

Query #1

Marketing wants to find out which products get ordered together, particularly in threes. Report out the sets of three products that get ordered together in the same customer order and the total number of orders that show all three of those products. Be sure that the same three products do not show up more than once. For instance, there should not be one row in your output with product A, B, and C and then another row with the products B, C, and A. Order the output by the number of orders that the three products occur together, in descending order. Only show those combination of products that appear in more than 20 orders. Returns 56 rows. There are (as always) several ways to approach this. For this exercise, please do this by joining three subqueries together. Each of the inline queries will just require a join between orderDetails and Products

1. The original Query

```
SELECT product1.PRODUCTNAME AS Product1, product2.PRODUCTNAME AS
Product2,
product3.PRODUCTNAME AS Product3 FROM
  (SELECT orderNumber, ProductName, orderDetails.PRODUCTCODE FROM
orderDetails INNER JOIN
  PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product1 INNER JOIN
  (SELECT orderNumber, ProductName, orderDetails.productCode FROM
orderDetails INNER JOIN
  PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product2
  USING(orderNumber) INNER JOIN
  (SELECT orderNumber, ProductName, orderDetails.productCode FROM
orderDetails INNER JOIN
  PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product3
  USING(orderNumber)
WHERE product2.PRODUCTCODE != product1.PRODUCTCODE AND
product2.PRODUCTCODE != product3.PRODUCTCODE
AND product3.PRODUCTCODE != product1.PRODUCTCODE AND
product1.PRODUCTCODE < product2.PRODUCTCODE AND
product2.PRODUCTCODE < product3.PRODUCTCODE
GROUP BY product1.PRODUCTNAME, product2.PRODUCTNAME,
product3.PRODUCTNAME,
product1.PRODUCTCODE, product2.PRODUCTCODE, product3.PRODUCTCODE
HAVING COUNT (*) > 20
ORDER BY COUNT(*) DESC;
```

2. The view(s) that you have created.

```
CREATE VIEW ProductPerOrder AS
(SELECT OrderNumber, ProductName, Products.ProductCode FROM
orderDetails INNER JOIN Products ON
orderDetails.PRODUCTCODE = Products.PRODUCTCODE);
```

3. The refactored version of the query, that uses the view.

```
SELECT p1.PRODUCTNAME AS Product1, p2.PRODUCTNAME AS Product2,
p3.PRODUCTNAME AS Product3
FROM ProductPerOrder p1 INNER JOIN ProductPerOrder p2 USING(orderNumber)
INNER JOIN ProductPerOrder p3 USING(orderNumber)
WHERE p1.PRODUCTCODE != p2.PRODUCTCODE AND p2.PRODUCTCODE !=
p3.PRODUCTCODE AND p1.PRODUCTCODE!= p3.PRODUCTCODE
AND p1.PRODUCTCODE< p2.PRODUCTCODE AND p2.PRODUCTCODE <
p3.PRODUCTCODE
GROUP BY p1.PRODUCTNAME, p2.PRODUCTNAME, p3.PRODUCTNAME,
p1.PRODUCTCODE, p2.PRODUCTCODE, p3.PRODUCTCODE
HAVING COUNT (*) > 20
ORDER BY COUNT(*) DESC
```

4. The output from running the original query

PRODUCT1	PRODUCT2	PRODUCT3
1 The Titanic	The Queen Mary	Pont Yacht
2 Corsair F4U (Bird Cage)	America West Airlines B757-200	American Airlines: MD-11S
3 1982 Ducati 900 Monster	1974 Ducati 350 Mk3 Desmo	2002 Yamaha YZR M1
4 1937 Horch 930V Limousine	HMS Bounty	Boeing X-32A JSF
5 1930 Buick Marquette Phaeton	American Airlines: B767-300	F/A 18 Hornet 1/72
6 1928 Ford Phaeton Deluxe	1930 Buick Marquette Phaeton	American Airlines: B767-300
7 1900s Vintage Bi-Plane	1937 Horch 930V Limousine	HMS Bounty
8 1996 Moto Guzzi 1100i	2003 Harley-Davidson Eagle Drag Bike	1936 Harley Davidson EL Knucklehead
9 1968 Ford Mustang	1968 Dodge Charger	1970 Plymouth Hemi Cuda
10 1964 Mercedes Tour Bus	1992 Ferrari 360 Spider red	1958 Chevy Corvette Limited Edition
11 1949 Jaguar XK 120	1969 Chevrolet Camaro Z28	2002 Chevy Corvette
12 1913 Ford Model T Speedster	1934 Ford V8 Coupe	18th Century Vintage Horse Carriage
13 1900s Vintage Bi-Plane	HMS Bounty	Boeing X-32A JSF
14 1900s Vintage Bi-Plane	1937 Horch 930V Limousine	Boeing X-32A JSF
15 P-51-D Mustang	1928 British Royal Navy Airplane	1900s Vintage Tri-Plane
16 2003 Harley-Davidson Eagle Drag Bike	1936 Harley Davidson EL Knucklehead	1997 BMW R 1100 S
17 1992 Ferrari 360 Spider red	1958 Chevy Corvette Limited Edition	1954 Greyhound Scenicruiser
18 1980s Black Hawk Helicopter	1900s Vintage Bi-Plane	1937 Horch 930V Limousine
19 1968 Ford Mustang	1970 Plymouth Hemi Cuda	1971 Alpine Renault 1600s
20 1964 Mercedes Tour Bus	1992 Ferrari 360 Spider red	1954 Greyhound Scenicruiser
21 1949 Jaguar XK 120	1952 Citroen-15CV	1969 Chevrolet Camaro Z28
22 1941 Chevrolet Special Deluxe Cabriolet	HMS Bounty	Boeing X-32A JSF
23 1941 Chevrolet Special Deluxe Cabriolet	1900s Vintage Bi-Plane	1937 Horch 930V Limousine
24 1939 Cadillac Limousine	1996 Peterbilt 379 Stake Bed with Outtrigger	1982 Camaro Z28
25 1903 Ford Model A	Collectable Wooden Train	The Mayflower
26 1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe	ATA: B757-300
27 1998 Chrysler Plymouth Prowler	1970 Dodge Coronet	Diamond T620 Semi-Skirted Tanker
28 1996 Moto Guzzi 1100i	2003 Harley-Davidson Eagle Drag Bike	1997 BMW R 1100 S
29 1996 Moto Guzzi 1100i	1936 Harley Davidson EL Knucklehead	1997 BMW R 1100 S
30 1982 Ducati 996 R	1974 Ducati 350 Mk3 Desmo	2002 Yamaha YZR M1
31 1982 Ducati 900 Monster	1982 Ducati 996 R	1974 Ducati 350 Mk3 Desmo
32 1970 Dodge Coronet	1992 Porsche Cayenne Turbo Silver	Diamond T620 Semi-Skirted Tanker
33 1970 Chevy Chevelle SS 454	1969 Chevrolet Camaro Z28	2002 Chevy Corvette
34 1970 Chevy Chevelle SS 454	1949 Jaguar XK 120	2002 Chevy Corvette

35	1970 Chevy Chevelle SS 454	1949 Jaguar XK 120	1969 Chevrolet Camaro Z28
36	1969 Harley Davidson Ultimate Chopper	2003 Harley-Davidson Eagle Drag Bike	1997 BMW R 1100 S
37	1969 Dodge Super Bee	1976 Ford Gran Torino	1971 Alpine Renault 1600s
38	1964 Mercedes Tour Bus	1958 Chevy Corvette Limited Edition	1954 Greyhound Scenicruiser
39	1957 Chevy Pickup	1998 Chrysler Plymouth Prowler	1970 Dodge Coronet
40	1957 Chevy Pickup	1998 Chrysler Plymouth Prowler	1958 Chevy Corvette Limited Edition
41	1957 Chevy Pickup	1992 Ferrari 360 Spider red	1958 Chevy Corvette Limited Edition
42	1957 Chevy Pickup	1964 Mercedes Tour Bus	1992 Ferrari 360 Spider red
43	1957 Chevy Pickup	1964 Mercedes Tour Bus	1958 Chevy Corvette Limited Edition
44	1957 Chevy Pickup	1958 Chevy Corvette Limited Edition	1954 Greyhound Scenicruiser
45	1952 Alpine Renault 1300	1958 Setra Bus	1940 Ford Pickup Truck
46	1941 Chevrolet Special Deluxe Cabriolet	1937 Horch 930V Limousine	HMS Bounty
47	1941 Chevrolet Special Deluxe Cabriolet	1900s Vintage Bi-Plane	HMS Bounty
48	1930 Buick Marquette Phaeton	American Airlines: B767-300	America West Airlines B757-200
49	1928 Ford Phaeton Deluxe	American Airlines: B767-300	F/A 18 Hornet 1/72
50	1928 Ford Phaeton Deluxe	1930 Buick Marquette Phaeton	F/A 18 Hornet 1/72
51	1928 British Royal Navy Airplane	1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe
52	1912 Ford Model T Delivery Wagon	The Schooner Bluenose	The USS Constitution Ship
53	1900s Vintage Tri-Plane	1930 Buick Marquette Phaeton	American Airlines: B767-300
54	1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe	American Airlines: B767-300
55	1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe	1930 Buick Marquette Phaeton
56	18th century schooner	The Queen Mary	Pont Yacht

5. The output from running the refactored query.

PRODUCT1	PRODUCT2	PRODUCT3
1 The Titanic	The Queen Mary	Pont Yacht
2 Corsair F4U (Bird Cage)	America West Airlines B757-200	American Airlines: MD-11S
3 1982 Ducati 900 Monster	1974 Ducati 350 Mk3 Desmo	2002 Yamaha YZR M1
4 1937 Horch 930V Limousine	HMS Bounty	Boeing X-32A JSF
5 1930 Buick Marquette Phaeton	American Airlines: B767-300	F/A 18 Hornet 1/72
6 1928 Ford Phaeton Deluxe	1930 Buick Marquette Phaeton	American Airlines: B767-300
7 1900s Vintage Bi-Plane	1937 Horch 930V Limousine	HMS Bounty
8 1996 Moto Guzzi 1100i	2003 Harley-Davidson Eagle Drag Bike	1936 Harley Davidson EL Knucklehead
9 1968 Ford Mustang	1968 Dodge Charger	1970 Plymouth Hemi Cuda
10 1964 Mercedes Tour Bus	1992 Ferrari 360 Spider red	1958 Chevy Corvette Limited Edition
11 1949 Jaguar XK 120	1969 Chevrolet Camaro Z28	2002 Chevy Corvette
12 1913 Ford Model T Speedster	1934 Ford V8 Coupe	18th Century Vintage Horse Carriage
13 1900s Vintage Bi-Plane	HMS Bounty	Boeing X-32A JSF
14 1900s Vintage Bi-Plane	1937 Horch 930V Limousine	Boeing X-32A JSF
15 P-51-D Mustang	1928 British Royal Navy Airplane	1900s Vintage Tri-Plane
16 2003 Harley-Davidson Eagle Drag Bike	1936 Harley Davidson EL Knucklehead	1997 BMW R 1100 S
17 1992 Ferrari 360 Spider red	1958 Chevy Corvette Limited Edition	1954 Greyhound Scenicruiser
18 1980s Black Hawk Helicopter	1900s Vintage Bi-Plane	1937 Horch 930V Limousine
19 1968 Ford Mustang	1970 Plymouth Hemi Cuda	1971 Alpine Renault 1600s
20 1964 Mercedes Tour Bus	1992 Ferrari 360 Spider red	1954 Greyhound Scenicruiser
21 1949 Jaguar XK 120	1952 Citroen-15CV	1969 Chevrolet Camaro Z28
22 1941 Chevrolet Special Deluxe Cabriolet	HMS Bounty	Boeing X-32A JSF
23 1941 Chevrolet Special Deluxe Cabriolet	1900s Vintage Bi-Plane	1937 Horch 930V Limousine
24 1939 Cadillac Limousine	1996 Peterbilt 379 Stake Bed with Outrigger	1982 Camaro Z28
25 1903 Ford Model A	Collectable Wooden Train	The Mayflower
26 1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe	ATA: B757-300
27 1998 Chrysler Plymouth Prowler	1970 Dodge Coronet	Diamond T620 Semi-Skirted Tanker
28 1996 Moto Guzzi 1100i	2003 Harley-Davidson Eagle Drag Bike	1997 BMW R 1100 S
29 1996 Moto Guzzi 1100i	1936 Harley Davidson EL Knucklehead	1997 BMW R 1100 S
30 1982 Ducati 996 R	1974 Ducati 350 Mk3 Desmo	2002 Yamaha YZR M1
31 1982 Ducati 900 Monster	1982 Ducati 996 R	1974 Ducati 350 Mk3 Desmo
32 1970 Dodge Coronet	1992 Porsche Cayenne Turbo Silver	Diamond T620 Semi-Skirted Tanker
33 1970 Chevy Chevelle SS 454	1969 Chevrolet Camaro Z28	2002 Chevy Corvette
34 1970 Chevy Chevelle SS 454	1949 Jaguar XK 120	2002 Chevy Corvette

35	1970 Chevy Chevelle SS 454	1949 Jaguar XK 120	1969 Chevrolet Camaro Z28
36	1969 Harley Davidson Ultimate Chopper	2003 Harley-Davidson Eagle Drag Bike	1997 BMW R 1100 S
37	1969 Dodge Super Bee	1976 Ford Gran Torino	1971 Alpine Renault 1600s
38	1964 Mercedes Tour Bus	1958 Chevy Corvette Limited Edition	1954 Greyhound Scenicruiser
39	1957 Chevy Pickup	1998 Chrysler Plymouth Prowler	1970 Dodge Coronet
40	1957 Chevy Pickup	1998 Chrysler Plymouth Prowler	1958 Chevy Corvette Limited Edition
41	1957 Chevy Pickup	1992 Ferrari 360 Spider red	1958 Chevy Corvette Limited Edition
42	1957 Chevy Pickup	1964 Mercedes Tour Bus	1992 Ferrari 360 Spider red
43	1957 Chevy Pickup	1964 Mercedes Tour Bus	1958 Chevy Corvette Limited Edition
44	1957 Chevy Pickup	1958 Chevy Corvette Limited Edition	1954 Greyhound Scenicruiser
45	1952 Alpine Renault 1300	1958 Setra Bus	1940 Ford Pickup Truck
46	1941 Chevrolet Special Deluxe Cabriolet	1937 Horch 930V Limousine	HMS Bounty
47	1941 Chevrolet Special Deluxe Cabriolet	1900s Vintage Bi-Plane	HMS Bounty
48	1930 Buick Marquette Phaeton	American Airlines: B767-300	America West Airlines B757-200
49	1928 Ford Phaeton Deluxe	American Airlines: B767-300	F/A 18 Hornet 1/72
50	1928 Ford Phaeton Deluxe	1930 Buick Marquette Phaeton	F/A 18 Hornet 1/72
51	1928 British Royal Navy Airplane	1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe
52	1912 Ford Model T Delivery Wagon	The Schooner Bluenose	The USS Constitution Ship
53	1900s Vintage Tri-Plane	1930 Buick Marquette Phaeton	American Airlines: B767-300
54	1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe	American Airlines: B767-300
55	1900s Vintage Tri-Plane	1928 Ford Phaeton Deluxe	1930 Buick Marquette Phaeton
56	18th century schooner	The Queen Mary	Pont Yacht

6. The code that you write to test that the output from the refactored query is identical to the original query that you wrote.

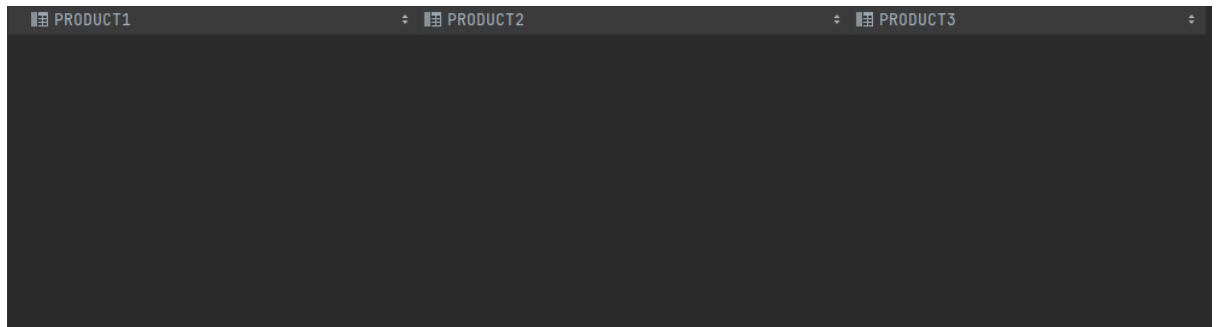
```
(SELECT product1.PRODUCTNAME AS Product1, product2.PRODUCTNAME AS
Product2,
product3.PRODUCTNAME AS Product3 FROM
(SELECT orderNumber, ProductName, orderDetails.PRODUCTCODE FROM
orderDetails INNER JOIN
PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product1 INNER JOIN
(SELECT orderNumber, ProductName, orderDetails.productCode FROM
orderDetails INNER JOIN
PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product2
USING(orderNumber) INNER JOIN
(SELECT orderNumber, ProductName, orderDetails.productCode FROM
orderDetails INNER JOIN
PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product3
USING(orderNumber)
WHERE product2.PRODUCTCODE != product1.PRODUCTCODE AND
product2.PRODUCTCODE != product3.PRODUCTCODE
AND product3.PRODUCTCODE != product1.PRODUCTCODE AND
product1.PRODUCTCODE < product2.PRODUCTCODE AND
product2.PRODUCTCODE < product3.PRODUCTCODE
GROUP BY product1.PRODUCTNAME, product2.PRODUCTNAME,
product3.PRODUCTNAME,
product1.PRODUCTCODE, product2.PRODUCTCODE, product3.PRODUCTCODE
HAVING COUNT (*) > 20
ORDER BY COUNT(*) DESC)
EXCEPT
(SELECT p1.PRODUCTNAME AS Product1, p2.PRODUCTNAME AS Product2,
p3.PRODUCTNAME AS Product3
FROM ProductPerOrder p1 INNER JOIN ProductPerOrder p2 USING(orderNumber)
INNER JOIN ProductPerOrder p3 USING(orderNumber))
```

```

WHERE p1.PRODUCTCODE != p2.PRODUCTCODE AND p2.PRODUCTCODE !=
p3.PRODUCTCODE AND p1.PRODUCTCODE!= p3.PRODUCTCODE
AND p1.PRODUCTCODE< p2.PRODUCTCODE AND p2.PRODUCTCODE <
p3.PRODUCTCODE
GROUP BY p1.PRODUCTNAME, p2.PRODUCTNAME, p3.PRODUCTNAME,
p1.PRODUCTCODE, p2.PRODUCTCODE, p3.PRODUCTCODE
HAVING COUNT (*) > 20
ORDER BY COUNT(*) DESC)
UNION
(SELECT p1.PRODUCTNAME AS Product1, p2.PRODUCTNAME AS Product2,
p3.PRODUCTNAME AS Product3
FROM ProductPerOrder p1 INNER JOIN ProductPerOrder p2 USING(orderNumber)
INNER JOIN ProductPerOrder p3 USING(orderNumber)
WHERE p1.PRODUCTCODE != p2.PRODUCTCODE AND p2.PRODUCTCODE !=
p3.PRODUCTCODE AND p1.PRODUCTCODE!= p3.PRODUCTCODE
AND p1.PRODUCTCODE< p2.PRODUCTCODE AND p2.PRODUCTCODE <
p3.PRODUCTCODE
GROUP BY p1.PRODUCTNAME, p2.PRODUCTNAME, p3.PRODUCTNAME,
p1.PRODUCTCODE, p2.PRODUCTCODE, p3.PRODUCTCODE
HAVING COUNT (*) > 20
ORDER BY COUNT(*) DESC)
EXCEPT
(SELECT product1.PRODUCTNAME AS Product1, product2.PRODUCTNAME AS
Product2,
product3.PRODUCTNAME AS Product3 FROM
(SELECT orderNumber, ProductName, orderDetails.PRODUCTCODE FROM
orderDetails INNER JOIN
PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product1 INNER JOIN
(SELECT orderNumber, ProductName, orderDetails.productCode FROM
orderDetails INNER JOIN
PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product2
USING(orderNumber) INNER JOIN
(SELECT orderNumber, ProductName, orderDetails.productCode FROM
orderDetails INNER JOIN
PRODUCTS ON orderDetails.PRODUCTCODE = products.PRODUCTCODE) AS
product3
USING(orderNumber)
WHERE product2.PRODUCTCODE != product1.PRODUCTCODE AND
product2.PRODUCTCODE != product3.PRODUCTCODE
AND product3.PRODUCTCODE != product1.PRODUCTCODE AND
product1.PRODUCTCODE < product2.PRODUCTCODE AND
product2.PRODUCTCODE < product3.PRODUCTCODE
GROUP BY product1.PRODUCTNAME, product2.PRODUCTNAME,
product3.PRODUCTNAME,
product1.PRODUCTCODE, product2.PRODUCTCODE, product3.PRODUCTCODE
HAVING COUNT (*) > 20

```

```
ORDER BY COUNT(*) DESC);
```



Query #2

Find each pair of customers and the products that they have both ordered for all pairs of customers who have ordered the same product during the first two months of 2015. Do not repeat customer pairs. You will want to create two subqueries that join customers to orders to order details to products. Order by the first customer name, then the second customer name, then the name of the product that they have ordered in common. Returns 84 rows.

1. The original Query

```
SELECT one.customerName, two.customerName, one.productName
FROM (SELECT c.customerName, c.customerNumber,
            d.productCode, p.productName
      FROM customers c
      INNER JOIN orders o
      ON c.customerNumber = o.customerNumber
      INNER JOIN orderDetails d
      ON o.orderNumber = d.orderNumber
      INNER JOIN products p
      ON d.productCode = p.productcode
      WHERE (o.orderDate BETWEEN '2015-01-01' AND '2015-02-28')) AS one
INNER JOIN
  (SELECT c.customerName, c.customerNumber,
        d.productCode, p.productName
    FROM customers c
    INNER JOIN orders o
    ON c.customerNumber = o.customerNumber
    INNER JOIN orderDetails d
    ON o.orderNumber = d.orderNumber
    INNER JOIN products p
    ON d.productCode = p.productcode
    WHERE (o.orderDate BETWEEN '2015-01-01' AND '2015-02-28')) AS two
ON one.productCode = two.ProductCode
WHERE one.customerNumber < two.CustomerNumber
ORDER BY one.customerName, two.customerName, one.productName;
```

2. The view(s) that you have created.

```
CREATE VIEW ProductOrderedByCustomer AS
  (SELECT c.customerName, c.customerNumber,
        d.productCode, p.productName
    FROM customers c
    INNER JOIN orders o
    ON c.customerNumber = o.customerNumber
```

```

INNER JOIN orderDetails d
ON
    o.orderNumber = d.orderNumber
INNER JOIN products p
ON
    d.productCode = p.productcode
WHERE (o.orderDate BETWEEN '2015-01-01' AND '2015-02-28'));

```

3. The refactored version of the query, that uses the view.

```

SELECT one.customerName, two.customerName, one.productName
FROM ProductOrderedByCustomer one
INNER JOIN ProductOrderedByCustomer two
ON
    one.productCode = two.productCode
WHERE one.customerNumber < two.CustomerNumber
ORDER BY one.customerName, two.customerName, one.productName;

```

4. The output from running the original query

	CUSTOMERNAME	CUSTOMERNAME	PRODUCTNAME
1	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1926 Ford Fire Engine
2	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1940 Ford Pickup Truck
3	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1958 Setra Bus
4	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1962 LanciaA Delta 16V
5	Anna's Decorations, Ltd	Royale Belge	1992 Ferrari 360 Spider red
6	Boards & Toys Co.	Suominen Souvenirs	1968 Dodge Charger
7	Corporate Gift Ideas Co.	Collectables For Less Inc.	18th Century Vintage Horse Carriage
8	Corporate Gift Ideas Co.	Collectables For Less Inc.	1913 Ford Model T Speedster
9	Corporate Gift Ideas Co.	Collectables For Less Inc.	1934 Ford V8 Coupe
10	Corporate Gift Ideas Co.	Collectables For Less Inc.	1936 Mercedes-Benz 500K Special Roadster
11	Corporate Gift Ideas Co.	Collectables For Less Inc.	1952 Alpine Renault 1300
...			
77	Technics Stores Inc.	Australian Gift Network, Co	2003 Harley-Davidson Eagle Drag Bike
78	Toys of Finland, Co.	Anna's Decorations, Ltd	1992 Ferrari 360 Spider red
79	Toys of Finland, Co.	Mini Creations Ltd.	1993 Mazda RX-7
80	Toys of Finland, Co.	Royale Belge	1992 Ferrari 360 Spider red
81	Toys of Finland, Co.	Royale Belge	1995 Honda Civic
82	Toys of Finland, Co.	Suominen Souvenirs	1948 Porsche 356-A Roadster
83	Toys of Finland, Co.	Suominen Souvenirs	1969 Dodge Charger
84	Toys of Finland, Co.	Suominen Souvenirs	1970 Plymouth Hemi Cuda

5. The output from running the refactored query.

1	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1926 Ford Fire Engine
2	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1940 Ford Pickup Truck
3	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1958 Setra Bus
4	Anna's Decorations, Ltd	Corporate Gift Ideas Co.	1962 LanciaA Delta 16V
5	Anna's Decorations, Ltd	Royale Belge	1992 Ferrari 360 Spider red
6	Boards & Toys Co.	Suominen Souvenirs	1968 Dodge Charger
7	Corporate Gift Ideas Co.	Collectables For Less Inc.	18th Century Vintage Horse Carriage
8	Corporate Gift Ideas Co.	Collectables For Less Inc.	1913 Ford Model T Speedster
9	Corporate Gift Ideas Co.	Collectables For Less Inc.	1934 Ford V8 Coupe
10	Corporate Gift Ideas Co.	Collectables For Less Inc.	1936 Mercedes-Benz 500K Special Roadster
11	Corporate Gift Ideas Co.	Collectables For Less Inc.	1952 Alpine Renault 1300
12	Corporate Gift Ideas Co.	Tokyo Collectables, Ltd	18th century schooner

...

78	Toys of Finland, Co.	Anna's Decorations, Ltd	1992 Ferrari 360 Spider red
79	Toys of Finland, Co.	Mini Creations Ltd.	1993 Mazda RX-7
80	Toys of Finland, Co.	Royale Belge	1992 Ferrari 360 Spider red
81	Toys of Finland, Co.	Royale Belge	1995 Honda Civic
82	Toys of Finland, Co.	Suominen Souvenirs	1948 Porsche 356-A Roadster
83	Toys of Finland, Co.	Suominen Souvenirs	1969 Dodge Charger
84	Toys of Finland, Co.	Suominen Souvenirs	1970 Plymouth Hemi Cuda

6. The code that you write to test that the output from the refactored query is identical to the original query that you wrote.

```
(SELECT one.customerName, two.customerName, one.productName
FROM (SELECT c.customerName, c.customerNumber,
             d.productCode, p.productName
      FROM customers c
      INNER JOIN orders o
      ON c.customerNumber = o.customerNumber
      INNER JOIN orderDetails d
      ON
           o.orderNumber = d.orderNumber
      INNER JOIN products p
      ON
           d.productCode = p.productcode
      WHERE (o.orderDate BETWEEN '2015-01-01' AND '2015-02-28')) AS one
INNER JOIN
(SELECT c.customerName, c.customerNumber,
       d.productCode, p.productName
 FROM customers c
 INNER JOIN orders o
 ON
       c.customerNumber = o.customerNumber
 INNER JOIN orderDetails d
 ON
       o.orderNumber = d.orderNumber
 INNER JOIN products p
 ON
       d.productCode = p.productcode
 WHERE (o.orderDate BETWEEN '2015-01-01' AND '2015-02-28')) AS two
ON one.productCode = two.ProductCode
```

```

WHERE one.customerNumber < two.CustomerNumber
ORDER BY one.customerName, two.customerName, one.productName)
EXCEPT
(SELECT one.customerName, two.customerName, one.productName
FROM ProductOrderedByCustomer one
INNER JOIN ProductOrderedByCustomer two
ON
    one.productCode = two.productCode
WHERE one.customerNumber < two.CustomerNumber
ORDER BY one.customerName, two.customerName, one.productName)
UNION
(SELECT one.customerName, two.customerName, one.productName
FROM ProductOrderedByCustomer one
INNER JOIN ProductOrderedByCustomer two
ON
    one.productCode = two.productCode
WHERE one.customerNumber < two.CustomerNumber
ORDER BY one.customerName, two.customerName, one.productName)
EXCEPT
(SELECT one.customerName, two.customerName, one.productName
FROM (SELECT c.customerName, c.customerNumber,
            d.productCode, p.productName
FROM customers c
INNER JOIN orders o
ON c.customerNumber = o.customerNumber
INNER JOIN orderDetails d
ON
    o.orderNumber = d.orderNumber
INNER JOIN products p
ON
    d.productCode = p.productcode
WHERE (o.orderDate BETWEEN '2015-01-01' AND '2015-02-28')) AS one
INNER JOIN
    (SELECT c.customerName, c.customerNumber,
            d.productCode, p.productName
FROM customers c
INNER JOIN orders o
ON
    c.customerNumber = o.customerNumber
INNER JOIN orderDetails d
ON
    o.orderNumber = d.orderNumber
INNER JOIN products p
ON
    d.productCode = p.productcode
WHERE (o.orderDate BETWEEN '2015-01-01' AND '2015-02-28')) AS two
ON one.productCode = two.ProductCode
WHERE one.customerNumber < two.CustomerNumber

```

```
ORDER BY one.customerName, two.customerName, one.productName);
```

CUSTOMERNAME	CUSTOMERNAME	PRODUCTNAME