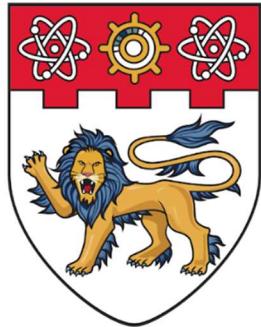


NANYANG TECHNOLOGICAL UNIVERSITY



**NANYANG
TECHNOLOGICAL
UNIVERSITY**
SINGAPORE

EE4791/IM4791 Database Systems

**Group Project Assignment:
Database Design and Implementation**

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Tutorial Class: F31

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(This group includes 2 people)

Table of Contribution

Parts in Table of Contents	Contents	Person in Charge
1. Summary	- Explain scenario - Summarizes the database	Le Ngoc Canh, Chia Ming Hui
2. ER Diagram	- Draw ER Diagram from scenario	Chia Ming Hui
3. Relational Model	- Connect all relationships and select primary and foreign keys	Le Ngoc Canh
4. Tables	- Create tables and input records	Le Ngoc Canh, Chia Ming Hui
5. Queries	- Create queries and aggregate information	Le Ngoc Canh, Chia Ming Hui
6. Forms	- Create form	Le Ngoc Canh
7. Report	- Create and design reports in nice manners	Le Ngoc Canh
8. Indexes	- Create indexes and capture	Le Ngoc Canh
9. Open-ended Questions	- Answer and provide corresponding information for questions	Le Ngoc Canh, Chia Ming Hui

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1. Executive Summary and Scenario Descriptions

1.1. Scenario of Database

The database is created to record retail sales and manage retail services for a supermarket with many branches.

- The database includes important information of employees, branches, customers, products, products purchased by customers, and products purchased from suppliers as well as suppliers' details.
- The database includes forms to insert information of employees, customers, and suppliers.
- Reports are useful insightful information for the management such as best performing branch, top sale of product and top supplier for decision-making purposes. With that valuable information, management can improve and further develop strategy to drive sale and later successfully operate the supermarket. With the popularity of data analytics and prescriptive analytics, most company uses existing insights to supply and manage their business better. For example, with report of top spending customers, the supermarket can timely give customers rewards to increase the customer stickiness. Moreover, with performance of branches, supermarket can reward and pride employees and branches with good performance in order to keep morale at high level.

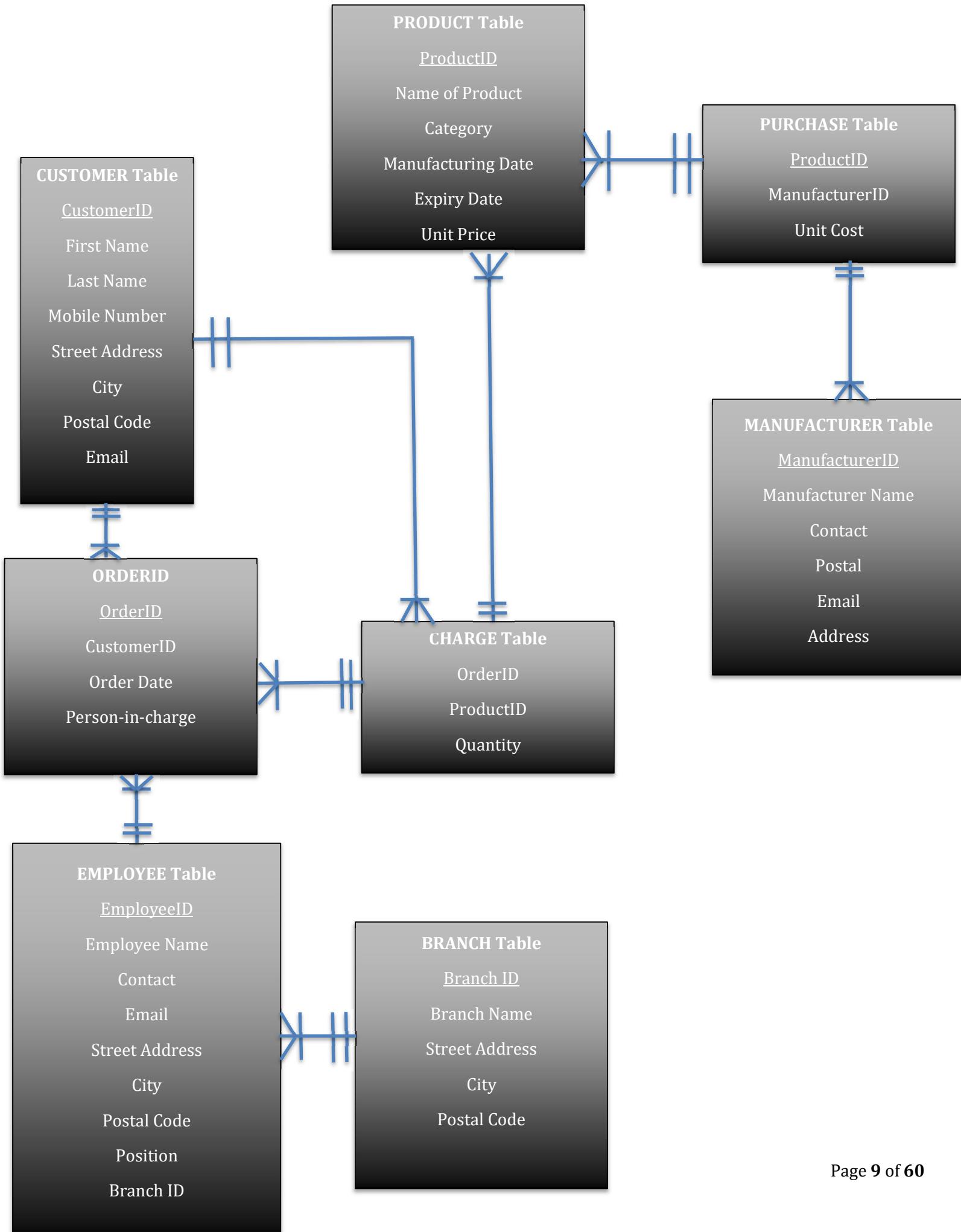
1.2. The summary of database

The database includes

- o 8 tables
 - Branch Table
 - Charge Table
 - Customer Table
 - Employee Table
 - Manufacturer Table
 - OrderID Table
 - Product Table
 - Purchase Table
- o 11 queries
 - Customer Information
 - Employee Information
 - Product Information
 - Cost of Goods Sold (COGS) per Companies
 - Cost of Goods Sold (COGS) per OrderID per items
 - Cost of Goods Sold (COGS) per Product
 - Revenue per OrderID
 - Revenue per Product
 - Revenue per Branch
 - Revenue per Customer
 - Revenue per OrderID per items

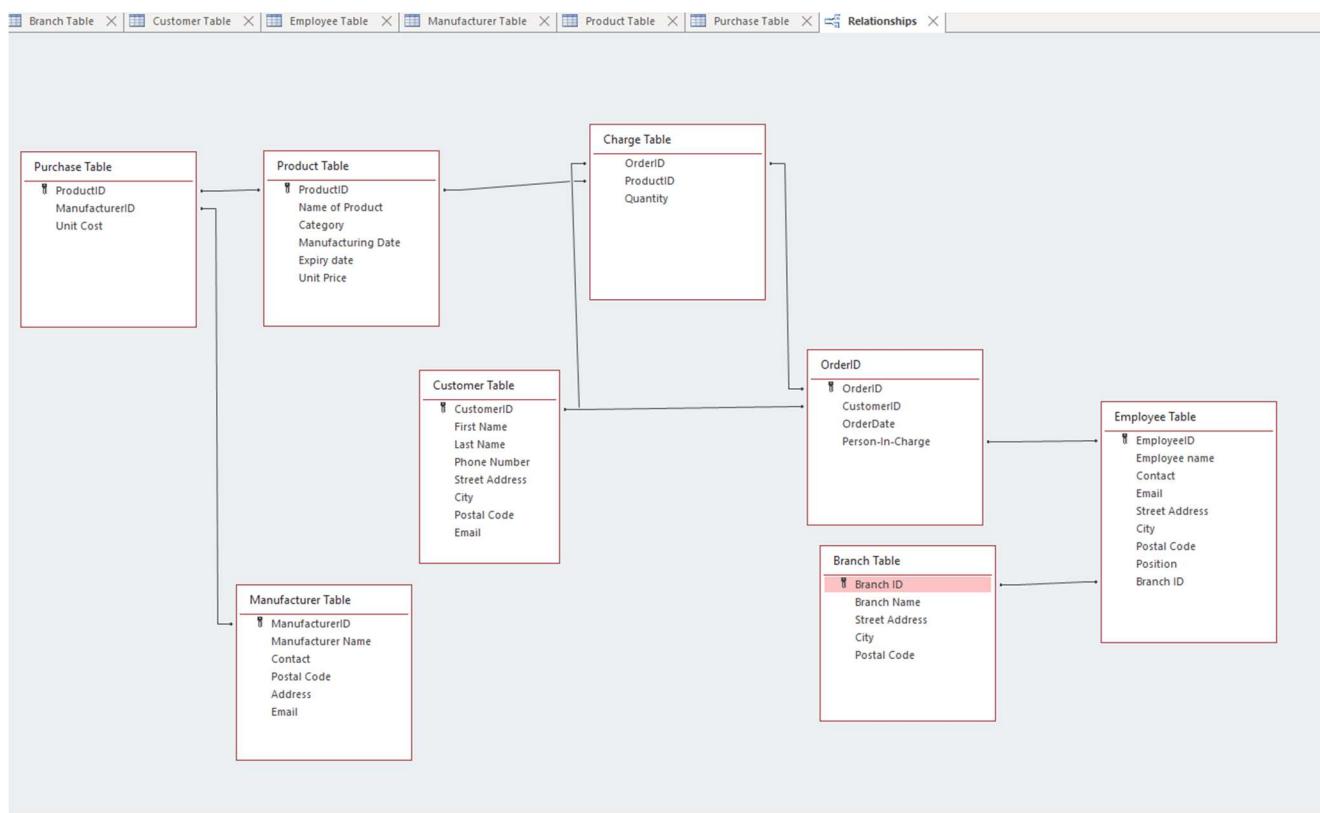
- 3 forms
 - Customer Information Form
 - Employee Information Form
 - Product Information Form
- 7 Reports
 - Individual Invoices Report
 - The report can be used to show all individual invoices
 - Top COGS Products
 - The report shows top products with high accumulative costs
 - Top Largest Orders
 - The report shows top largest orders and provides insights for managements to have timely rewards and discounts for loyal customers
 - Top Largest Suppliers
 - Management can use this report to manage the relationship as well as negotiate discounts for better profitability in the business operation
 - Top Performance Branch
 - The report helps management team check on performance and compare them with Key Performance Indicators (KPIs) set during the period
 - Top Selling Products
 - The report highlights products with good selling records to have a better supply chain of products. Moreover, the report lets the team know which products had bad performance and manage to change the further order from manufacturers for those items.
 - Top Spending Customers
 - Customers are important. Management team can ensure that they manage well relationship with loyal customers and provide them rewards/discounts to strengthen customers' stickiness.

2. Entity Relationship (ER) Diagram



3. Relational Model

The table structures include all referential integrity and cardinalities.



4. Tables

4.1. Branch Table

4.1.1. Datasheet view

Branch Table		Customer Table		Employee Table		Manufacturer Table	
	Branch ID	Branch Name	Street Address	City	Postal Code		
+	JE001	Jurong Branch	10 Adam Str	Singapore	127832		
+	JE002	Boonlay Branch	20 Avenue Str	Singapore	189237		
+	JE003	Bugis Branch	11 Bugis Str	Singapore	242344		
+	JE004	Orchard Branch	1 Orchid Str	Singapore	324324		
+	JE005	Simei Branch	10 River Str	Singapore	545564		

4.1.2. Design view

Field Name	Data Type	Description
Branch ID	Short Text	Index created for tracking purpose
Branch Name	Short Text	Name of Branch
Street Address	Short Text	Street Address of Branch
City	Short Text	City of Branch located
Postal Code	Number	Postal Code of Branch located

4.2. Charge Table

4.2.1. Datasheet view

OrderID	ProductID	Quantity
1	3	5
1	3	5
1	4	3
1	2	5
2	1	10
2	2	3
2	4	5
2	5	5
3	1	5
3	2	3
3	4	5
3	5	5
4	2	8
4	5	7
4	4	6
4	1	3
5	1	3
5	3	10
5	5	3
5	7	5
5	9	6
6	2	5
6	4	5
6	6	8
6	8	7
6	1	3
7	4	5
7	6	14
7	7	10

4.2.2. Design view

Field Name	Data Type	Description (Optional)
OrderID	Number	Order ID with reference to OrderID table
ProductID	Number	Product ID with reference to Product Table
Quantity	Number	Quantity of products purchased

4.3. Customer Table

4.3.1. Datasheet view

CustomerID	First Name	Last Name	Phone Number	Street Address	City	Postal Code	Email
1	David	Lee	86951268	21 Nanyang Dr	Singapore	125896	david.lee@gmail.com
2	Adam	Levin	16547993	20 Lien Ying Chow Dr	Singapore	789632	adam001@gmail.com
3	Nancy	Shaw	78963215	12 Student Walk	Singapore	178965	hiiamnancy@gmail.com
4	Steven	Tan	33242345	9 Rivervale Str	Singapore	342342	Steven112@gmail.com
5	Ryan	Chua	45656767	97 Kallang Ave	Singapore	453453	Ryannn2@gmail.com
6	Elaine	Kim	78526544	12 Nanyang Dr	Singapore	785545	elaine.kim@gmail.com
7	Lisa	Nguyen	12548956	13 Lien Ying Chow Dr	Singapore	449842	lisa111@gmail.com
8	Jisoo	Kim	89564452	112 Student Walk	Singapore	547842	jisoohere@gmail.com
9	David	Wu	45487842	19 Rivervale Str	Singapore	544653	david.wu@gmail.com
10	Bradon	Ong	54486212	917 Kallang Ave	Singapore	659965	lemonong@gmail.com
11	James	Le	89447821	21 Somerest Dr	Singapore	125636	james.le@gmail.com

4.3.2. Design view

The screenshot shows the Microsoft Access 'Customer Table' in Design View. The table has eight fields: CustomerID, First Name, Last Name, Phone Number, Street Address, City, Postal Code, and Email. The 'CustomerID' field is set as the primary key. The 'Email' field is highlighted with a red border.

Field Name	Data Type	Description (Optional)
CustomerID	AutoNumber	CustomerID reference for track record.
First Name	Short Text	First Name of customer
Last Name	Short Text	Last Name of customer
Phone Number	Number	Telephone Number of Customer
Street Address	Short Text	Street Address of customer
City	Short Text	City address of customer
Postal Code	Number	Postal code of address
Email	Short Text	Personal email of customer for purchasing

4.4. Employee Table

4.4.1. Datasheet view

The screenshot shows the Microsoft Access 'Employee Table' in Datasheet View. The table includes columns for EmployeeID, Employee name, Contact, Email, Street Address, City, Postal Code, Position, and Branch ID. The data shows five employees: Claudia, John, Cloud, Zack, and Zoe, all based in Singapore.

EmployeeID	Employee name	Contact	Email	Street Address	City	Postal Code	Position	Branch ID
111	Claudia	21322221	Clauuud@gmail.com	Skyville street 1	Singapore	222233	Manager	JE005
123	John	33923233	john@hotmail.com	Fisher street 21	Singapore	424233	Sales Assistant	JE001
222	Cloud	29890897	Cloudy@gmail.com	Faker Lamp street 21	Singapore	566666	Sales Assistant	JE003
445	Zack	43435454	zack995@yahoo.com	Taker street 31	Singapore	555343	Manager	JE004
896	Zoe	44432333	zoe96@gmail.com	Lamp Street 52	Singapore	324434	Sales Assistant	JE002

4.4.2. Design view

Field Name	Data Type	Description (Optional)
EmployeeID	Number	ID for references
Employee name	Short Text	Employee's Name
Contact	Number	Employee's Contact Number
Email	Short Text	Employee's Email
Street Address	Short Text	Employee's Address
City	Short Text	Employee's City
Postal Code	Number	Employee's Address Postal Code
Position	Short Text	Employee's Position in Branch
Branch ID	Short Text	Employee's Branch that he/she works

4.5. Manufacturer Table

4.5.1. Datasheet view

ManufacturerID	Manufacturer Name	Contact	Postal Code	Address	Email	CI
1	Trading Limited	18695225	798966	11 Trading Dr	TradingLtd@gmail.com	
2	Fish Trading Center	78965412	456988	22 Trading Dr	FishT@hotmail.com	
3	Farmer ABC	36569545	265659	22 Export Str	FarmABC@gmail.com	
4	HuaChen Canned	54956536	222656	24 Student Link	HCCANNED@hotmail.com	
5	FreshFarm	19596232	659959	232 Lavender Str	Ffarm@gmail.com	
6	Fruit & Farm	15499653	788788	123 Donbass Str	Fruitandfarm@gmail.com	

4.5.2. Design view

Field Name	Data Type	Description
ManufacturerID	AutoNumber	ID for references
Manufacturer Name	Short Text	Manufacturer's name
Contact	Short Text	Manufacturer's contact
Postal Code	Short Text	Manufacturer's Postal Code
Address	Short Text	Manufacturer's Address
Email	Short Text	Manufacturer's Email

4.6. OrderID Table

4.6.1. Datasheet view

	OrderID	CustomerID	OrderDate	Person-In-Ch	Click to Add
+	1	2	11/3/2022	111	
+	2	4	10/3/2022	896	
+	3	3	9/3/2022	222	
+	4	1	20/2/2022	445	
+	5	5	25/2/2022	111	
+	6	10	12/3/2022	222	
+	7	9	12/3/2022	445	
+	8	8	12/3/2022	896	
+	9	7	12/3/2022	111	
+	10	6	12/3/2022	222	
+	11	5	12/3/2022	896	
+	12	9	16/3/2022	111	
*	(New)	0		0	

4.6.2. Design view

Field Name	Data Type	Description
OrderID	AutoNumber	ID for references
CustomerID	Number	CustomerID corresponding with customer purchasing on this order
OrderDate	Date/Time	Order Date
Person-In-Charge	Number	EmployeeID who directly handled this order

4.7. Product Table

4.7.1. Datasheet view

ProductID	Name of Product	Category	Manufacturing Date	Expiry date	Unit P	Click to Add
1	Lays	Snack	3/2/2021	3/2/2022	\$3.50	
2	Fish	Fresh Product	9/2/2022	11/2/2022	\$4.50	
3	Lettuce	Vegetable	10/2/2022	13/2/2022	\$2.00	
4	Luncheon Meat	Canned Food	22/2/2022	23/9/2029	\$5.00	
5	Cucumber	Vegetable	22/2/2022	24/2/2022	\$0.50	
6	Orange	Fresh Fruit	1/3/2022	30/4/2022	\$4.50	
7	Fresh Apple	Fresh Fruit	1/3/2022	30/4/2022	\$5.00	
8	Apple	Fresh Fruit	1/3/2022	30/4/2022	\$4.00	
9	Peanut Candy	Candy	1/3/2022	12/3/2024	\$8.00	
10	Premium Peanut Can	Candy	4/3/2022	8/4/2025	\$18.00	
11	Fresh Bread	Bread	10/3/2022	17/3/2022	\$5.60	
12	Peanut Butter	Grocery	2/2/2021	2/2/2023	\$3.00	
13	Chocolate Oreo	Grocery	1/1/2022	1/1/2024	\$8.00	
14	Banana	Fruit	10/3/2022	13/3/2022	\$5.00	
15	Kiwi	Fruit	10/3/2022	17/3/2022	\$5.00	

4.7.2. Design view

Product Table		
Field Name	Data Type	Description (Optional)
ProductID	AutoNumber	ID of Product
Name of Product	Short Text	Name of product
Category	Short Text	Category product belongs to
Manufacturing Date	Date/Time	Manufacturing Date
Expiry date	Date/Time	Expiry date of product
Unit Price	Currency	Price of product

Field Properties

General Lookup

4.8. Purchase Table

4.8.1. Datasheet view

	ProductID	ManufacturerID	Unit Cost	Click to Add
[+]	1	1	\$1.00	
[+]	2	2	\$2.00	
[+]	3	3	\$1.50	
[+]	4	4	\$4.00	
[+]	5	5	\$0.30	
[+]	6	6	\$1.80	
[+]	7	5	\$1.80	
[+]	8	5	\$3.00	
[+]	9	1	\$4.00	
[+]	10	1	\$4.00	
[+]	11	3	\$2.00	
[+]	12	2	\$2.00	
[+]	13	1	\$2.00	
[+]	14	1	\$2.50	
[+]	15	1	\$2.90	
*	0		\$0.00	

4.8.2. Design view

Field Name	Data Type	Description
ProductID	Number	Product ID for references
ManufacturerID	Number	Manufacturer ID referencing to Manufacturer Table
Unit Cost	Currency	Unit Cost of product

5. Queries

5.1. Customer Information

5.1.1. Design View

The screenshot shows the Microsoft Access 'Design View' window for a query named '1-Customer Information'. The top pane displays the 'Customer Table' with fields: * (selected), CustomerID, First Name, Last Name, Phone Number, Street Address, City, Postal Code, and Email. The bottom pane shows the query's structure with fields: First Name, Last Name, Phone Number, Street Address, City, Postal Code, and Email, all selected from the 'Customer Table'. The 'Sort' and 'Criteria' sections are empty.

5.1.2. Datasheet view

The screenshot shows the Microsoft Access 'Datasheet view' for the '1-Customer Information' query. The table contains 12 rows of customer data:

First Name	Last Name	Phone Number	Street Address	City	Postal Code	Email
David	Lee	86951268	21 Nanyang Dr	Singapore	125896	david.lee@gmail.com
Adam	Levin	16547993	20 Lien Ying Chow Dr	Singapore	789632	adam001@gmail.com
Nancy	Shaw	78963215	12 Student Walk	Singapore	178965	hiamnancy@gmail.com
Steven	Tan	33242345	9 Rivervale Str	Singapore	342342	Steven112@gmail.com
Ryan	Chua	45656767	97 Kallang Ave	Singapore	453453	Ryannn2@gmail.com
Elaine	Kim	78526544	12 Nanyang Dr	Singapore	785545	elaine.kim@gmail.com
Lisa	Nguyen	12548956	13 Lien Ying Chow Dr	Singapore	449842	lisa111@gmail.com
Jisoo	Kim	89564452	112 Student Walk	Singapore	547842	jisoohere@gmail.com
David	Wu	45487842	19 Rivervale Str	Singapore	544653	david.wu@gmail.com
Bradon	Ong	54486212	917 Kallang Ave	Singapore	659965	lemonong@gmail.com
James	Le	89447821	21 Somerest Dr	Singapore	125636	james.le@gmail.com

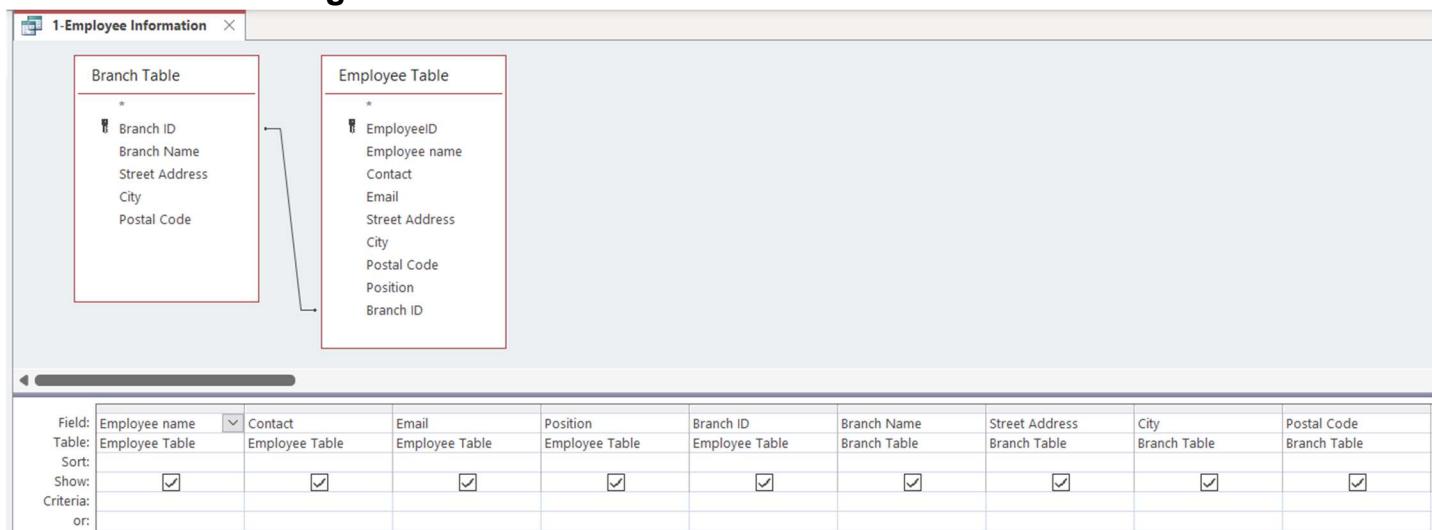
5.1.3. SQL view

```
SELECT [Customer Table].[First Name], [Customer Table].[Last Name], [Customer Table].[Phone Number], [Customer Table].[Street Address], [Customer Table].City, [Customer Table].[Postal Code], [Customer Table].Email
```

```
FROM [Customer Table];
```

5.2. Employee Information

5.2.1. Design view



5.2.2. Datasheet view

Employee name	Contact	Email	Position	Branch ID	Branch Name	Street Address	City	Postal Code
John	33923233	john@hotmail.com	Sales Assistant	JE001	Jurong Branch	10 Adam Str	Singapore	127832
Zoe	44432333	zoe96@gmail.com	Sales Assistant	JE002	Boonlay Branch	20 Avenue Str	Singapore	189237
Cloud	29890897	Cloudy@gmail.com	Sales Assistant	JE003	Bugis Branch	11 Bugis Str	Singapore	242344
Zack	43435454	zack995@yahoo.com	Manager	JE004	Orchard Branch	1 Orchid Str	Singapore	324324
Claudia	21322221	Clauuud@gmail.com	Manager	JE005	Simei Branch	10 River Str	Singapore	545564

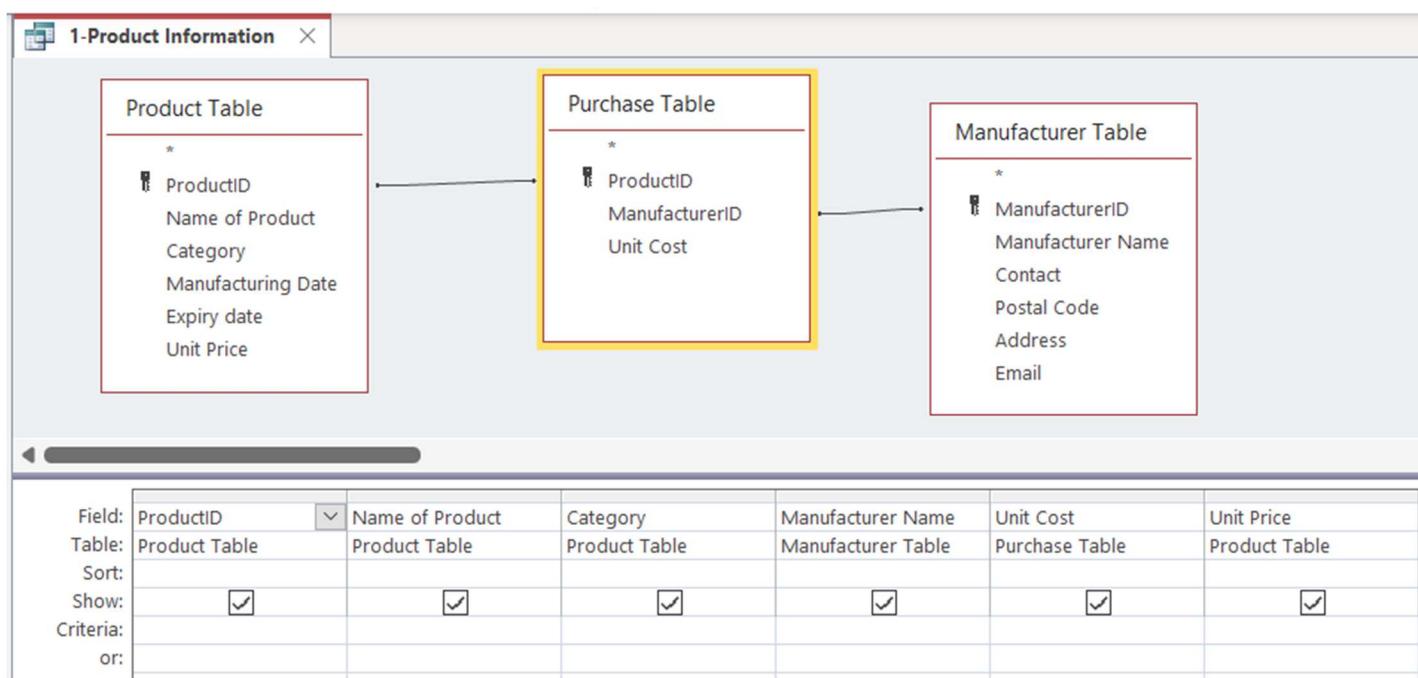
5.2.3. SQL view

```
SELECT [Employee Table].[Employee name], [Employee Table].Contact, [Employee Table].Email, [Employee Table].Position, [Employee Table].[Branch ID], [Branch Table].[Branch Name], [Branch Table].[Street Address], [Branch Table].City, [Branch Table].[Postal Code]
```

```
FROM [Branch Table] INNER JOIN [Employee Table] ON [Branch Table].[Branch ID] = [Employee Table].[Branch ID];
```

5.3. Product Information

5.3.1. Design view



5.3.2. Datasheet view

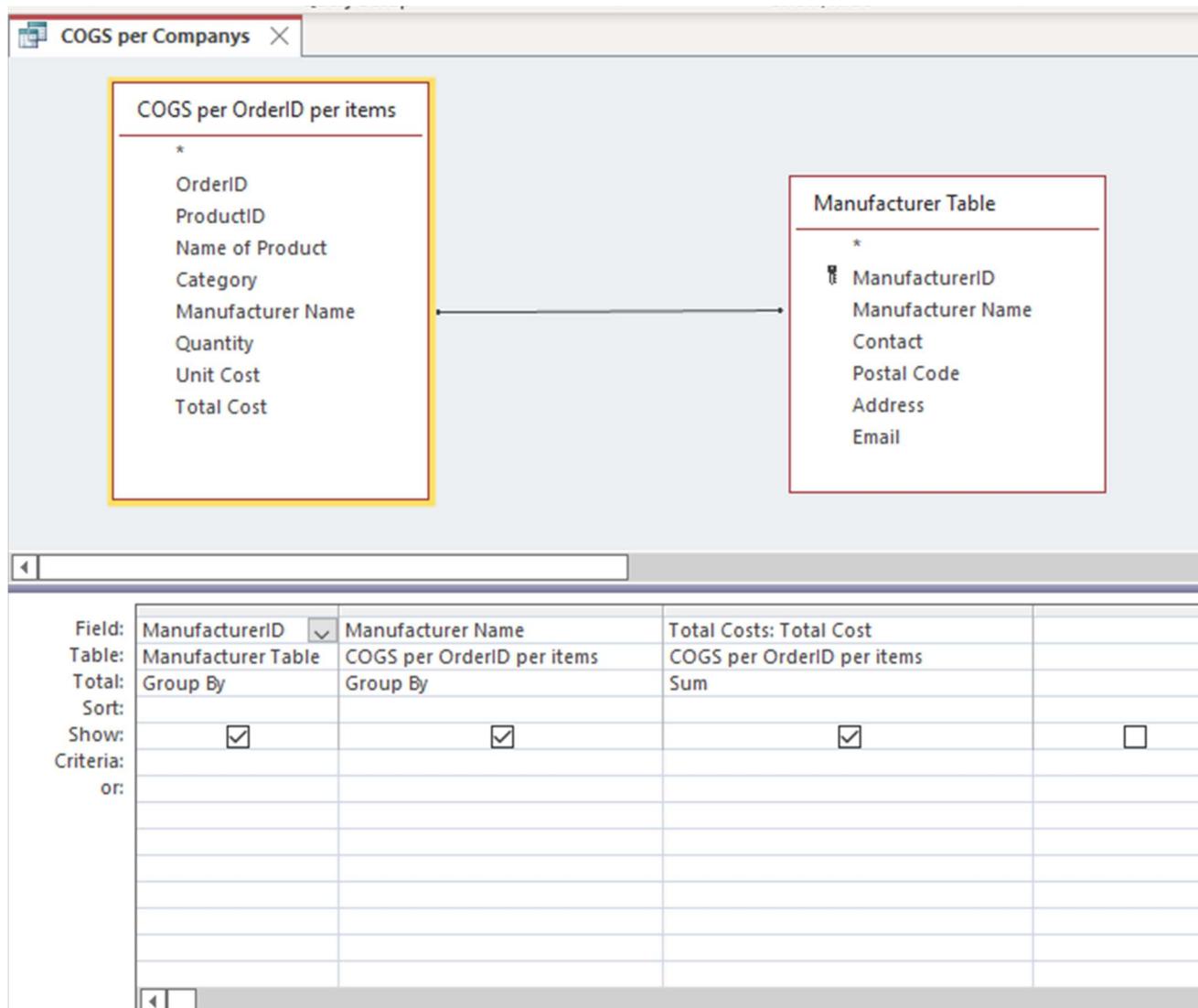
ProductID	Name of Product	Category	Manufacturer Name	Unit Cost	Unit Price
1	Lays	Snack	Trading Limited	\$1.00	\$3.50
2	Fish	Fresh Product	Fish Trading Center	\$2.00	\$4.50
3	Lettuce	Vegetable	Farmer ABC	\$1.50	\$2.00
4	Luncheon Meat	Canned Food	HuaChen Canned	\$4.00	\$5.00
5	Cucumber	Vegetable	FreshFarm	\$0.30	\$0.50
6	Orange	Fresh Fruit	Fruit & Farm	\$1.80	\$4.50
7	Fresh Apple	Fresh Fruit	FreshFarm	\$1.80	\$5.00
8	Apple	Fresh Fruit	FreshFarm	\$3.00	\$4.00
9	Peanut Candy	Candy	Trading Limited	\$4.00	\$8.00
10	Premium Peanut Candy	Candy	Trading Limited	\$4.00	\$18.00
11	Fresh Bread	Bread	Farmer ABC	\$2.00	\$5.60
12	Peanut Butter	Grocery	Fish Trading Center	\$2.00	\$3.00
13	Chocolate Oreo	Grocery	Trading Limited	\$2.00	\$8.00
14	Banana	Fruit	Trading Limited	\$2.50	\$5.00
15	Kiwi	Fruit	Trading Limited	\$2.90	\$5.00

5.3.3. SQL view

```
SELECT [Product Table].ProductID, [Product Table].[Name of Product], [Product Table].Category,  
[Manufacturer Table].[Manufacturer Name], [Purchase Table].[Unit Cost], [Product Table].[Unit Price]  
FROM [Manufacturer Table] INNER JOIN ([Product Table] INNER JOIN [Purchase Table] ON [Product  
Table].[ProductID] = [Purchase Table].[ProductID]) ON [Manufacturer Table].ManufacturerID =  
[Purchase Table].ManufacturerID;
```

5.4. Cost Of Goods Sold (COGS) per company

5.4.1. Design view



5.4.2. Datasheet view

The screenshot shows a Microsoft Access datasheet titled "COGS per Companies". The table has three columns: "ManufacturerID", "Manufacturer Name", and "Total Costs". The data is as follows:

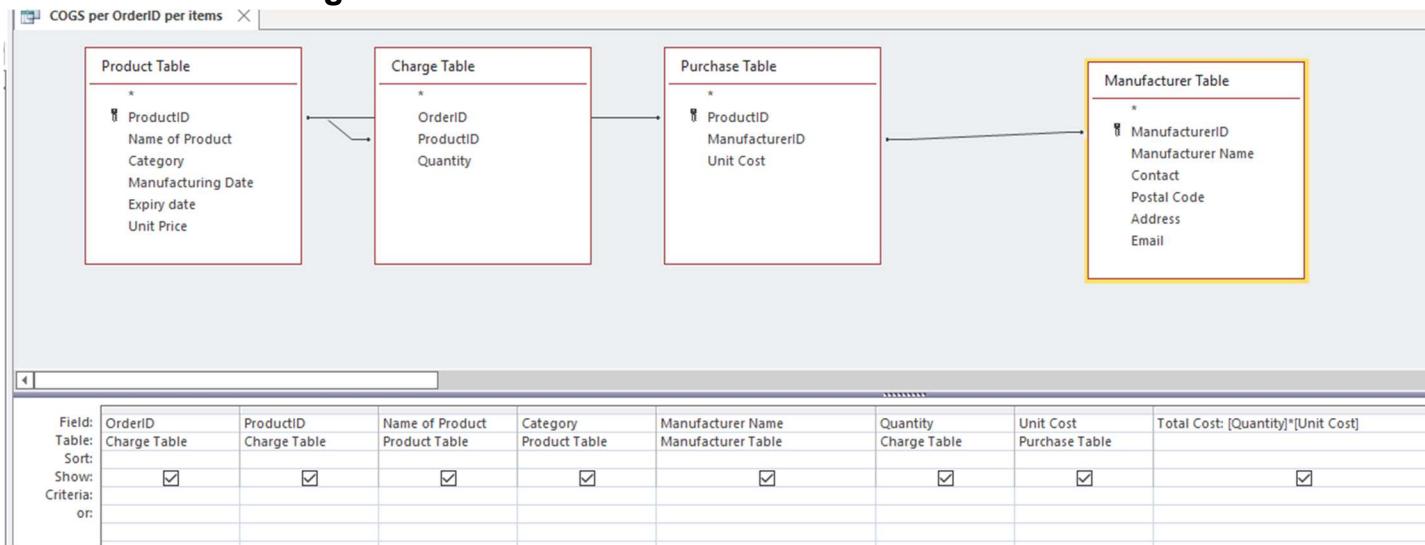
ManufacturerID	Manufacturer Name	Total Costs
1	Trading Limited	\$257.50
2	Fish Trading Center	\$134.00
3	Farmer ABC	\$61.50
4	HuaChen Canned	\$208.00
5	FreshFarm	\$102.00
6	Fruit & Farm	\$95.40

5.4.3. SQL view

```
SELECT DISTINCTROW [Manufacturer Table].ManufacturerID, [COGS per OrderID per items].[Manufacturer Name], Sum([COGS per OrderID per items].[Total Cost]) AS [Total Costs]
FROM [Manufacturer Table] INNER JOIN [COGS per OrderID per items] ON [Manufacturer Table].[Manufacturer Name] = [COGS per OrderID per items].[Manufacturer Name]
GROUP BY [Manufacturer Table].ManufacturerID, [COGS per OrderID per items].[Manufacturer Name];
```

5.5. Cost Of Goods Sold (COGS) per OrderID per item

5.5.1. Design view



5.5.2. Datasheet view

OrderID	ProductID	Name of Product	Category	Manufacturer Name	Quantity	Unit Cost	Total Cost
2	1	Lays	Snack	Trading Limited	10	\$1.00	\$10.00
3	1	Lays	Snack	Trading Limited	5	\$1.00	\$5.00
4	1	Lays	Snack	Trading Limited	3	\$1.00	\$3.00
5	1	Lays	Snack	Trading Limited	3	\$1.00	\$3.00
6	1	Lays	Snack	Trading Limited	3	\$1.00	\$3.00
2	2	Fish	Fresh Product	Fish Trading Center	3	\$2.00	\$6.00
3	2	Fish	Fresh Product	Fish Trading Center	3	\$2.00	\$6.00
4	2	Fish	Fresh Product	Fish Trading Center	8	\$2.00	\$16.00
6	2	Fish	Fresh Product	Fish Trading Center	5	\$2.00	\$10.00
8	2	Fish	Fresh Product	Fish Trading Center	23	\$2.00	\$46.00
9	2	Fish	Fresh Product	Fish Trading Center	8	\$2.00	\$16.00
11	2	Fish	Fresh Product	Fish Trading Center	4	\$2.00	\$8.00
1	2	Fish	Fresh Product	Fish Trading Center	5	\$2.00	\$10.00
1	3	Lettuce	Vegetable	Farmer ABC	5	\$1.50	\$7.50
1	3	Lettuce	Vegetable	Farmer ABC	5	\$1.50	\$7.50
5	3	Lettuce	Vegetable	Farmer ABC	10	\$1.50	\$15.00
9	3	Lettuce	Vegetable	Farmer ABC	7	\$1.50	\$10.50
10	3	Lettuce	Vegetable	Farmer ABC	2	\$1.50	\$3.00
2	4	Luncheon Meat	Canned Food	HuaChen Canned	5	\$4.00	\$20.00
3	4	Luncheon Meat	Canned Food	HuaChen Canned	5	\$4.00	\$20.00
4	4	Luncheon Meat	Canned Food	HuaChen Canned	6	\$4.00	\$24.00
6	4	Luncheon Meat	Canned Food	HuaChen Canned	5	\$4.00	\$20.00
7	4	Luncheon Meat	Canned Food	HuaChen Canned	5	\$4.00	\$20.00
8	4	Luncheon Meat	Canned Food	HuaChen Canned	12	\$4.00	\$48.00
9	4	Luncheon Meat	Canned Food	HuaChen Canned	5	\$4.00	\$20.00
11	4	Luncheon Meat	Canned Food	HuaChen Canned	6	\$4.00	\$24.00
1	4	Luncheon Meat	Canned Food	HuaChen Canned	3	\$4.00	\$12.00
2	5	Cucumber	Vegetable	FreshFarm	5	\$0.30	\$1.50
3	5	Cucumber	Vegetable	FreshFarm	5	\$0.30	\$1.50

5.5.3. SQL view

```
SELECT [Charge Table].OrderID, [Charge Table].ProductID, [Product Table].[Name of Product],  
[Product Table].Category, [Manufacturer Table].[Manufacturer Name], [Charge Table].Quantity,  
[Purchase Table].[Unit Cost], [Quantity]*[Unit Cost] AS [Total Cost]
```

```
FROM [Manufacturer Table] INNER JOIN ([Product Table] INNER JOIN [Charge Table] ON [Product  
Table].[ProductID] = [Charge Table].[ProductID]) INNER JOIN [Purchase Table] ON [Product  
Table].[ProductID] = [Purchase Table].[ProductID] ON [Manufacturer Table].ManufacturerID =  
[Purchase Table].ManufacturerID;
```

5.6. Cost Of Goods Sold (COGS) per Product

5.6.1. Design view

Field:	ProductID	Name of Product	Unit Cost	Sum Of Quantity: Quantity	Sum Of Total Cost: Total Cost
Table:	COGS per OrderID per items				
Total:	Group By	Group By	Group By	Sum	Sum
Sort:					
Show:	<input checked="" type="checkbox"/>				
Criteria:					
or:					

5.6.2. Datasheet view

ProductID	Name of Product	Unit Cost	Sum Of Quantity	Sum Of Total Cost
1	Lays	\$1.00	24	\$24.00
2	Fish	\$2.00	59	\$118.00
3	Lettuce	\$1.50	29	\$43.50
4	Luncheon Meat	\$4.00	52	\$208.00
5	Cucumber	\$0.30	20	\$6.00
6	Orange	\$1.80	53	\$95.40
7	Fresh Apple	\$1.80	15	\$27.00
8	Apple	\$3.00	23	\$69.00
9	Peanut Candy	\$4.00	22	\$88.00
10	Premium Peanut Candy	\$4.00	21	\$84.00
11	Fresh Bread	\$2.00	9	\$18.00
12	Peanut Butter	\$2.00	8	\$16.00
13	Chocolate Oreo	\$2.00	5	\$10.00
14	Banana	\$2.50	9	\$22.50
15	Kiwi	\$2.90	10	\$29.00

5.6.3. SQL View

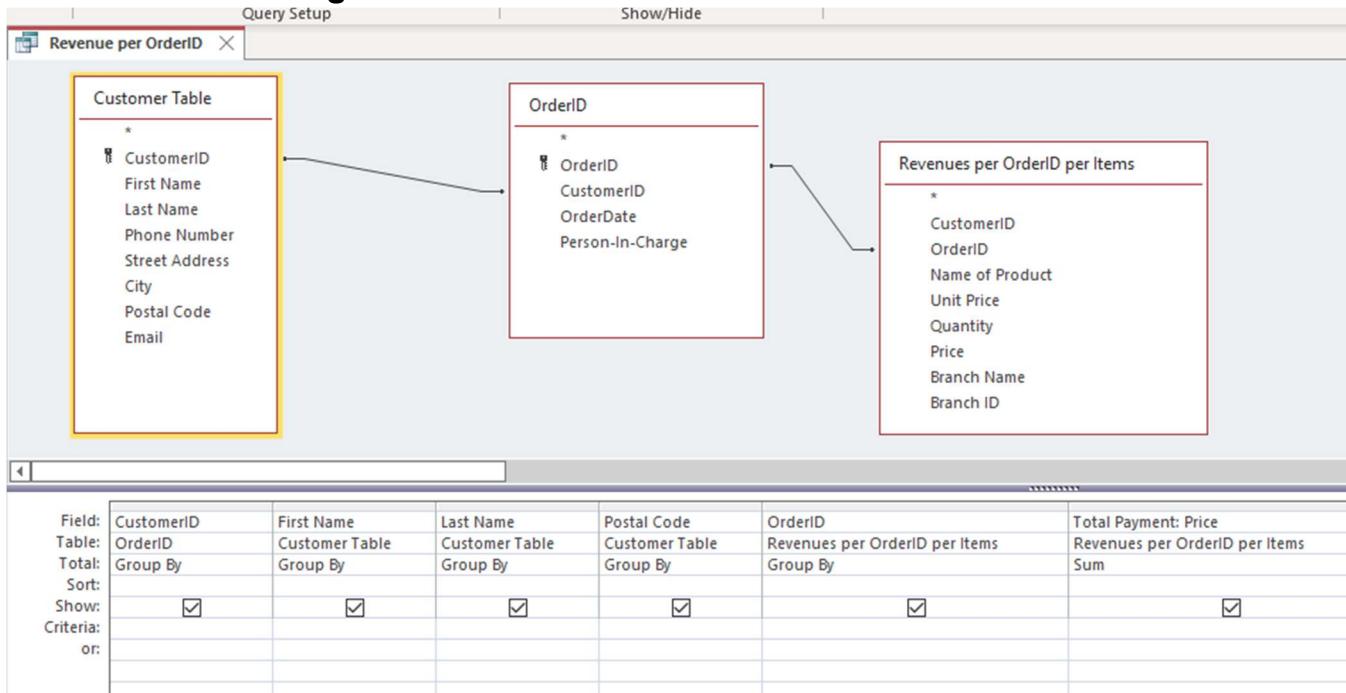
```
SELECT DISTINCTROW [COGS per OrderID per items].ProductID, [COGS per OrderID per items].[Name of Product], [COGS per OrderID per items].[Unit Cost], Sum([COGS per OrderID per items].Quantity) AS [Sum Of Quantity], Sum([COGS per OrderID per items].[Total Cost]) AS [Sum Of Total Cost]
```

```
FROM [COGS per OrderID per items]
```

```
GROUP BY [COGS per OrderID per items].ProductID, [COGS per OrderID per items].[Name of Product], [COGS per OrderID per items].[Unit Cost];
```

5.7. Revenue per OrderID

5.7.1. Design view



5.7.2. Datasheet view

CustomerID	First Name	Last Name	Postal Code	Revenues per OrderID per Items.OrderID	Total Payment
1	David	Lee	125896	4	\$80.00
2	Adam	Levin	789632	1	\$47.50
3	Nancy	Shaw	178965	3	\$58.50
4	Steven	Tan	342342	2	\$76.00
5	Ryan	Chua	453453	5	\$105.00
5	Ryan	Chua	453453	11	\$164.00
6	Elaine	Kim	785545	10	\$94.00
7	Lisa	Nguyen	449842	9	\$87.00
8	Jisoo	Kim	547842	8	\$429.00
9	David	Wu	544653	7	\$190.00
9	David	Wu	544653	12	\$383.40
10	Bradon	Ong	659965	6	\$122.00

5.7.3. SQL view

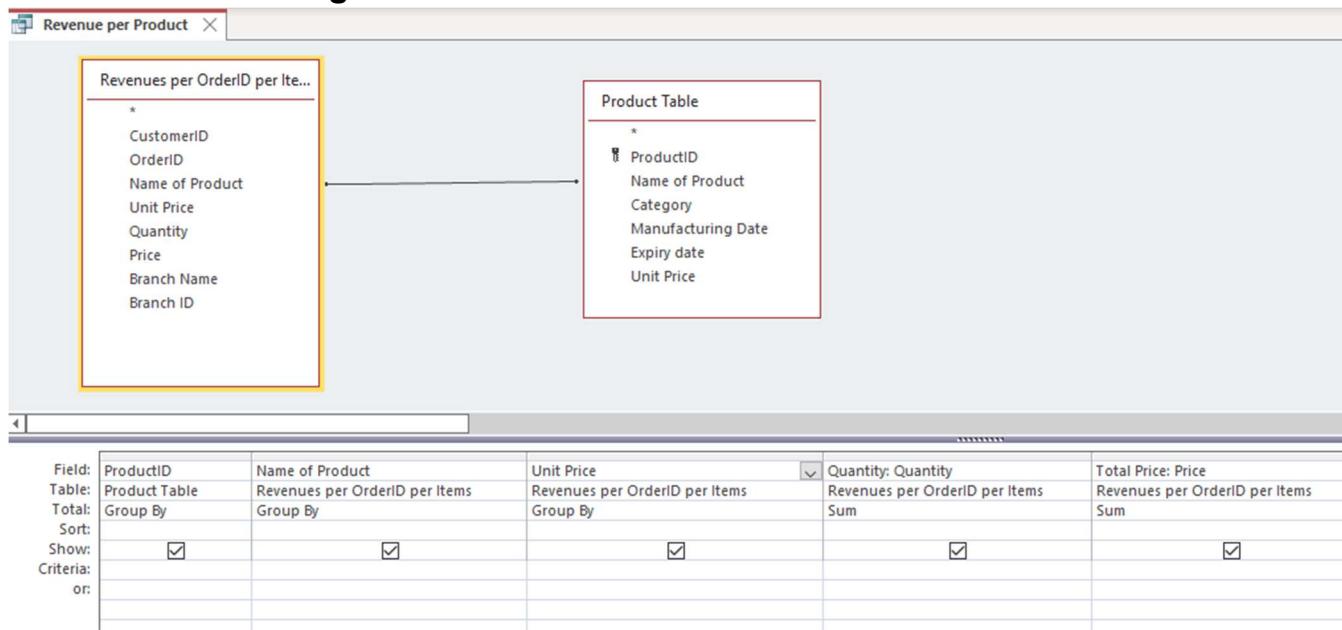
```
SELECT DISTINCTROW OrderID.CustomerID, [Customer Table].[First Name], [Customer Table].[Last Name], [Customer Table].[Postal Code], [Revenues per OrderID per Items].OrderID, Sum([Revenues per OrderID per Items].Price) AS [Total Payment]
```

```
FROM [Customer Table] INNER JOIN ([Revenues per OrderID per Items] INNER JOIN OrderID ON [Revenues per OrderID per Items].OrderID = OrderID.OrderID) ON [Customer Table].CustomerID = OrderID.CustomerID
```

```
GROUP BY OrderID.CustomerID, [Customer Table].[First Name], [Customer Table].[Last Name], [Customer Table].[Postal Code], [Revenues per OrderID per Items].OrderID;
```

5.8. Revenue per Product

5.8.1. Design view



5.8.2. Datasheet view

ProductID	Name of Product	Unit Price	Quantity	Total Price
1	Lays	\$3.50	24	\$84.00
2	Fish	\$4.50	59	\$265.50
3	Lettuce	\$2.00	24	\$48.00
4	Luncheon Meat	\$5.00	52	\$260.00
5	Cucumber	\$0.50	20	\$10.00
6	Orange	\$4.50	53	\$238.50
7	Fresh Apple	\$5.00	15	\$75.00
8	Apple	\$4.00	23	\$92.00
9	Peanut Candy	\$8.00	22	\$176.00
10	Premium Peanut Candy	\$18.00	21	\$378.00
11	Fresh Bread	\$5.60	9	\$50.40
12	Peanut Butter	\$3.00	8	\$24.00
13	Chocolate Oreo	\$8.00	5	\$40.00
14	Banana	\$5.00	9	\$45.00
15	Kiwi	\$5.00	10	\$50.00

5.8.3. SQL view

```
SELECT DISTINCTROW [Product Table].ProductID, [Revenues per OrderID per Items].[Name of Product], [Revenues per OrderID per Items].[Unit Price], Sum([Revenues per OrderID per Items].Quantity) AS Quantity, Sum([Revenues per OrderID per Items].Price) AS [Total Price]  
FROM [Revenues per OrderID per Items] INNER JOIN [Product Table] ON [Revenues per OrderID per Items].[Name of Product] = [Product Table].[Name of Product]  
GROUP BY [Product Table].ProductID, [Revenues per OrderID per Items].[Name of Product], [Revenues per OrderID per Items].[Unit Price];
```

5.9. Revenue per Branch

5.9.1. Design view

The screenshot shows the Microsoft Access Design View for a query titled "Revenues per Branch". The query is based on the table "Revenues per OrderID per Items". The results are grouped by "Branch ID". The columns displayed are "Branch Name" and "Sum Of Price: Price".

Field:	Branch ID	Branch Name	Sum Of Price: Price
Table:	Revenues per OrderID per Items	Revenues per OrderID per Items	Revenues per OrderID per Items
Total:	Group By	Group By	Sum
Sort:			
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Criteria:			
or:			

5.9.2. Datasheet view

Branch ID	Branch Name	Sum Of Price
JE002	Boonlay Branch	\$669.00
JE003	Bugis Branch	\$274.50
JE004	Orchard Branch	\$270.00
JE005	Simei Branch	\$622.90

5.9.3. SQL view

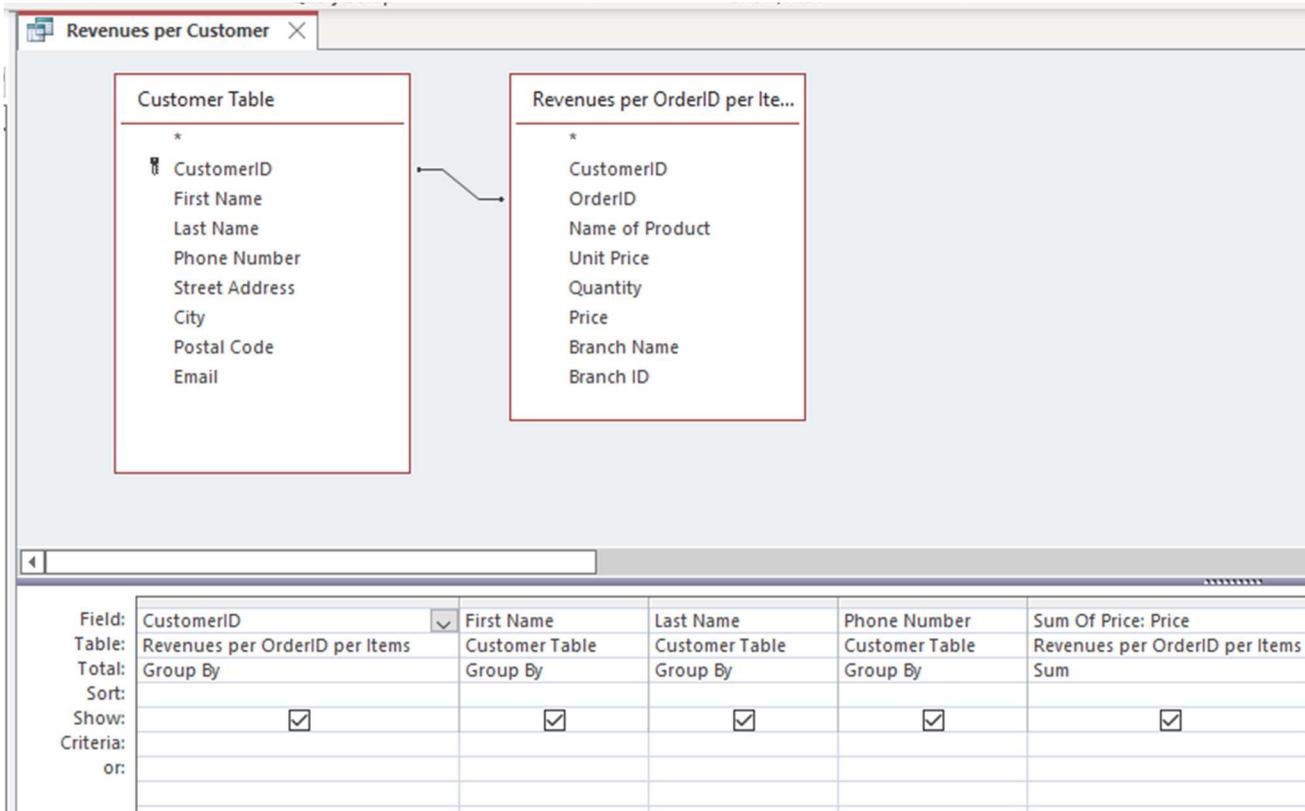
```
SELECT DISTINCTROW [Revenues per OrderID per Items].[Branch ID], [Revenues per OrderID per Items].[Branch Name], Sum([Revenues per OrderID per Items].Price) AS [Sum Of Price]
```

```
FROM [Revenues per OrderID per Items]
```

```
GROUP BY [Revenues per OrderID per Items].[Branch ID], [Revenues per OrderID per Items].[Branch Name];
```

5.10. Revenue per Customer

5.10.1. Design view



5.10.2. Datasheet view

CustomerID	First Name	Last Name	Phone Number	Sum Of Price
1 Steven	Tan		33242345	\$80.00
2 David	Lee		86951268	\$47.50
3 Nancy	Shaw		78963215	\$58.50
4 Adam	Levin		16547993	\$76.00
5 James	Le		89447821	\$164.00
5 Ryan	Chua		45656767	\$105.00
6 Bradon	Ong		54486212	\$94.00
7 David	Wu		45487842	\$87.00
8 Jisoo	Kim		89564452	\$429.00
9 Lisa	Nguyen		12548956	\$190.00
10 Elaine	Kim		78526544	\$122.00

5.10.3. SQL view

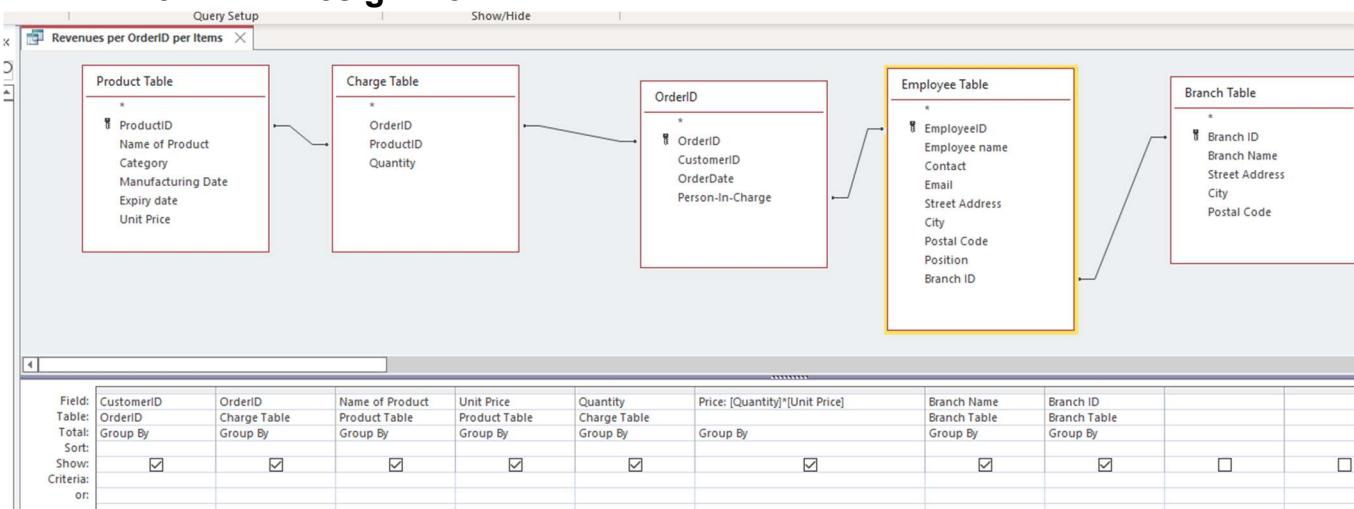
```
SELECT DISTINCTROW [Revenues per OrderID per Items].CustomerID, [Customer Table].[First Name], [Customer Table].[Last Name], [Customer Table].[Phone Number], Sum([Revenues per OrderID per Items].Price) AS [Sum Of Price]
```

```
FROM [Customer Table] INNER JOIN [Revenues per OrderID per Items] ON [Customer Table].[CustomerID] = [Revenues per OrderID per Items].[OrderID]
```

```
GROUP BY [Revenues per OrderID per Items].CustomerID, [Customer Table].[First Name], [Customer Table].[Last Name], [Customer Table].[Phone Number];
```

5.11. Revenue per OrderID per item

5.11.1. Design view



5.11.2. Datasheet view

CustomerID	OrderID	Name of Product	Unit Price	Quantity	Price	Branch Name	Branch ID
1	1	4 Cucumber	\$0.50	7	\$3.50	Orchard Branch	JE004
1	1	4 Fish	\$4.50	8	\$36.00	Orchard Branch	JE004
1	1	4 Lays	\$3.50	3	\$10.50	Orchard Branch	JE004
1	1	4 Luncheon Meat	\$5.00	6	\$30.00	Orchard Branch	JE004
2	1	Fish	\$4.50	5	\$22.50	Simei Branch	JE005
2	1	Lettuce	\$2.00	5	\$10.00	Simei Branch	JE005
2	1	Luncheon Meat	\$5.00	3	\$15.00	Simei Branch	JE005
3	3	Cucumber	\$0.50	5	\$2.50	Bugis Branch	JE003
3	3	Fish	\$4.50	3	\$13.50	Bugis Branch	JE003
3	3	Lays	\$3.50	5	\$17.50	Bugis Branch	JE003
3	3	Luncheon Meat	\$5.00	5	\$25.00	Bugis Branch	JE003
4	2	Cucumber	\$0.50	5	\$2.50	Boonlay Branch	JE002
4	2	Fish	\$4.50	3	\$13.50	Boonlay Branch	JE002
4	2	Lays	\$3.50	10	\$35.00	Boonlay Branch	JE002
4	2	Luncheon Meat	\$5.00	5	\$25.00	Boonlay Branch	JE002
5	5	Cucumber	\$0.50	3	\$1.50	Simei Branch	JE005
5	5	Fresh Apple	\$5.00	5	\$25.00	Simei Branch	JE005
5	5	Lays	\$3.50	3	\$10.50	Simei Branch	JE005
5	5	Lettuce	\$2.00	10	\$20.00	Simei Branch	JE005
5	5	Peanut Candy	\$8.00	6	\$48.00	Simei Branch	JE005
5	11	Fish	\$4.50	4	\$18.00	Boonlay Branch	JE002
5	11	Luncheon Meat	\$5.00	6	\$30.00	Boonlay Branch	JE002
5	11	Orange	\$4.50	8	\$36.00	Boonlay Branch	JE002
5	11	Peanut Candy	\$8.00	10	\$80.00	Boonlay Branch	JE002
6	10	Lettuce	\$2.00	2	\$4.00	Bugis Branch	JE003
6	10	Orange	\$4.50	12	\$54.00	Bugis Branch	JE003
6	10	Premium Peanut Candy	\$18.00	2	\$36.00	Bugis Branch	JE003
7	9	Apple	\$4.00	3	\$12.00	Simei Branch	JE005
7	9	Fish	\$4.50	8	\$36.00	Simei Branch	JE005
7	9	Lettuce	\$2.00	7	\$14.00	Simei Branch	JE005
7	9	Luncheon Meat	\$5.00	5	\$25.00	Simei Branch	JE005
8	8	Fish	\$4.50	23	\$103.50	Boonlay Branch	JE002
8	8	Luncheon Meat	\$5.00	12	\$60.00	Boonlay Branch	JE002
8	8	Orange	\$4.50	11	\$49.50	Boonlay Branch	JE002
8	8	Premium Peanut Candy	\$18.00	12	\$216.00	Boonlay Branch	JE002
9	7	Apple	\$4.00	13	\$52.00	Orchard Branch	JE004
9	7	Fresh Apple	\$5.00	10	\$50.00	Orchard Branch	JE004
9	7	Luncheon Meat	\$5.00	5	\$25.00	Orchard Branch	JE004
9	7	Orange	\$4.50	14	\$63.00	Orchard Branch	JE004
9	12	Banana	\$5.00	9	\$45.00	Simei Branch	JE005

5.11.3. SQL view

```
SELECT OrderID.CustomerID, [Charge Table].OrderID, [Product Table].[Name of Product], [Product Table].[Unit Price], [Charge Table].Quantity, [Quantity]*[Unit Price] AS Price, [Branch Table].[Branch Name], [Branch Table].[Branch ID]
```

```
FROM ([Branch Table] INNER JOIN [Employee Table] ON [Branch Table].[Branch ID] = [Employee Table].[Branch ID]) INNER JOIN (OrderID INNER JOIN ([Product Table] INNER JOIN [Charge Table] ON [Product Table].[ProductID] = [Charge Table].[ProductID]) ON OrderID.OrderID = [Charge Table].OrderID) ON [Employee Table].EmployeeID = OrderID.[Person-In-Charge]
```

GROUP BY OrderID.CustomerID, [Charge Table].OrderID, [Product Table].[Name of Product], [Product Table].[Unit Price], [Charge Table].Quantity, [Quantity]*[Unit Price], [Branch Table].[Branch Name], [Branch Table].[Branch ID];

6. Forms

6.1. Customer Info Form

6.1.1. Design view

The screenshot shows the design view of a 'Customer Info Form' titled '1-Customer Info Form'. The form is structured with a header, a main detail section, and a footer. The header contains the text 'Customer Form'. The detail section is divided into four columns: 'First Name', 'Last Name', 'Phone Number', and 'Email'. Below these, there are four more columns: 'Street Address', 'City', 'Postal Code', and another 'Email' field. The footer section is currently empty. The interface includes a toolbar at the top with various icons and a 'Controls' palette on the right.

6.1.2. Data Entry view

Records | Find | Text Formatting

Customer Table X

Customer Form

First Name Last Name
 Phone Number Email
 Street Address City Postal Code

Customer Table X

Customer Form

First Name John Last Name Wick
Phone Number 95964958 Email jw1996@gmail.com
Street Address Gold road street 92 City Singapore Postal Code 232323

Once the form is saved, the record will appear in the Customer Information Table.

- Before entering a new customer information

CustomerID	First Name	Last Name	Phone Number	Street Address	City	Postal Code	Email
1	David	Lee	86951268	21 Nanyang Dr	Singapore	125896	david.lee@gmail.com
2	Adam	Levin	16547993	20 Lien Ying Chow Dr	Singapore	789632	adam001@gmail.com
3	Nancy	Shaw	78963215	12 Student Walk	Singapore	178965	hiamnancy@gmail.com
4	Steven	Tan	33242345	9 Rivervale Str	Singapore	342342	Steven112@gmail.com
5	Ryan	Chua	45656767	97 Kallang Ave	Singapore	453453	Ryannn2@gmail.com
6	Elaine	Kim	78526544	12 Nanyang Dr	Singapore	785545	elaine.kim@gmail.com
7	Lisa	Nguyen	12548956	13 Lien Ying Chow Dr	Singapore	449842	lisa111@gmail.com
8	Jisoo	Kim	89564452	112 Student Walk	Singapore	547842	jisoohere@gmail.com
9	David	Wu	45487842	19 Rivervale Str	Singapore	544653	david.wu@gmail.com
10	Bradon	Ong	54486212	917 Kallang Ave	Singapore	659965	lemonong@gmail.com
11	James	Le	89447821	21 Somerest Dr	Singapore	125636	james.le@gmail.com

- After entering a new customer information

Customer Table							
CustomerID	First Name	Last Name	Phone Number	Street Address	City	Postal Code	Email
1	David	Lee	86951268	21 Nanyang Dr	Singapore	125896	david.lee@gmail.com
2	Adam	Levin	16547993	20 Lien Ying Chow Dr	Singapore	789632	adam001@gmail.com
3	Nancy	Shaw	78963215	12 Student Walk	Singapore	178965	hiiamnancy@gmail.com
4	Steven	Tan	33242345	9 Rivervale Str	Singapore	342342	Steven112@gmail.com
5	Ryan	Chua	45656767	97 Kallang Ave	Singapore	453453	Ryannn2@gmail.com
6	Elaine	Kim	78526544	12 Nanyang Dr	Singapore	785545	elaine.kim@gmail.com
7	Lisa	Nguyen	12548956	13 Lien Ying Chow Dr	Singapore	449842	lisa111@gmail.com
8	Jisoo	Kim	89564452	112 Student Walk	Singapore	547842	jisoohere@gmail.com
9	David	Wu	45487842	19 Rivervale Str	Singapore	544653	david.wu@gmail.com
10	Bradon	Ong	54486212	917 Kallang Ave	Singapore	659965	lemonong@gmail.com
11	James	Le	89447821	21 Somerest Dr	Singapore	125636	james.le@gmail.com
12	John	Wick	95964958	Gold road street 92	Singapore	232323	jw1996@gmail.com

6.2. Employee Info Form

6.2.1. Design view

1-Employee Info Form X

1 2 3 4

Form Header

Employee Forms

Detail

EmployeeID	EmployeeID	Employee name	Employee name	Contact	Contact	Email	Email
Street Address	Street Address	City	City	Postal Code	Postal Code	Position	Position
Branch ID	Branch ID						

6.2.2. Data Entry view

Employee Table X

Employee Forms

EmployeeID	0
Employee name	
Contact	0
Email	
Street Address	
City	
Postal Code	0
Position	
Branch ID	

Customer Table X Employee Table X Employee Table X

Employee Forms

EmployeeID	999
Employee name	john joe
Contact	56456456
Email	jj@gmail.com
Street Address	Gold lock road st 23
City	Singapore
Postal Code	232322
Position	Manager
Branch ID	JE006

Once the form is saved, the record will appear of Employee Table.

Customer Table X Employee Table X Employee Table X

EmployeeID	Employee na	Contact	Email	Street Addre:	City	Postal Code	Position	Branch ID
111	Claudia	21322221	Clauuud@gmail.com	Skyville street 1	Singapore	222233	Manager	JE005
123	John	33923233	john@hotmail.com	Fisher street 21	Singapore	424233	Sales Assistant	JE001
222	Cloud	29890897	Cloudy@gmail.com	Faker Lamp stre	Singapore	566666	Sales Assitant	JE003
445	Zack	43435454	zack995@yahoo.com	Taker street 31	Singapore	555343	Manager	JE004
896	Zoe	44432333	zoe96@gmail.com	Lamp Street 52	Singapore	324434	Sales Assistant	JE002
999	john joe	56456456	jj@gmail.com	Gold lock road	Singapore	232322	Manager	JE006

6.3. Product Info Form

6.3.1. Design view

1-Product Info Form X

	1	2	3	4	5	6
Form Header	Product Table					
Manufacturing Info						
Detail	ProductID:	ProductID				
	Name of Product	Name of Product				
1	Category	Category				
	Manufacturing Date	Manufacturing				
2	Expiry date	Expiry date				
	Unit Price:	Unit Price				
3						

6.3.2. Data Entry view

The screenshot shows a Microsoft Access form titled "Product Table". At the top, there are two tabs: "Product Table" and "Purchase Table". The main area is titled "Product Table" and contains a sub-form titled "Manufacturing Info". The sub-form has the following fields:

ProductID	(New)
Name of Product	
Category	
Manufacturing Date	
Expiry date	
Unit Price	

From the Product Table form, click on Manufacturing info and it will open the (sub-form) Manufacturer form to enter manufacturer information. Remember to key in ProductID before entering other fields information.

The screenshot shows a Microsoft Access form titled "Purchase Table". At the top, there are two tabs: "Product Table" and "Purchase Table". The main area is titled "Purchase Table" and contains a table with the following columns:

ProductID	ID	Unit Cost	Manufacturer Name	Contact	Postal Code	Address	Email

To add a product, enter product and manufacturing information in the form and save it.

Manufacturer Table X OrderID X Product Table X **Product Table X** Purchase Table X

Product Table

Manufacturing Info

ProductID	16
Name of Product	Kettle chips
Category	Snack
Manufacturing Date	9/3/2022
Expiry date	23/3/2022
Unit Price	\$5.00

Manufacturer Table X OrderID X Product Table X Product Table X **Purchase Table X**

Purchase Table

ProductID	ID	Unit Cost	Manufacturer Name	Contact	Postal Code	Address	Email
16	7	\$4.00	Kettle Pte Ltd	2323121211	2313231	kettle st 21	kettle@gmail.com

Once the form is saved, the record will appear in product, purchase, and manufacturer table.

Manufacturer Table X OrderID X Product Table X

	ProductID	Name of Product	Category	Manufacturing Date	Expiry date	Unit Price
[+]	1	Lays	Snack	3/2/2021	3/2/2022	\$3.50
[+]	2	Fish	Fresh Product	9/2/2022	11/2/2022	\$4.50
[+]	3	Lettuce	Vegetable	10/2/2022	13/2/2022	\$2.00
[+]	4	Luncheon Meat	Canned Food	22/2/2022	23/9/2029	\$5.00
[+]	5	Cucumber	Vegetable	22/2/2022	24/2/2022	\$0.50
[+]	6	Orange	Fresh Fruit	1/3/2022	30/4/2022	\$4.50
[+]	7	Fresh Apple	Fresh Fruit	1/3/2022	30/4/2022	\$5.00
[+]	8	Apple	Fresh Fruit	1/3/2022	30/4/2022	\$4.00
[+]	9	Peanut Candy	Candy	1/3/2022	12/3/2024	\$8.00
[+]	10	Premium Peanut Candy	Candy	4/3/2022	8/4/2025	\$18.00
[+]	11	Fresh Bread	Bread	10/3/2022	17/3/2022	\$5.60
[+]	12	Peanut Butter	Grocery	2/2/2021	2/2/2023	\$3.00
[+]	13	Chocolate Oreo	Grocery	1/1/2022	1/1/2024	\$8.00
[+]	14	Banana	Fruit	10/3/2022	13/3/2022	\$5.00
[+]	15	Kiwi	Fruit	10/3/2022	17/3/2022	\$5.00
[+]	16	Kettle chips	Snack	9/3/2022	23/3/2022	\$5.00

Manufacturer Table X OrderID X Product Table X Purchase Table X

ProductID	ManufacturerID	Unit Cost	Click to Add
1	1	\$1.00	
2	2	\$2.00	
3	3	\$1.50	
4	4	\$4.00	
5	5	\$0.30	
6	6	\$1.80	
7	5	\$1.80	
8	5	\$3.00	
9	1	\$4.00	
10	1	\$4.00	
11	3	\$2.00	
12	2	\$2.00	
13	1	\$2.00	
14	1	\$2.50	
15	1	\$2.90	
16	7	\$4.00	

Manufacturer Table X OrderID X Product Table X

Manufacture	Manufacturer Name	Contact	Postal Code	Address	Email
1	Trading Limited	18695225	798966	11 Trading Dr	tradingl@gmail.com
2	Fish Trading Center	78965412	456988	22 Trading Dr	Fish2trade@gmail.com
3	Farmer ABC	36569545	265659	22 Export Str	farmabc@gmail.com
4	HuaChen Canned	54956536	222656	24 Student Link	Hccanned@gmail.com
5	FreshFarm	19596232	659959	232 Lavender Str	freshfarm@gmail.com
6	Fruit & Farm	15499653	788788	123 Donbass Str	Fruitandfarm@gmail.com
7	Kettle Pte Ltd	232312121	2313231	kettle st 21	kettle@gmail.com

7. Access Reports

7.1. Individual Invoices Report

Report shows customer information and invoice

7.1.1. Design view

The screenshot shows the Microsoft Access report design view for the 'Individual Invoices Report'. The report structure is as follows:

- Page Header:** Contains a dark blue header bar with the text "INVOICES REPORT".
- Detail:** Contains a large title "RETAIL INVOICE" and a grid of four text boxes for customer information: "Invoice ID", "OrderID", "CustomerID", "CustomerID", "First Name", "Last Name", "Phone Number", and "Postal Code".
- Report Header:** Contains a row of four text boxes labeled "Product", "Unit Price", "Quantity", and "Price".
- Detail:** Contains a row of four text boxes labeled "Name of Product", "Unit Price", "Quantity", and "Price".
- Page Footer:** Contains a row with two text boxes: "Total Payments" and "Sum([Price])".
- Report Footer:** Contains a single empty text box.
- Page Footer:** Contains a single empty text box.

7.1.2. Report results view

Individual Invoices Report X

INVOICES REPORT

RETAIL INVOICE

Invoice ID	1	CustomerID	2
First Name	Adam	Last Name	Levin
Phone Number	16547993	Postal Code	789632

<u>Product</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Price</u>
Fish	\$4.50	5	\$22.50
Lettuce	\$2.00	5	\$10.00
Luncheon Meat	\$5.00	3	\$15.00
<u>Total Payments</u>		\$47.50	

RETAIL INVOICE

Invoice ID	2	CustomerID	4
First Name	Steven	Last Name	Tan
Phone Number	33242345	Postal Code	342342

<u>Product</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Price</u>
Cucumber	\$0.50	5	\$2.50
Fish	\$4.50	3	\$13.50
Lays	\$3.50	10	\$35.00
Luncheon Meat	\$5.00	5	\$25.00
<u>Total Payments</u>		\$76.00	

7.2. Top Cost of Goods Sold (COGS) Report

7.2.1. Design view

The screenshot shows the design view of a report titled "TOP COST OF GOODS SOLD PRODUCTS". The report structure includes:

- Report Header:** A blue header section.
- Page Header:** A row with columns for No, Name of Product, Unit Cost, Quantity, and Costs.
- Detail:** A data section with a header row containing =1, Name of Product, Unit Cost, Sum Of Quantity, and Sum Of Total Cost.
- Page Footer:** A row with a formula `=Now()` and a text field `="Page " & [Page] & " of " & [Pages]`.
- Report Footer:** A row with a summary cell Total Costs of Goods Sold and a formula cell `=Sum([Sum Of Total Cost])`.

7.2.2. Report results view

COGS per OrderID per items Query

TOP COST OF GOODS SOLD PRODUCTS

No	Name of Product	Unit Cost	Quantity	Costs
1	Luncheon Meat	\$4.00	52	\$208.00
2	Fish	\$2.00	59	\$118.00
3	Orange	\$1.80	53	\$95.40
4	Peanut Candy	\$4.00	22	\$88.00
5	Premium Peanut Candy	\$4.00	21	\$84.00
6	Apple	\$3.00	23	\$69.00
7	Lettuce	\$1.50	29	\$43.50
8	Kiwi	\$2.90	10	\$29.00
9	Fresh Apple	\$1.80	15	\$27.00
10	Lays	\$1.00	24	\$24.00
11	Banana	\$2.50	9	\$22.50
12	Fresh Bread	\$2.00	9	\$18.00
13	Peanut Butter	\$2.00	8	\$16.00
14	Chocolate Oreo	\$2.00	5	\$10.00
15	Cucumber	\$0.30	20	\$6.00
<u>Total Costs of Goods Sold</u>				\$858.40

7.3. Largest Order Report

7.3.1. Design view

The screenshot shows the design view of a report titled "TOP LARGEST ORDERS". The report structure includes:

- Report Header:** Contains the title "TOP LARGEST ORDERS".
- Page Header:** Contains fields for "No", "First Name", "Last Name", "OrderID", and "Total Payment".
- Detail:** A repeating section containing fields for "First Name", "Last Name", "[Revenue per item]", and "Total Payment". A placeholder value "[=1]" is shown in the first row.
- Page Footer:** Contains a page number placeholder "[Page]" and a total page count placeholder "[Pages]".
- Report Footer:** Contains a summary row with a label "Total Revenues" and a formula cell containing "=Sum([Total Payr])".

At the bottom of the interface, there is a toolbar with the following options:

- Sort by **Total Payment** ▾ from largest to smallest ▾ More ▾
- Add a group
- Add a sort

7.3.2. Report results view

Top largest Orders

TOP LARGEST ORDERS

No	First Name	Last Name	OrderID	Total Payment
1	Jisoo	Kim	8	\$429.00
2	David	Wu	12	\$383.40
3	David	Wu	7	\$190.00
4	Ryan	Chua	11	\$164.00
5	Bradon	Ong	6	\$122.00
6	Ryan	Chua	5	\$105.00
7	Elaine	Kim	10	\$94.00
8	Lisa	Nguyen	9	\$87.00
9	David	Lee	4	\$80.00
10	Steven	Tan	2	\$76.00
11	Nancy	Shaw	3	\$58.50
12	Adam	Levin	1	\$47.50
Total Revenues				\$1,836.40

7.4. Top Largest Supplier Report

7.4.1. Design view

The screenshot shows the report design interface for 'Top Largest Suppliers'. The report structure includes:

- Report Header:** A blue header section containing the title **TOP LARGEST SUPPLIERS**.
- Page Header:** A row with columns for **No**, **Manufacturer Name**, and **Total Costs**.
- Detail:** A data row showing the first supplier: **No =1**, **Manufacturer Name**, and **Total Costs**.
- Page Footer:** Displays the current page number **=Now()** and the total number of pages **="Page " & [Page] & " of " & [Pages]**.
- Report Footer:** A summary row with **Total COGS** and **=Sum([Total Costs])**.

7.4.2. Report results view

The screenshot shows the report results for 'COGS per OrderID per items Query'. The results are displayed in a table:

No	Manufacturer Name	Total Costs
1	Trading Limited	\$257.50
2	HuaChen Canned	\$208.00
3	Fish Trading Center	\$134.00
4	FreshFarm	\$102.00
5	Fruit & Farm	\$95.40
6	Farmer ABC	\$61.50

At the bottom, there is a summary row with **Total COGS** and **\$858.40**.

At the bottom left: Saturday, March 19, 2022. At the bottom right: Page 1 of 1.

7.5. Best Performing Branch Report

7.5.1. Design view

The screenshot shows the design view of a report titled "TOP PERFORMANCE BRANCHES". The report structure includes:

- Report Header:** Contains the title "TOP PERFORMANCE BRANCHES".
- Page Header:** Contains columns for "No", "Branch ID", "Branch Name", and "Sum Of Price".
- Detail:** A table with columns for "No", "Branch ID", "Branch Name", and "Sum Of Price". The first row has values: No=1, Branch ID, Branch Name, and Sum Of Price.
- Page Footer:** Contains the formula "=Now()" and a page number placeholder "Page " & [Page] & " of " & [Pages].
- Report Footer:** Contains a blank area.

7.5.2. Report results view

TOP LARGEST ORDERS

No	First Name	Last Name	OrderID	Total Payment
1	Jisoo	Kim	8	\$429.00
2	David	Wu	12	\$383.40
3	David	Wu	7	\$190.00
4	Ryan	Chua	11	\$164.00
5	Bradon	Ong	6	\$122.00
6	Ryan	Chua	5	\$105.00
7	Elaine	Kim	10	\$94.00
8	Lisa	Nguyen	9	\$87.00
9	David	Lee	4	\$80.00
10	Steven	Tan	2	\$76.00
11	Nancy	Shaw	3	\$58.50
12	Adam	Levin	1	\$47.50

Total Revenues

\$1,836.40

7.6. Top Sale Product Report

7.6.1. Design view

The screenshot shows the Crystal Reports design interface for a report titled "Top Selling Product". The report structure includes:

- Report Header:** Contains the title "TOP SALE PRODUCTS".
- Page Header:** A table with columns: No, Name of Product, Retail Unit Price, Quantity, and Total Sales.
- Detail:** A table with columns: No (containing formula =1), Name of Product, Unit Price, Quantity, and Total Price.
- Page Footer:** A formula field =Now() and a page number formula =Page & [Page] & " of " & [Pages].
- Report Footer:** A table with a single row containing a "Total Revenue" label and a formula =Sum([Total Price]).

7.6.2. Report results view

TOP SALE PRODUCTS				
No	Name of Product	Retail Unit Price	Quantity	Total Sales
1	Premium Peanut Candy	\$18.00	21	\$378.00
2	Fish	\$4.50	59	\$265.50
3	Luncheon Meat	\$5.00	52	\$260.00
4	Orange	\$4.50	53	\$238.50
5	Peanut Candy	\$8.00	22	\$176.00
6	Apple	\$4.00	23	\$92.00
7	Lays	\$3.50	24	\$84.00
8	Fresh Apple	\$5.00	15	\$75.00
9	Fresh Bread	\$5.60	9	\$50.40
10	Kiwi	\$5.00	10	\$50.00
11	Lettuce	\$2.00	24	\$48.00
12	Banana	\$5.00	9	\$45.00
13	Chocolate Oreo	\$8.00	5	\$40.00
14	Peanut Butter	\$3.00	8	\$24.00
15	Cucumber	\$0.50	20	\$10.00
				Total Revenue
				\$1,836.40

7.7. Top Spending Customer Report

7.7.1. Design view

The screenshot shows the design view of a report titled "TOP SPENDING CUSTOMERS". The report structure includes:

- Report Header:** A blue header bar containing the title "TOP SPENDING CUSTOMERS".
- Page Header:** A row of columns labeled "No", "First Name", "Last Name", "Phone Number", and "Total Spending".
- Detail:** A data table with columns for "No" (containing the value "=1"), "First Name", "Last Name", "Phone Number", and "Sum Of Price".
- Page Footer:** A row containing the formula "=Now()" and the formula "=Page " & [Page] & " of " & [Pages]".
- Report Footer:** A section at the bottom of the page.

7.7.2. Report results view

Revenues per Customer X

TOP SPENDING CUSTOMERS

<u>No</u>	<u>First Name</u>	<u>Last Name</u>	<u>Phone Number</u>	<u>Total Spending</u>
1	Jisoo	Kim	89564452	\$429.00
2	John	Wick	95964958	\$383.40
3	Lisa	Nguyen	12548956	\$190.00
4	James	Le	89447821	\$164.00
5	Elaine	Kim	78526544	\$122.00
6	Ryan	Chua	45656767	\$105.00
7	Bradon	Ong	54486212	\$94.00

8. Screen captures of any indexes created.

8.1. Indexes for Branch Table

Index Name	Field Name	Sort Order
Branch ID	Branch ID	Ascending
Postal Code	Postal Code	Ascending
PrimaryKey	Branch ID	Ascending

Index Properties

Primary	Yes
Unique	Yes
Ignore Nulls	No

The name for this index. Each index can use up to 10 fields.

8.2. Indexes for Customer Table

Index Name	Field Name	Sort Order
CustomerID	CustomerID	Ascending
Postal Code	Postal Code	Ascending
PrimaryKey	CustomerID	Ascending

Index Properties

Primary	Yes
Unique	Yes
Ignore Nulls	No

The name for this index. Each index can use up to 10 fields.

8.3. Indexes for Employee Table

Index Name	Field Name	Sort Order
Employee TableBranch	Branch ID	Ascending
EmployeeID	EmployeeID	Ascending
Postal Code	Postal Code	Ascending
PrimaryKey	EmployeeID	Ascending

Index Properties

Primary	Yes
Unique	Yes
Ignore Nulls	No

The name for this index. Each index can use up to 10 fields.

8.4. Indexes for Manufacturer Table

Index Name	Field Name	Sort Order
Postal Code	Postal Code	Ascending
PrimaryKey	ManufacturerID	Ascending

Index Properties

Primary	Yes
Unique	Yes
Ignore Nulls	No

8.5. Indexes for OrderID table

Index Name	Field Name	Sort Order
CustomerID	CustomerID	Ascending
PrimaryKey	OrderID	Ascending

Index Properties

Primary	Yes
Unique	Yes
Ignore Nulls	No

The name for this index. Each index can use up to 10 fields.

8.6. Indexes for Product Table

Index Name	Field Name	Sort Order
PrimaryKey	ProductID	Ascending

Index Properties

Primary	Yes
Unique	Yes
Ignore Nulls	No

The name of the field to be indexed.

8.7. Indexes for Purchase Table

Index Name	Field Name	Sort Order
PrimaryKey	ProductID	Ascending
ProductID	ProductID	Ascending

Index Properties

Primary	Yes
Unique	Yes
Ignore Nulls	No

The name for this index. Each index can use up to 10 fields.

9. Open-ended questions

9.1. Briefly explain what database integration is about. List three top challenges for DBMS teams to accomplish the task.

- Database Integration is an efficient approach to utilizing data by combining data from different sources including databases, cloud, data warehouse, virtual databases, files. The benefit of database integration is to make data accessible to other users without duplicating or moving the data.
- Top 3 Challenges:
 - o Inconsistent formats and data models - The differences in data models can cause problem when integrating between two or more systems.
 - o Poor data quality - Poor data quality such as outdated or inconsistent data
 - o Right data not in right place - unable to access data/missing data

9.2. Propose an approach as to how you can integrate another database into your current system. Briefly explain why your approach is cost effective and practical.

- Before integrating the database, we should always track and identify the data quality as unexpected issues can occur, causing the whole integration process to fail.
- Data warehousing in the cloud. This approach is cost effective and practical as it uses a common storage area (cloud) to cleanse, format, and store data. Data from different sources are copied to the data warehouse, where it can be queried by users. Performance is good as the data warehouse provide resources for queries. Users can also view data in a centralized location.