

Key Terms

Modelling	A program which has been developed to mimic a real life system. Spreadsheets use mathematical formulas and calculations to predict what is likely to happen based on data recorded about what actually did happen in the past. Software includes Microsoft Excel and Google Sheets.
Cell	One box on a spreadsheet. A group of cells together is called a range .
Cell Reference	The unique 'address' of a cell on a spreadsheet, made up of the Column letter and Row number, e.g. A1.
Range	A group of cells that are next to each other, e.g. A2:B6.
Active cell	The currently selected cell. It has a thick black line around it with a small dot called the fill handle in the bottom right corner.
Row	A group of cells 1 cell high going across a worksheet. In Excel, these are the numbers down the left side of the page.
Column	A group of cells 1 cell wide going from the top to the bottom of a worksheet. In Excel these are the letters going across the top of the page.
Label	This is a piece of text that explains what the data in the cell next to it represents.
Absolute cell reference	Refers to a specific cell and doesn't change when copied to other cells using the fill handle. E.g. \$D\$3
Chart	A picture of data made from a range of cells. There are lots of types which are useful for different reasons, e.g. pie, line, scatter, area, radar, bar, radar etc.
Legend	A table that explains which data is represented by different colours on a chart.
Formula	Used in a spreadsheet cell, this starts with an '=' and combines numbers, mathematical operators and functions to manipulate data.
Function	These are built in to spreadsheets and perform standard tasks, like finding the average, highest and lowest of a set of numbers. They always look like =FunctionName(Details the function needs). Tooltips will appear as you type them to tell you what details that function needs.
Fill	Copies the contents of a cell or range of cells into others by dragging the fill handle in the bottom right of the active cell or range.
Conditional Formatting	Changes what a cell looks like based on rules about the data a cell contains.

Key Facts / Methods / Processes/Questions

Where are Computer Models used?	Computer models are used in schools to predict student performance in exams, they are used to predict the weather, to predict how financial markets are going to change, to see whether car components will fit together before they are made and to see if a business is making enough money to stay open.
How are spreadsheets used in computer models?	Spreadsheets are very good at processing data and then presenting it in graphical form. Presenting data in the form of a chart makes it much easier to understand, which makes it more persuasive than a table of numbers.

Cell references begin with a letter, and finish with a number. EG: A1

	A	B	C	D	E	F	G
1							
2							
3							
4							
5							

A range is a selection of cells. EG: A2:F4

	A	B	C	D	E	F	G
1							
2							
3							
4							
5							

Golden rule: every formula always starts with an =

Name of the formula
See below for common formulae. Normally written in capitals.

=SUM(B10:B23)

= sign
An equal sign tells Excel that the cell contains a formula.

The selected range
The range used in the formula. This can be selected by clicking and dragging.

Cell Formatting

Number	Tell the spreadsheet what type of data the cell contains, e.g. currency, percentage, date, time, etc.
Alignment	Align the text in the cell vertically (top, bottom or middle), horizontally (left or right) or at an angle.
Font	Change the font used, text size and colour.
Border	Add a solid, dotted, dashed or coloured border to the cell.
Adjusting column width and row height	To adjust a column's width or a row's height, move your mouse cursor between two columns or rows. Click and drag to resize. To automatically resize a row to fit the data entered in a cell, double-click between the current row and the row after it.

Modelling Data

Example Question

- Begin by calculating **Min Max Average** for the price of the products sold.
- Use a function to calculate the **total stock**.
- Add an **IF function** to monitor stock levels. If stock falls below 20 then **'Re-Order'** or **'No Action'**.
- Add conditional formatting on the Re-Order cells.

Common Functions

= sum ()	Adds a range of cells together.
= average ()	Finds the average for a range of cells.
= min ()	Returns the smallest value in the range.
= max ()	Returns the highest value in the range.
= count ()	Counts how many cells meet a condition, e.g. count(A:A, "April") would return the number of times the word April (with a capital letter), occurs in column A.

Advance Functions

IF	Change the value of a cell if something is true, e.g. if a customer's total bill is over £100, deduct 10% from their bill.
COUNTIF	Adds up cells that meet a certain rule, e.g. count the number of students that achieved level 6.
VLOOKUP	Matches contents of a cell with an answer, e.g. how much is a pepperoni pizza?

Charts & Graphs

Charts and graphs provide a visual representation of data, which can often be easier to understand. There are several types of charts and present data - you must always consider which would be a suitable chart or graph for your model.

- LINE GRAPH** – to show a change over time.
- PIE CHART** – show the individual parts that make up a whole.
- BAR CHART** – compare things that aren't directly related.
- SCATTER GRAPH** – look for a pattern or link between two sets of data.

Modelling Data Example - CASH FLOW FORECAST

	April	May	June	July	August	September	October	November	December	January	February	March
Cash Inflows												
Sales	£3,600	£7,200	£22,000	£26,000	£27,000	£25,200	£18,000	£21,600	£36,000	£18,000	£14,400	£18,000
Loans	£20,000	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Savings	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
TOTAL	£23,600	£7,200	£22,000	£26,000	£27,000	£25,200	£18,000	£21,600	£36,000	£18,000	£14,400	£18,000
Cash Outflows												
Wages	£3,280	£3,280	£3,300	£3,330	£3,330	£3,330	£3,330	£3,330	£3,500	£3,500	£3,500	£3,500
Start-Up costs	£7,201	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0	£0
Stock purchases	£1,440	£4,380	£17,800	£17,500	£18,500	£17,500	£4,500	£4,500	£4,500	£4,500	£4,500	£4,500
Telephone/Internet	£45	£45	£45	£45	£45	£45	£45	£45	£45	£45	£45	£45
Utility Bills	£65	£65	£65	£65	£65	£65	£65	£65	£65	£65	£65	£65
Advertising	£60	£60	£60	£60	£60	£60	£70	£70	£70	£70	£70	£70
Loan repayment	£185	£185	£185	£185	£185	£185	£185	£185	£185	£185	£185	£185
Business Rates	£152	£152	£152	£152	£152	£152	£152	£152	£152	£152	£152	£152
Rent	£833	£833	£833	£833	£833	£833	£833	£833	£833	£833	£833	£833
Drawings	£2,000	£2,000	£4,000	£4,000	£5,000	£6,000	£6,000	£10,000	£10,000	£14,000	£14,000	£11,000
TOTAL	£15,261	£11,000	£26,440	£26,170	£28,170	£28,170	£15,180	£19,180	£19,350	£23,350	£23,350	£20,350
Opening Balance	£0	£8,339	£4,539	£99	-£71	-£1,241	-£4,211	-£1,391	£1,029	£17,679	£12,329	£3,379
Net Cash Flow	£8,339	-£3,800	-£4,440	-£170	-£1,170	-£2,970	£2,820	£2,420	£16,650	-£5,350	-£8,950	-£2,350
Closing Balance	£8,339	£4,539	£99	-£71	-£1,241	-£4,211	-£1,391	£1,029	£17,679	£12,329	£3,379	£1,029

A **Cash Flow Forecast** is to show how much cash a business receives into the bank account for a period of 12 months. The cash from Sales and from the Loans that the business has borrowed from the bank make up the cash inflows.

It also shows the cash outflows, so anything that business has to pay for example bills it has to pay those each month and we can total them for each month to calculate the total cash outflows.

The cash flow forecast also shows the opening balance in the bank account at the start of each month. We then work out the net cash flow so the inflows minus the outflows each month and we then can work out the closing balance by adding those two items together.

This document enables the business to see if they are achieving a surplus of cash or a deficit of cash so it helps them when they are planning their bank account and their spending.

Modelling Data Example in Formula View- CASH FLOW FORECAST

	April	May	June	July	August	September	October	November	December	January	February	March
Cash Inflows												
Sales	3600	7200	22000	26000	27000	25200	18000	21600	36000	18000	14400	18000
Loans	20000	0	0	0	0	0	0	0	0	0	0	0
Savings	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	=B3+B4+B5	=C3+C4+C5	=D3+D4+D5	=E3+E4+E5	=F3+F4+F5	=G3+G4+G5	=H3+H4+H5	=I3+I4+I5	=J3+J4+J5	=K3+K4+K5	=L3+L4+L5	=M3+M4+M5
Cash Outflows												
Wages	3280.32	3280	3300	3330	3330	3330	3330	3330	3500	3500	3500	3500
Start-Up costs	7200.51	0	0	0	0	0	0	0	0	0	0	0
Stock purchases	=B3*\$B\$25	4380	17800	17500	18500	17500	4500	4500	4500	4500	4500	4500
Telephone/Internet	45	45	45	45	45	45	45	45	45	45	45	45
Utility Bills	65	65	65	65	65	65	65	65	65	65	65	65
Advertising	60	60	60	60	60	60	70	70	70	70	70	70
Loan repayment	185	185	185	185	185	185	185	185	185	185	185	185
Business Rates	152	152	152	152	152	152	152	152	152	152	152	152
Rent	833	833	833	833	833	833	833	833	833	833	833	833
Drawings	2000	2000	4000	4000	5000	6000	6000	10000	10000	14000	14000	11000
TOTAL	=SUM(B9:B18)	=SUM(C9:C18)	=SUM(D9:D18)	=SUM(E9:E18)	=SUM(F9:F18)	=SUM(G9:G18)	=SUM(H9:H18)	=SUM(I9:I18)	=SUM(J9:J18)	=SUM(K9:K18)	=SUM(L9:L18)	=SUM(M9:M18)
Opening Balance	0	=B23	=C23	=D23	=E23	=F23	=G23	=H23	=I23	=J23	=K23	=L23
Net Cash Flow	=B6-B19	=C6-C19	=D6-D19	=E6-E19	=F6-F19	=G6-G19	=H6-H19	=I6-I19	=J6-J19	=K6-K19	=L6-L19	=M6-M19
Closing Balance	=B22	=C21+C22	=D21+D22	=E21+E22	=F21+F22	=G21+G22	=H21+H22	=I21+I22	=J21+J22	=K21+K22	=L21+L22	=M21+M22

A **FORMULA** is an expression which calculates the value of a cell.

In this example the Cash Inflows Total for April, would be to add the value of Sales, Loans and any savings for the month. Excel would calculate this using the formula =B3+B4+B5

A **FUNCTION** is a predefined formula that performs calculations using specific values in a particular order. The **SUM function** adds values. You can add individual values, cell references or ranges or a mix of all three.

Excel includes many common **functions** that can be used to quickly find the sum, average, count, maximum value, and minimum value for a range of cells.

CONDITIONAL FORMATTING is a feature in many spreadsheet applications that allows you to apply specific **formatting** to cells that meet certain criteria. It is most often used as colour-based **formatting** to highlight, emphasize, or differentiate among data and information stored in a spreadsheet.

Algorithms

Algorithms

- An **algorithm** is a **sequence** of step-by-step **instructions** to solve a problem.
- Algorithms can be written in code, or be a **sequence** of pictures.

A computer algorithm.



Algorithm for making a sandwich.

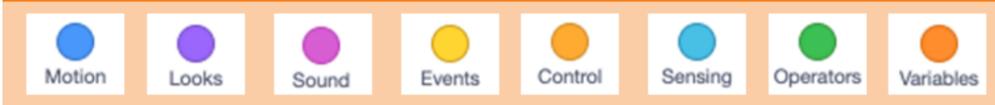
Scratch

Word	Definition	Image
Sprite	The name of a character in Scratch.	
Scratch	The name of the programming language we are learning.	
Turn # degrees	How far to the left or right you want to move your sprite. # is replaced with the number.	
Block	A single instruction in our algorithm.	

Key Terms

Instructions	Detailed information about how something should be done or operated.
Execute	When you create a program for a computer, you give it a set of commands to execute.
Sequence	The order the instructions need to be in.
Selection	Making choices.
Iteration	Doing the same thing more than once Iteration in computing is the process of repeatedly executing instructions.
Repeat	The block that makes an instruction happen more than once.
Variables	A variable is a name that refers to data being stored by the computer.
Subroutines	In computer programming , a subroutine is a sequence of program instructions that performs a specific task.
If block	Allows us to check a condition and perform an operation if the condition evaluates to 'true'.
Debugging	Finding errors in our code.
Abstraction	Taking away all the information that isn't needed.
Decomposition	Breaking down a problem.
Count-controlled	Count-controlled iteration will execute the commands a set number of times.
Condition-controlled	Condition-controlled will execute the commands until the condition you set is no longer being met.

Scratch blocks and programme examples



We can use **algorithmic prediction** to guess what will happen. My **Sprite** is going to get bigger!

The **repeat loop** in this example, will move ten times. This is **more efficient** than writing out ten **commands**.

The **turn # degrees** block will turn my sprite. This **algorithm** will turn my **sprite** in a circle