Introduction: During this unit, you will learn what a database is and why they are so useful. You will gain knowledge of key concepts such as: flat file databases, tables, primary keys, fields, entities, records, forms, queries and operators. You will also learn how to create queries, forms and reports.

Overview

Data	When we store data in a database, it is in a format that the computer can understand and might not make much sense to us. When we collect and use the data in a database so that it is meaningful to us, we say that the data becomes information.
Database	A structured collection of data, on a computer, that allows people to perform complex sorting and searching of the data to find the information they need. The Police Criminals Database is a good example.
Flat file	A flat file database is a database that comprise a single table. These are often created from a single spreadsheet. If a single spreadsheet was sufficient to contain all the information needed, a flat file database may also suffice.
Table	A structured collection of data in a table format (a bit like a spreadsheet) that normally stores data about a particular entity – like patients in a hospital or students in a school or customers of a business.
Record	A record is a row in a database table that describes a single entity – such as one customer or one student or one patient. All the relevant data about a single customer or patient in a table will be contained in a single record.
Field	A field is the same as a column in a databases table. Each field describes one characteristic of a record – such as a student's name or a customer's phone number. Fields have different field types: text, currency, Yes/No, numbers.
Primary Key	A primary key is a unique identifier in tables that enables a database to find related information across more than one table. Examples are a bank customer's unique account number and a workers unique National Insurance Number.
Form	An object in the database that allows you to add, edit and delete the data in one or more databases tables. Forms make it easier to work with data in a database because they hide the data you don't need to see.
Query	When we request data from the database, we do so by creating and running a query. A query can also sort and order data when it is presented to us.
Query Operators	Query operators determine the range or conditions applicable to a query. For example: : >=, BETWEEN, AND, OR, NOT and the wildcard * in queries.
Parameterised Query	A parameterised query is a query where we ask the user to provide one of more of search criteria. For example, we may ask the user which gender to search for: male or female, or to provide a ranges of dates within which to search.
Validation	We can provide rules for the database to check that information being entered by a user is correct. The database can provide a message to say why the data entered cannot be accepted.
Report	A document that presents the results of a query formatted so that people can understand and make use of the data. We can print database reports or save them electronically.

### Key Learning that will take place in this unit

- To understand what a databases is and why databases are so useful.
- To know some key definitions: table, field, field types ,record, form, query and report.
- To understand the term 'flat file' database.
- To be able to add records to a table.
- To be able to create queries including a complex query and parametrised query.
- To be able to sort data in a table.
- To be able to add a calculated field.
- To be able to enter data into forms, modify data and to use forms to navigate records.
- To understand the different operators: >=, BETWEEN, AND, OR, NOT and the wildcard * in queries.
- To appreciate the significance of a primary key in a table.
- To know how to validate data in a table.
- To create a report based on a query, and to be able to apply consistent formatting.

Databases we take for granted

When we go 'shopping online', we expect to be able to *search* for items, to *compare* prices, to *sort* items, to *collate* a wish-list, to *add items* to a shopping cart and to make a purchase. Databases help to do all of these things for use – behind the scenes!


Keys and relationships
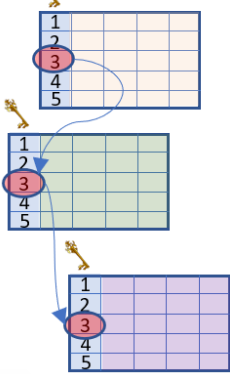
Primary keys are unique items of data that establish the relationship between tables in a database. Without a primary key, a databases can't reliably locate related data in other tables. For example, a customer's unique account number must be the same in every table with related information about a customer.

THE OLD WAY

THE DATABASE WAY

Lots of people – sometimes all over the world – accessing and using the same data, but in lots of different ways.

Databases for the world we live in

In the not-so-distant-past, people were content with all their information-needs stored as paper in filing cabinets!

The world has radically changed. Today, people, organisations and businesses are connected and interact globally. Data also needs to be available and shared globally for people and businesses to connect with each other 24/7. Can you imagine a world trying to do all of this only using paper stored in filing cabinets?
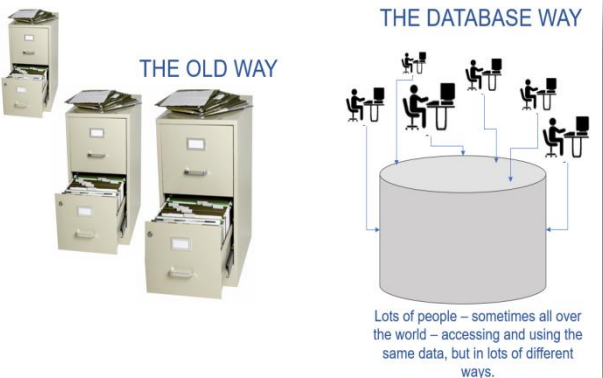
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TEST YOURSELF

1 Explain why a primary keys in tables are so important for databases to work properly.

2 What is the difference between a record and a field?

3 What is a flat-file database?

4 Why do databases store data in different tables rather than in one larger table?

5 What is a parameterised query?

6 Give 3 examples of data that might be validated before being entered into a database.

7 Give 3 example of types of data (field types) that you need to consider when you design a table.

8 Would you store a phone number as a number data type or as a text data type? Explain your choice.

AT HOME. (Parents/carers may be able to help with this.)

How many customers does Amazon have across the world? This will be the number of customers that Amazon would have to store in its database systems!

Find out if members of your family use a database at work. If so, what type of information does each database need to store as data?

Why do you think that large companies use databases rather than lots of spreadsheets to store their data?

Creating Tables and Queries: In this unit you will learn how to design a table that caters for different types of data. You will become familiar with the concept of data validation, the significance of a primary key, and how to create queries using more than one table. You will also learn how to create parameterised queries that ask a user for input.

All about tables, entities, fields, rows and keys

A primary key identifies each car uniquely

The Primary Key

A field describes a shared characteristic of every car – such as the date.

A field

A record describes each car in the table – such as a Peugeot

A record

Car ID*	Make	Model	Class	Seats	Price	Date
356	Kia	Picanto	Mini	4	£29.80	18/01/2013
357	Vauxhall	Corsa	Economy	4	£31.50	24/04/2013
358	Peugeot	308 Estate	Compact	5	£94.79	20/11/2013
359	BMW	E-Class	Luxury	5	£150.56	22/11/2013

Cars are a distinct **entity**. Every car is stored in the same table because all cars share common characteristics such a model and make, and number of seats.

Choosing field types

Common data types

Number
Text (short or long)
Yes/No (Boolean)

Primary key
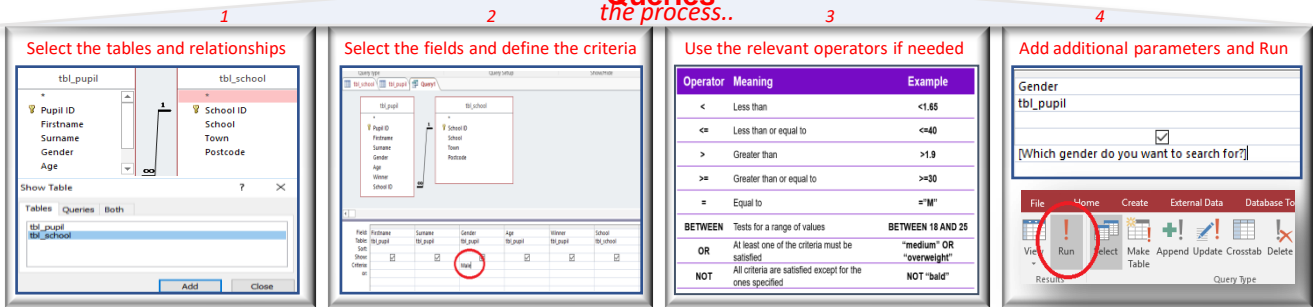
AutoNumber is used to create a primary key of numbers in order 1, 2, 3, 4, 5 etc

tbl_school   tbl_pupil

Field Name	Data Type
School ID	AutoNumber
School	Short Text
Town	Short Text
Postcode	Short Text

Short text is text that is limited – usually to 255 characters

Creating Queries
the process..

1
Select the tables and relationships

tbl_pupil
Pupil ID
Firstname
Surname
Gender
Age

tbl_school
School ID
School
Town
Postcode

Show Table
Tables Queries Both
tbl_pupil
tbl_school
Add   Close

2
Select the fields and define the criteria

3
Use the relevant operators if needed

Operator	Meaning	Example
<	Less than	<1.65
<=	Less than or equal to	<=40
>	Greater than	>1.9
>=	Greater than or equal to	>=30
=	Equal to	="M"
BETWEEN	Tests for a range of values	BETWEEN 18 AND 25
OR	At least one of the criteria must be satisfied	"medium" OR "overweight"
NOT	All criteria are satisfied except for the ones specified	NOT "bald"

4
Add additional parameters and Run

Gender
tbl_pupil

[Which gender do you want to search for?]

File   Home   Create   External Data   Database To
View   Run   Select   Make Table   Append   Update   Crosstab   Delete
Results   Query Type

Database users should receive messages so that they know how to correct a mistake entering data.

How we verify and validate data entry

Crime report
File   Home   Insert   Page Layout   Formulas
Error!
The number you have entered has too many digits.
OK

Validation rules

Data is validated or checked to see if it meets certain rules when entered into a field. It cannot be checked for accuracy. For example, a validation rule may only allow mobile phone numbers that are 11 digits long, but the mobile number itself could be wrong.

- Field length check – only allows a specific number of characters to be entered.
- Range check – number entered must be within a certain range, eg between 1-100.
- List check – only specific data can be entered, eg male or female.
- Present check – the field cannot be left empty.
- Input mask – data must be entered in a specific way, eg including a space between the first and last part of a postcode.

In addition, an **input mask** – which you can see below - is great for validating data of a specific format. For example, entering post codes.
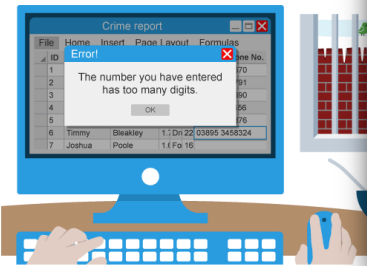
General   Lookup

Field Size	255
Format	
Input Mask	
Caption	
Default Value	
Validation Rule	Is Not Null
Validation Text	You MUST enter a surname
Required	No
Allow Zero Length	Yes
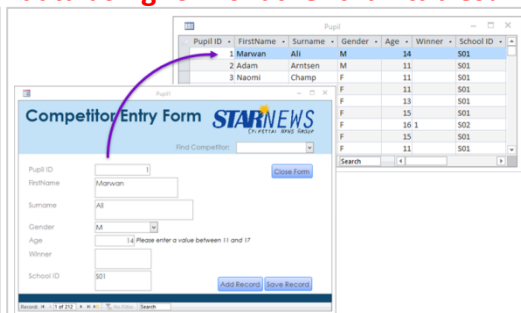
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Forms and Reports: In this unit you will learn how to create forms that can be used to enter, edit, and delete data. You will also create a form using a query. You will learn to create reports from your database tables and a query, and you will explore why these might feature in a company's branding and use of house-style. You will have the opportunity to customise your own forms and reports to make them more user-friendly.

Why do people enter data using forms rather than tables?

- A more user-friendly experience for both data entry and for navigation.
- Using forms does not require training on how to use a database.
- A form can be designed in much the same way as any user interface: with regard to the target audience and their needs.
- A form can provide additional filtering of data only relevant to the person using it.
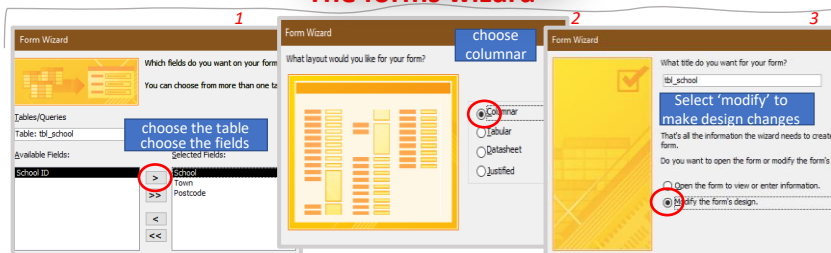- Forms can provide additional security and restrictions to data entry if needed.

customising a form

- Give the form a heading
- Change the background colour
- Add some useful command buttons
- Add a combo box
- Add help text to one of the text boxes
- Change the width and depth of the fields to reflect the amount of space required for entering data in the field
- Make sure all the fields are nicely lined up
- Add a logo or graphic to the form

You can customise your form by clicking on any object on the form (such as a text box) and using tools you will have seen before in MS Powerpoint and Word – such as the colouring tools and font tools.
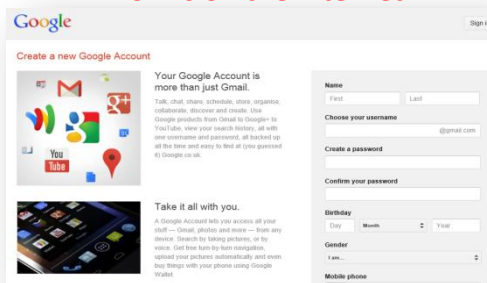
The forms wizard

Useful links:

https://www.Britannica.com/technology/databases

https://edu.gcfglobal.org/en/access2013/creatingforms/1/

https://www.khanacademy.org/computing/computer-programming/sql/sql-basics/v/welcome-to-sql

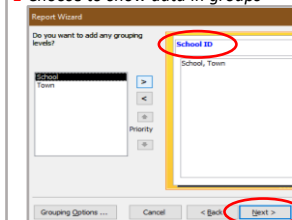https://www.bbc.co.uk/bitesize/guides/zswnb9q/revision/3
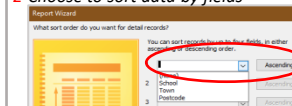
Forms on the internet

The reports wizard

The first few steps of the reports wizard are the same as the forms wizard. Then we have some steps specific to reports which are shown below. You don't have to group data, but you might want to experiment!
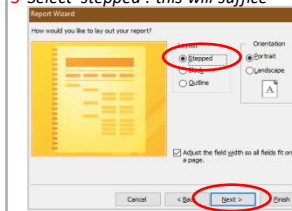
1 Choose to show data in groups

2 Choose to sort data by fields

3 Select 'stepped': this will suffice
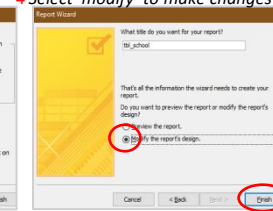

4 Select 'modify' to make changes

Branding

Reports are sometimes produced for people outside an organisation as well as for employees. Companies have to be very careful to ensure sensitive data is protected, but reports shared with colleagues and customers can help to communicate the organisation's products, services, culture and values through branding and house-style. This includes use of the company logo and any additional strap-line.

TEST YOURSELF

1. Write a list of all the information you think might be useful for a business to know about its customers to put in a database.

2. Explain why a database form is used rather than allowing someone to use the data in a table directly.

3. What is a query? Why are queries needed?

4. When you design a report you can group data. What does it mean to group data in a report?

5. Explain why reports may use a logo and branding?

5. Think of 3 examples of forms you have seen on the internet. What do they have in common?

AT HOME. (Parents/carers may be able to help with this).

Imagine that you have a database that stores your favourite MP3 playlists. Think about the type of information you would want to store. Now make a rough sketch of a database form that you would use to store, edit or delete playlist data.

Design a report in MS Powerpoint to show how you might format information about your playlist in your database form, with information about each of your MP3 tracks, the artists, the track titles and the album the track comes from.