

1. Revenue by Customer

a)

```
SELECT Orders.CustomerID AS CustomerID,  
Customers.CompanyName AS CompanyName,  
ROUND(SUM(UnitPrice*Quantity*(1-Discout)),2) AS Revenue  
FROM Orders  
LEFT JOIN Customers ON Orders.CustomerID= Customers.CustomerID  
LEFT JOIN OrderDetail ON Orders.OrderId = OrderDetail.OrderId  
GROUP BY Orders.CustomerID  
ORDER BY Orders.CustomerID
```

	CustomerID	CompanyName	Revenue
1	ALFKI	Alfreds Futterkiste	4273
2	ANATR	Ana Trujillo Emparedados y helados	1402.95
3	ANTO	NULL	7023.98
4	AROUT	Around the Horn	13390.65
5	BERGS	Berglunds snabbköp	24927.58
6	BLAUS	Blauer See Delikatessen	3239.8
7	BLONP	Blondesddsl père et fils	18534.08
8	BOLID	Bólido Comidas preparadas	4232.85
9	BONAP	Bon app	21963.25
10	BOTTM	Bottom-Dollar Markets	20801.6
11	BSBEV	B's Beverages	6089.9
12	CACTU	Cactus Comidas para llevar	1814.8

b)

```
SELECT Customers.CustomerID, Customers.CompanyName, 0 AS Revenue  
FROM Customers  
LEFT JOIN Orders ON Orders.CustomerID= Customers.CustomerID  
WHERE Orders.OrderID IS NULL
```

	CustomerID	CompanyName	Revenue
1	ANTON	Antonio Moreno Taquería	0
2	DUMON	Du monde entier	0
3	FISSA	FISSA Fabrica Inter. Salchichas S.A.	0
4	OCEAN	Océano Atlántico Ltda.	0
5	PARIS	Paris spécialités	0
6	QUEEN	Queen Cozinha	0

2. Employee Information

a)

```
SELECT DepartmentName, EmployeeName
FROM Empl
LEFT JOIN Dept ON Dept.DeptID = Empl.DeptID
```

DepartmentName	EmployeeName
Engineering	Qing
Engineering	Eugene
Data Science	JR
Data Science	Francesca
Product	AJ
<i>NULL</i>	Arthur

b)

```
SELECT DepartmentName, COUNT(Empl.DeptID) AS NumEmployees
FROM Dept
LEFT JOIN Empl ON Empl.DeptID = Dept.DeptID
GROUP BY DepartmentName
```

	DepartmentName	NumEmployees
1	Data Science	2
2	Engineering	2
3	Finance	0
4	Product	1

c)

```
SELECT DepartmentName, COUNT(Empl.DeptID) AS NumEmployees
FROM Empl
FULL JOIN Dept ON Dept.DeptID = Empl.DeptID
GROUP BY DepartmentName
```

DepartmentName	NumEmployees
<i>NULL</i>	1
Data Science	2
Engineering	2
Finance	0
Product	1

3. Gathering Pareto Analysis Information

a)

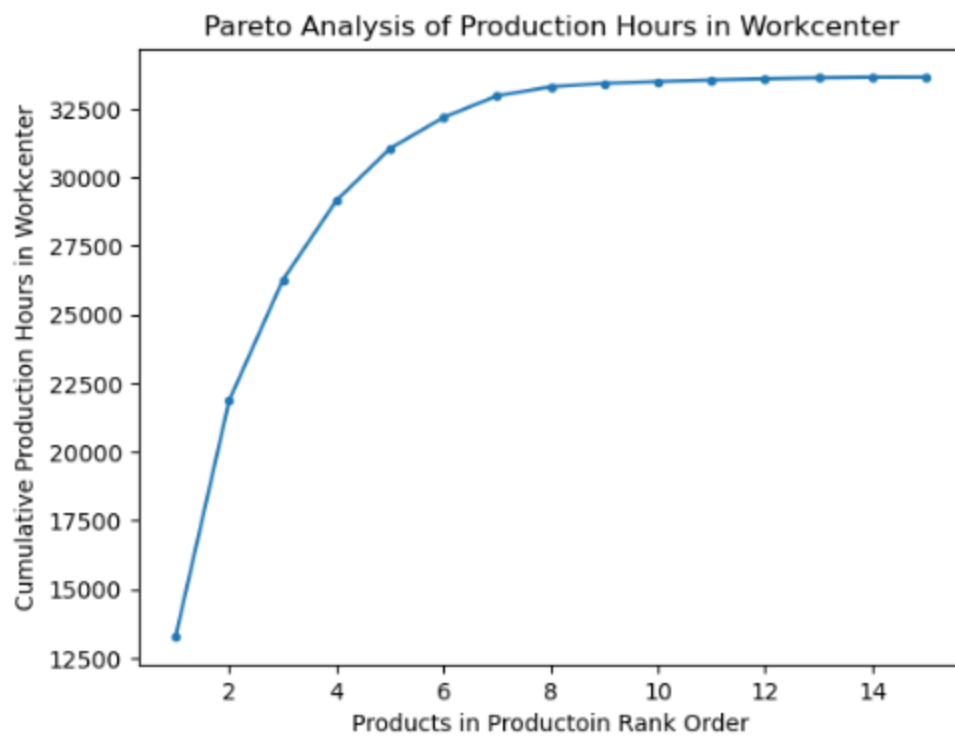
```
WITH Step1 AS (SELECT T1.ProductID, T1.ProductionHours,  
T2.ProductionHours AS GreaterProductionHours  
FROM WorkCenterHoursByProduct AS T1  
INNER JOIN WorkCenterHoursByProduct AS T2  
ON T1.ProductionHours <= T2.ProductionHours)
```

```
SELECT ProductID, AVG(ProductionHours) AS ProductionHours,  
COUNT(ProductID) AS ProductionRank,  
SUM(GreaterProductionHours) AS CumulativeHours  
FROM Step1  
GROUP BY ProductID
```

ProductID	ProductionHours	ProductionRank	CumulativeHours
A406-030	4385	3	26267
A406-040	8592	2	21882
A500-015	785	7	32974
B127-010	328	8	33302
C120-010	124	9	33426
M820-010	2893	4	29160
M830-010	35	13	33629
N900-010	57	11	33551
R400-020	1136	6	32189
R400-025	1893	5	31053
R400-030	43	12	33594
S830-010	68	10	33494
S830-040	23	14	33652
T103-080	13290	1	13290
X999-000	2	15	33654

```
SELECT ProductionRank, CumulativeHours  
FROM Step2  
ORDER BY ProductionRank
```

ProductionRank	CumulativeHours
1	13290
2	21882
3	26267
4	29160
5	31053
6	32189
7	32974
8	33302
9	33426
10	33494



Q4. % Orders by Region

a)

```
WITH S1 AS (SELECT ShipRegion, CompanyName
FROM Orders
INNER JOIN Shippers ON Orders.ShipVia = Shippers.ShipperID)
SELECT ShipRegion, CompanyName AS ShipperName,
COUNT(CompanyName) AS Count
FROM S1
GROUP BY ShipRegion, CompanyName
```

British Isles	Federal Shipping	28
British Isles	Speedy Express	15
British Isles	United Package	32
Central America	Federal Shipping	14
Central America	Speedy Express	4
Central America	United Package	10
Eastern Europe	Federal Shipping	4
Eastern Europe	Speedy Express	1
Eastern Europe	United Package	2
North America	Federal Shipping	56

```
SELECT ShipRegion, SUM(Count) AS TotalCount
FROM S2
GROUP BY ShipRegion
```

ShipRegion	TotalCount
British Isles	75
Central America	28
Eastern Europe	7
North America	152
Northern Europe	55
Scandinavia	28
South America	145
Southern Europe	64
Western Europe	276

```
SELECT S2.ShipRegion, S2.ShipperName,
ROUND(CAST(Count AS FLOAT)/TotalCount * 100,2) AS PctShippingVolume
FROM S2
INNER JOIN S3 ON S2.ShipRegion= S3.ShipRegion
```

ShipRegion	ShipperName	PctShippingVolume
British Isles	Federal Shipping	37.33
British Isles	Speedy Express	20
British Isles	United Package	42.67
Central America	Federal Shipping	50
Central America	Speedy Express	14.29
Central America	United Package	35.71
Eastern Europe	Federal Shipping	57.14
Eastern Europe	Speedy Express	14.29
Eastern Europe	United Package	28.57
North America	Federal Shipping	36.84

Q5 Type I and Type II errors

(a) What is the Type I error of this hypothesis test?

From the information, we can calculate that the probability of drawing two heads and two tails is 0.375 when $p = 0.5$, using the Binomial Distribution. We also know that we will reject the null hypothesis of a fair coin whenever we do not draw two heads and two tails.

Using fundamentals of probability theory, the Type 1 error is

$$1 - P(\text{drawing 2 heads and two tails from 4 tosses with } p=0.5) = 1 - 0.375 = \underline{0.625}.$$

(b) What is the Type II error of this hypothesis test when $p = \frac{1}{4}$?

From the question, we can calculate that the probability of drawing two heads and two tails is 0.212 when $p = 0.25$, using the Binomial Distribution.

The null hypothesis is that the coin has $p = 0.25$, and from our hypothesis test we know we fail to reject the null hypothesis when we draw two heads and two tails. So the type 2 error is equal to the probability that we draw two heads and two tails, in other words, 0.212.