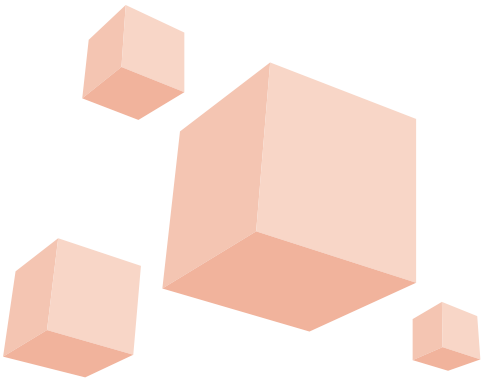
Level Up

Through **Digital Discoveries**

8

Mc Graw Hill

binarylogic



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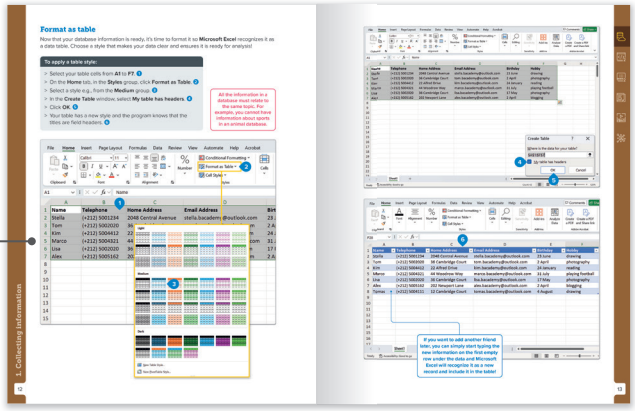
Contents

Key Features

An innovative approach to building digital competencies, developed by expert educators.

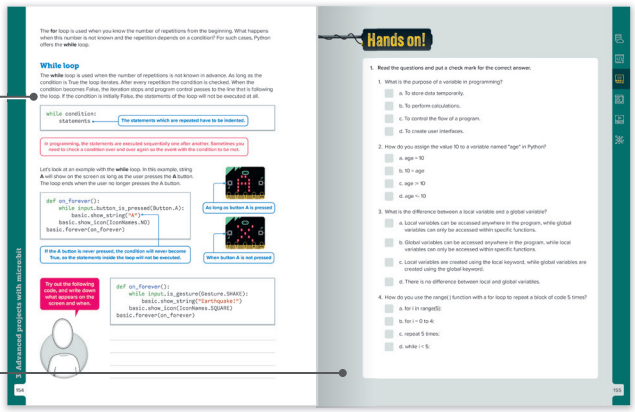
Each unit offers straightforward explanations and contemporary examples, making technology concepts accessible and relevant.



Curriculum aligns with the latest industry standards, preparing students for certifications and future careers.

Every unit includes a variety of tasks and activities designed to help students build essential digital competencies.

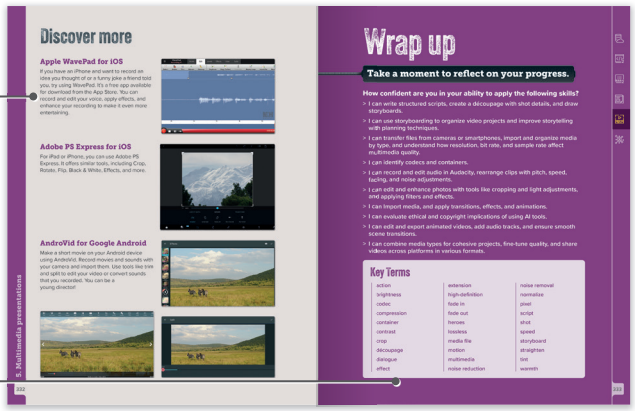
Projects and exercises throughout the course reinforce students' understanding and practical application of digital skills in real-world scenarios.



Well-defined learning goals and hands-on, applicable digital skills.

Students learn about platform diversity, expanding their digital toolkit and adaptability.

Each unit organizes key terms that are crucial for digital literacy, equipping students for today's technology-driven workplace.



1. Collecting information

Data is all around us, and knowing how to organize and make sense of it can help you in school, work, and everyday life. This unit covers how to create and use a simple database, sort and filter information, work with percentages and powers, use formulas with references, and create charts to make data clear and understandable.

Learning Objectives

In this unit, you will:

> identify what data and information are, and how they are different.

> create a simple database with fields to organize information.

> identify how computers use the binary system to represent data.

> identify what the ASCII character set is.

> apply filters or custom filters to show only specific records that meet your needs.

> sort data including multi-level sorting to organize by more than one field.

> import and export data as a CSV file.

> calculate percentages and powers.

> use relative and absolute cell references in spreadsheet formulas.

> recognize, troubleshoot, and fix common spreadsheet errors.

> identify the types of charts you can use in Excel.

> create different charts and add titles, labels, and colors.

> use conditional formatting to highlight important numbers in your data.

> add mini charts to show trends in your data.

> identify how a data logging software can display the data as a chart.

Tools

> Microsoft Excel

LESSON 1

Introduction to databases

Have you ever wondered how your school keeps track of attendance, or how a library knows which books are available or checked out?

Data is facts or details that are collected but not processed or organized yet. For example, a list of numbers or names is data. **Information**, on the other hand, refers to the organized or processed form of data that is meaningful or useful. For instance, when data is sorted or explained, it becomes information.

Types of data

Data is usually in the form of text, numbers, and symbols, and sometimes it may be in the form of images, videos, and sounds. You will now learn about some types of data.

Numerical data: Numerical data contains measurable facts. Examples of numerical data include the number of visitors to a museum, the number of cars passing through a toll booth, and a student's test scores in various subjects.

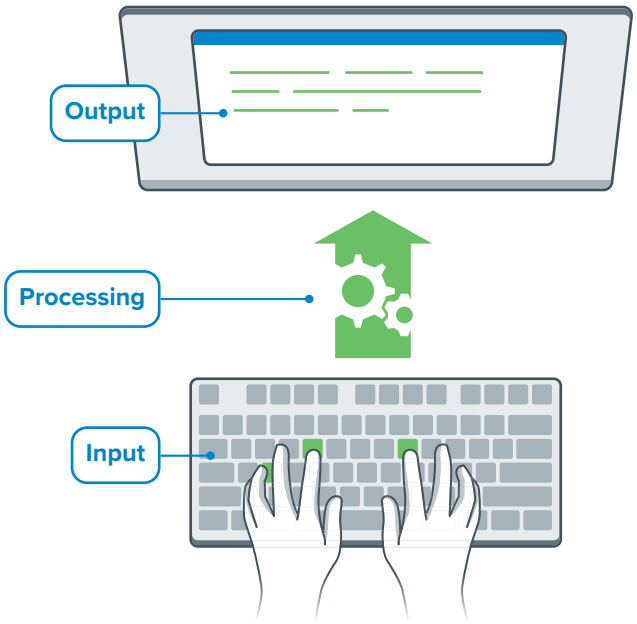
Alphabetic data: Alphabetic data consists of all the letters of the alphabet and spaces used to separate words. Examples of alphabetic data include product names, street addresses, and names.

Alphanumeric data: This type of data includes all alphabetic characters, numbers, and special symbols such as #, $, %, etc. Examples of alphanumeric data include tracking codes like A12345, product identifiers such as XTR56A, and student IDs like S00123. These combinations of letters and numbers help organize and identify items efficiently across different systems.

Turning data into information

Computers are powerful tools that transform raw data into meaningful information. They take input from sources like keyboards or sensors, process it through calculations or sorting, and generate organized output.

For example, they can analyze temperature readings to produce a clear weather report.



Data representations

Computers work by handling data in different ways. However, they can only understand data as binary digits, which are just 0s and 1s. This means we need to change many types of data, like numbers, text, pictures, and videos, into binary format so computers can store and use them.

Representing numbers

For numbers, computers use the binary system to represent positive whole numbers (like 1, 2, 3). But when we need to work with negative numbers or decimal numbers (like -5 or 3.14), there are other special methods to represent these numbers using just 0s and 1s.

Representing text

To represent text (like letters and symbols) in computers, we use something called character sets. A character set is a list that matches each letter, number, or symbol with a specific binary code. One of the most common character sets is called ASCII (which stands for American Standard Code for Information Interchange).

ASCII character set

In the ASCII character set, each letter, number, or symbol has its own binary code. For example, the letter 'A' is represented by the number 65, and the letter 'a' is represented by the number 97. Computers use these codes to understand and display text.

However, the first 32 characters in ASCII are special. They don't represent letters or numbers that you can print on the screen. These characters are used for things like the Enter key or the Tab key on your keyboard.

The decimal value of the character. Decimal is a base-10 numbering system (the system we commonly use).

The hexadecimal value of the character. Hexadecimal is a base-16 numbering system.

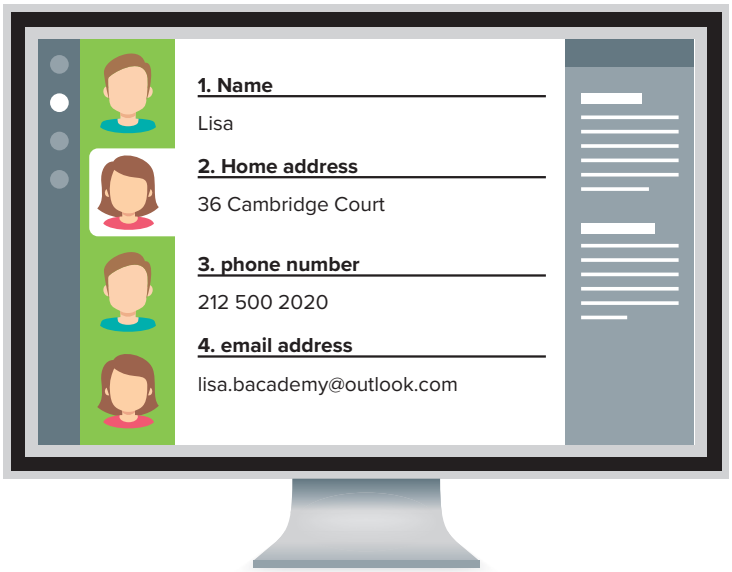
The actual character or symbol represented by the ASCII code.

Dec	Hex	Char	Action (if non-printing)	Dec	Hex	Char	Dec	Hex	Char	Dec	Hex	Char
0	0	NUL	(null)	32	20	Space	64	40	@	96	60	`
1	1	SOH	(start of heading)	33	21	!	65	41	A	97	61	a
2	2	STX	(start of text)	34	22	"	66	42	B	98	62	b
3	3	ETX	(end of text)	35	23	#	67	43	C	99	63	c
4	4	EOT	(end of transmission)	36	24	$	68	44	D	100	64	d
5	5	ENQ	(enquiry)	37	25	%	69	45	E	101	65	e
6	6	ACK	(acknowledge)	38	26	&	70	46	F	102	66	f
7	7	BEL	(bell)	39	27	'	71	47	G	103	67	g
8	8	BS	(backspace)	40	28	(	72	48	H	104	68	h
9	9	HT	(horizontal tab)	41	29	)	73	49	I	105	69	i
10	A	LF	(NL linefeed, new line)	42	2A	*	74	4A	J	106	6A	j
11	B	VT	(vertical tab)	43	2B	+	75	4B	K	107	6B	k
12	C	FF	(NP linefeed, new page)	44	2C	,	76	4C	L	108	6C	l

13	D	CR	(carriage return)	45	2D	-	77	4D	M	109	6D	m
14	E	SO	(shift out)	46	2E	.	78	4E	N	110	6E	n
15	F	SI	(shift in)	47	2F	/	79	4F	O	111	6F	o
16	10	DLE	(data link escape)	48	30	0	80	50	P	112	70	p
17	11	DC1	(device control 1)	49	31	1	81	51	Q	113	71	q
18	12	DC2	(device control 2)	50	32	2	82	52	R	114	72	r
19	13	DC3	(device control 3)	51	33	3	83	53	S	115	73	s
20	14	DC4	(device control 4)	52	34	4	84	54	T	116	74	t
21	15	NAK	(negative acknowledge)	53	35	5	85	55	U	117	75	u
22	16	SYN	(synchronous idle)	54	36	6	86	56	V	118	76	v
23	17	ETB	(end of trans. block)	55	37	7	87	57	W	119	77	w
24	18	CAN	(cancel)	56	38	8	88	58	X	120	78	x
25	19	EM	(end of medium)	57	39	9	89	59	Y	121	79	y
26	1A	SUB	(substitute)	58	3A	:	90	5A	Z	122	7A	z
27	1B	ESC	(escape)	59	3B	;	91	5B	[	123	7B	{
28	1C	FS	(file separator)	60	3C	<	92	5C	\	124	7C	|
29	1D	GS	(group separator)	61	3D	=	93	5D	]	125	7D	}
30	1E	RS	(record separator)	62	3E	>	94	5E	^	126	7E	~
31	1F	US	(unit separator)	63	3F	?	95	5F	_	127	7F	DEL

What is a database?

Now that you know how data is turned into information and how computers store and use data, let's examine databases in more detail. A **database** is a tool that helps us organize and manage large amounts of data, like a school keeping track of student grades or a library keeping records of borrowed books. Databases use tables with rows and columns to neatly store information, making it simple to find, update, and analyze. You will learn how to create a simple database using tools like Microsoft Excel and explore how fields (columns) and records (rows) work together to organize data.



In the address book database, each record has four fields:
1. Name
2. Home address
3. Phone number
4. Email address

Databases can be used in various tasks in everyday life, such as tracking purchases in online shopping, storing patient information in health care, organizing books in libraries, handling financial transactions in banking, and personalizing content on social media and streaming platforms.

A record in a database is a single, complete set of related data within a table. It is represented as a row in the table and contains all the information about a specific item, person, or event.

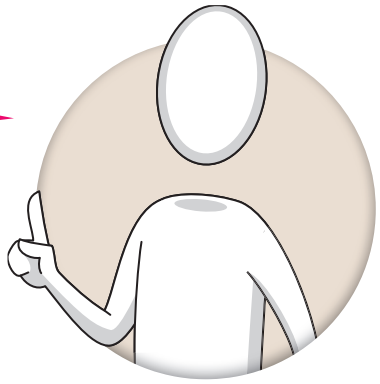
Every specific category of information is called a field. A field is represented as a column in the table and stores one type of data for all the records.

Teachers

Students

Name	Home Address	Phone Number	Email Address
Kim	22 Alfred Drive	212 500 4412	kim.bacademy@outlook.com
Marco	44 Woodrow Way	212 500 4321	marco.bacademy@outlook.com
Lisa	36 Cambridge Court	212 500 2020	lisa.bacademy@outlook.com
Alex	202 Newport Lane	212 500 5162	alex.bacademy@outlook.com

A database table is like a structured container that holds related information, such as names, addresses, or grades, and organizes them into rows (horizontal) and columns (vertical), making it easier to search and analyze the data to obtain information.



Why use databases?

Databases are useful for storing, searching, and updating large amounts of data efficiently. Imagine trying to keep track of all students' grades in your school without a database. It would take much longer to organize and find the right information. With a database, you can:

- Save all your data in one organized place.
- Quickly find specific information (for example, all students who scored above 90%).
- Add new information or change existing details (for example, update a student's grade).

History

Edgar F. "Ted" Codd was an English computer scientist who invented the relational model for database management in 1970 while working for IBM. His theory is the basis for relational databases and data management.

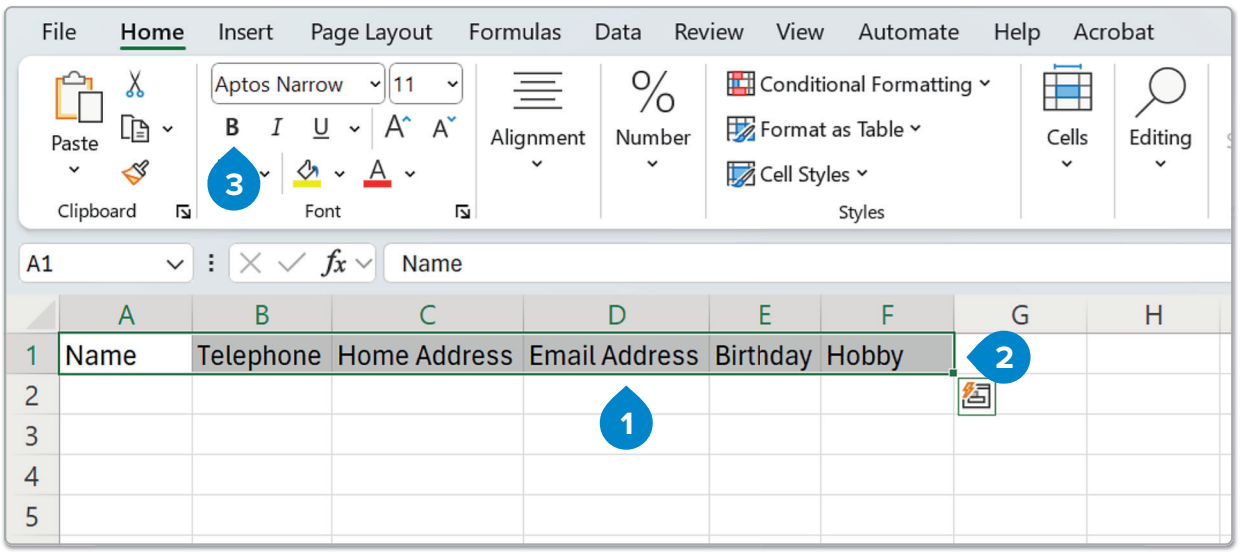
Create a database

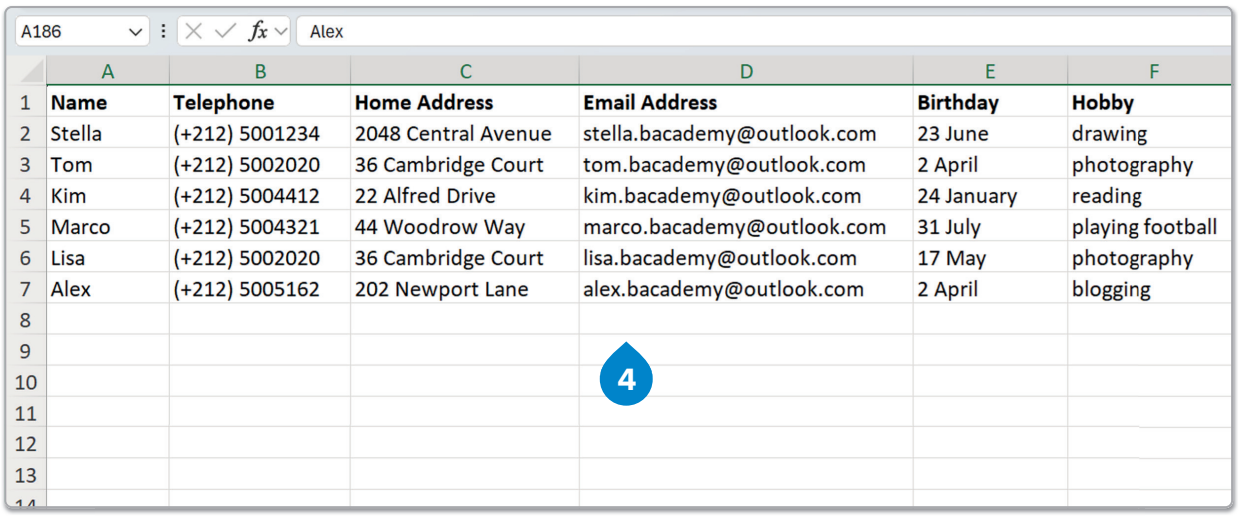
Now it's time to create your own database. The first thing you have to do is decide what kind of information you want to include. Think of the characteristics you want to collect for each record and give them a title or a field name. Although there are various programs for database management, you can use **Microsoft Excel** to create your database table.

Let's create an address book database of your friends' information.
The field names are: **Name**, **Telephone**, **Home Address**, **Email Address**, **Birthday**, **Hobby**.

To create a database:

> Open a new worksheet.
> Type the database field names horizontally in different cells (from **A1** to **F1**). 1
> Select **A1** to **F1**. 2
> Click the **Bold** button 3 to make the titles stand out.
> Now add one record for each of your friends. Every record must have information about the six different fields displayed here. 4





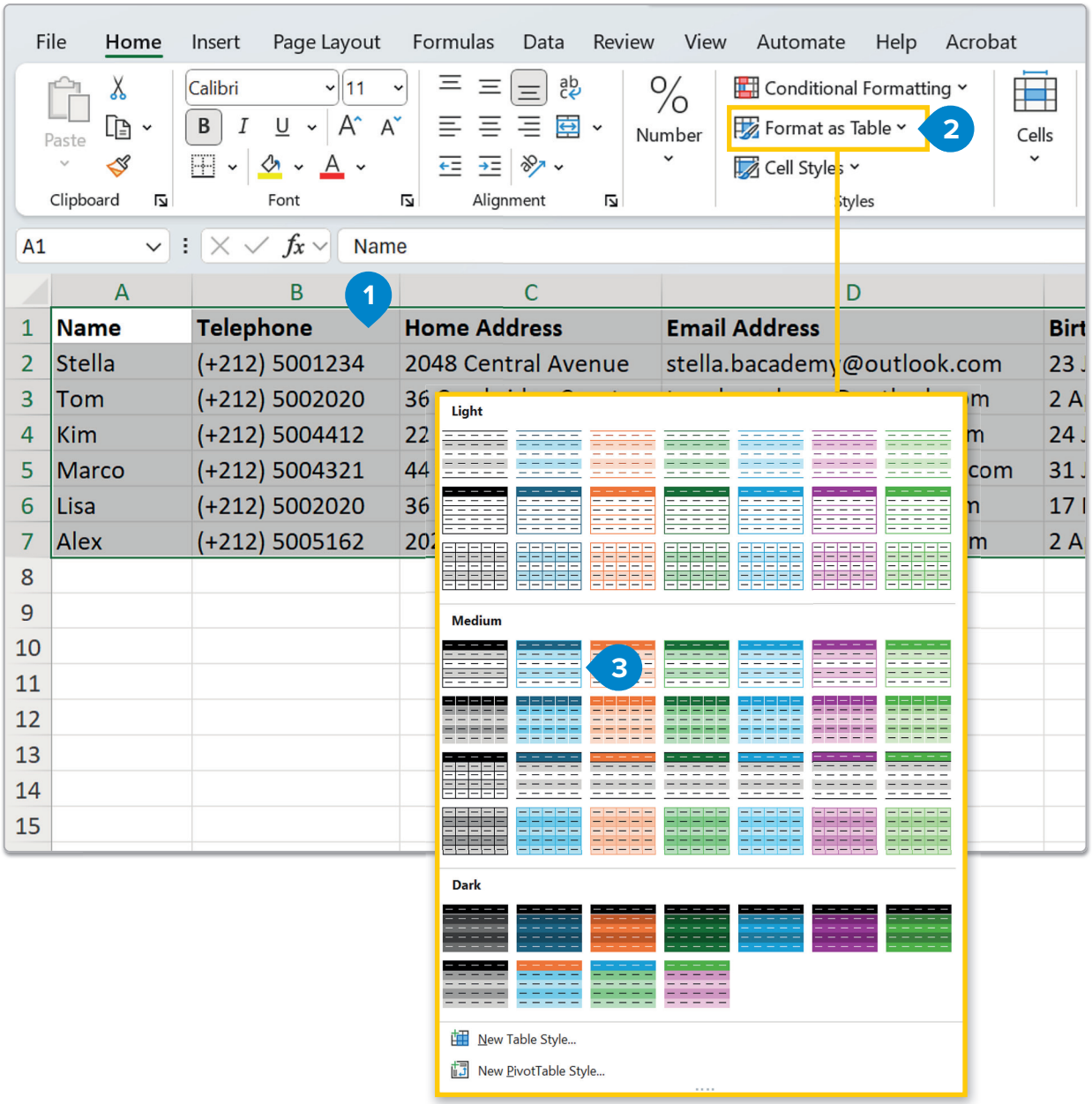
Format as table

Now that your database information is ready, it's time to format it so **Microsoft Excel** recognizes it as a data table. Choose a style that makes your data clear and ensures it is ready for analysis.

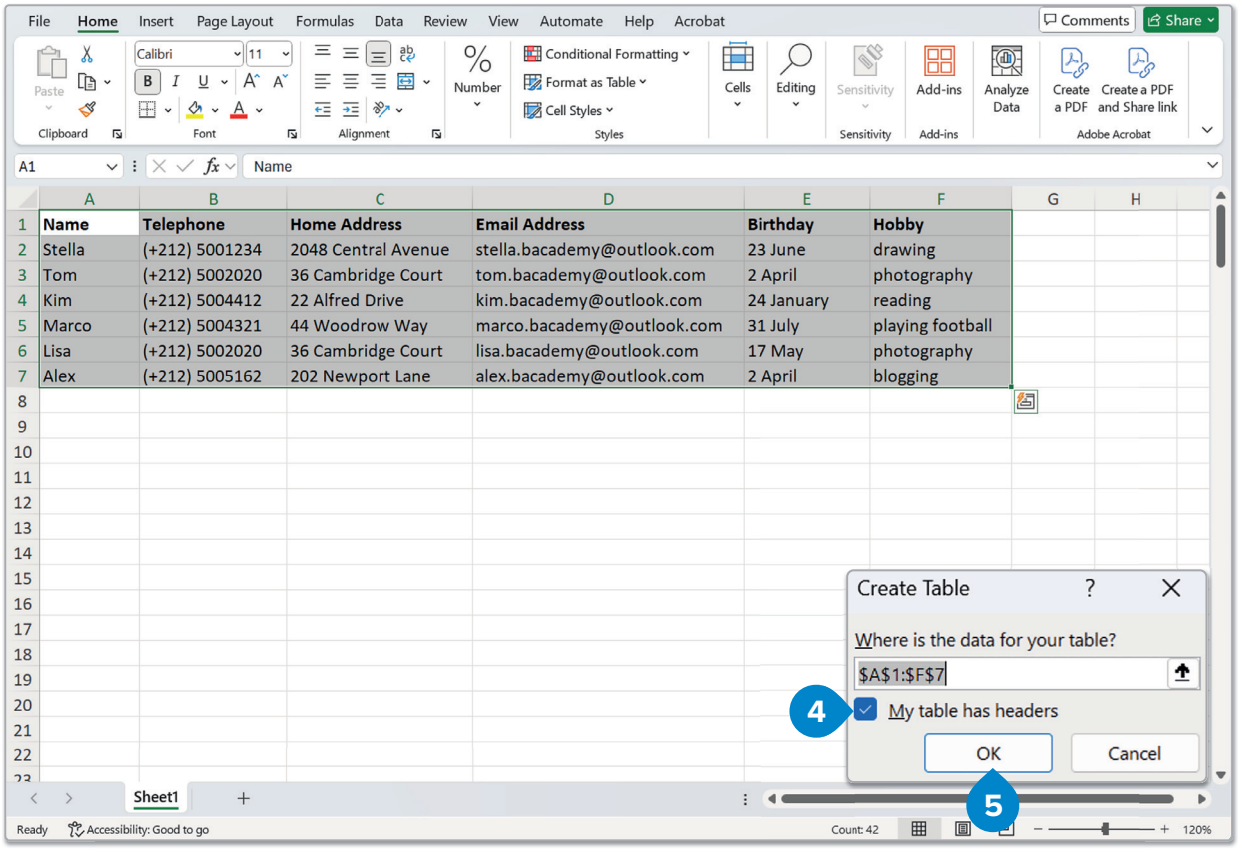
To apply a table style:

> Select your table cells from **A1** to **F7**. 1
> On the **Home** tab, in the **Styles** group, click **Format as Table**. 2
> Select a style, e.g., from the **Medium** group. 3
> In the **Create Table** window, select **My table has headers**. 4
> Click **OK**. 5
> Your table has a new style, and the program knows that the titles are field headers. 6

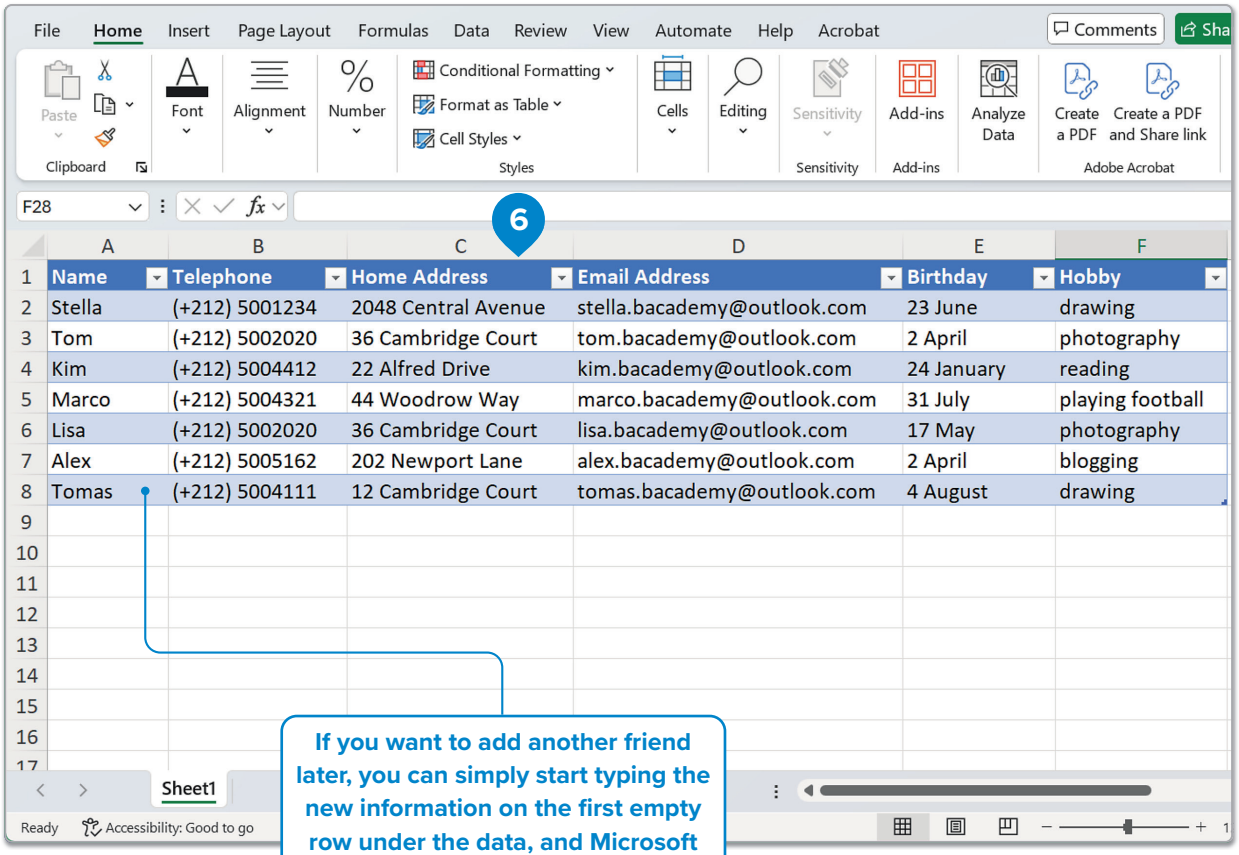
All the information in a database must relate to the same topic. For example, you cannot have information about sports in an animal database.



	A	B	C	D	
1	**Name**	**Telephone**	**Home Address**	**Email Address**	**Birt**
2	Stella	(+212) 5001234	2048 Central Avenue	stella.bacademy@outlook.com	23 J
3	Tom	(+212) 5002020	36	m	2 A
4	Kim	(+212) 5004412	22	m	24 J
5	Marco	(+212) 5004321	44	com	31 J
6	Lisa	(+212) 5002020	36	n	17 I
7	Alex	(+212) 5005162	20	m	2 A
8					
9					
10					
11					
12					
13					
14					
15					



Name	Telephone	Home Address	Email Address	Birthday	Hobby
Stella	(+212) 5001234	2048 Central Avenue	stella.bacademy@outlook.com	23 June	drawing
Tom	(+212) 5002020	36 Cambridge Court	tom.bacademy@outlook.com	2 April	photography
Kim	(+212) 5004412	22 Alfred Drive	kim.bacademy@outlook.com	24 January	reading
Marco	(+212) 5004321	44 Woodrow Way	marco.bacademy@outlook.com	31 July	playing football
Lisa	(+212) 5002020	36 Cambridge Court	lisa.bacademy@outlook.com	17 May	photography
Alex	(+212) 5005162	202 Newport Lane	alex.bacademy@outlook.com	2 April	blogging



Name	Telephone	Home Address	Email Address	Birthday	Hobby
Stella	(+212) 5001234	2048 Central Avenue	stella.bacademy@outlook.com	23 June	drawing
Tom	(+212) 5002020	36 Cambridge Court	tom.bacademy@outlook.com	2 April	photography
Kim	(+212) 5004412	22 Alfred Drive	kim.bacademy@outlook.com	24 January	reading
Marco	(+212) 5004321	44 Woodrow Way	marco.bacademy@outlook.com	31 July	playing football
Lisa	(+212) 5002020	36 Cambridge Court	lisa.bacademy@outlook.com	17 May	photography
Alex	(+212) 5005162	202 Newport Lane	alex.bacademy@outlook.com	2 April	blogging
Tomas	(+212) 5004111	12 Cambridge Court	tomas.bacademy@outlook.com	4 August	drawing

If you want to add another friend later, you can simply start typing the new information on the first empty row under the data, and Microsoft Excel will recognize it as a new record and include it in the table.

Hands on!

1. Read the questions and put a check mark for the correct answer.

1. What is a field in a database?
   - ☐ a. A row of data
   - ☐ b. A type of record
   - ☐ c. A column that stores one type of data
   - ☐ d. A whole table
2. Which of the following is an example of alphabetic data?
   - ☐ a. 12345
   - ☐ b. A12345
   - ☐ c. John Doe
   - ☐ d. $%&
3. What does the ASCII character set do?
   - ☐ a. It processes binary numbers into text.
   - ☐ b. It assigns a binary code to each letter, number, or symbol.
   - ☐ c. It organizes large amounts of data into databases.
   - ☐ d. It helps format Excel tables.
4. What is the purpose of formatting data as a table in Excel?
   - ☐ a. To make it more polished
   - ☐ b. To make data clear to read and analyze
   - ☐ c. To change data into text
   - ☐ d. To remove information
5. What is a record in a database?
   - ☐ a. A row in a table that contains all the information about a single entity.
   - ☐ b. A column in a table that categorizes data.
   - ☐ c. A binary code for representing characters.
   - ☐ d. A header row of a table.

2. Complete with the missing words.

numerical	field	data	record

1. A database is a collection of _____ that can be organized, sorted, and searched.

2. In a database, a _____ represents one row of information about a person or item.

3. The _____ data includes measurable facts like test scores or visitor numbers.

4. A _____ is a column in a database table that holds one type of information.

3. Why do you think it's essential to use a database in a school to manage student information, such as grades, attendance, and contact details? How does it help teachers and administrators efficiently update, search, and generate reports from this data? What problems might arise by inserting incorrect fields?

4. Create a database about music.

Choose your favorite music artist or band and search the Web for their discography. A discography contains information about all the albums an artist or band has ever released. Create a database in Microsoft Excel that includes the following fields: Album Title, Date Released, Top Chart Position, Albums Sold. Finally, format your database as a table.

LESSON 2

Filter and sort

Have you ever needed to find something specific in an extensive list? What could you do to find it quickly, and how would you decide where to start searching?

Filter and sort

After you create a database table, you can use filters and sorting to organize and find information quickly. Filters help you display only the data you need, like specific names or numbers, while sorting puts the data in order, such as from smallest to largest or A to Z.

To filter and sort data:

> Click the column header arrow on the **Name** header. 1

> Apply a filter by selecting only the names you want to display, 2 and click **OK**. 3 Only the selected records will be displayed in the spreadsheet. 4

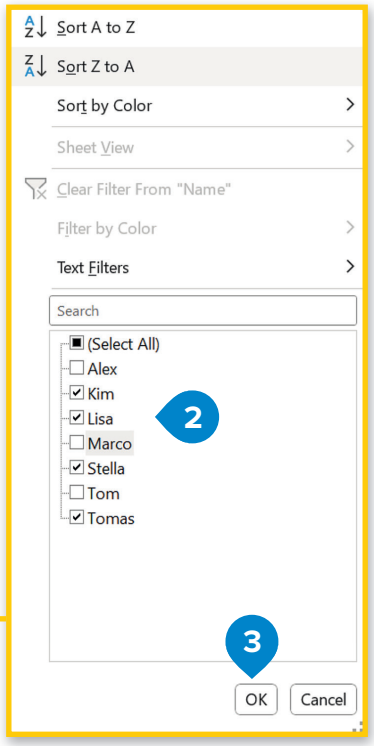
> The column header arrow 5 of the field header will change to indicate that a filter has been applied to the specific records.

> Click the column header arrow on the **Name** header again. 6

> Click **Sort A to Z** to sort the specific records alphabetically. 7

> The set of records will automatically change position in the table and will now be sorted based on the **Name** field. 8

> The column header arrow 9 of the field header will also change to show that the table is displayed in a specific order.



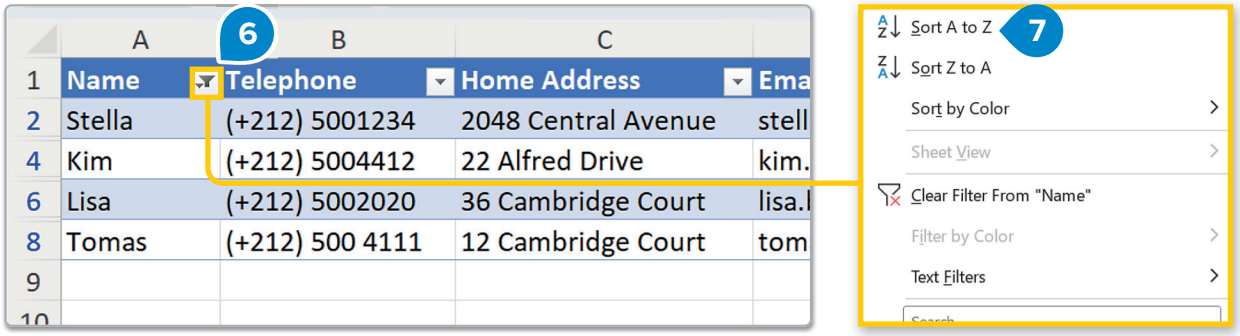
	A	B	C
1	Name	Telephone	Home Address
2	Stella	(+212) 5001234	2048 Central Avenue
3	Tom	(+212) 5002020	36 Cambridge Court
4	Kim	(+212) 5004412	22 Alfred Drive
5	Marco	(+212) 5004321	44 Woodrow Way
6	Lisa	(+212) 5002020	36 Cambridge Court

1

5

4

	A	B	C	D	E	F
1	Name	Telephone	Home Address	Email Address	Birthday	Hobby
2	Stella	(+212) 5001234	2048 Central Avenue	stella.bacademy@outlook.com	23 June	drawing
4	Kim	(+212) 5004412	22 Alfred Drive	kim.bacademy@outlook.com	24 January	reading
6	Lisa	(+212) 5002020	36 Cambridge Court	lisa.bacademy@outlook.com	17 May	photography
8	Tomas	(+212) 500 4111	12 Cambridge Court	tomas.bacademy@outlook.com	4 August	drawing



	A	B	C	D	E	F
1	Name	Telephone	Home Address	Email Address	Birthday	Hobby
2	Kim	(+212) 5004412	22 Alfred Drive	kim.bacademy@outlook.com	24 January	reading
8	Lisa	(+212) 5002020	36 Cambridge Court	lisa.bacademy@outlook.com	17 May	photography
6	Stella	(+212) 5001234	2048 Central Avenue	stella.bacademy@outlook.com	23 June	drawing
8	Tomas	(+212) 500 4111	12 Cambridge Court	tomas.bacademy@outlook.com	4 August	drawing

9

Multi-level sorting

Sometimes it's useful to sort your database data according to multiple fields instead of just one. This is called **multi-level sorting**, and it works like this:

Let's say you want to sort your data alphabetically by hobby and then by name. This means that all your records will be sorted by hobby, and if some of those records happen to have the same hobby, they will be sorted again by name.

To apply multi-level sorting:

> Select your table cells from **A1** to **F8**. 1

> On the **Home** tab, in the **Editing** group, click **Sort & Filter** 2 and then **Custom Sort**. 3

> In the **Sort by** list, click **Hobby**. 4

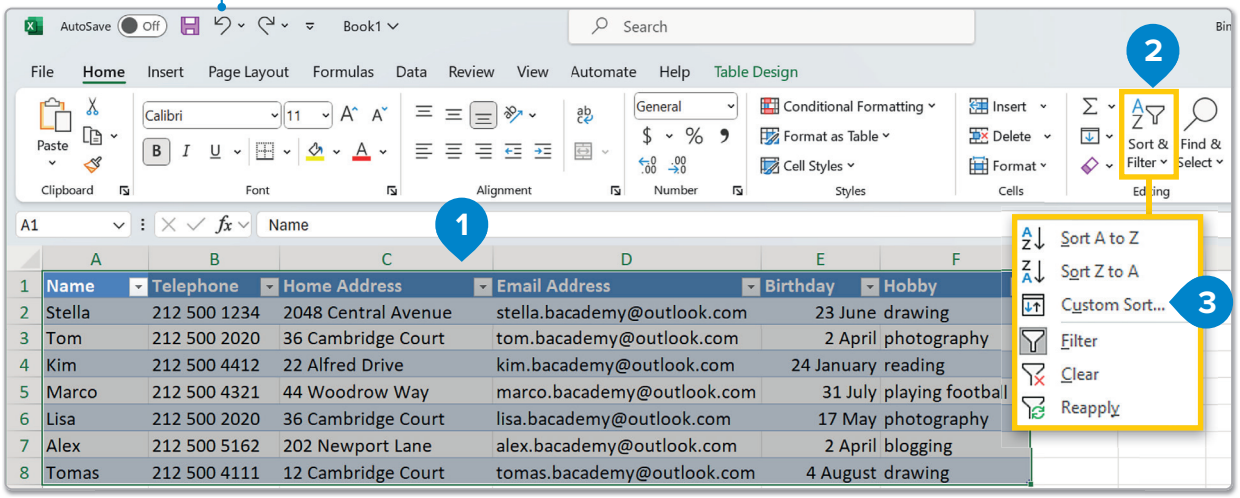
> Click **Add Level** 5 to add a second level of sorting to your data. A new row will be displayed.

> In the **Then by** list, click **Name**. 6

> Click **OK**. 7

> All records will be sorted based on the **Hobby** field 8 and then based on the **Name** field. 9

If you have already sorted a field, such as the Name field mentioned in the previous example, you can click the Undo button to go back and work with the unsorted data.



	A	B	C	D	E	F
1	Name	Telephone	Home Address	Email Address	Birthday	Hobby
2	Stella	212 500 1234	2048 Central Avenue	stella.bacademy@outlook.com	23 June	drawing
3	Tom	212 500 2020	36 Cambridge Court	tom.bacademy@outlook.com	2 April	photography
4	Kim	212 500 4412	22 Alfred Drive	kim.bacademy@outlook.com	24 January	reading
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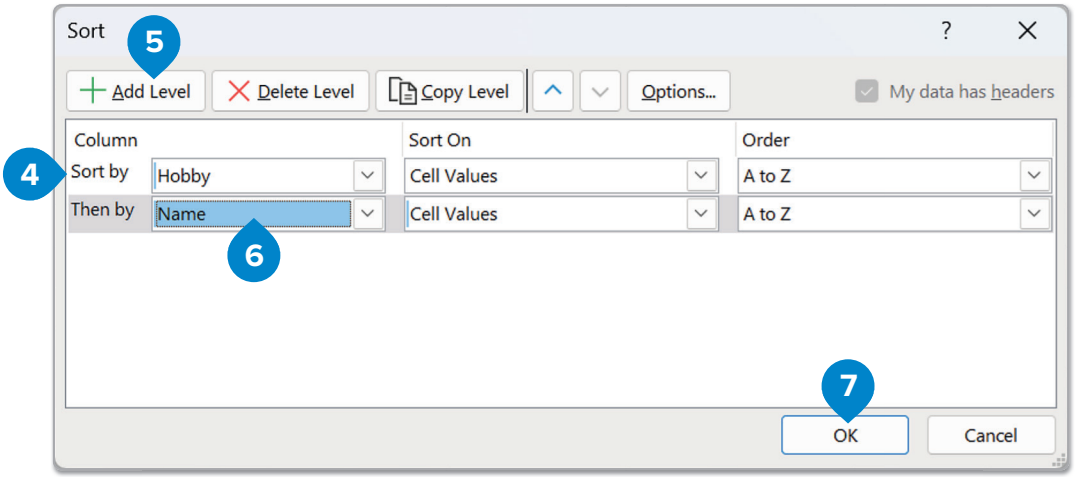
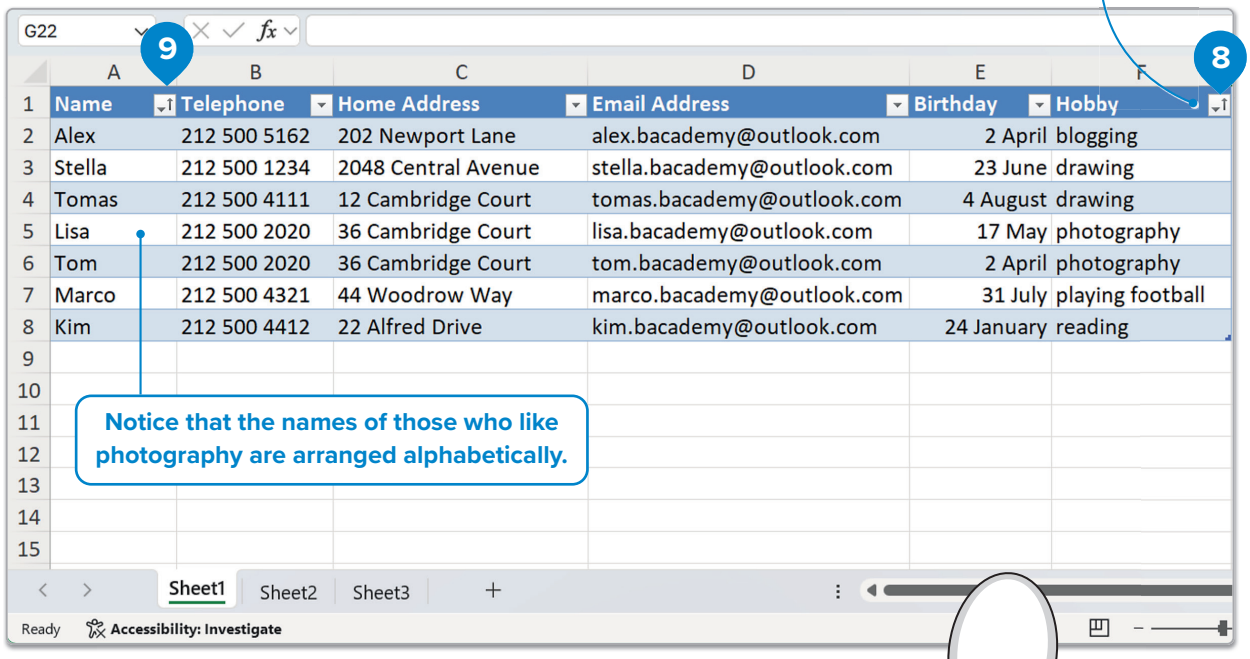


The arrow buttons of the field headers will change to show that the table is displayed in a specific order.



Notice that the names of those who like photography are arranged alphabetically.

Try sorting the database table using other fields, like Telephone, and check the results.

Smart Tip

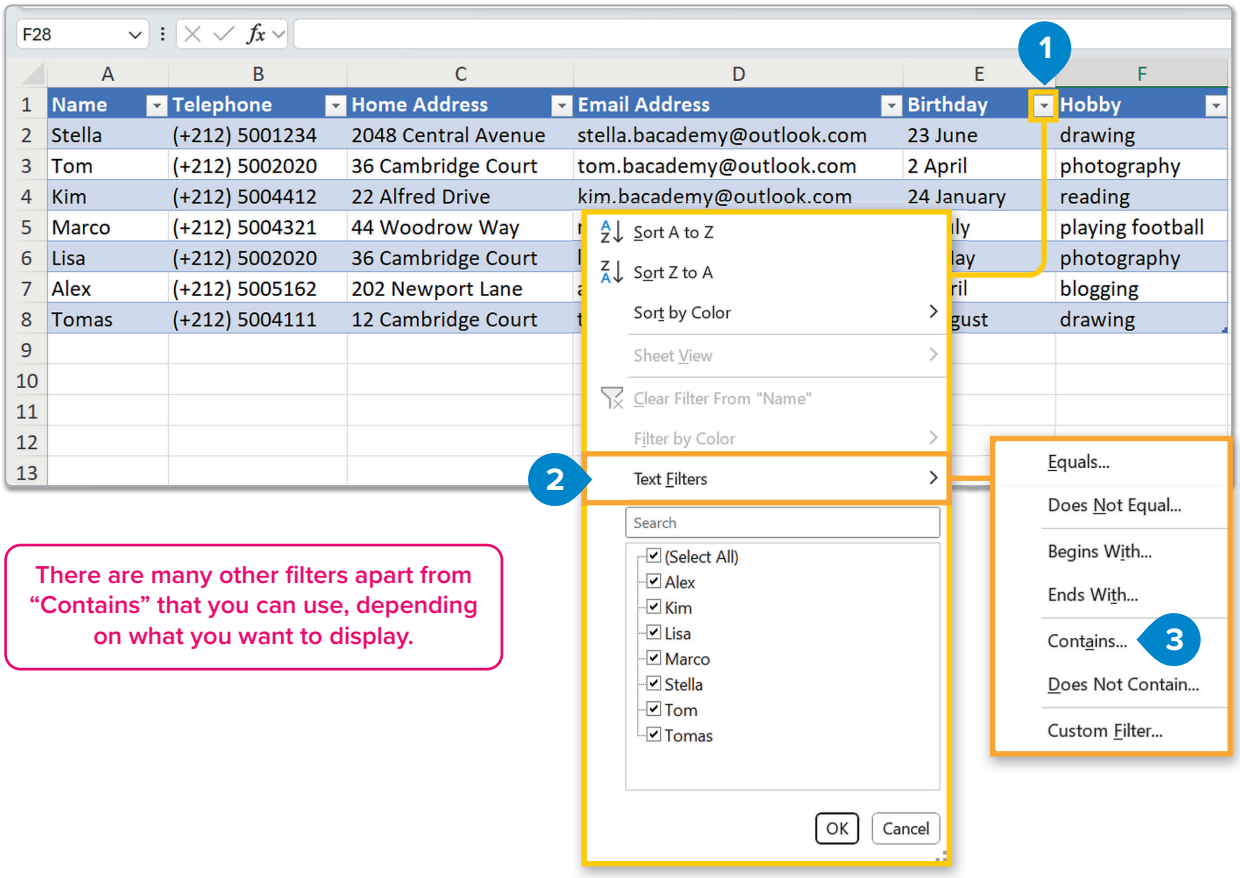
Sorting is an effective method for organizing your data in any program that supports it. When data is sorted, it becomes much easier to find the information you need.

Custom filters

Now let's explore some more advanced filters. Let's display only the records of people whose birthdays are in April.

To apply a custom filter:

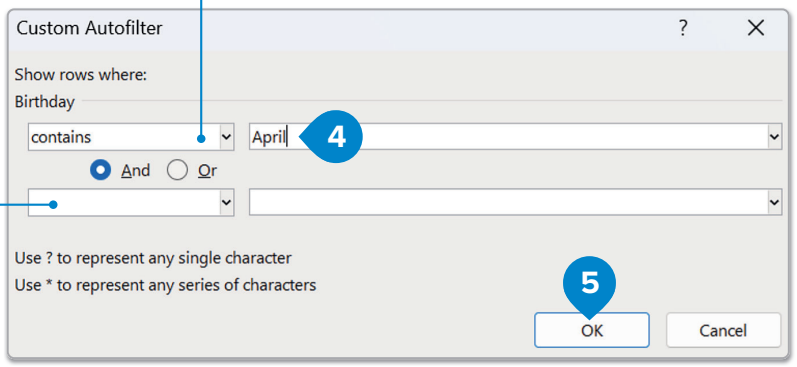
> Click the column header arrow next to a field header, in this example, **Birthday**. 1
> Click **Text Filters**, 2 and then click **Contains**. 3
> In the **Custom AutoFilter** window, in the text box, type "**April**". 4
> Click **OK**. 5
> As a result, only records with the word "April" in the **Birthday** field are displayed. 6

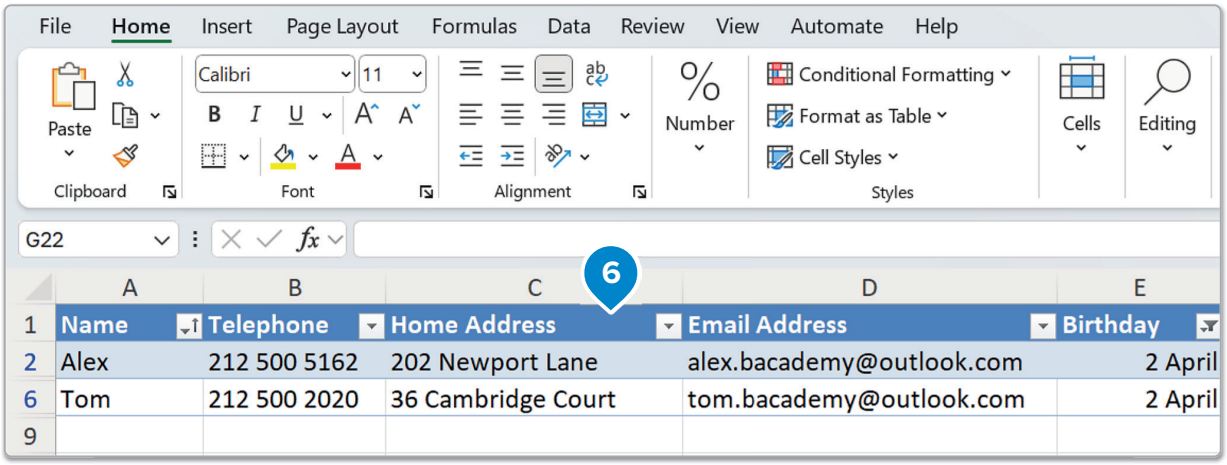


There are many other filters apart from "Contains" that you can use, depending on what you want to display.

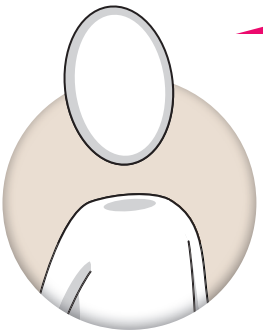
Notice the options in the drop-down list. The filter names are self-explanatory.

You can try out different filters to check what effect they have. You can also apply another filter in another field of your database right after the last one, to filter your records even more.





	A	B	C	D	E
1	Name	Telephone	Home Address	Email Address	Birthday
2	Alex	212 500 5162	202 Newport Lane	alex.bacademy@outlook.com	2 April
6	Tom	212 500 2020	36 Cambridge Court	tom.bacademy@outlook.com	2 April
9					



Can you apply a custom filter to show the records of people whose birthday is on the 17th of any month?

Exporting data

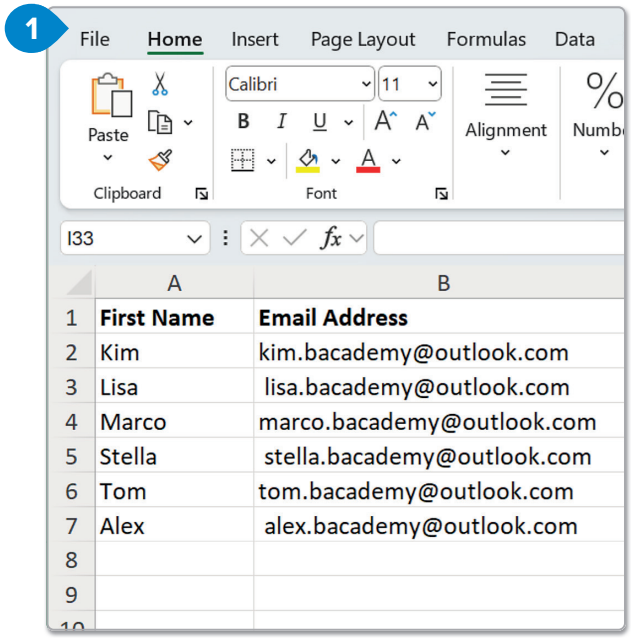
Sometimes, data created in Microsoft Excel needs to be stored in a format that can be interpreted by other applications. This can be done by exporting the data to a CSV (Comma-Separated Values) text file.

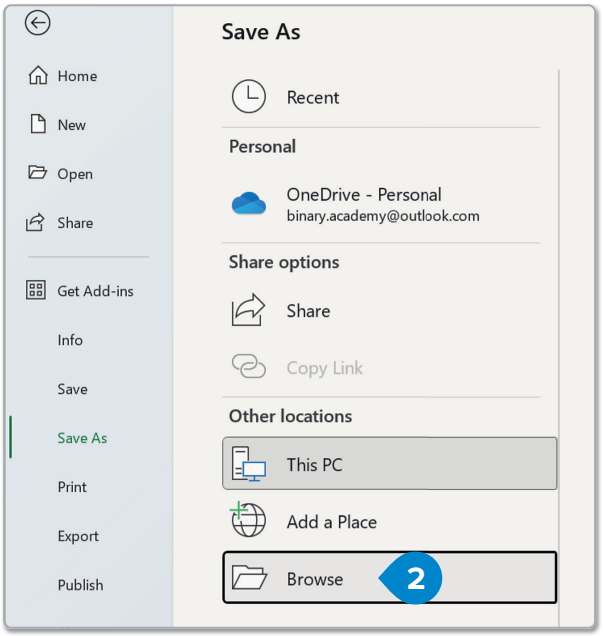
A Comma-Separated Values (CSV) text file is a simple file format that is widely used by scientists and businessmen. As its name suggests, the values in each row of data are separated by commas or tabs. CSV text files are simple but important. A **CSV** file is a simple text file with no format. The data is stored as a sequence of characters. This way, the file is relatively small in size, even though it can hold a large amount of data.

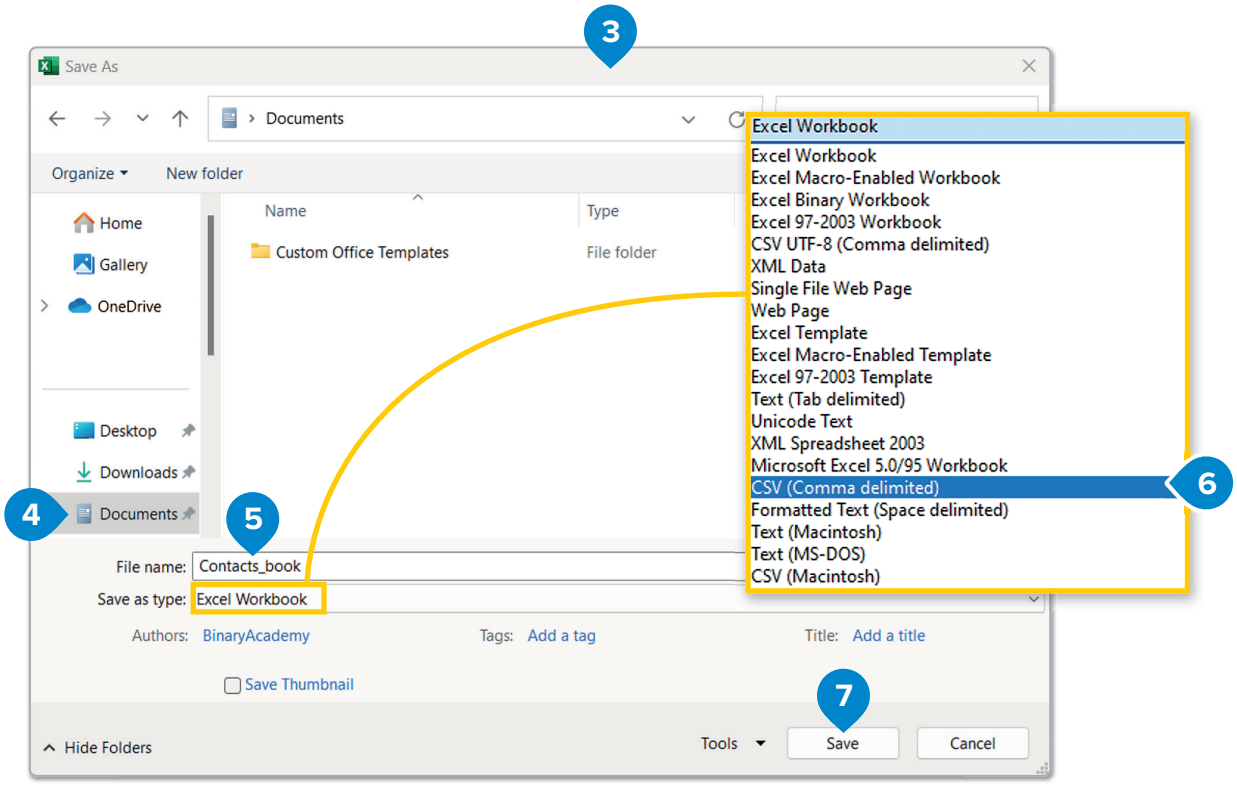
Consider the worksheet below:

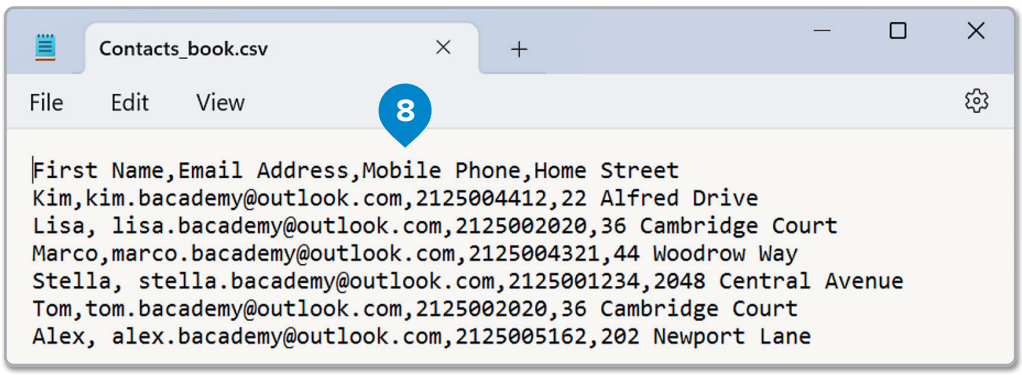
To export data from Microsoft Excel to a CSV file:

> Click the **File** tab. 1
> Click **Save As** and then click **Browse**. 2 The **Save As** window will open. 3
> Choose the folder where you want your file to be saved. 4
> Type a name for your file in the **File name** text box. 5
> In the **Save as type** list, click **CSV (Comma delimited)**. 6
> Click **Save**. 7 A new CSV file has been created. 8







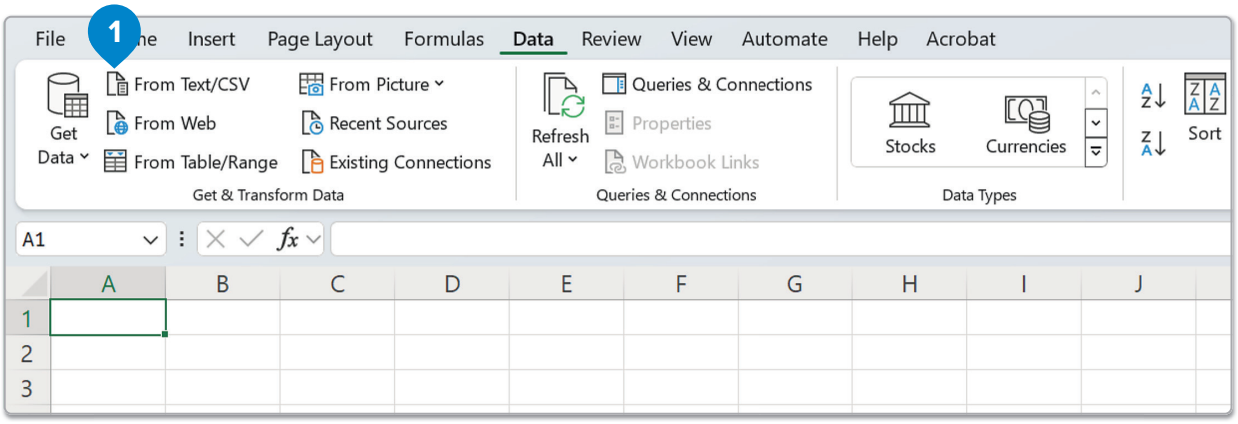


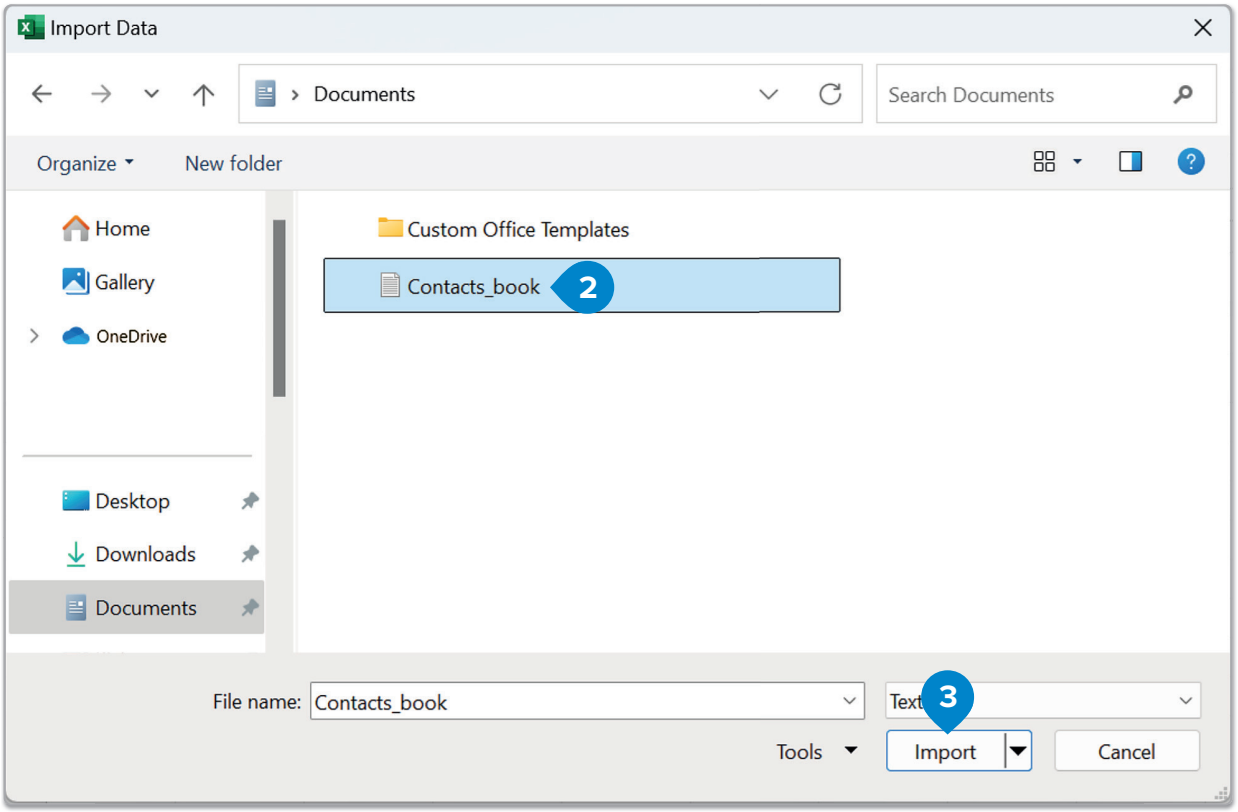
Importing data

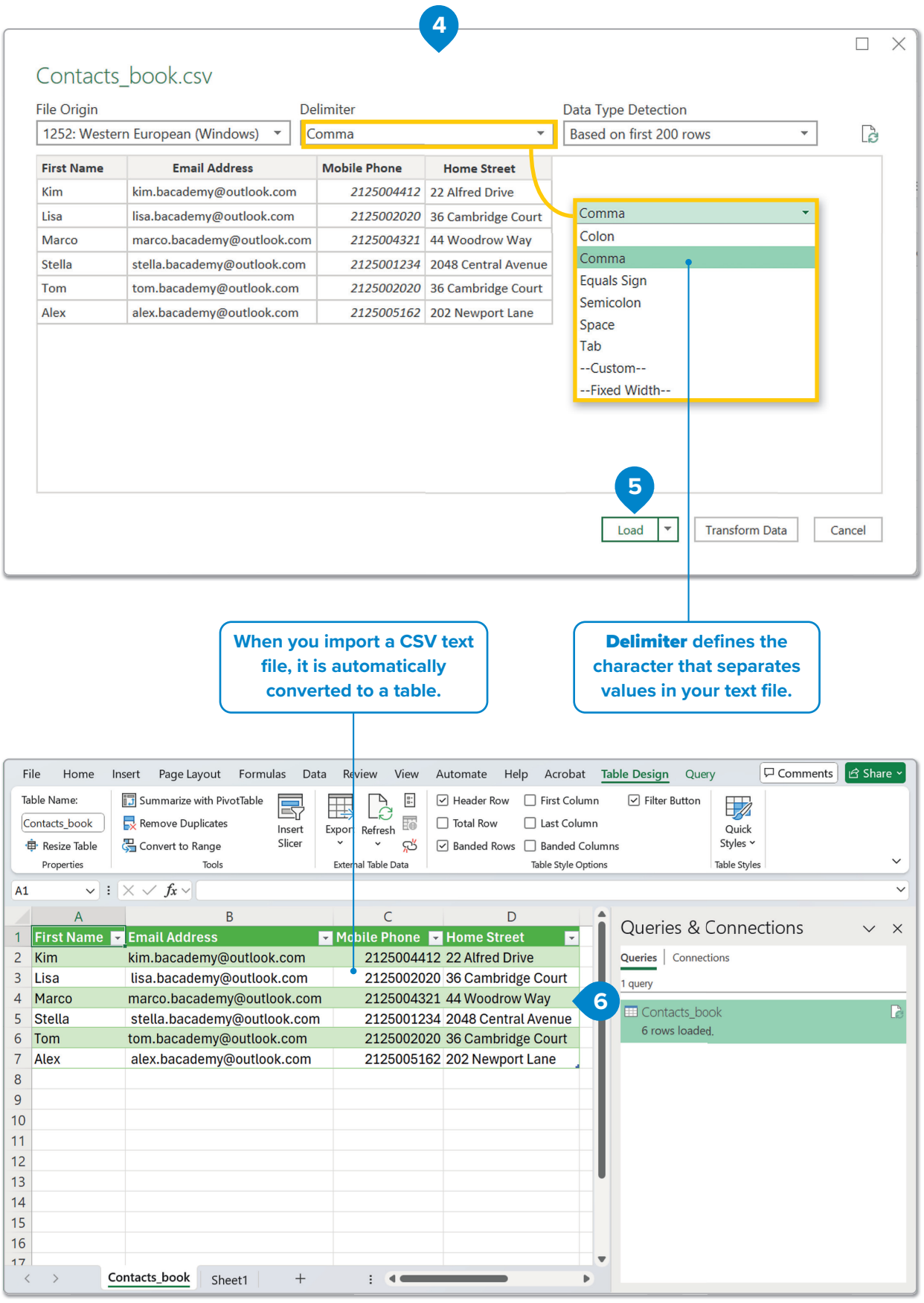
It is also possible to import data from a CSV text file into an existing or a new Microsoft Excel worksheet. This is helpful because data can be formatted and analyzed. Open a new spreadsheet.

Import data from a CSV file:

> On the **Data** tab, in the **Get & Transform Data** group, click **From Text/CSV**. 1
> Locate and choose the text file you want, e.g., click **Contacts_book**. 2
> Click **Import**. 3
> The **Contacts_book.csv** window will open. 4
> Click **Load** to import a delimited file in a new worksheet. 5
> The data has been entered in the spreadsheet as a table. 6







When you import a CSV text file, it is automatically converted to a table.

Delimiter defines the character that separates values in your text file.

Hands on!

1. Read the following sentences and put a check mark for True or False.

	True	False
1. Applying a filter is useful for checking only a specific set of records from a large table.		
2. Data for text fields can be sorted alphabetically, but there is no way for numerical data to be sorted.		
3. Multi-level sorting allows you to sort data by more than one field.		
4. Custom filters allow you to display records based on specific conditions, such as dates or numbers.		
5. Sorting data is unnecessary if the data is arranged randomly in your table.		
6. In Microsoft Excel, you cannot import data from a CSV file.		
7. In a CSV file, values in each row of data are separated by a comma or a tab.		

2. Complete with the missing words.

multi-level **filter** **sort** **custom** **contains** **table**

1. Applying a _____, allows you to display only a specific set of data records in a large table.

2. A filter that only shows records containing a specific word or phrase uses the _____ filter option.

3. To display only the records of people whose birthday is in April, you would use a _____ filter.

4. A _____ is used to organize your data in alphabetical or numerical order, making it simple to find information.

5. Sorting data by more than one field is called _____ sorting.

6. When you import a CSV file, it is automatically converted to a _____.

3. **Why is it important to use filters when working with a large dataset, and how can it help save time? In what situations might sorting data by multiple fields be more beneficial than sorting it by just one field?**

4. **Create a new music database with fields such as Artist Name, Album Title, Genre, and Release Date. Once the database is set up, sort the records based on the Release Date field, arranging them from oldest to newest. After sorting, filter the Release Date field to check if any albums were released the year you were born. If no records match, apply another filter to check if any albums were released on your birthday, ignoring the year. Finally, export your database table to a CSV text file.**

LESSON 3

Making complex calculations

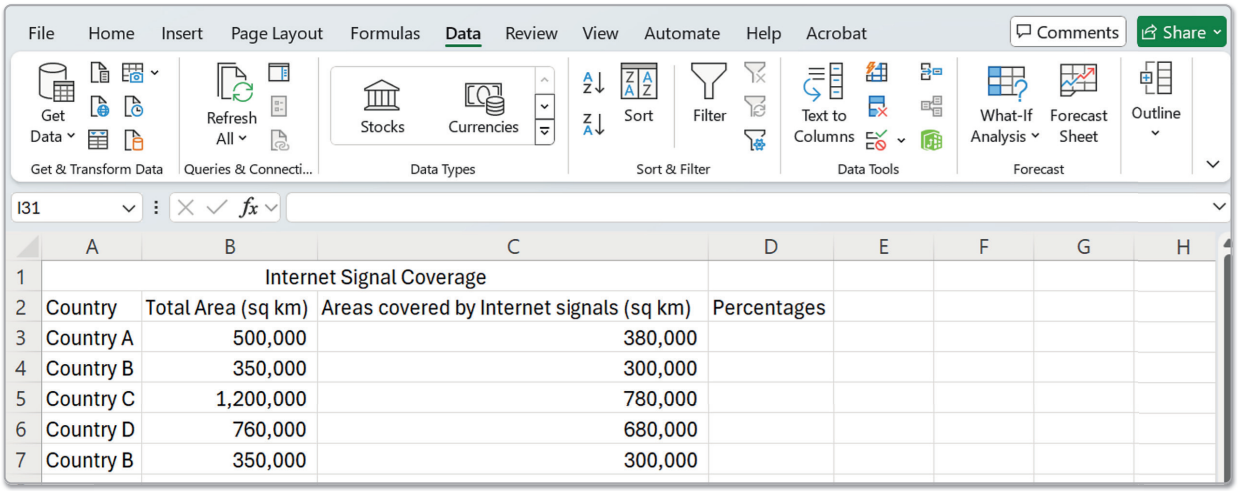
Are there any circumstances under which we need to change the format of a number or separate characters from a text?

Working with databases and spreadsheet tables in Excel helps you organize, sort, and filter data to quickly find specific information. Now, let's talk about an important step in working with data, which is "data cleaning." Data cleaning means improving the accuracy of data by fixing errors or filling in missing information.

Removing duplicates

When working with data, you might notice that some entries are repeated. These are called duplicates, and they can cause problems by making your data inaccurate or messy. Removing duplicates is an important part of data cleaning.

An institution of your city has conducted research to find out how much of each country is covered by Internet signals. Create the following table:



	A	B	C	D	E	F	G	H
1	Internet Signal Coverage							
2	Country	Total Area (sq km)	Areas covered by Internet signals (sq km)	Percentages				
3	Country A	500,000	380,000					
4	Country B	350,000	300,000					
5	Country C	1,200,000	780,000					
6	Country D	760,000	680,000					
7	Country B	350,000	300,000					

To remove duplicate values from a data table:

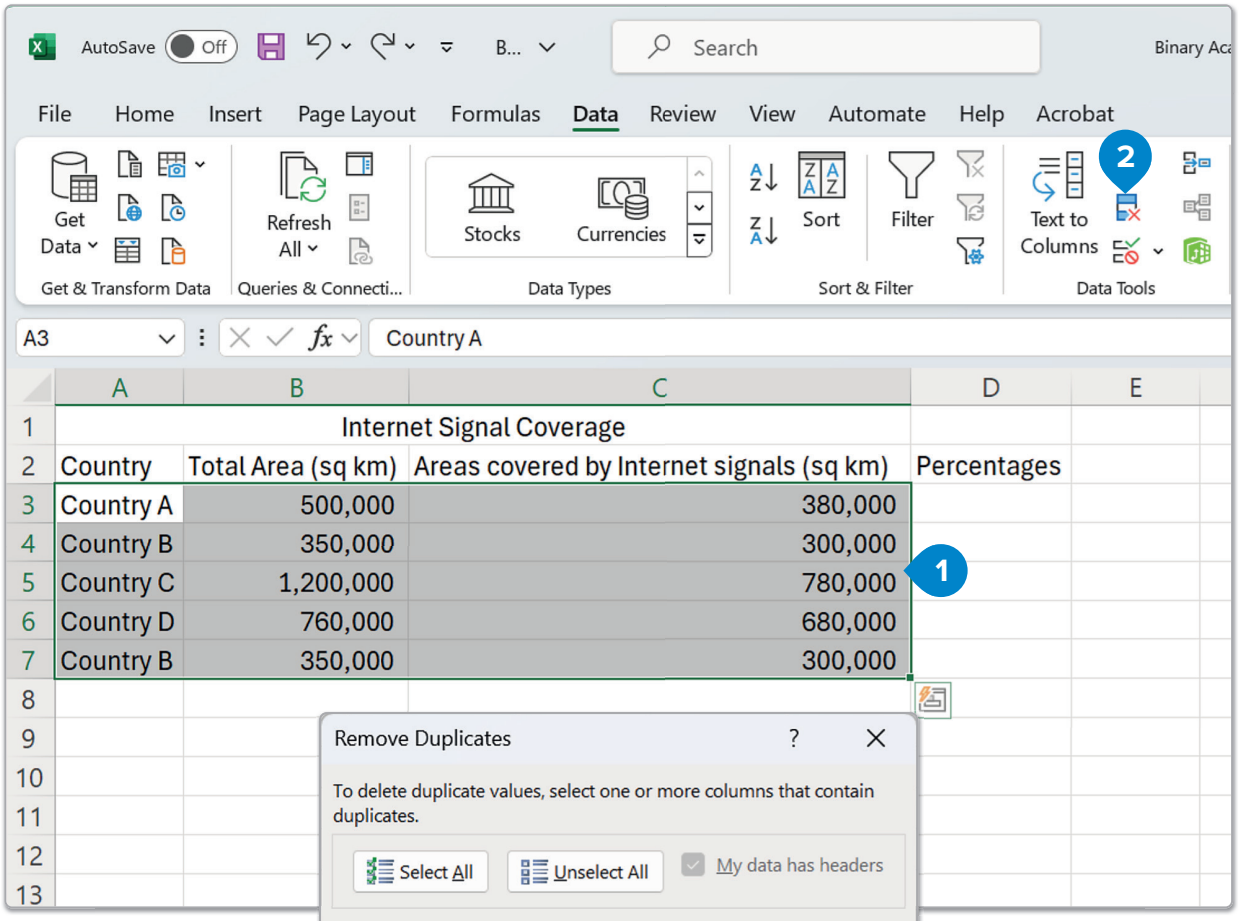
> Select the range of cells in your table from which you want to remove duplicates, e.g., cells **A2** to **C7**. 1

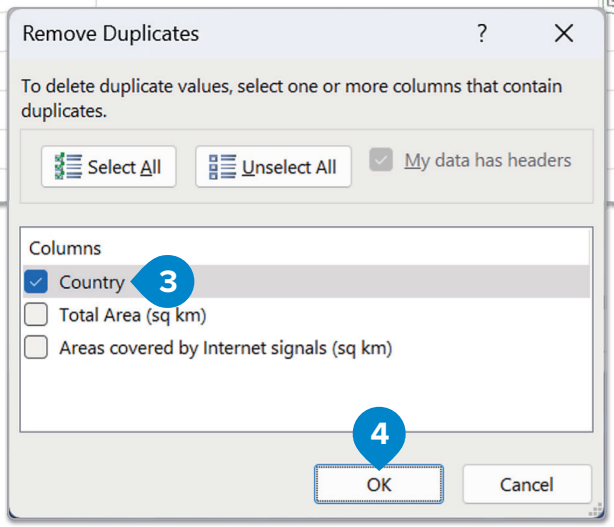
> In the **Data** tab, in the **Data Tools** group, click **Remove Duplicates**. 2

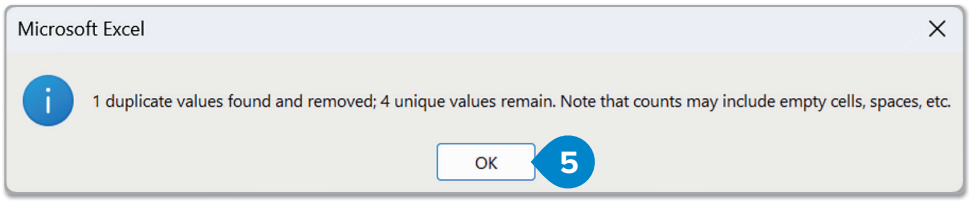
> The **Remove Duplicates** window opens. Select the column from which the duplicates will be removed 3 and click **OK**. 4

> A window pops up to inform you about duplicates removed and unique data remaining. Click **OK**. 5

> Your table or range of cells now has unique data values. 6







	A	B	C	D
1	Internet Signal Coverage			
2	Country	Total Area (sq km)	Areas covered by Internet signals (sq km)	Percentages
3	Country A	500,000	380,000	
4	Country B	350,000	300,000	
5	Country C	1,200,000	780,000	
6	Country D	760,000	680,000	
7				
8				

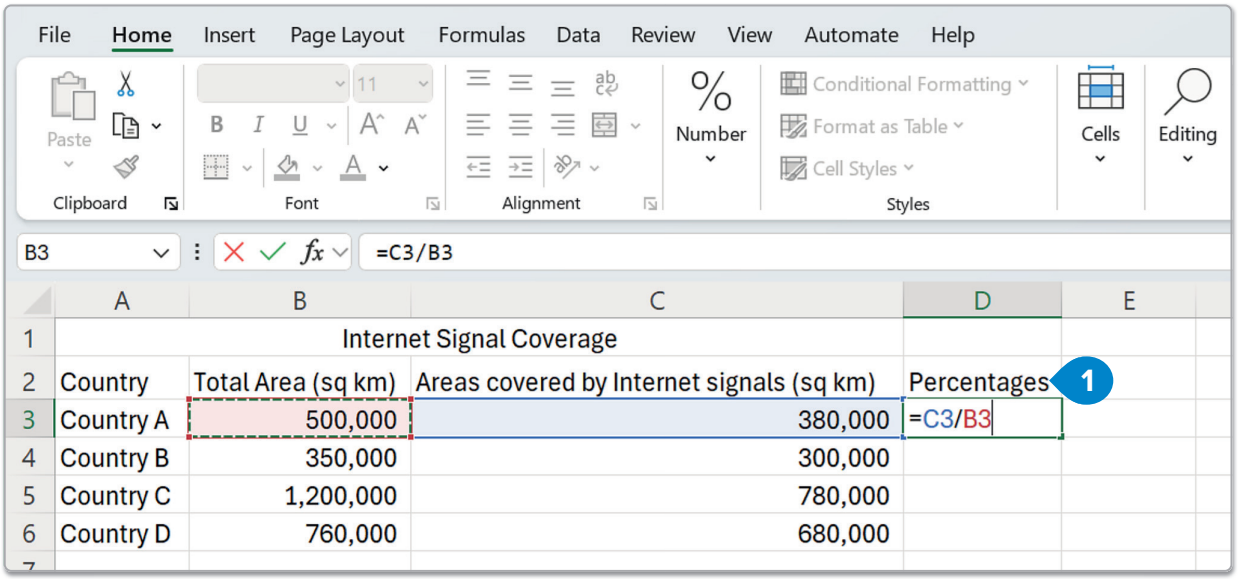
6

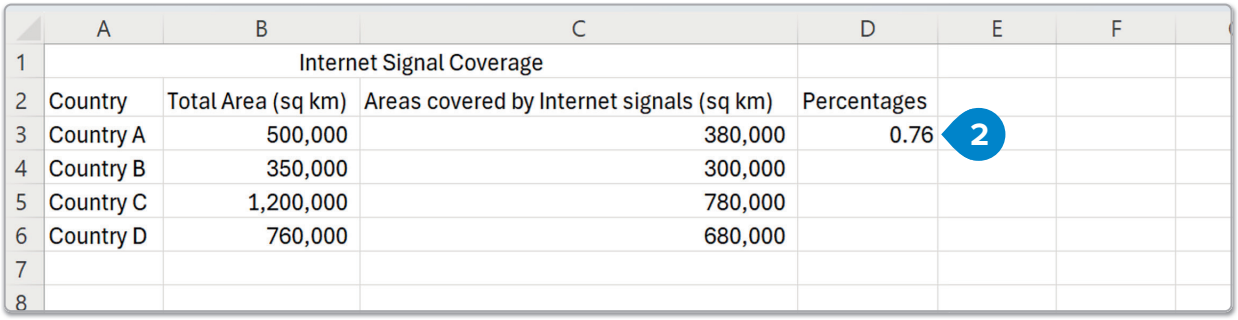
Working with percentages

Working with **percentages** can be difficult at first, but with practice, it becomes easier. To change a decimal number to a percentage, apply the percentage format. Microsoft Excel multiplies the value in the cell by 100 and displays the result with a percentage sign.

To change a number to a percentage:

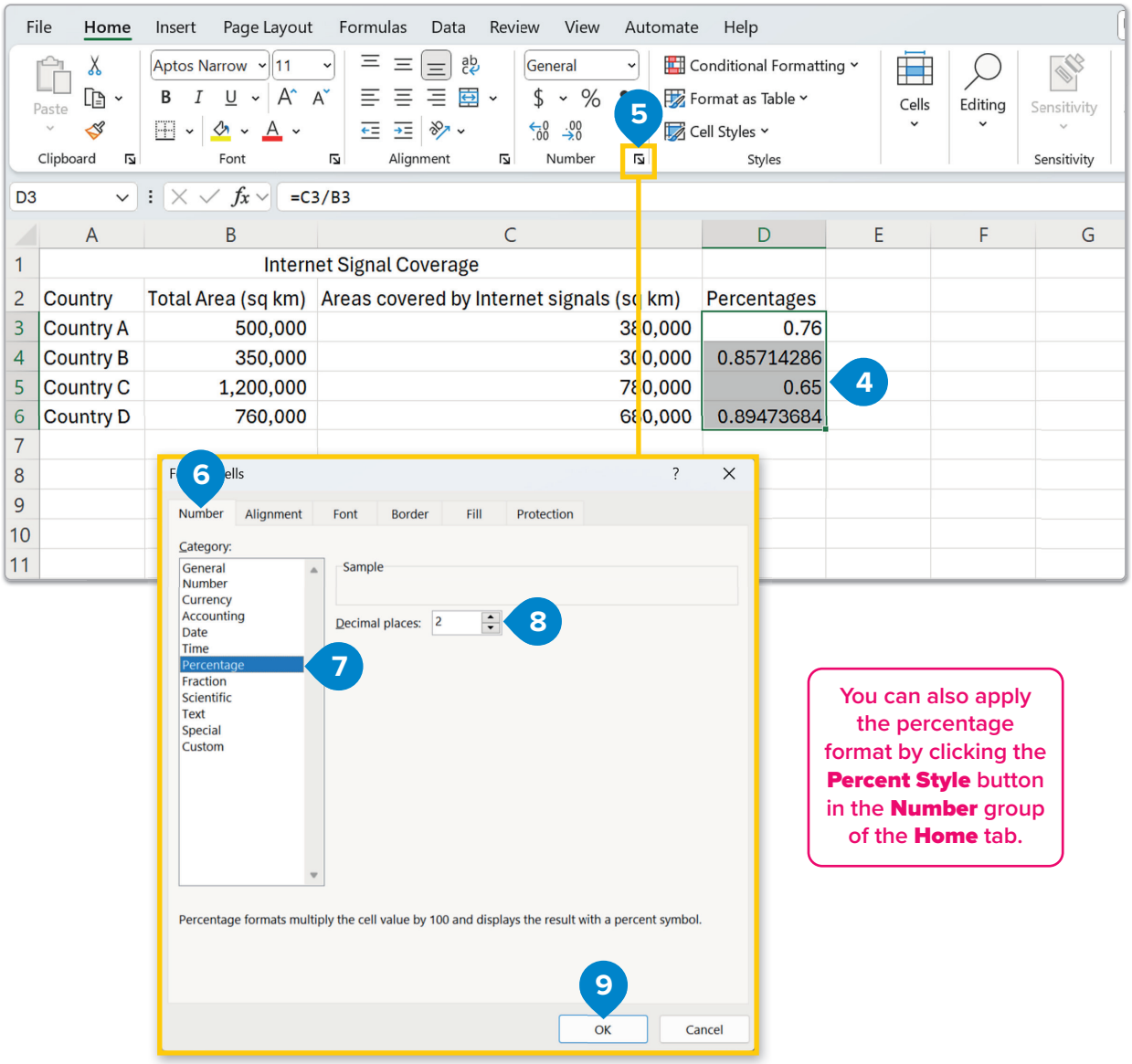
> Click on cell **D3**, type "**=C3/B3**", 1 and press **Enter** ↵. 2
> Use the **AutoFill** tool to copy the formula to cells **D4** to **D6**. 3
> Select the cells that contain the numbers you want to format, in this case, cells **D3** to **D6**. 4
> On the **Home** tab, in the **Number** group, click the **Expand** button. 5
> In the **Format Cells** window, click the **Number** tab. 6
> In the **Category** list, click **Percentage**. 7
> Type a number in the **Decimal places** text box, e.g., "**2**". 8
> Click **OK**. 9
> The numbers in cells **D3** to **D6** are now shown as percentages. 10





	A	B	C	D
1	Internet Signal Coverage			
2	Country	Total Area (sq km)	Areas covered by Internet signals (sq km)	Percentages
3	Country A	500,000	380,000	0.76
4	Country B	350,000	300,000	0.85714286
5	Country C	1,200,000	780,000	0.65
6	Country D	760,000	680,000	0.89473684
7				

3



You can also apply the percentage format by clicking the **Percent Style** button in the **Number** group of the **Home** tab.

	A	B	C	D	E
1	Internet Signal Coverage				
2	Country	Total Area (sq km)	Areas covered by Internet signals (sq km)	Percentages	
3	Country A	500,000	380,000	76.00%	
4	Country B	350,000	300,000	85.71%	
5	Country C	1,200,000	780,000	65.00%	
6	Country D	760,000	680,000	89.47%	

10

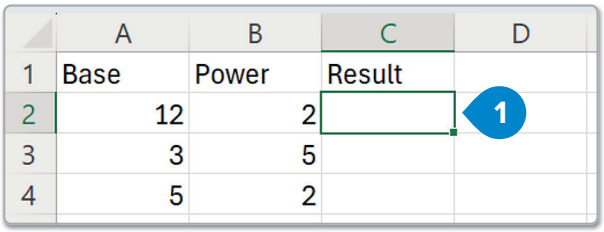
Calculating powers

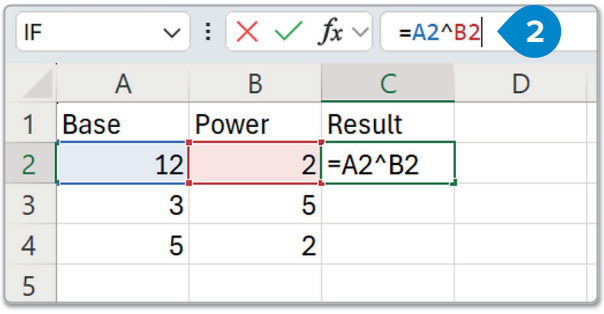
Calculating powers in Excel allows you to raise a number to a specific exponent. The process uses the caret (^) symbol or the **POWER** function for flexibility and precision.

Create the following table:

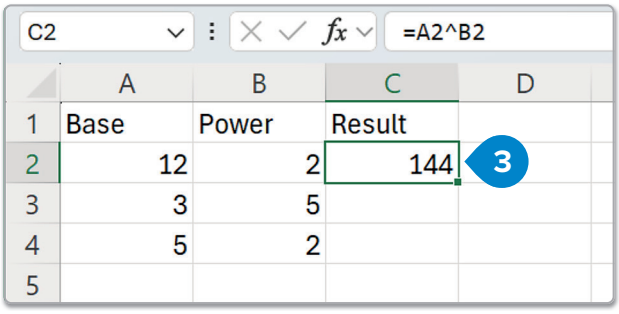
To calculate powers:

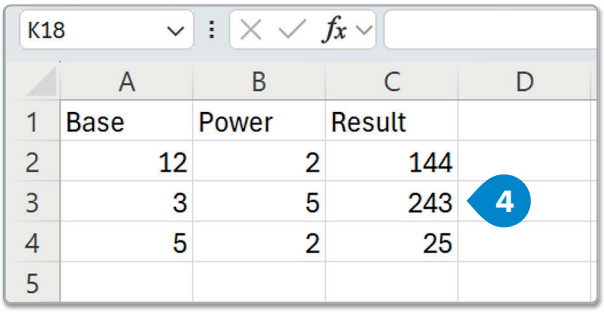
> Click on cell **C2**. 1
> In the **Formula bar**, type "**=A2^B2**". 2
> Press **Ctrl** + **Enter** to calculate the formula and stay in the same cell. 3
> Use the **AutoFill** tool to copy the formula to cells **C3** and **C4**. 4





You can use the function POWER(x,y) instead of using the ^ symbol. Depending on Regional settings, Microsoft Excel functions are written with a semicolon between the Function Arguments e.g., POWER(x;y).





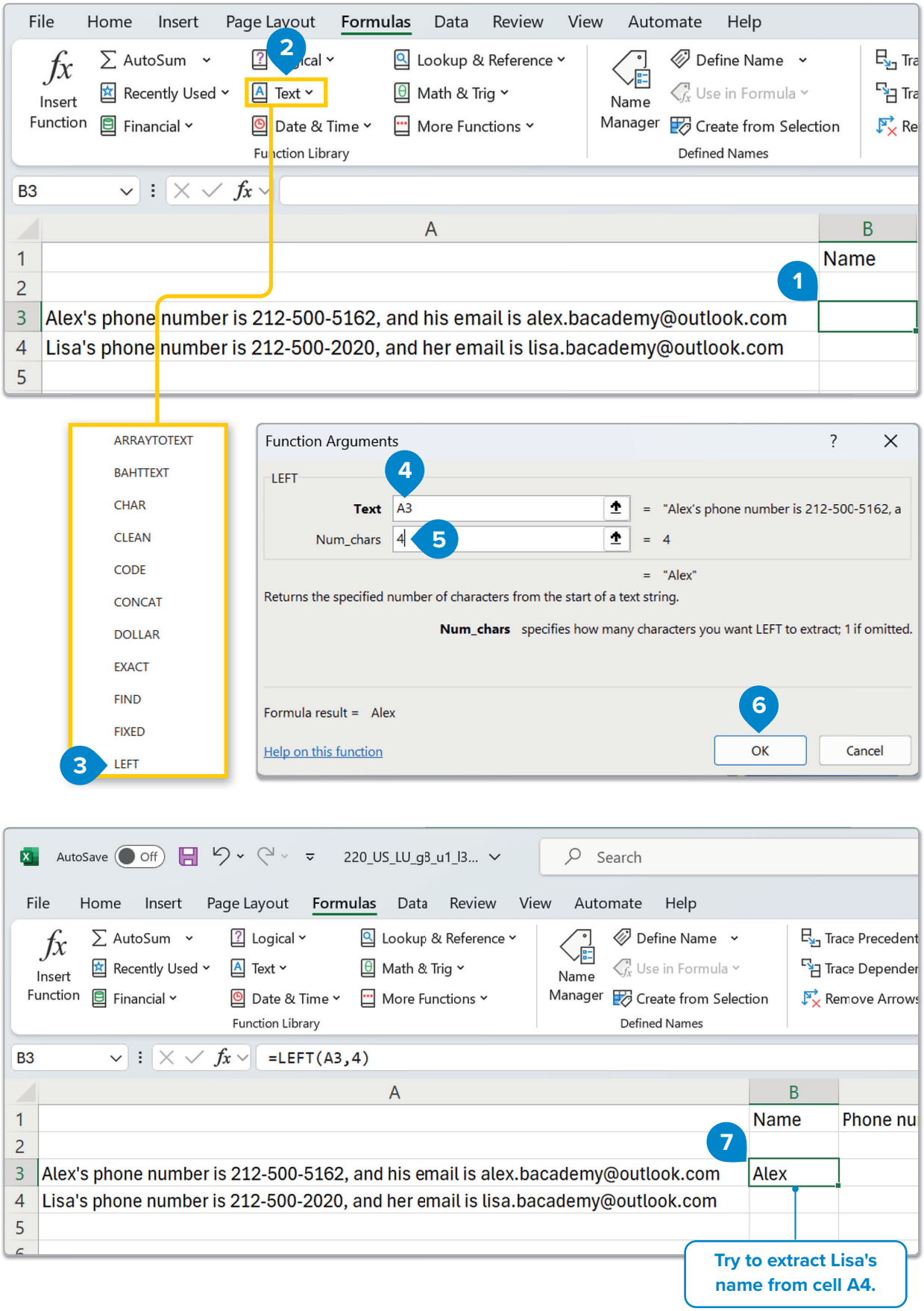
The LEFT function

In computational language, data that is represented as text is called a string. If you want to extract a part of a strong, called a substring, from the left side, use the **LEFT** function.

To use the LEFT function:

> Click in cell **B3**. 1
> On the **Formulas** tab, in the **Function Library** group, click **Text**. 2
> In the list, click **LEFT**. 3
> In the **Function Arguments** window, in the **Text** box, type "**A3**". 4 It's the cell from which you are going to extract characters.
> In the **Num_chars** text box, type "**4**". 5 You are specifying how many characters you want to extract from the left side of the text.
> Click **OK**. 6
> The result of the function is displayed in cell **B3**. 7

Type the following data:

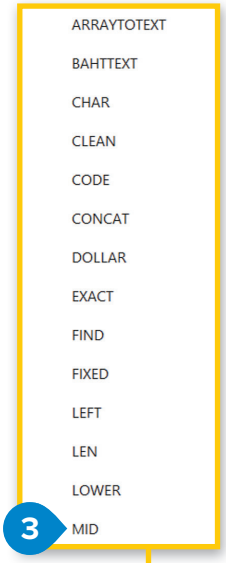


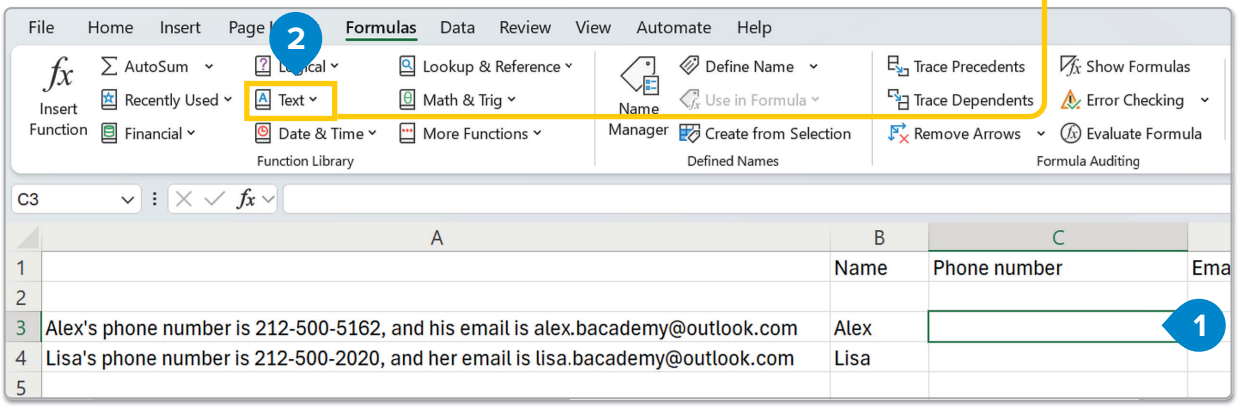
The MID function

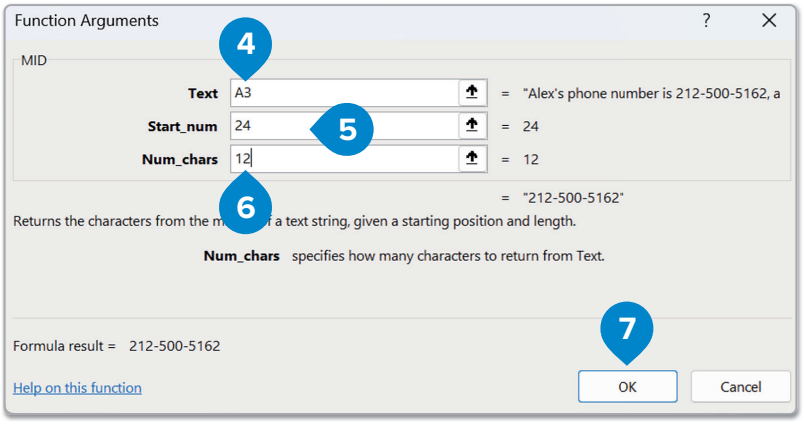
Let's extract characters from the middle of a text string (substring). Extract Alex's email from cell **A3**. To do that, use the **MID** function.

To use the MID function:

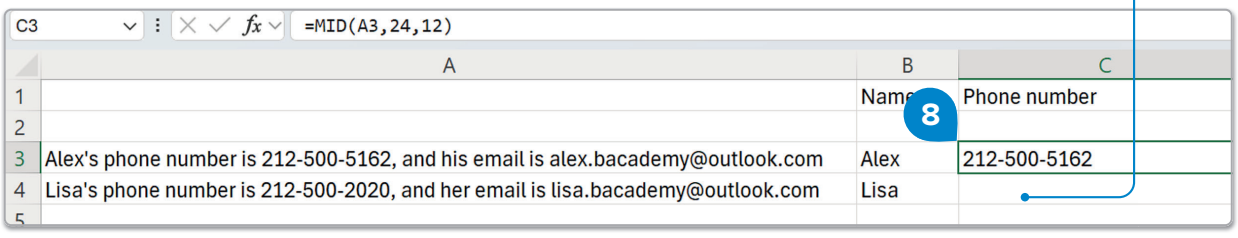
> Click in cell **C3**. 1
> On the **Formulas** tab, in the **Function Library** group, click **Text**. 2
> In the list, click **MID**. 3
> In the **Function Arguments** window, in the **Text** box, type "**A3**". 4 It's the cell from which you are going to extract characters.
> In the **Start_num** text box, type "**24**". 5 It's the position of the first character you want to extract.
> In the **Num_chars** text box, type "**12**". 6 You are specifying how many characters you want to extract.
> Click **OK**. 7
> The result of the function is displayed in cell **C3**. 8







Try to extract Lisa's phone number from cell A4.

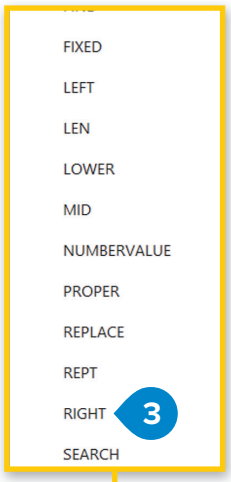


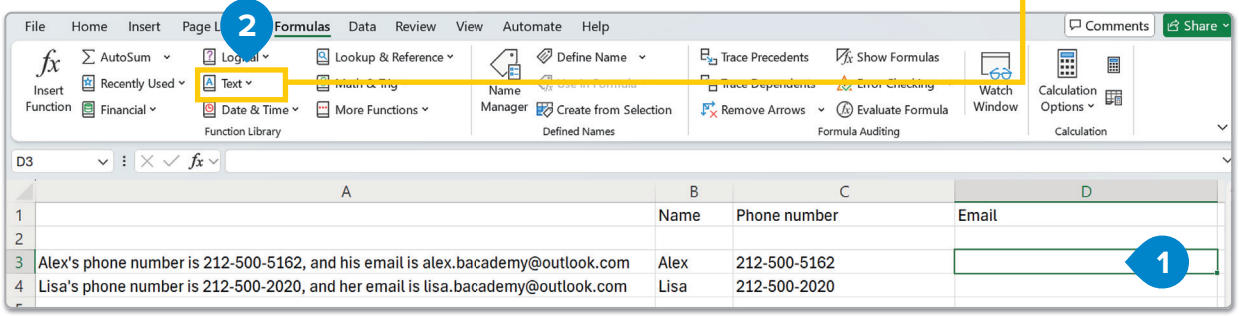
The RIGHT function

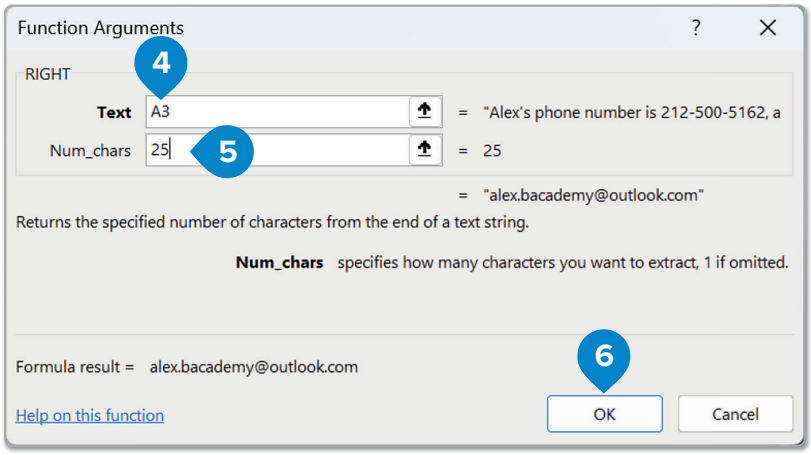
Let's extract characters from the end of a text string. To do that, use the **RIGHT** function.

To use the RIGHT function:

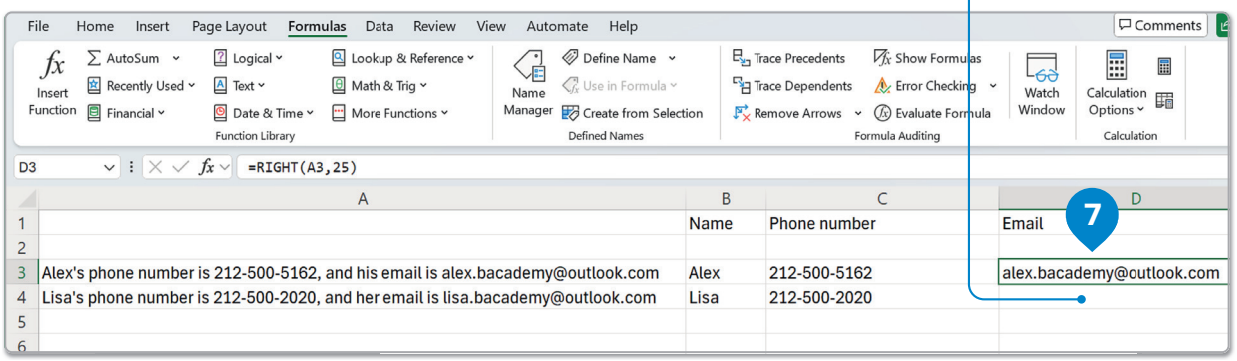
> Click in cell **D3**. 1
> On the **Formulas** tab, in the **Function Library** group, click **Text**. 2
> In the list, click **RIGHT**. 3
> In the **Function Arguments** window, in the **Text** box, type "**A3**". 4 It's the cell from which you are going to extract characters.
> In the **Num_chars** text box, type "**25**". 5 You are specifying how many characters you want to extract from the end of the string.
> Click **OK**. 6
> The result of the function is displayed in cell **D3**. 7







Try to extract Lisa's email from cell A4.

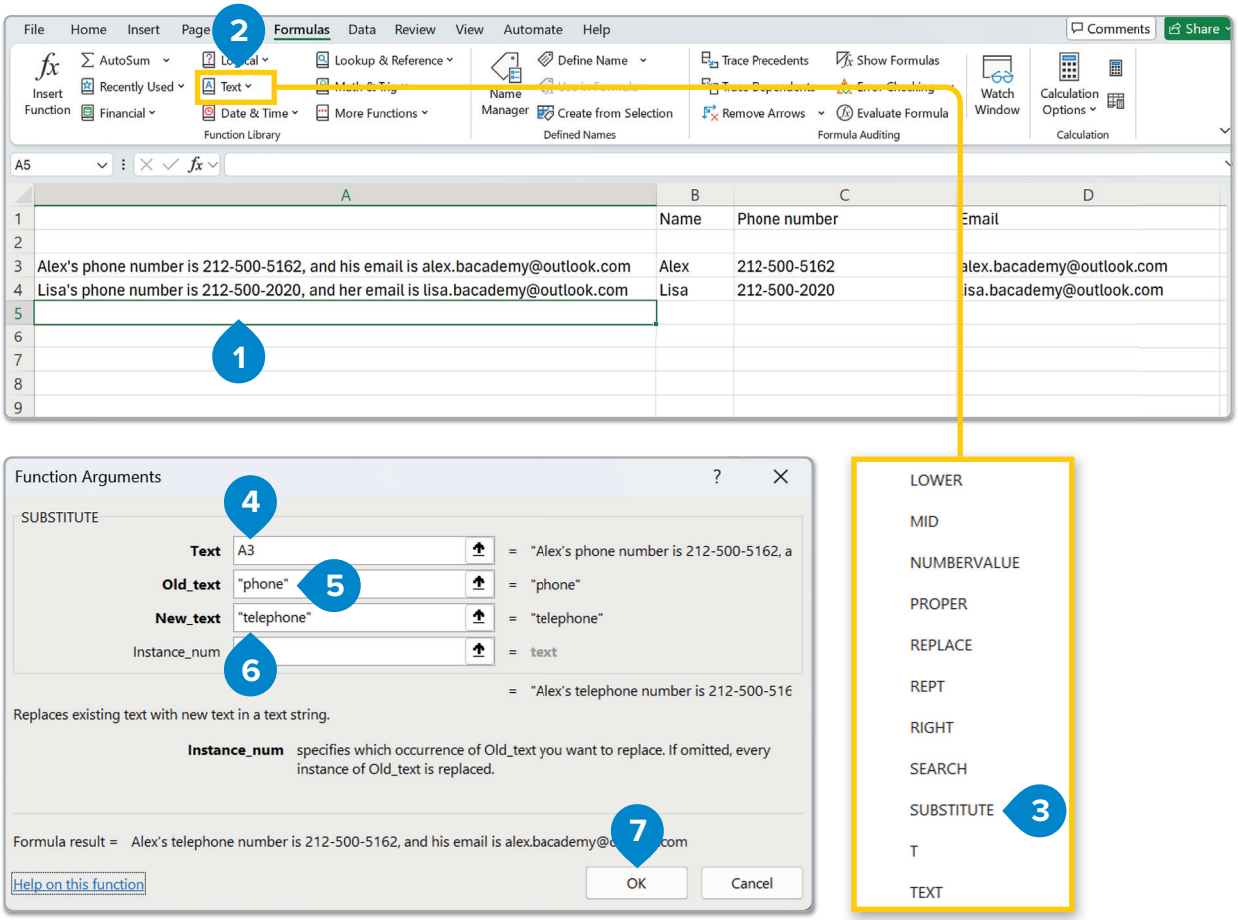


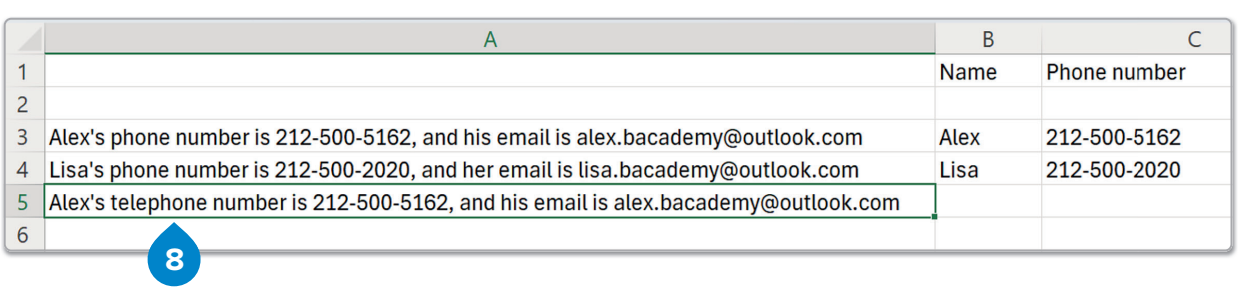
The SUBSTITUTE function

If you want to replace part of the text in a cell, use the **SUBSTITUTE** function.

To use the SUBSTITUTE function:

> Click in cell **A5**. 1
> On the **Formulas** tab, in the **Function Library** group, click **Text**. 2
> In the list, click **SUBSTITUTE**. 3
> In the **Function Arguments** window, in the **Text** box, type "**A3**". 4 It's the cell that contains the part of the text you are going to replace.
> In the **Old_text** box, type "**phone**". 5 This is the word you want to change.
> In the **New_text** box, type "**telephone**". 6 This is the new word.
> Click **OK**. 7
> The result of the function is displayed in cell **A5**. 8





Hands on!

1. Read the following sentences and put a check mark for True or False.

	True	False
1. The "LEFT" function in Excel takes the first part of a word or code from the left side.		
2. If you want to find half of a number, you use the "POWER" function in Excel.		
3. The "RIGHT" function in Excel can help you extract a word or code's last letters or numbers.		
4. The "MID" function in Excel can only extract letters from the beginning of a word.		
5. A key part of the data cleaning process is removing duplicates.		

2. Read the questions and put a check mark for the correct answer.

1. Which function would you use to extract the last two letters of the word "APPLE"?
   - a. LEFT
   - b. MID
   - c. RIGHT
   - d. None of the above
2. If you want to extract the first three letters from a word in Excel, which function do you use?
   - a. RIGHT
   - b. LEFT
   - c. POWER
   - d. MID

3. Which function can you use to get the second and the third letters in the word "BEACH"?

   - a. MID
   - b. LEFT
   - c. RIGHT
   - d. POWER

4. In the following table, if you want to calculate the percentage of rainy days, which formula would you use as a first step?

   - a. A1/B1
   - b. =A2+B2
   - c. =A2/B2
   - d. =A1/A2

	A	B	C
1	Rainy days	Total Days	
2	12	31	
3			
4			

3. You have a list of file names, such as Report.docx, Photo.jpeg, and Present.ppt. Which function could you use to extract the file type (or extension)? Explain how identifying file types could be helpful if you're sorting or organizing many files.

4. Open a new spreadsheet and type this sentence: "The employee code is EMP-12345-USA".
Next, you should:

- Use the appropriate functions to replace "EMP" with "STAFF".
- Extract the country and the number in different cells.

5. Your school did some research to find out which is the most interesting subject to students. The questionnaire below displays the votes for each subject. Now, using Microsoft Excel, type the text and numbers as they are in the worksheet. Calculate the total number of votes and the percentage of votes for each subject. Fill the empty cells with the appropriate formulas and format the cells B4:F4 as percentages.

	A	B	C	D	E	F	G	H
1	***Questionnaire***							
2	**Lesson**	**Physics**	**Mathematics**	**English Literature**	**History**	**Chemistry**		**Total Votes**
3	**Votes**	192	100	178	52	100		
4	**Percentage**							
5								

LESSON 4

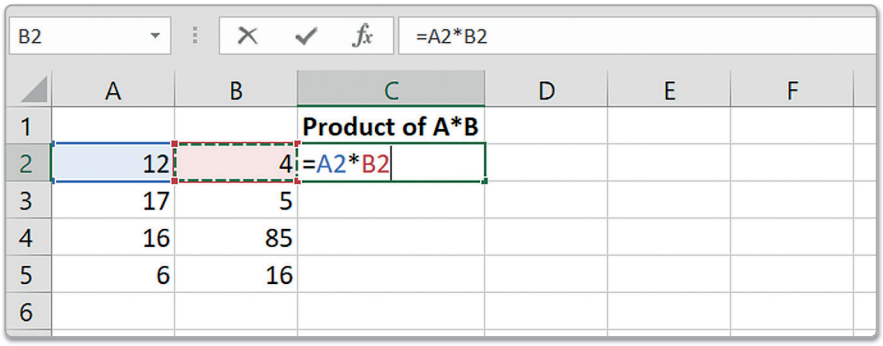
References

What happens when you drag a formula to other cells using AutoFill? Does the formula remain the same? What could you do if you would like to use the same cell in a formula?

A cell takes its name from the column letter and row number to which it belongs. A cell reference is the "address" of the cell and identifies its location. In some cases, you may want to use the same formula in different places on your spreadsheet. Copying the formula helps you work faster and analyze the data accurately. When you want to copy the same formula to new cells, you can use **relative** and **absolute references**.

Relative reference

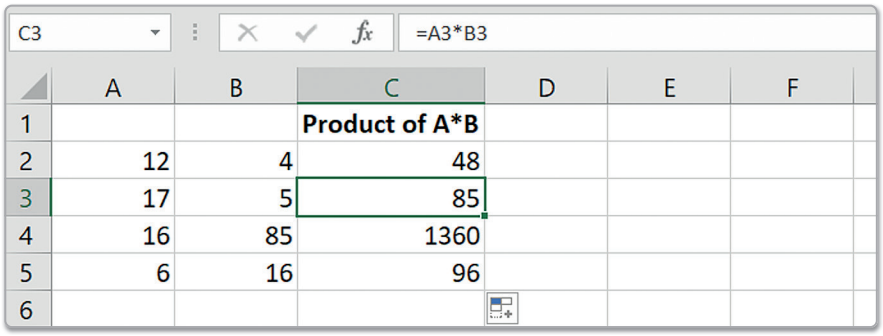
Relative reference is the cell reference. When you copy a cell that has a formula, the formula changes automatically. The change depends on the relative position of rows and columns.



Type the contents of columns A and B and in cell C2, type "=A2*B2".

Absolute reference

Sometimes you want to keep a cell, a row, or a column constant when copying a formula. You have to declare this when you create the formula by using the **$** (dollar sign). This way, you create an absolute reference which doesn't change when it's copied or "filled."



If you copy the formula =A2*B2 to cell C3, it will become =A3*B3.

Types of cell referencing	
Reference type	Reference action
$E$1	The cell doesn't change when it is copied. Both the column and the row remain the same.
$E1	The row changes when it is copied, but the column remains the same.
E$1	The column changes when it is copied, but the row remains the same.

For example, type the contents of columns A and B below and in cell **C2**, type "**=$D$1*B2**".

B2 =$D$1*B2

	A	B	C	D
1	**Products**	**Cost**	**Tax**	**25%**
2	Product 1	81	=$D$1*B2	
3	Product 2	25		
4	Product 3	18		
5	Product 4	125		
6	Product 5	68		

C2 =$D$1*B2

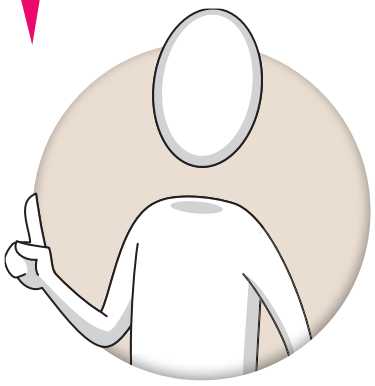
	A	B	C	D
1	**Products**	**Cost**	**Tax**	**25%**
2	Product 1	81	20.25	
3	Product 2	25		
4	Product 3	18		
5	Product 4	125		
6	Product 5	68		

C3 =$D$1*B3

	A	B	C	D
1	**Products**	**Cost**	**Tax**	**25%**
2	Product 1	81	20.25	
3	Product 2	25	6.25	
4	Product 3	18	4.5	
5	Product 4	125	31.25	
6	Product 5	68	17	

If you apply the formula =$D$1*B2 to column C, the formula will change to become =$D$1*B3, =$D$1*B4, etc.

Notice that when the number of the row changes, the cell that has the $ signs stays the same.



Smart Tip

You can use the Copy and Paste commands as well, instead of the **AutoFill** feature.

Create the following table:

	A	B	C	D	E	F	G	H
						Ticket	*$12.00*	
	Visitors							
	Museums	August	September	October	November	December	Total Visitors	Income
	Louvre Museum	45485	65635	52000	12500	62000	237620	
	Army Museum	45632	45635	42000	21000	56204	210471	
	Maillol Museum	25246	53543	12520	14002	25021	130332	
	The Advertising Museum	12415	15425	42510	18002	12000	100352	
	Museum of Naïve Art	15832	14585	15200	16012	17000	78629	
	Cité des Sciences et de l'Industrie	15352	15325	16000	15004	16200	77881	

To create and copy a formula using references:

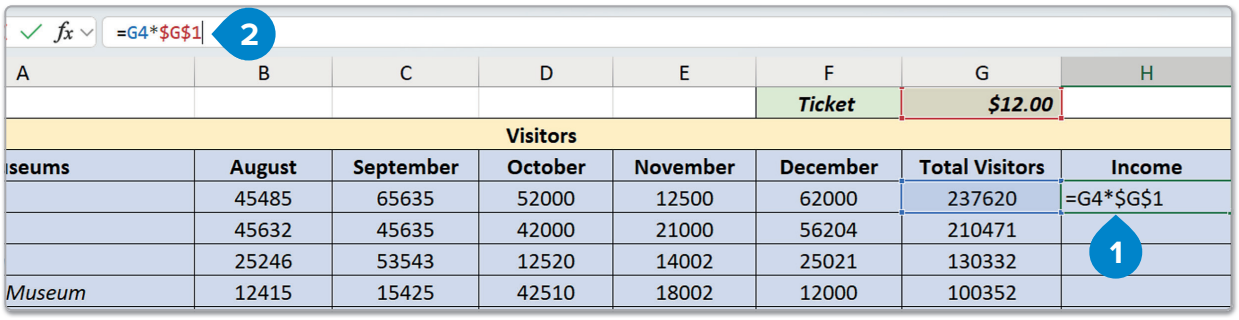
> Click in cell **H4**. 1

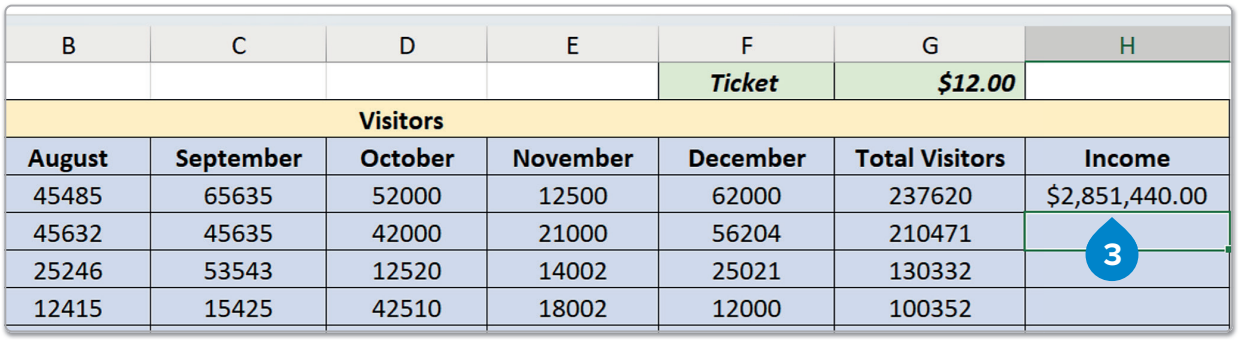
> In the **Formula bar**, type the formula "**=G4*$G$1**". 2

> Press **Ctrl** + **Enter** ↵ to calculate the formula and stay in the same cell. 3

> Use the **Auto Fill** feature to copy the formula. 4

A way to remember how to use the dollar sign is to think about how you want to use the **Auto Fill** feature. If you want to use it horizontally, then type the dollar sign in front of the letter (column). If you want to use it vertically, type it in front of the number (row).





Visitors						
August	September	October	November	December	Total Visitors	Income
45485	65635	52000	12500	62000	237620	$2,851,440.00
45632	45635	42000	21000	56204	210471	$2,525,652.00
25246	53543	12520	14002	25021	130332	$1,563,984.00
12415	15425	42510	18002	12000	100352	$1,204,224.00

4

To create and copy a formula using row absolute reference:

> Create this table and click in cell **E2**. 1

> In the **Formula bar**, type "**=D2*B$8**". 2

> Press Ctrl + Enter ↵ to calculate the formula and stay in the same cell. 3

> Use the **Auto Fill** feature to copy the formula. 4

E2

	A	B	C	D	E
1		Sales	Cost per item	Value	Discount
2	Product 1	125	25	3125	
3	Product 2	156	85	13260	
4	Product 3	25	62	1550	
5	Product 4	154	56	8624	
6	Product 5	255	25	6375	
7					
8	Discount	10%			

1

B8 =D2*B$8 2

	A	B	C	D	E
1		Sales	Cost per item	Value	Discount
2	Product 1	125	25	3125	=D2*B$8
3	Product 2	156	85	13260	
4	Product 3	25	62	1550	
5	Product 4	154	56	8624	
6	Product 5	255	25	6375	
7					
8	Discount	10%			

E2 =D2*B$8

	A	B	C	D	E
1		Sales	Cost per item	Value	Discount
2	Product 1	125	25	3125	312.5
3	Product 2	156	85	13260	
4	Product 3	25	62	1550	
5	Product 4	154	56	8624	
6	Product 5	255	25	6375	
7					
8	Discount	10%			

3

Q20

	A	B	C	D	E
1		Sales	Cost per item	Value	Discount
2	Product 1	125	25	3125	312.5
3	Product 2	156	85	13260	1326
4	Product 3	25	62	1550	155
5	Product 4	154	56	8624	862.4
6	Product 5	255	25	6375	637.5
7					
8	Discount	10%			

4

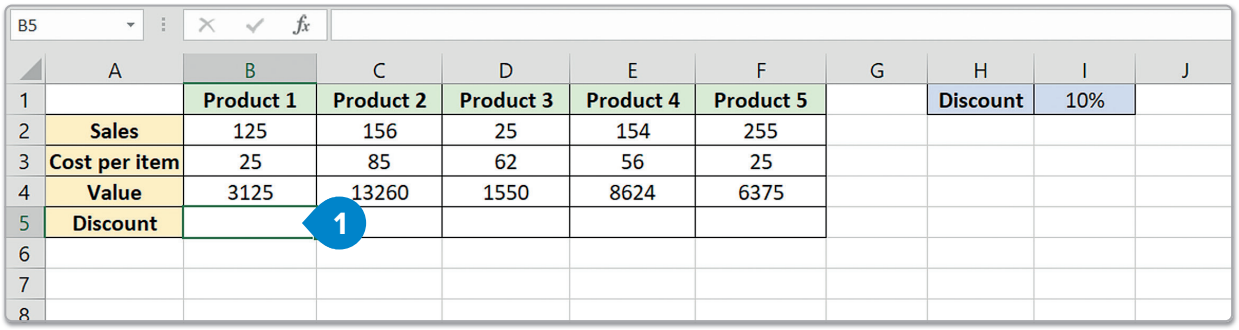
To create and copy a formula using column absolute reference:

> Create this table and click in cell **B5**. 1

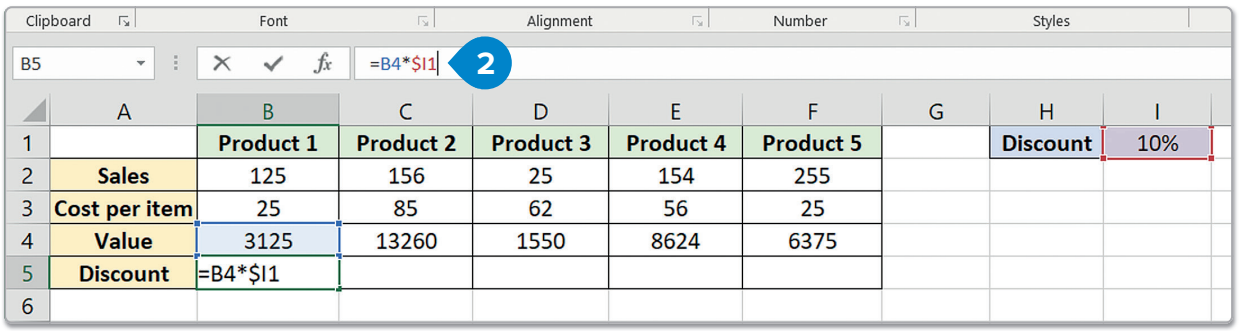
> In the **Formula bar**, type "**=B4*$I1**". 2

> Press **Ctrl** + **Enter** to calculate the formula and stay in the same cell. 3

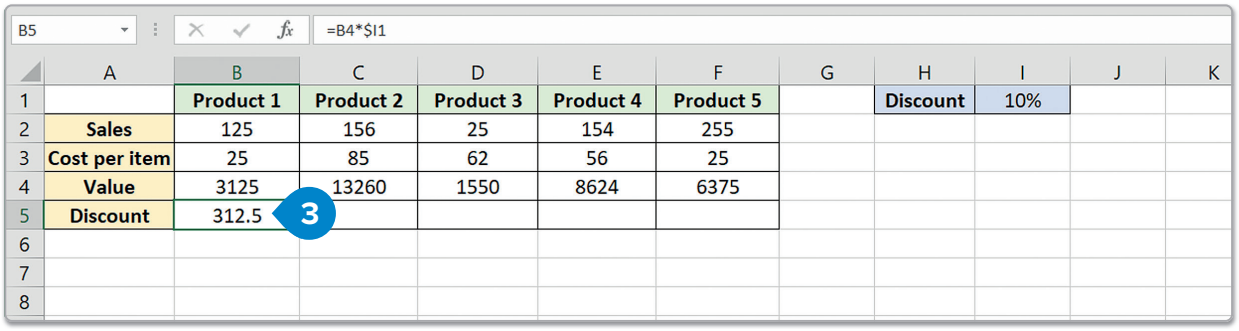
> Use the **Auto Fill** feature to copy the formula. 4



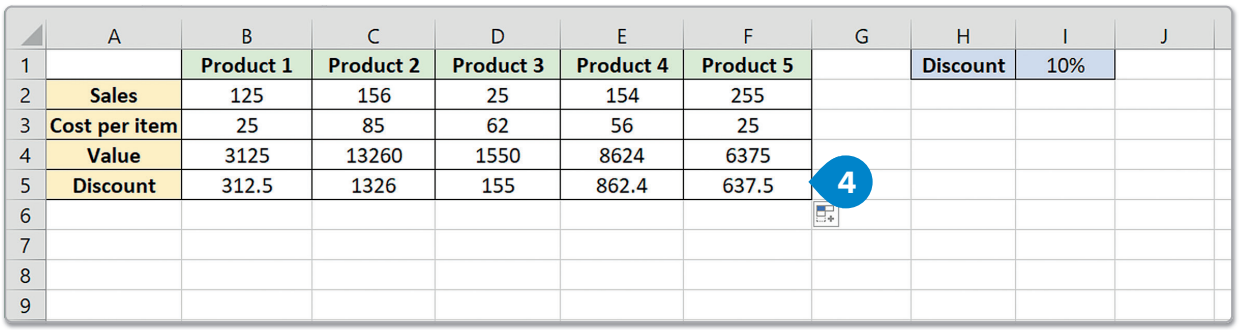
	A	B	C	D	E	F	G	H	I	J
1		Product 1	Product 2	Product 3	Product 4	Product 5		Discount	10%	
2	Sales	125	156	25	154	255				
3	Cost per item	25	85	62	56	25				
4	Value	3125	13260	1550	8624	6375				
5	Discount									
6										
7										
8										



	A	B	C	D	E	F	G	H	I
1		Product 1	Product 2	Product 3	Product 4	Product 5		Discount	10%
2	Sales	125	156	25	154	255			
3	Cost per item	25	85	62	56	25			
4	Value	3125	13260	1550	8624	6375			
5	Discount	=B4*$I1							
6									



	A	B	C	D	E	F	G	H	I	J	K
1		Product 1	Product 2	Product 3	Product 4	Product 5		Discount	10%		
2	Sales	125	156	25	154	255					
3	Cost per item	25	85	62	56	25					
4	Value	3125	13260	1550	8624	6375					
5	Discount	312.5									
6											
7											
8											



	A	B	C	D	E	F	G	H	I	J
1		Product 1	Product 2	Product 3	Product 4	Product 5		Discount	10%	
2	Sales	125	156	25	154	255				
3	Cost per item	25	85	62	56	25				
4	Value	3125	13260	1550	8624	6375				
5	Discount	312.5	1326	155	862.4	637.5				
6										
7										
8										
9										

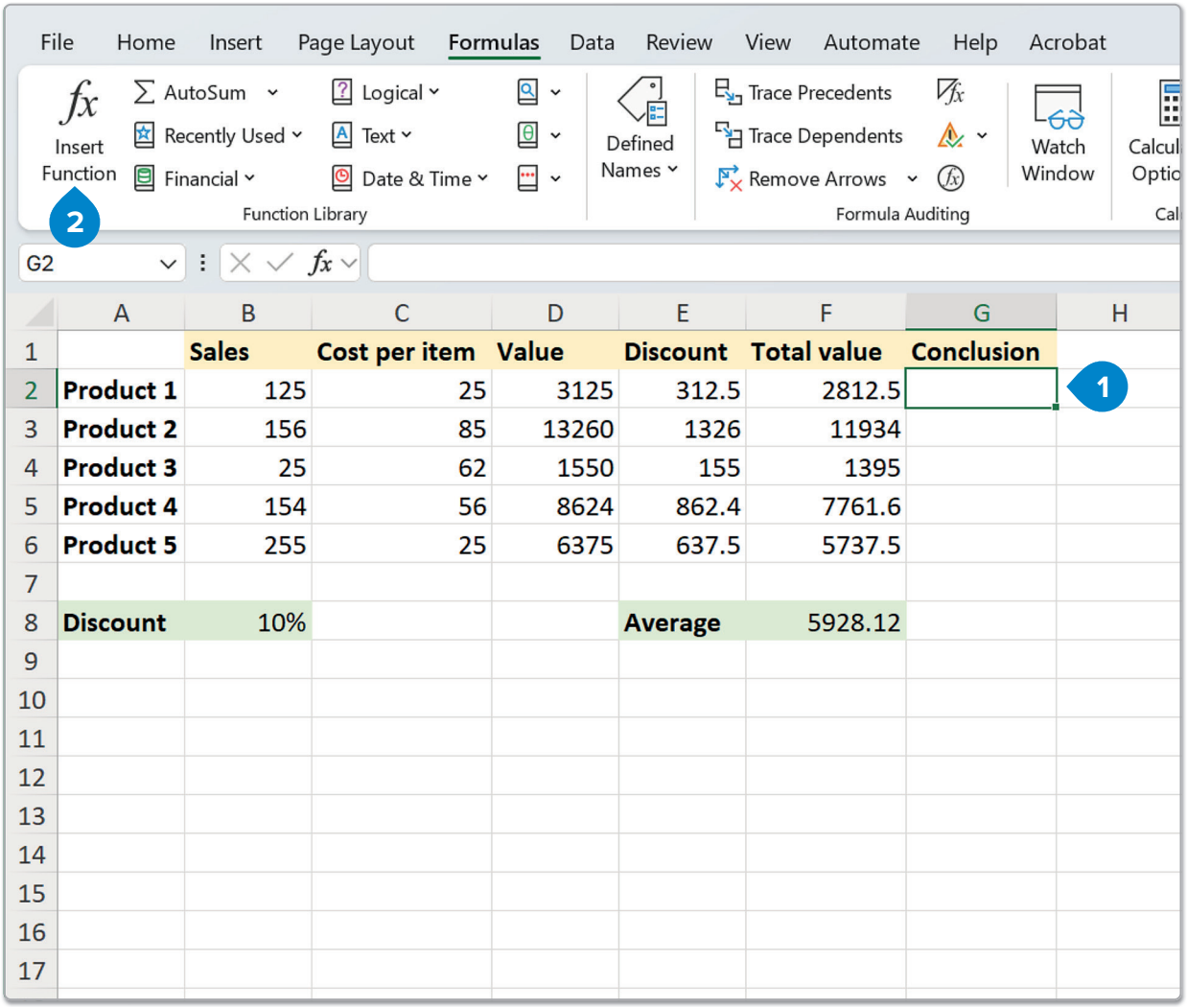
IF and references

You are going to combine the IF function with an absolute reference. Before you start, let's find the **Total value**, which is the **Value** minus the **Discount**, in column **F**, and find the **Average** value in cell **F8**.

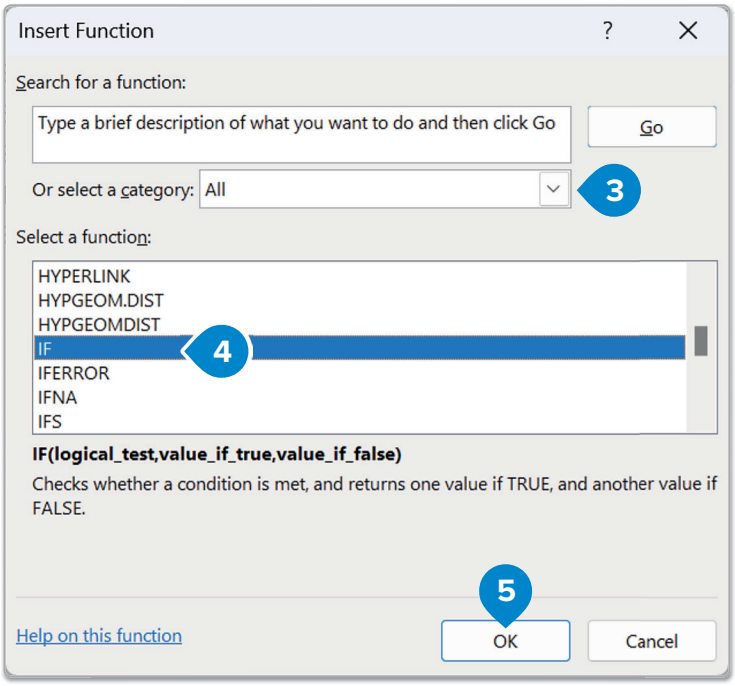
If the **Total value** is more than the **Average** value, then it is above average. If it is less (**ELSE**), then it is below average.

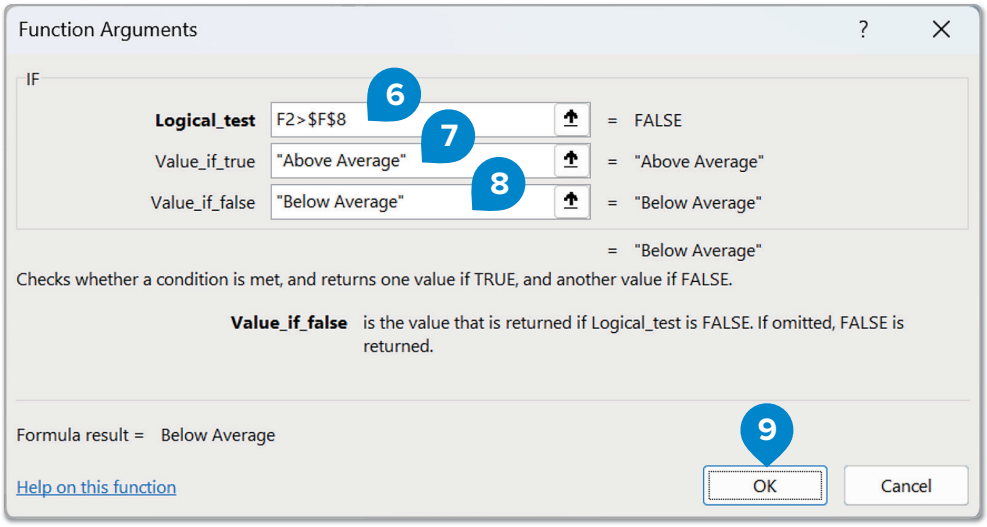
To use IF with a reference:

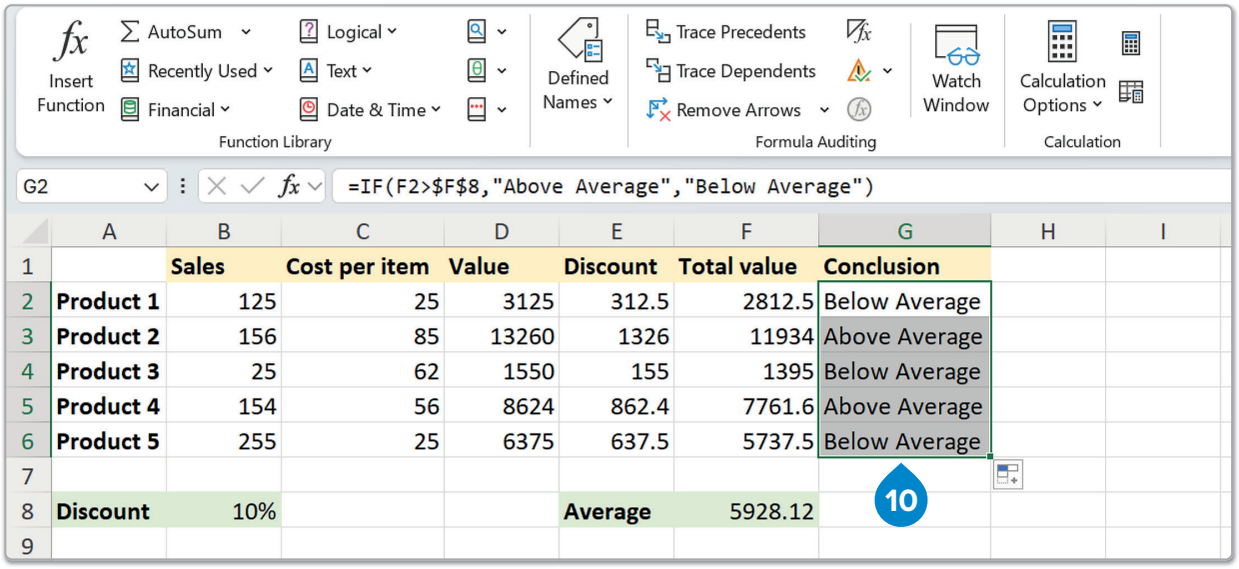
> Click in cell **G2**. 1
> On the **Formulas** tab, in the **Function Library** group, click **Insert Function**. 2
> In the **Insert Function** window, in the **Or select a category** list, click **All**. 3
> Click **IF**, 4 and then click **OK**. 5
> In the **Function Arguments** window, type "**F2>$F$8**" in the **Logical_test** text box. 6
> In the **Value_if_true** text box, type "**Above Average**". 7
> In the **Value_if_false** text box, type "**Below Average**". 8
> Click **OK**. 9
> Use the **Auto Fill** feature to copy the function. 10



	A	B	C	D	E	F	G	H
1		Sales	Cost per item	Value	Discount	Total value	Conclusion	
2	Product 1	125	25	3125	312.5	2812.5		
3	Product 2	156	85	13260	1326	11934		
4	Product 3	25	62	1550	155	1395		
5	Product 4	154	56	8624	862.4	7761.6		
6	Product 5	255	25	6375	637.5	5737.5		
7								
8	Discount	10%			Average	5928.12		
9								
10								
11								
12								
13								
14								
15								
16								
17								







	A	B	C	D	E	F	G	H	I
1		Sales	Cost per item	Value	Discount	Total value	Conclusion		
2	Product 1	125	25	3125	312.5	2812.5	Below Average		
3	Product 2	156	85	13260	1326	11934	Above Average		
4	Product 3	25	62	1550	155	1395	Below Average		
5	Product 4	154	56	8624	862.4	7761.6	Above Average		
6	Product 5	255	25	6375	637.5	5737.5	Below Average		
7									
8	Discount	10%			Average	5928.12			
9									

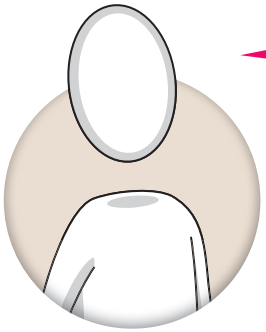
Common error messages

If you happen to make a mistake when typing a formula, you will receive an error message on the worksheet.

	A	B	C	D	E	F	G	H	I
1		Sales	Cost per item	Value	Discount	Total Value	Conclusion		
2	Product 1	125	25	3125	312.5	2812.5	Below Average		
3	Product 2	156	85	####	1326	11934	Above Average		
4	Product 3	25	62	1550	155	1395	Below Average		
5	Product 4	154	56	8624	862.4	7761.6	Above Average		
6	Product 5	255	25	6375	637.5	5737.5	Below Average		
7									
8	Discount	10%			Average	5928.12			
9									
10	Sum	#VALUE!							
11									

You can correct the mistake by clicking the button that is located next to the cell that displays the message and choosing Edit in Formula Bar.

Most common error messages	
Error code	Error explanation
######	You will get this error message when a column with numerical data is not wide enough to display all of its content. You can correct it by increasing the width of the column to fit everything correctly.
#DIV/0!	You will get this error message when you divide something by 0. You can correct it by changing the divisor in the function or formula so it is not 0 or blank.
#NAME?	You will get this error message when you have typed an incorrect formula, and Microsoft Excel cannot recognize it. You can correct it by typing the formula's correct name.
#VALUE!	You will get this error message when a mathematical formula includes cells that contain text as well as numbers. You can correct it by removing references to cells containing text. In the example above, cell B10 displays this error.



Change the discount in cell B8 to 20, and notice the changes in your data. What changes have been made to your data? Did references help you with that?

Hands on!

1. Read the following sentences and put a check mark for True or False

	True	False
1. A cell reference is the "address" of the cell and identifies its location.		
2. When using a relative reference, the formula changes automatically based on the position of rows and columns.		
3. The error message #DIV/0! occurs when dividing by zero.		
4. The #NAME? error is displayed if you use a formula name incorrectly in Excel.		
5. Absolute references change when copied to other cells.		
6. When you use the dollar sign in front of a letter and in front of a number (e.g., $E$1) the row and the column remain the same.		

2. Read the questions and put a check mark for the correct answer.

1. Which symbol is used to create an absolute reference in Excel?
   - a. %
   - b. #
   - c. $
   - d. !

2. Which error indicates a cell is too narrow to display all its contents?

   a. #DIV/0!

   b. ######

   c. #NAME?

   d. #VALUE!

3. Which error occurs when a column with numerical data is not wide enough to display all of its content?

   a. #VALUE!

   b. #NAME?

   c. #DIV/0!

   d. ######

4. If you want a column to remain constant, where should you place the $ sign?

   a. Before the column letter

   b. Before the row number

   c. Both before the column letter and row number

   d. Between the letter and the number of the cell's name

5. Which of these functions would create an absolute reference for cell D1?

   a. $D$1

   b. D1$

   c. D1

   d. D1_$

6. Which error is displayed when a mathematical formula includes cells that contain text as well as numbers?

   a. #NAME?

   b. #VALUE!

   c. ######

   d. #DIV/0!

3. How can you apply tax across multiple items? Would it be more helpful to do that using absolute references? Describe what could go wrong when using an absolute reference.

4. Create the following table and fill in the cells with the appropriate function. In cells I4:I10, remember to use a function with an absolute reference.

	A	B	C	D	E	F	G	H	I
1						Ticket	$ 7.00		
2	City Cinema								
3	Movies	January	February	March	April	May	Total Viewers	Average Viewers	Income
4	Adventure	36524	15420	52000	82541	21115			
5	Comedy	45858	36452	42000	45452	20365			
6	Action	36458	52645	12520	15234	35122			
7	Animation	31092	15345	42510	25100	15334			
8	Science Fiction	26734	56353	15200	24542	15454			
9	Mystery	15856	41312	16000	35244	85600			
10	Drama	15455	15205	15552	15243	15485			

5. Create the table below and use formulas to fill in the cells. In column G, add the sales from January to May for each person using a relative reference. In column H, calculate the bonus for each person. The bonus is 10% of their total sales. Use an absolute reference for the 10%, which is in cell B10.

	A	B	C	D	E	F	G	H
1	Monthly sales							
2	Name	January	February	March	April	May	Total sales	Bonus
3	Alex	2000	5000	1600	2200	1400		
4	Lisa	1500	4200	800	1800	3200		
5	Marco	900	4600	4300	850	1900		
6	Stella	1800	2700	2100	3100	700		
7								
8								
9								
10	Bonus	10%						

LESSON 5

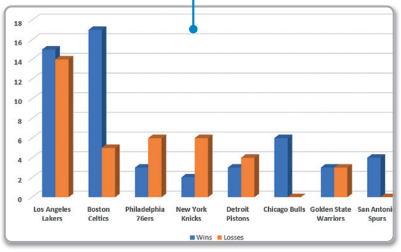
Advanced charts

In which cases could a visual representation of your data give you a more accurate analysis?

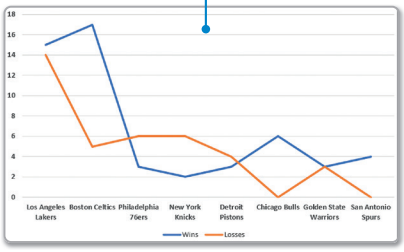
Chart types

To make data presentations more engaging and informative, charts can be used. There are various types of charts to choose from, but it is important to select the most effective one for the specific purpose. Choosing the wrong chart could lead to confusion or misinterpretation of the data.

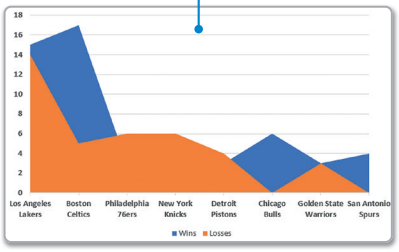
The **Column or Bar Chart** is used to illustrate comparisons between a series of data. In a column chart, categories are horizontal (X-axis) and numeric values are vertical (Y-axis). The opposite happens in a bar chart, which is one of the most commonly used chart types.



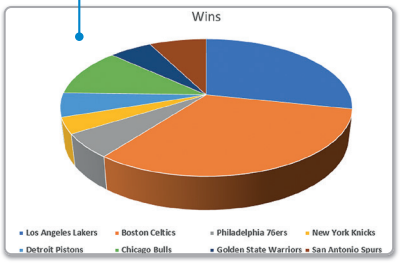
The **Line Chart** is used to display trends. It presents the changes in data over a period of time. Numeric values are always vertical (Y-axis) and time horizontal (X-axis). It is suitable for presenting data for a large number of groups.



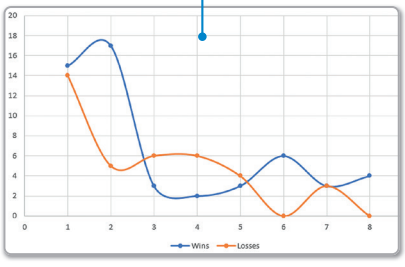
The **Area Chart** is like a Line Chart, except the area below the plotted line is filled in with color. It is used to display trends over time or some other category, and it is suitable for presenting data for a limited number of groups.



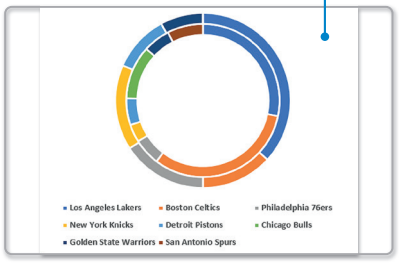
The **Pie Chart** is used to display only one series of data. It presents the relationship of the parts to the whole. It is suitable for presenting data for one group.



The **Scatter Chart** is used to display the values of two series and compare them over time. It is like a Line Chart, except the plotted line presents data points. It is suitable for presenting the relationship between two variables.



The **Doughnut Chart** is used to display data as doughnut slices and is similar to the Pie Chart.



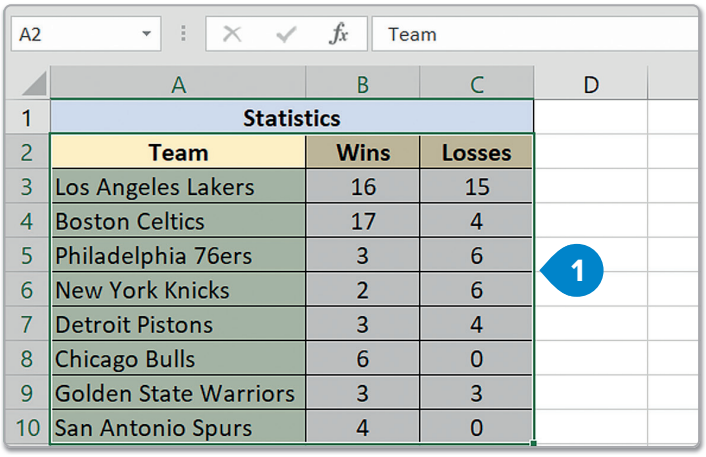
To add a chart:

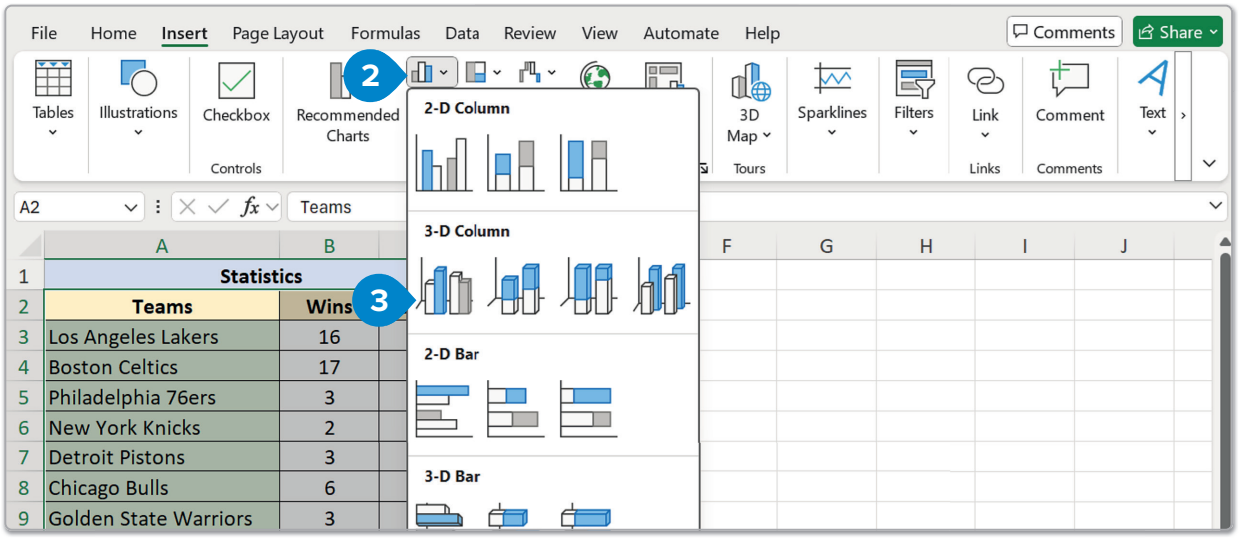
> Create this table and select cells **A2** to **C10**. 1

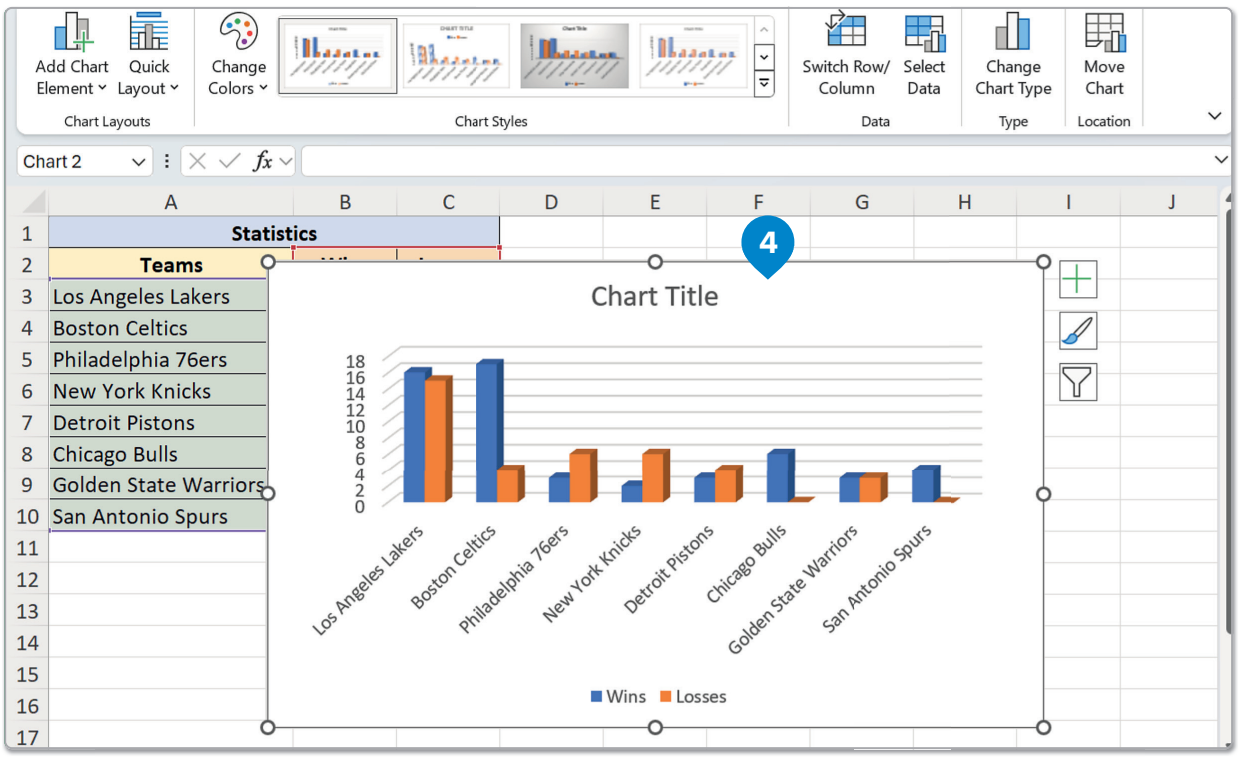
> On the **Insert** tab, in the **Charts** group, click **Insert Column or Bar Chart**. 2

> In the list of column chart sub-types, click the one you like. 3

> The chart will be added to your worksheet. 4

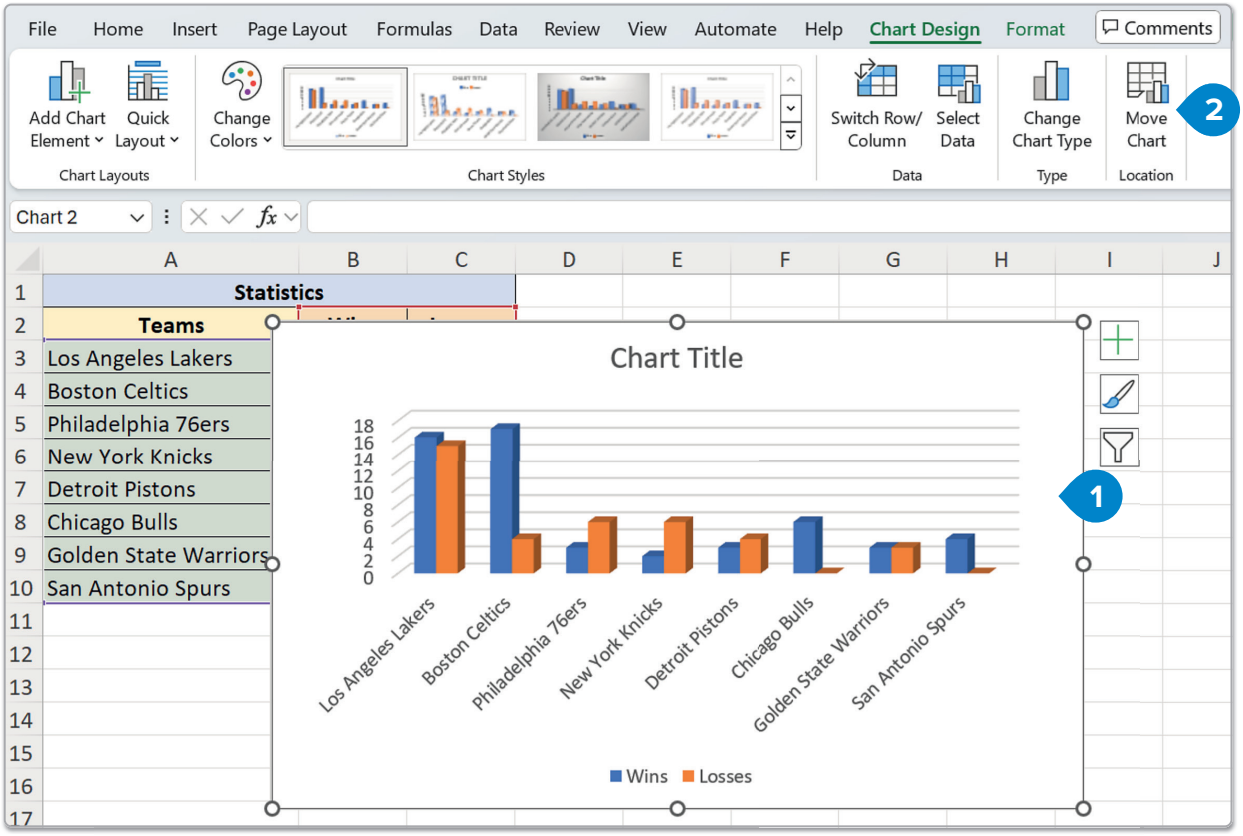


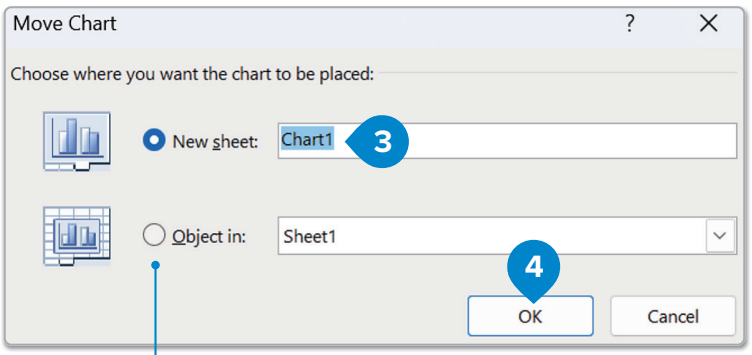




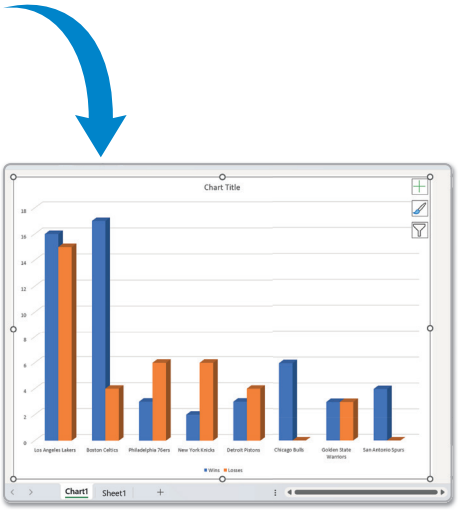
To move the chart:

> Click on the chart. 1
> On the **Chart Design** tab, in the **Location** group, click **Move Chart**. 2
> On the **Move Chart** window, select **New sheet** to move your chart to a new worksheet. 3
> Click **OK**. 4





Use **Object in** to move your chart to an existing worksheet.



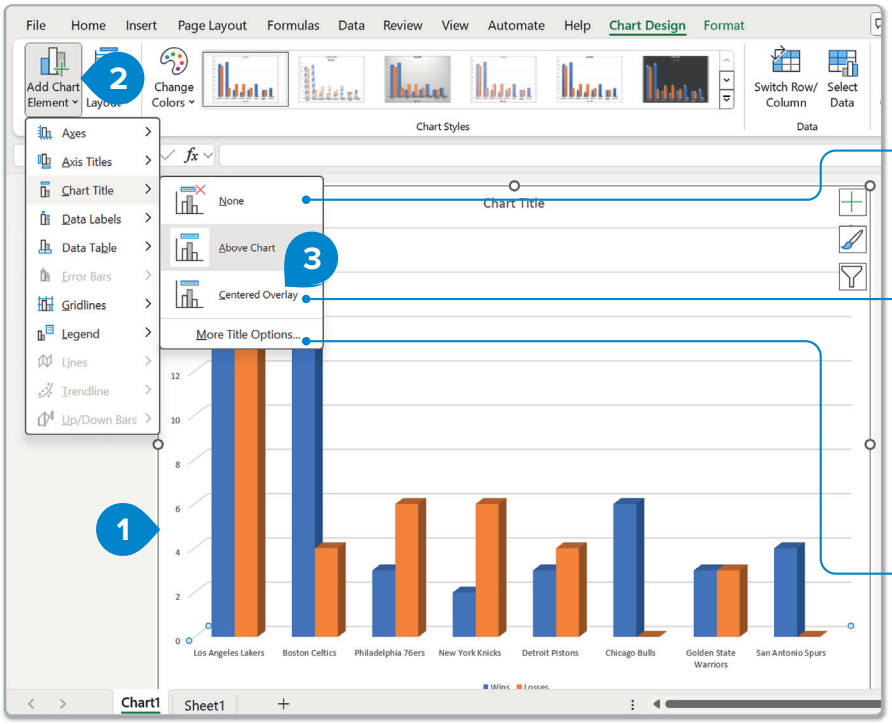
You can choose to have your chart on a new sheet. In that case, your chart will take up the whole spreadsheet.

Modifying a chart

After you create a chart, you can modify it. For instance, you may want to change its titles or its type.

To change the title:

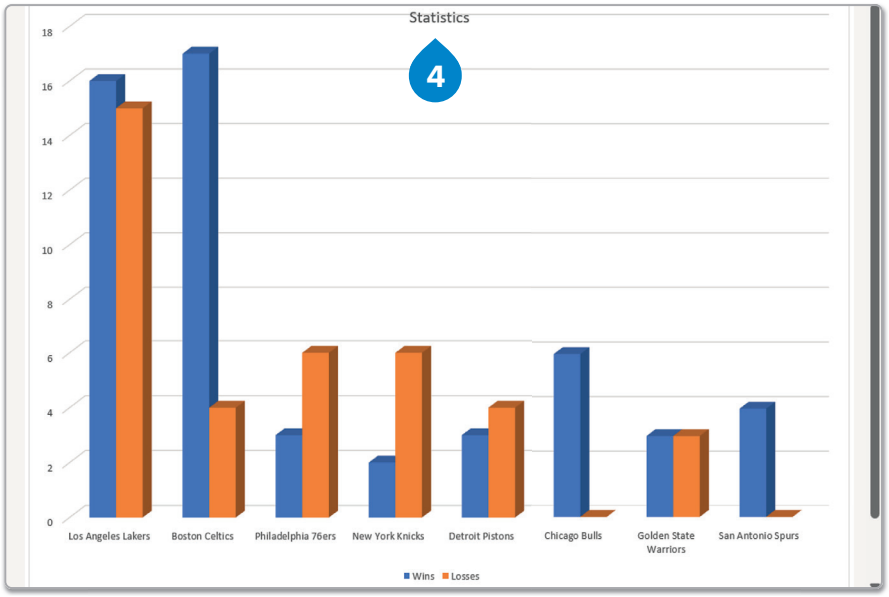
> Click on the chart. 1
> On the **Chart Design** tab, in the **Chart Layouts** group, click **Add Chart Element**. 2
> Click **Chart Title** and then click **Centered Overlay**. 3
> Double-click on the chart title, delete the text, and type "**Statistics**". 4
> Click anywhere outside the chart title.



Use **None** if you don't want a title.

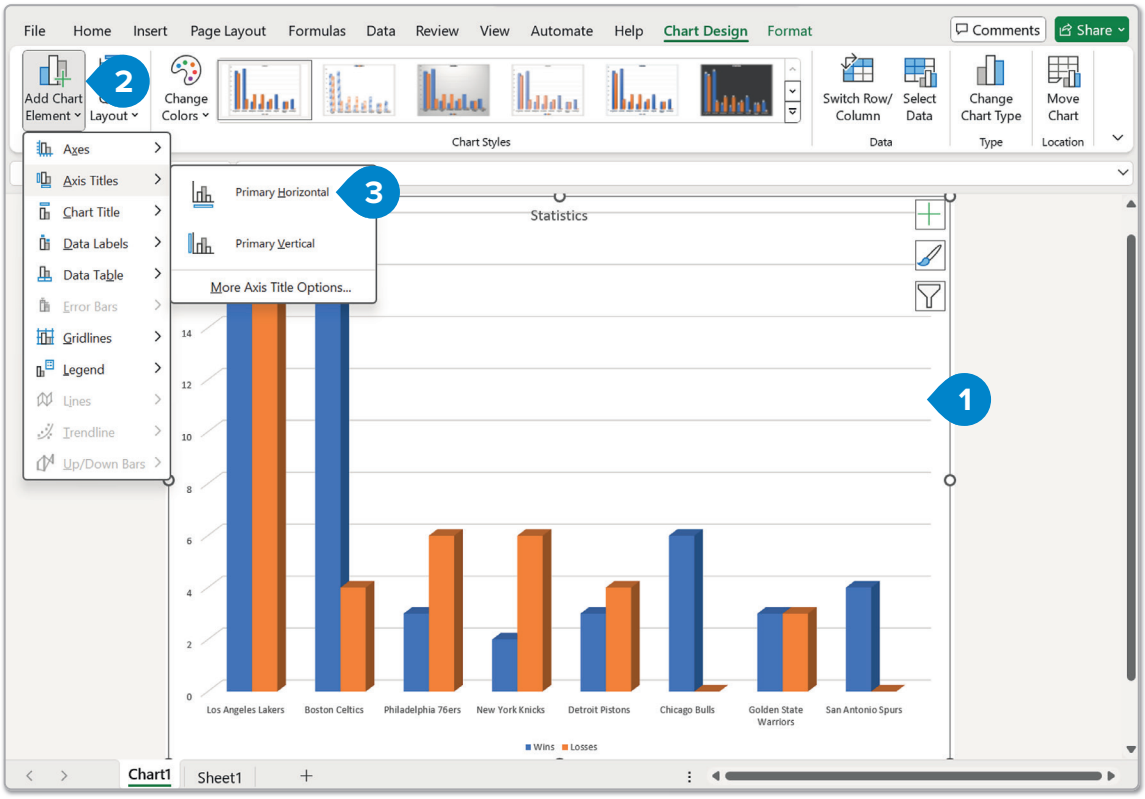
Use **Centered Overlay** when you want to center the title over the chart, but don't want to change the size of the chart.

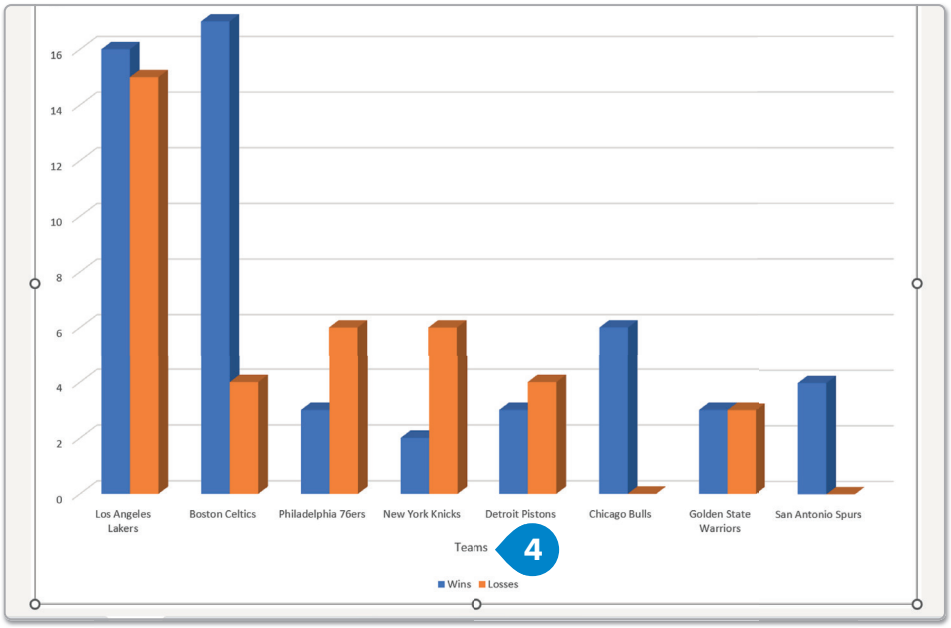
Use **More Title Options** when you want more options about filling, line style, etc.



To change the format of an axis:

> Click on the chart. 1
> On the **Chart Design** tab, in the **Chart Layouts** group, click **Add Chart Element**. 2
> In the **Axis Titles** pop-out menu, click **Primary Horizontal**. 3
> Double-click on the horizontal axis title, delete the text, and type "**Teams**". 4
> Click anywhere outside the horizontal axis title.





Coloring a chart

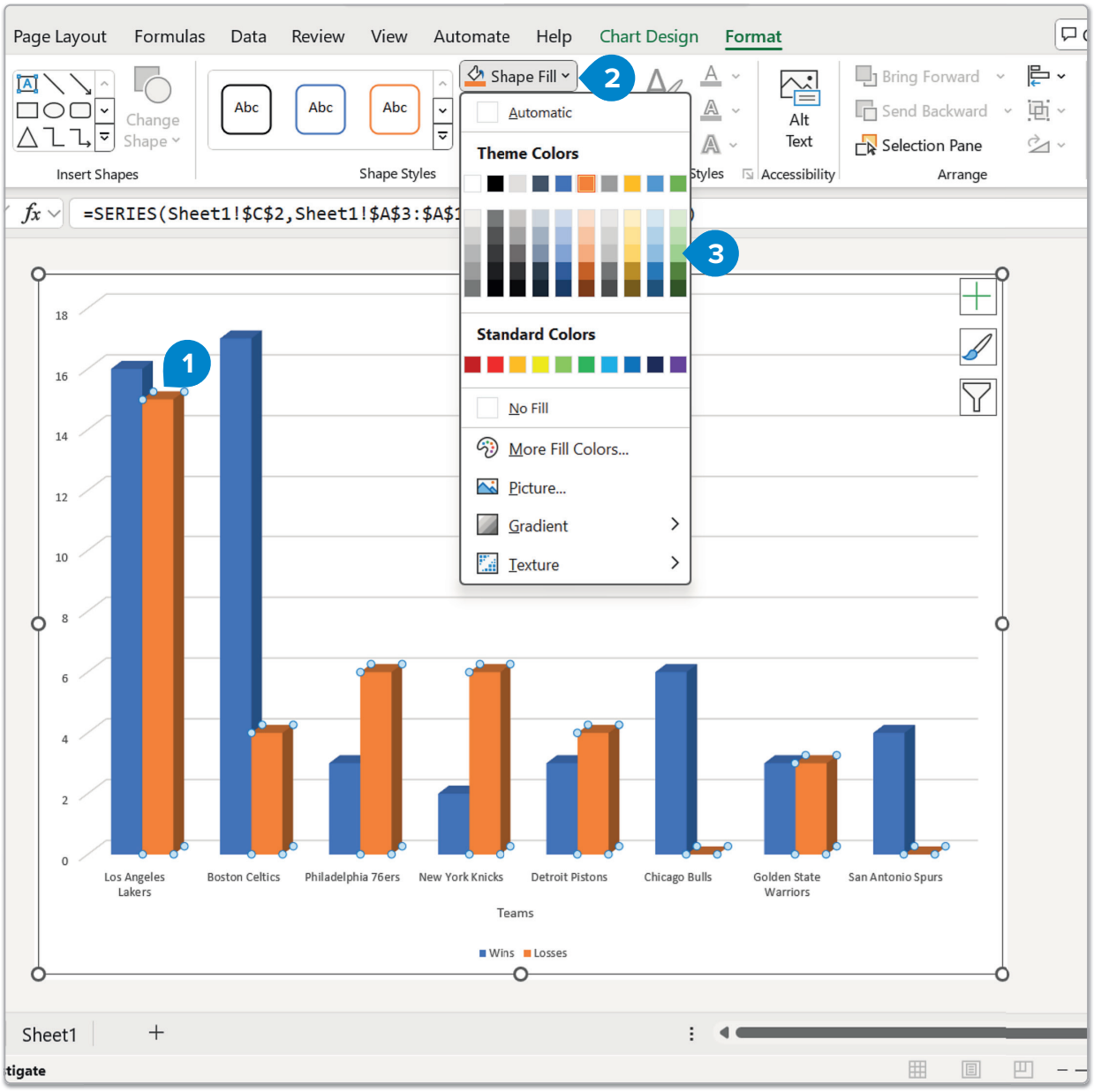
You can make your charts more attractive in Excel by changing the colors and fills of different chart parts. You can use regular colors, apply textures, or even fill shapes with pictures. This helps make your data clearer and easier to understand.

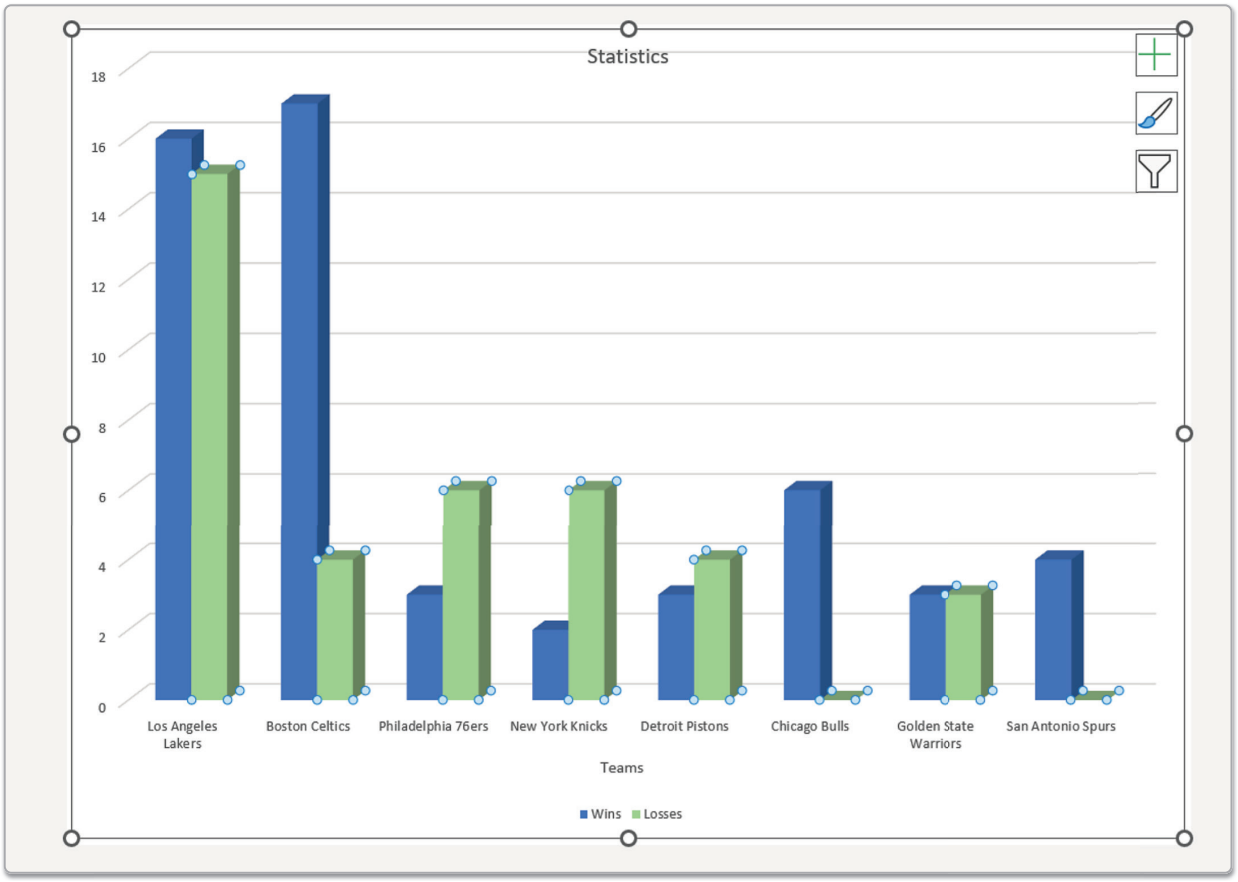
To change the Shape Fill of the chart:

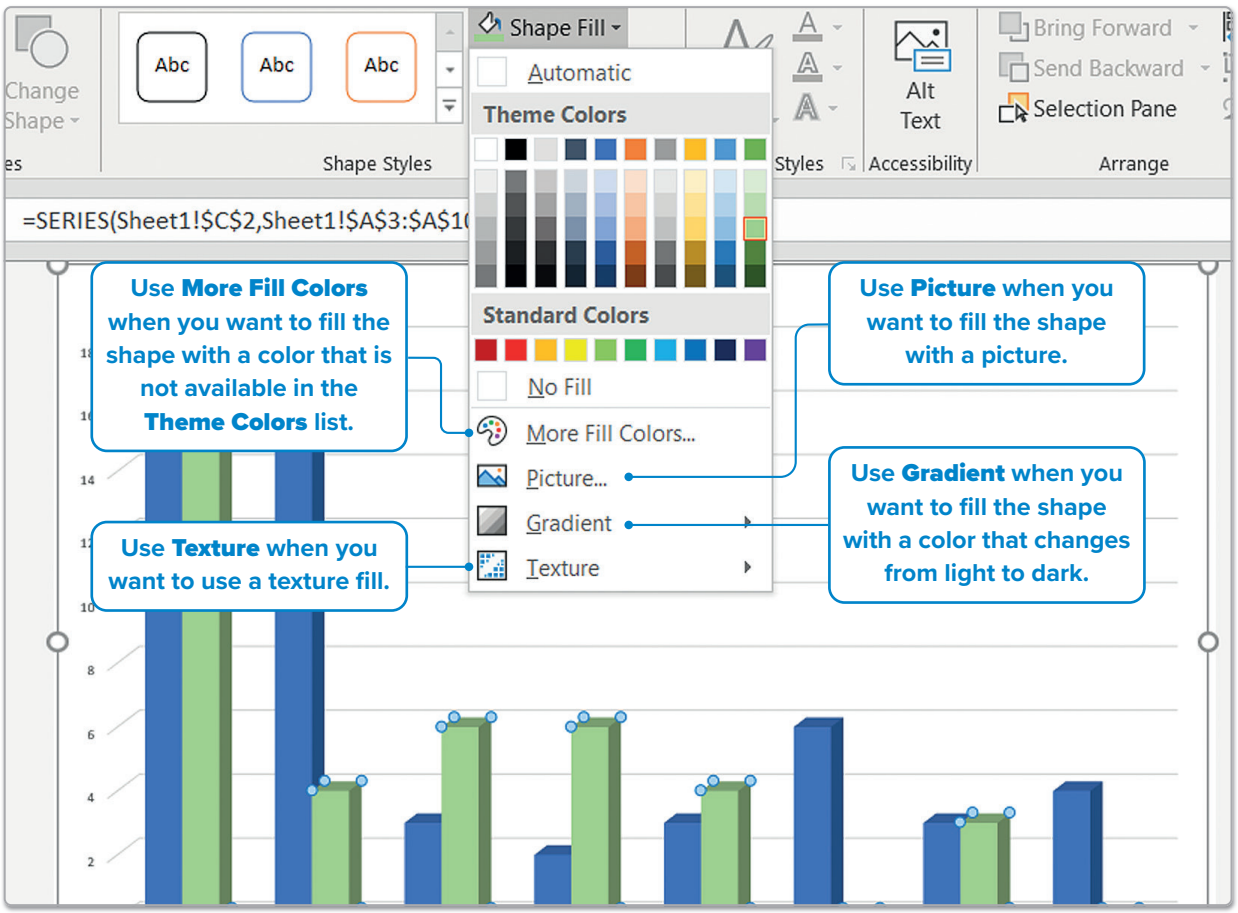
> Click on the bars you want to make changes to, e.g., those that represent the losses. 1

> On the **Format** tab, in the **Shape Styles** group, click **Shape Fill**. 2

> Click on a color of your choice. 3







Mini charts (Sparklines)

At times, a simple graphical representation of data within a table is needed. This can be achieved with mini charts. **Mini charts** (sparklines) are small versions of regular charts, placed next to the data for clear visualization.

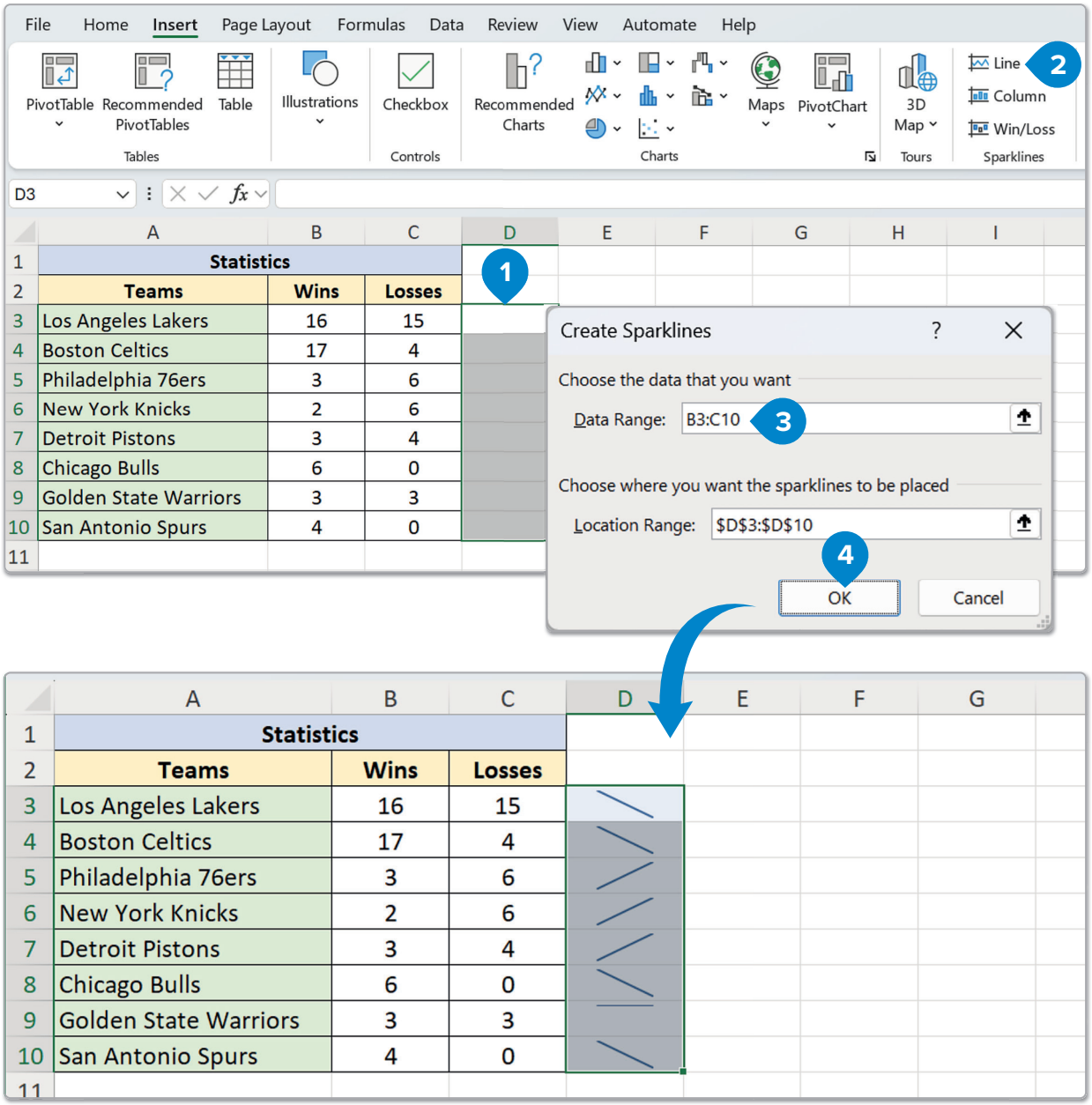
To add a mini chart:

> Select the cells where you want your mini chart to be displayed, e.g., select cells **D3** to **D10**. 1

> On the **Insert** tab, in the **Sparklines** group, click **Line**. 2

> In the **Create Sparklines** window, in the **Data Range** box, type "**B3:C10**". 3 These cells contain the data you want to represent in a mini chart.

> Click **OK**. 4

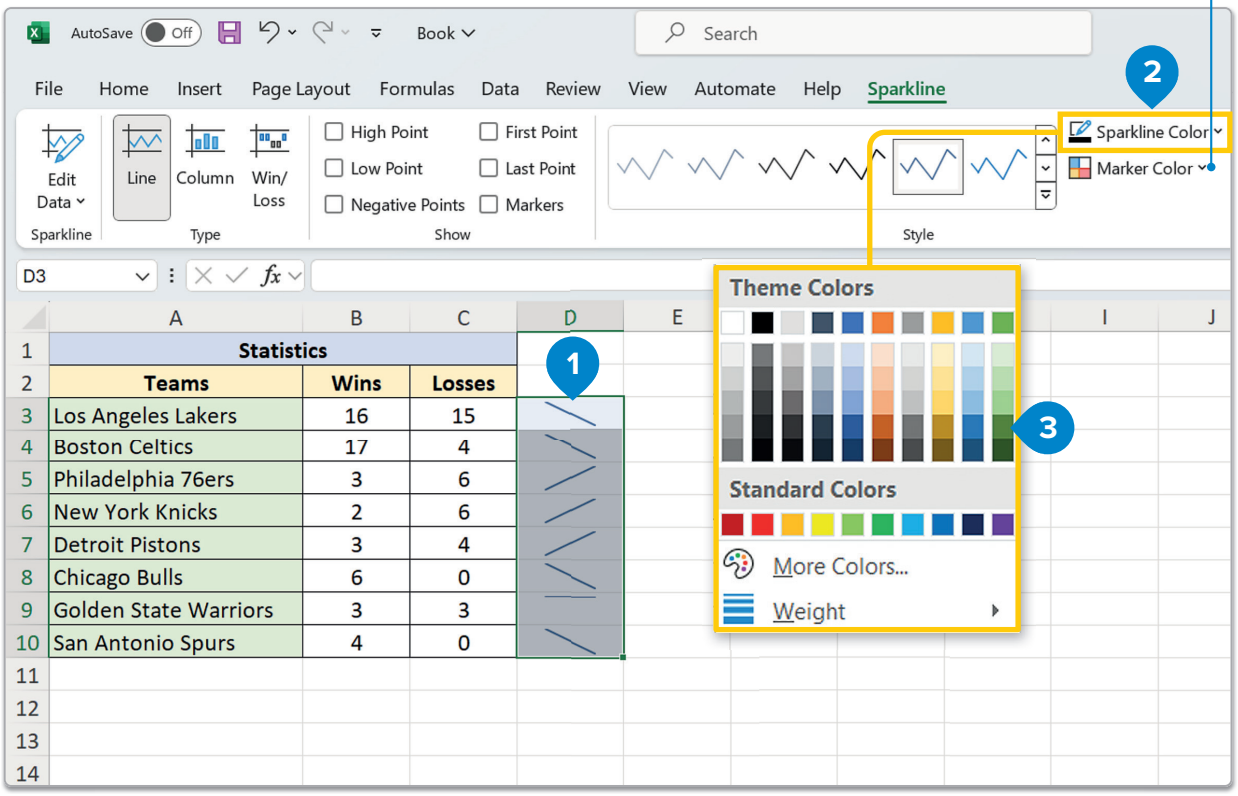


To modify a mini chart:

> Select from cell **D3** to cell **D10**, where the mini chart is. 1

> On the **Sparkline** tab, in the **Style** group, click **Sparkline Color** 2 and click on a color of your choice. 3

You can also click **Marker Color** to color your markers.



	A	B	C	D	E	I	J
1	Statistics						
2	Teams	Wins	Losses				
3	Los Angeles Lakers	16	15				
4	Boston Celtics	17	4				
5	Philadelphia 76ers	3	6				
6	New York Knicks	2	6				
7	Detroit Pistons	3	4				
8	Chicago Bulls	6	0				
9	Golden State Warriors	3	3				
10	San Antonio Spurs	4	0				
11							
12							
13							
14							

	A	B	C
1	Statistics		
2	Teams	Wins	Losses
3	Los Angeles Lakers	16	15
4	Boston Celtics	17	4
5	Philadelphia 76ers	3	6
6	New York Knicks	2	6
7	Detroit Pistons	3	4
8	Chicago Bulls	6	0
9	Golden State Warriors	3	3
10	San Antonio Spurs	4	0
11			
12			

The sparklines in column D depict the performance trends for each team by showing their wins and losses in a compact line graph.

Smart Tip

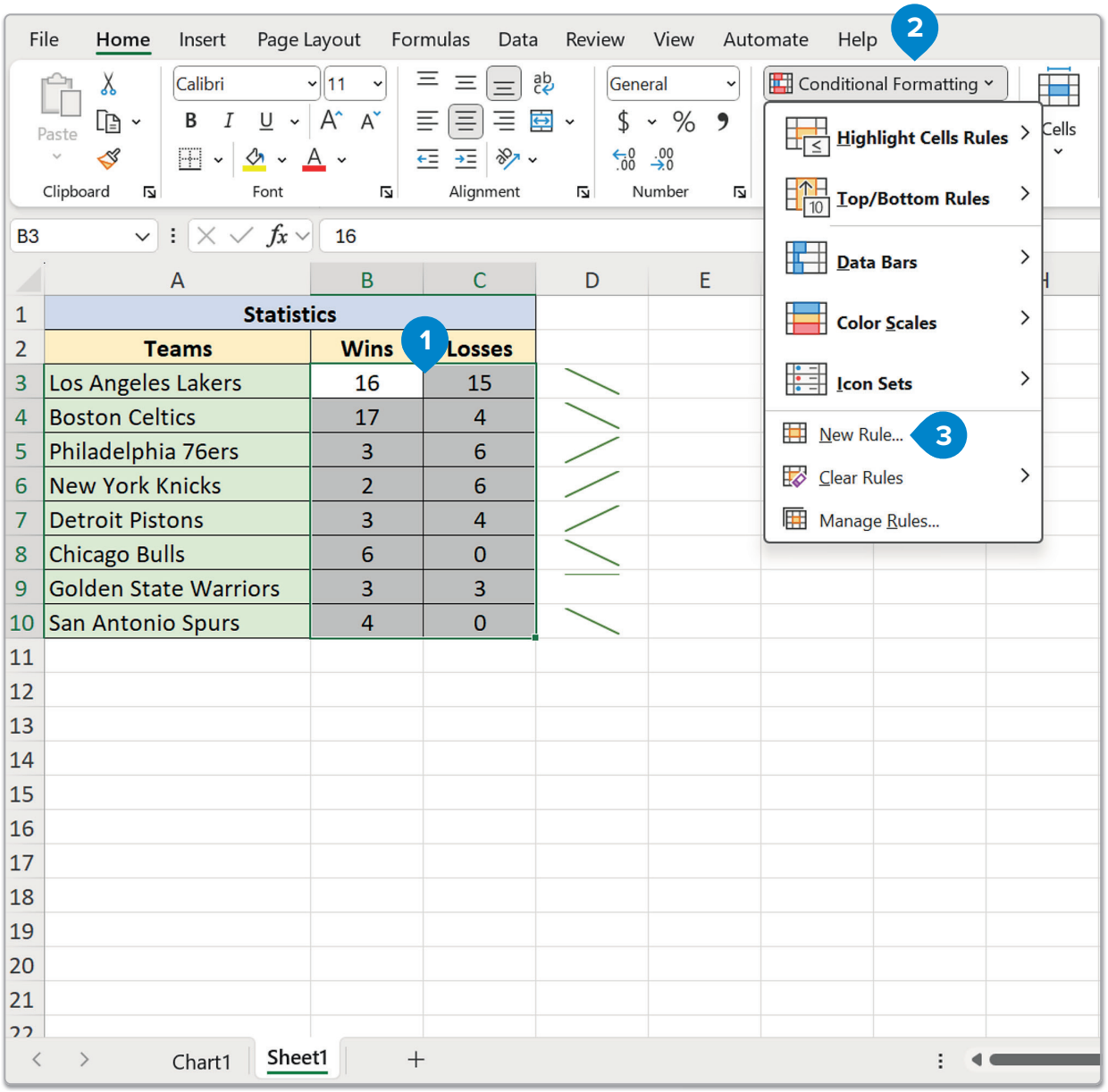
Mini charts are created in small spaces, so be careful not to use unnecessary formatting.

Conditional formatting

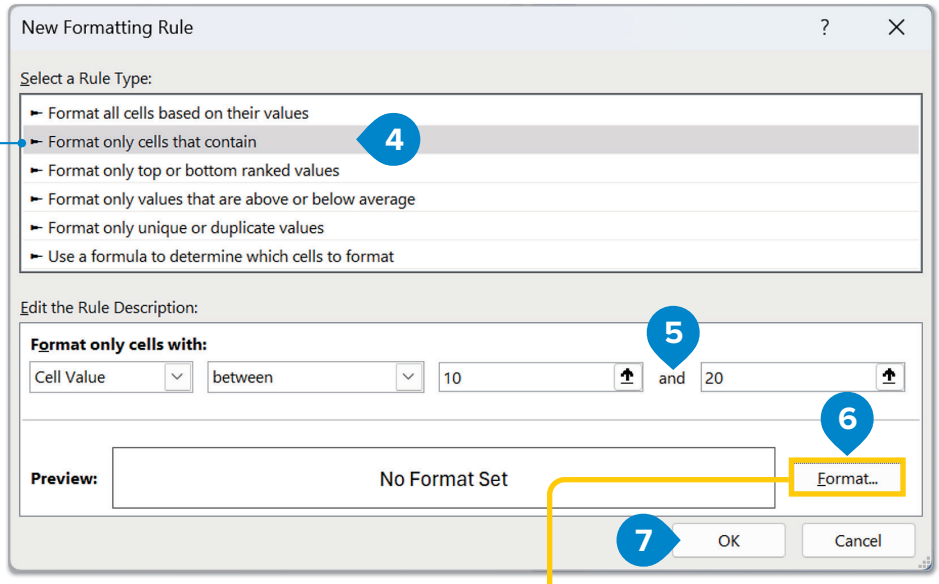
Conditional formatting allows you to change the layout of cells based on their content. By specifying certain conditions, the cell's formatting will automatically adjust to meet those conditions.

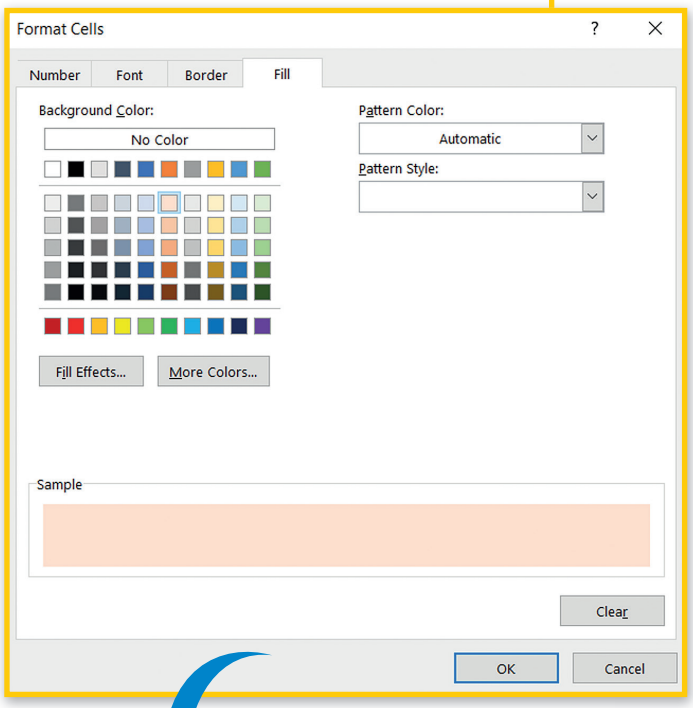
To apply Conditional Formatting:

> Select the cells where you want to apply conditional formatting, e.g., **B3** to **C10**. 1
> On the **Home** tab, in the **Styles** group, click **Conditional Formatting**. 2
> Click **New Rule**. 3
> You can select the criteria you want to use, e.g., click **Format only cells that contain**. 4
> Type "**10**" and "**20**". 5
> Click the **Format** button 6 and format the cells accordingly.
> Click **OK**. 7



Use **Format only cells that contain** to create rules and format your cells based on these.





	A	B	C	D
1	**Statistics**			
2	**Team**	**Wins**	**Losses**	
3	Los Angeles Lakers	16	15	
4	Boston Celtics	17	4	
5	Philadelphia 76ers	3	6	
6	New York Knicks	2	6	
7	Detroit Pistons	3	4	
8	Chicago Bulls	6	0	
9	Golden State Warriors	3	3	
10	San Antonio Spurs	4	0	
11				
12				

If a value is between 10 and 20, the cell color is filled with an orange color.

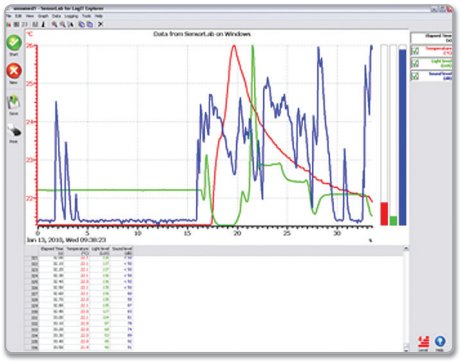
Lab data collection

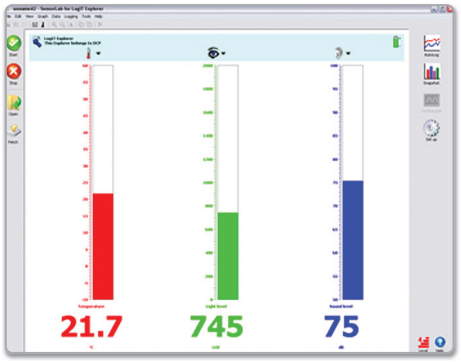
In a science lab, you can perform many different experiments. Some of these experiments involve taking measurements. Data loggers are specifically designed for this purpose. They are devices with sensors that help you measure and record data, such as light, sound, and temperature measurements.

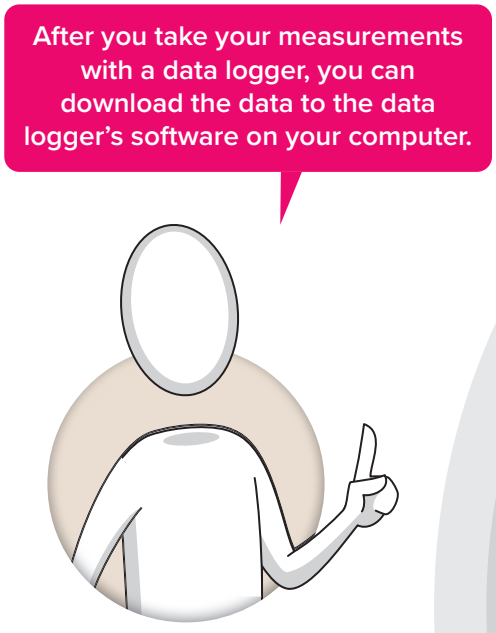
A data logger can take repeated measurements and then transfer the data to your computer for analysis. Just connect the data logger to the USB port of the computer and download the recorded data.

Displaying data as charts

With a data logger, you can capture and display real-time data continuously or at regular intervals over long periods of time. One kind of data logger is a weather station, which records everything about the current weather conditions. Scientists can then use this data to predict changes in the weather. Using data logging software, you can display the data as a chart.







What can you do with a data logger?

1. Accurately measure sound and light as well as **temperature**.
2. Take measurements that are too slow or too fast to record by traditional means.
3. Collect data anywhere and then download the data to a computer for analysis.
4. Get visual representation of your measurements such as charts or graphs.

Experiment

Use a data logger to take measurements of temperature, light level, and sound level in different parts of your school.

After analyzing this data, you will be able to answer questions like:

- Which is the hottest place in school?
- Which is the noisiest place in school?
- Which is the darkest place in school?

Let's import our data to Microsoft Excel in order to analyze it and answer our questions.

To import your data:

> Using the data logger software, you should be able to display your data as a table by clicking the **Display Table** button. 1

> Select the values displayed in the table and copy them.

> Open Microsoft Excel and paste your data in a new worksheet. 2

Item Number	Reading	Temperature °C
1	1	32.0
2	2	29.9
3	3	29.3
4	4	32.3
5	5	32.8
6	6	31.0
7	7	30.2

1

	A	B	C	D	E
1	Reading	Temperature (Celsius)	Light Level (Lux)	Sound Level (dB)	
2	1	32.00	423	49	
3	2	23.90	2568	47	
4	3	29.30	789	56	
5	4	32.30	8325	47	
6	5	32.80	22364	64	
7	6	31.00	365	46	
8	7	30.20	525	58	

2

To find the hottest place, e.g., you can sort your table by Temperature and check where the highest temperature was recorded.

	A	B	C	D
1	Reading	Temperature (Celcius)	Light Level (Lux)	Sound Level (dB)
2	5	32.80	22364	64
3	4	32.30	8325	47
4	1	32.00	423	49
5	6	31.00	365	46
6	7	30.20	525	58
7	3	29.30	789	56
8	2	23.90	2568	47

Hands on!

1. Read the following sentences and put a check mark for True or False.

	True	False
1. You can move a chart as an object only to an existing worksheet.		
2. You can fill the shape in a chart with a picture.		
3. To add a "Mini" chart next to a data table, you have to determine the data range and the location range.		
4. When you change the title of a chart, the centered overlay operation changes the size of the title.		
5. When you apply "Conditional formatting," you can create rule types that apply only to values in a certain range.		
6. The "Pie" chart displays the changes in data over a period of time.		
7. Data loggers are used to record only sound and temperature measurements.		
8. By using a data logger, you can get visual representation of your measurements.		

2. Complete with the missing words.

sensors **chart** **trends** **"Add Chart Element"**
repeated **"Centered Overlay"**

1. A Line Chart is used to display _____ over a period of time.

2. To change the title of a chart, click on the chart, go to the "Chart Design" tab, and click _____.

3. Use _____ when you want to center the title over the chart, but don't want to change the size.

4. A data logger can take _____ measurements and then transfer the data to your computer for analysis.

5. Data loggers are devices that use _____ to measure and record data, such as light and temperature.

6. Scientists can use data logger software to display data as a _____ for analysis.

3. **Imagine you are tracking the sales of different types of snacks over time, and you want to compare the changes in sales for each snack. Which chart type would you choose, and why? Explain how using the wrong chart type could confuse or create misleading data.**

4. **Create the following table. Add a pie chart and a column chart. Change the fill colors and the names of the axes in the chart.**

	A	B	C	D
1	Pollutant	Emissions in 2020 (ktonnes)	Emissions ceiling target in 2030 (ktonnes)	
2	NOx	1486	1167	
3	SO_2	591	585	
4	NMVOCs	942	12	
5	NH_3	289	297	
6				

Project

Organizing and analyzing product inventory

Set up a database to organize a list of products, including product names, categories, prices, stock levels, and supplier names.

Open a new spreadsheet and complete the following tasks:

1. Data setup

- Set up columns for Product Name, Category, Price, Stock Level, and Supplier.
- Create your own data for at least 10 products of your choice. Include the category (e.g., electronics, groceries), price, stock level, and supplier. Use the screenshot provided as a reference example.

2. Data organization

- Format the data as a table. Next, sort the table by price to display products from the cheapest to the most expensive.
- Apply a filter to display only products within a specific category, such as electronics.

3. Using functions

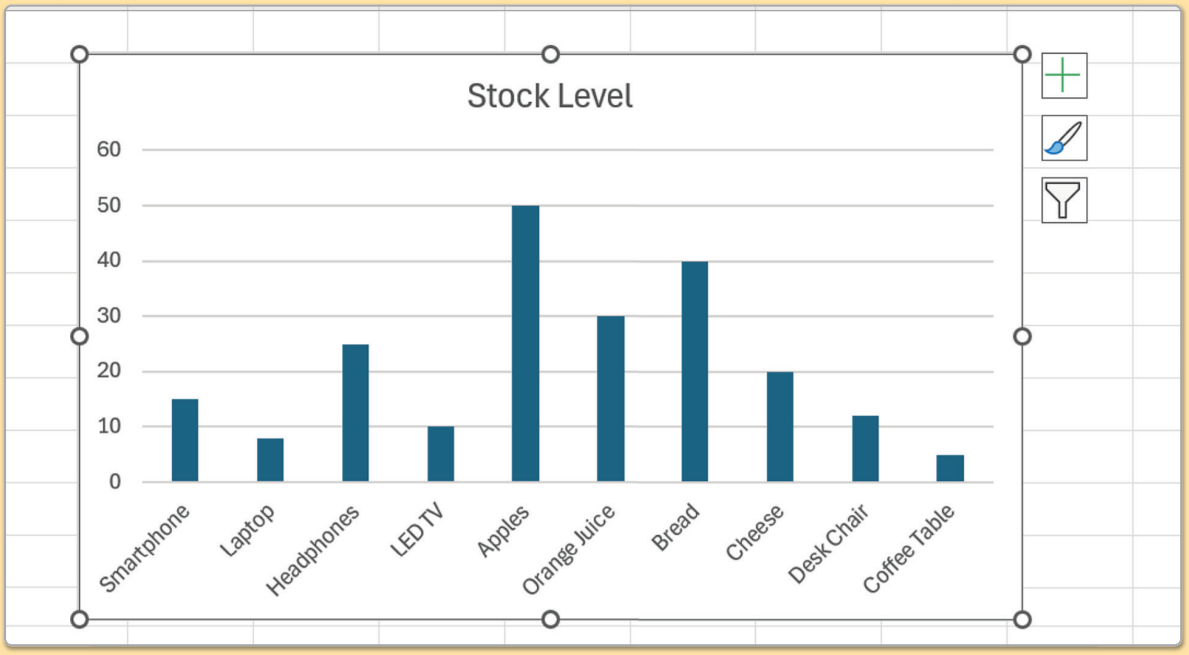
- Use the LEFT function to extract the first three letters of each product name.

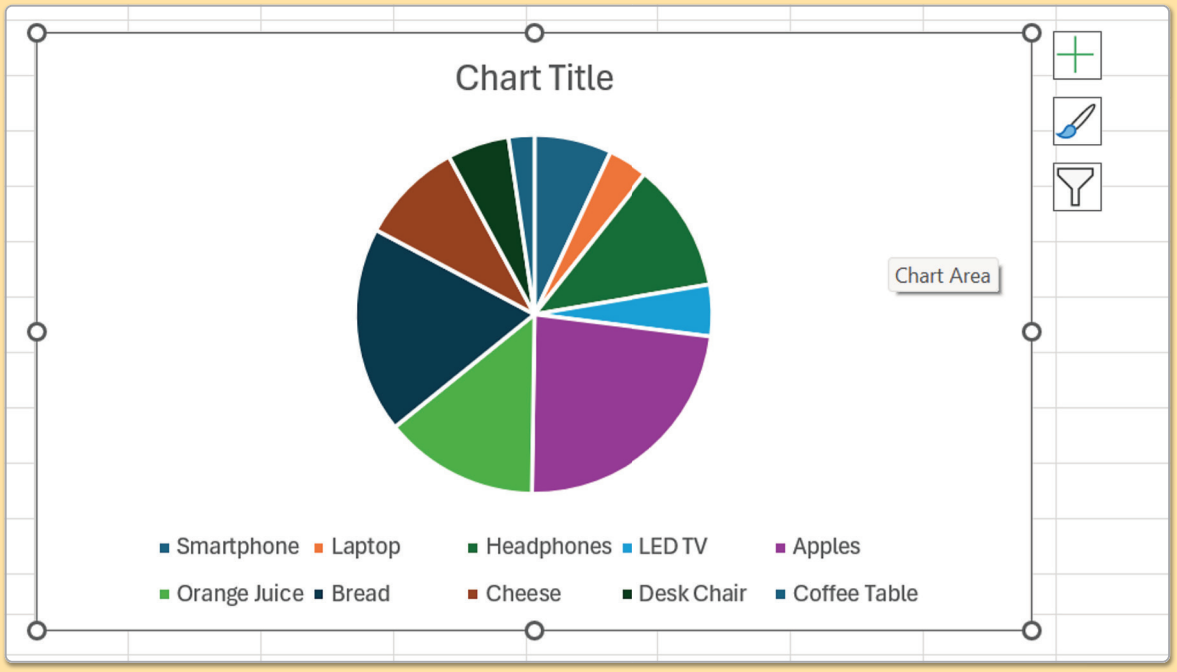
	A	B	C	D	E	F
1	Product Name	Category	Price	Stock Level	Supplier	
2	Smartphone	Electronics	699	15	TechWorld	
3	Laptop	Electronics	1200	8	Byte Supplies	
4	Headphones	Electronics	150	25	SoundGear Ltd	
5	LED TV	Electronics	450	10	Vision Electronics	
6	Apples	Groceries	3	50	FreshFarms Co	
7	Orange Juice	Groceries	5	30	HealthySips	
8	Bread	Groceries	2	40	Baker's Delight	
9	Cheese	Groceries	4	20	DairyBest	
10	Desk Chair	Furniture	85	12	Comfort Office	
11	Coffee Table	Furniture	120	5	HomeCraft Supplies	

- Use the MID function to extract the middle part of each supplier's name.
- Use the RIGHT function to extract the last two letters of each product category.
- Use the SUBSTITUTE function to replace a word in the Category column (e.g., replace "Groceries" with "Food").

4. Advanced calculations

- Create a formula to calculate a 10% tax on each product's price using the appropriate references.
- Find the percentage of each product's stock level according to the total stock level.
- Create a column chart to display the stock levels of different products and a pie chart to display the percentages of products' stock levels.





Reflect

1. Which Excel feature did you find the most challenging to use, and how did you manage to use it efficiently?

2. How did using filters and sorting help you quickly locate information within your database?

3. How did creating charts help you recognize patterns or trends in your data that might not have been obvious from examining the numbers alone?

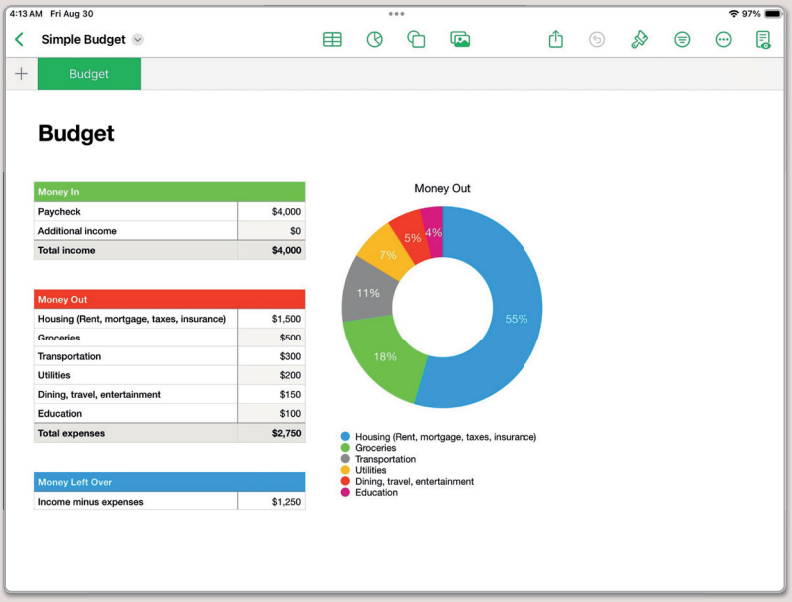
4. Reflecting on the project as a whole, how has learning to use Excel changed the way you think about managing information and making decisions based on data?

Discover more

Apple Numbers for iPad OS

Apple Numbers will help you create your own tables and charts on an iPhone or iPad. The interface is similar to Microsoft Excel.

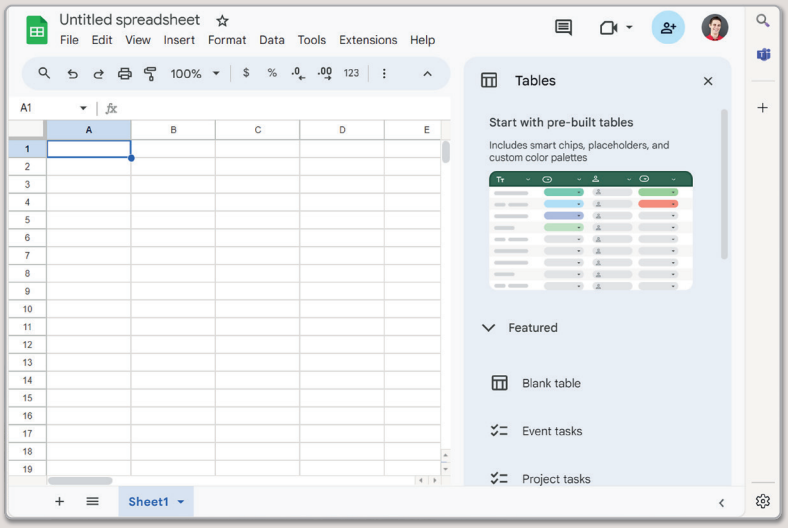
One difference you may notice is that the spreadsheet tabs are at the top of the window.



Google Sheets

You can have a spreadsheet program in any platform. If you have a Google Android device, you can use Google Sheets.

Tap the menu and insert all the known functions or new rows and columns.

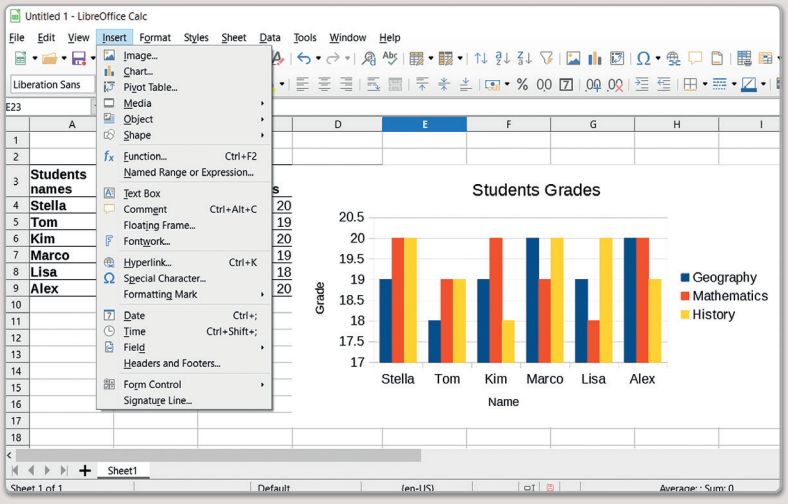


LibreOffice Calc

LibreOffice Calc is a free spreadsheet program that you can download from the Internet.

It has all the tools that you've learned in this module. Create charts, use formulas, and play with numbers.

Edit your tables and print them to present your data.



Wrap up

Take a moment to reflect on your progress.

How confident are you in your ability to apply the following skills?

> I can differentiate between data and information.

> I can create a simple database to organize information.

> I can apply filters to show only specific data in a database.

> I can sort data, including using multiple sorting levels, to organize it in a helpful order.

> I can import and export data as CSV files.

> I can convert data into percentages, apply formatting, and calculate powers using Excel functions.

> I can extract parts of strings using LEFT, RIGHT, and MID functions and replace text with SUBSTITUTE.

> I can use relative and absolute references appropriately in formulas.

> I can identify the different types of charts and know when to use each one.

> I can create a chart in Excel and add titles, labels, and colors to make it clear to understand.

> I can add sparklines to a worksheet to show data trends in a compact way.

Key Terms

absolute reference
area chart
bar chart
column chart
conditional formatting
CSV
database
doughnut chart
error message
export
formula
gradient
import
LEFT
line chart
MID
mini chart
percentage
pie chart
POWER
relative reference
RIGHT
scatter chart
sparkline
SUBSTITUTE