Lecture 10:

STRUCTURED QUERY LANGUAGE (SQL) PART 1

Objectives

- Introduce the structured query language (SQL)
- Use simple and compound conditions in SQL
- Use computed fields in SQL
- Use built-in SQL functions
- Use subqueries in SQL
- Group records in SQL

Objectives (Con’t)

- Join tables using SQL
- Perform union operations in SQL
- Use SQL to update database data
- Use an SQL query to create a table in a database

SQL (Structured Query Language)

- Provides users with the capability to query a relational database
- Must enter commands to obtain desired results
- Developed under the name SEQUEL at IBM

Table Creation

- SQL CREATE TABLE
  - Used to describe layout of a table
- Typical restrictions placed by DBMS
  - Names cannot exceed 18 characters
  - Names must start with a letter
  - Names can contain only letters, numbers, and underscores (_)
  - Names cannot contain spaces

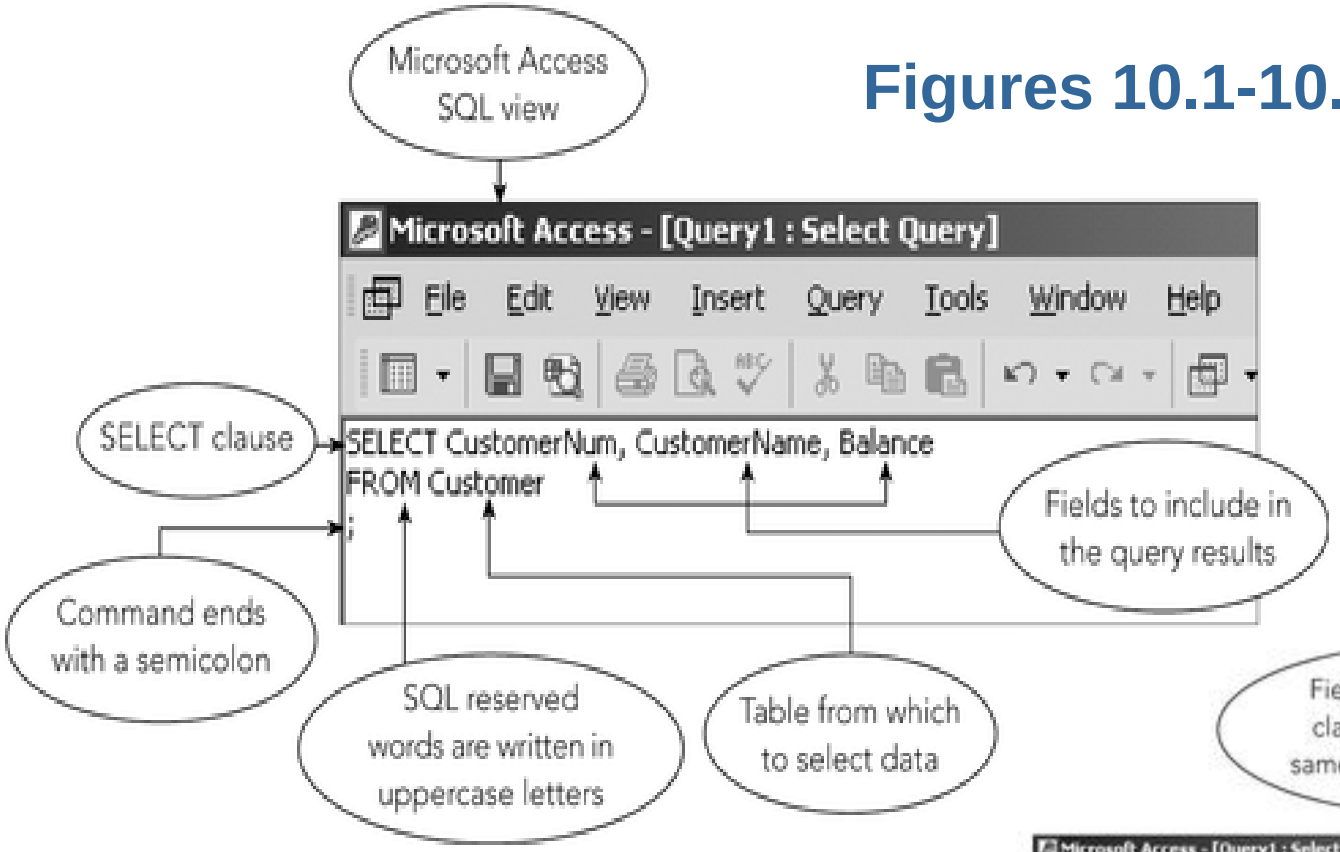
Typical Data Types

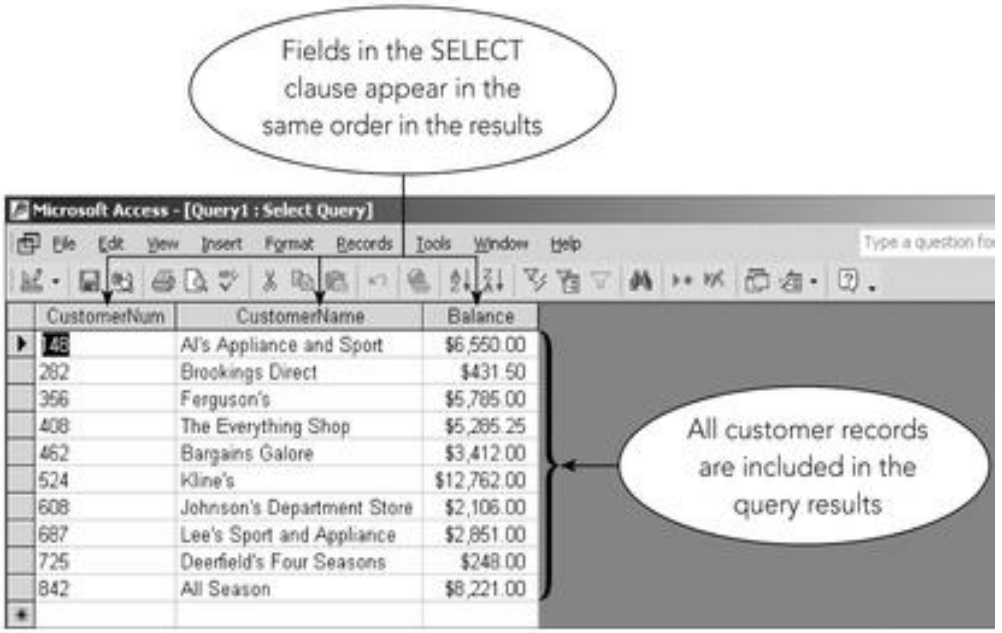
- INTEGER
  - Numbers without a decimal point
- SMALLINT
  - Uses less space than INTEGER
- DECIMAL(p,q)
  - P number of digits; q number of decimal places
- CHAR(n)
  - Character string n places long
- DATE
  - Dates in DD-MON-YYYY or MM/DD/YYYY

Simple Retrieval

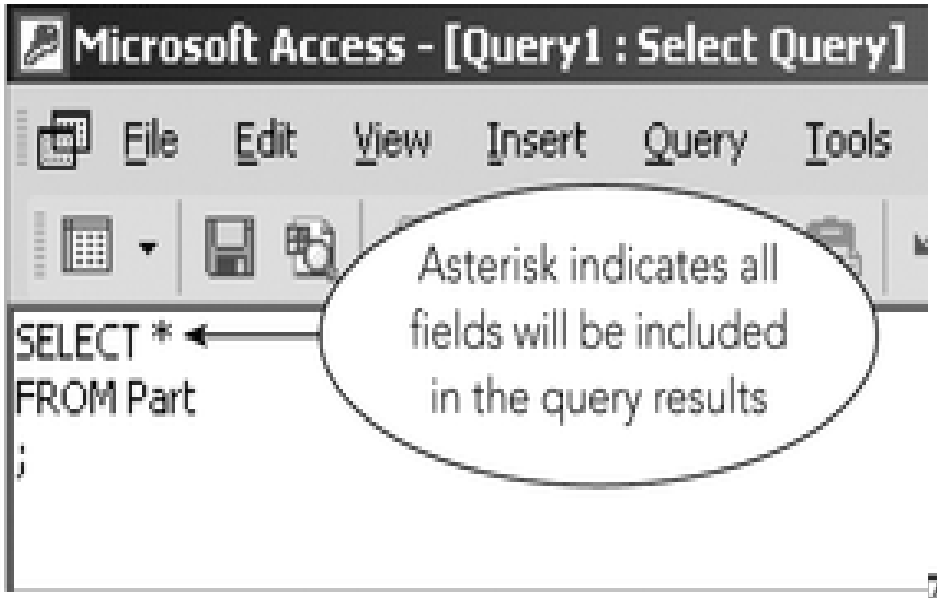
- SELECT-FROM-WHERE-- basic form of SQL retrieval command
- SELECT clause – lists fields that you wish to display
- FROM clause – lists table or tables that contain data to display in query results
- WHERE clause – optional section used to list any conditions to be applied to the data to retrieve

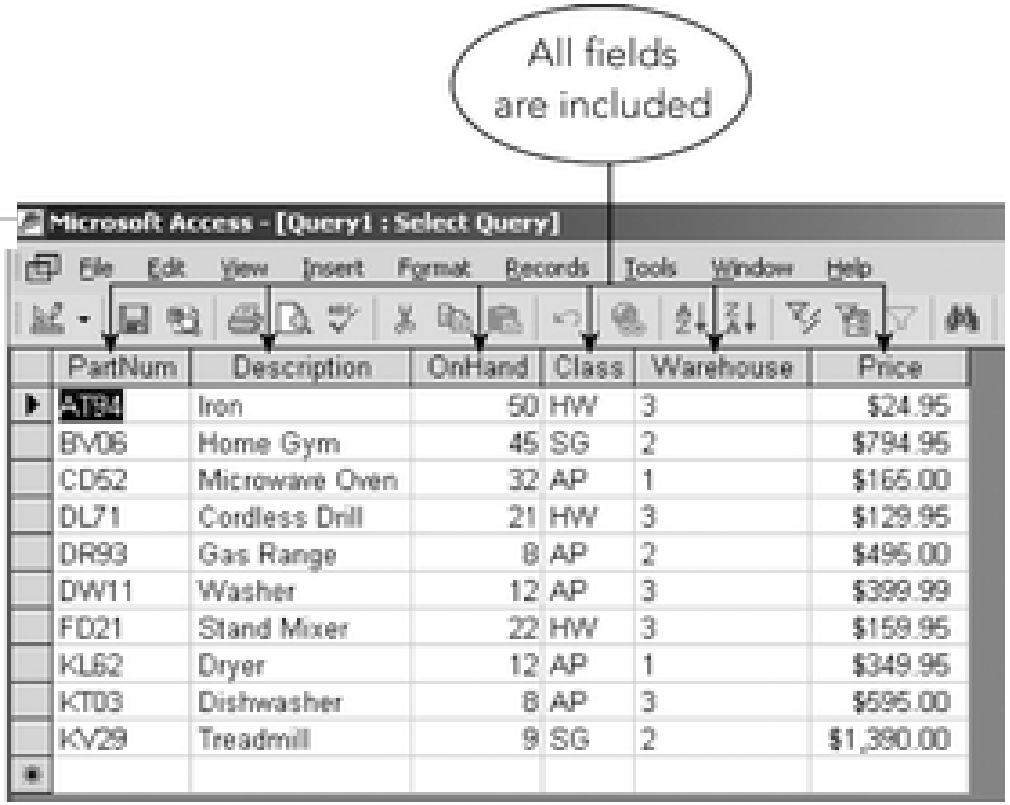
Figures 10.1-10.2: Simple Retrieval

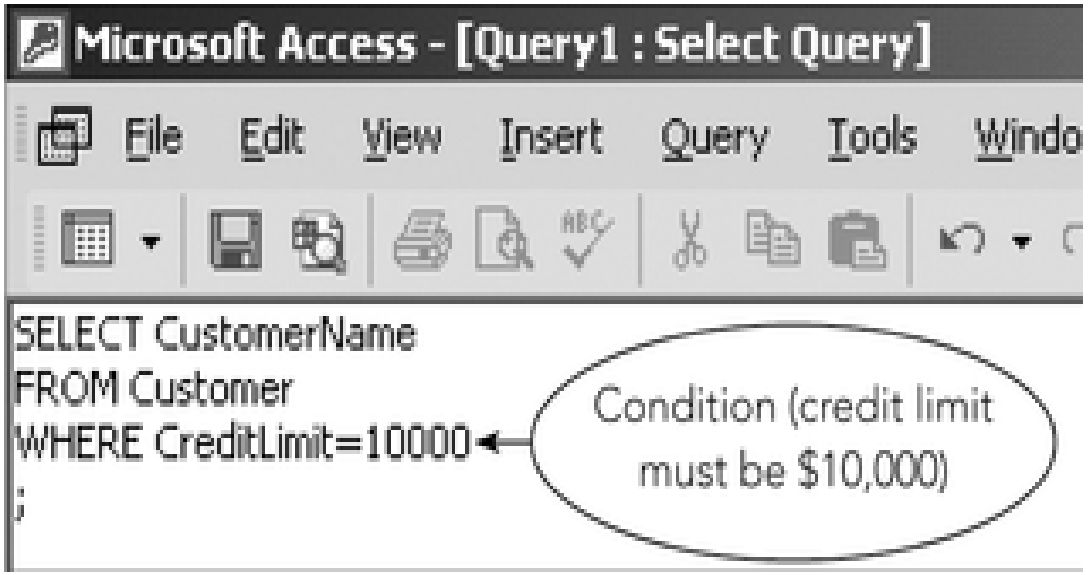




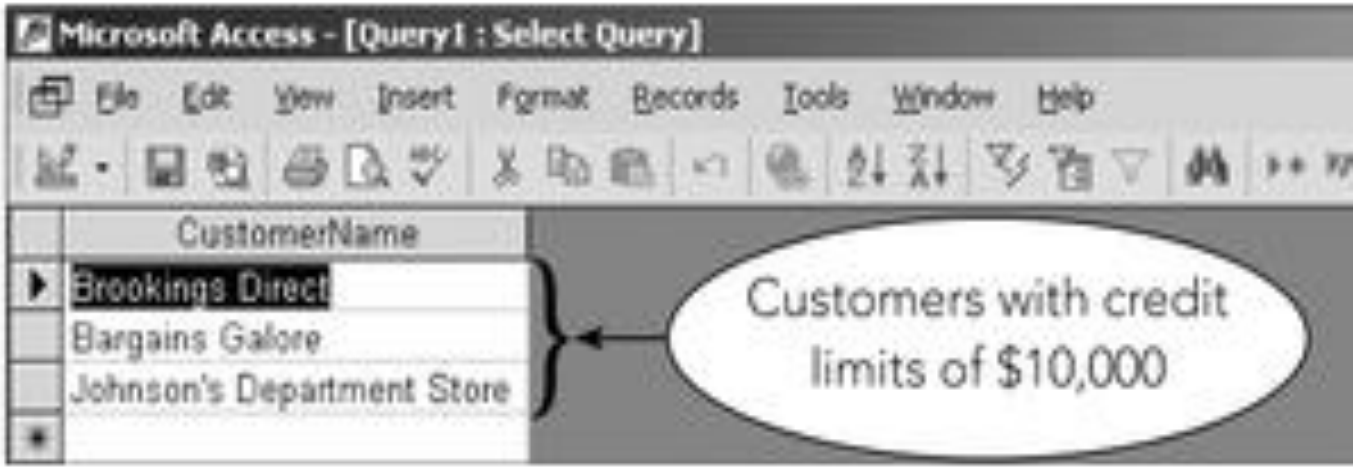
Figures 10.3-10.4: SQL Query to List Part Table







Figures 10.5-10.6: SQL Query with Where Condition



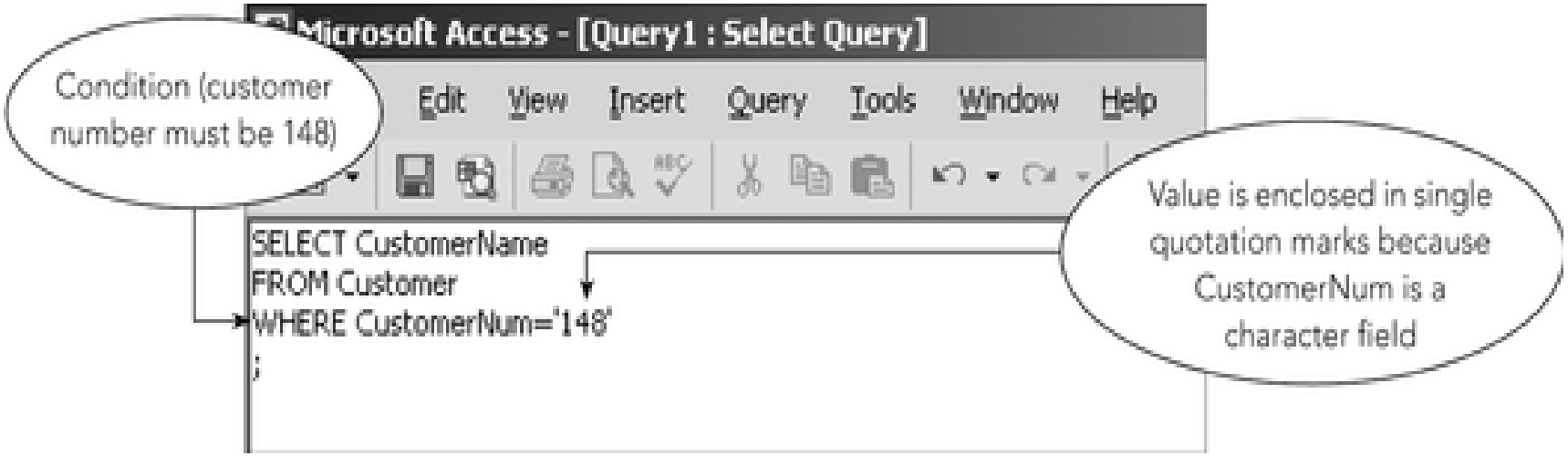
Simple Condition

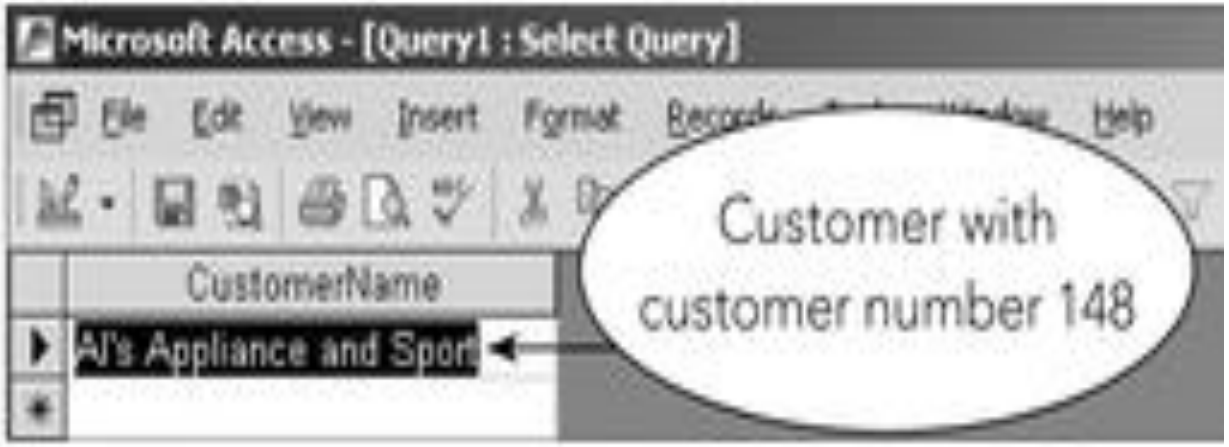
- Includes the field name, comparison operator, and either another field or a value
- Two versions of the “not equal to” operator
  - < > and !=
- Use correct one for the version of SQL
- Using wrong version will generate an error

Figure 10.7: SQL Comparison Operators

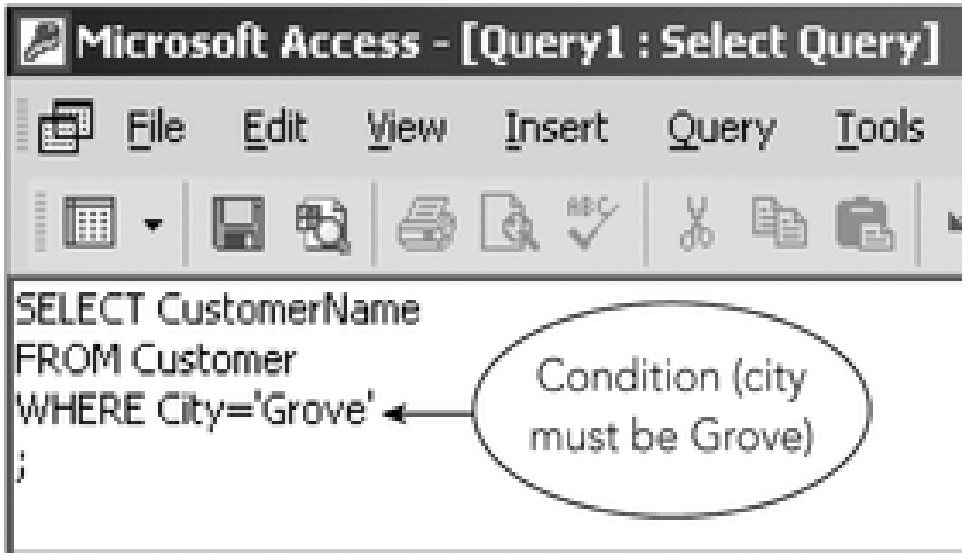
Comparison Operator	Meaning
=	Equal to
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
< >	Not equal to (used by most implementations of SQL)
!=	Not equal to (used by some implementations of SQL)

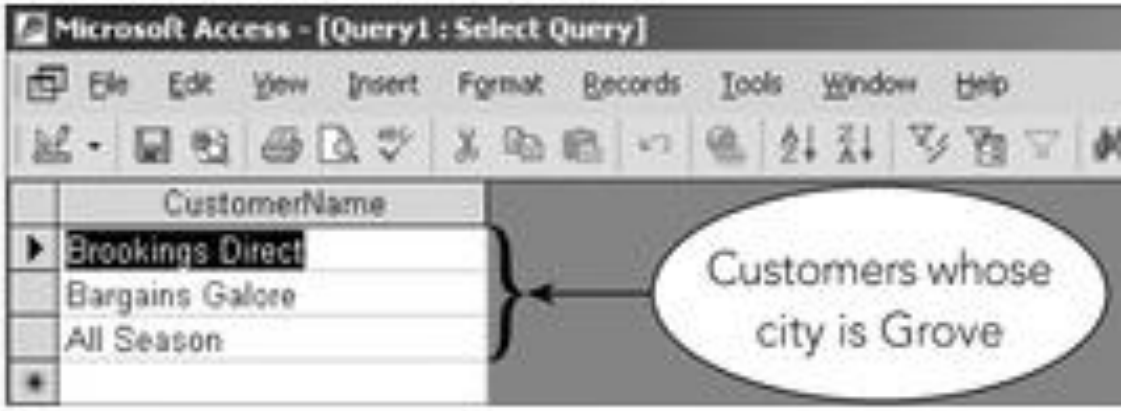
Figures 10.8-10.9: SQL Query to Find Customer 148



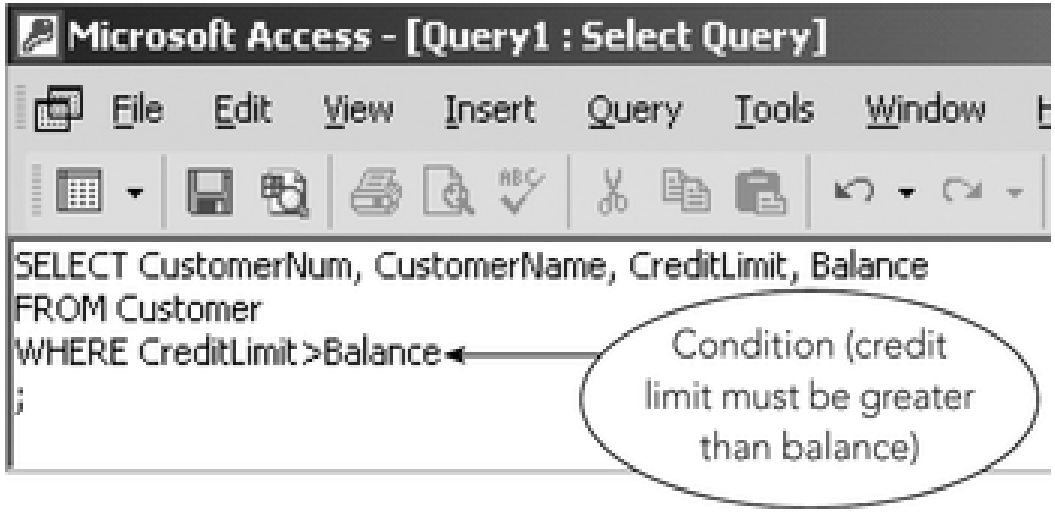


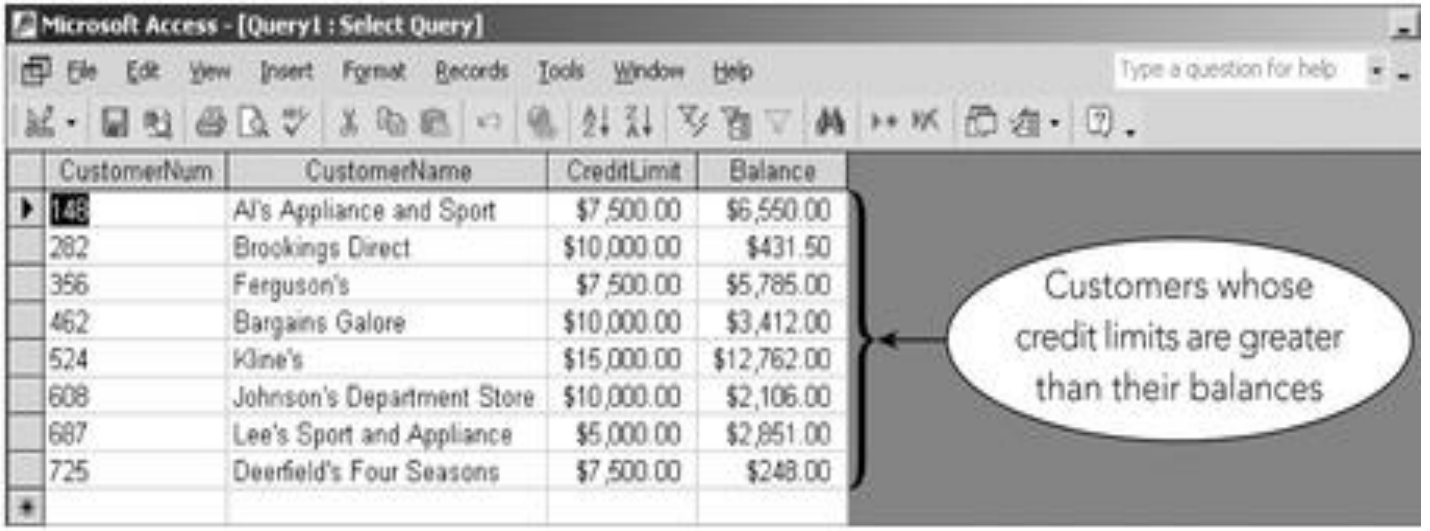
Figures 10.10-10.11:
SQL Query to Find All Customers in 'Grove'





Figures 10.12-10.13: Query to find Customers with Credit Limit Exceeding Balance

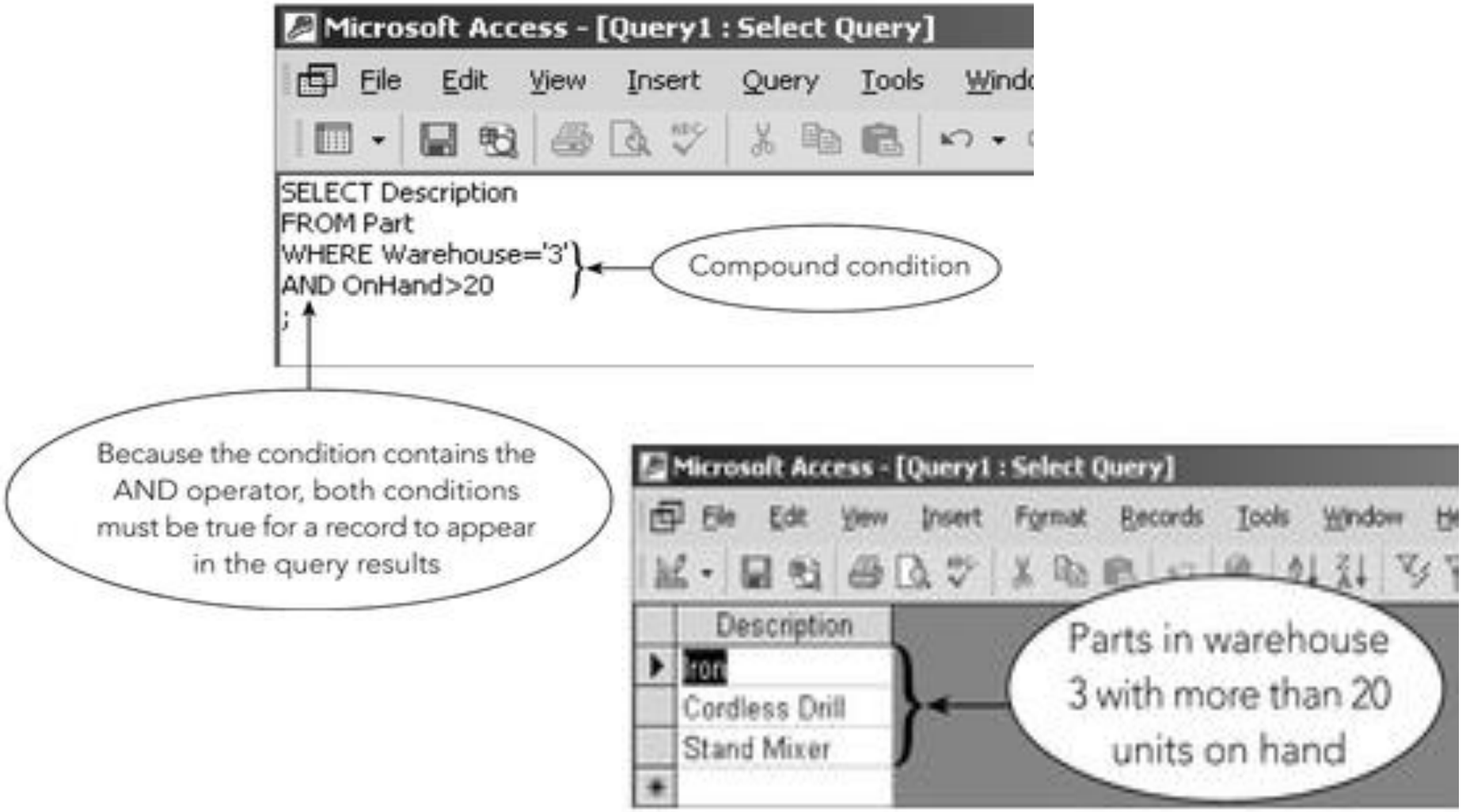




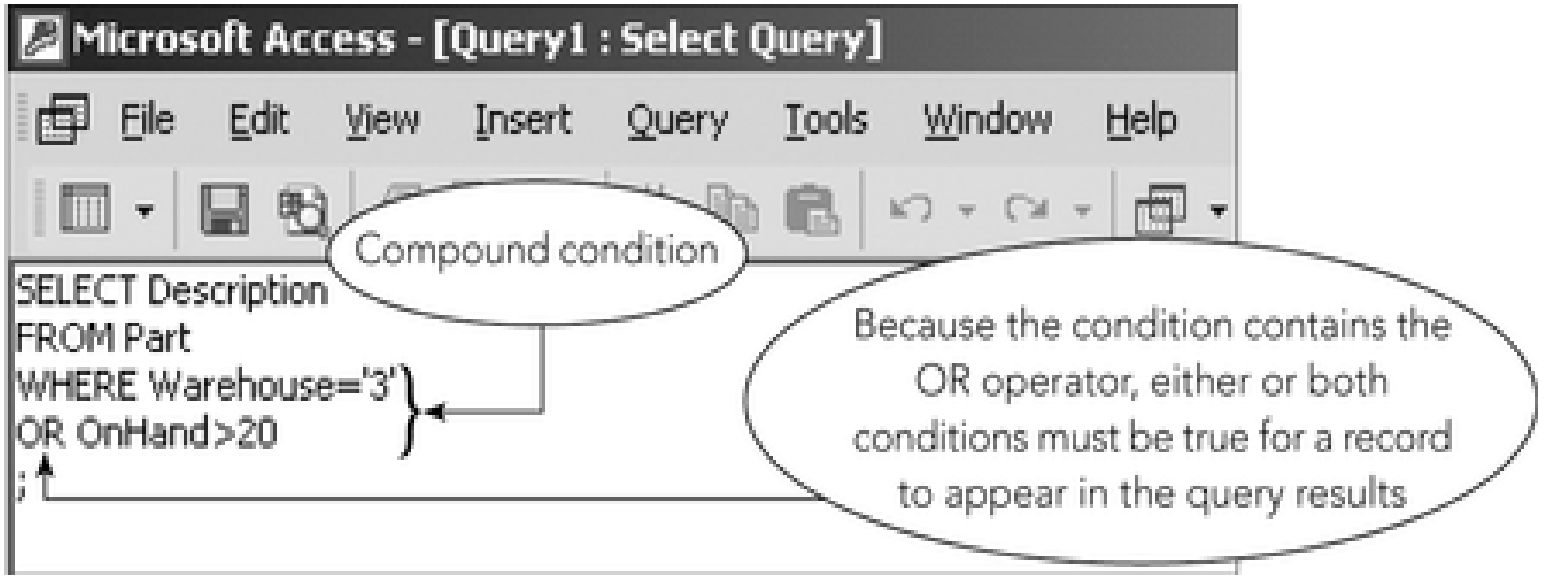
Compound Conditions

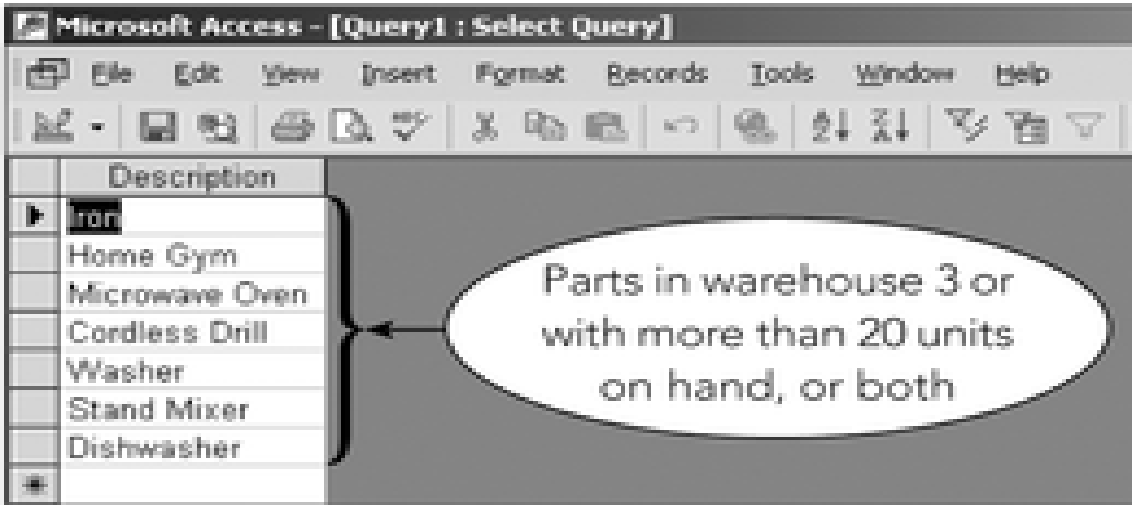
- Formed by connecting two or more simple conditions using one or both of the operators AND and OR
- Can also precede a single condition with NOT operator to negate a condition
- With AND all simple conditions must be true for the compound condition to be true
- With OR the compound condition will be true when any of the simple conditions are true

Figures 10.14-10.15:
SQL Query with Compound Condition using 'AND'

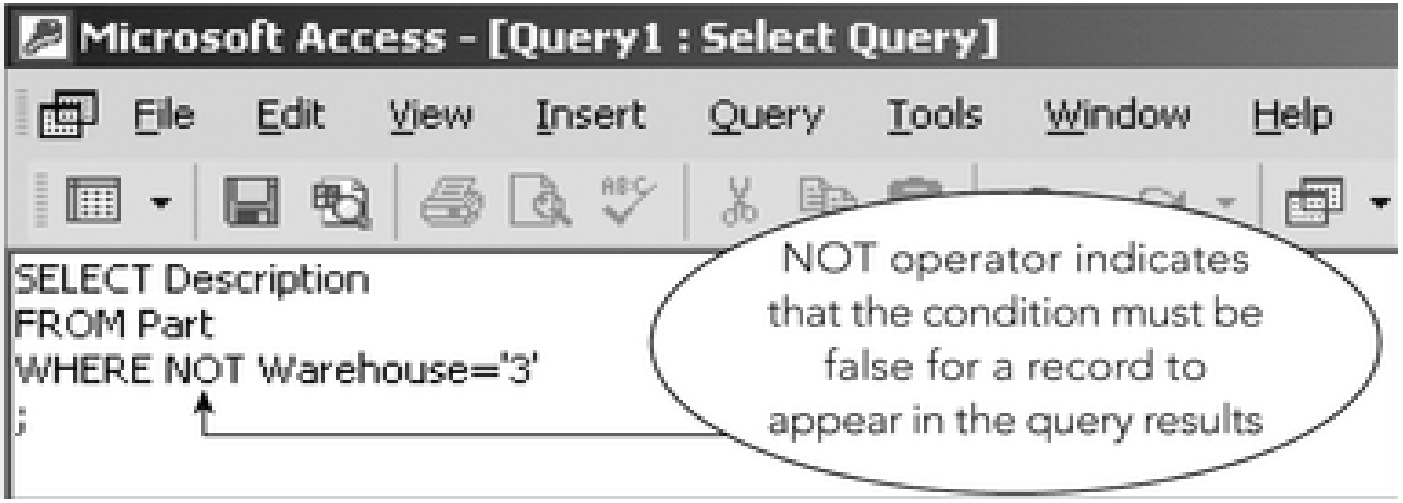


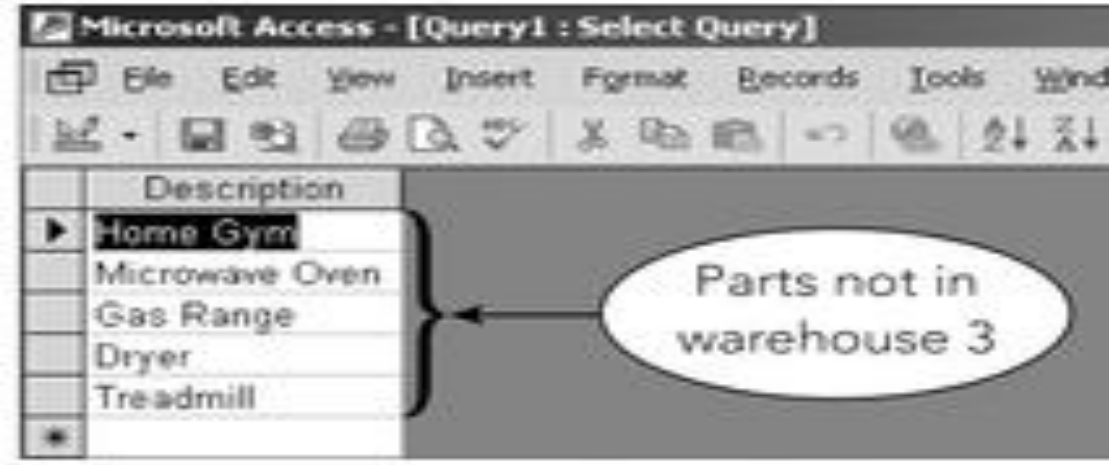
Figures 10.16-10.17: SQL Query using 'OR'



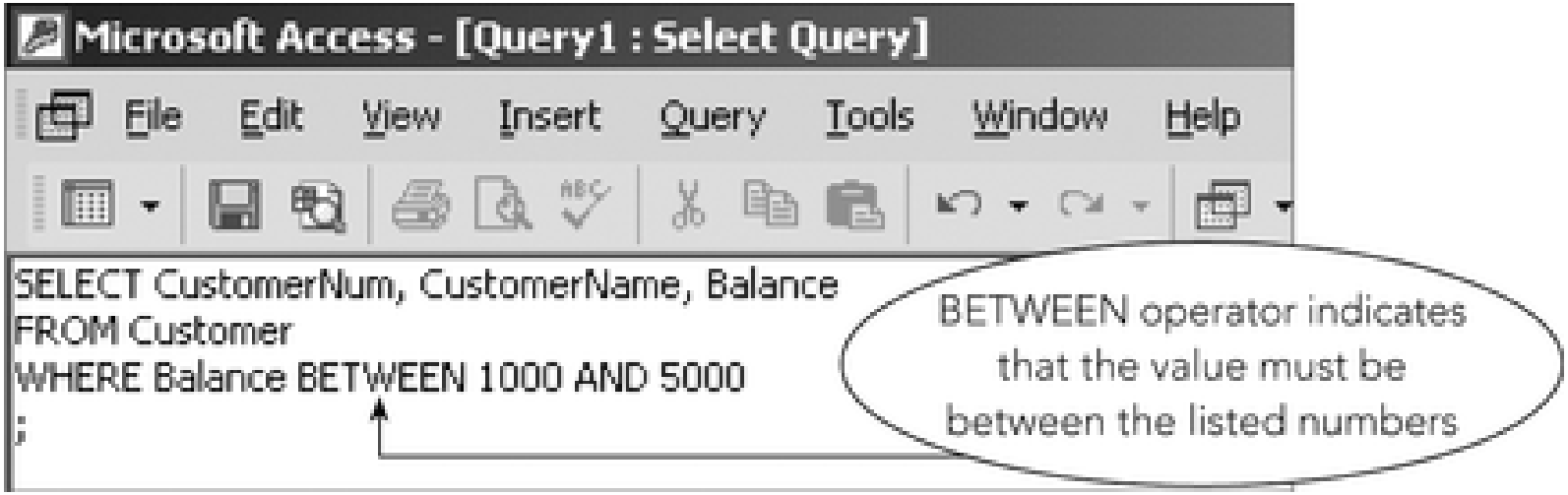


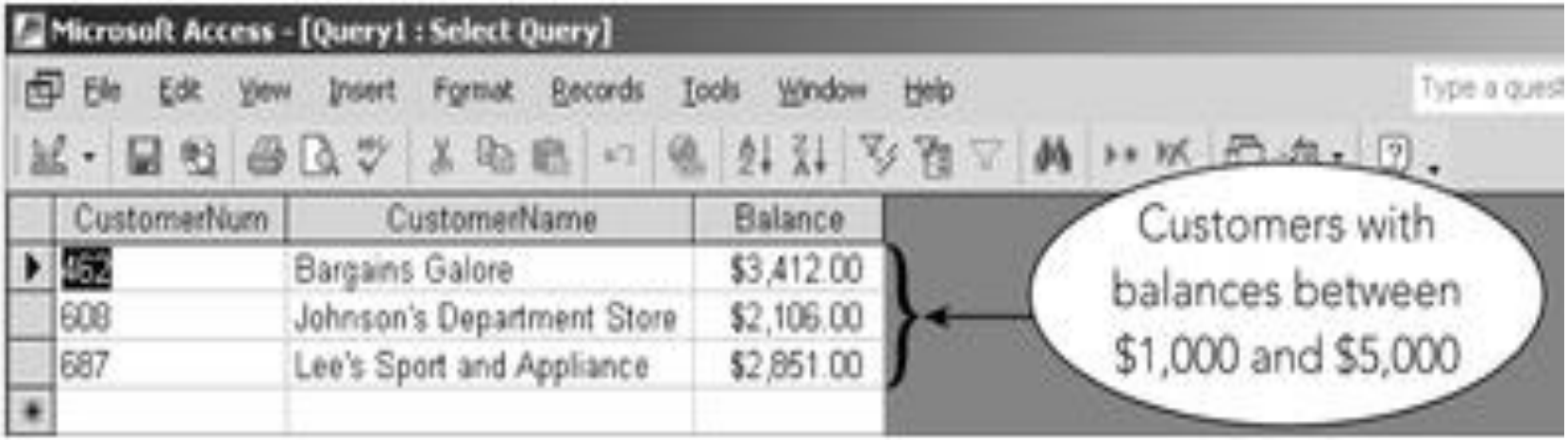
Figures 10.18-10.19: SQL Query using 'NOT'





Figures 10.20-10.21: Query with 'BETWEEN' Operator

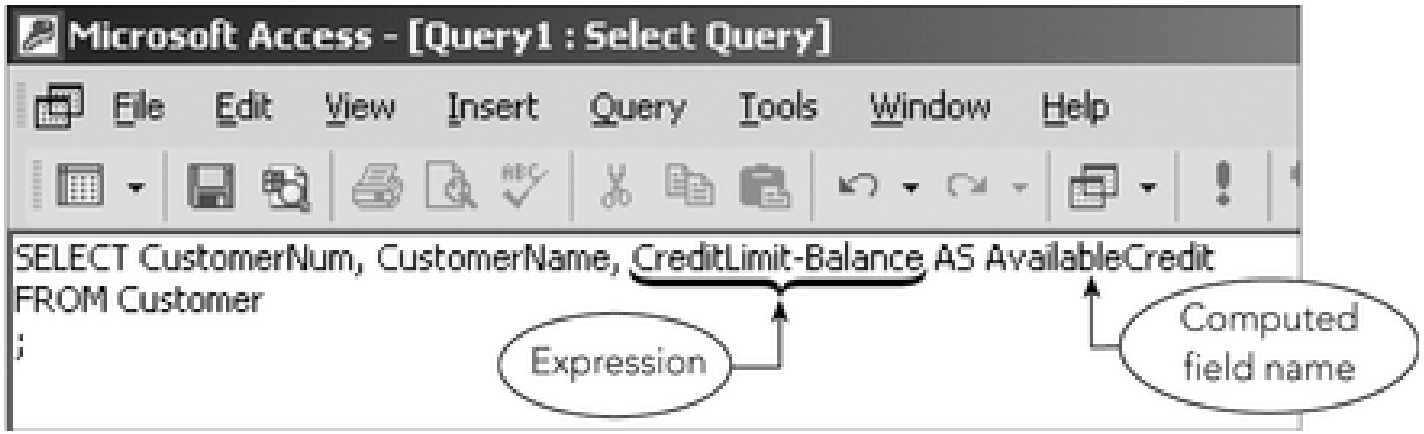


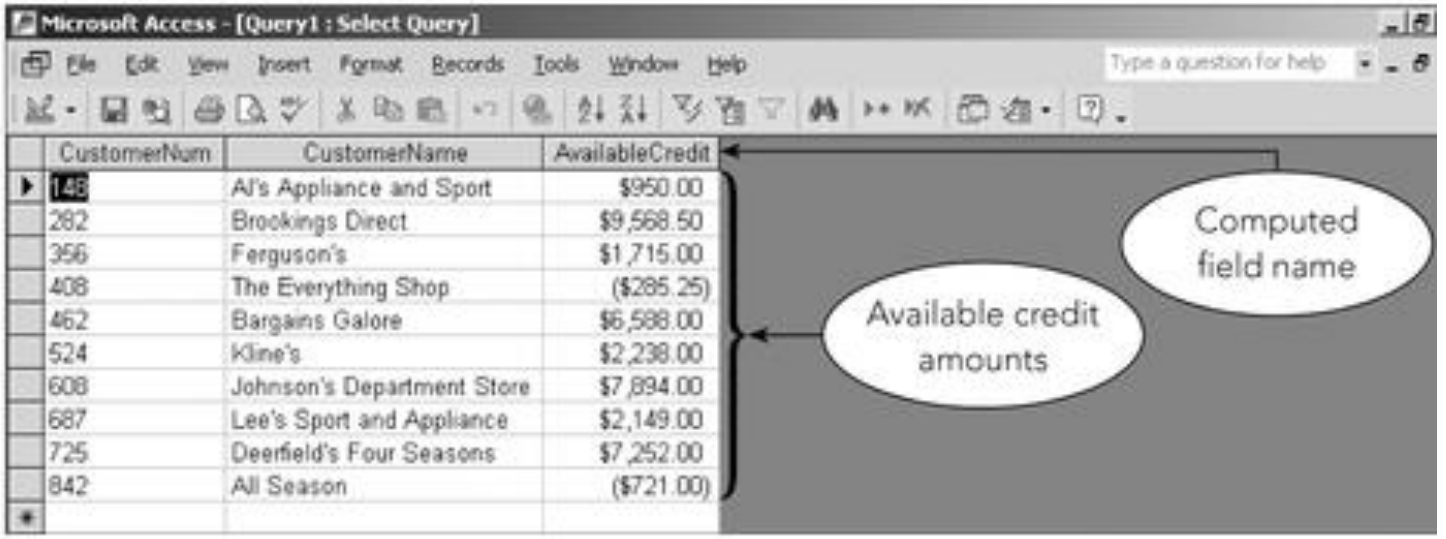


Computed Fields

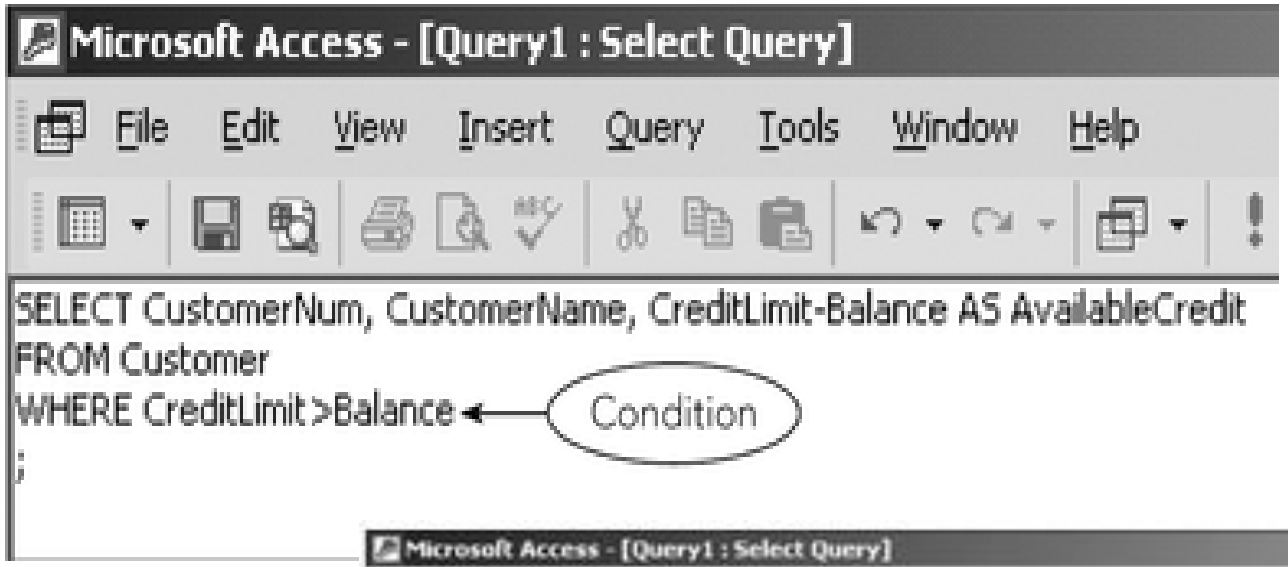
- Field whose values are derived from existing fields
- Computed fields can involve:
  - Addition (+)
  - Subtraction (-)
  - Multiplication (*)
  - Division (/)

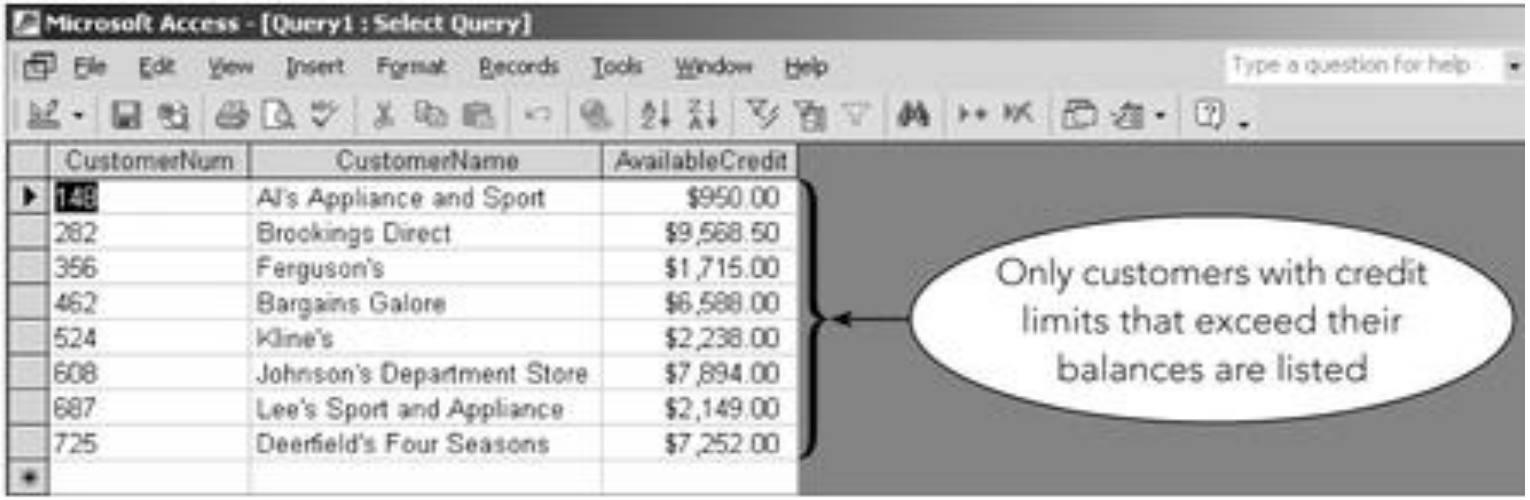
Figures 10.22-10.23: SQL Query with Computed Field





Figures 10.24-10.25:
SQL Query with Computed Field and Condition

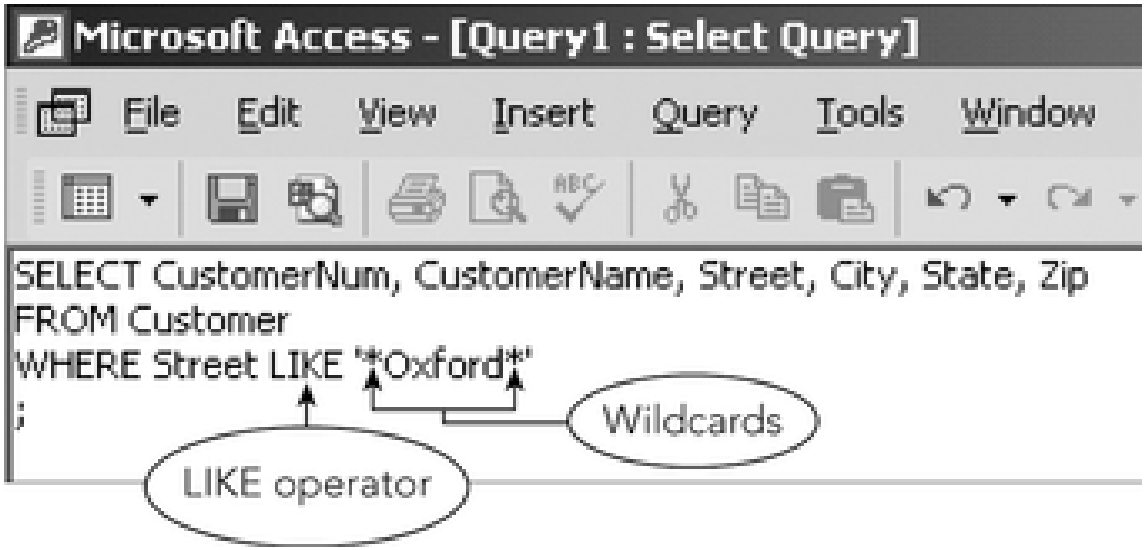


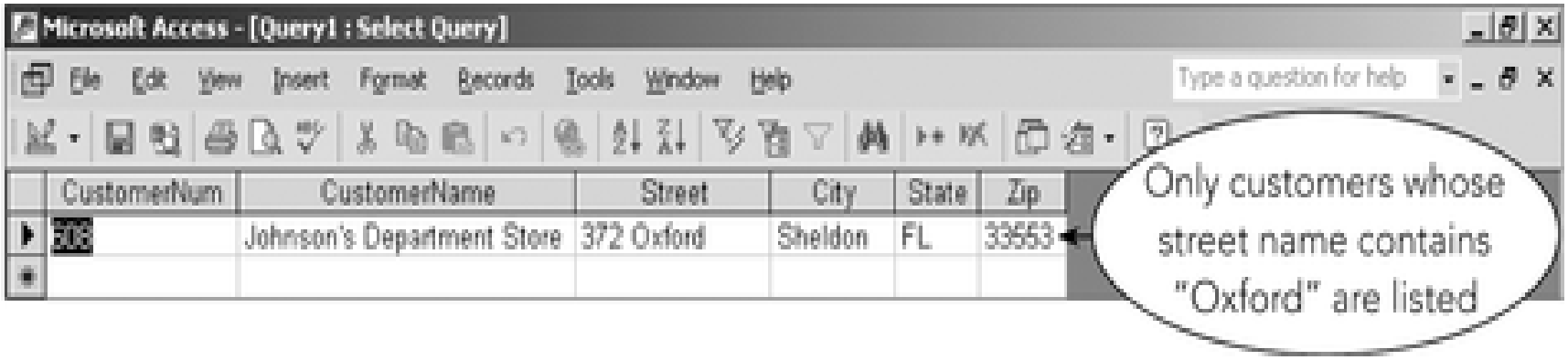


Special Operators and Sorting

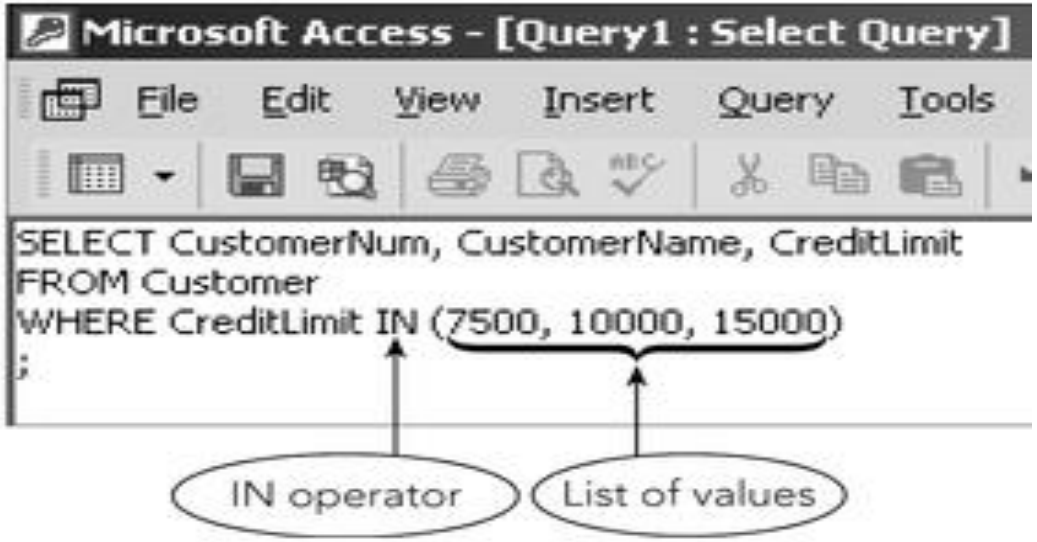
- LIKE operator is used with a wildcard symbol to find non-exact matches
- IN operator provides a concise way of phrasing certain conditions
- ORDER BY clause is used to display results in desired order
- Sort key or key – field on which to sort data

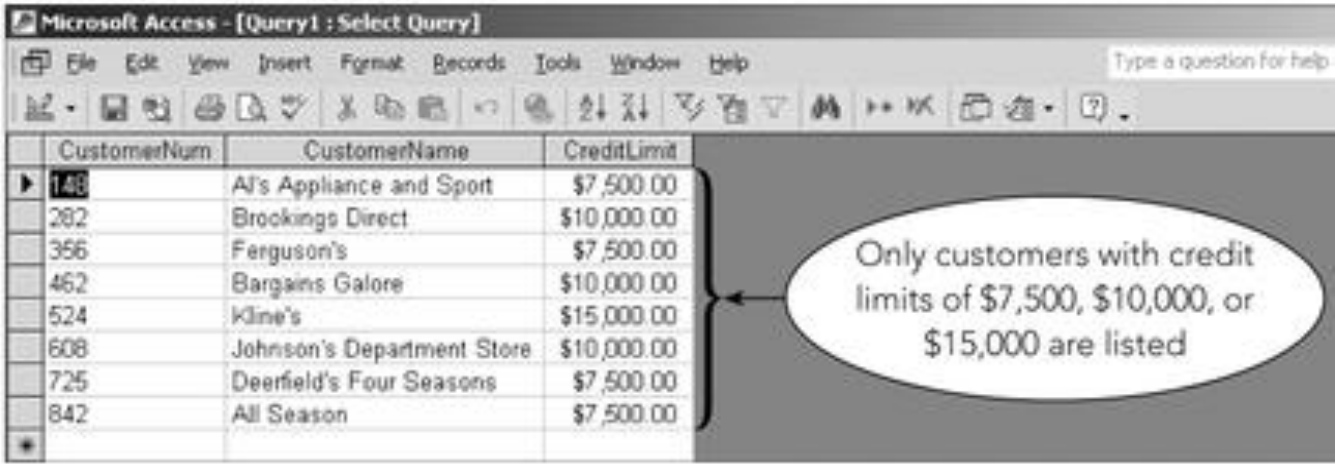
Figures 10.26-10.27: SQL Query with 'LIKE' Operator



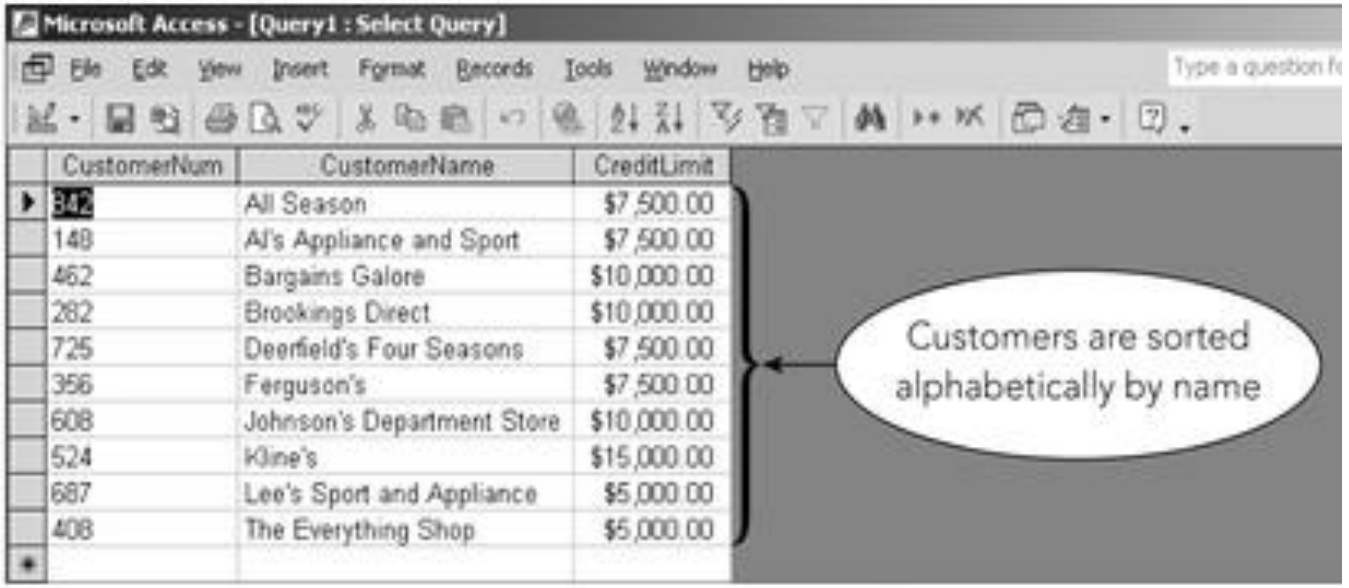


Figures 10.28-10.29: SQL Query with 'IN' Operator

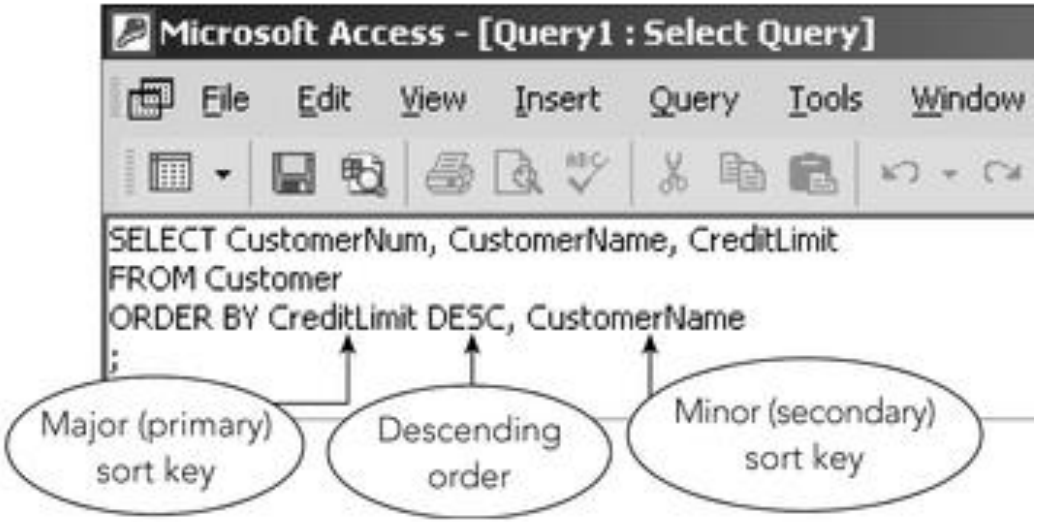


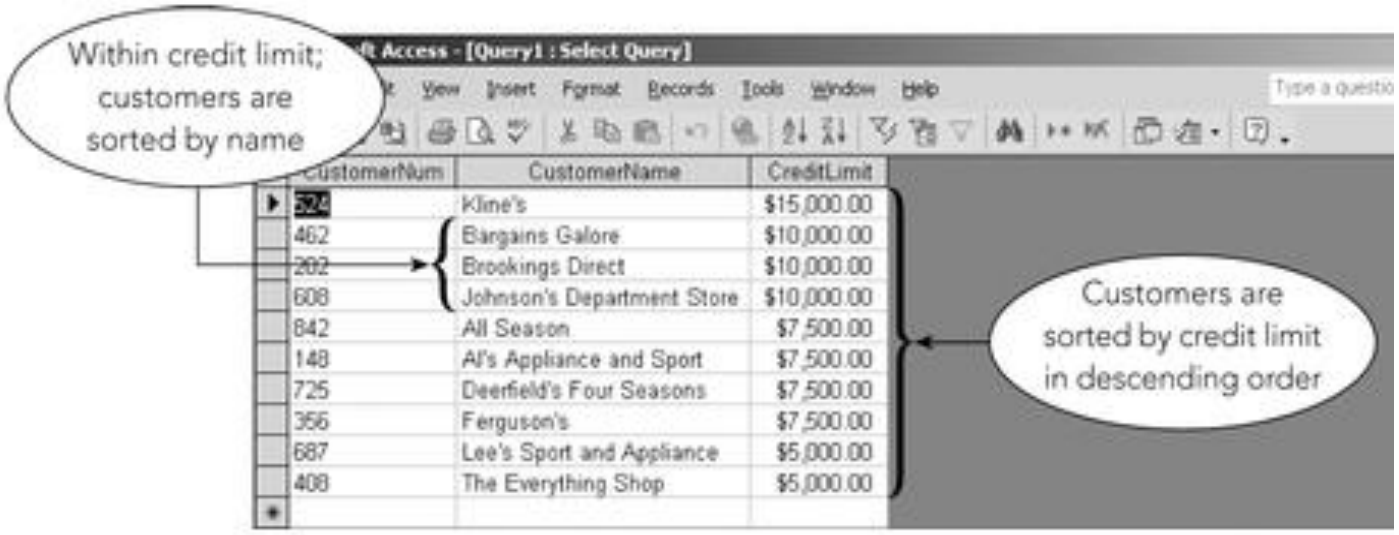


Figures 10.30-10.31: SQL Query to Sort Data



Figures 10.32-10.33: SQL Query to Sort on Multiple Fields

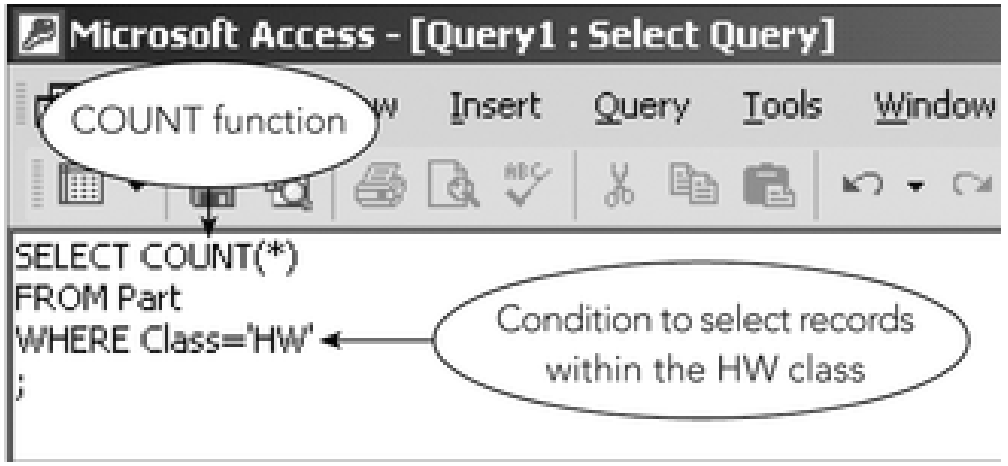


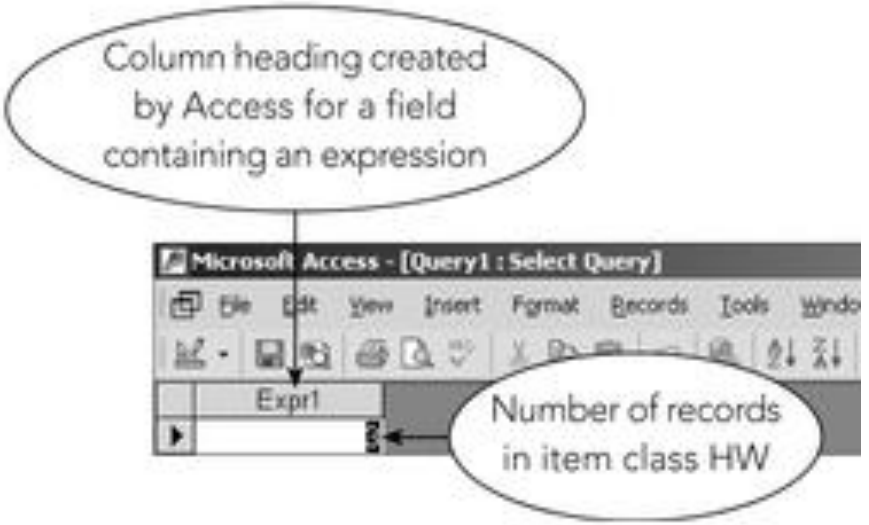


Built-In Functions

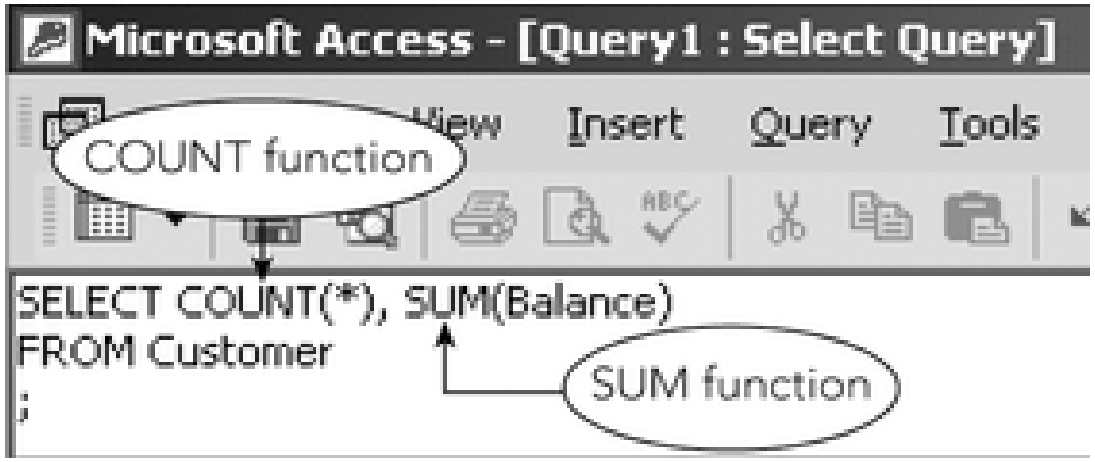
- Built-In functions (aggregate functions) are used to
  - COUNT - calculate number of entries
  - SUM or AVG – finds sum or average of all entries in a given column
  - MAX or MIN – finds largest or smallest values respectively

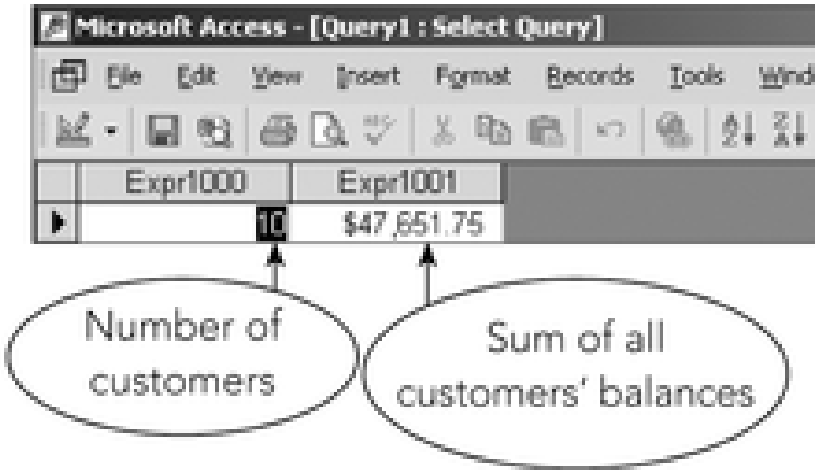
Figures 10.34-10.35: SQL Query to Count Records



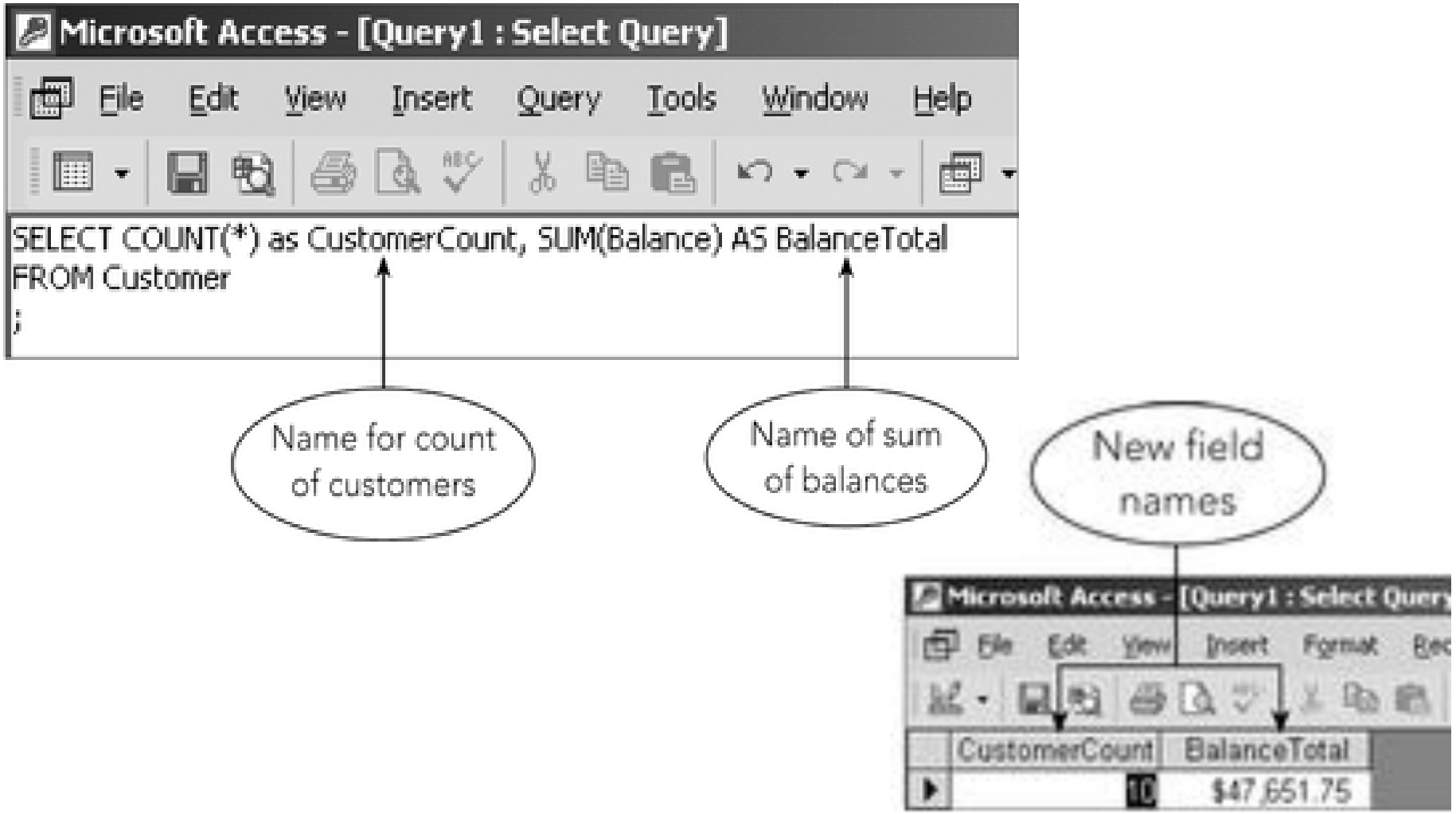


Figures 10.36-10.37:
SQL Query to Count Records and Calculate a Total





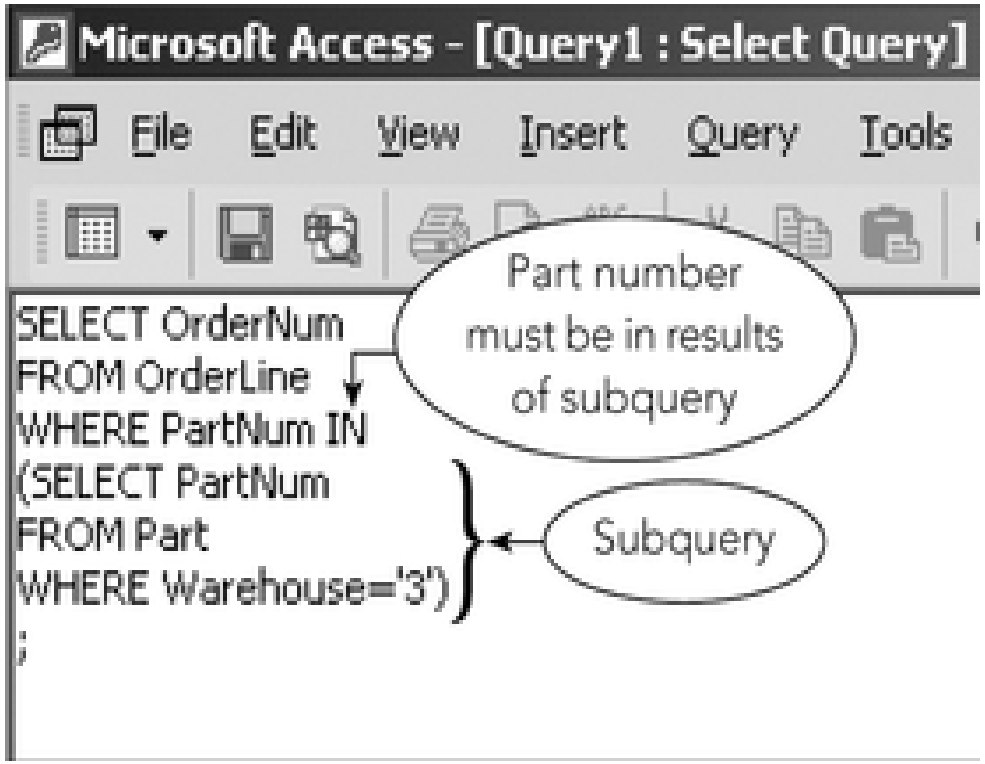
Figures 10.38-10.39:
SQL Query to Perform Calculations and Rename Fields

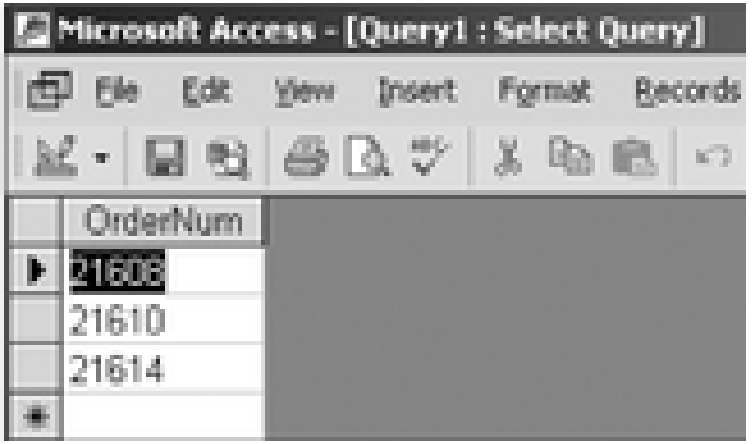


Nesting Queries

- Nested query - place one query inside another
- Subquery – inner query
- Subquery is evaluated first
- Outer query is evaluated after the subquery

Figures 10.40-10.41: SQL Query with Subquery

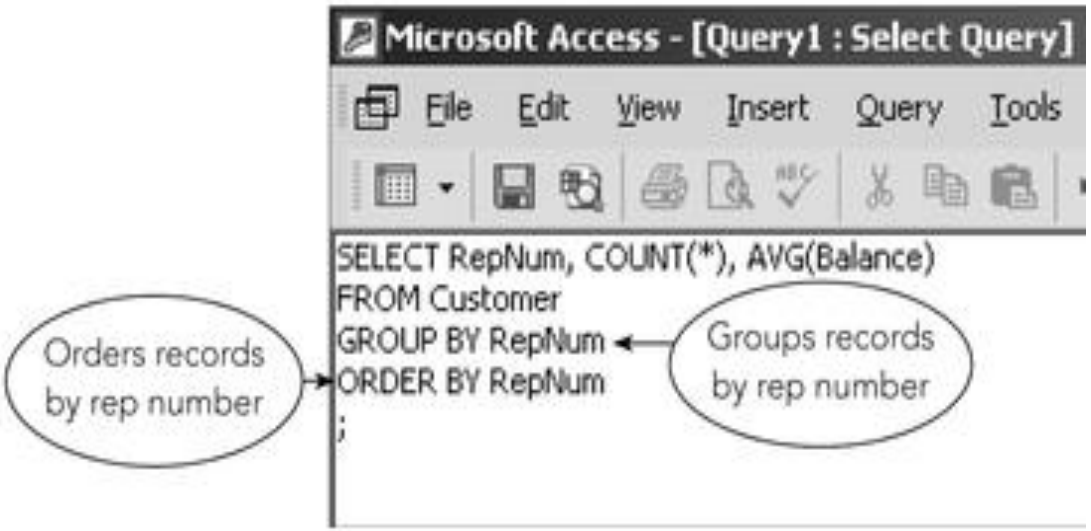


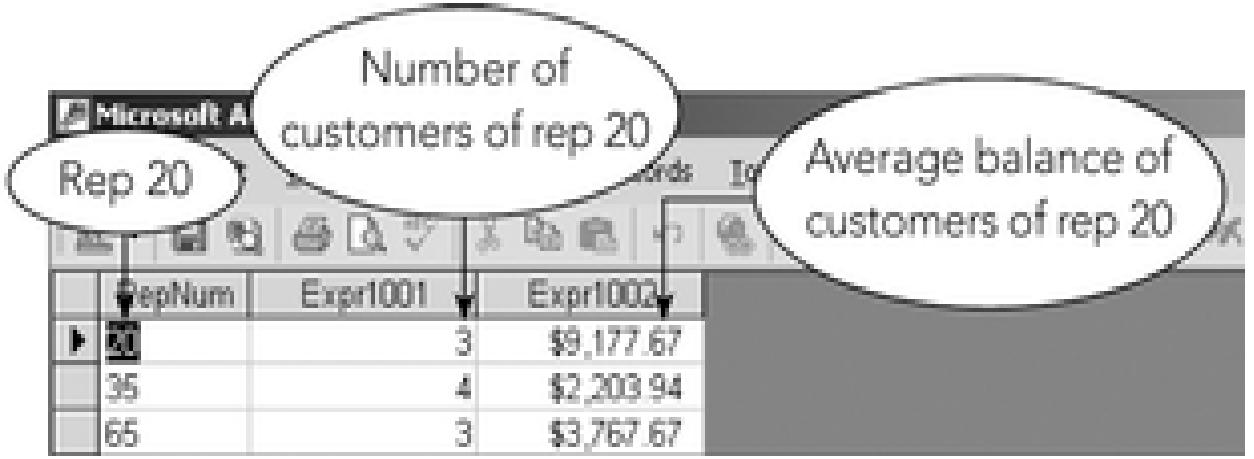


Grouping

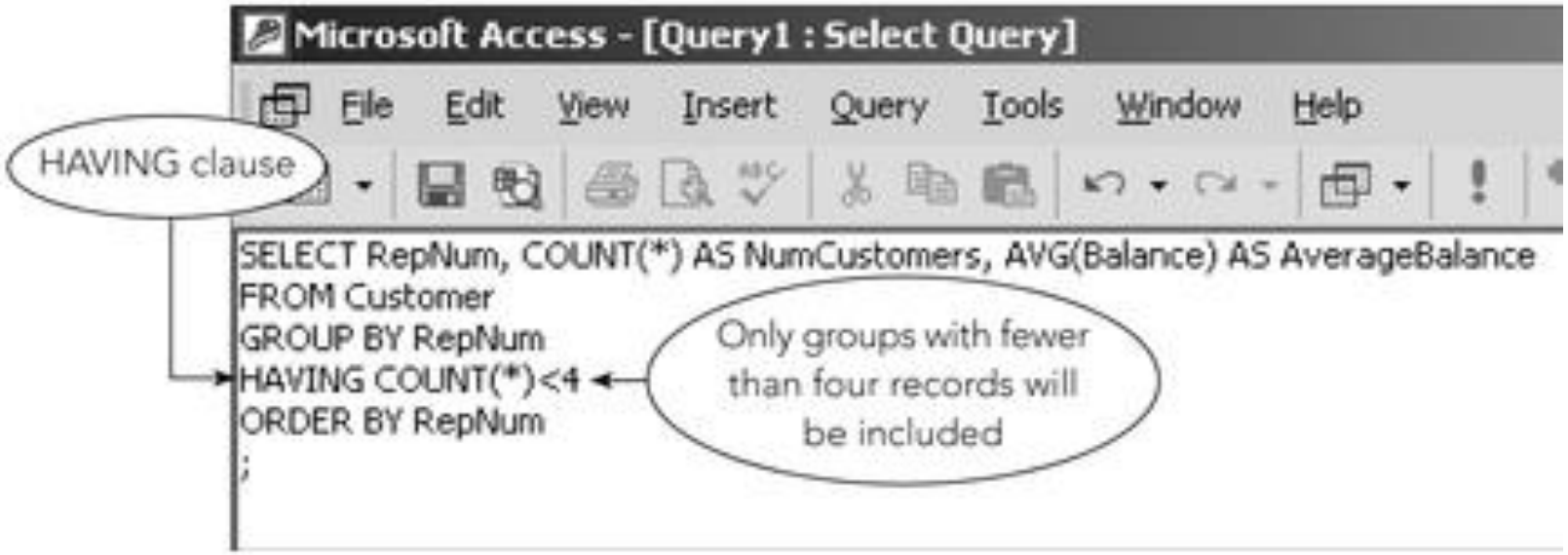
- Means creating groups of records that share some common characteristic
- GROUP BY clause used to indicate grouping in SQL
- HAVING clause – is to groups what the WHERE clause is to rows

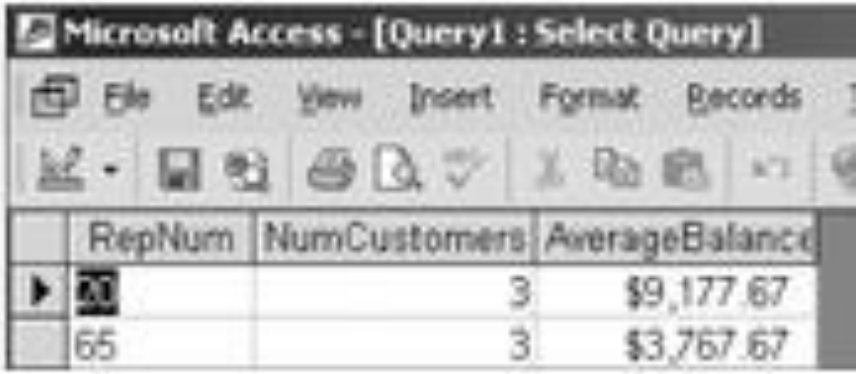
Figures 10.42-10.43:
SQL Query to Group Records



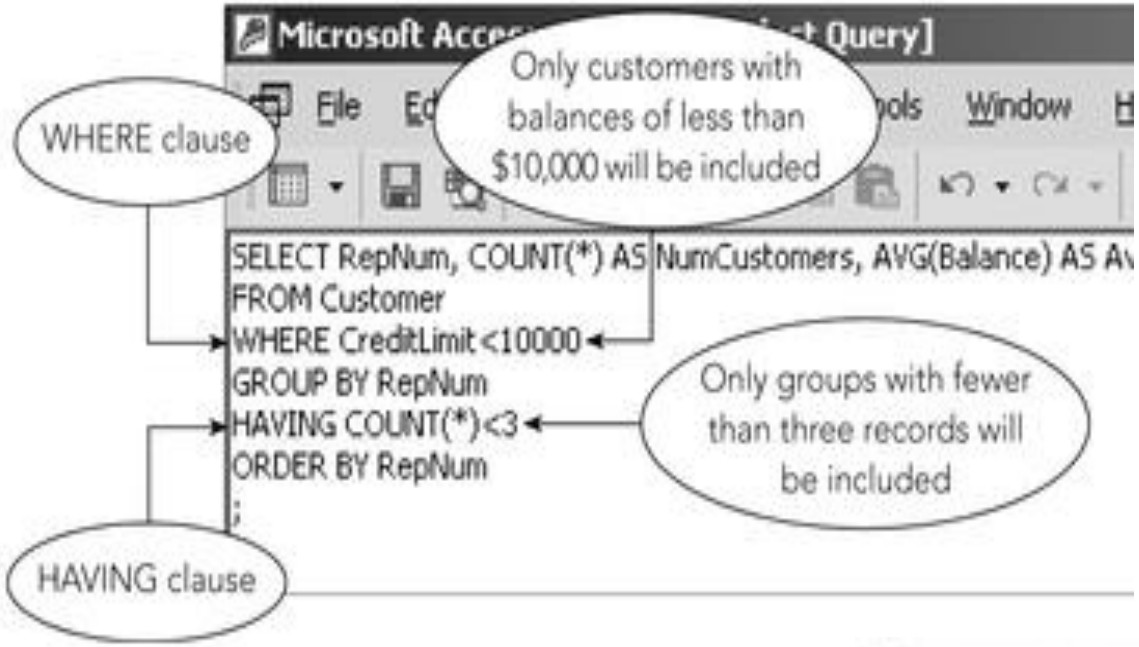


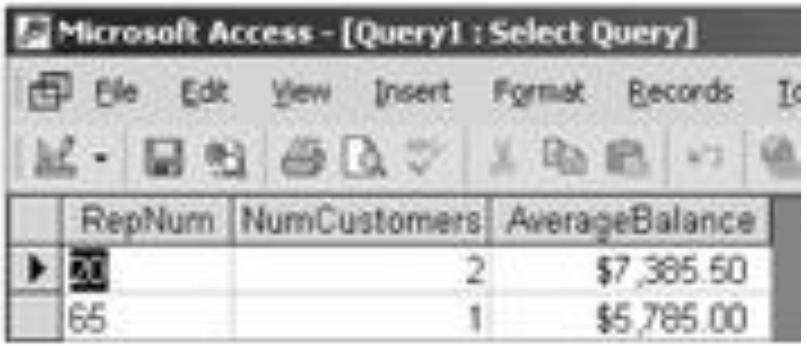
Figures 10.44-10.45:
SQL Query to Restrict Groups





Figures 10.46-10.47:
SQL Query with 'WHERE' and 'HAVING' Clauses

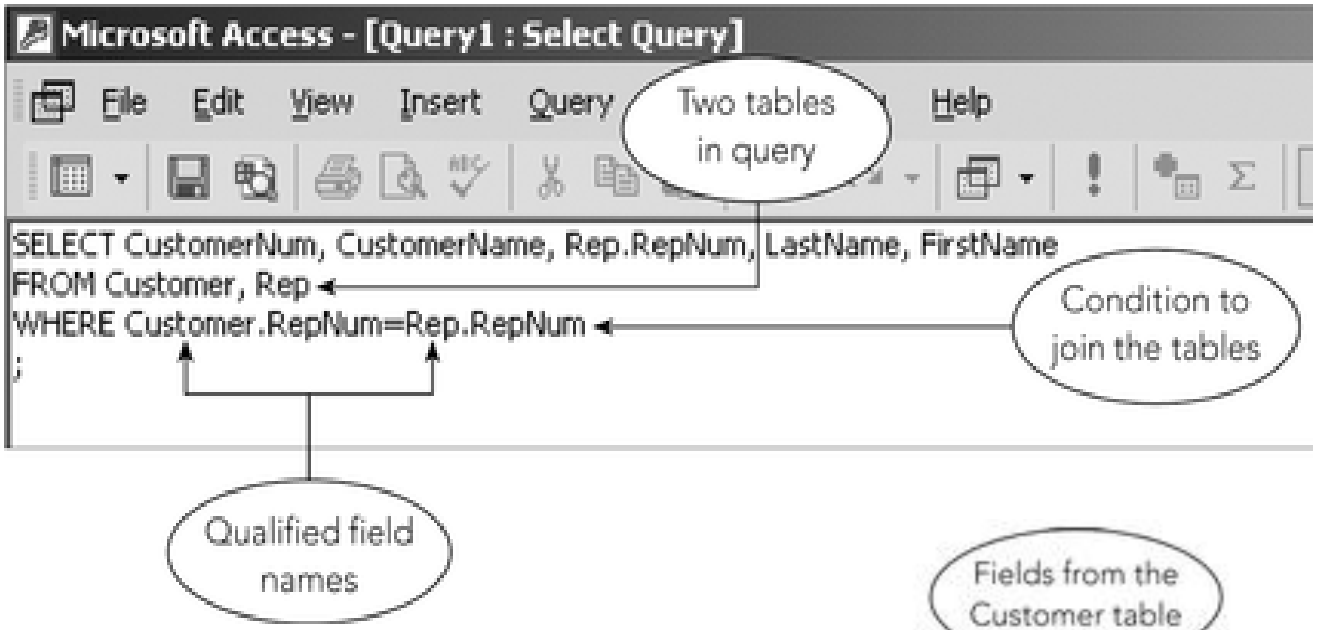


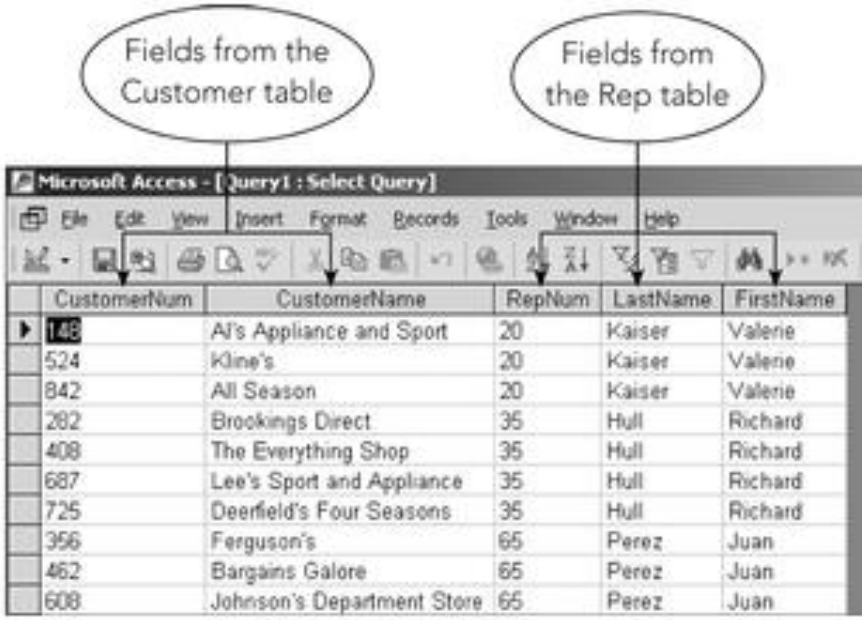


Joining Tables and Union

- Allow queries to locate data from more than one table
- Accomplished by entering the appropriate conditions in the WHERE clause
- Two tables involved in a union must have the same structure
  - Same number of fields
  - Corresponding fields must have same data types

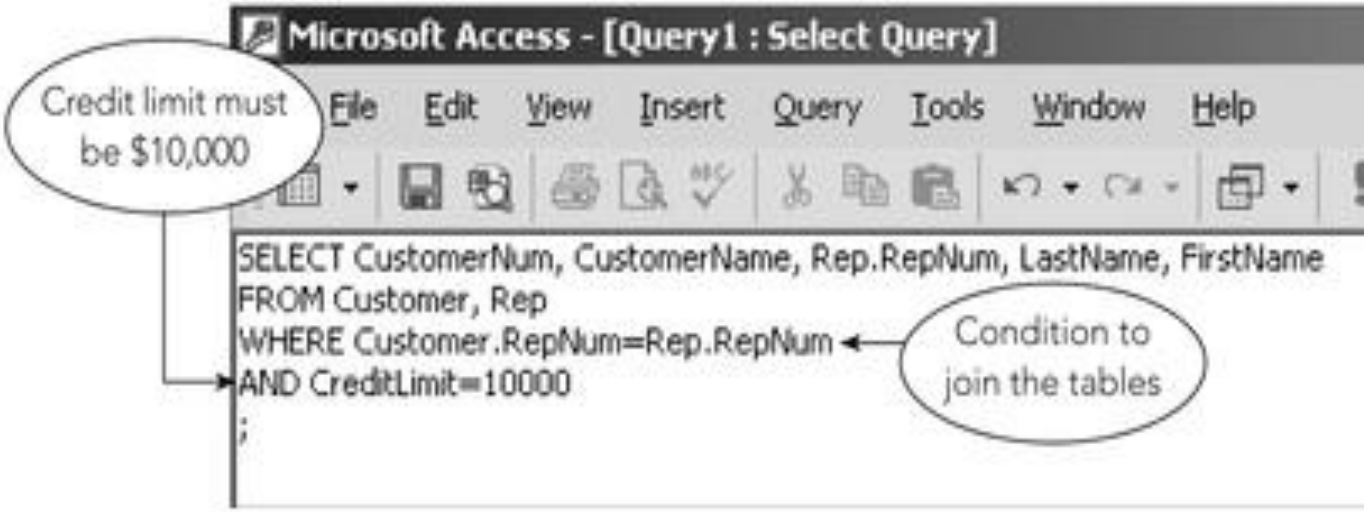
Figures 10.48-10.49: SQL Query to Join Tables

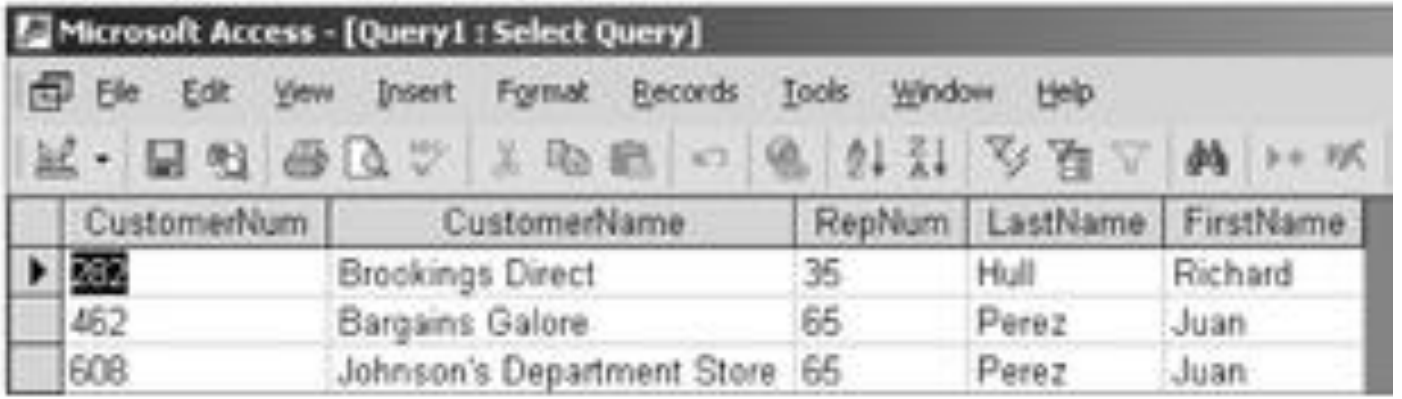




CustomerNum	CustomerName	RepNum	LastName	FirstName
148	Al's Appliance and Sport	20	Kaiser	Valerie
524	Kline's	20	Kaiser	Valerie
842	All Season	20	Kaiser	Valerie
282	Brookings Direct	35	Hull	Richard
408	The Everything Shop	35	Hull	Richard
687	Lee's Sport and Appliance	35	Hull	Richard
725	Deerfield's Four Seasons	35	Hull	Richard
356	Ferguson's	65	Perez	Juan
462	Bargains Galore	65	Perez	Juan
608	Johnson's Department Store	65	Perez	Juan

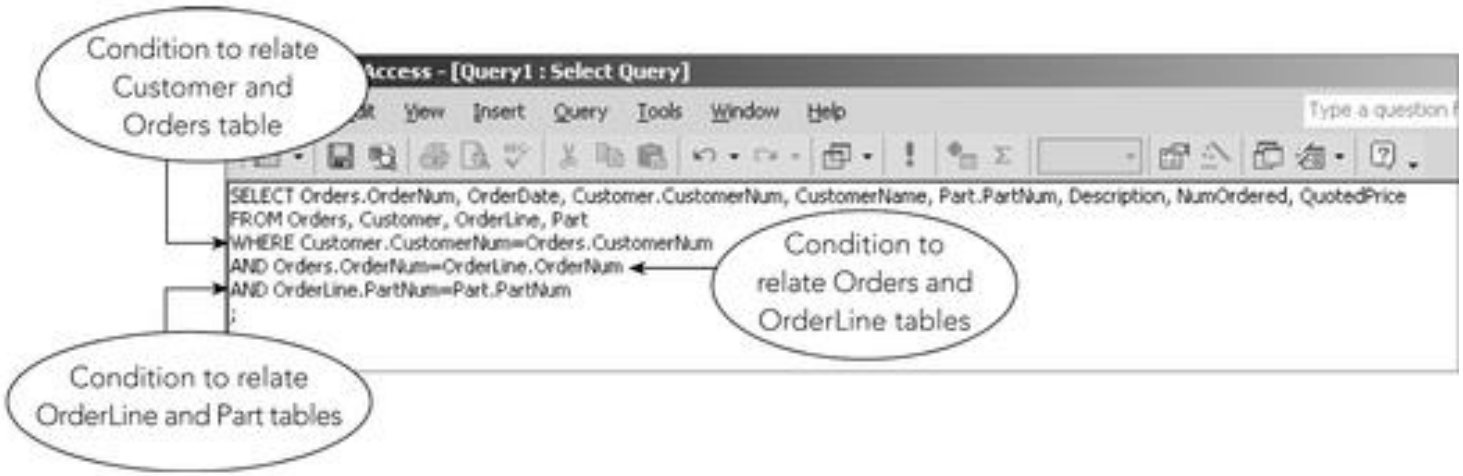
Figures 10.50-10.51:
Query to Restrict Records in Join





CustomerNum	CustomerName	RepNum	LastName	FirstName
282	Brookings Direct	35	Hull	Richard
462	Bargains Galore	65	Perez	Juan
608	Johnson's Department Store	65	Perez	Juan

Figures 10.52-10.53:
Query to Join Multiple Tables



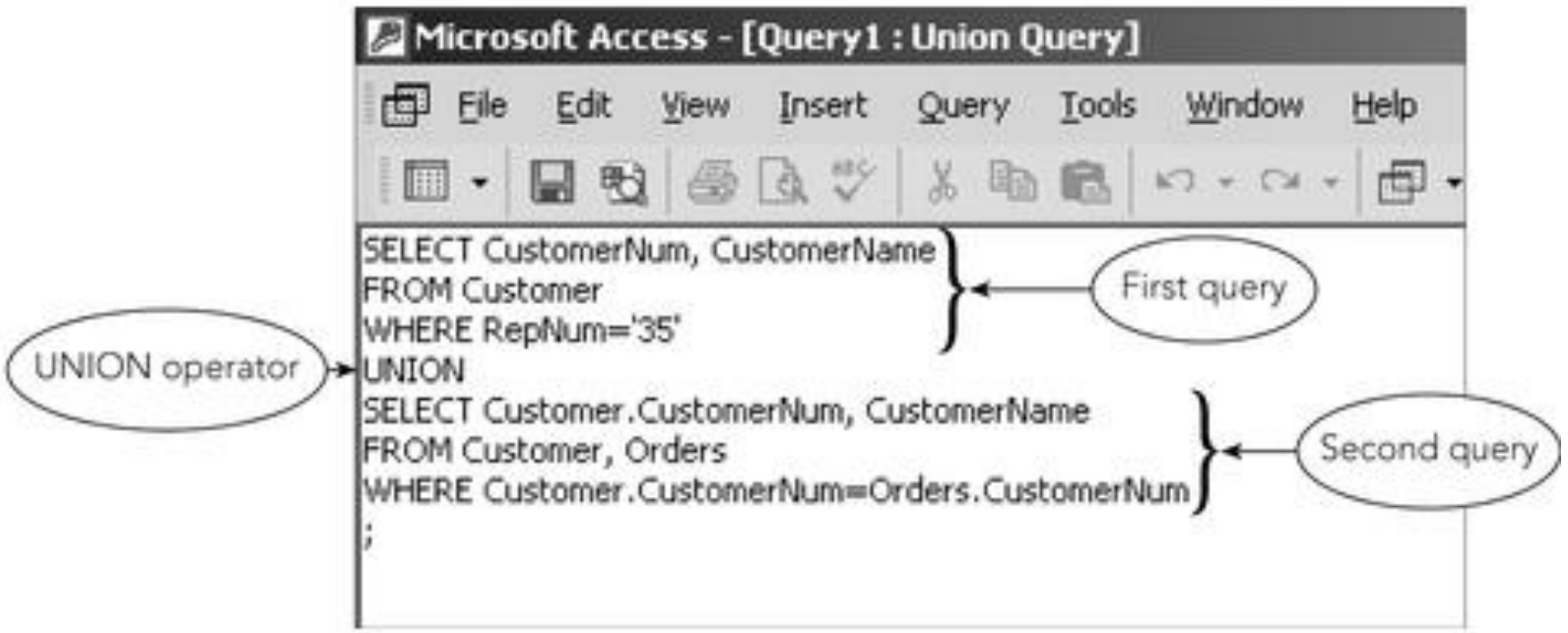
Microsoft Access - [Query1 : Select Query]

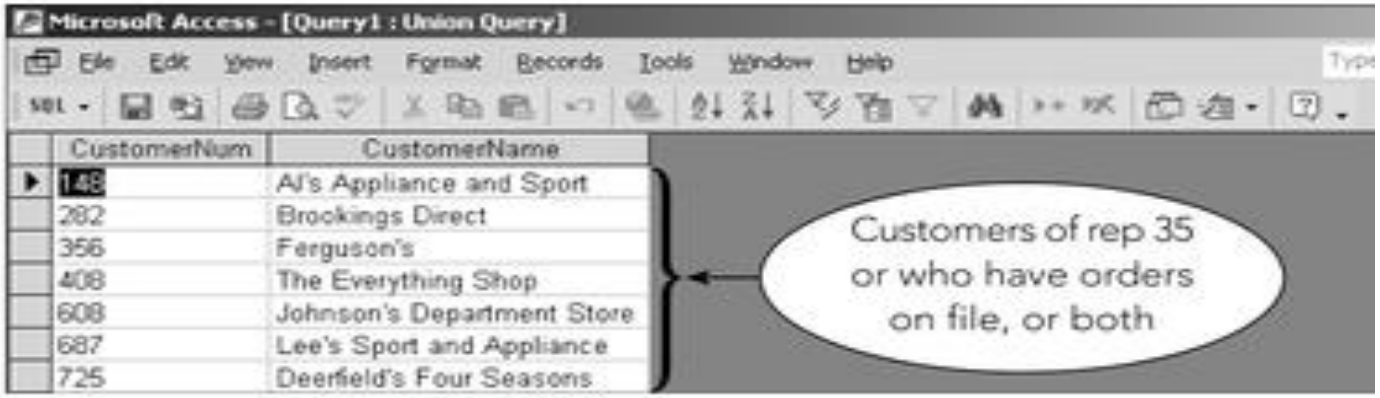
File Edit View Insert Format Records Tools Window Help

Type a question for help

OrderNum	OrderDate	CustomerNum	CustomerName	PartNum	Description	NumOrdered	QuotedPrice
21608	10/20/2003	148	Al's Appliance and Sport	AT94	Iron	11	$21.95
21610	10/20/2003	356	Ferguson's	DR93	Gas Range	1	$495.00
21610	10/20/2003	356	Ferguson's	DW11	Washer	1	$399.99
21613	10/21/2003	408	The Everything Shop	KL62	Dryer	4	$329.95
21614	10/21/2003	282	Brookings Direct	KT03	Dishwasher	2	$595.00
21617	10/23/2003	608	Johnson's Department Store	BV06	Home Gym	2	$794.95
21617	10/23/2003	608	Johnson's Department Store	CD52	Microwave Oven	4	$150.00
21619	10/23/2003	148	Al's Appliance and Sport	DR93	Gas Range	1	$495.00
21623	10/23/2003	608	Johnson's Department Store	KV29	Treadmill	2	$1,290.00

Figures 10.54-10.55: SQL Query to Perform Union

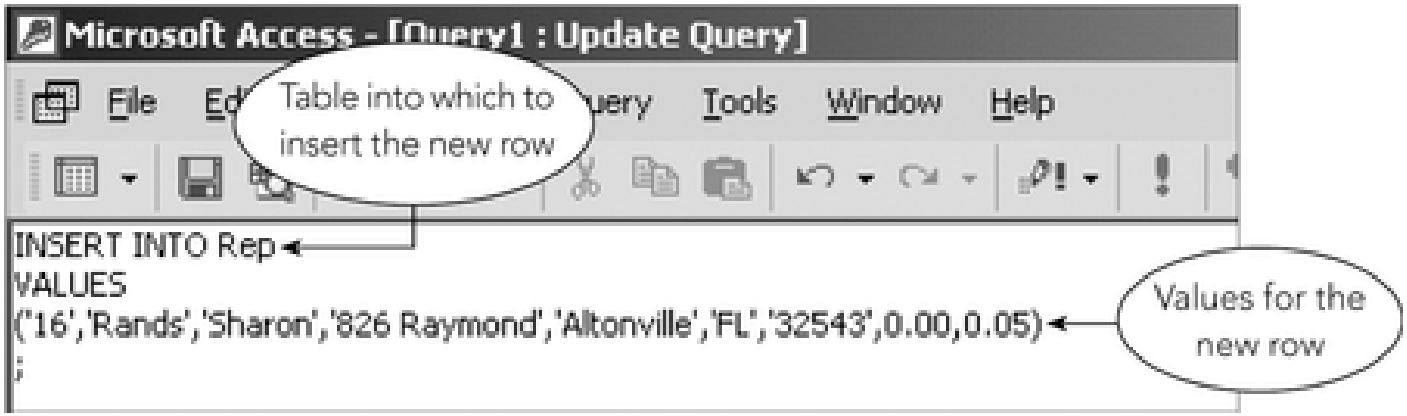




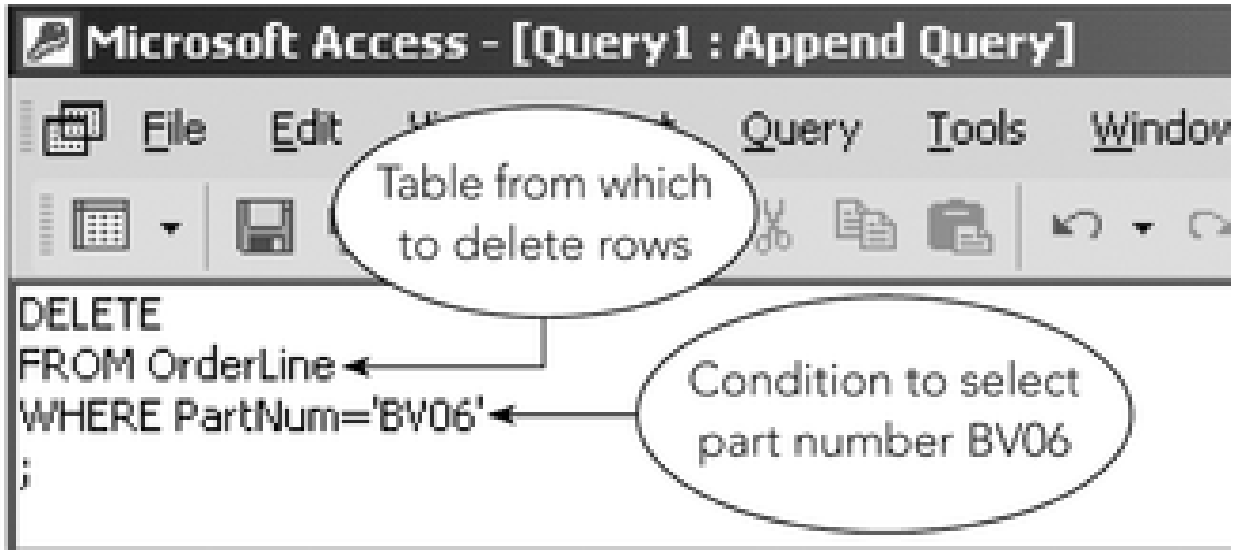
Updating Tables

- UPDATE command used to make changes to existing data
- INSERT command used to add new data to a table
- DELETE command used to delete data from the database

Figures 10.56-10.57:
SQL Query to Update Data



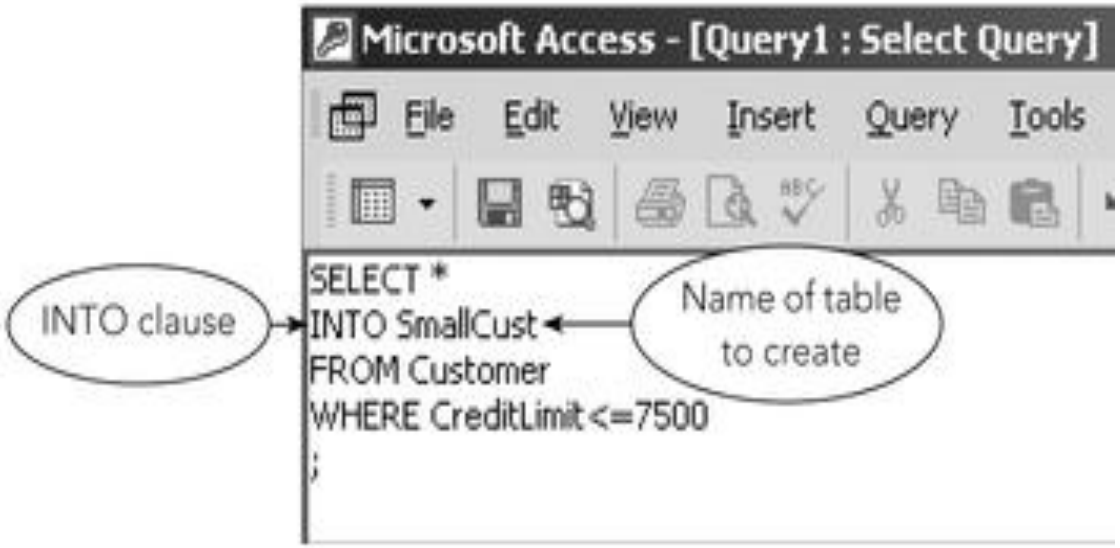
Figures 10.58: SQL Query to Delete Rows

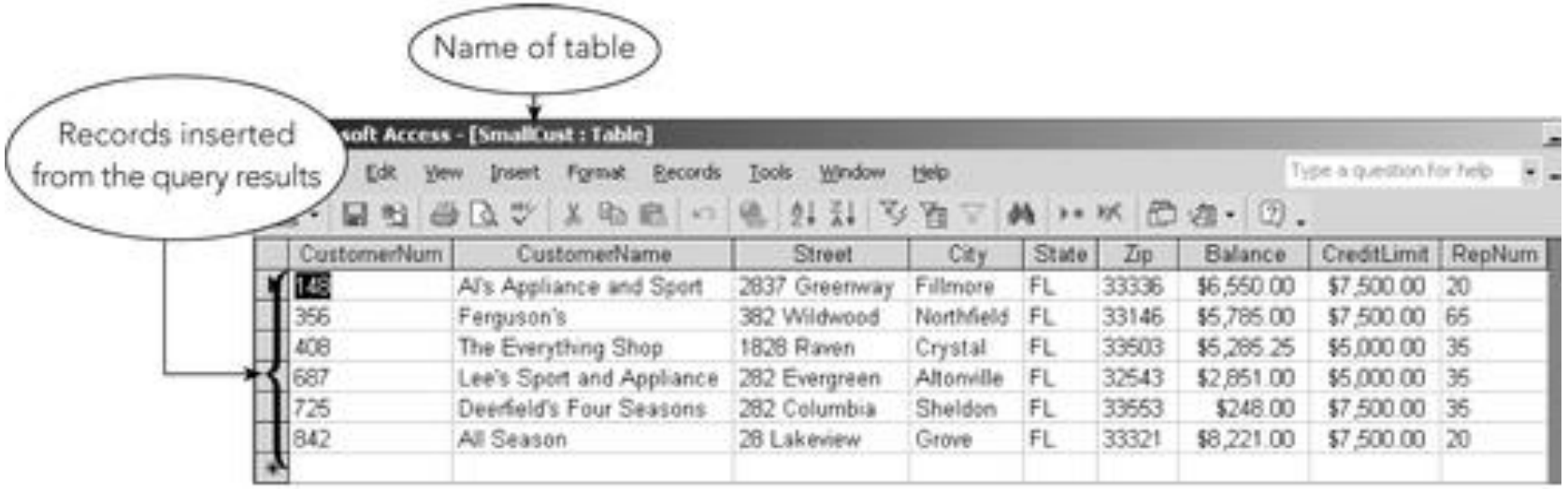


Create a Table from a Query

- INTO clause used to save the results of a query as a table
- Specified before FROM and WHERE clauses

Figures 10.59-10.60: SQL Query to Create New Table





Summary

- SQL (Structured Query Language): language for manipulating relational databases
- Three classes of statements: definition, query, and manipulation
- You create objects with the CREATE statement
- You perform queries with the SELECT statement → the condition is part of the WHERE clause

Summary (con’t.)

- Simple queries use operators such as <, >, etc. to compare field names with the values you are seeking
- Compound conditions are formed with logical operators, AND, OR, and NOT
- Queries can be nested by using subqueries
- The GROUP BY clause can group data in a query
- The JOIN clause can combine data from two or more tables

Summary

- Built-in functions allow you to count rows in a query and summarize data, such as sums or averages
- The UNION statement allows you to view data from two queries in one result set
- SQL allows you to create tables from queries with the INTO clause
- You can delete and update data as well