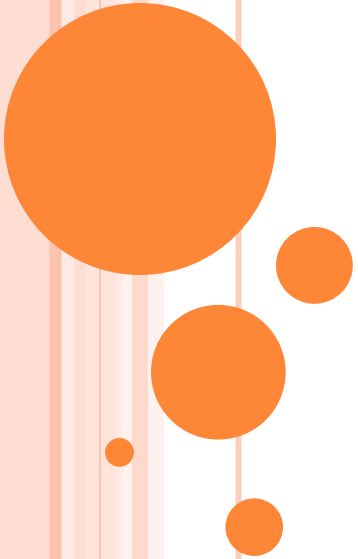
CIS 412
DATABASE MANAGEMENT SYSTEMS



Chapter 6
Database Design 2: Design Method

Database Design Language (DBDL)

- Table name followed by columns in parentheses
  - Primary key column(s) underlined
- AK identifies alternate keys
- SK identifies secondary keys
- FK identifies foreign keys
  - Foreign keys followed by an arrow pointing to the table identified by the foreign key

Database Design Language (DBDL) (continued)

```
Employee (EmployeeNum, LastName, FirstName, Street, City, State, Zip,
      WageRate, SocSecNum, DepartmentNum)
      AK    SocSecNum
      SK    LastName
      FK    DepartmentNum → Department
```

FIGURE 6-1: DBDL for the Employee table

Entity-Relationship (E-R) Diagrams

- Visually represents database structure
- Rectangle represents each entity
  - Entity's name appears above the rectangle
- Primary key for each entity appears above the line in the entity's rectangle
- Other columns of entity appear below the line in rectangle

Entity-Relationship (E-R) Diagrams (continued)

- Letters AK, SK, and FK appear in parentheses following the alternate key, secondary key, and foreign key, respectively
- For each foreign key, a line leads from the rectangle for the table being identified to the rectangle for the table containing the foreign key
- Text uses **IDEF1X** style of E-R diagram

ENTITY-RELATIONSHIP (E-R) DIAGRAMS (CONTINUED)

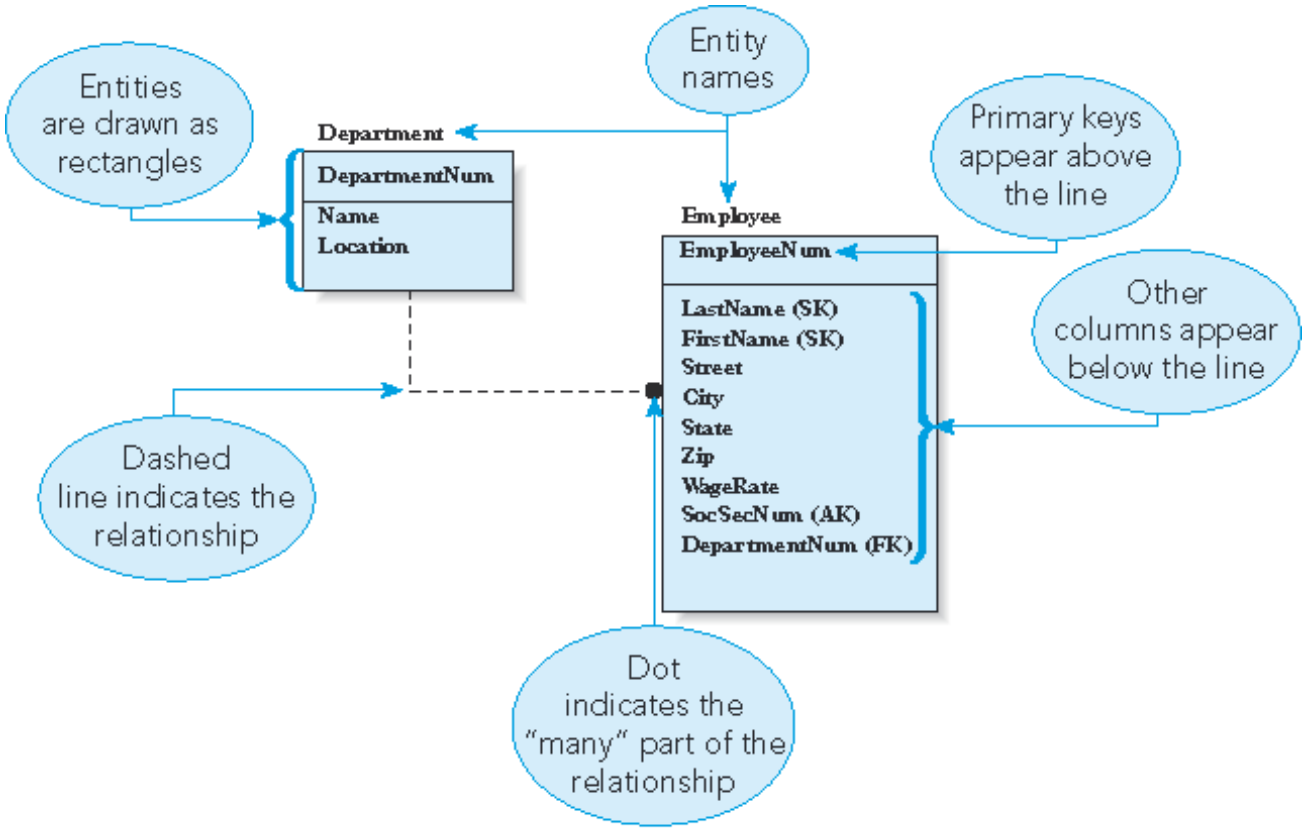


FIGURE 6-2: E-R diagram

Database Design Examples (continued)

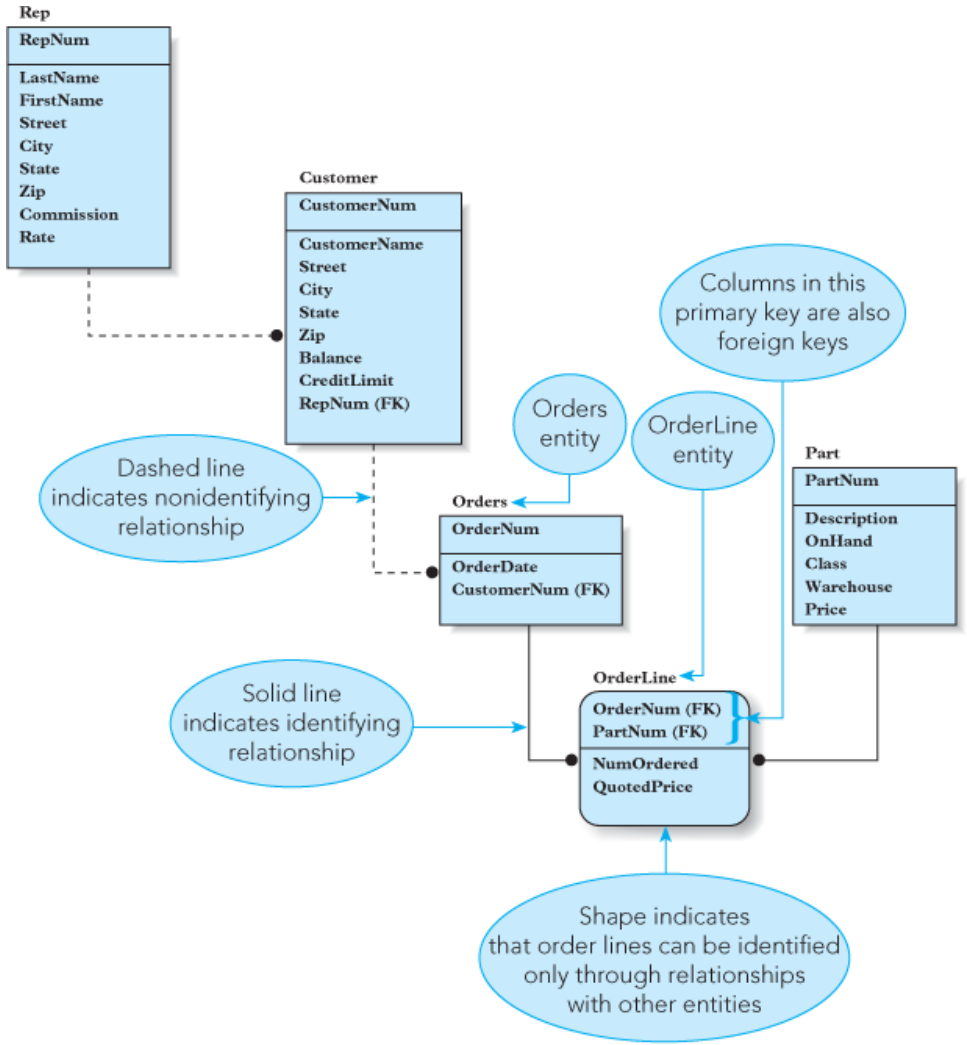


FIGURE 6-8: Final information-level design

Physical-Level Design

- Undertaken after information-level design completion
- Most DBMSs support primary, candidate, secondary, and foreign keys
- To enforce restrictions, DB programmers must include logic in their programs

Survey Form

- Used to collect information from users
- Must contain particular elements
  - Entity information
  - Attribute (column) information
  - Relationships
  - Functional dependencies
  - Processing information

Obtaining Information from Existing Documents

- Existing documents can furnish information about database design
- Identify and list all columns and give them appropriate names
- Identify functional dependencies
- Determine the tables and assign columns

One-to-One Relationship Considerations

- Simply include the primary key of each table as a foreign key in the other table
  - No guarantee that the information will match
- One solution: create a single table
  - Workable, but not the best solution
- Better solution
  - Create separate tables for customers and sales reps
  - Include the primary key of one of them as a foreign key in the other

One-to-One Relationship Considerations (continued)

Solution 1:

Rep

RepNum	LastName	FirstName	CustomerNum
20	Kaiser	Valerie	148
35	Hull	Richard	282
65	Perez	Juan	356

Customer

CustomerNum	CustomerName
148	Al's Appliance and Sport
282	Brookings Direct
356	Ferguson's

Solution 2:

Rep

RepNum	LastName	FirstName
20	Kaiser	Valerie
35	Hull	Richard
65	Perez	Juan

Customer

CustomerNum	CustomerName	RepNum
148	Al's Appliance and Sport	20
282	Brookings Direct	35
356	Ferguson's	65

FIGURE 6-23: One-to-one relationship implemented by including the primary key of one table as the foreign key (and alternate key) in the other table

Many-to-Many Relationship Considerations

- Complex issues arise when more than two entities are related in a many-to-many relationship
- **Many-to-many-to-many relationship**: involves multiple entities
- Deciding between a single many-to-many-to-many relationship and two (or three) many-to-many relationships
  - Crucial issue: independence

Many-to-Many Relationship Considerations (continued)

RepCustomer

RepNum	CustomerNum
20	148
20	282
35	148
65	282
65	356

PartRep

PartNum	RepNum
AT94	20
AT94	65
DR93	20
DR93	35
DR93	65
DW11	35

CustomerPart

CustomerNum	PartNum
148	AT94
148	DR93
148	DW11
282	AT94
282	DR93
356	AT94

FIGURE 6-25: Result obtained by splitting the Sales table into three tables

Many-to-Many Relationship Considerations (continued)

Sales

RepNum	CustomerNum	PartNum
20	148	AT94
20	148	DR93 !!!!
20	282	AT94 !!!!
20	282	DR93
35	148	DR93
35	148	DW11
65	282	AT94
65	282	DR93
65	356	AT94

FIGURE 6-26: Result obtained by joining three tables—the second and third rows are in error!

Nulls and Entity Subtypes

- Null
  - Special value
  - Represents *absence* of a value in a field
  - Used when a value is unknown or inapplicable
- Splitting tables to avoid use of null values
- **Entity subtype**: table that is a subtype of another table

NULLS AND ENTITY SUBTYPES (CONTINUED)

Student

StudentNum	LastName	FirstName	DormNum
1253	Johnson	Ann	3
1662	Anderson	Tom	1
2108	Lewis	Bill	
2546	Davis	Mary	2
2867	Albers	Cathy	2
2992	Matthew	Mark	
3011	Candela	Tim	3
3574	Talen	Sue	

Student

StudentNum	LastName	FirstName
1253	Johnson	Ann
1662	Anderson	Tom
2108	Lewis	Bill
2546	Davis	Mary
2867	Albers	Cathy
2992	Matthew	Mark
3011	Candela	Tim
3574	Talen	Sue

StudentDorm

StudentNum	DormNum
1253	3
1662	1
2546	2
2867	2
3011	3

FIGURE 6-27: Student table split to avoid use of null values

Nulls and Entity Subtypes (continued)

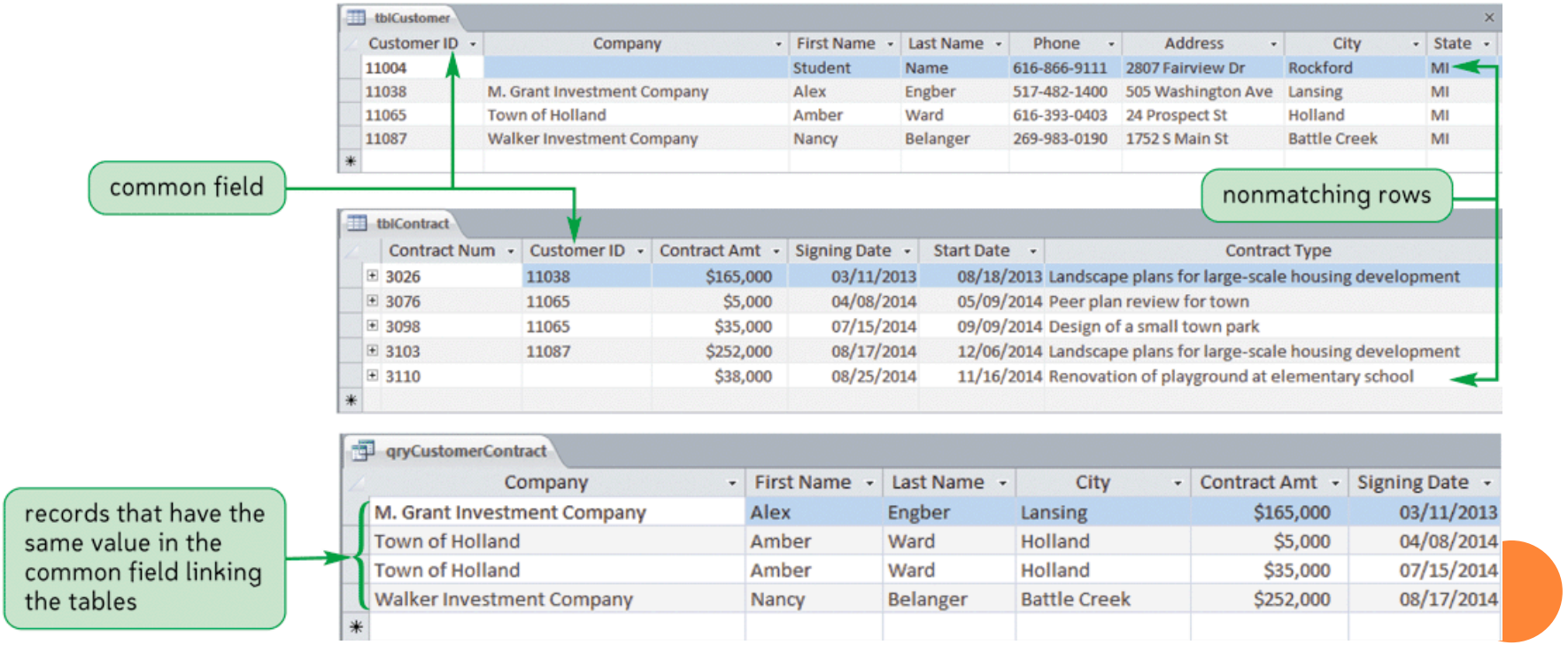
- Subtype called a **category** in IDEF1X terminology
- **Incomplete category**: records that do not fall into the subtype
- **Complete categories**: all records fall into the categories

Avoiding Problems with Third Normal Form When Merging Tables

- When combining third normal form tables, the result might not be in third normal form
- Be cautious when representing user views
- Always attempt to determine whether determinants exist and include them in tables

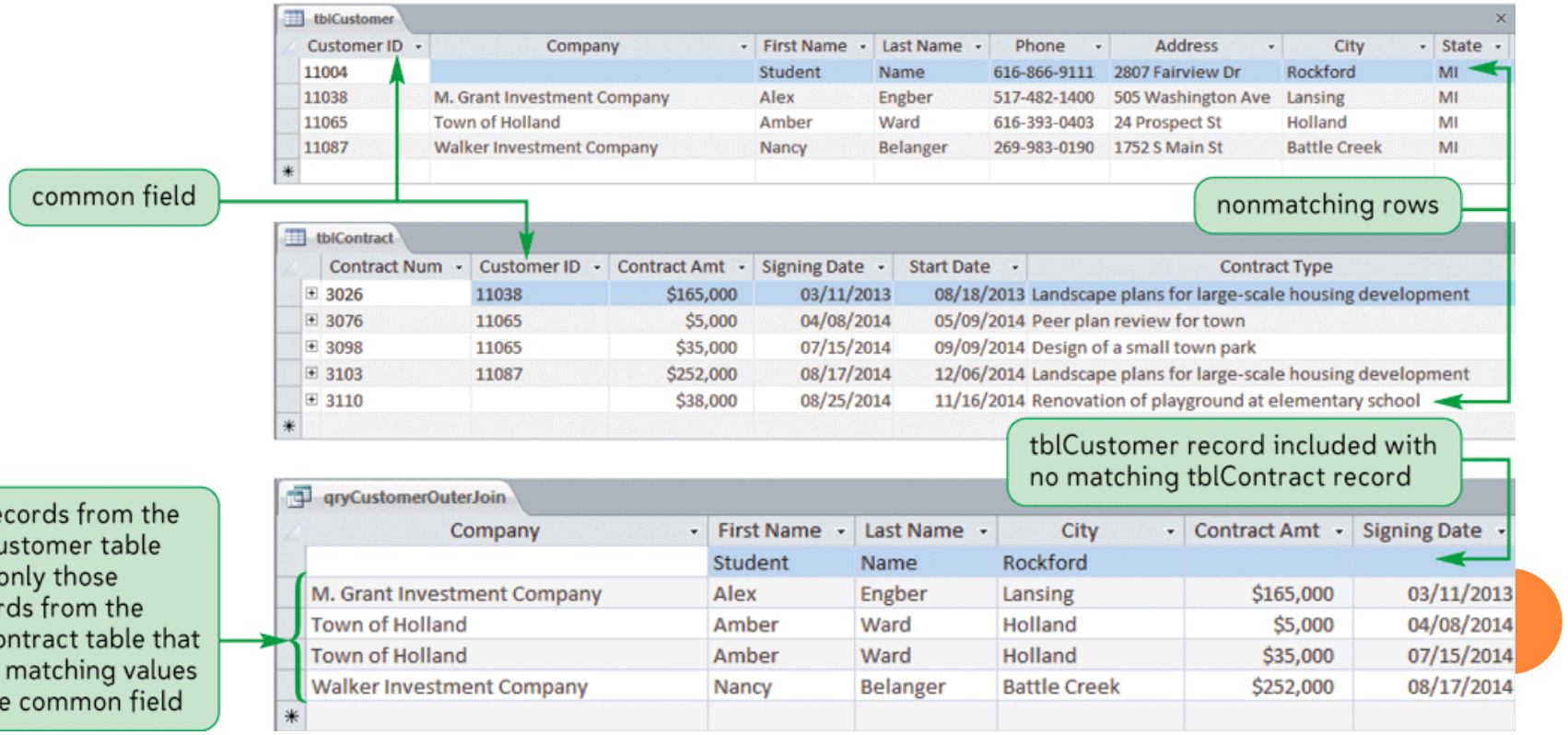
Joining Tables

- An **inner join** is a join in which the DBMS selects records from two tables only when the records have the same value in the common field that links the tables



Joining Tables

- An **outer join** is a join in which the DBMS selects all records from one table and only those records from a second table that have matching common field values



How to create Outer Join Queries

- Watch this handy video for instruction on how to create an Outer Join in Access.

  http://www.youtube.com/watch?v=87b2w-i1i7c
- After viewing the video, create an outer join in Premier Products database between the Customer table and the Order table. Create Customers with no Orders if necessary in order to test this.
- Look at the SQL view of your query to study the SQL commands necessary for this type of query.

The Entity-Relationship Model

- An approach to representing data in a database
- Entities are drawn as rectangles
- Relationships are drawn as diamonds with lines connecting the entities involved in relationships
- **Composite entity**: exists to implement a many-to-many relationship
- **Existence dependency**: existence of one entity depends on the existence of another related entity
- **Weak entity**: depends on another entity for its own existence

The Entity-Relationship Model (continued)

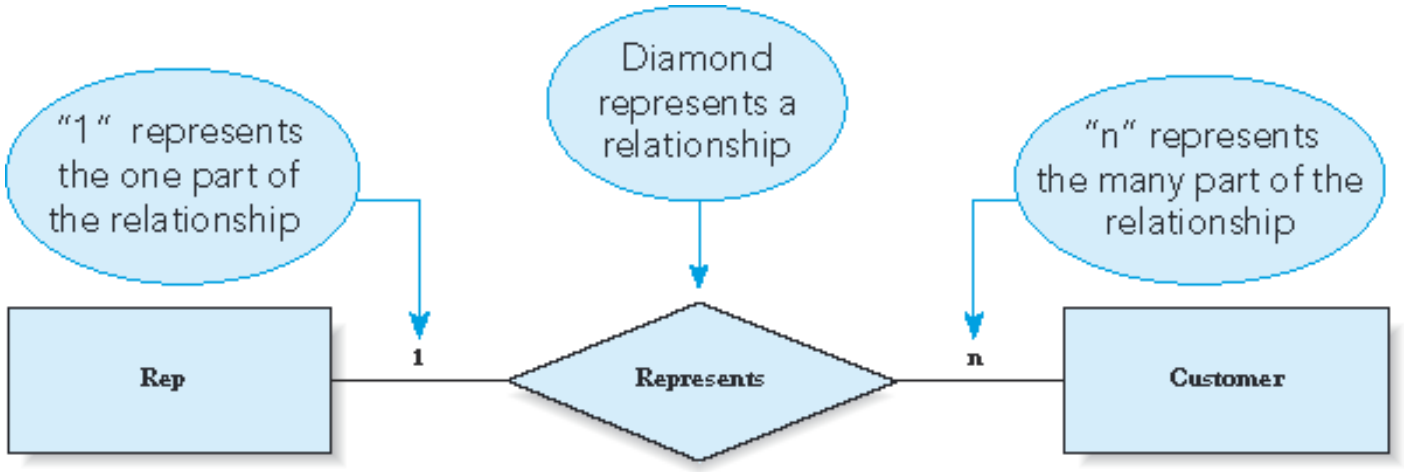


FIGURE 6-34: One-to-many relationship

The Entity-Relationship Model (continued)

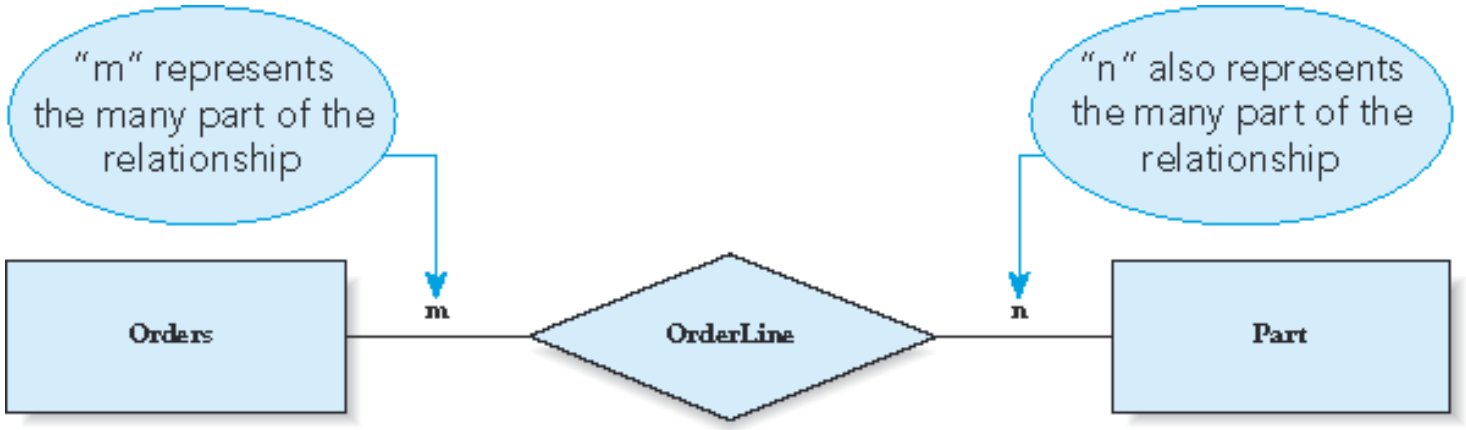


FIGURE 6-35: Many-to-many relationship

The Entity-Relationship Model (continued)

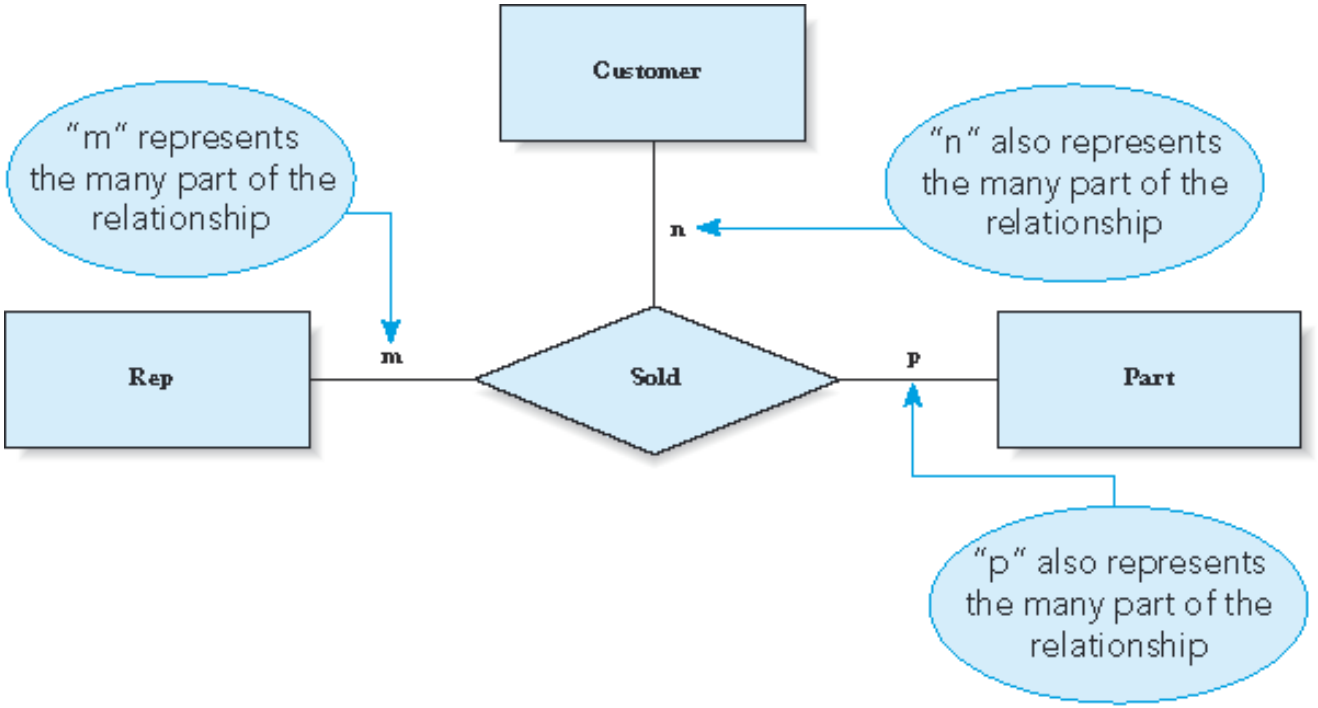


FIGURE 6-36: Many-to-many-to-many relationship

The Entity-Relationship Model (continued)

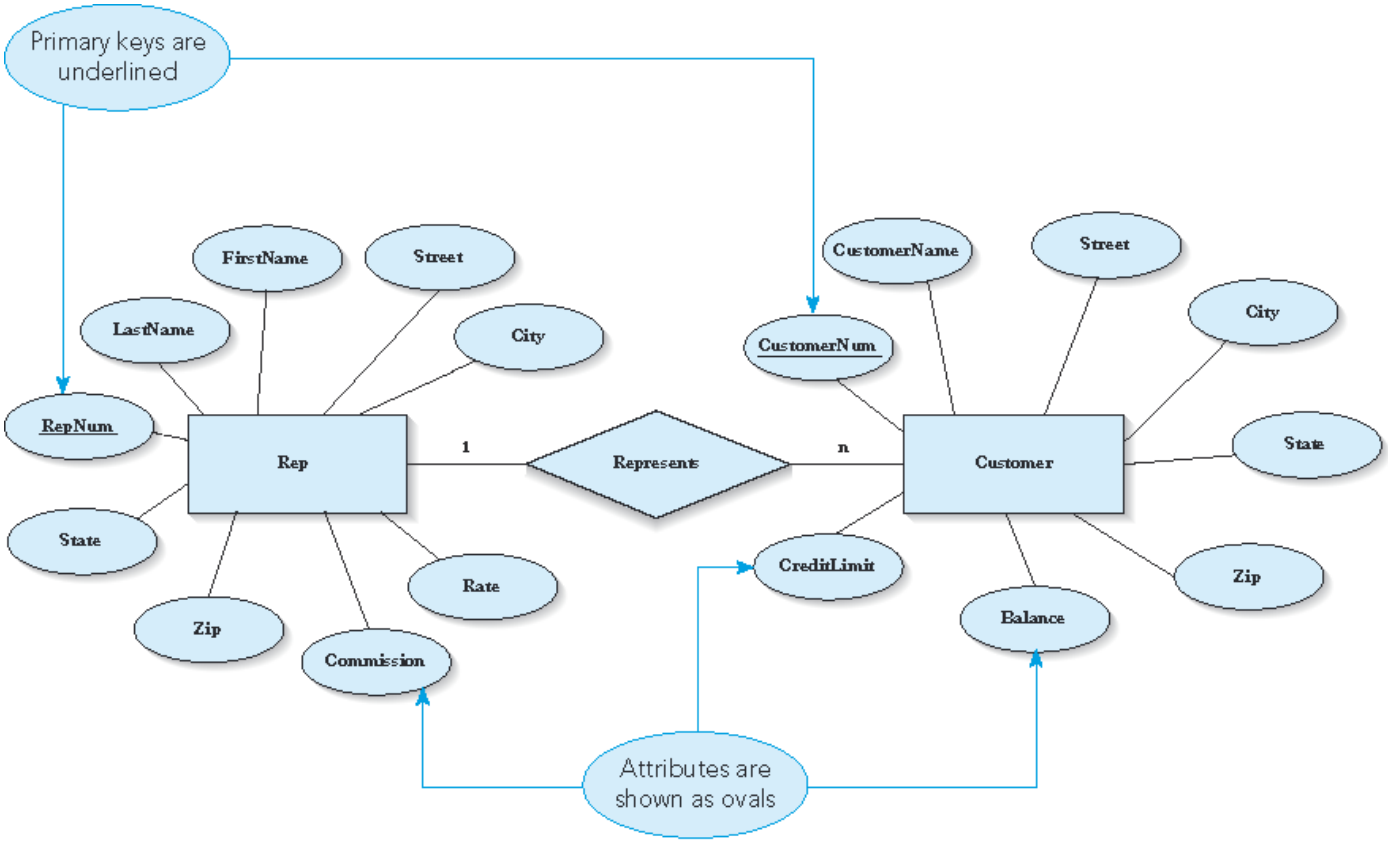


FIGURE 6-37: One-to-many relationship with attributes added

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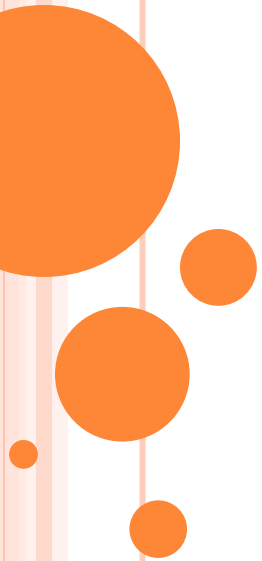
DATABASE MANAGEMENT SYSTEMS



ADDITIONAL MATERIAL
Creating Custom Reports

Designing a Custom Report

- Before you create a custom report, you should first plan the report's contents and appearance
  - Purpose and record source
  - Sort order
  - Grouping fields
  - Balance attractiveness and readability
  - Group related fields
  - Identify field values
  - Include title, page number, and date on every page
  - Identify end of report
  - Use little formatting
  - Use consistent style

Overview of Report Creation

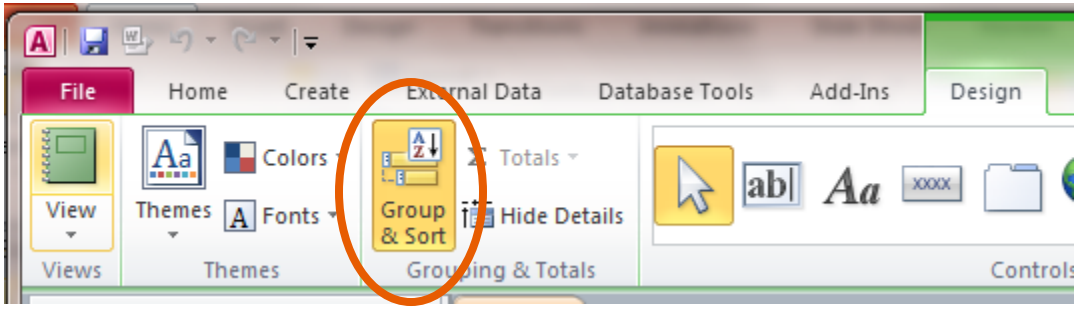
- Watch this video for a quick overview of the process: http://www.youtube.com/watch?v=8qZ4Z7-e6pI
- The creator of this video also has the sample database for download, as well as a written example here: http://www.gcflearnfree.org/access2010/10 AND http://www.gcflearnfree.org/access2010/11
- Try these to learn the basics of report design.

Working with Controls in Design View

- Compared to Layout view, Design view gives you greater control over the placement and sizing of controls, and lets you add and manipulate many more controls, but at the expense of not being able to see live data in the controls to guide you as you make changes

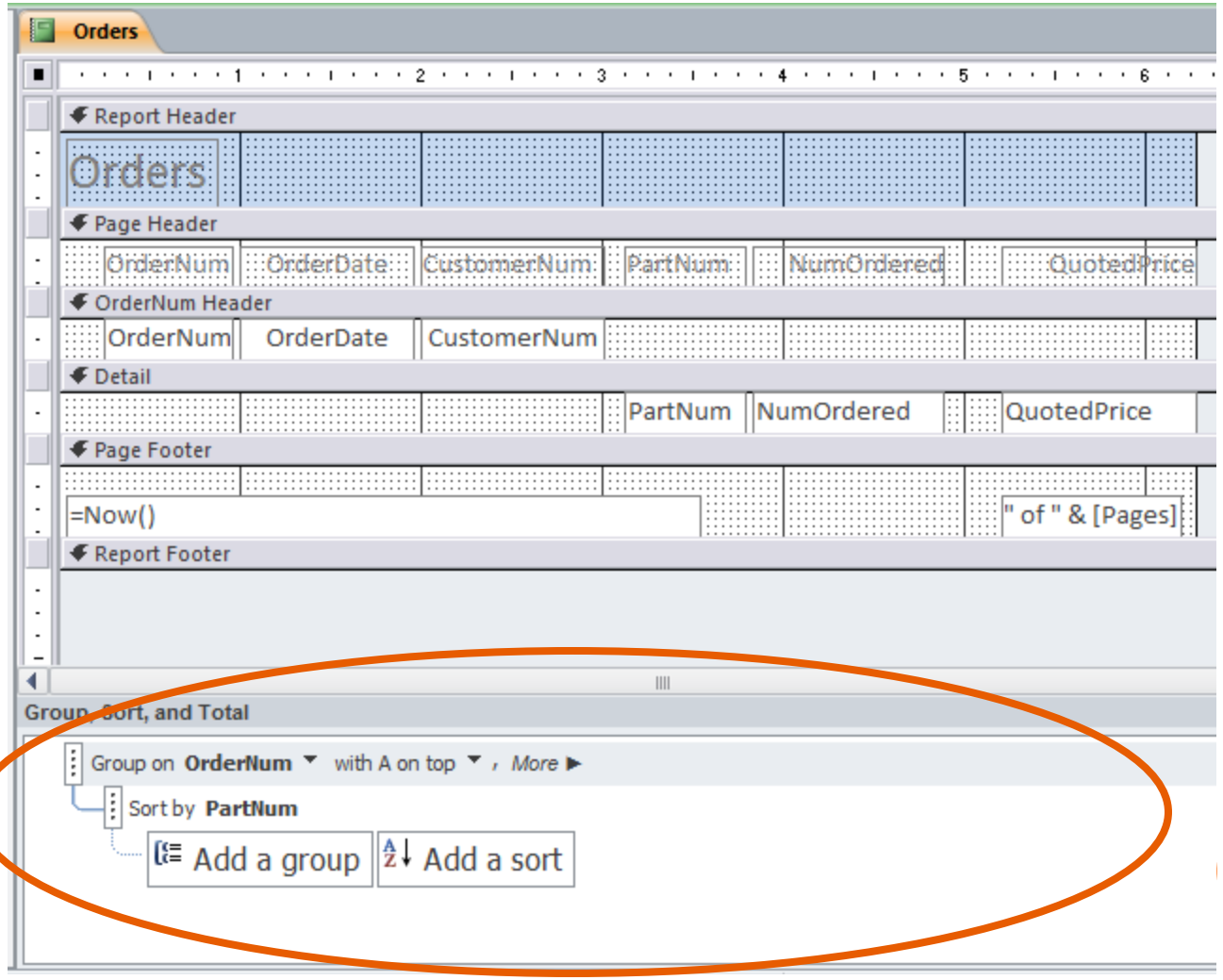
Sorting and Grouping Data in a Report

- Information is often easier to understand when it is divided into groups. For example, a report that groups Sales by SalesRep easily provides sales totals, as well as other statistical information.
- **EXPLORE:** Open the Orders report in PremiereProducts.accdb in Design View.
- On the Design tab – click Group and Sort



Sorting and Grouping Data in a Report

- Review the Group on OrderNum and Sort by PartNum

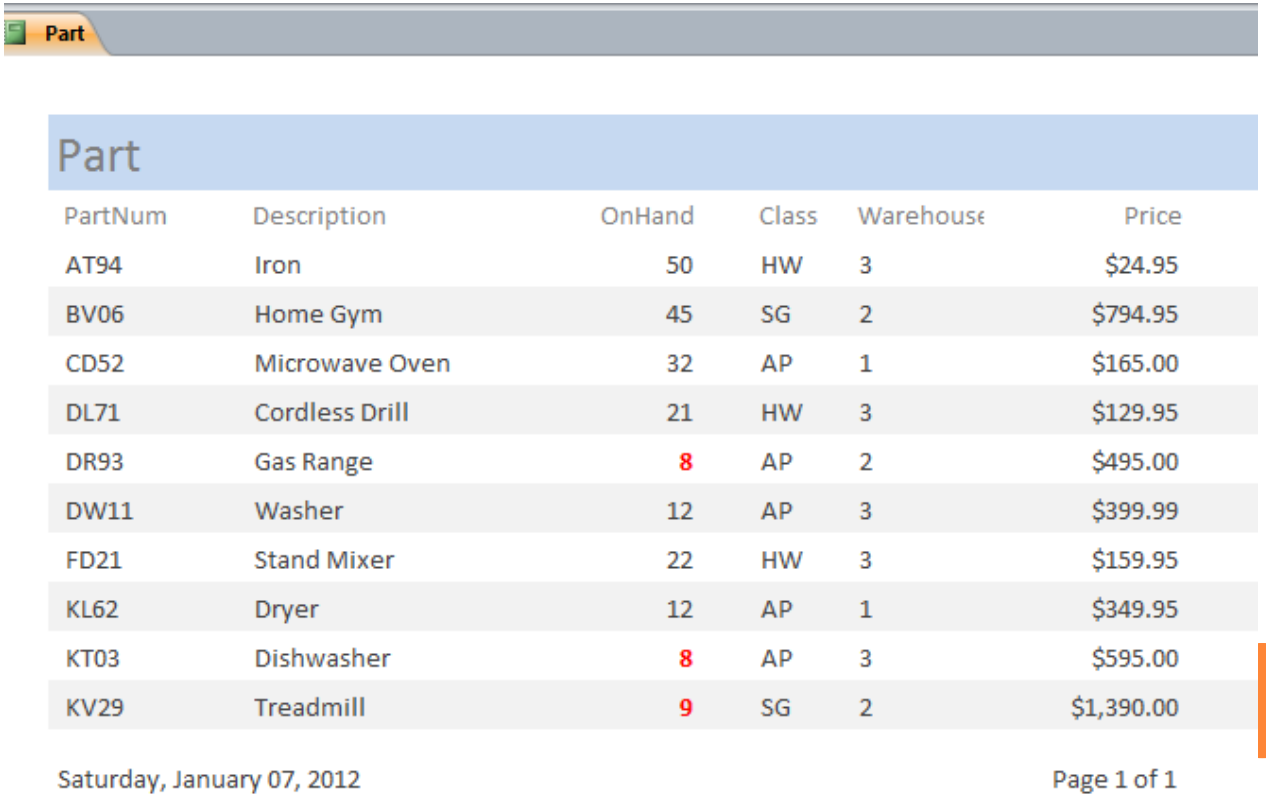


Using Conditional Formatting in a Report (1/2)

- **Conditional formatting** in a report (or form) is special formatting applied to certain field values depending on one or more conditions
- Click the appropriate field value
- In the Control Formatting group on the Format tab, click the **Conditional Formatting** button
- Click the **New Rule** button and set a format for a new rule.
- For example – you could set a format that will make a red, bold font if the number of parts falls below 10 for a given item:

Using Conditional Formatting in a Report (2/2)

- **Try IT:** Set a conditional format that will make a red, bold font if the number of parts falls below 10 for a given item in the Premiere Products database/ Part table:



Part

Part

PartNum	Description	OnHand	Class	Warehouse	Price
AT94	Iron	50	HW	3	$24.95
BV06	Home Gym	45	SG	2	$794.95
CD52	Microwave Oven	32	AP	1	$165.00
DL71	Cordless Drill	21	HW	3	$129.95
DR93	Gas Range	8	AP	2	$495.00
DW11	Washer	12	AP	3	$399.99
FD21	Stand Mixer	22	HW	3	$159.95
KL62	Dryer	12	AP	1	$349.95
KT03	Dishwasher	8	AP	3	$595.00
KV29	Treadmill	9	SG	2	$1,390.00

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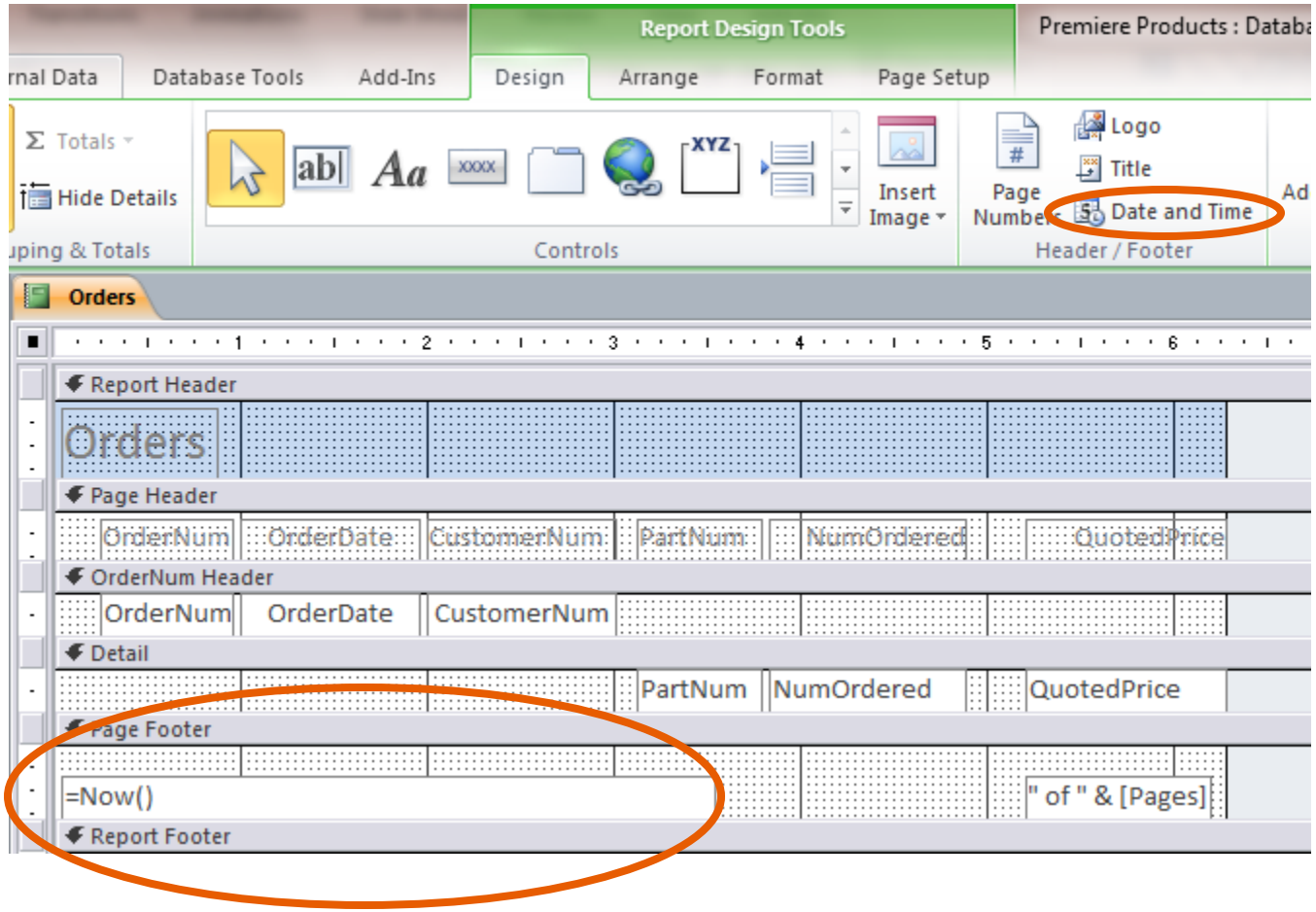
Adding the Date and Time to a Report

- Display the report in Layout or Design view
- In the Header/Footer group on the Design tab in Design view or in Layout view, click the Date and Time button to open the Date and Time dialog box
- To display the date, click the Include Date check box, and then click one of the three date option buttons
- To display the time, click the Include Time check box, and then click one of the three time option buttons
- Click the OK button

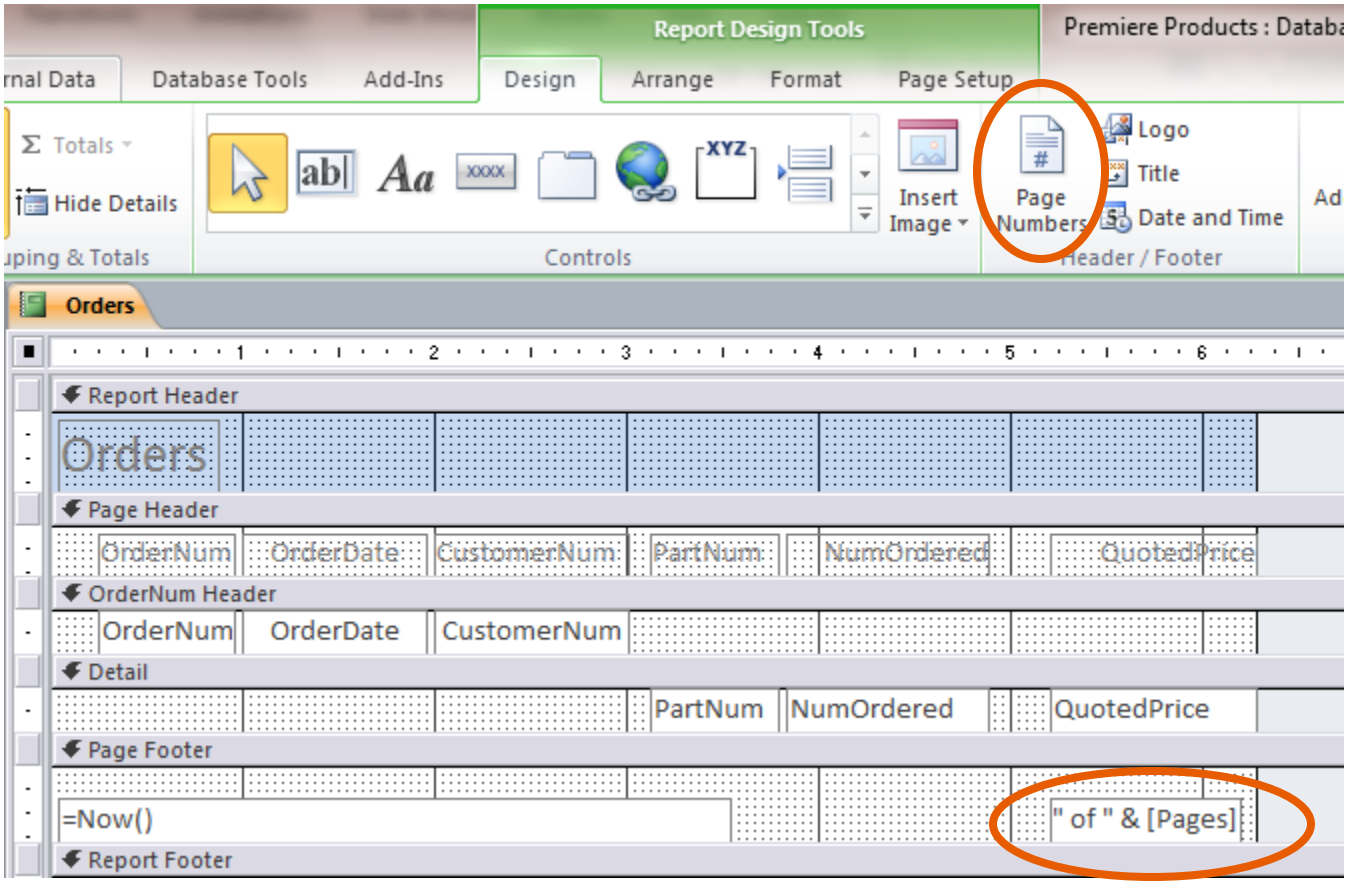
Adding the Date and Time to a Report



Adding Page Numbers to a Report

- Display the report in Layout or Design view
- In the Header/Footer group on the Design tab in Design view or in Layout view, click the Page Numbers button to open the Page Numbers dialog box
- Select the format, position, and alignment options you want
- Select whether you want to display the page number on the first page
- Click the OK button to place the page number expression in the report

Adding Page Numbers to a Report



References

- Additional material for this presentation came from the following sources:
  - Adamski, Joseph and Kathy T. Finnegan, *New Perspectives on Microsoft Access 2010, Comprehensive*, Course Technology, 2010.
  - With permission by Goodwill Community Foundation, Inc. website – www.gclearnfree.org – as accessed 1/7/2012.