Databases

A database is a large collection of data organised in such a way that allows it to be accessed easily by the user in various ways. Therefore, a database makes it easier for the user to search for particular information from a large amount of data. A well designed database should follow certain principles such as that the same data is stored only once and that data should take the minimum amount of storage space.

Data stored in a database should be about one topic. A telephone directory is an example of a database as it holds information about persons and their telephone numbers. A school database contains data related to a school such as data on students, teachers and subjects taught.

Manual or Electronic Database

A database can be stored on paper and therefore all operations are done manually. For example, a printed telephone directory is a manual database. However, an electronic database, where a database is created and accessed through a computer, can offer many advantages over a manual database.

In an electronic database:

- One can store large amounts of data in less space. It becomes very difficult to organise large amounts of data manually.

- Particular records can be located more quickly. One can still search for a particular record on a manual database but a computer can do the same job in less time.

- Records can be located using different information. For example, to find a telephone number of a particular person on a manual telephone directory one has to know the surname. Otherwise it will be an almost impossible task. However, an electronic database can still locate a record using other information such as the address of the person.

- It is easier to update data. Sometimes one has to add new records, delete records or edit current records in a database. Doing this task manually requires a lot of work as tables have to be rewritten and reorganised. An electronic database makes this task very simple.

- Records can be sorted in various ways using different fields.

- Reports, that can be printed, can be produced easily. Sometimes a database user would need to present and print information in a particular way. An electronic database makes this task simple by producing professionally looking reports.

Database Management System (DBMS)

A database is a very complex thing and can be very difficult to create and use. To eliminate this problem, Database Management Systems are used. A DBMS is a software application that helps someone to create and maintain a database. More importantly, it helps a non-professional user to

access the information in a database through a simple menu but it also hides the details of how the data is actually stored.

Examples of DBMS are MS Access, Oracle, FoxPro and dBase.

Important terms related to a database

In a database, data is stored in table format. The table below contains the data on students as part of a school database.

Record: All the information on one of the subjects in the table (e.g. one student).

Field: One property common to all the subjects (one column of the table).

Data Item: One piece of information found in a record.

Primary Key Field: A field that uniquely identifies a record from another. All the data in this field is different for each record.

Updating a Database

Once data is entered in a database it will be updated, this is changed as required, from time to time. There are many ways how a database could be updated; the user may need to *insert (append)* new records, *delete* unwanted records or *change (edit)* items and fields.

Data Types

The type of data in certain fields is different from the type of data contained in other fields. For example, while the *Student No* field contains numbers, the *Name* field contains characters and the DOB field contains a date.

Therefore, when designing a database table, one has to choose the appropriate data type for each field in the database. The data types that can be used are:

Text	Accepts any character from the keyboard (letters, numbers or symbols) up to 255 characters, such as last name or a street address.
Memo	Accepts an almost unlimited amount of text. Used mainly for long paragraphs.
Number	Accepts numbers only. No letters or symbols can be entered.
Date/Time	Accepts a date or time entry.
Currency	Accepts entries that have to do with money.
Autonumber	This is not entered by the user. The database itself automatically gives a number to each new record added to the database. The number given is incremental.
Rich Text	Text or combinations of text and numbers that can be formatted using colour and font controls.
Attachment	Attached images, spreadsheet files, documents, charts, and other types of supported files to the records in your database, similar to attaching files to e-mail messages.
Hyperlink	A website address.
Yes/No	Accepts only one of two values such as 'Yes' or 'No'.
OLE Object	Inserting objects (such as pictures) into the database as data items. Short for Object Linking and Embedding.

MS Access Database Objects

When using MS Access to create a database, one is given the required tools to create and maintain the database. As already stated, Tables are very important objects in a database but other objects, such as Queries, Forms and Reports, are required to organise and access the data in the database.

Tables:	The most important objects as they hold all the data in the database.
Queries:	These are used to select particular records from the database. The records selected have to satisfy a certain condition or conditions. A Simple Query is a query that selects records that satisfy one condition while a Compound Query selects records that satisfy more than one condition.
Forms:	These give an alternative way for viewing and entering records. Forms give the possibility to view the records in a more attractive way, to view the records one by one or to enter new records in a different way from a table.
Reports:	These are used to represent information from the database in a printed format. One is allowed to organise and decorate a report as required.

Fixed or Variable Length Records

A database either uses fixed length records or variable length records. Both these type of records have their advantages and disadvantages.

Fixed Length Records: A database where all the records are of the same length is said to have fixed length records. A database that uses such records access the data faster as the computer knows where each record starts. However, those databases using fixed length records are usually larger and therefore need more storage space.

Variable Length Records: In these type of records, the fields can be of different lengths in each record. Variable length records take less storage space but since the computer will be unable to determine where each record starts, processing the records will be slower.

Relationships

In some situations data cannot be stored in one table as this may result in duplication of data. Therefore, a Relational Database is used where data is stored in different tables which are related together through a common field. There are different ways how these tables are related to one another.

Relationship types

There are different types of database relationships, each named according to the number of table rows that may be involved in the relationship. Each of these relationship types exists between two tables:

One-to-one relationships occur when each entry in the first table has one, and only one, corresponding entry in the second table. One-to-one relationships are rarely used because it is often more efficient to simply put all of the information in a single table.

One-to-many relationships are the most common type of database relationship. They occur when each record in the first table corresponds to one or more records in the second table but each record in the second table corresponds to only one record in the first table. For example, the relationship between a Teachers table and a Students table in a Primary school database would likely be a one-to-many relationship, because each student has only one teacher, but each teacher may have multiple students.