

20.1 Create a data model

Syllabus 2026 - 2028

WHAT YOU NEED TO KNOW

- Create and edit a spreadsheet model: insert and delete cells, rows and columns, merge cells
- Create formulae using cell references; replicate them with absolute and relative references; use arithmetic operators, named cells and named ranges
- Use functions: SUM, AVERAGE, MAX, MIN, INT, ROUND, COUNT, LOOKUP, VLOOKUP, HLOOKUP, XLOOKUP, IF, nested functions and external data sources
- Know the difference between a formula and a function, the order of operations, and absolute and relative referencing

Editing the spreadsheet

Action	What it does
Insert row, column or cell	Adds a new empty row, column or cell. Existing data moves down or right, and formulae adjust to keep working.
Delete row, column or cell	Removes it with its contents. Formulae that used it show an error such as #REF!.
Merge cells	Joins several cells into one, usually for a title or heading that spans columns.

Formulae and functions

A **formula** is a calculation typed by the user. It always begins with = and uses cell references and operators, for example =B2*C2. A **function** is a ready-made calculation built into the software that has a name and brackets, for example =SUM(B2:B10). A formula can contain functions.

Operator	Meaning	Example
+	Add	=A1+B1
-	Subtract	=A1-B1
*	Multiply	=A1*B1
/	Divide	=A1/B1
^	Indices (power)	=A1^2 (A1 squared)

Order of operations

The computer does not work from left to right. It follows the order **BIDMAS**: Brackets, Indices, Division and Multiplication (left to right), then Addition and Subtraction (left to right). Use brackets to force a different order.

Formula	Result (A1=10, B1=5, C1=2)	Why
=A1+B1*C1	20	B1*C1 is done first (10 + 10)
=(A1+B1)*C1	30	Brackets first (15 * 2)
=A1/B1+C1^2	6	Indices, then division, then addition (2 + 4)
=A1-B1-C1	3	Left to right (5 - 2)

Cell referencing

Type	Example	Behaviour when copied (replicated)
Relative	=B2*C2	References change by the same amount as the formula moves. Copy it down one row and it becomes =B3*C3.
Absolute	=B2*\$F\$1	\$ locks the column and row. The reference always points to the same cell, for example a tax rate or exchange rate in F1.
Mixed	=B\$2 or =\$B2	Only the row or only the column is locked.

Use a relative reference when each row should use its own data. Use an absolute reference when every copy of the formula must use the same fixed cell.

Named cells and named ranges

A cell or a group of cells can be given a name, such as **VAT** or **Marks**. The name can then be used instead of the reference, which makes formulae easier to read and works like an absolute reference.

```
=B2*VAT          (VAT is the name of cell F1)
=AVERAGE(Marks) (Marks is the name of range C2:C31)
```

Functions you must know

Function	Use	Example
SUM	Adds the numbers in a range.	=SUM(B2:B10)
AVERAGE	Gives the mean of a range.	=AVERAGE(B2:B10)
MAX / MIN	Largest / smallest value.	=MAX(B2:B10)
INT	Removes the decimal part (rounds down to a whole number).	=INT(7.8) gives 7
ROUND	Rounds to a stated number of decimal places.	=ROUND(3.14159,2) gives 3.14
COUNT	Counts the cells that contain numbers. (COUNTA counts non-empty cells.)	=COUNT(B2:B10)
IF	Chooses between two results depending on a condition.	=IF(B2>=50,"Pass","Fail")
LOOKUP	Finds a value in one row or column and returns the matching value from another.	=LOOKUP(A2,F2:F6,G2:G6)
VLOOKUP	Searches the first column of a table (vertical) and returns a value from a column to the right.	=VLOOKUP(A2,F2:H10,3,FALSE)
HLOOKUP	Searches the first row of a table (horizontal) and returns a value from a row below.	=HLOOKUP(A2,F1:L3,2,FALSE)
XLOOKUP	Newer lookup: searches one range and returns from another range, in any direction.	=XLOOKUP(A2,F2:F10,H2:H10)

In VLOOKUP and HLOOKUP the third argument is the column (or row) number to return, and **FALSE** asks for an exact match. A lookup table should be an absolute reference, for example \$F\$2:\$H\$10, so that it does not move when the formula is copied down.

Nested functions and external data

A **nested function** is a function placed inside another function. The inner one is worked out first.

```
=IF(AVERAGE(B2:D2)>=50,"Pass","Fail")
=ROUND(AVERAGE(B2:B10),1)
=IF(B2>=80,"A",IF(B2>=60,"B","C"))          (nested IF)
=VLOOKUP(A2,'[Prices.xlsx]Sheet1'!$A$2:$C$50,3,FALSE) (external data source)
```

An **external data source** is another file or workbook. A function can use it by referring to the file name, sheet and range, so the data does not have to be typed in again. If the file is moved or renamed, the link breaks.

Advantages	Disadvantages
+ Formulae recalculate automatically when a value changes, so what-if questions are answered quickly	- A wrong reference, brackets or order of operations gives wrong results without a warning
+ Replicating formulae saves time and reduces typing errors	- Broken external links and deleted cells cause errors
+ Named ranges and lookups make a model easier to read and update	- Large models with many nested functions are hard to check

EXAM TIP

In exam questions about references, say what happens when the formula is copied: a relative reference changes, an absolute reference (\$) stays fixed. Also remember that every formula starts with = and that brackets change the order of working.

Key terms

Term	Meaning
Formula	A calculation typed by the user, starting with =.
Function	A built-in calculation with a name, such as SUM or IF.
Relative reference	A cell reference that changes when the formula is copied.
Absolute reference	A cell reference with \$ that does not change when copied.
Named range	A group of cells given a name that can be used in formulae.
Nested function	A function used inside another function.
BIDMAS	The order of operations: brackets, indices, division/multiplication, addition/subtraction.