Database Management



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A **database** is a collection of an organised logically related data.

Data refers to the raw facts that can be recorded and stored on computer media, such facts could be in any format; for example, text, graphics, and images.

Information is processed data that could be used for further information processing.



A database application is a software package that lets us create, access, manipulate and manage data in a database; i.e. sort, edit, index, update, filter, etc.

Relational Database Management Systems (RDBMS) – is a database collection of tables that are interrelated or interlinked to be treated as a sing unit or entity.



Advantages of data in DBMS

- Data is shared among different users and applications.
- Data exist **permanently** and it can live beyond the scope of the process that created it.
- Valid and correctness since data can be validated before it is saved to the tables.
- Data is **secure** and **protected** from un authorized access using passwords and access codes.



- Non-redundancy Eliminates or decreases duplication of data in the same container.
- Files are saved automatically as they are adjusted.



Disadvantages of DBMS

- They are complex, costly and take much time to develop.
- Organization security may be compromised since a database is used by many people.
- They are difficult to thoroughly test and audit errors.
- Initial expense is high.



- Requires special skills to handle.
- Vulnerability data in the database may be exposed to software and hardware failure, sabotage, theft, destruction, etc.
- Requires Routine Backup which at times is very time consuming.



Examples of database applications

- Microsoft Access,
- FoxPro,
- Paradox,
- •Oracle,
- Structured Query Language (SQL),
- Crystal Reports,
- Claris FileMaker Pro,
- Lotus Approach



Application/Uses of databases

- Storage of data.
- Ensure easy and efficient retrieval of data.
- To keep the data secure.
- To protect data from wear and tear.
- To sort records.
- To generate reports.



Forms of databases

Databases generally can be classified in four forms or types:

- 1. Manual databases,
- 2. Electronic databases
- 3. Flat-file (single-file) databases
- 4. Relational databases.

Features of database software

- Create a database structure to accommodate data.
- Enter data easily, quickly and organize records in different ways i.e. sorted and indexed order.
- Locate specific records i.e. search and find.
- Eliminate duplicate data say by editing e.g. deleting and retyping.



- Create relationships between tables.
- Ask questions about your data and get answers using queries.
- Create data entry forms.
- Create professional good-looking reports.
- Change appearance of information, i.e. perform some formatting etc.



Manual databases

- Manual systems are the traditional filing systems where individuals manually record information and file them in physical paper records, folders and filing cabinets; a filing cabinet is where all related information on a particular subject is kept.
- Examples of manual databases include the post office directory books where information such as subscribers' names and addresses are recorded, contact lists, library cards etc.

Disadvantages of manual databases

- Finding records can be a time-consuming process.
- Files and folders can be easily misplaced if they are not filed properly.
- These databases require large amounts of physical storage space.
- Cross-referencing information between files is difficult.
- Accessing information from another location (e.g. another office) is difficult.
- There is unnecessary duplication of data.



Flat-file Database Systems

- A flat-file system is a computerised filing system where all the data is stored at the same level (root) on a storage medium such as a hard disk or floppy disk.
- It is relatively static and the data is not structurally related; that means the data in the flat file is not linked to any other files, so there is little that can be accomplished with the information other than editing, reading, and storing data.

Disadvantages of flat-file database

- Unnecessary duplicate data since Flat-file systems cannot relate one file to another.
- Flat-file systems offer limited user access.
- It is not possible to request and retrieve data from various files at the same time.
- Retrieving data is slow because users needs to read it line by line to obtain needed information.



Relational Database

- A relationship is the situation that exists between two or more relational database tables when one table has a field (foreign key) that references the primary key of the other table.
- A relational database has more than one table and the tables are linked using keyfields. i.e. each tables shares atleast one field with another table in a "one to one" relationship, or with other tables in a "one to many" or "many to many" relationship.



Advantages of Relational Database

- The relational database is easier to edit, modify and query than other models.
- Use queries in an optimum manner means faster data retrieval and efficient reporting.
- They support different platforms such as Linux, Windows, and Apple Mac.
- Less storage space is required to store large amount of data compared to manual systems.

- Relational databases have excellent security which allows database administrators to implement data access permissions.
- Data being entered can be easily validated, thereby preventing mistakes on entry.
- Searching for specific data is quick and easier than using paper records.

It ensures data security through access controls.

DISADVANTAGES OF DATABASE MANAGEMENT SYSTEMS

- Computer breakdown can cause files to become inaccessible or corrupted.
- It is easy to copy or steal files unless the files are stored and protected carefully.
- Database administration requires training, which may take some time.
- Searching the database can be time consuming in the case of very big databases.

DATABASE CONCEPTS.



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- A database management system (DBMS) is a specialised computer software program that manages databases.
- It controls the organisation, storage, management, and retrieval of data in a database.
- a database file is the entire database.



•a table is a basic/primary unit of a database and contains data on a specific topic, e.g. all the personal information about all the members of a video club. tables are made up of Columns that contain Fields, and Rows that contain Records.

•A field is an area within a record reserved for one specific piece of data, e.g. the address of one video club member. Tables therefore have multiple fields.



A field name describes the nature of the contents of the field, for example name or Date of birth.

A **primary key** is a field, or a collection of fields, whose values uniquely identify each record in a table.

 Data type specifies the way the data is represented on the disk and in RAM. The different data types are described later in the chapter.

A foreign key is a column in one table referring to a primary key in another.

Data is the information that is held in the table fields.

A record is a group of related fields containing information for an individual record. e.g. student and exam marks.



•A field definition/property is the set of attributes that describe a field.

 Query is a database tool used to locate and retrieve information from a database using a set of commands or expressions.



A form is a graphical representation of a table. It allows you to create a more visually pleasing display for data entry.

 Report a tool used to present a selected set of contents from the database in a format that is easy to mentally interpret.



CREATING A DATABASE



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Creating and Saving a Database

- Click Start
- All Programs
- Microsoft Office
- Select Microsoft Office Access
- Choose blank database.
- Browse for save location by clicking folder icon
- Choose location to save database.
- Enter filename of the database
- Click Create button.



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WORKING WITH TABLES



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Creating a Table in Design View





Setting the Primary Key in Design View

- In the Table window in Design view, click in the row for the field you've chosen to be the primary key.
- In the Tools group on the Table Tools Design tab, click the Primary Key button/Icon.



Figure 2-18

Invoice Num field selected as the primary key

8	Home Create External Dat	ta Database Tools	Table Tools Belmont : Database (Access 2007) - Microsoft Access - - × Design 6
View Views	Primary Key Builder Test Validation Rules Tools	Insert Rows Delete Rows Lookup Column Shoet	Primary Key button
»	Table1		x
	Field Name	Data Type	Description
2 A	Field Name Invoice Num	Data Type Text	Description Primary key
	Field Name Invoice Num Contract Num	Data Type Text Text	Description A Primary key Foreign key
	Field Name Invoice Num Contract Num Invoice Amt	Data Type Text Text Currency	Description 4 Primary key Foreign key
	Field Name Invoice Num Contract Num Invoice Amt Invoice Date	Data Type Text Text Currency Date/Time key st	Description Primary key Foreign key Symbol indicates
	Field Name Invoice Num Contract Num Invoice Amt Invoice Date Invoice Paid	Data Type Text Text Currency Date/Time Yes/No the ta	Primary key Foreign key symbol indicates able's primary key



Creating a Table in Datasheet View

Figure 1-11

Table with field names entered

8	Home	Create	Externa	l Data	Database Tools	Table Tools Datasheet	Belmont : Datab	base (Access 2007)	- Micros	oft Access		-	□ X 0
View Views	New Field	Add Existin Fields Fields	g Lookup Column & Columns	'≟ Insert ∜ Delete ■ Rename	Data Type: Format: \$ %	Formatting	Unique Is Required matting	Relationships C Depe Relationship	Dbject endencies ps	five field entered	names		
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Entering Records

	Access	base (Access 2007) - Microsoft A	Table Tools Belmont : Data			• (21 •) =	0 🖪 🤊
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е	Navigation Pane	Relationships Object Dependencies	v v V Unique Dis Required v v v v	Data Type: Text Format: Form	Lookup Column 🗐 Renam	New Add Existing	
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	development	plans for large-scale housing de	3/11/2010 Landscape	\$165,000.00	11038		3026
eld values are	field	on for backyard, residential	2/18/2010 Consultati	\$300.00	11027		3012
omplotoly		plan for backyard, residential	3/1/2010 Schematic	\$1,500.00	11005		3015
ompletely		design for two entrances	4/14/2010 Landscape	\$22,000.00	11043		3022
isible	VISI	review for town	3/1/2010 Peer plan	\$2,250.00	11012		3017
	open space	n of large multifamily housing o	3/22/2010 Renovatio	\$39,000.00	11070		3023
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Figure 1-14

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Saving a Table

- Click the Save button on the Quick Access Toolbar. The Save As dialog box opens.
- In the Table Name text box, type the name for the table.
- Click the OK button



DATA TYPES



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- Text Text or combinations of text and numbers that don't require calculations, such as phone numbers. – Can contain upto 255 characters.
- Memo Lengthy text or combinations of text and numbers - Up to 65,535 characters.
- Number Integers, decimals data that can be used in mathematical calculations.
- Date/Time Date and time values for the dates, years 100 through 9999



Currency – Monetary values. e.g Salary, Fees

 AutoNumber - A unique sequential number or random number assigned by Microsoft Access whenever a new record is added to a table.

 Yes/No - Yes and No values and fields that contain only one of two values (Yes/No, True/False, or On/Off).



- OLE Object Allows user to embed objects like Spreadsheet, Video, Sound, documents and other binary data to a Microsoft Access table.
- Hyperlink Links like web addresses and emails.
- Attachment Allows user to store files in the data base
- Lookup- Allows user to lookup values from another table.



FIELD PROPERTIES



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Field Size: Specifies maximum number of characters to be stored in that field. When used the extra characters will be rejected,

Format: Specifies how data is displayed which may be default or custom. e.g long/short date, scientific, standard number and currency fields.

Input mask. Specifies the pattern or predefined format for data to be entered in that field e.g. (--/--/--) ie dd/mm/yy.



Caption. This is a default label in a form or report e.g. DOB for date of birth, L/name for lastname etc.

Default Value. A value that appears in the field automatically even before you enter anything i.e. it works as a placeholder e.g. MSMN/ _ e.t.c.

Validation rule. Expression that limits the values to be entered in the field. e.g. "F" or "M" for sex, >=10 for age, "married" or "Single" for marital status.

Validation Text. Error message that appears when a value prohibited by the validation rule is entered in a field. e.g. Enter M or F for sex."

Required - Specifies whether or not an entry must be entered in that field i.e. if **yes** you must type an entry but if No, you may proceed without entering anything.

Indexed - It specifies whether or not duplicates should be allowed in a field.

- The **import** process allows you to copy the data from a source without having to open the source file.
- Click External Data on the Ribbon.
- Click the Excel button in the Import group to start the wizard



	Get External I	Data - Excel Spreadsheet d	lialog box	Figure 2-26
Get External Data - Excel Spreadsheet			8 3	
Select the source and dest	nation of the data	click to find the Excel workbook	1	
Specify the source of the data.	you might see a different path here	containing the data you want to import		
Elename: C:\Lisers\Documen	/zt		Łowse	
 Import the source data If the specified table does n with the imported data. Cha Append a copy of the re If the specified table exists to the source data will not b Link to the data source Access will create a table to reflected in the linked table 	into a new table in the current database interest, Access will create it, if the specified t anges made to the source data will not be refle coords to the table: Contract Access will add the records to the table. If the reflected in the database. By creating a linked table. at will maintain a link to the source data in Exco. However, the source data cannot be changed	e. table already exists, Access might overwrite its cted in the database. e table does not exist, Access will create it. Che el. Changes made to the source data in Excel w d from within Access.	contents anges made Il be	
option for adding records to an existing table				
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			Invoi	ce table after impor	ting data f	from Exe	cel
		Table Tools	Belmont : Datab	ase (Access 2007) - Microsoft Access		-	e x
Name Cardo Cita	al Data	Datashast		interviewers			6
Home Create Extern	al Data Database Io	ois Datasheet					
Saved Access Excel SharePoint	Text File	Excel SharePoint	Word Text File Create	Manage Work Synchronize The Balink	d Changes * List Data Lists Data		
Imports Ust 1	Exports	List 4	E-mail	Replies Online	Lists SharePoi	nt	
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All Tables 🔍 🔍	Invoice						×
Contract 🛠	Invoice Num •	Contract Num •	Invoice Date •	Invoice Item	 Invoice Amt - 	Invoice Paid	- A
Contract : Table	2011	3011	03/23/2010	Schematic Plan	\$1,500.00		
Contract List	2012	3011	05/10/2010	Planting Plan	\$2,500.00		
Contract Data	2021	3012	02/25/2010	Consultation	\$300.00		_
Contract Details	2031	3020	04/19/2010	Schematic Plan	\$1,500.00		_
nvolce	2032	3020	08/19/2010	Landscape Planting	\$2,000.00		
Invoice : Table	2033	3020	09/20/2010	Lighting Plan	\$2,000.00		
Invoice : Table	2034	3020	10/20/2010	Permitting	\$1,000.00		
	2041	3015	04/01/2010	Schematic Plan	\$1,500.00		
	2051	3017	04/01/2010	Peer Plan Review	\$2,250.00		
	2061	3026	03/11/2011	Schematic Open Space Plan	\$35,000.00		
	2062	3026	09/12/2011	Permitting	\$10,000.00		
	2063	3026	07/11/2012	Construction Documents	\$70,000.00		
	2064	3026	04/04/2014	Construction Admin. & Observation	\$50,000.00		
	2071	3023	11/22/2010	Schematic Open Space Plan	\$9,000.00		
a sauda ana	2072	3023	07/22/2011	Planting Plan	\$20,000.00		
ecords are	2073	3023	09/21/2012	Construction Observation	\$10,000.00		
lisplayed in order	2081	3025	07/23/2010	Schematic Plan	\$4,000.00		
ov the Invoice	2082	3025	12/20/2010	Construction Documents	\$8,000.00		
hum field values	2083	3025	06/24/2011	Construction Observation	\$3,500.00		
with field values	2091	3027	06/07/2010	Schematic Plan	\$1,250.00		
	2101	3022	07/14/2010	Schematic Plan	\$4,500.00		
	2102	3022	11/15/2010	Construction Documents	\$12,000.00		
	2103	3022	07/14/2011	Construction Observation	\$5,500.00		
	2111	3021	10/12/2010	Schematic Landscape Plan	\$4,500.00		
	2112	3021 table	ontaine	mitting	\$3,000.00		
	Record: H 1 of 176	table c	ontains a		C12 000 00	(1)	

Figure 2-28



WORKING WITH QUERIES



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- A Query is a database object used to retrieve specific data based on a criteria/query.
- The Simple Query Wizard allows you to select records and fields quickly



Updating a Database

• **Updating** a database is the process of adding, modifying, and deleting records in database tables to keep them current and accurate.



Uses of queries

- Display selected fields and records from a table
- Sort records
- Perform calculations
- Generate data for forms, reports, and other queries
- Update data in the tables in a database
- Find and display data from two or more tables



Creating Queries

• Click the **Create** tab on the Ribbon.

 In the Other group on the Create tab, click the Query Design button

		Show Table dialog box	Figure 3-5
list of tables in the database	Show Table	tabs for selecting the source of the query	



Query Design

- The Show Table dialog box lists all the tables in the Belmont database.
- Click **Customer** in the Tables list box, click the **Add** button, and then click the **Close** button.
- Access places the Customer table's field list in the Query window and closes the Show Tables dialog box.



Query Design Window



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Creating and Running a Query



Running a Query

- Click the Save button on the Quick Access toolbar. The Save as dialog box opens.
- Type **Customer E-mail** in the Query Name text box and then press the **Enter** key.
- Access saves the query and displays the name on the tab for the query.



- In addition to using queries to retrieve, sort, and filter data in a database, you can use a query to perform calculations
 - Expression Builder is an Access tool that makes it easy for you to create an expression
- Open the query in Design view
- In the design grid, position the insertion point in the Field text box of the field for which you want to create an expression
- In the Query Setup group on the Query Tools Design tab, click the Builder button
- Use the expression elements and common operators to build the expression, or type the expression directly
- Click the OK button

Creating a New Query That Will Inclue a Calculated Field

- Click the Create tab on the Ribbon and then click the Query Design button in the Other Group.
- Add the Contract and Invoice tables to the Query Window and then close the Show Tables dialog box.
- Add the Contract Num and Contract Amt fields from the Contract field list to columns 1 and 2.
- Add Invoice Item, Invoice Paid, and Invoice Amt fields from the Invoice table to columns 3 to 5.

In the Invoice Paid Criteria text box, enter No,

- Click the Invoice Paid Show check box and remove the check.
- Save the query with the name Unpaid Invoices With Late Fees.



- Click the blank Field text box to the right of the Invoice Amt field. The calculated field will be placed in this box.
- In the Query Setup group on the Query Tools Design tab, click the Building button. Access opens the Expression Builder dialog box.
- Enter the **Invoice Amt** field in the expression either by double-clicking or clicking once and then clicking the **Paste** button.
- Click the * button in the row of common operators and then enter **.03**.



- You have now completed the expression. It should read Invoice Amt * .03, as shown on the next slide.
- Click the OK button to close the Expression Builder dialog box and add the expression in the design grid of the Field text box.
- Press the Home key to position the insertion point to the left of the expression.
- Enter "Late Fee":
- Run the query. Access displays the query datasheet, which includes the calculated field with the name "Late Fee."



Completed expression for the calculated field



Figure 3-33

and so on.



Formatting a Calculated Field

- Switch to Design view.
- Right-click the Late Fee calculated field in the design grid to open the shortcut menu and then click on Properties in the menu.
- In the Property Sheet for the calculated field, as shown on the next slide:
 - Click the right side of the Format text box to display a list of formats and then click on Currency.
 - Click the right side of the Decimal Places text box and then click on 2.
- Close the Property Sheet and run the query. The amounts in the calculated field are displayed with dollar signs and two decimal places.
- Save the query and then close it.

Formatting a Calculated Field

 You can specify a particular format for a calculated field, just as you can for any field, by modifying its properties

angure 5-55		Invoices With Late antrot Contract Num Customer ID Contract Ant Signing Date Contract Type		revolce Num Involce Num Involce Date Involce Ant Involce Paid	u	Propert Sheet displaye	y ed	Property Sheet Selection type: Field Properties General Lookup Description Format Decimal Pisces Deput Mask Caption Smet Tags
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	Field: Table: Sort:	Contract Num Contract	Contract Ant Contract	Invoice item Invoice	Invoice Paid Invoice	Invoice Amt	Late Fee: (Im	
	Show: Criteria: or:				No		¥	

Creating a Simple Query



First Simple Query Wizard dialog box





WORKING WITH FORMS



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- A form is an object you use to enter, edit, and view records in a database
- You can design your own forms, use the Form Wizard, or use the **Form tool** to create a simple form with one mouse click.

				Form created b	by the Form tool	Figure 1-24
	Contract Cont	new tak	o for form		×	
•	Contract Num:	3011			1	
	Customer ID:	11001	field values for first			
	Contract Amt: Signing Date:	\$4,000.00 2/9/2010	record displayed]	
	Contract Type:	Residential landscape plan				
	form display	and				
	in Layout vie	ew record 1 of 65 total records				
Re yout V	cord: I4 4 1 of 65	▶ ▶ ▶ ▶ ₩ 🕅 🔆 No Filter Search				

Uses of forms

- Used to view and enter data for one record at a time.
- Viewing records. The Filter tool is used to view records that match a given criteria.
- Sorting records. This means arranging the records in a database either alphabetically, numerically.
- Performing calculations on table data.



WORKING WITH REPORTS



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- A **report** is a formatted printout (or screen display) of the contents of one or more tables in a database.
- A report can be generated from a query, filter or table.
- The report can be formatted in a wide variety of ways to suite the desired purpose


Creating a Simple Report



... continued

Figure 1-26	Firs	t page of the	e report in Pr	int Previ	ew				
		Print Preview	Image: Selent and Selent an						
	Print Print	Size Portrait Landsca	pe Margins Page Layout	ins Dnly Page Setup	om One Page Zoom	More Pages + All	th Excel SharePoint List Data	Close Print Preview Iose Preview	
	» 🗉	Contract Contract						×	
			Contract				Thursday, August 25, 2 11:32:11	011 AM	
		Contract Num		Customer ID	Contract Amt	Signing Date	Contract Type		
		3077		11058	\$0,500.00	5/17/2011	senior center	scroll box	
		3078		11020	\$13,750.00	4/25/2011	Landscape design for business property		
VOUR	n Pane	3080		11030	\$22,800.00	4/14/2011	Landscape design and site plan for restaurant site		
records	avigatio	3081		11071	\$21,000.00	5/10/2011	Landscape design for business property		
sorted in a	ž	3082		11060	\$5,000.00	6/1/2011	Residential landscape plan		
different		3085		11068	\$52,500.00	6/23/2011	Open space & playground design f public housing site	ior	
order		3086		11054	\$17,250.00	7/11/2011	Landscape design for commercial property		
page		3090	Current	11079	\$25,500.00	6/14/2011	Renovation of playground at elementary school		
navigation		3093	rage DOX	11085	\$5,000.00	7/25/2011	Residential landscape plan		
Duttons		3094		11015	\$5,000.00	7/26/2011	Front walk and drive design,	-	
	Page		K No Filter						
	Ready								

... continued

Figure 1-27

						Viewing the last p	age of t	ne report
	u) - (u -) =	Belmont : Da	atabase (Access 2	007) - Microso	ft Access		_ = ×
	Print Preview							
Print Print	Size Portra	A Show Margins Margins Print Data Only Columns Page Layout	Page Setup	One Two Page Pages Zoom	More Pages + All	sh Excel SharePoint List Data	Close Print Preview Close Preview	
	Contract	Contract						×
	3068		11049	\$4,500.00	2/7/2011	Front walk and drive design, residential		ſ
	3069		11030	\$15,750.00	2/24/2011	Landscape design for restaurant	site	
	3070		11079	\$35,000.00	3/3/2011	Renovation of playground at elementary school		
	3071		11059	\$37,000.00	3/11/2011	Landscape design for affordable housing site	8	
	3072		11059	\$46,000.00	3/11/2011	Landscape design for affordable housing site		
Lane	3073		11072	\$205,000.00	5/5/2011	Landscape plans for large-scale housing development		
dano	3075		11067	\$16,500.00	4/8/2011	Design of a playground for a day center	care	
	3076		11065	\$5,000.00	4/8/2011	Peer plan review for town		
				\$1,762,575.00				=
				1	tot cal Co	al automatically Iculated for Intract Amt field		
		report contains total of 3 pages	a	► Page 3 of 3				
Pag	e: H 4 3	🕨 🖂 🖄 No Filter 🛛 🕯						*



Printing a Report

- Open the report in any view, or select the report in the Navigation Pane.
- Click the Office Button, point to Print, and then click Quick Print

Or

 Click the Office Button, point to Print, and then click Print button.

Foreign Key

• This is a field that references a column, most often the primary key of another table.