Unit 7.4 The power of data: Using data modelling

Get started!

Have you or your family ever needed to analyse a large amount of information or data to help you make a decision or solve a problem?

Discuss the following with a partner:

- What was the situation where you had a large amount of data to **analyse** to help you solve a problem?
- Give some examples of the data you needed to analyse.
- When you collected all of the data, did you carry out any calculations or extra processing to help you make your decision?

It can be difficult to make decisions using a large amount of data. Computer applications can be used to create a **model** of the problem you are trying to solve. Doing this helps you to understand the data. Once you understand the data, you can easily use it to make decisions.

In this unit, you will use Microsoft Access (a database application) and Microsoft Excel (a spreadsheet application) to select and use data to help make decisions.

KEYWORDS

analyse: examine something in detail to ensure you fully understand it

model: a computer application that replicates a real-life environment, where data is changed to see what happens; simple models can be built in spreadsheet software

Learning outcomes

In this unit, you will learn to:

- explain what is meant by a data model
- identify a range of real-life scenarios where data models and simulations are used
- describe how spreadsheet and database applications can be used to model real-life scenarios
- evaluate the layout of a data capture form to decide if it is an effective model and easy to use
- write rules for applying conditional formatting in a spreadsheet and in database applications to highlight important data
- explain why a primary key is needed in a database table
- identify an appropriate field to use as the primary key in an existing database table
- amend the structure of a database to include a primary key
- use criteria such as > or < to search a pre-existing database for useful information
- describe how data is used to model scenarios in a range of industries.

Warm up

In pairs, discuss the **data** you would need to collect to organise a student end-of-year party. Imagine that you have a **fixed budget**.

Think about the data you would need to collect. Create a mind map to describe the data by adding questions about the details you will need to collect:

- **Venue:** How much does it cost to hire the venue? What date is the party? What time is the party? When should the party finish?
- **Guests:**
- **Food and drink:**
- **Entertainment:**

Note your ideas on the mind map.

Discuss the following questions with a partner. Add your ideas for each question to the mind map:

- What other things do you need to consider when you are organising a party?
- What calculations are needed to make sure you stay within budget?
- What software application could you use to help you analyse your costs?
- What software application could you use to help you keep track of invitations and who will attend?

SCENARIO

Your school wishes to host a gaming competition to help raise funds to purchase new portable digital devices for students in your school; the target is $5000.00. As part of the fundraiser, the school is also planning on hosting a **meet and greet** with a gaming celebrity as well as selling **merchandise** in advance of the day.

The main organiser has started to create a database to hold the usernames and some personal details of all of the competitors so that they can match gamers to the correct competition levels.

The event is going to take place in four weeks and the organiser has asked for your help.

Your challenge is to help the organiser plan the event. You will need to help them complete the **database** they need to use to collect and store competitors' details and show them how to use the database to organise competitors for different competitions.

They also need your help using a **spreadsheet** to keep track of profits and losses in the sales of competition merchandise.

KEYWORDS

data: raw facts and figures

fixed budget: a fixed amount of money available to complete a task

meet and greet: an event where members of the public are able to meet famous individuals

merchandise: items that can be bought at events

database: a computer application that is used to organise data that can then be stored, processed and accessed electronically

spreadsheet: a computer application that uses rows and columns to organise data and carry out calculations using that data

DID YOU KNOW?

Database applications are more common than you realise. For example, each time you use an internet streaming service (for example, to watch a film or play an online game) you are accessing a large database that generates lists of games, TV shows and films for you to watch or play.

Do you remember?

Before starting this unit, you should be able to:

- ✔ design a spreadsheet and a database to collect, organise and process data correctly
- ✔ identify the data required in a problem to solve a data-processing task
- ✔ design and create a single table database for storing data in an appropriate format
- ✔ select appropriate data attributes for each of the fields in a database application
- ✔ design a form for collecting data that is to be stored in a database
- ✔ use the search facility to retrieve data from a database
- ✔ design a spreadsheet that can be used to store data and carry out calculations on the data using mathematical symbols and some functions such as SUM and AVERAGE
- ✔ use cell ranges in a spreadsheet formula
- ✔ give examples of where data is collected and used to solve problems in different applications.

Before starting this unit, you will need to install the following software on your own personal device (or use a similar database and spreadsheet software application):

- Microsoft Access
- Microsoft Excel

Data models, simulations and real-life scenarios

Learn

Computer models are representations of real-life situations created using software or specially designed programs. In a computer model, data is used to represent the real-life situation. Rules that link the data are coded using **formulae** and programming instructions.

Models keep track of the **factors** that represent a real-life scenario. For example, when trying to decide whether you can buy something in a shop, one of the factors to consider is how much money you have. Simple models can be created using applications such as spreadsheets. The factors inside the model are represented using spreadsheet labels and data. The links between the factors are represented using formulae. For example, we could create a model to show the costs of organising a birthday party:

	A	B	C	D	E
1	**Birthday Party Costs**				
2					
3	**Party Budget**	$100.00			
4					
5	**Item**	**Quantity**	**Price Each**	**Cost**	
6	Pizza for 10	2	$12.00	$24.00	
7	Cupcakes for 10	2	$13.00	$26.00	
8	Bottle water for 10	2	$5.00	$10.00	
9	Party Balloons (Pack 40)	1	$5.00	$5.00	
10	Party Hats (Pack 20)	1	$5.00	$5.00	
11	Party Cups (Pack 20)	1	$4.00	$4.00	
12	Party Napkins (Pack 20)	1	$3.00	$3.00	
13	Birthday Banner	3	$3.00	$9.00	
14					
15					
16			**Total cost**	$86.00	
17			**Still to spend**	$14.00	
18					

Can you list the factors used in this birthday-party model? What formulae are used to link the factors in this model? Think carefully about how the cost of individual items, total cost and still to spend would be calculated.

Do you remember how to create formulae that use SUM and AVERAGE to calculate the SUM (total) and AVERAGE of a list of numbers automatically in a spreadsheet application?

The spreadsheet below uses the average function to calculate each student's Average score in Tests 1, 2 and 3.

How could this be changed to calculate their total score in Tests 1, 2 and 3?

F2 =AVERAGE(C2:E2)

	A	B	C	D	E	F	G
1	**Firstname**	**Surname**	**Test 1**	**Test 2**	**Test 3**	**Average**	
2	J	Allen	56	76	39	57	
3	J	Kumar	55	72	46	58	
4	P	Huang	62	67	44	58	
5	R	Ali	63	78	51	64	
6							

Databases can also be used to model real-life situations. In a database model, a table is used to model important data about a situation. The data relating to the model is organised under **field headings**. For example, in the image below, which shows part of a database used to represent a group of students who are entering a computer-gaming competition, these are username, password, email, and so on.

Registration Data

Username	Password	Email	Age	Date Joined
student001	9PHKJHYT7	student001@school.com	11	09/09/2021
student002	3EDGFBNA6	student002@school.com	12	15/09/2021
student003	9LKNAJGK6	student003@school.com	13	10/09/2021
student004	4DFAECHY7	student004@school.com	11	07/09/2021
student005	2APFGBET6	student005@school.com	11	03/09/2021
student006	5MAOEJHD4	student006@school.com	11	17/09/2021
student007	4ALKEBFU8	student007@school.com	12	08/09/2021
student008	9JHYTABG6	student008@school.com	13	09/09/2021
student009	3EDASJHB8	student009@school.com	11	15/09/2021
student010	2QDRCHYT7	student010@school.com	12	25/09/2021
student011	4SSJYTFV6	student011@school.com	12	29/09/2021
student012	8ASLKIJH7	student012@school.com	13	25/09/2021
student013	5CDENHYF8	student013@school.com	11	03/09/2021
student014	9JHWGYTV5	student014@school.com	12	09/09/2021
student015	7GHTYAKH7	student015@school.com	13	24/09/2021

Discuss in a small group any additional factors (data items) you think should be represented in this data model. Think carefully about what the data model might be used for; this will help determine what data is required in the data model.

Databases and spreadsheet applications can be used to create complex models of real-life situations. Databases and spreadsheets use words, numbers and formulae to represent a real-life scenario, such as the students participating in a gaming convention. **Simulations** are more complex models than those created using databases and spreadsheets. Simulations will often use complex **graphics** to help represent the real-life situation they are modelling. Simulations allow the user to see a visual representation of a scenario, for example a gaming simulation that the user can interact with.

Here's a reminder about the different ways in which models and **simulators** can be used:

Medicine and healthcare

Medical staff collect a wide range of data about patients (for example, data about a patient's age, symptoms, current medication). This can be used with specialised databases to help diagnose patients' illnesses. Using digital models in this way means doctors can collect and analyse a huge amount of data quickly to help decide what treatment a patient might need.

Training

An example is training a pilot. Trainee pilots are placed in simulators that look and feel like a real aeroplane. They can interact with the aeroplane controls to complete tasks such as take-off and landing in different weather conditions. This helps to ensure that the trainee pilots and their instructors are safe and there is no danger to life or to an expensive aeroplane.

Scientific experiments

Scientists use data models to help them make predictions, such as how changing temperature might affect a nuclear reaction.

Weather and climate

Modelling is used to assess the impact of climate change or changes in weather patterns. Weather-forecasting models use complex formulae to help predict how weather patterns will change over time. Data is collected from all over the world and from space and fed back into the models to help make predictions.

Business

Businesses can use data collected over a long period of time to identify patterns in sales of items at different times of the year. Using this data, the businesses are then able to make predictions about how stock levels will change at certain times of the year. This helps them make sure that they have the correct number of items in stock to meet demand. For example, in summer months most stores will know that they need to increase their stock of bottled water and sun-protection cream.

Data models and simulations are used to represent real-life situations such as flying an aeroplane. Data models use data to represent the scenario while simulations use a large amount of data and complex graphics. All of the data used to create data models or in simulations is stored in a database. Simulations tend to be very complex and can have many advantages and disadvantages:

Pros of simulations	Cons of simulations
Using a simulation for training can help avoid loss of life	Expensive to produce
Lots of different situations can be modelled	Too many factors for all outcomes to be considered
Cheaper than using the real equipment	

KEYWORDS

computer models: computerised representations of real-life situations created using software or specialised software applications

formulae: mathematical calculations expressed with letters

factors: the key data items represented in a data model

field heading: a word or phrase used to describe the contents of a field in a database

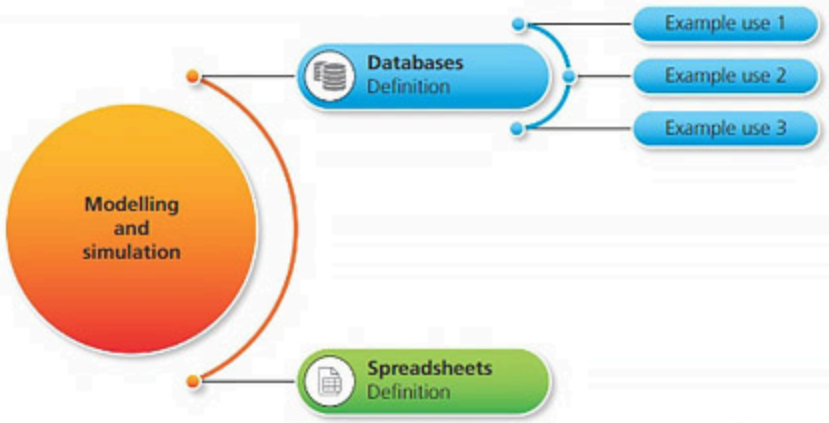
simulation: a computer model that can predict the outcome of a real-world system or scenario

graphics: the use of images to illustrate a real-world situation

simulator: software to simulate a real-world application

Practise

1 Create an **infographic** to show how databases and spreadsheets can be used to represent real-life situations and how they might be used to help with training, decision-making or even designing products.
   - Copy the infographic outline on the next page.
   - Expand your infographic to include three examples of applications where databases can be used to help with training, decision-making, designing products or in some other way.
   - Add more detail to your infographic to include examples of where spreadsheets could be used to analyse data to help with training, decision-making or designing products.



2 Carry out some research into the use of simulations and how they are used in real-life situations.
   - Discuss your findings with a partner and then expand your infographic. Add a new strand that has the title 'Simulations'. The new section of your infographic should be shaded a different colour from the other two.
   - Expand your infographic to include three examples of applications you know of where simulations can be used to help with training, decision-making, designing products or in some other way.

3 In a small group, discuss some of the ways in which businesses and other organisations could use data modelling to help make decisions in the following scenarios:

   - modelling supermarket queues
   - modelling the design of a new car for car-safety tests
   - simulating the impact that reducing pollution has on climate change
   - modelling traffic flow on a busy road with new traffic-control systems.

   - Create an infographic to show how data modelling and/or a simulation can be used in one scenario.
   - Use your infographic to illustrate the advantages and disadvantages of data modelling or a simulation in that scenario.

4 Discuss the following questions with a partner:
   - How could the gaming competition organisers use a database to model the competition entry?
   - Can you think of any other ways they could make use of a database?
   - How might the gaming competition organisers use a spreadsheet application to model the sales of merchandise at the event?

5 If the gaming competition organisers decided to include a simulation game in the competition, do you think this would make the competition more appealing? Why?

KEYWORD

infographic: a chart or a diagram that represents information in a visual way

Spreadsheets: Using Microsoft Excel

Learn

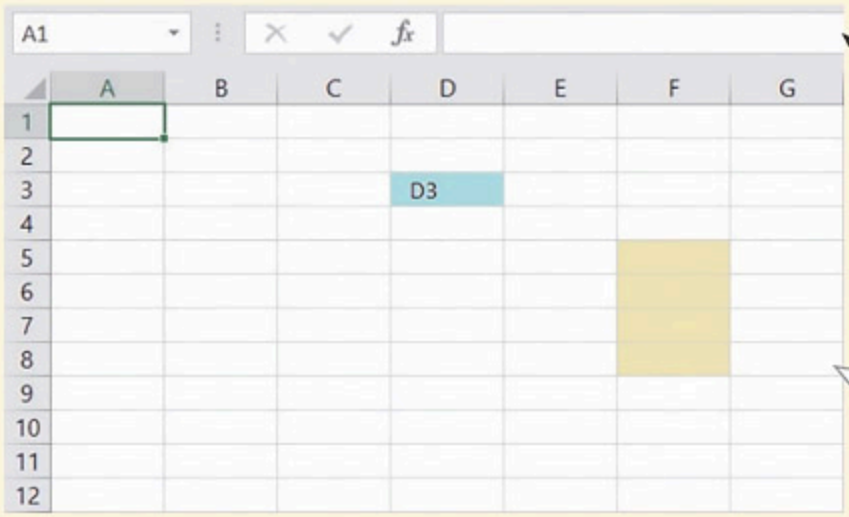
MS Excel is one example of a spreadsheet application. Spreadsheets such as MS Excel can contain worksheets that are divided into rows and columns. The rows and columns in a spreadsheet are identified using numbers and letters.

Spreadsheets are used mainly for applications that require a lot of calculations to be carried out quickly.

Spreadsheet models start out as a table of words and numbers. They become more complex data models when you add **formulae** to link the data in the model. This can help the user see patterns in the data.

Worksheets in a spreadsheet are divided into boxes called **cells**. Each cell can contain text, numbers or a formula. Formulae can then be used to enable the user to carry out calculations involving other data items in the spreadsheet.

The letters and numbers along the top and side of the spreadsheet are used to identify each cell. For example, cell D3 is coloured bright blue in the spreadsheet shown below. When the column letters and row numbers are used to identify a cell this is known as a **cell reference**.

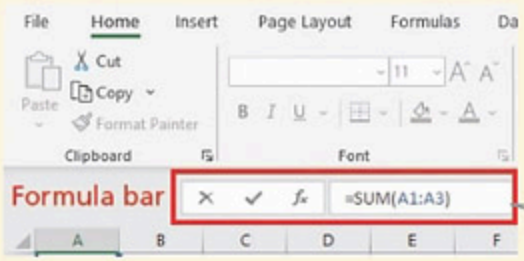


A formula can be added to a spreadsheet cell by clicking on the cell and typing the formula into the **formula bar**.

In a spreadsheet, it is also possible to select more than one cell in a group. In the yellow shaded area of this spreadsheet, cells F5 to F8 have been selected.

A formula can be entered into an area of the spreadsheet called the formula bar. All formulae in a spreadsheet must start with an = sign. After the = sign, the formula can contain combinations of numbers, cell references and mathematical symbols. Formulae can be used to perform calculations on individual cells or a **cell range**. Formulae can also include some **built-in functions**, which are designed to provide the user with a quick way of carrying out common processing tasks.

Some of the most common spreadsheet functions include the **SUM** and **AVERAGE** functions.



Discuss with a partner:

How would you amend this formula if you wanted to calculate the total of cells B1 to C11? Can you think of another way of performing this calculation?

How would you amend this formula if you wanted to calculate the average of the data stored in cells A1 to A10?

The formula shown above will automatically calculate the SUM (total) of the data stored in cells A1:A3.

In the spreadsheet below, a formula has been used to calculate a student's average score in three tests.

F2 =AVERAGE(C2:E2)

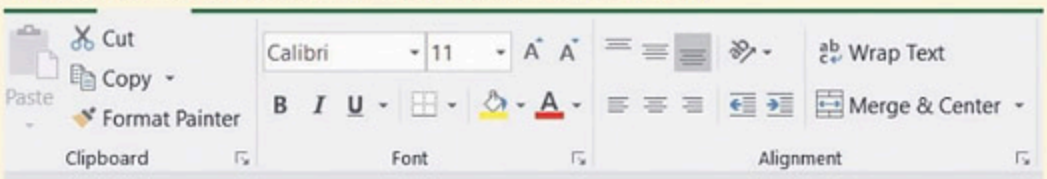
	A	B	C	D	E	F
1	Firstname	Surname	Test 1	Test 2	Test 3	Average
2	J	Allen	56	76	39	57
3	J	Kumar	55	72	46	58
4	P	Huang	62	67	44	58
5	R	Adeyemi	63	78	51	64
6						

The formula shown in this example calculates the average value of the data in all of the cells between cells C2 and E2. Note how the formula starts with = and contains the cell range C2:E2.

Formulae allow spreadsheets to carry out calculations using values in other spreadsheet cells. A formula will tell the computer what mathematical operation (+, –, /, *) needs to be applied to the cells included in the formula. Some formulae, such as the ones shown above, use special functions to carry out more complex calculations.

You will notice that some of the text (the spreadsheet **labels**) in this spreadsheet is styled differently from the data stored in the spreadsheet. Styling labels in a different format makes the spreadsheet easier to understand. It helps separate the data from the labels.

MS Excel provides a wide range of tools that can be used to change the appearance of text in the spreadsheet. Most of the tools available are the same as those used in word-processing applications. To change the presentation of the contents of a cell, you highlight the cell and click on the correct tool. For example, to format the cells A1 to F1 so that the text is darker than the rest of the spreadsheet, you click on cell A1, keep your finger on the mouse button, highlight all of the other cells from A1 to F1, then click on B. The 'B' button will format the text so that it is displayed in bold format.



KEYWORDS

formula: a combination of numbers, mathematical symbols, cell references and functions used to process data in a spreadsheet

cell: an area where a row and column intersect and data can be entered

cell reference: a combination of letters and numbers used to identify individual cells in a spreadsheet

formula bar: an area in the spreadsheet window where a formula can be entered

cell range: a group of cells in a spreadsheet, identified by naming the first and last cells in the group, e.g. A1:A5

built-in functions: carry out a set of tasks or operations using data specified by the user; the function will output a result for the user

labels: headings used in a spreadsheet application to aid the understanding of data

Practise

1 Open the file **Introducing Spreadsheets.xlsx** provided by your teacher.
   - Change the format of cells A1:F1 and A2:A5 so that they are formatted in bold.
   - Copy to cell F2 the formula `=AVERAGE(C2:E2)`, which calculates the average for the first student.
   - Use the same method to add a formula that calculates the average score for the remaining students.
   - Can you think of any other ways of calculating the average score for a student in this spreadsheet? Think about how you might add together the students' three scores and then divide the result by 3. Discuss with a partner how you might add this formula to the spreadsheet instead of using the AVERAGE function.

It is important that you follow the rules for the formula exactly and do not leave out any brackets or symbols. If your formula does not work exactly as you expect it to, check carefully what you have entered against the example shown.

2 The teacher wishes to record the students' total scores in column F instead of the average score. Discuss with a partner how you could use the SUM function to calculate the total scores in this column, instead of AVERAGE.

   Change the label text in cell F1 to read **Total** and add an appropriate formula for each student to enable you to calculate their total score.

3 Spreadsheets are often used for modelling and decision-making, especially in scenarios where numeric data and calculations are involved. Now open the file **School Trip.xlsx** provided by your teacher. This spreadsheet is being used by a teacher to keep track of payments made by students each month for an upcoming school trip.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	StudentID	Jan	Feb	March	April	May	Jun	Jul	Aug	Sept	Oct	Total Paid	Balance		Trip Cost	550	
2	1	20	30	150	25	50	25										
3	2	50	45	75	20	15	30										
4	3	20	30	150	75	20	15										
5	4	20	30	20	20	30	50										
6	5	45	50	50	20	30	50										
7	6	100	20	30	45	20	100										
8	7	25	50	50	50	20	30										
9	8	45	20	30	45	45	30										
10	9	20	30	60	45	50	20										
11	10	40	50	25	25	20	30										
12																	

- With a partner, discuss what calculations are needed in columns L and M.
- Highlight cells B2 to M11 and format those cells to represent currency data. To select a different format for the data in a spreadsheet cell, highlight the cells, then right-click and select `Format Cells ...` Then select `Currency`.
  Select the correct currency, for example $.
- With a partner, discuss the spreadsheet structure. Are there any additional cells that should be formatted in currency format?
- Amend the contents of cell L2 to include a formula that will calculate the total of all of the payments made by Student 1 in this example.
- When you are happy with the formula entered into cell L1, you need to copy this formula into cells L2 to L11 so that you can calculate the **Total Paid** for the remaining students.
  - Click on cell L1 and hover the mouse over the bottom-right hand corner of the cell. A small plus sign will appear: this is called a **fill handle**. Keep your finger on the mouse button and drag down to highlight cells L2 to L11. The formula will automatically copy into the remaining cells. You are able to copy the formula in this way because we have used **relative cell referencing** in this formula.

What about **Trip Cost**? Think carefully about what the value in this cell might be used for.

We have looked at SUM and AVERAGE formulas so far. Which one is most appropriate for this task?

Remember to include the cells for every month in your formula, even though the students have not made a payment for the remaining months yet!

4 Now calculate the balance remaining for each student. Think about how you could use the value in cell P1 to help calculate the balance remaining for each student:

`Balance = Trip Cost - Total Paid`

L	M
Total Paid	Balance
300	✗

- Can you add a formula to cell M1 to perform this calculation?

=P1–L2

- Check that the Balance calculated for Student 1 is correct.
- Now fill this formula down to calculate the balance for the remaining students.

L	M	N	O	P
Total Paid	Balance		Trip Cost	550
300	250			
235	-235			
310	-310			
170	-170			
245	-245			
315	-315			
225	-225			
215	-215			
225	-225			
190	-190			

The balance calculated for these students is incorrect, e.g. 550 – 235 = 315, not –235.

- The results are no longer correct. Examine the formula to work out what has gone wrong.
  - Using $ in a cell reference in this way tells the spreadsheet not to update the cell reference when the formula is copied. This is known as an **absolute cell reference**.
- Save your spreadsheet.

Click on cell M3 and look at the formula carefully The formula now reads `=P2-L3`

Sometimes relative cell referencing is not useful when you are trying to copy formulae. In this example, you want the formula always to point to cell P1 to read the correct cost of the trip.

Update your formula in cell M2 to read `=$P$1-L2`

Copy the updated formula into the cells for the remaining students. The correct balance should now appear for each student.

KEYWORDS

fill handle: a square that appears in a spreadsheet cell to let the user know that the contents can be copied and filled into the cells the user drags the fill handle into; when you hover over it the plus sign appears, which is what you click on and drag to replicate the contents

relative cell referencing: a cell reference that will be updated as part of a formula if the formula is copied and pasted into another cell

absolute cell referencing: a cell reference that will not be updated as part of a formula if the formula is copied and pasted into another cell

Modelling tools: Conditional formatting

Learn

Spreadsheet applications allow users to format data using **conditional formatting**. This can be useful if you want to highlight important data.

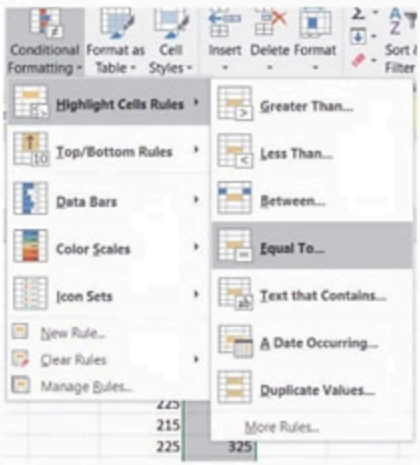
You could do this in a number of ways. For example, in our school trip model we could set the cells in column M to green if the balance for a student is 0.

KEYWORD
conditional formatting: formatting a data item that meets a specific rule

Practise

In the school trip example from the last theme, the teacher might wish to see quickly who has paid all $550.00 towards their school trip. Open your saved copy of the file **School Trip.xlsx**.

- Highlight cells M2 to M11.
- Select `Conditional Formatting` from the Home Tab, then select `Highlight Cell Rules` and set the cell rule to be equal to 0, and select the `Green Fill` formatting option.



- Nothing should happen just yet. Add the following payments for Student 1 in the months July to August.

50	50	100	100

- Add additional payments for the remaining students for the months of July to October, so that some have not yet paid the full balance of the trip.
- Test your spreadsheet and conditional formatting now that some students have paid the entire balance of their trip.

Do this by increasing payments already recorded for some students.

- Now change the overall cost of the trip to $600. How does this affect the data highlighted in the spreadsheet?

Databases: Using Microsoft Access

Learn

MS Access is an example of a database application that can be used to store data that represents a real-life scenario.

In MS Access, data is stored in a table structure. The data in the table is organised under special headings called **field headings** and each data item must be assigned a specific **data type**. Each field in the database can be assigned a data type. A data type is used to describe the kind of data the field can store.

Some of the main data types used in MS Access include:

Data type	Use
Text	Used to store data that is a mixture of text and numbers. Normally used to store data that is not used as part of a calculation.
Number	Stores data that may be used as part of a calculation. Different number types are available, e.g. integer or decimal number.
Date/Time	Different date and time formats can be selected so that a field can be used to record a date such as 12 October 2021, or a time, e.g. 10:04 pm.
Currency	Money values can be stored using this data type, and different currency formats such as dollar can be selected.
Autonumber	Can be used to assign a number to each record in a database. The computer creates a new sequential number for each record added to the data table. Once a number has been assigned to a record, it cannot be used again, even if that record is deleted.
Yes/No	Data entered into a field can have only one of two values, such as **YES/NO** or **TRUE/FALSE**.

MS Access automatically sets aside 255 characters for each field that has been set as a text data type. Database developers can set the field size for text fields to make sure memory is not wasted. For example, when you create a text field to store 'Surname' in a database, MS Access will automatically assign this a field size of 255 characters. Most people's surnames would not need 255 characters so when you are making a field to store surnames in a database you could set the field size for the Surname field to 30 characters instead of 255.

In large databases it is important that you are able to identify each record individually in a database table.

The database table shown below was used to store details of the members of a group of students going on a trip. In the database, there are two students with the same first name. When teachers are using the database to look up student details they would use their name to locate each individual student record. In this case, they need to make sure that they have selected the record for the correct student.

Surname	First Name	Stage	Class	DOB
Bhat	Aran	7	7T3	12/01/2010
Alarcos	Julia	7	7T2	09/04/2010
Arias	Gustav	7	7T5	01/06/2010
Gomez	Arianna	7	7T5	03/04/2010
Bhat	Aran	7	7T3	07/12/2010
Bekal	Genevieve	7	7T2	18/06/2010

To help uniquely identify one student from the other, an additional field called a **primary key** is added. The primary key will contain a unique value for each record. This helps make sure that the correct record is selected each time data needs to be accessed.

Many database developers use the autonumber data type when creating a primary key. This means that a new number is automatically assigned to that field each time a new record is added. You will see in the Practise box below how to set appropriate data types for fields in a MS Access table.

Adding a primary key field to the school trip table would mean the table would now have an extra column containing the primary key field, 'StudentID'.

StudentID	Surname	First name	Year	Class	DOB
1	Bhat	Aran	7	7T3	12/01/2010
2	Alarcos	Julia	7	7T2	09/04/2010
3	Arias	Gustav	7	7T5	01/06/2010
4	Gomez	Arianna	7	7T5	03/04/2010
5	Bhat	Aran	7	7T3	07/12/2010
6	Bekal	Genevieve	7	7T2	18/06/2010

Students with the same name could now be distinguished from each other using their StudentID.

KEYWORDS

field heading: a word or phrase used to describe the contents of a field in a database

data type: the different ways in which data can be stored, e.g. integer, string, decimal number

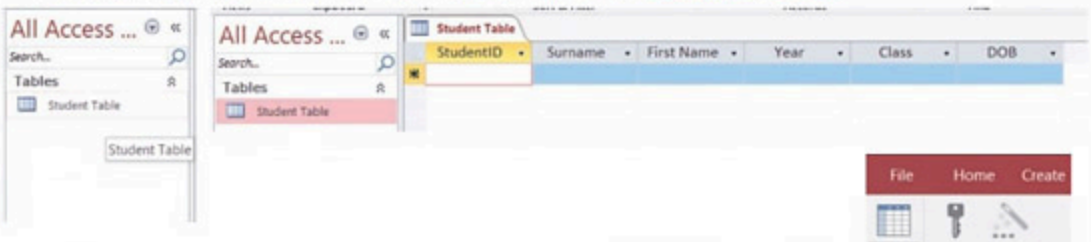
integer: whole number

primary key: a value that is unique for every record in a database

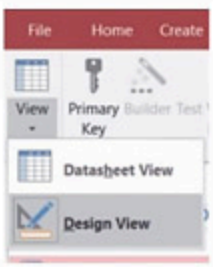
Practise

1 Practise using MS Access with the small school trip database from the Learn box above.

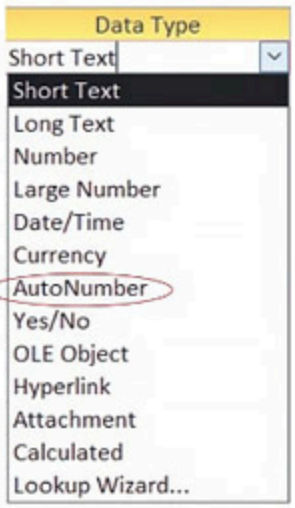
- Open the file **SchoolTrip.accdb** provided by your teacher.
- Double-click on the table in the database, called `Student Table`.



- This will open a blank database table. Click on the **design view** icon. You will see that data types for each field have been set as `short text`. This means that each field can be used to record up to 255 letters, numbers or other keyboard characters.



- In this database, we will use StudentID as a primary key. MS Access provides a special data type that will automatically assign a number to each record in a database. Each time a new record is added this number is automatically increased by 1.
- Click on the field heading 'StudentID' and select the autonumber data type for this field to ensure that this happens with StudentID.
- Click on the 'StudentID' field again. This time you are going to set this field to be the primary key field for the database.
- Do this by clicking on the Primary key icon. `Surname`, `Firstname`, `Year` and `Class` can all remain as 'short text' data types. However, `DOB` should be formatted using the 'date/time' data type.



Can you work out how to edit the data type for the DOB field in the database in design view? If so, select an appropriate data type for this field.

2 You have now successfully edited your first MS Access database table! To add data to the database table you must now exit design view and instead enter **data sheet view.**

- Add the details for each of the students attending the school trip using the table of information provided in the Learn box. Do this by clicking on each cell in turn and adding the students' details under each field heading.
- Save your database by clicking on `File` and then `Save`.

Note how the StudentID field now appears in the database. Discuss with a partner why you think it is displayed with the word `New)` already under the field heading.

KEYWORDS

design view: a method of viewing content in MS Access where the layout of the database can be changed

data sheet view: a method of viewing content in MS Access that allows the user to edit data

Database models: Setting up your data model

Learn

The database table in the gaming competition Scenario will hold details about competitors. Before the data can be stored, it is important to think about the type of data each field needs to store. In the school trip database (in the previous theme), you updated the database to ensure each field had the appropriate data types (shown below). Each field heading represents one factor in this data model:

Field name	Data type
StudentID	Autonumber
Surname	Short text
Firstname	Short text
Stage	Short text
DOB	Date/Time

You are able to leave Stage (for example Stage 7) as a short text data type as you do not plan to use this field later in any calculations.

Database developers, just like programmers, have to think carefully about the data type they assign to each piece of data stored in a database. This is because the data type selected will affect the type of processing you can carry out on the data item. For example, if you identify a field as being a text data item, you would not be able to carry out calculations using that data item.

Practise

1 Examine the car database example shown below and discuss with a partner the questions that follow. Write down your answers.

Registration	Make	Model	Colour	Mileage	Price
395 BYN	Nissan	Sunny	Red	34,000	$7000
765 GGT	Kia	Ceed	Blue	45,000	$4500
765 MNE	Toyota	Corolla	White	12,000	$8995
223 PWL	Kia	Rio	Black	67,000	$6598
990 UJN	Opel	Corsa	White	78,658	$4656

- Which field would be best used as a primary key and why?
- What data type would you select for each field?
- What would be an appropriate field length for each field?
- What do you think should be the maximum number of characters required for each field?

2 Consider the most appropriate data types for the gaming competition database table called 'Registration Data'.

Username	Password	Email	Age	Date Joined	Gamer Level	Parental Permission
student001	9PHKJHYT7	student001@school.com	11	09/09/2021	Beginner	☑
student002	3EDGFBNA6	student002@school.com	12	15/09/2021	Intermediate	☑
student003	9LKNAJGK6	student003@school.com	13	10/09/2021	Expert	☑
student004	4DFAECHY7	student004@school.com	11	07/09/2021	Expert	☑
student005	2APFGBET6	student005@school.com	11	03/09/2021	Beginner	☑
student006	5MAOEJHD4	student006@school.com	11	17/09/2021	Beginner	☑
student007	4ALKEBFU8	student007@school.com	12	08/09/2021	Intermediate	☑
student008	9JHYTABG6	student008@school.com	13	09/09/2021	Expert	☑
student009	3EDASJHB8	student009@school.com	11	15/09/2021	Expert	☑
student010	2QDRCHYT7	student010@school.com	12	25/09/2021	Beginner	☑
student011	4SSJYTFV6	student011@school.com	12	29/09/2021	Intermediate	☑
student012	8ASLKIJH7	student012@school.com	13	25/09/2021	Expert	☑
student013	5CDENHYF8	student013@school.com	11	03/09/2021	Expert	☑
student014	9JHWGYTV5	student014@school.com	12	09/09/2021	Intermediate	☑
student015	7GHTYAKH7	student015@school.com	13	24/09/2021	Intermediate	☑
student016	3ASFGTRV9	student016@school.com	12	18/09/2021	Beginner	☑
student017	5HGFAWES4	student017@school.com	13	03/09/2021	Expert	☑
student018	2WQSAFRG6	student0108@school.com	12	07/09/2021	Intermediate	☑

- Copy the table structure shown below.
- List the field names from the gaming competition database in the table you have created. The first row has been completed for you.

Field name	Data type	Field length
Username	Short text	30

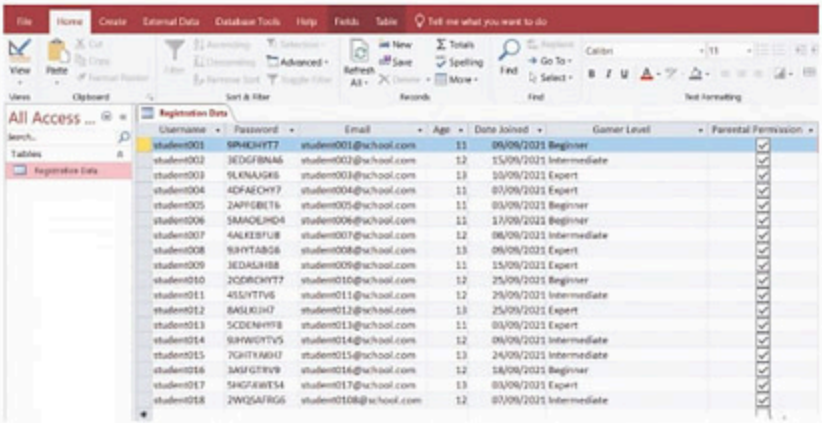
Developers use tables like this to identify the data items or fields when they are designing a new database. This is known as a data dictionary.

- Place an asterisk (*) beside the field you think could be used as a primary key field. Write a sentence to explain why you selected this field.

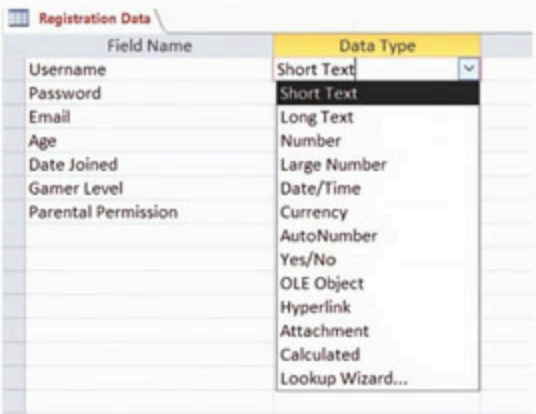
3 Edit your table to show the data types and field lengths you would assign to each field. The first row in the table has been completed for you.

4 Use your new data dictionary to help you as you develop the gaming competition database further. In this part of the task, you are going to assign the correct data types and field lengths to the gaming competition database. Follow these instructions:

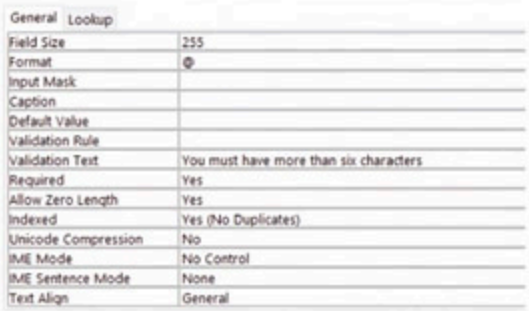
- Open the file **GamingComp.accdb** provided by your teacher.
- Open the table called `Registration Data`.



- Click to view the table called `Registration Data` in design view.
- Select the most appropriate data type for each field in the database by selecting the data type from the dropdown list beside each field name.



The drop-down list contains the list of all of the data types available in MS Access. We will not use all of these data types in this exercise.



Each time you select a field in data sheet view, additional properties associated with that data type will appear. When you select a text data type, you are able to edit the field length using the properties section.

- Edit the field size where appropriate.
- Set Username to be the primary key field. To do this, highlight the row containing the `Username` field and click on the `Primary Key` icon in the menu bar.
- Save the file.

KEYWORD

data dictionary: a table used to identify key data items and their key features (such as data type and field length) when designing a database

Collecting user data

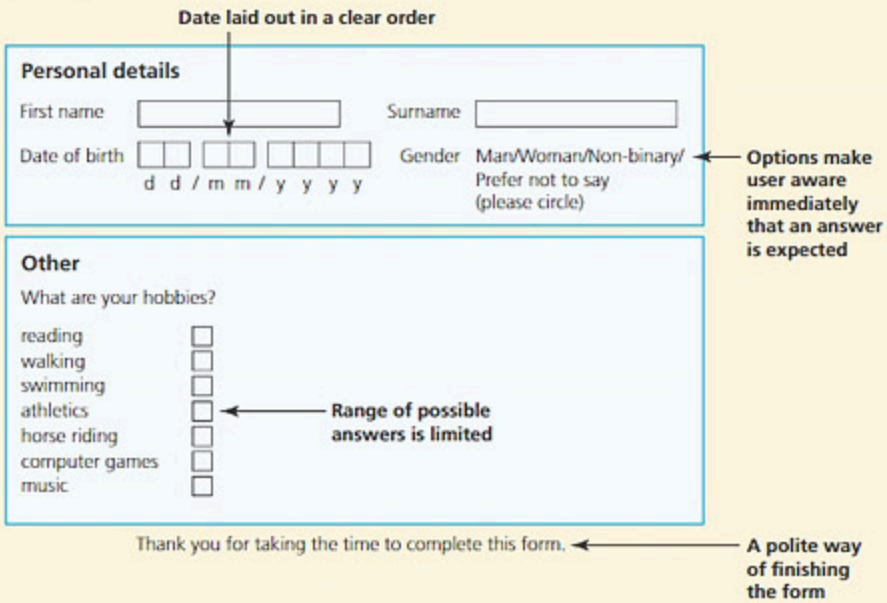
Learn

Before data can be added to a database, it must be collected in some way. Often this is done using a **data capture form**.

Data capture forms use labels, spaces, boxes (such as tick boxes) and a range of options for the user to select from. Sometimes example data is provided to make sure the correct data is collected in the correct format for each field in a database table.

In MS Access, for example, form designers can use text boxes to add additional information to the form. The text boxes can be used to add example data or other instructions to help the user complete the form.

The example below is a data capture form, collecting personal details from users for a database:



Data capture forms can be used to collect data in many different ways. Some forms may be available only on a computer screen; others may be printed and sent out to be completed by hand. Some may be emailed out and data entered using a keyboard. No matter how the forms are completed, they must be easy to understand. This makes sure that the correct data is collected from the person providing it.

When forms are completed online, the data is returned to the database electronically and automatically added underneath the correct field heading in the database. When a form is completed on paper, the data must be manually entered by copying and typing the data into the database.

A well-designed data capture form should be **user-friendly**. To help with this, it is a good idea to ensure the form contains:

- clear instructions for the user to help them complete the form
- a description stating the purpose of the data collection
- the name of the organisation collecting the data
- a graphic or a logo to help explain the purpose of the form
- correctly sized boxes for each response, appropriate to the question
- a format that matches the database field headings
- examples to help the user complete the form
- options for the user to select a response from (a **multiple-choice format**) where appropriate.

KEYWORDS

data-capture form: a form designed to collect data for a specific task

user friendly: easy to use or understand

multiple-choice format: a question that provides a set of possible answers the user must choose from

Computational thinking – pattern recognition

- Examine the data capture forms below. Both are designed to collect data for a survey that is trying to understand students' favourite hobbies.
- Evaluate the effectiveness of each form. Copy and complete the table shown below. Use the criteria in the Learn box above.

Form 1

Data capture

This form will be used to record your details with our company. Complete this form by answering all questions using the boxes provided. Write all of your answers in capital letters.

Title
Forename
Surname
Address

Home Telephone Number
Mobile Telephone Number
Date of Birth

Are you interested in fashion?

What are your other interests?

Thank you for completing the form.

Form 2

CUSTOMER INFORMATION DATA CAPTURE FORM

This form will be used to help with our parent-survey records for mathematics and statistical analysis. Complete this form by answering all questions using the boxes provided.

Name
Title Mr / Mrs / Miss / Ms / Dr (Please circle)
Forename Surname

Address
House no / Name & Road
Town
County
Postcode

Contact details
Home Mobile

Personal Details
Date of Birth /// (d d mm y y y y)

Other
Are you interested in fashion? Yes / No (please circle)

What are your other interests? (please tick 2)
Reading ☐
Walking ☐
Swimming ☐
Athletics ☐
Horse riding ☐
Computer games ☐
Music ☐

Thank you for taking the time to complete this form.

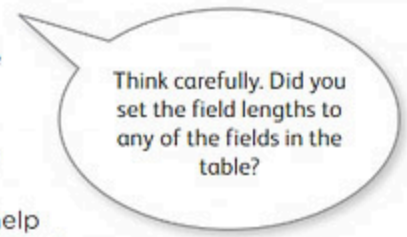
Form 1		Form 2	
Areas for improvement	**Examples of good design**	**Areas for improvement**	**Examples of good design**

Practise

1 Use what you have learned to design a user-friendly form that could be used to collect data for new competitors in the gaming competition.

Things to consider when designing your form include:

- Should you design a gaming competition logo or use the school logo?
- What title should you include on the form?
- What field headings are you collecting data for?
- Do all of these field headings need to link to data that must be provided by the competitors (for example, some forms include a section with the heading 'For office use only')?
- Should all of the data be included on the form?
- Should any of the fields contain a limit to the number of characters the person completing the form can include in their answer?
- Do any of the fields contain options the user could select from? How might you present these on the form?
- Should any additional guidance be provided to help users complete the form? What should this be and where should it be added?



2 Ask a partner to review and evaluate the data capture form you have designed.

3 Make improvements to the design of your form based on the feedback provided by your partner.

Searching for the answers

Learn

Databases often hold large amounts of data. **Queries** are used to search a database and select data that can be used to answer questions for the user. For example, in the gaming competition database, a teacher might wish to search for students who have not yet paid their deposit for the trip.

Queries use **criteria** to search databases. The criteria are used to provide a set of **conditions** the data must meet for it to be selected when a search is carried out. For example, when searching a database for all of the students in Stage 7 in school, the condition is 'Stage = 7'.

When developers create a database, they need to know in advance the types of searches the database users will want to apply to the data they have. Database designers work with the database users to plan the queries they need.

Criteria for database queries can include text, numbers or **comparison operators**. A comparison operator is an operator that is used to compare something. When a comparison operator is applied to compare two data items, the outcome can only ever be **TRUE** or **FALSE**. Examples of comparison operators include >, <, =.

In the gaming competition database you have a field for age, so you could check the condition 'age>11'. If the competitor's age is 12, this would be **TRUE**, but if the competitor's age is 10 this would be **FALSE**.

Database queries select the correct data from a data table and present it to the end user. For example, here's the student data table from the gaming competition database:

StudentID	Surname	First Name	Stage	Class	DOB
1	Bhat	Aran	7	7T3	12/01/2010
2	Alarcos	Julia	7	7T2	09/04/2010
3	Arias	Gustav	7	7T5	01/06/2010
4	Gomez	Arianna	7	7T5	03/04/2010
5	Bhat	Aran	7	7T3	07/12/2010
6	Bekal	Genevieve	7	7T2	18/06/2010

Some example queries could include:

Query description	Table	Fields	Search criteria for query
List all the details of all the students in 7T2 who are going on the trip	Student table	Student ID Surname First name Stage Class DOB	Class = 7T2
List the name and DOB of all students in 7T3	Student table	First Name Surname DOB Class	Class = 7T3

KEYWORDS

query: a tool used in some applications to allow users to select useful data

criteria: a set of key words, rules or conditions used to search for data items

condition: something that is checked to determine whether it is true or false

comparison operator: a symbol that can be used to compare values, e.g. >, <, =

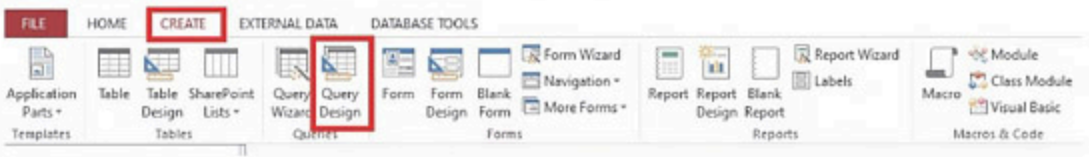
Practise

You will need a copy of the file **GamingComp.accdb** to complete this task.
Practise designing and creating a query using the table called Registration Data, saved in our gaming competition database. The table below shows the fields and the criteria used to search the registration data table. The query shows students who have not returned parental permission forms.

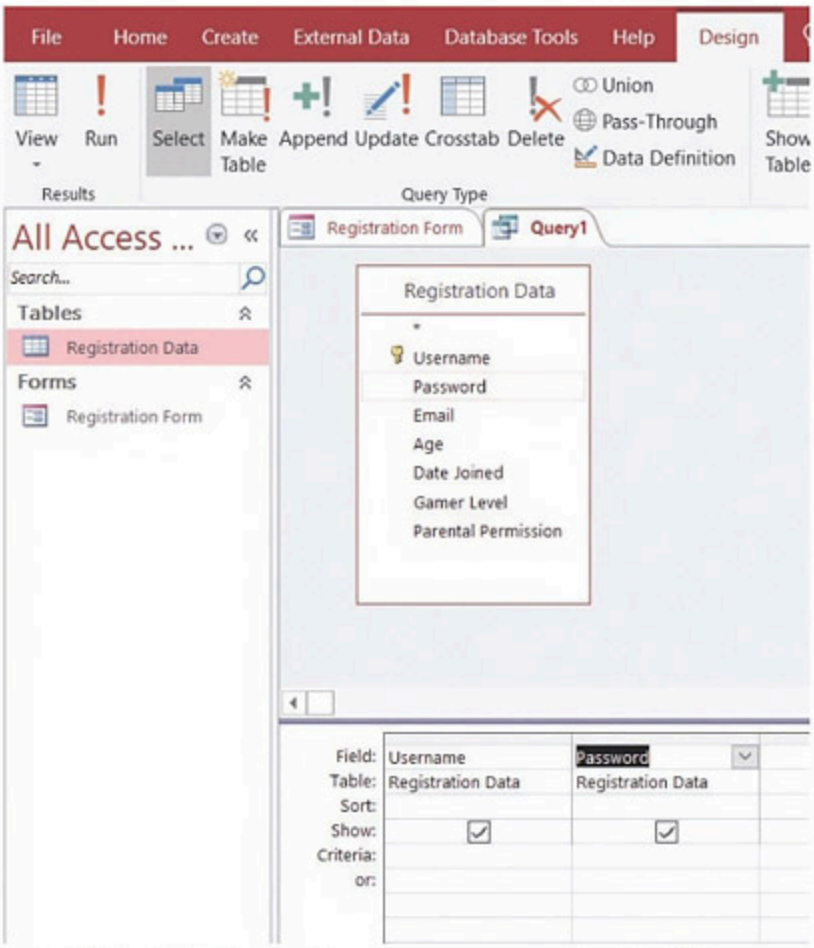
Query description	Table	Fields	Criteria
List all the details of all the students who have not returned parental permission forms	Registration Data	Username Password Email Age Date joined Gamer level Parental permission	Parental permission = NO

Follow these instructions:

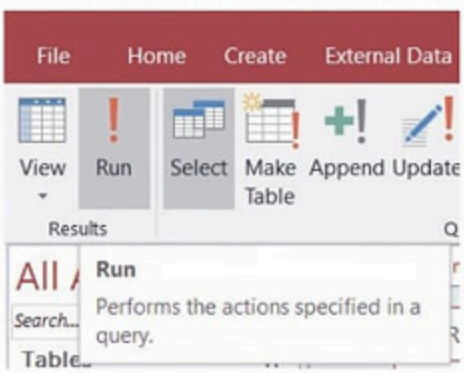
- Open **GamingComp.accdb** provided by your teacher.
- Click on the `Create` tab. Select `Query Design` from the `Queries` group. This opens the query design window.



- Click on **Registration Data** and then click on **Add**.
- Click on each field in turn to add them to the query.



- Enter F (for FALSE) into the **Criteria** row under the field **Parental Permission**.
- Select **Run** from the **Design** tab to carry out the actions in the query you have just created.



- You should obtain the following results:

Username	Password	Email	Age	Date Joined	Gamer Level	Parental Perr
student002	3EDGFBNA6	student002@school.com	12	15/09/2021	Intermediate	☑
student004	4DFAECHY7	student004@school.com	11	07/09/2021	Expert	☑
student005	2APFGBET6	student005@school.com	11	03/09/2021	Beginner	☑
student006	5MAOEJHD4	student006@school.com	11	17/09/2021	Beginner	☑
student008	9JHYTABG6	student008@school.com	13	09/09/2021	Expert	☑
student011	4SSJYTFV6	student011@school.com	12	29/09/2021	Intermediate	☑
student012	8ASLKIJH7	student012@school.com	13	25/09/2021	Expert	☑
student015	7GHTYAKH7	student015@school.com	13	24/09/2021	Intermediate	☑
student017	5HGFAWES4	student017@school.com	13	03/09/2021	Expert	☑
						☐

- Save your query by clicking on the `close` icon. You will then be asked to give your query a name. Call your query 'No permission' and click on `Save`.

Computational thinking – logic and evaluation

Databases that model real-life scenarios often require lots of queries to allow users to get the important data they need. It is always a good idea to plan your searches before you begin to create them. That way, you will make sure you have included all of the data that the user needs in your query.

1 Copy and complete the query design template shown.

Query description	Table	Fields	Criteria

Complete the table to design searches to select the following data from the gaming competition database:

- Output the username and password of everyone in the database whose gamer level is intermediate.
- Output the username only of everyone who is older than 10.

Remember: think carefully not only about the fields you wish to display in the query results, but also those you need to help you set the criteria.

2 Open your database from the Practise task above. Examine the data stored in the gaming competition database.

- Can you think of any additional searches the organisers might find useful as they try to organise the competitions?
- Design some additional searches you think might be useful for the organisers of the competition. Try to use all of the comparison operators we looked at in the Learn box above.
- Create queries based on the designs you have produced.
- Ask a partner to examine your queries in design view in MS Access. Can your partner recreate a design table for each of your queries?
- When your partner has produced a design table for the searches, check whether yours matches it.

Highlighting the important data

Learn

Data models are often used to help organisers and managers make decisions. To help make decisions quickly, the important data must be easy find. To help with this, you can use a feature in MS Access called **conditional formatting** to highlight the really important areas. To do this, you need to set rules so that data that matches those rules is automatically highlighted.

In MS Access you can use conditional formatting to highlight data on input forms and output reports.

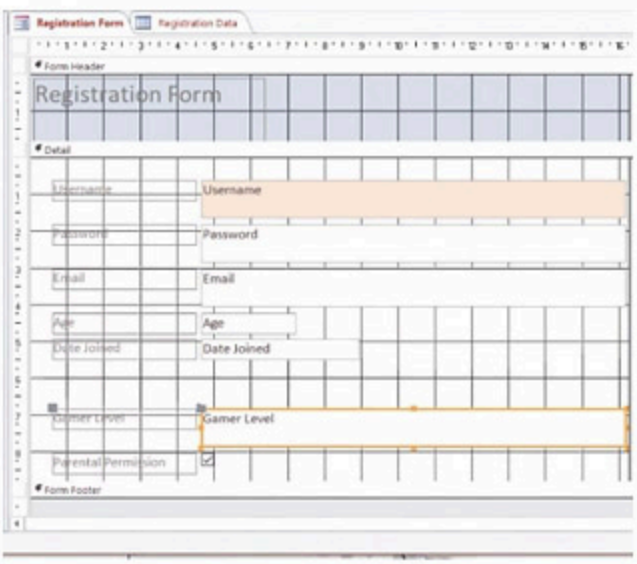
KEYWORD
conditional formatting: formatting a data item that meets a specific rule

Practise

1 The gaming competition organiser wants to highlight the beginner level gamers when they are registering for the competition, as they would like to check that they are familiar with the rules of the competition.

Use conditional formatting in the Registration Form (this form has already been created for you) to highlight any students who are beginner level. This will help give the organisers a quick view of how many beginners they have in the competition.

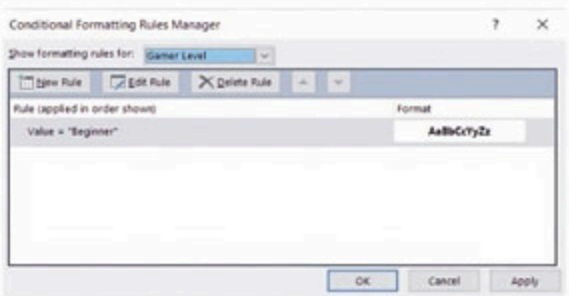
- Open **GamingComp3.accdb** provided by your teacher.
- Open the item called `Registration Form` by double-clicking on it.
- Display the form in `design` view.
- Highlight the **control** (the text box) in the form where the user will enter the gamer level of the student.

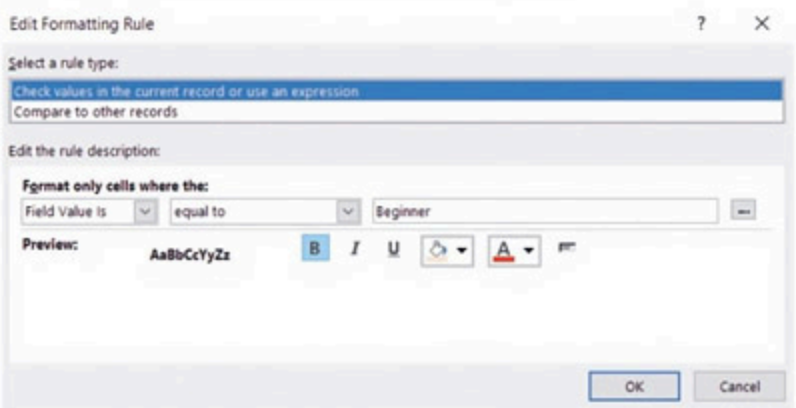


- Click on the **Format** tab.
- Click on **Conditional Formatting** to display the conditional formatting rules manager.

You can also right-click on the control and select **Conditional Formatting**.

- In the conditional formatting rules manager, click on **New Rule** and set the rule for the gamer level field, as shown.





- Click **OK** in the **Edit Formatting Rule** screen and then click **OK** again to return to your form in design view.

2 Save your form and scroll through the records in your form to check that all beginner level registrations are highlighted.

Change the format to suit your own form colour scheme.

KEYWORD

control: an element on a database input form, e.g. a text box or a label

Modelling methods: Software choices

Learn

Decision-making can be difficult when you have a lot of data to take into consideration. Computer applications such as spreadsheets and databases can help you make sense of large amounts of data. Databases and spreadsheets provide lots of useful tools that can be used to help us organise the data. They can also help us analyse the data and allow us to use it to solve problems. It can be difficult sometimes deciding which application to use!

Here's a comparison:

Database features	Spreadsheet features
• Organises data under field headings and in a table to make it easier to understand • Queries to allow us to search the data to answer questions • Forms to allow us to enter data in a user-friendly way • Primary keys to help identify one data item from another • Data types that can be used to change how data is presented • Conditional formatting to highlight data that meets certain criteria	• Stores data in individual cells • Labels to organise data and make it easier to understand • Data types to improve the formatting of data • Formulae to perform calculations and create links between different data items in a model • Conditional formatting to highlight data that meets certain criteria

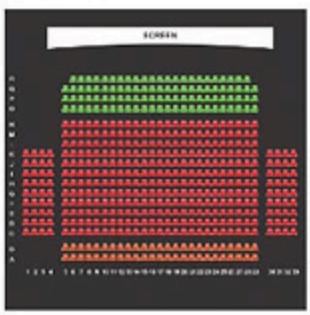
Database and spreadsheet applications can both use conditional formatting to highlight data that meets certain criteria.

Practise

1 Examine each of the scenarios listed below. With a partner, discuss the following questions:
- What factors do you need to record for each scenario? For example, what data do you need to store?
- List the field headings you would use to organise the data associated with each scenario.
- List any queries or calculations you would need to help you to model each scenario.

Scenario 1

You are creating a data model to record seat bookings in a cinema.



Scenario 2

You are creating a model to keep a record of student performance in a school swimming gala where an award is given to the team with most points.

2 Copy and complete the table below to help you decide which application you would use to model each scenario:

	Spreadsheet or database?	Give a reason for your answer
Cinema scenario		
Swimming gala scenario		

Should you use a spreadsheet or a database for the data model in each scenario? Think carefully. Do you need to perform a lot of calculations? Is the data mainly numbers? If the answer to either question is 'yes', then a spreadsheet may be better.

Go further

You have looked at how spreadsheets can be used to perform calculations on data. Database **models** can also be used to carry out calculations on data. One way of including calculations in a database model is by displaying data in a report and then adding a calculation to the report.

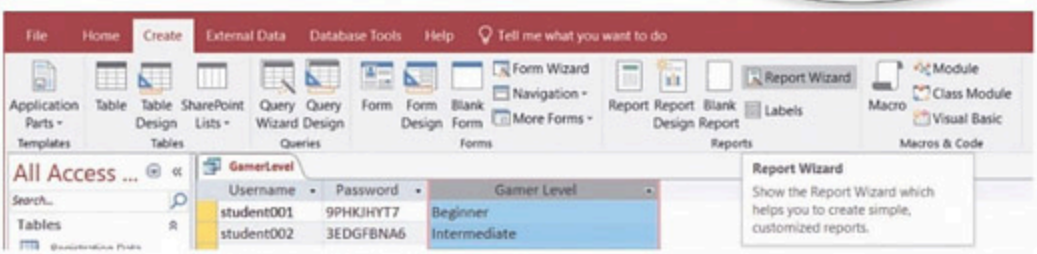
For example **database reports** can be used to produce data summaries with calculations. This helps to give the user of the data a quick overview of important facts and statistics.

The gaming competition organisers have asked you to help them extract some useful data from the competition database. They need a list of usernames and passwords with a count of the number of gamers in each of the levels (beginner, intermediate and expert). Follow these instructions:

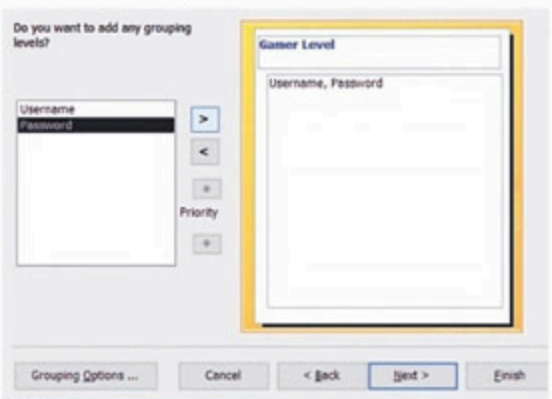
1 Open **GamingComp.accdb**.
   - Create a query that contains the data the organisers need to help them to complete this task.
   - Save the query as **GamerLevel**.

2 Create a report to display the results of the query above in a way that will help the gaming competition organiser see how many gamers of each level they have in the competition. Follow these instructions:
   - Click on the `Create` tab and click on `Report Wizard`.

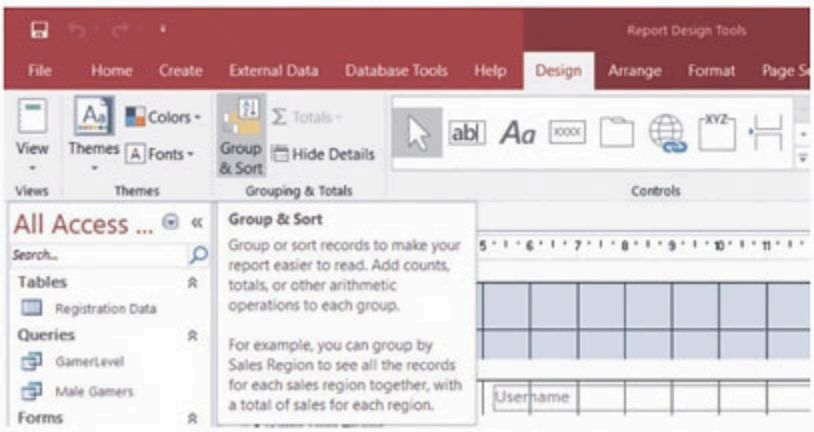
Queries can be used to select data from a database table without adding criteria into the query design. Think carefully about the fields you need to help you to solve this problem.



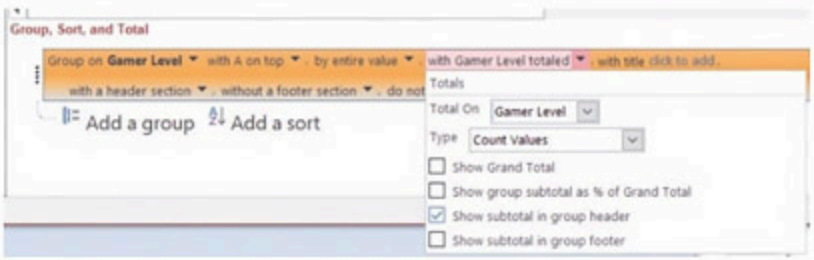
   - Select the `GamerLevel` query from the `Tables/Queries` dropdown box.
   - Click the double arrow to select all three fields.
   - Click `Next`.
   - Select `Group by Gamer Level` and click `Next` again.



- Click **Next** again (as you are not sorting the data at this stage).
- Select **Stepped Layout** and click **Next**.
- Name the report **GamerLevel** and click **Modify the reports design**.
- Click **Finish**.
- Add additional calculations to the report in design view. Click on **Group & Sort** in the **Design** tab.



- Click on **More** in the **Group, Sort and Total** box, which appears at the bottom of the report screen, and select the options **Total On – Gamer Level**, **Type – Count Values** and **Show subtotal in group header**:



- Change the report to **Report View** to check the results.

3 Can you amend the layout of the report to include an additional text label to explain the totals that have appeared on the report? The data in the report should be displayed in three sections, grouped according to GamerLevel.

Use conditional formatting to highlight important data. For example, if the number entered for each gamer level is <6, use conditional formatting to highlight the number using a red background.

To amend the layout of the report, open the report in design view:
Click on any text box you wish to change the size of.
Place your mouse over the side of the text box.
When a double-sided arrow appears, press the left-hand mouse button to resize the text box.

KEYWORDS

model: a computer application that replicates a real-life environment, where data is changed to see what happens; simple models can be built in spreadsheet software

database report: a tool within a database used to output data for the user

Computational thinking – abstraction

During the gaming competition, the competition at each level can carry on only if there are more than five competitors at that level. Use what you have learned about conditional formatting in data-entry forms to amend the reports so that the number in the level is highlighted with a red background and black text if there are not enough entrants.

Remember: before you can add conditional formatting, you will have to view the report in design view; you then need to select the `Format` tab. Think carefully about where on the report you need to apply the formatting.

Challenge yourself

Earlier in this unit, you used a spreadsheet to keep track of pupil payments into a school-trip fund. You then changed the cost of the trip and some of the payment figures to try to make sure that every student paid the trip balance in full.

Changing data in a model in this way is known as *What-If Analysis*. Spreadsheet applications such as MS Excel offer some built-in tools, such as What-if Analysis, to help organisations make decisions.

Another valuable tool offered by MS Excel is *Goal-Seek Analysis*.

- Use the internet to find out more about each of the tools listed below and how they can be used to analyse data in a spreadsheet application.
- Describe what the tools are designed to do. Say how you think the gaming competition organisers could use these tools in a spreadsheet to help them keep track of the funds they are raising for the school. Copy and complete this table.

Tool	What does this tool do?	How the competition organisers could use it
Goal-Seek Analysis		
What-If Analysis		

Final project

Some of the competitors in the gaming competition have asked the organisers whether they will have an opportunity to use simulations in the competition. The organisers have asked you to help them understand the difference between a model and a simulation.

1 Write a short paragraph to explain to the organisers what is meant by a *data model*. Explain the key features of a data model and the advantages and disadvantages of using one.
   - Use an example to show how data models are used in a real-life application you have studied in this unit.
   - Explain how a data model is used in this application to help make decisions.

2 Describe one application where simulations can be used to help model a real-life situation. What are the advantages of using a simulation in the real-life application you have selected?

Database task

The gaming competition organiser has created a data model in the form of a database to help keep track of the sales of both **merchandise** and **meet-and-greet** tickets. They have asked you to help them set up the database so that they can produce some useful data about how the sales have gone so far.

Before you can do this, however, you must amend the database design to ensure that:

- the correct data items have been assigned to each field
- a key field has been correctly assigned to the database table
- the field lengths have been amended so that the database does not take up too much space.

1 Open the file **Sales.accdb** provided by your teacher. Use this file to complete the following tasks:
   - Produce queries to list the student numbers of each person that has purchased baseball caps (as they would like to distribute these to the students at the end of the week).
   - Identify merchandise that has sold fewer than ten items. To do this, open the report called 'Sales'. Edit the report to highlight in red merchandise items where fewer than ten items have been sold.
   - Save your database.

2 Consider additional queries that might be useful to the organisers of the gaming competition. Design the queries using a table similar to the one used on page 135. If you have time, you should also create the queries.

3 Design a data capture form that would allow users to enter data into the table called Orders in the database called **Sales.accdb**.

Spreadsheet task

The organiser needs your help to set up a system that can enable them to make decisions such as:

- how much the meet-and-greet tickets should cost
- how much each T-shirt, sweatshirt and baseball cap should cost.

You have advised the organiser that a spreadsheet would be the best tool for this task.

- Review the key features of a spreadsheet, covered earlier in this unit.
- Write a sentence to explain why you feel a spreadsheet would be best for this task.

The organisers have created a spreadsheet to help them keep track of the data they have collected so far. They need your help developing some of the calculations in the spreadsheet.

3 Open the file **Final Project.xlsx** provided by your teacher.
   - Continue the development of the spreadsheet by adding the data and additional labels shown in the spreadsheet below. (Do not worry about shading your spreadsheet cells in the same way.)

	A	B	C	D	E	F	G	H	I
1	Income								
2	Item	Number Sold	Selling price	Income					
3	Baseball Cap	50	5						
4	T-Shirt (S)	67	6						
5	T- Shirt (M)	34	7						
6	T-Shirt (L)	22	8						
7	Hoody (S)	60	10						
8	Hoody (M)	45	12						
9	Hoody (L)	12	14						
10	Meet and Greet	120	7						
11			Total Income				Funds Raised		
12							Target	5,000	
13									
14	Expenses	Number Purchased	Cost	Expenses					
15	Celebrity Fee	1	500						
16	Hall Rental	1	100						
17	Baseball Cap	200	3						
18	T-Shirt (S)	150	3.5						
19	T- Shirt (M)	100	4						
20	T-Shirt (L)	100	4.5						
21	Hoody (S)	150	5.5						
22	Hoody (M)	100	6.5						
23	Hoody (L)	100	8						
24			Total Expenses						
25									