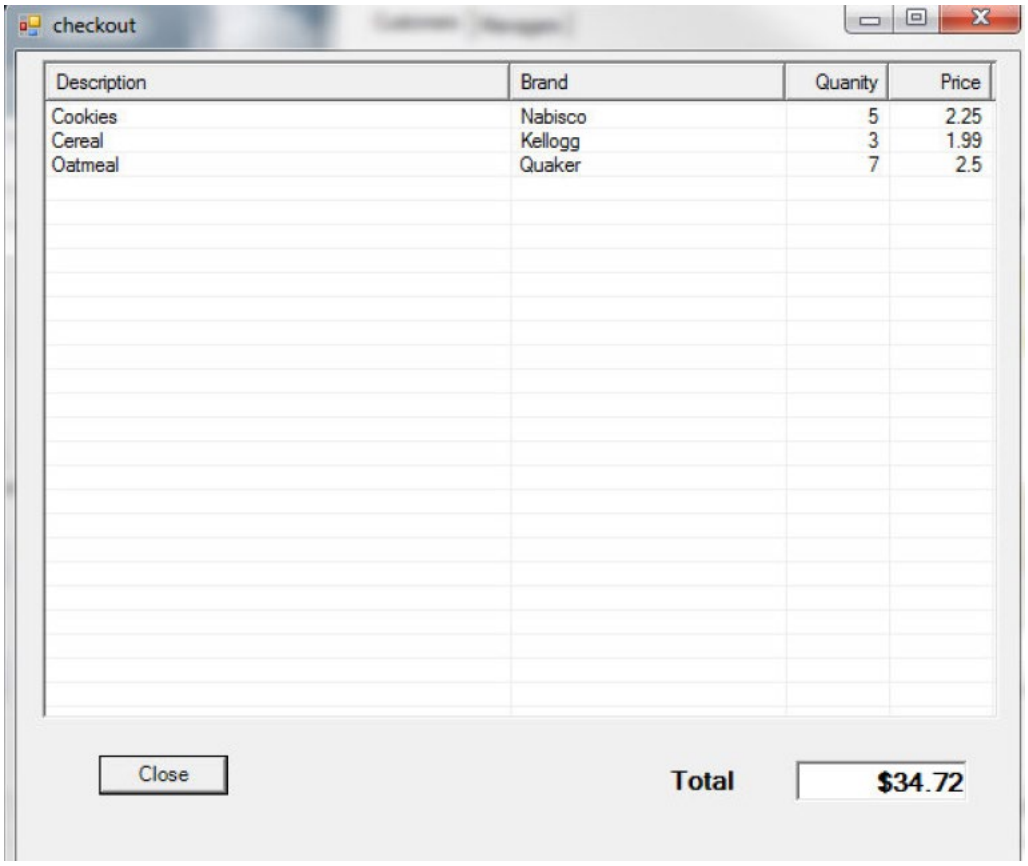


Purchase Report



ST1501 CA1

Customer Invoice



Sample Data

	Emp_ID	EmpName	SSN	Phone	StoreRef_ID	Address	PayType	Password	Manager	Email	Date_hired	Date_Start	Date_end	pay
1	1	Darrel Philbin	654269856	5489659874	854	258 Cumberland dr	0	1234	14	baldman@gmail.com	NULL	1985-04-05	2011-02-02	20.00
2	10	Jerry Garcia	758965897	6521458569	247	214 Q st	1	1234	9	govperson@gov.gov	NULL	1990-09-24	NULL	52000.00
3	11	Lawarnce Tom	625458569	9658745632	159	2154 Beech st	0	NULL	14	NULL	NULL	1989-01-20	2011-09-01	15.00
4	12	Dexter Robert	254125478	1111111111	778	365 Moon dr	0	NULL	15	NULL	NULL	1990-05-06	NULL	12.25
5	13	Mark Nick	563258965	2225478512	989	65412 B St	0	NULL	15	NULL	NULL	1998-02-05	NULL	8.25
6	14	Jeremy David	111111112	2356895654	159	2 Molly Way	1	NULL	9	NULL	NULL	2000-06-03	NULL	16000.00
7	15	Luke Ted	111111144	2144544123	354	65 Southland Av	1	NULL	9	NULL	NULL	2004-09-09	NULL	20000.00
8	2	Ricky Tanner	125651452	6988532587	696	1587 H st	0	Abcdef	4	omegaman@aol.com	NULL	1990-06-08	1999-06-10	10.00
9	3	Susan Phillips	145969658	9856984523	369	695 LMNOP st	0	Password	4	streetsmartkid@hampster.edu	NULL	1972-06-09	NULL	15.00
10	4	George Scott	147589652	2586521452	696	4521 Gold st	1	Alpha	9	NULL	NULL	1999-07-25	NULL	42000.00
11	5	Erin Abernathy	256985698	5896583541	369	635 Number ln	0	Bottle	6	drinkerster@gmail.com	NULL	1998-12-20	NULL	30.00
12	6	Ted Smith	352956587	4736593569	369	12 S st	1	Worksu...	9	NULL	NULL	1989-06-08	NULL	50000.00
13	7	Harry Buts	458521658	2586584763	674	1 wonder st	0	Password	6	NULL	NULL	1970-10-20	NULL	12.00
14	8	Maynar Teener	256656521	2596573257	674	24 nice ln	0	Password	6	Meme585@gmail.com	NULL	2005-06-04	NULL	9.25
15	9	Matt Longfell...	958786548	5249868525	354	6144 Computer ...	1	Password	NULL	thisisshort@az.com	NULL	2000-09-21	NULL	60000.00

Note: Pay column indicates either per annum or per hour basis

	Cust_ID	CustName	Phone	Email	Date_Joined
1	105	Master Shake	5555555555	MixMaster@crimefighter.org	2000-08-25
2	178	Bruce Wayne	6619872145	IamBatman@crimefighter.org	2000-01-09
3	179	Seymoure Butes	4789582145	SButes@education.edu	2001-01-01
4	50	Bob Hope	6615552485	Bobhope@gmail.com	2001-01-01
5	51	Renee Hicks	4589854588	Dragonthing@aol.com	2005-05-05
6	52	Scott Sheer	4176521425	Scotts@hotmail.com	2011-12-12
7	53	Colleen Mctyre	NULL	CMcT@ct.com	2008-08-12
8	58	Bart Simpson	NULL	NULL	2001-06-06
9	67	Lisa Girl	6619755896	NULL	1999-04-09
10	99	Jeremy Scott	4586895847	TheBigMan@gmail.com	2000-01-09

	Item_ID	Brand	Description	Price	Cost	Shape	Size	UPC	Weight	Taxable
1	12	Nabisco	Cookies	2.25	1.00	Oval	23x5x20	224852	22.40	1
2	145	Kleenex	Tissues	2.99	1.00	Rectangle	3x19x4	178965	34.00	0
3	1566	HomeBrand	Spagehetti	0.99	0.50	Round	3x3x3	698547	3.00	0
4	2365	Kellogg	Cereal	1.99	0.50	Round	10x10x10	557858	18.00	1
5	256	Hersey	Candy	3.99	2.00	Rectangle	4x16x6	123058	52.80	0
6	335	DelMonte	Canned Fruit	0.50	0.10	Square	3x3x3	411255	5.20	1
7	3521	Nabisco	Crackers	4.00	2.00	Round	4x4x4	254413	2.00	0
8	4587	Kraft	Cheese	6.00	4.00	Rectangle	6x12x3	845532	0.11	0
9	658	PhillpMorris	Cigarettes	5.00	3.00	Square	8x8x8	596543	89.00	0
10	84854	Quaker	Oatmeal	2.50	1.00	Square	2x2x2x	556487	1.00	0

C. Required Tasks

As a data specialist, you are asked to design and setup the database to support the business scenario.

(a) Design the database to support the business scenario described in Section B- Business Scenario. You should state the assumptions in your database design, if you find the user cases are not specific enough. **Use the sample data provided apart from other data developed by you in fulfilling the business scenario and queries**.

(b) Create the database (create the tables) in the **Microsoft SQL Server** based on your database design.

- The database should be named as **GroceryStore999999** where 9999999 is to be replaced by your admission number.
- The Entity Relationship Diagram is to be submitted.
- The Database diagram and SQL scripts are to be submitted.

(i) Write a query to show the name of customer, the date of transaction made by the customer, the store where the transaction takes place, its manager's name, the item brand, description and quantity purchased for the transaction and the employee who serves the transaction. A sample output should be as shown below.

	custName	Store_ID	Store Address	Manager of the Store	Transaction Date	Brand	Description	Quantity Purchased	Served By
1	Bob Hope	854	22556 Elm St	Jeremy David	2011-06-10	Hersey	Candy	2	Darrel Philbin
2	Bob Hope	854	22556 Elm St	Jeremy David	2011-06-10	Kellogg	Cereal	2	Darrel Philbin
3	Bruce Wayne	778	341 Main St	Luke Ted	2011-12-12	Kleenex	Tissues	10	Dexter Robert
4	Jeremy Scott	159	13636 Fir St	Jeremy David	2010-06-05	Kraft	Cheese	2	Lawarnce Tom
5	Master Shake	369	940 Green St	Ted Smith	2007-04-05	Kraft	Cheese	4	Susan Phillips
6	Renee Hicks	354	820 Birch Rd	Luke Ted	2011-06-09	HomeBrand	Spagehetti	4	Luke Ted
7	Renee Hicks	354	820 Birch Rd	Luke Ted	2011-06-09	Kleenex	Tissues	3	Luke Ted
8	Renee Hicks	354	820 Birch Rd	Luke Ted	2011-06-09	Nabisco	Crackers	2	Luke Ted
9	Renee Hicks	354	820 Birch Rd	Luke Ted	2011-06-09	Quaker	Oatmeal	2	Luke Ted
10	Scott Sheer	696	710 Edison Dr	George Scott	2010-08-12	Kellogg	Cereal	2	Ricky Tanner
11	Scott Sheer	696	710 Edison Dr	George Scott	2010-08-12	Kraft	Cheese	2	Ricky Tanner
12	Seymoure Butes	674	14496 Maple Way	Ted Smith	2009-11-05	Nabisco	Cookies	2	Harry Buts
13	Seymoure Butes	674	14496 Maple Way	Ted Smith	2009-11-05	PhillpMorris	Cigarettes	2	Harry Buts

ST1501 CA1

ii) Write a query to show the following store details and their item inventories.

	Store Manage ID	Name of Manager	Store managed	Item	Quantity on inventory
1	14	Jeremy David	159	1566	31
2	14	Jeremy David	159	335	27
3	10	Jerry Garcia	247	145	56
4	10	Jerry Garcia	348	256	100
5	15	Luke Ted	354	1566	4
6	6	Ted Smith	369	3521	113
7	6	Ted Smith	674	2365	0
8	6	Ted Smith	674	4587	23
9	4	George Scott	696	12	23
10	4	George Scott	696	658	38
11	15	Luke Ted	778	84...	350
12	14	Jeremy David	854	12	10
13	14	Jeremy David	854	658	10
14	15	Luke Ted	989	145	560

iii) Write a query to list all customers who bought not more than 2 items on any single transaction.

iv) Write a query to show the item_ID, its description, total amount 'Retail', based on Price and total amount based on cost 'Wholesale' for those items which are kept by at least 2 stores.

v) Write a query to list all of the addresses of grocery stores that have at least one item that retails at over $5.00 on their inventory.

vi) Write a query to show the ID and name of employees and the ID and names their managers

vii) Write a query to list the emp_ID, name of manager and the boss' ID and name together with the store_ID and its address where both the manager and the boss are stationed at the same store. Your output must have the header as follows:

Name of Manager	Boss ID	Manager ID	Name of Boss	Store ID	Address

D. Assessment

Components	Weightage	
Section A - Database Design (Entity Relationship Diagram) • The database supports the described business scenario. • Application of correct use of notations	30%	
Section B - Database Design (Database Diagram) • The database supports the described business scenario. • The chosen table names, field names and attributes are descriptive. • The database is normalized.	10%	
Section C - Database Creation • Attach an SQL file to include create table statememts including the primary key and foreign key definition. • Enter the details of each table in the template.	10%	
Section D - The Query Statements		35%
• Query 1	9	
• Query 2	7	
• Query 3	7	
• Query 4	4	
• Query 5	3	
• Query 6	5	
CA1 Assignment Demo/Interview The CA1 Demo/Interview will be conducted where you have: • To explain the database design and the submission • To explain/answer questions given by the module tutor	15%	
Total	100%	

*** **End of Assignment Specifications** ***