

## Database

### Database Management System (DBMS)

#### Introduction to databases

A database is a collection of structured and related data items organized so as to provide a consistent and controlled access to items. To create and manage databases, we use Database management System (DBMS) software. This software facilitates the creation, organization and maintenance of databases.

Examples of database management software

- Microsoft office Access (Ms Access)
- Microsoft SQL Server
- Oracle
- FoxPro
- DbaseIV
- Lotus Approach
- MySQL. Etc.

Functions of database management software

- ☞ Allow the user to add or delete records
- ☞ Update or modify existing records
- ☞ Organize data for easy access, retrieval and manipulation of records
- ☞ Act as an interface between a database and other application programs
- ☞ Ensure security for the data in the database by safeguarding it against unauthorized access and corruption (damage).
- ☞ Keep statistics of data items in a database.

#### Database model

Databases can be classified according to the method used to organize data. The main database models are:

1. Flat file
2. Hierarchical
3. Network
4. Relational

NB. The current database model trend is towards new models namely object relational and object oriented models.

#### Database objects

These features include database objects e.g.

- ✎ Tables
- ✎ Queries
- ✎ Forms
- ✎ Reports
- ✎ Macros and Modules
- ✎ Computer programming language.

### **Tables/file structure**

This is a database structure that is used to hold related records.

Tables are organized in rows and columns with each row representing a record while each column represents common fields in each record.

STUDENT ID	FIRST NAME	LAST NAME	ADDRESS
ST001	Namayanja	Miriam	510Masaka
ST002	Mutebi	Gilbert	657Mutungo

### **Queries**

A query is a statement used to extract, change, analyze or request for specific data from one or more tables. Query is a question posed to a database using special language called SQL.

### **Form/input screen**

A form is a graphical interface that resembles an ordinary paper form. Forms enable the user to view and enter data into a table.

### **Reports**

Most database systems provide user with a tool for generating reports from underlying tables or queries. It is the report generator that provides the user with a means to specify the output layout and what is to be output or printed on a report.

### **Macros**

In most DBMS software, it is possible to automate frequently performed procedures or task using database component known as a macro. For example if you frequently use a particular form when you start a database program, you need to create a macro that automates the opening of the form.

### **Programmable model**

When a database becomes more complex, you may need a more powerful tool than the macros to automate your database operations further. Ms Access comes with a language called *Visual Basic* included as a *module* in the software.

### **Data organization in database**

One of the functions of a database system is to organize data for easy access, retrieval and manipulation. Data is organized from the simplest form called a field to a very complex structure called a database.

### **Fields**

A field is a character or a logical combination of characters that represent data item. For example, in a class list, the student name is a field.

### **Record**

A record is a collection of related fields that represent a single entity. An example of a record is the student report card that may contain the student's name, admission number, class, total marks and average grade

### **Table**

A table is a collection of related records. For example, the student's file in a school database contains the details of all the students in the school.

### **Database**

This is the highest in data organization hierarchy that holds all related files or tables. For example, a school database may contain students and staff tables/files.

### **Description of field data types**

The type of data to be used in a database must be clearly defined for the purpose of manipulation and storage. For example, if the field is to be used for calculation, it must be defined as a number.

The data types allowed in Ms Access include:

☞ Text, Number, Memo, Date/Time, Currency, AutoNumber, Yes/No, OLE Object

### **Text**

This type includes alphabetic letters, numbers, spaces and punctuation. Text can be used for fields that do not require calculations such as names, places, identification numbers etc. This type of field accommodates a maximum of 255 characters.

### **Number**

These are fields made up of numeric numbers 0 to 9 that are to be manipulated mathematically. Numbers are used to carry out calculations in queries and form.

### **Memo**

This is a field made up of alphanumeric (both alphabetic and numeric) data. Instead of using Text, use this data type if you need to enter several paragraphs of text as it accommodates a maximum of 32000 characters.

### **Time/date**

Used to identify a field as either a date or time. This is because date/time values can be manipulated mathematically in a database. For example, you can calculate the age of a person from the date of birth to the current age.

### **Currency**

Use to identify numeric values that have decimals or fractions. Use this data type especially when dealing with monetary values such as fees balance, amount sold, etc.

### **Auto Number**

This is a numeric value used if you wish MS Access to automatically increase the values in a field. For example, when entering a list of forty students and you have a field labeled Stud Number; the numbers will increase by one every time you enter a new record.

### **Yes/No**

This is a logical field where an entry is either yes or no, true or false, For example, a field may require you to answer whether you are male or female.

### **OLE Object**

OLE stands for Object linking and Embedding. This type of field is mostly used with graphical user interface applications for inserting graphical objects such as pictures, drawings, charts etc.

### **Field properties**

As you create more and more complex tables, you will find a need to use field properties to specify find details related to fields and table entries expected. Field properties depend on the type of field selected.

### **Field size**

Field size property allows the user to set the number of characters in a field instead of the default 50. For numeric fields we use properties such as integer, long integer, Byte, Single and Double.

### **Format**

Determine how information appears on the screen when printed. For example, you can format a number to scientific, currency, percentage or general format. For date type dd/mm/yyyy long date d, dd, for date m , mmmm for month y, yyyy for year

### **Decimal places**

For number and currency fields, you can specify the number of decimal places.

### **Input mask**

Input mask automatically formats the field entry into a specified format. This property is mostly used to format phone and address entries.

### **Caption**

This is more descriptive name for a field to be used in a table or a form display. For example, the caption for StudName Could be Student Name.

### **Default value**

This is a value that appears automatically in the datasheet or form if nothing is entered by the user to change it. For example, =Date () automatically displays the current date in a date field.

### **Validation rule**

Logical expression that restricts the values to be entered in a field. For example, if you want to restrict marks entered in a field to values between zero and a hundred, type  $\geq 0$  and  $\leq 100$ .

### **Validation text**

This is a message that appears once the validation rule is violated. For example, you may create a validation text for the above validation rule to display "Enter a number between 0 and 100" whenever the user enters a value outside this range.

### **Required**

Determines if an entry must be made in the field before you proceed to the next field or record. For example, if a primary key is required, you must enter it before you proceed.

### **Allow Zero length**

This allows the user to proceed without making any entry in the field set as Zero length.

### **Indexed**

An indexed facilitates the organization of records for easy search. A primary key is an example of an index set to No duplicates.

### **Primary key and indexes**

An **index** is a key(s) used to speed up searching and sorting records in a table, while a primary key is an index that uniquely identifies each record stored in the table.

**A primary key** is an index that uniquely identifies each record stored in the table.

A primary key prevents the user from making null or double entries into a table. Access uses the primary key to order records, and control redundancy. Once a field is set as primary key, the datasheet is automatically indexed or sorted using the primary key.

### **Specifying search criteria**

In order to search for a particular set of records, you have to enter a conditional statement in the criteria row. For example, if I want a query to display *Masaka* only or employees who earn more than 5,000. Type in criteria row, ="Masaka", >5000

To define criteria use either relational or logical operators. Less than (<), greater than (>), less than or equal to (<=), not equal to (<>) and equal to (=). Logical operators include AND, OR and NOT  
Type: on criteria row e.g. >4000 AND <6000 for values between 4000 and 6000

Use OR if you wish to get one or Two value.

Jinja OR Busia

Also use NOT to display exceptional record e.g. NOT 6000

### **Wildcard**

Wildcards are special symbols (asterisk) and question mark use in other characters (J\*).

Use Like and wildcard, in criteria type:

Like "J\*" for dates Like \*/\*/1993

Wild card display all names with letter J and years in 1993

Creating a calculated field

Calculations can be performed in queries and Forms. In the field name type an expression

Amount: [Quantity]\*[Unit Price]

Or Use a Builder

For dates specify in search criteria and type

>#1/1/2009# AND <#31/12/2013#

Click the Run



### **Creating a database using Microsoft office access**

Starting Microsoft Access

1. Click start, point to All programs, Microsoft office, then Click Microsoft office access 2007
2. On the New blank database, click database
3. Select the location where the database will be created, type the database name then click Create.
4. Click view, then design view to create table object. Save table then proceed to design.

### **Sample Practical Questions on Microsoft Access**

#### **Extract UNEB UACE 2013**

#### **Questions 1**

The table below shows the medical records of certain Clinic.

PID	F name	District	DoB	Diagnosis	Treat fee
P02	Omondi	Busia	03/02/66	Malaria	10000
P04	Katiba	Kampala	06/09/77	Typhiod	100000
P05	Waiswa	Busia	03/05/81	Tuberculosis	20000
P06	Nambi	Busia	02/08/89	Dysentry	120000
P09	Lumu	Kampala	04/05/90	Malaria	30000
P11	Nafula	Busia	05/11/89	Tuberculosis	20000
P15	Waiswa	Jinja	10/11/78	Malaria	60000

- (a) Create a database called **Medical details**. (01 mark)
- (b) Design a table with appropriate data types in design view called **Patients**. (04 marks)
- (c) Enter the given data in the table. (02 marks)
- (d) Create a query to display all the details of patients who come from either Jinja or Busia. Save it as **Eastern patients**. (02 marks)
- (e) Create a query to display all the details of the patients who were **not** diagnosed with malaria. Save it as **No Malaria**. (02 marks)
- (f) If the Government pays 40% of the treatment fee for all patients, create a query to calculate discounted fee. Put only **F name, DoB, Diagnosis** and **Treat fee** on the display. Save it as **Discounted fee**. (03 marks)
- (g) Create a report to display the information in the discounted fee query. (03 marks)
- (h) Create a form from discounted fee query showing all details and save it as **Patients' form**. (02 marks)
- (i) Print your work. (01 mark)

### QUESTION 2 Paper 3

The table below represents Kagali Secondary School students' data.

- (a) Create a database and save it as Kagali database

STUDENT NUMBER	NAME	SEX	AGE	CLASS	HOME DISTRICT
K0067	Babirye	F	18	S.5	Iganga
K0078	Najjuka	F	19	S.3	Masaka

K0045	Aronda	M	20	S.4	Mbale
K0043	Nassuna	F	25	S.6	Arua
K0140	Sempa	M	17	S.2	Mityana
K0134	Mulira	M	45	S.6	Zirobwe

(01 mark)

(b) Create a table to capture the given information with appropriate data types.

(03 marks)

(c) Enter the data in the table.

(02 marks)

(d) Generate a form to return the records of the following fields. **STUDENT NUMBER, NAME, AGE and HOME DISTRICT**. Save it as **Students' form**.

(02

marks)

(e) In the form,

(i) Insert any clip art or picture from the library to appear as a logo.

(02 marks)

(ii) Include the title as KAGALI SECONDARY SCHOOL with font size 20.

(iii) Indicate the date and time it has been created.

(01 mark)

(f) Use a query to filter out student(s):

(i) from Masaka district. Save it as **Masaka**.

(01 mark)

(ii) With the age above 18. Save it as Age.

(02 marks)

(g) Generate a report from the table. Save it as **Students' report**.

(02 marks)

(h) Add your name and personal number as a footer on your report.

(01 mark)

(i) Print your work.

(01 mark)

### QUESTION 3 Paper 3

The table below gives information about a small home business in Kampala. Study the tables carefully to answer their related questions.

Table 1: Activity Table

Activity ID	Qty Bought	Activity Date	Price	Client ID	Prod ID	Total Amount
T1120	500	20-01-13	200	C2245	P3200	
T1121	325	21-01-13	400	C2241	P3201	
T1122	425	22-01-13	450	C2244	P3202	
T1123	150.	23-01-13	120	C2243	P3203	
T1124	85	24-01-13	250	C2242	P3204	



T1125	450	25-01-13	800	C2240	P3205	
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Table 2: Clients Table.

Client ID	Client Name	Gender	Client Phone	Client Location
C2240	Lutokomoi	Male	+254 400 000	Nakapiripirt
C2241	Byaruhanga	Male	+254 100000	Gulu
C2242	Barigye	Female	+254 200000	Mubende
C2243	Musungu	Female	+254 500000	Arua
C2244	Oitangol	Male	+254 300 000	Luwero
C2245	Bamulanzeki	Female	+254 700 000	Nakasongola

**You are required to:**

Create a database called '**Clients**' and use it for the following activities (02 marks)

- (i) Create the activity table with appropriate primary key and data types. (05 marks)
- (ii) Create the client's table with appropriate design. Use the lookup wizard for the gender field. (05 marks)
- (iii) Create a one-to-one relationship between the client's table and activities table (01 mark)
- (iv) Create a query for all those clients whose locations begin with 'N'. The query should have the following fields; Client Names, client phone, Client Location and Qty Bought. Name it '**Naka Query**' NB: (Total Amount is a product of "**Price**" and "**QtyBought**") (01 mark)
- (v) Create a calculated query to return the total amount value in the activity table. Save it as "Activity **Calc Query**". (02marks)
- (vi) Create another query to pick out all those activities that took place after 22<sup>nd</sup> January 2013. Save it as "**Late comers**". (02 marks)
- (vii) Create a report of the calc. query, **and** save it as "**Activity report**" (02 marks)