

Task 4: SQL for Data Analysis

a. Use SELECT, WHERE, ORDER BY, GROUP BY

1. List all customers from Lahore, ordered by Last Name

SELECT FirstName, LastName, Email, Contact

FROM Customer

WHERE Contact LIKE '03%' -- Assuming contacts starting with 03 are local numbers

ORDER BY LastName ASC;

The screenshot shows a database application interface. At the top, there's a 'Result Grid' tab with a table of customer data. Below it, the 'Output' section shows an 'Action Output' log with details for each SQL statement executed, including the number of rows affected and the execution time.

FirstName	LastName	Email	Contact
Nabeel	Abbas	S2016266047@Umt.Edu.Pk	03070655610
Kamran	Abbas	KamranAbbas@gmail.com	03002329767
Zaheer	Abbas	Zaheer.Abbas@Orient-Power.Com	03461112130
Ali	Abbas	Irtu197@gmail.Com	03154133704
Tayyab	Abbas	Tayabkhan@gmail.Com	03201460363
Ali	Abbas	AliAbbas@gmail.com	03346052777

#	Time	Action	Message	Duration / Fetch
60	19:50:54	INSERT INTO Orders (CustomerID, OrderDate, AddressID, VendorCourierID, TrackingID) VALUES ('1','2011-0...	741 row(s) affected Records: 741 Duplicates: 0 Warnings: 0	0.031 sec
61	19:50:54	INSERT INTO Orders (CustomerID, OrderDate, AddressID, VendorCourierID, TrackingID) VALUES ('256','201...	717 row(s) affected Records: 717 Duplicates: 0 Warnings: 0	0.031 sec
62	19:50:54	INSERT INTO OrderedProduct (VendorProductID, OrderID, Quantity) VALUES ('1','1','5'), ('2','2','1'), ('3','3','6'), ...	649 row(s) affected Records: 649 Duplicates: 0 Warnings: 0	0.016 sec
63	19:50:54	INSERT INTO OrderedProduct (VendorProductID, OrderID, Quantity) VALUES ('50','650','6'), ('51','651','4'), ('5...	809 row(s) affected Records: 809 Duplicates: 0 Warnings: 0	0.047 sec
64	19:50:54	INSERT INTO Review (Rating, Comment, CustomerID, OrderedProductID) VALUES ('4','Great Product Slow d...	397 row(s) affected Records: 397 Duplicates: 0 Warnings: 0	0.031 sec
65	20:03:00	SELECT FirstName, LastName, Email, Contact FROM Customer WHERE Contact LIKE '03%' -- Assuming con...	532 row(s) returned	0.016 sec / 0.000 sec

2. Count number of products in each category

SELECT c.CategoryName, COUNT(p.ProductID) AS TotalProducts

FROM Category c

JOIN Product p ON c.CategoryID = p.CategoryID

GROUP BY c.CategoryName

ORDER BY TotalProducts DESC;

The screenshot shows a database application interface. At the top, there's a 'Result Grid' tab with a table of category and product counts. Below it, the 'Output' section shows an 'Action Output' log with details for each SQL statement executed, including the number of rows affected and the execution time.

CategoryName	TotalProducts
Bluetooth Handsfree	22
Smart Watch	19
Android Smart TV Box/Air Mouse	16
Bluetooth Speakers	16
Bluetooth Headphone	14
Barcode Scanner/Thermal Receipt Printer	13
Power Bank	11
Security Cameras and Gadgets	10
USB Hub	10
Attendance Machine	8

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64	19:50:54	INSERT INTO Review (Rating, Comment, CustomerID, OrderedProductID) VALUES ('4','Great Product Slow d...	397 row(s) affected Records: 397 Duplicates: 0 Warnings: 0	0.031 sec
65	20:03:00	SELECT FirstName, LastName, Email, Contact FROM Customer WHERE Contact LIKE '03%' -- Assuming con...	532 row(s) returned	0.016 sec / 0.000 sec
66	20:10:25	SELECT c.CategoryName, COUNT(p.ProductID) AS TotalProducts FROM Category c JOIN Product p ON c.C...	10 row(s) returned	0.000 sec / 0.000 sec

b. Use JOINS (INNER, LEFT, RIGHT)

1. INNER JOIN: Orders with customer names

```
SELECT o.OrderID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderDate  
FROM Orders o  
INNER JOIN Customer c ON o.CustomerID = c.CustomerID;
```

OrderID	CustomerName	OrderDate
1	Aamir Abbasi	2011-01-27
487	Aamir Abbasi	2013-09-10
973	Aamir Abbasi	2013-05-16
2	Aamir Raees	2013-07-26
488	Aamir Raees	2011-10-07
974	Aamir Raees	2014-02-08

#	Time	Action	Message	Duration / Fetch
62	19:50:54	INSERT INTO OrderedProduct (VendorProductID, OrderID, Quantity) VALUES (1,1,5), (2,2,1), (3,3,6), ...	649 row(s) affected Records: 649 Duplicates: 0 Warnings: 0	0.016 sec
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65	20:03:00	SELECT FirstName, LastName, Email, Contact FROM Customer WHERE Contact LIKE '03%' -- Assuming con...	532 row(s) returned	0.016 sec / 0.000 sec
66	20:10:25	SELECT c.CategoryName, COUNT(p.ProductID) AS TotalProducts FROM Category c JOIN Product p ON c.C...	10 row(s) returned	0.000 sec / 0.000 sec
67	20:14:08	SELECT o.OrderID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderDate FROM Orders o I...	1000 row(s) returned	0.016 sec / 0.000 sec

2. LEFT JOIN: All customers and their orders

```
SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID  
FROM Customer c  
LEFT JOIN Orders o ON c.CustomerID = o.CustomerID;
```

CustomerID	CustomerName	OrderID
1	Aamir Abbasi	1
1	Aamir Abbasi	487
1	Aamir Abbasi	973
2	Aamir Raees	2
2	Aamir Raees	488
2	Aamir Raees	974

#	Time	Action	Message	Duration / Fetch
1	21:07:51	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	Error Code: 1046. No database selected Select the default DB to be used by double-clicking its name in the SC...	0.000 sec
2	21:08:02	USE OnlineShopping	0 row(s) affected	0.016 sec
3	21:08:09	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	1000 row(s) returned	0.047 sec / 0.000 sec

3. RIGHT JOIN: All vendors and the products they sell

```
SELECT v.Name AS VendorName, p.ProductName  
FROM Product p  
RIGHT JOIN VendorProduct vp ON p.ProductID = vp.ProductID  
RIGHT JOIN Vendor v ON vp.VendorID = v.VendorID;
```

Result Grid		Filter Rows:	Exports:	Wrap Cell Content:
VendorName	ProductName			
BESTEZY	Air Mouse C 120 for Android and Smart TV			
BESTEZY	Smart Health Bracelet Sprots K1 Black			
BLAZEPUULSE	Air Mouse MX3 for Android and Smart TV			
BLAZEPUULSE	SMART WATCH BATTERY X01			
BLAZEPUULSE	ASPOR POWER BANK 10000MAH POLYMER AIR...			
BRANDITUDE(ZUBAIR)	MINI TOUCH PAD RF 500 WIRELESS WITH 3 C...			
BRANDITUDE(ZUBAIR)	ASPOR POWER BANK 10000MAH POLYMER AIR...			

Result 2 x

Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	21:07:51	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	Error Code: 1046. No database selected Select the default DB to be used by double-clicking its name in the SC...	0.000 sec
2	21:08:02	USE OnlineShopping	0 row(s) affected	0.016 sec
3	21:08:09	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	1000 row(s) returned	0.047 sec / 0.000 sec
4	21:11:37	SELECT v.Name AS VendorName, p.ProductName FROM Product p RIGHT JOIN VendorProduct vp ON p.Pro...	200 row(s) returned	0.047 sec / 0.000 sec

c. Write subqueries

Products priced above the average price

SELECT p.ProductName, vp.Price

FROM VendorProduct vp

JOIN Product p ON vp.ProductID = p.ProductID

WHERE vp.Price > (SELECT AVG(Price) FROM VendorProduct);

Result Grid		Filter Rows:	Exports:	Wrap Cell Content:
ProductName	Price			
ZKTECO I face 702 advance machine	7350.00			
ZKTECO TX628 attendance machine	16500.00			
ZKTECO live 20R usb fingerprint reader	7850.00			
I face 702 Battery	8150.00			
Barcode Bluetooth Scanner Speed-X 3100	7950.00			
Barcode Handy Scanner 2D Speed-X 6100	10000.00			
Barcode Handy Scanner 2D Speed-X 6100	10000.00			

Result 3 x

Read Only

Output

Action Output

#	Time	Action	Message	Duration / Fetch
1	21:07:51	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	Error Code: 1046. No database selected Select the default DB to be used by double-clicking its name in the SC...	0.000 sec
2	21:08:02	USE OnlineShopping	0 row(s) affected	0.016 sec
3	21:08:09	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	1000 row(s) returned	0.047 sec / 0.000 sec
4	21:11:37	SELECT v.Name AS VendorName, p.ProductName FROM Product p RIGHT JOIN VendorProduct vp ON p.Pro...	200 row(s) returned	0.047 sec / 0.000 sec
5	21:14:28	SELECT p.ProductName, vp.Price FROM VendorProduct vp JOIN Product p ON vp.ProductID = p.ProductID ...	70 row(s) returned	0.015 sec / 0.000 sec

d. Use aggregate functions (SUM, AVG)

Total and average quantity ordered per customer

SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName,

SUM(op.Quantity) AS TotalQuantity,

AVG(op.Quantity) AS AvgQuantity

FROM Orders o

JOIN OrderedProduct op ON o.OrderID = op.OrderID

JOIN Customer c ON o.CustomerID = c.CustomerID

GROUP BY c.CustomerID

ORDER BY TotalQuantity DESC;

The screenshot shows a database management tool interface. At the top, there's a 'Result Grid' with columns: CustomerID, CustomerName, TotalQuantity, and AvgQuantity. The data is sorted by TotalQuantity in descending order. Below the grid, there's an 'Output' window showing a list of actions and their results. The actions include SQL queries for selecting customer data, using a stored procedure, and selecting product data with joins and aggregations.

CustomerID	CustomerName	TotalQuantity	AvgQuantity
25	hamza Shadab	18	6.0000
81	Adeel Tariq	18	6.0000
105	Ajaz Raja	18	6.0000
1	Aamir Abbasi	17	5.6667
3	Abbas Raza	17	5.6667
86	Adnan afzal	17	5.6667

#	Time	Action	Message	Duration / Fetch
1	21:07:51	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	Error Code: 1046. No database selected Select the default DB to be used by double-clicking its name in the SC...	0.000 sec
2	21:08:02	USE OnlineShopping	0 row(s) affected	0.016 sec
3	21:08:09	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Customer ...	1000 row(s) returned	0.047 sec / 0.000 sec
4	21:11:37	SELECT v.Name AS VendorName, p.ProductName FROM Product p RIGHT JOIN VendorProduct vp ON p.Pro...	200 row(s) returned	0.047 sec / 0.000 sec
5	21:14:28	SELECT p.ProductName, vp.Price FROM VendorProduct vp JOIN Product p ON vp.ProductID = p.ProductID ...	70 row(s) returned	0.015 sec / 0.000 sec
6	21:17:48	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, SUM(op.Quantity) AS T...	486 row(s) returned	0.031 sec / 0.000 sec

e. Create views for analysis

Create a view for top-selling products

CREATE VIEW TopSellingProducts AS

SELECT p.ProductName, SUM(op.Quantity) AS TotalSold

FROM OrderedProduct op

JOIN VendorProduct vp ON op.VendorProductID = vp.VendorProductID

JOIN Product p ON vp.ProductID = p.ProductID

GROUP BY p.ProductName

ORDER BY TotalSold DESC;

-- Check the view

SELECT * FROM TopSellingProducts;

The screenshot shows the same database management tool interface. The 'Result Grid' now displays the results of the 'TopSellingProducts' view, showing ProductName and TotalSold. The 'Output' window shows the execution of the view creation and a subsequent query to retrieve the top 1000 products.

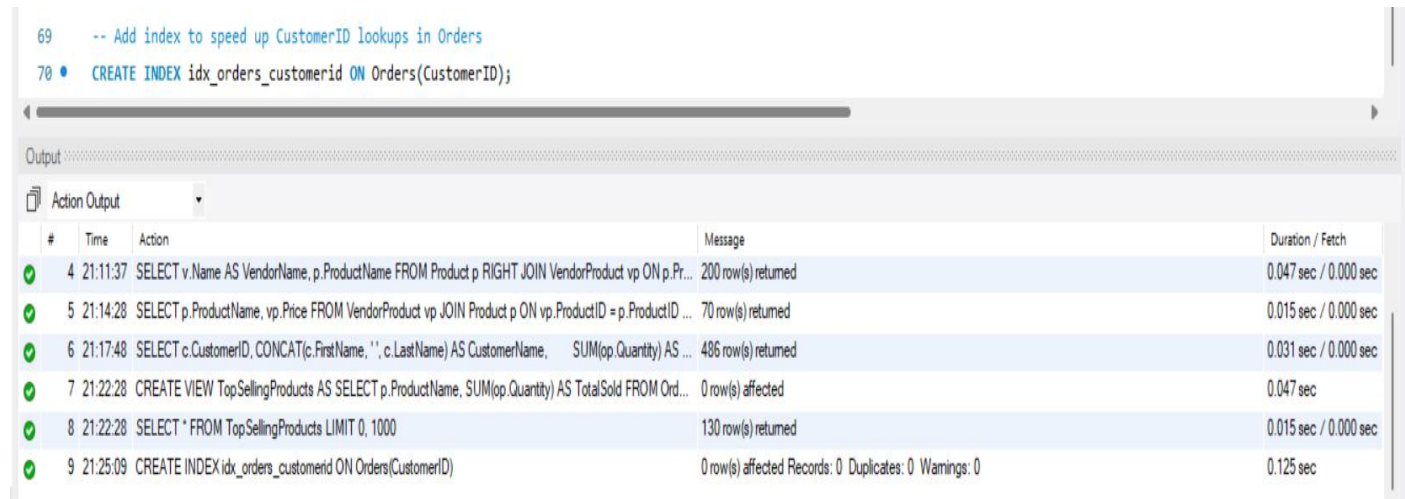
ProductName	TotalSold
MECOOL K13 PRO ANDRIOD TV OCTA CORE 3...	154
Air Mouse MX3 for Android and Smart TV	146
Android Smart watch GT08 Plus with WIFI and 3...	93
Smart Health Bracelet Sprots K1 Black	87
SMART WATCH BATTERY X01	86
Android Hdmi Dongle Quad Core TV Stick 2G+8...	85

#	Time	Action	Message	Duration / Fetch
3	21:08:09	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, o.OrderID FROM Custome...	1000 row(s) returned	0.047 sec / 0.000 sec
4	21:11:37	SELECT v.Name AS VendorName, p.ProductName FROM Product p RIGHT JOIN VendorProduct vp ON p.Pr...	200 row(s) returned	0.047 sec / 0.000 sec
5	21:14:28	SELECT p.ProductName, vp.Price FROM VendorProduct vp JOIN Product p ON vp.ProductID = p.ProductID ...	70 row(s) returned	0.015 sec / 0.000 sec
6	21:17:48	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, SUM(op.Quantity) AS ...	486 row(s) returned	0.031 sec / 0.000 sec
7	21:22:28	CREATE VIEW TopSellingProducts AS SELECT p.ProductName, SUM(op.Quantity) AS TotalSold FROM Ord...	0 row(s) affected	0.047 sec
8	21:22:28	SELECT * FROM TopSellingProducts LIMIT 0, 1000	130 row(s) returned	0.015 sec / 0.000 sec

f. Optimize queries with indexes

1. Add index to speed up CustomerID lookups in Orders

CREATE INDEX idx_orders_customerid ON Orders(CustomerID);



69 -- Add index to speed up CustomerID lookups in Orders

70 • CREATE INDEX idx_orders_customerid ON Orders(CustomerID);

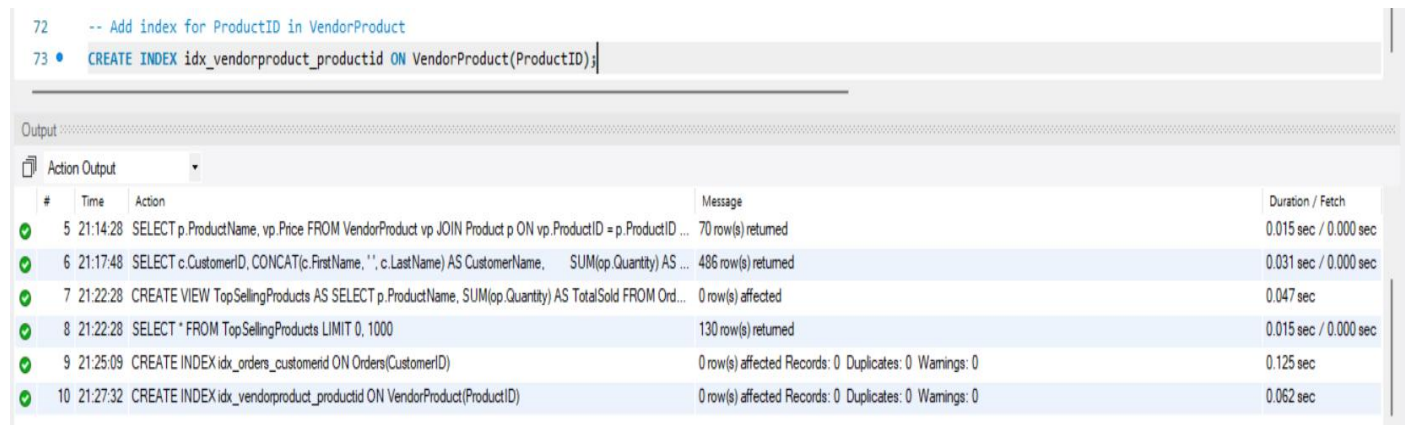
Output

Action Output

#	Time	Action	Message	Duration / Fetch
4	21:11:37	SELECT v.Name AS VendorName, p.ProductName FROM Product p RIGHT JOIN VendorProduct vp ON p.Pr...	200 row(s) returned	0.047 sec / 0.000 sec
5	21:14:28	SELECT p.ProductName, vp.Price FROM VendorProduct vp JOIN Product p ON vp.ProductID = p.ProductID ...	70 row(s) returned	0.015 sec / 0.000 sec
6	21:17:48	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, SUM(op.Quantity) AS ...	486 row(s) returned	0.031 sec / 0.000 sec
7	21:22:28	CREATE VIEW TopSellingProducts AS SELECT p.ProductName, SUM(op.Quantity) AS TotalSold FROM Ord...	0 row(s) affected	0.047 sec
8	21:22:28	SELECT * FROM TopSellingProducts LIMIT 0, 1000	130 row(s) returned	0.015 sec / 0.000 sec
9	21:25:09	CREATE INDEX idx_orders_customerid ON Orders(CustomerID)	0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0	0.125 sec

2. Add index for ProductID in VendorProduct

CREATE INDEX idx_vendorproduct_productid ON VendorProduct(ProductID);



72 -- Add index for ProductID in VendorProduct

73 • CREATE INDEX idx_vendorproduct_productid ON VendorProduct(ProductID);

Output

Action Output

#	Time	Action	Message	Duration / Fetch
5	21:14:28	SELECT p.ProductName, vp.Price FROM VendorProduct vp JOIN Product p ON vp.ProductID = p.ProductID ...	70 row(s) returned	0.015 sec / 0.000 sec
6	21:17:48	SELECT c.CustomerID, CONCAT(c.FirstName, ' ', c.LastName) AS CustomerName, SUM(op.Quantity) AS ...	486 row(s) returned	0.031 sec / 0.000 sec
7	21:22:28	CREATE VIEW TopSellingProducts AS SELECT p.ProductName, SUM(op.Quantity) AS TotalSold FROM Ord...	0 row(s) affected	0.047 sec
8	21:22:28	SELECT * FROM TopSellingProducts LIMIT 0, 1000	130 row(s) returned	0.015 sec / 0.000 sec
9	21:25:09	CREATE INDEX idx_orders_customerid ON Orders(CustomerID)	0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0	0.125 sec
10	21:27:32	CREATE INDEX idx_vendorproduct_productid ON VendorProduct(ProductID)	0 row(s) affected Records: 0 Duplicates: 0 Warnings: 0	0.062 sec