Cambridge (CIE) IGCSE ICT

Create a Data Model

Contents

Create & Edit a Spreadsheet Formulae & Functions Order of Operations Cell Referencing Present Data Search & Select Data **Create & Edit a Spreadsheet**

Create and edit a spreadsheet

What is a spreadsheet?

- A spreadsheet is a piece of software used to analyse, visualise and manipulate data
- A spreadsheet is made up of cells, rows and columns
- A cell is one box on the spreadsheet and is referenced using its cell reference (e.g. A1)
- A row goes across and is referenced using the number down the side
- A column goes down and is referenced using the letter at the top

Inserting and deleting cells, rows, and columns

- You can alter the structure of a spreadsheet by inserting or deleting cells, rows, and columns
- This flexibility allows you to manage and organise your data effectively

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MERGING CELLS :

Merging cells combines two or more cells into one larger cell

This is useful for creating headers or titles that span across multiple columns



Creating formulae using cell references

- Formulae allow you to perform calculations on your data
- You can reference specific cells in your formulae to make them dynamic and adaptable



Replicating formulae using absolute and relative cell references

 Absolute cell references (\$A\$1) stay constant, while relative cell references (A1) change when you copy or drag a formula

		A	В	С	
	1	Price per unit	£2.00		
	2				
	3		Items sold	Income	
	4	Jan	5	= <mark>B4</mark> *\$B\$1	
	5	Feb	8		
	6	Mar	2		
1					

 Use absolute references when you want the same cell referenced and use relative references when you want the reference to change

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1	Price per unit	£ 2.00			
2					
3		Items sold	Income		
4	Jan	5			
5	Feb	8			
6	Mar	2			
7					
8					
9					
10					
11					
12					
13					

Use of arithmetic operators in formulae

- Arithmetic operators allow you to perform basic mathematical operations in your formulae: add (+), subtract (-), multiply (*), divide (/), and indices (^)
- More information about formulae can be found on the formulae revision note

Using named cells and named ranges

- Named cells:
 - Easily refer to a group of adjoining cells

Shortens/simplifies

formulae

- Enables referring to a group of cells without having to lookup cell references
- Don't have to re-set the absolute referencing manually

🖿 Namec	l ranges	×
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Sheet1!A3:0	26	⊞
	Cancel	Done

Worked Example

Tawara school has a shop that sells items needed by pupils in school. Part of a spreadsheet with details of the items is shown.

1	A	В	С	D	E	F	G	Н	1
1			Tawara S	School Shop				Tax rate	20%
2	Item		Cost Price	Selling Price	Profit	Tax	Amount sold	Total profit per item	Total tax per item
3									
4	School tie		\$7.00	\$9.99	\$2.99	Y	139	£415.61	\$277.72
5	School scarf		\$10.00	\$15.00	\$5.00	Y	50	\$250.00	\$150.00
6	School blazer		\$20.00	\$25.00	\$5.00	Y	180	\$900.00	\$900.00
7	Pen set		\$10.00	\$12.50	\$2.50	N	100	\$250.00	

a. Write down the number of rows that are shown in the spreadsheet that contain text.

[1]

6 rows [1]

b. Write down the number of columns that are shown in the spreadsheet that contain text.

8 columns [1]

Examiner Tips and Tricks

 Make sure you know which way round rows and columns are - rows go across and columns go down

Formulae & Functions

Formulae

What is a formula?

- A formula is a statement that performs simple calculations in a spreadsheet
- Formulas start with a = sign
- A formula can perform calculations using:
 - Numbers directly (e.g. =5*2)
 - Referenced data held in cells (e.g. =A1*B2)
- Changing data in a cell that is being referenced in a formula will cause the formula to automatically recalculate based on the new value
- This is a core concept of spreadsheet modelling

	G	н
)	2023 Pass Rate (%)	Total
0	80	
0	77	
0	72	
0	74	
0	82	
0	80	
0	77	

Adding simple formulas to a spreadsheet

Arithmetic operators

- Formulas will make use of basis arithmetic operators

Symbol	Operation	
+	Addition	
-	Subtraction	
*	Multiplication	
/	Division	
^	Indices (power of)	

Functions

What is a function?

- A function is a pre-defined formula that can be used to carry out more complex calculations
- Functions are built into spreadsheet software
- Functions can help to simplify complex calculations
- Each function has a specific name that tells the software what calculation is being carried out

10	Geography	270	70	280
11	French	240	68	250
12	Spanish	210	65	220
13	Computer Science	180	62	190
14	Total			
15	Average			

Adding functions to a spreadsheet

Function	Operation
SUM	Adds all the numbers in a range of cells
	=SUM(A1:A10)

AVERAGE	Calculates the average of a range of cells	
	=AVERAGE(A1:A10)	
MAX and MIN	Finds the largest and smallest numbers in a range respectively	
	=MAX(A1:A10)	
	=MIN(A1:A10))
INT	Rounds a number down to the nearest integer	
	=INT(A1)	
ROUND	Rounds a number to a specified number of digits	
	=ROUND(A1,2) - round to 2 decimal places	
COUNT	Counts the number of cells in a range that contain numbers	
	=COUNT(A1:A10)	
COUNTA	Counts the number of cells in a range that contain numbers and/or labels	
	=COUNTA(A1:A10)	
IF	Returns one value if a condition is true and another if it's false	
	=IF(condition, true, false)	
	=IF(A1 ="SME",100,B7*3)	
HLOOKUP	Performs a horizontal look up of data	
	=HLOOKUP('Bananas', A2:D4, 3)	
VLOOKUP	Performs a vertical look up of data	
	=VLOOKUP(100, A2:D4, 2, TRUE)	
XLOOKUP	Performs either a horizontal or vertical look up of data	
	=XLOOKUP('Oranges', A1:A4, Sales Q3, "Not found")	

12	Spanish	210
13	Computer Science	180
14	Totals	3920
15	Average	326.6666667
16		
17		
18		
19		

Average, Max, Min & Int in a spreadsheet

Using external data sources within functions

- Spreadsheets allow you to use external data sources within functions
- This could be data from another worksheet, workbook, or even a database

Using nested functions

- Nesting is using a function within another function
- For example:
 - = =IF(A1>B1, MAX(A1:B1), MIN(A1:B1))
 - This checks if A1 is greater than B1, and if true, it returns the max value, else it returns the min value



Worked Example

awara school has a shop that sells items needed by pupils in school. Part of a spreadsheet with details of the items is shown.

1	A	B	С	D	E	F	G	Н	1
1			Tawara S	chool Shop				Tax rate	20%
2	Item		Cost Price	Selling Price	Profit	Tax	Amount sold	Total profit per item	Total tax per item
3									
4	School tie		\$7.00	\$9.99	\$2.99	Y	139	£415.61	\$277.72
5	School scarf		\$10.00	\$15.00	\$5.00	Y	50	\$250.00	\$150.00
6	School blazer		\$20.00	\$25.00	\$5.00	Y	180	\$900.00	\$900.00
7	Pen set		\$10.00	\$12.50	\$2.50	N	100	\$250.00	

Tax is paid on certain items sold in the shop. The tax rate that has to be paid is 20% of the selling price. If tax is to be paid on an item, then 'Y' is placed underneath the Tax heading.

The formula in I4 is: IF(F4="Y",(\$I\$1*D4*G4),"")

Explain, in detail, what the formula does.

Answer

Five of:

If Tax is payable then//If F4 is equal to "Y" then [1] If true the tax is paid [1] Multiply the rate of tax/I1 [1] By the selling price/D4 [1] By the amount sold/G4[1] If Tax is not payable//If F4 <> "Y"//Else//Otherwise [1] Then display a blank [1] The tax is not paid [1] [5]

Order of Operations

Order of Operations

What is the order of operations?

- The order of operations is what determines the sequence in which calculations are performed within a formula
- The order of operations ensures the calculation is completed correctly
- A spreadsheet performs all calculations using a mathematical order of operations known as BIDMAS

В	Brackets first	\mathbf{O}
I	Indices (power of and square root etc.)	5
DM	Division and Multiplication (left to right)	2
AS	Addition and Subtraction (left to right)	

<u>=</u>Q

Case Study

Consider the following example spreadsheet:

	А	В	С
1	10	20	
2	5	15	
3		=20*2	

- If you input the formula "=A1+B3" in cell C1, the result will be 50, because B3 is calculated first (20*2=40), and then A1 is added (10+40=50)
- If you input the formula "=(A1+B1)*2" in cell C2, the result will be 60, because A1+B1 is calculated first (10+20=30), and then the result is multiplied by 2 (30*2=60)

Examiner Tips and Tricks

It's always a good idea to use brackets to make sure that your formulae work as expected, even if they might not be necessary

- It makes the formula easier to read and understand
- It can prevent errors if the formula is edited in the future

Cell Referencing

Relative

What is an relative cell reference?

- A relative cell reference means that when a formula is copied the cell reference can change
- The reference is relative to the cell containing the formula
- It is the default cell referencing used in spreadsheets

Example

• Consider the following example spreadsheet:

	А	В	С
1	10	20	
2	5	15	

- When you copy a formula that includes a relative cell reference, spreadsheet software adjusts the reference relative to the new location
- For example, if you copy the formula "=A1+B1" from cell C1 to C2, the formula will adjust to "=A2+B2"

What are the benefits of relative cell references?

- Relative cell references saves time by automatically adjusting references when being copied, improving efficiency
- Relative cell references are flexible and allow users to create formulas that can be used on a range of data

Absolute

What is an absolute cell reference?

- An absolute cell reference means that when a formula is copied the cell reference does not change
- Absolute cell references are fixed using the \$ symbol

Example

- Consider the following example spreadsheet:

	А	В	С
1	10	20	
2	5	15	

- If you input the formula "=A1+B1" in cell C1 and drag the fill handle down to copy the formula to cell C2, the formula in C2 will change to "=A2+B2"
- But if you input the formula "=\$A\$1+B1" in cell C1 and drag the fill handle down, the formula in C2 will still refer to cell A1: "=\$A\$1+B2"

What are the benefits of absolute cell references?

- Absolute cell reference provide consistency in a spreadsheet, for example:
 - Calculations using a tax rate (fixed) that you want consistently applied across the spreadsheet
- Absolute cell references provide clarity in formulas, they become easier to understand

S

Present Data

Display Features

What are the display features of a spreadsheet?

- Display features of a spreadsheet include:
 - Displaying either formulas or values
 - Adjusting height and width of rows/columns
 - Wrapping text

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2	English Language	550	78	570	82	560	90	1680
3	English Literature	480	75	500	78	490	77	1470
÷.	Mathematics	520	70	530	74	510	72	1560
5	Double Award Science	420	72	440	76	430	74	1290
6	Biology	280	80	290	83	280	82	850
7	Chemistry	250	78	260	82	250	80	760
	Physics	220	75	230	79	220	77	670
9	History	300	D 72	310	75	300	73	910
10	Geography	270	70	290	73	270	71	\$20
11	French	240	68	250	71	240	69	730
12	Spanish	210	65	220	68	210	66	640
13	Computer Science	180	62	190	68	580	65	550
34	Total	1920	865	4070	909	3940	586	11930
15	Average	325.6666667	72.08333333	339.1666667	75.75	328.33333333	73.83333333	994.1666667
16	Max	550	80	570	83	560	82	1680
37	Min	180	62	190	68	160	65	550

Adjusting basic display features in a spreadsheet

Formatting Spreadsheets

How can you format a spreadsheet?

- Formatting a spreadsheet can be split in to three parts:
 - Enhancing the look
 - Formatting numeric data
 - Using conditional formatting

Enhancing the look

- To enhance the look of a spreadsheet it involves changing:
 - Text colour
 - Cell colour
 - Cell emphasis (Bold, italic, underline etc.)

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English Liberature	480	.75	500	79	49	0 77	143
Mathematics	520	70	530	74	50	0 72	150
Double Award Science (Combined):	420	72	440	28		0 74	125
Biology	380	80	290	#3	29	0 82	8
Chemistry	250	79	250	62	25	0 00	7
Physics	220	.75	230	. 79	22	0 77	6
History	100	72	310	75	30	0 73	
Geography	270	70	280	20	27	9 71	8
french	240	68	250	23		0 69	70
Spanish	210	65	2,20	68	29	0 66	6
Computer Science	180	62	190	. 68	18	0 65	5
Total	3920	.865	4070	909	194	0 886	119
Average	325.6666667	72.06333333	139.1666667	75.75	128,333333	1 71.83333333	994.166666
Atax	550	80	570	83	50	0 82	1.64
f Min	180	62	190	68	1.0	0 65	53

Formatting a spreadsheet

Formatting numeric data

- Formatting numeric data includes:
 - Adjusting number of decimal places
 - Using different currency symbols as appropriate
 - Dealing with percentages

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1 Income	And the second se	1		
2 Salary (after tax)		2500		
3 Expenses				
4 Housing	Rent/Mortgage	1200		
5 Utilities	Electricity, water, gas, etc.	150		
6 Groceries	Food for the household	400		
7 Transportation	Petrol, car payment, public transport	200		
8 Insurance	Car, home etc.	100		
9 Phone & Internet	Monthly bill	100		
10 Entertainment	Dining out, movies, etc.	100		
11 Miscellaneous	Personal care, clothing, etc.	50		
12 Savings	A second construction of the second second			
13 Target Savings Goal (monthly)	Emergency fund, retirement, etc.	200		
14 Totals				
15 Total Income		2500		
16 Total Expenses (excluding savings)		2300		
17 Available for Savings		200		
18 Savings Progress		On Track!		

Formatting data in a spreadsheet

Using conditional formatting

- Conditional formatting means dynamically changing the format of a cell based on it's contents

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2	English Language	550	78	570	82	560	80
3	English Literature	480	75	500	78	490	77
4	Mathematics	520	70	530	74	510	72
5	Double Award Science (Combined)	420	72	440	76	430	74
6	Biology	280	80	290	83	280	82
7	Chemistry	250	75	260	82	250	80
8	Physics	220	75	230	79	220	77
9	History	300	72	310	75	300	73
10	Geography	270	70	280	71	270	71
11	French	240	68	250	71	240	69
12	Spanish	210	65	220	68	210	66
13	Computer Science	190	62	190	68	180	65

Using conditional formatting in a spreadsheet

Page Layout How can you set the page layout of a spreadsheet?

- Changing the page layout of a spreadsheet includes:
 - Changing orientation (portrait/landscape)
 - Controlling the print layout

Changing orientation

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3	English überature	690	75	500	75	450	77	3478
4	Mathematics	520	70	.530	74	510	72	1560
5	Double Award Science (Combined)	620	72		76	430	74	1290
4	Biology	290	80	290	83	280	82	850
7	Chemistry	500	28	260	12	250	80	3000
8	Physics	220	75	230	79	220	77	670
9	History	LP 300	22	210	75	300.	n	910
10	Geography	270	70	280	73	270	71	820
11	French	240	68	250	71	240	69	730
12	Spanish	210	65	220	68	210	66	640
12	Computer Science	180	62	190	68	180	65	\$50
14	Tetal	38,20	165	40.70	909	2940	885	11830
15	Average	328.2222222	72.08833333	129.1666657	75.75	128.1111111	73.43333333	945.8222222
16	Max	\$20	80	570	41	560	12	1560
17	Min	180	62	290	68	180	65	550
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Changing the page orientation in a spreadsheet

Controlling print layout

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	English Literature	440	75	200	.78	490	77	3470
-	Mathematics	520	70	3.80		530	72	1560
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	Biology	290	80	290	63	390	82	850
	Chemistry	500	78	260	82	250	80	1030
	Physics	220	75	230	79	220	77	670
-	History	300	72	310	15	300	73	910
	Geography	276	70 .	280	71	270	71	820
-	French	240	68 47	250	71	240	69	790
1	Spanish	230	65	220	66	210	65	640
-	Computer Science	180	62	190	68	180	45	550
1	Total	3820	865	40.70	909	1940	886	11830
	Average	10.10100	72.08333333	333.1666667	75.75	1208.33333133	78.85333338	345 83777
	Max	520	80	\$70	- 81	560	12	2560
	Min	280	62	190	64	350	65	550
_								

Changing the page setup in a spreadsheet

Search & Select Data

Search & Select Data in Spreadsheets

What is data selection?

- Data selection allows you to focus on a specific subset of your data based on certain criteria
- This is useful for analysing parts of a larger dataset
- You can select data using a single criterion or multiple criteria

Searching for data

- Specific data in spreadsheets can found by using various operators, these include:
 - AND
 - OR
 - NOT
 - Greater than >
 - Less than
 - Equal to =
 - Greater than or equal to >=
 - Less than or equal to<=
 - Not equal to <>
- For example, you might search for all students who scored above 85 (>) AND are in Year 11

Wildcards

- wildcards can be used when you're unsure of the exact data you're looking for
- The most common wildcards are the asterisk (*) and the question mark (?)
- An asterisk represents any number of characters
 - For example, "A*" would find "Alex", "Aaron", etc.
- A question mark represents a single character
 - For example, "A?e" would find "Abe", but not "Alex"

	Α	В	С	
1	Name	Mark	Year	
2	Alex	85	11	
3	Ben	90	12	
4	Chloe	80	11	
5	Dave	88	12	
6	Eve	82	11	

- To select all students in Year 11, you could use the criterion "Year = 11"
- To search for students who are in Year 11 AND scored above 85, you could use the criteria "Year = 11" AND "Grade > 85"

Examiner Tips and Tricks

Remember that you can use operators and wildcards in your searches to find data more efficiently. Wildcards are especially useful when you're unsure of the exact value you're looking for.

Sorting data in a spreadsheet

Why do we need to sort data in a spreadsheet?

- Sorting data is a powerful feature in spreadsheets
- It arranges your data based on specific criteria
- You can sort in ascending or descending order
- You can sort data using a single criterion
 - For example, you could sort a list of names alphabetically

 In Excel, select the column you want to sort and then choose 'Sort A to Z' for ascending order or 'Sort Z to A' for descending order

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English Language	550	78	570	82	560	80
English Literature	480	75	500	78	490	77
Mathematics	520	70	530	74	510	72
Double Award Science (Combined)	420	72	440	76	430	74
Biology	280	80	290	83	280	82
Chemistry	250	78	260	82	250	80
Physics	220	75	230	79	220	77
History	2 300	72	310	75	300	73
Geography	270	70	280	73	270	71
French	240	68	250	71	240	69
Spanish	210	65	220	68	210	66
Computer Science	180	62	190	68	180	65
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You can also sort data using multiple criteria

- For example, you could sort a list of students first by grade, and then alphabetically by name within each grade
- In Excel, select your data and then choose 'Sort'. Add levels for each of your criteria

Consider the following example spreadsheet:

	Α	В
1	Name	Age
2	Alex	15
3	Ben	17
4	Alex	16

If you sort by 'Name' (A to Z), the spreadsheet might look like this:

	Α	В
1	Name	Age

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2	Alex	16
3	Alex	15
4	Ben	17

If you sort by 'Name' (A to Z) and then 'Age' (Smallest to Largest), the spreadsheet would look like this:

	Α	В
1	Name	Age
2	Alex	15
3	Alex	16
4	Ben	17

Examiner Tips and Tricks

• Be sure to select all relevant columns before sorting, especially when dealing with multiple criteria. Failure to do so may result in misalignment of your data!