



MOS 2016 Study Guide

Joan Lambert



EXAM 77-727

**Microsoft
Excel**

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MOS 2016 Study Guide for Microsoft Excel

Joan E. Lambert



Microsoft Office Specialist
Exam 77-727

MOS 2016 Study Guide for Microsoft Excel

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Introduction

The Microsoft Office Specialist (MOS) certification program has been designed to validate your knowledge of and ability to use programs in the Microsoft Office 2016 suite of programs. This book has been designed to guide you in studying the types of tasks you are likely to be required to demonstrate in Exam 77-727: Microsoft Excel 2016.

See Also For information about the tasks you are likely to be required to demonstrate in Exam 77-728: Microsoft Excel 2016 Expert, see *MOS 2016 Study Guide for Microsoft Excel Expert* by Paul McFedries (Microsoft Press, 2017).

Who this book is for

MOS 2016 Study Guide for Microsoft Excel is designed for experienced computer users seeking Microsoft Office Specialist certification in Excel 2016.

MOS exams for individual programs are practical rather than theoretical. You must demonstrate that you can complete certain tasks or projects rather than simply answer questions about program features. The successful MOS certification candidate will have at least six months of experience using all aspects of the application on a regular basis; for example, using Excel at work or school to create and manage workbooks and worksheets, modify and format cell content, summarize and organize data, present data in tables and charts, perform data operations by using functions and formulas, and insert and format objects on worksheets.

As a certification candidate, you probably have a lot of experience with the program you want to become certified in. Many of the procedures described in this book will be familiar to you; others might not be. Read through each study section and ensure that you are familiar with the procedures, concepts, and tools discussed. In some cases, images depict the tools you will use to perform procedures related to the skill set. Study the images and ensure that you are familiar with the options available for each tool.

How this book is organized

The exam coverage is divided into chapters representing broad skill sets that correlate to the functional groups covered by the exam. Each chapter is divided into sections addressing groups of related skills that correlate to the exam objectives. Each section includes review information, generic procedures, and practice tasks you can complete on your own while studying. We provide practice files you can use to work through the practice tasks, and results files you can use to check your work. You can practice the generic procedures in this book by using the practice files supplied or by using your own files.

Throughout this book, you will find Exam Strategy tips that present information about the scope of study that is necessary to ensure that you achieve mastery of a skill set and are successful in your certification effort.

Download the practice files

Before you can complete the practice tasks in this book, you need to copy the book's practice files and results files to your computer. Download the compressed (zipped) folder from the following page, and extract the files from it to a folder (such as your Documents folder) on your computer:

<https://aka.ms/MOSExcel2016/downloads>

IMPORTANT The Excel 2016 program is not available from this website. You should purchase and install that program before using this book.

You will save the completed versions of practice files that you modify while working through the practice tasks in this book. If you later want to repeat the practice tasks, you can download the original practice files again.

The following table lists the practice files provided for this book.

Folder and objective group	Practice files	Result files
MOSEExcel2016\Objective1 Create and manage worksheets and workbooks	Excel_1-1.xlsx Excel_1-2.xlsx Excel_1-3.xlsx Excel_1-4.xlsx Excel_1-5.xlsx	Excel_1-1_Results subfolder: ▪ Excel_1-1_results.xlsx ▪ MyBlank_results.xlsx ▪ MyCalc_results.xlsx Excel_1-2_results.xlsx Excel_1-3_results.xlsx Excel_1-4_results.xlsx Excel_1-5_Results subfolder: ▪ Excel_1-5a_results.xlsx ▪ MOS-Compatible.xls ▪ MOS-Template.xltm
MOSEExcel2016\Objective2 Manage data cells and ranges	Excel_2-1.xlsx Excel_2-2.xlsx Excel_2-3.xlsx	Excel_2-1_results.xlsx Excel_2-2_results.xlsx Excel_2-3_results.xlsx
MOSEExcel2016\Objective3 Create tables	Excel_3-1.xlsx Excel_3-2.xlsx Excel_3-3.xlsx	Excel_3-1_results.xlsx Excel_3-2_results.xlsx Excel_3-3_results.xlsx
MOSEExcel2016\Objective4 Perform operations with formulas and functions	Excel_4-1a.xlsx Excel_4-1b.xlsx Excel_4-1c.xlsx Excel_4-2.xlsx Excel_4-3.xlsx	Excel_4-1a_results.xlsx Excel_4-1b_results.xlsx Excel_4-1c_results.xlsx Excel_4-2_results.xlsx Excel_4-3_results.xlsx
MOSEExcel2016\Objective5 Create charts and objects	Excel_5-1.xlsx Excel_5-2.xlsx Excel_5-3a.xlsx Excel_5-3b.jpg Excel_5-3c.txt	Excel_5-1_results.xlsx Excel_5-2_results.xlsx Excel_5-3_results.xlsx

Adapt procedure steps

This book contains many images of user interface elements that you'll work with while performing tasks in Excel on a Windows computer. Depending on your screen resolution or app window width, the Excel ribbon on your screen might look different from that shown in this book. (If you turn on Touch mode, the ribbon displays significantly fewer commands than in Mouse mode.) As a result, procedural instructions that involve the ribbon might require a little adaptation.

Simple procedural instructions use this format:

- On the **Insert** tab, in the **Illustrations** group, click the **Chart** button.

If the command is in a list, our instructions use this format:

- On the **Home** tab, in the **Editing** group, click the **Find** arrow and then, in the **Find** list, click **Go To**.

If differences between your display settings and ours cause a button to appear differently on your screen than it does in this book, you can easily adapt the steps to locate the command. First click the specified tab, and then locate the specified group. If a group has been collapsed into a group list or under a group button, click the list or button to display the group's commands. If you can't immediately identify the button you want, point to likely candidates to display their names in ScreenTips.

The instructions in this book assume that you're interacting with on-screen elements on your computer by clicking (with a mouse, touchpad, or other hardware device). If you're using a different method—for example, if your computer has a touchscreen interface and you're tapping the screen (with your finger or a stylus)—substitute the applicable tapping action when you interact with a user interface element.

Instructions in this book refer to user interface elements that you click or tap on the screen as *buttons*, and to physical buttons that you press on a keyboard as *keys*, to conform to the standard terminology used in documentation for these products.

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<https://aka.ms/MOExcel2016/detail>

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Taking a Microsoft Office Specialist exam

Desktop computing proficiency is increasingly important in today's business world. When screening, hiring, and training employees, employers can feel reassured by relying on the objectivity and consistency of technology certification to ensure the competence of their workforce. As an employee or job seeker, you can use technology certification to prove that you already have the skills you need to succeed, saving current and future employers the time and expense of training you.

Microsoft Office Specialist certification

Microsoft Office Specialist certification is designed to assist students and information workers in validating their skills with Office programs. The following certification paths are available:

- A Microsoft Office Specialist (MOS) is an individual who has demonstrated proficiency by passing a certification exam in one or more Office programs, including Microsoft Word, Excel, PowerPoint, Outlook, or Access.
- A Microsoft Office Specialist Expert (MOS Expert) is an individual who has taken his or her knowledge of Office to the next level and has demonstrated by passing two certification exams that he or she has mastered the more advanced features of Word or Excel.
- A Microsoft Office Specialist Master (MOS Master) is an individual who has demonstrated a broader knowledge of Office skills by passing the Word and Word Expert exams, the Excel and Excel Expert exams, and the PowerPoint, Access, or Outlook exam.

Selecting a certification path

When deciding which certifications you would like to pursue, assess the following:

- The program and program version(s) with which you are familiar
- The length of time you have used the program and how frequently you use it

- Whether you have had formal or informal training in the use of that program
- Whether you use most or all of the available program features
- Whether you are considered a go-to resource by business associates, friends, and family members who have difficulty with the program

Candidates for MOS Expert and MOS Master certification are expected to successfully complete a wide range of standard business tasks. Successful candidates generally have six or more months of experience with the specific Office program, including either formal, instructor-led training or self-study using MOS-approved books, guides, or interactive computer-based materials.

Candidates for MOS Expert and MOS Master certification are expected to successfully complete more complex tasks that involve using the advanced functionality of the program. Successful candidates generally have at least six months, and might have several years, of experience with the programs, including formal, instructor-led training or self-study using MOS-approved materials.

Test-taking tips

Every MOS certification exam is developed from a set of exam skill standards (referred to as the *objective domain*) that are derived from studies of how the Office programs are used in the workplace. Because these skill standards dictate the scope of each exam, they provide critical information about how to prepare for certification. This book follows the structure of the published exam objectives.

See Also For more information about the book structure, see "How this book is organized" in the Introduction.

The MOS certification exams are performance based and require you to complete business-related tasks in the program for which you are seeking certification. For example, you might be presented with a document and told to insert and format additional document elements. Your score on the exam reflects how many of the requested tasks you complete within the allotted time.

Here is some helpful information about taking the exam:

- Keep track of the time. Your exam time does not officially begin until after you finish reading the instructions provided at the beginning of the exam. During the exam, the amount of time remaining is shown in the exam instruction window. You can't pause the exam after you start it.
- Pace yourself. At the beginning of the exam, you will receive information about the tasks that are included in the exam. During the exam, the number of completed and remaining tasks is shown in the exam instruction window.
- Read the exam instructions carefully before beginning. Follow all the instructions provided completely and accurately.
- If you have difficulty performing a task, you can restart it without affecting the result of any completed tasks, or you can skip the task and come back to it after you finish the other tasks on the exam.
- Enter requested information as it appears in the instructions, but without duplicating the formatting unless you are specifically instructed to do so. For example, the text and values you are asked to enter might appear in the instructions in bold and underlined text, but you should enter the information without applying these formats.
- Close all dialog boxes before proceeding to the next exam item unless you are specifically instructed not to do so.
- Don't close task panes before proceeding to the next exam item unless you are specifically instructed to do so.
- If you are asked to print a document, worksheet, chart, report, or slide, perform the task, but be aware that nothing will actually be printed.
- Don't worry about extra keystrokes or mouse clicks. Your work is scored based on its result, not on the method you use to achieve that result (unless a specific method is indicated in the instructions).
- If a computer problem occurs during the exam (for example, if the exam does not respond or the mouse no longer functions) or if a power outage occurs, contact a testing center administrator immediately. The administrator will restart the computer and return the exam to the point where the interruption occurred, with your score intact.

~~~~~  
**Exam Strategy** This book includes special tips for effectively studying for the Microsoft Office Specialist exams in Exam Strategy paragraphs such as this one.  
~~~~~

Certification benefits

At the conclusion of the exam, you will receive a score report, indicating whether you passed the exam. If your score meets or exceeds the passing standard (the minimum required score), you will be contacted by email by the Microsoft Certification Program team. The email message you receive will include your Microsoft Certification ID and links to online resources, including the Microsoft Certified Professional site. On this site, you can download or order a printed certificate, create a virtual business card, order an ID card, review and share your certification transcript, access the Logo Builder, and access other useful and interesting resources, including special offers from Microsoft and affiliated companies.

Depending on the level of certification you achieve, you will qualify to display one of three logos on your business card and other personal promotional materials. These logos attest to the fact that you are proficient in the applications or cross-application skills necessary to achieve the certification. Using the Logo Builder, you can create a personalized certification logo that includes the MOS logo and the specific programs in which you have achieved certification. If you achieve MOS certification in multiple programs, you can include multiple certifications in one logo.

For more information

To learn more about the Microsoft Office Specialist exams and related courseware, visit:

<http://www.certiport.com/mos>



Microsoft Office Specialist

Exam 77-727

Microsoft Excel 2016

This book covers the skills you need to have for certification as a Microsoft Office Specialist in Excel 2016. Specifically, you need to be able to complete tasks that demonstrate the following skill sets:

- 1 Create and manage worksheets and workbooks
- 2 Manage data cells and ranges
- 3 Create tables
- 4 Perform operations with formulas and functions
- 5 Create charts and objects

With these skills, you can create and populate Excel workbooks, and format, organize, and present the types of data most commonly used in a business environment.

Prerequisites

We assume that you have been working with Excel 2016 for at least six months and that you know how to carry out fundamental tasks that are not specifically mentioned in the objectives for this Microsoft Office Specialist exam. Before you begin studying for this exam, you might want to make sure you are familiar with the information in this section.

Select content

To select all the content in a worksheet

- At the junction of the row and column headings (above row 1 and to the left of column A), click the **Select All** button.

To select an individual worksheet column or row

- Click the column heading (labeled with the column letter) or the row heading (labeled with the row number).

To select data in a table, table column, or table row

- Point to the upper-left corner of the table. When the pointer changes to a diagonal arrow, click once to select only the data, or twice to select the data and headers.

Tip This method works only with tables, not with data ranges.

- Point to the top edge of the table column. When the pointer changes to a downward-pointing arrow, click once to select only the data, or twice to select the data and header.

Tip You must point to the edge of the table, not to the column heading or row heading.

- Point to the left edge of the table row. When the pointer changes to a right-pointing arrow, click once to select the data.

Manage data entry

You enter text or a number in a cell simply by clicking the cell and entering the content. When entering content, a Cancel button (an X) and an Enter button (a check mark) are located between the formula bar and Name box, and the indicator at the left end of the status bar changes from Ready to Enter.

Excel allows a long text entry to overflow into an adjacent empty cell and truncates the entry only if the adjacent cell also contains an entry. However, unless you tell it otherwise, Excel displays long numbers in their simplest form, as follows:

- If you enter a number with fewer than 12 digits in a standard-width cell (which holds 8.43 characters), Excel adjusts the width of the column to accommodate the entry.
- If you enter a number with 12 or more digits, Excel displays it in scientific notation. For example, if you enter 12345678912345 in a standard-width cell, Excel displays 1.23457E+13 (1.23457 times 10 to the thirteenth power).
- If you enter a value with many decimal places, Excel might round it. For example, if you enter 123456.789 in a standard-width cell, Excel displays 123456.8.
- If you manually set the width of a column and then enter a numeric value that is too large to be displayed in its entirety, Excel displays pound signs (#) instead of the value.

To complete data entry

- Click the **Enter** button (the check mark) on the formula bar to complete the entry and stay in the same cell.
- Press **Enter** or the **Down Arrow** key to complete the entry and move down to the next cell in the same column.
- Press the **Tab** key or the **Right Arrow** key to complete the entry and move (to the right) to the next cell in the same row, or to the next cell in the table (which might be the first cell of the next row).
- Press **Shift+Enter** or the **Up Arrow** key to complete the entry and move up to the previous cell in the same column.
- Press **Shift+Tab** or the **Left Arrow** key to complete the entry and move (to the left) to the previous cell in the same row.

Manage worksheets

To delete a worksheet

- Right-click the worksheet tab, and then click **Delete**.
- With the worksheet active, on the **Home** tab, in the **Cells** group, click the **Delete** arrow, and then click **Delete Sheet**.

Reuse content

Excel offers several methods of cutting and copying content. After selecting the content, you can click buttons on the ribbon, use a keyboard shortcut, or right-click the selection and click commands on the shortcut menu. Cutting or copying content places it on the Microsoft Office Clipboard, which is shared by Excel and other Office programs such as Word and PowerPoint. You can paste content that is stored on the Clipboard into a workbook (or any Office file) by using commands from the ribbon, shortcut menu, or keyboard, or directly from the Clipboard.

Experienced users might find it fastest to use a keyboard shortcut. The main keyboard shortcuts for editing tasks are shown in the following table.

Task	Keyboard shortcut
Cut	Ctrl+X
Copy	Ctrl+C
Paste	Ctrl+V
Undo	Ctrl+Z
Repeat/Redo	Ctrl+Y

Exam Strategy When you paste content onto an Excel worksheet, the Paste Options menu presents options for formatting the pasted content. Exam 77-727 requires that you demonstrate the ability to use common paste options, including pasting values, pasting without formatting, and transposing data.

Excel shares the Office Clipboard with Word and other programs in the Microsoft Office suite of products. You can easily reuse content from one Office file in another.

To paste cells from the Clipboard to a data range

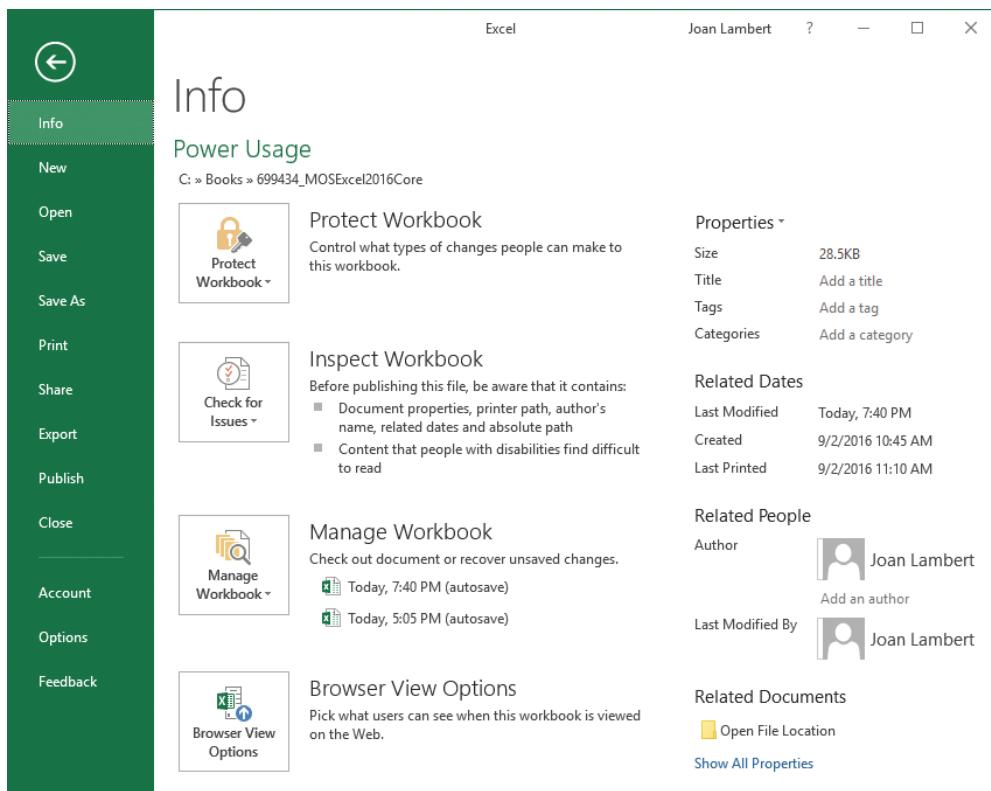
1. Select the upper-left cell of the area into which you want to insert the cut or copied cells.
2. On the **Home** tab, in the **Cells** group, click the **Insert** arrow, and then click **Insert Cut Cells** or **Insert Copied Cells**.
3. In the **Insert Paste** dialog box, click **Shift cells right** or **Shift cells down** to move the existing data. Then click **OK**.

To paste cells from the Clipboard over existing data

1. Select the upper-left cell of the area into which you want to insert the cut or copied cells.
2. Do either of the following:
 - On the **Home** tab, in the **Clipboard** group, click **Paste**.
 - Press **Ctrl+V**.

Access program commands and options

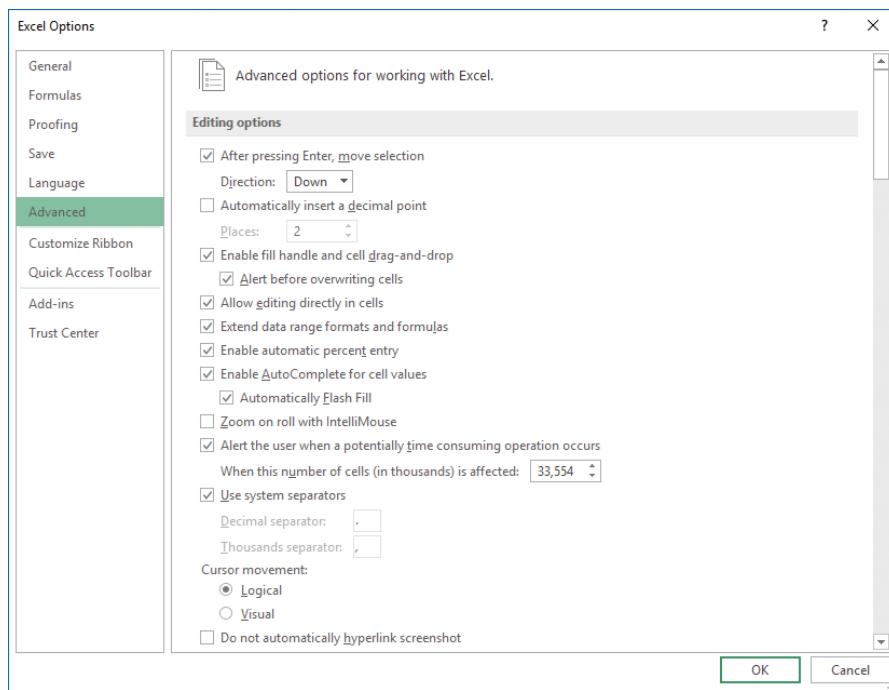
Commands for working with Excel workbooks (rather than worksheet content) are available from the Backstage view. You display the Backstage view by clicking the File tab on the ribbon.



The Backstage view displays information about the current workbook

The links in the left pane of the Backstage view provide access to 11 pages that contain information about the current workbook, commands for working with the workbook or active worksheet, or commands for working with Excel. To display the Info, New, Open, Save As, History, Print, Share, Export, Account, Options, or Feedback page, click the page name in the left pane.

You manage many aspects of Excel functionality from the Excel Options dialog box, which you open by clicking Options in the left pane of the Backstage view.



The Excel Options dialog box

The Excel Options dialog box has 10 separate pages of commands, organized by function. To display the General, Formulas, Proofing, Save, Language, Advanced, Customize Ribbon, Customize Quick Access Toolbar, Add-ins, or Trust Center page of the Excel Options dialog box, click the page name in the left pane.

Objective group 5

Create charts and objects

The skills tested in this section of the Microsoft Office Specialist exam for Microsoft Excel 2016 relate to creating charts and objects. Specifically, the following objectives are associated with this set of skills:

- 5.1 Create charts
- 5.2 Format charts
- 5.3 Insert and format objects

You can store a large amount of data in an Excel workbook. When you want to present that data to other people, you might choose to include additional information to help viewers interpret the information, or to present the data in the form of a chart. Using Excel 2016, you can create many types of charts from data stored on one or more worksheets. To simplify the process of choosing a chart type, the Quick Analysis tool recommends charts that are most appropriate for the data you’re working with. To aid viewers in interpreting the chart data, you can configure a chart to include identifying elements such as a title, legend, and data markers.

You can enhance the information you present in a workbook by including images such as company logos directly on worksheets, displaying text and graphics in SmartArt business diagrams, and displaying text independent of the worksheet or chart sheet structure within text boxes.

This chapter guides you in studying ways of presenting data in charts and enhancing worksheets by including images, business diagrams, and text boxes.

5

To complete the practice tasks in this chapter, you need the practice files contained in the **MOSExcel2016\Objective5** practice file folder. For more information, see “Download the practice files” in this book’s introduction.

Objective 5.1: Create charts

Charts (also referred to as *graphs*) are created by plotting data points onto a two-dimensional or three-dimensional axis to assist in data analysis and are therefore a common component of certain types of workbooks. Presenting data in the form of a chart can make it easy to identify trends and relationships that might not be obvious from the data itself.

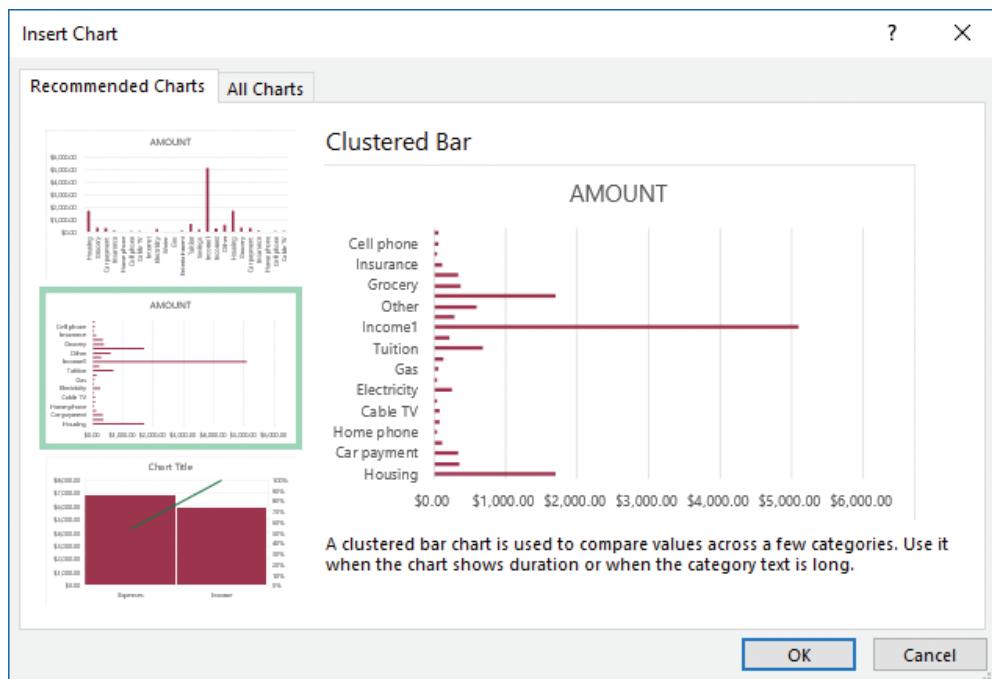
Different types of charts are best suited for different types of data. The following table shows the available chart types and the data they are particularly useful for plotting.

Chart type	Typically used to show	Variations
Area	Multiple data series as cumulative layers showing change over time	Two-dimensional or three-dimensional Independent or stacked data series
Bar	Variations in value over time or the comparative values of several items at a single point in time	Two-dimensional or three-dimensional Stacked or clustered bars Absolute or proportional values
Box & Whisker	Distribution of data within a range, including mean values, quartiles, and outliers	
Column	Variations in value over time or comparisons	Two-dimensional or three-dimensional Stacked or clustered columns Absolute or proportional values
Funnel	Categorized numeric data such as sales or expenses	
Histogram	Frequency of occurrence of values within a data set	Optional Pareto chart includes additive contributions

Chart type	Typically used to show	Variations
Line	Multiple data trends over evenly spaced intervals	Two-dimensional or three-dimensional Independent or stacked lines Absolute or proportional values Can include markers
Pie	Percentages assigned to different components of a single item (nonnegative, nonzero, no more than seven values)	Two-dimensional or three-dimensional Pie or doughnut shape Secondary pie or bar subset
Radar	Percentages assigned to different components of an item, radiating from a center point	Can include markers and fills
Stock	High, low, and closing prices of stock market activity	Can include opening price and volume traded
Sunburst	Comparisons of multilevel hierarchical data	
Surface	Trends in values across two different dimensions in a continuous curve, such as a topographic map	Two-dimensional or three-dimensional Contour or surface area
Treemap	Comparisons of multilevel hierarchical data	
X Y (Scatter)	Relationships between sets of values	Data points as markers or bubbles Optional trendlines
Waterfall	The effect of positive and negative contributions on financial data	Optional connector lines

You can also create combination charts that overlay different data charts in one space.

To plot data as a chart, all you have to do is select the data and specify the chart type. You can select any type of chart from the Charts group on the Insert tab. You can also find recommendations based on the selected content either on the Charts tab of the Quick Analysis tool or on the Recommended Charts tab of the Insert Chart dialog box.

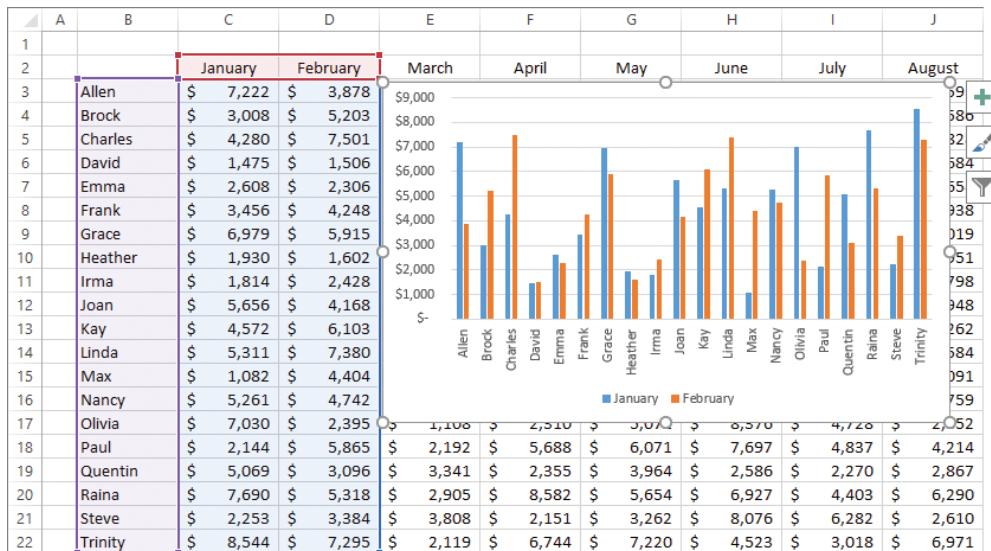


Excel displays the active data in each of the recommended chart thumbnails

Tip The Quick Analysis tool provides access to formatting options that pertain to the currently selected data. From the tabs of the Quick Analysis tool, you can apply conditional formatting, perform mathematical operations, create tables and PivotTables, and insert sparklines. Like the Mini Toolbar, the Paste Options menu, and other context-specific tools, the Quick Analysis tool makes existing functionality available in a central location. The reason this is a tool rather than simply a toolbar or menu is that the options shown in the tool—for example, the charts shown on the Charts tab—are selected as appropriate for the current data.

Before you select the data that you want to present as a chart, ensure that the data is correctly set up for the type of chart you want to create (for example, you must set up hierarchical categories differently for a box & whisker, sunburst, or treemap chart than for a bar or column chart). Select only the data you want to appear in the chart. If the data is not in a contiguous range of rows or columns, either rearrange the data or hold down the Ctrl key while you select noncontiguous ranges.

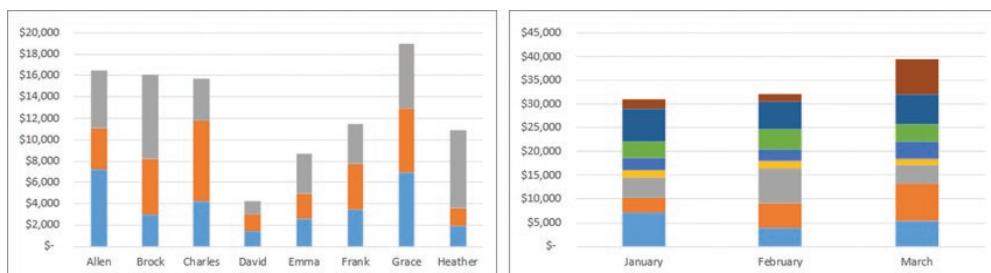
A chart is linked to its worksheet data, so any changes you make to the plotted data are immediately reflected in the chart. If you want to add or delete values in a data series or add or remove an entire series, you need to increase or decrease the range of the plotted data in the worksheet.



Change a chart by including more or less data

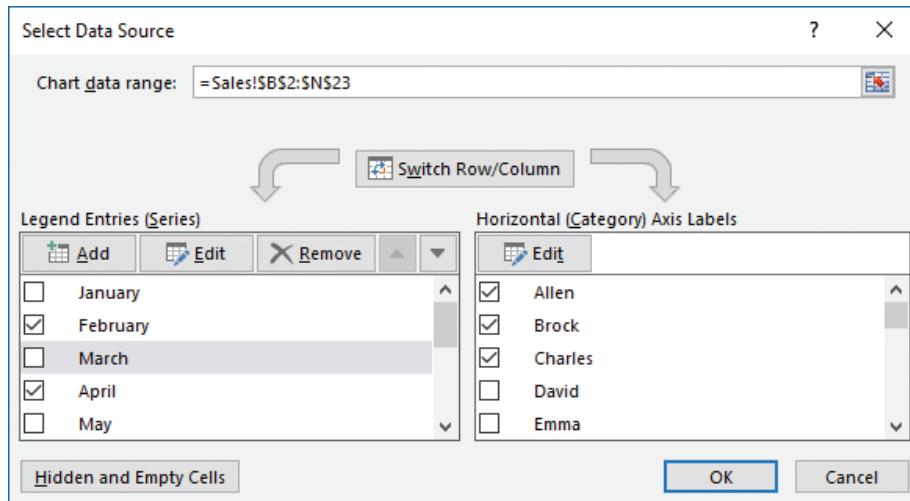
Sometimes a chart does not produce the results you expect because the data series are plotted against the wrong axes; that is, Excel is plotting the data by row when it should be plotting by column, or vice versa. You can quickly switch the rows and columns to see whether that produces the desired effect. You can preview the effect of switching axes in the Change Chart Type dialog box.

You can present a different view of the data in a chart by switching the data series and categories across the axis.



Change a chart by switching the data series and categories

You can swap data across the axis from the Change Chart Type dialog box or you can more precisely control the chart content from the Select Data Source dialog box.

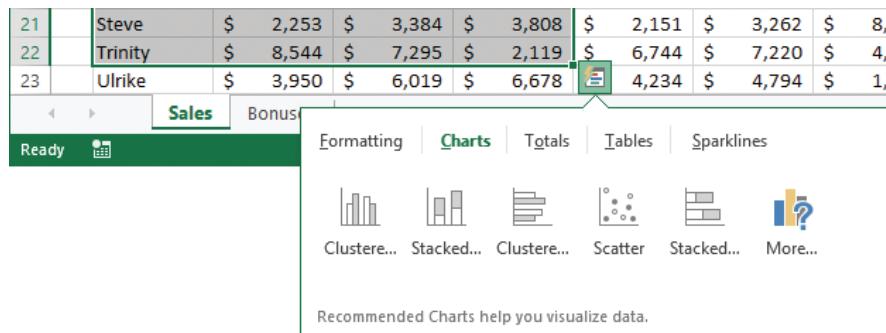


Choosing the data to include in a chart

~~~~~  
Exam Strategy Practice plotting the same data in different ways. In particular, understand the effects of plotting data by column or by row.  
~~~~~

To plot data as a chart on the worksheet

1. On the worksheet, select the data that you want to plot in the chart.
2. Do any of the following:
 - On the **Insert** tab, in the **Charts** group, click the general chart type you want, and then on the menu, click the specific chart you want to create.
Tip Pointing to a chart type on the menu displays a live preview of the selected data plotted as that chart type.
 - On the **Insert** tab, in the **Charts** group, click **Recommended Charts**. Preview the recommended charts by clicking the thumbnails in the left pane. Then click the chart type you want, and click **OK**.
 - Click the **Quick Analysis** button that appears in the lower-right corner of the selection, click **Charts**, and then click the chart type you want to create.



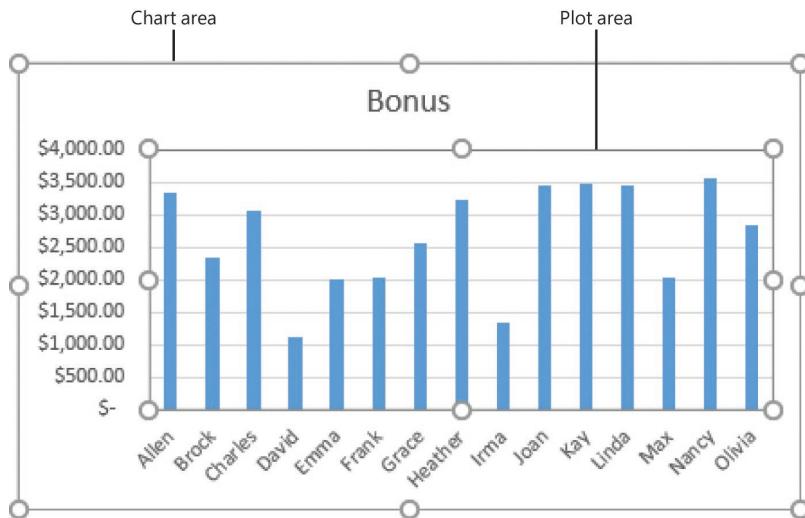
The Quick Analysis menu provides quick access to data transformation options

To modify the data points in a chart

- In the linked Excel worksheet, change the values within the chart data.

To select the chart data on the linked worksheet

- Click the chart area or plot area.



Selecting data on the chart selects the corresponding data on the worksheet

To change the range of plotted data in a selected chart

- In the linked Excel worksheet, drag the corner handles of the series selectors until they enclose the series you want to plot.

Or

1. Do either of the following:
 - On the **Design** tool tab, in the **Data** group, click **Select Data**.
 - Right-click the chart area or plot area, and then click **Select Data**.
2. In the **Select Data Source** dialog box, do any of the following, and then click **OK**:
 - Click the worksheet icon at the right end of the **Chart data range** box, and then drag to select the full range of data you want to have available.
 - In the **Legend Entries (Series)** list and **Horizontal (Category) Axis Labels** boxes, select the check boxes of the rows and columns of data you want to plot.

To plot additional data series in a selected chart

1. Do either of the following:
 - On the **Design** tool tab, in the **Data** group, click **Select Data**.
 - Right-click the chart area or plot area, and then click **Select Data**.
2. In the **Select Data Source** dialog box, at the top of the **Legend Entries (Series)** list, click **Add**.
3. In the **Edit Series** dialog box, do either of the following:
 - Enter the additional series in the **Series name** box.
 - Click in the **Series name** box and then drag in the worksheet to select the additional series.
4. If necessary, enter or select the series values. Then click **OK**.
5. In the **Select Data Source** dialog box, click **OK**.

To switch the display of a data series in a selected chart between the series axis and the category axis

- On the **Design** tool tab, in the **Data** group, click the **Switch Row/Column** button.

Or

1. Do either of the following:
 - On the **Design** tool tab, in the **Data** group, click **Select Data**.
 - Right-click the chart area or plot area, and then click **Select Data**.
2. In the **Select Data Source** dialog box, click **Switch Row/Column**, and then click **OK**.

Objective 5.1 practice tasks

The practice file for these tasks is located in the **MOSEExcel2016\Objective5** practice file folder. The folder also contains a result file that you can use to check your work.

► Open the **Excel_5-1** workbook and do the following:

- Plot the data on the **Seattle** worksheet as a 2-D Pie chart on that worksheet.
- Plot the data on the **Sales** worksheet as a simple two-dimensional column chart.

► On the **Fall Sales** worksheet, do the following:

- Switch the rows and columns of the chart.
- Change the October sales amount for the Flowers category to 888.25 and ensure that the chart reflects the change.
- Expand the data range plotted by the chart to include November, so that you can compare sales for the two months.

► Save the **Excel_5-1** workbook.

► Open the **Excel_5-1_results** workbook. Compare the two workbooks to check your work.

► Close the open workbooks.

Objective 5.2: Format charts

A chart includes many elements, some required and some optional. The chart content can be identified by a *chart title*. Each data series is represented in the chart by a unique color. A *legend* that defines the colors is created by default but is optional. Each data point is represented in the chart by a data marker, and can also be represented by a *data label* that specifies the data point value. The data is plotted against an x-axis (or *category axis*) and a y-axis (or *value axis*). Three-dimensional charts also have a z-axis (or *series axis*). The axes can have titles, and gridlines can more precisely indicate the axis measurements.

To augment the usefulness or the attractiveness of a chart, you can add elements. You can adjust each element in appropriate ways, in addition to adjusting the plot area (the area defined by the axes) and the chart area (the entire chart object). You can move and format most chart elements, and easily add or remove them from the chart.

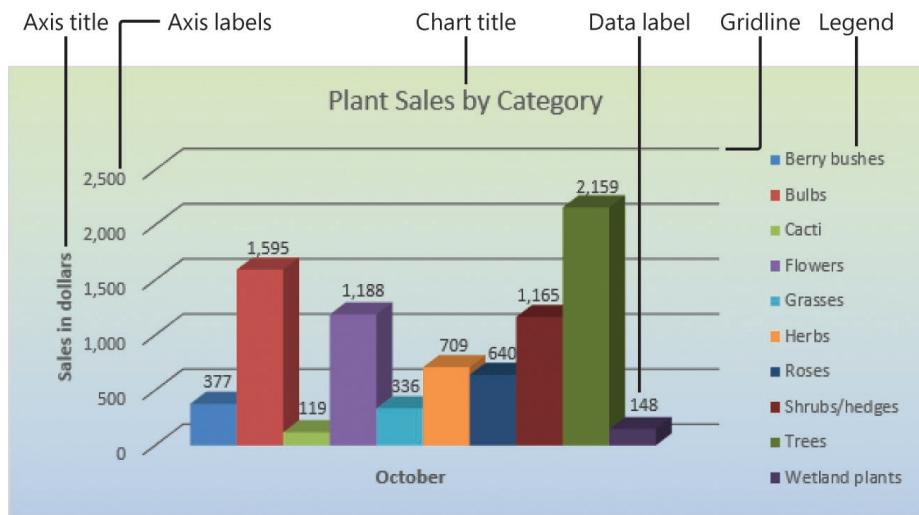
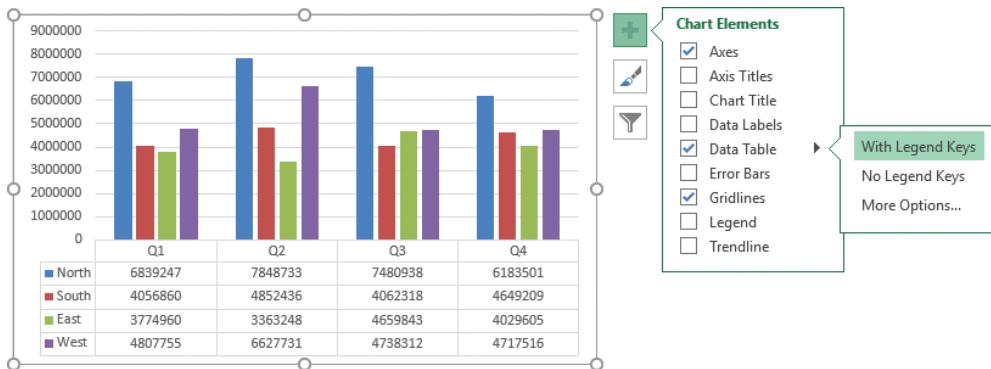


Chart elements can eliminate the need for other explanatory text

Tip Data labels can clutter up all but the simplest charts. If you need to show the data for a chart on a separate chart sheet, consider using a data table instead.

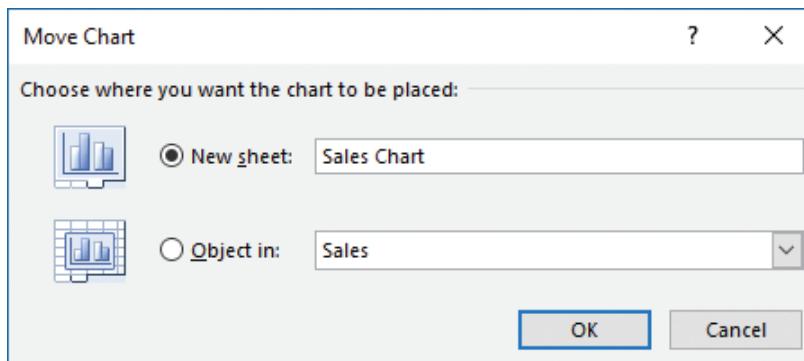
You can add and remove chart elements from the Chart Elements pane or from the Design tool tab.



The options in the Chart Elements pane vary based on the chart type

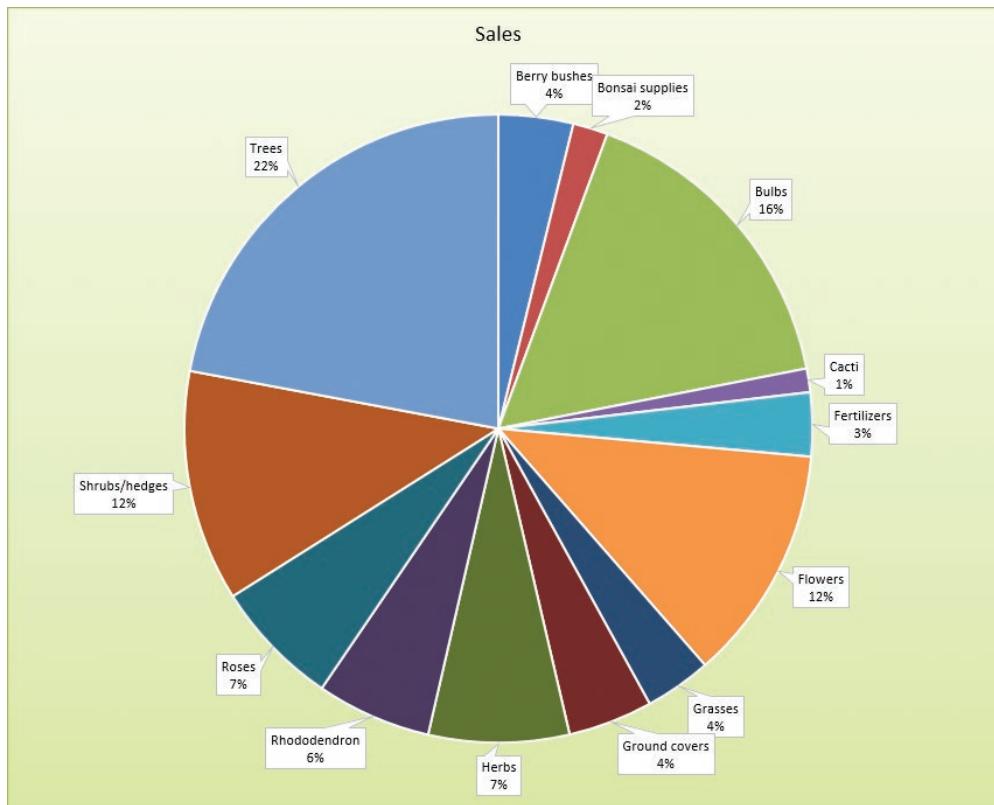
~~~~~  
**Exam Strategy** You can tailor the elements of charts in too many ways for us to cover them in detail here. In addition to choosing options from galleries, you can open a Format dialog box for each type of element. Make sure you are familiar with the chart elements and how to use them to enhance a chart.

~~~~~  
By default, Excel creates charts on the same worksheet as the source data. You can move or size a chart on the worksheet by dragging the chart or its handles, or by specifying a precise position or dimensions. If you prefer to display a chart on its own sheet, you can move it to another worksheet in the workbook, or to a dedicated chart sheet.



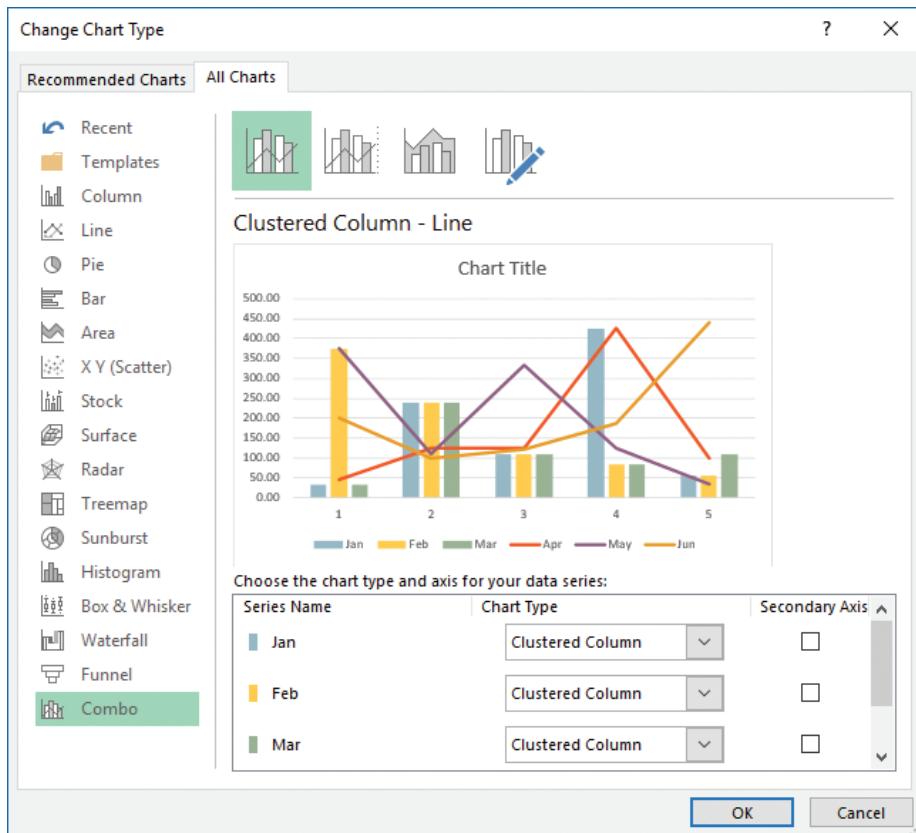
Move a chart to its own sheet to remove the distraction of the background data

You can apply predefined combinations of layouts and styles to quickly format a chart. You can also apply a shape style to the chart area to set it off from the rest of the sheet.



Preset formatting options make it easy to achieve the look you want

If the chart you initially create doesn't depict your data the way you want, you can change the chart type or select a different variation of the chart. Many chart types have two-dimensional and three-dimensional variations or optional elements.



Preview chart data in other types of charts

To display and hide chart elements

- Click the chart, and then click the **Chart Elements** button (labeled with a plus sign) that appears in the upper-right corner of the chart. In the **Chart Elements** pane, select the check boxes of the elements you want to display, and clear the check boxes of the elements you want to hide.
- On the **Design** tool tab, in the **Chart Layouts** group, click **Add Chart Element**, click the element type, and then click the specific element you want to display or hide.
- On the **Design** tool tab, in the **Chart Layouts** group, click **Quick Layout**, and then click the combination of elements you want to display.

To resize a chart

- Select the chart, and then drag the sizing handles.
- On the **Format** tool tab, in the **Size** group, enter the **Height** and **Width** dimensions.
- On the **Format** tool tab, click the **Size** dialog box launcher, and enter the **Height** and **Width** dimensions or **Scale Height** and **Scale Width** percentages on the **Size & Properties** page of the **Format Chart Area** pane.

To move a selected chart

- Drag the chart to another location on the worksheet.

Or

1. On the **Design** tool tab, in the **Location** group, click **Move Chart**.
2. In the **Move Chart** dialog box, select a location and click **OK**.

To change the type of a selected chart

1. On the **Design** tool tab, in the **Type** group, click **Change Chart Type**.
2. In the **Change Chart Type** dialog box, click a new type and sub-type, and then click **OK**.

To apply a style to a selected chart

- On the **Design** tool tab, in the **Chart Styles** gallery, click the style you want.
- Click the **Chart Styles** button (labeled with a paintbrush) that appears in the upper-right corner of the chart. On the **Style** page of the **Chart Styles** pane, click the style you want.

To apply a shape style to a selected chart

- On the **Format** tool tab, in the **Shape Styles** gallery, click the style you want.

To change the color scheme of a selected chart

- On the **Design** tool tab, in the **Chart Styles** group, click **Change Colors**, and then click the color scheme you want.
- Click the **Chart Styles** button that appears in the upper-right corner of the chart. On the **Color** page of the **Chart Styles** pane, click the color scheme you want.
- Apply a different theme to the workbook.

See Also For information about applying themes, see “Objective 1.3: Format worksheets and workbooks.”

Objective 5.2 practice tasks

The practice files for these tasks are located in the **MOSExcel2016\Objective5** practice file folder. The folder also contains a result file that you can use to check your work.

- Open the **Excel_5-2** workbook, display the **Sales** worksheet, and do the following:
 - Change the pie chart to a 3-D Clustered Column chart.
 - Apply *Layout 1, Style 7* to the chart.
 - Apply the *Subtle Effect – Olive Green, Accent 3* shape style.
 - Increase the size of the chart until it occupies cells A1:L23.
 - Move the chart to a new chart sheet named **Sales Chart**.
- On the **Seattle** worksheet, do the following:
 - Add the title **Air Quality Index Report** to the chart.
 - Add data labels that show the percentage of the whole that is represented by each data marker.
- Save the **Excel_5-2** workbook.
- Open the **Excel_5-2_results** workbook. Compare the two workbooks to check your work.
- Close the open workbooks.

Objective 5.3: Insert and format objects

Although graphics are not frequently associated with the storage of data within Excel workbooks, it is worthwhile to note that when preparing to present data, you can incorporate almost all of the graphic elements available in Microsoft Word and PowerPoint into an Excel workbook. This can be particularly useful when creating summary pages or when a workbook must provide a standalone information source for text content in addition to data.

Tip You use the same methods to insert and format graphic objects in Excel as you do in other Microsoft Office programs. As an experienced Excel user, you are likely familiar with the methods for inserting, creating, and configuring graphic objects in other programs.

Insert text boxes and shapes

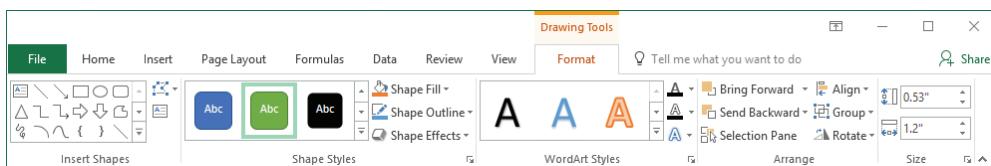
To convey information more succinctly, you can add text. When you add text directly to a worksheet, you are restricted by the width and height of the worksheet cells in which you must insert the text. To bypass that restriction or to distinctly separate the text from the worksheet data, you can insert the text in a text box or shape that you can position independently on the worksheet. You can also use shapes as simple navigational aids that use hyperlinks to move to a specific location.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2																	
3																	
4																	
5	Person	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year			
6	Allen	\$ 7,222	\$ 3,878	\$ 5,369	\$ 2,763	\$ 8,491	\$ 5,009	\$ 3,956	\$ 6,595	\$ 8,224	\$ 2,790	\$ 4,279	\$ 8,598	\$ 67,174			
7	Brock	\$ 3,008	\$ 5,203	\$ 7,854	\$ 1,201	\$ 3,576	\$ 2,123	\$ 2,416	\$ 3,586	\$ 4,582	\$ 2,679	\$ 7,565	\$ 3,234	\$ 47,027			
8	Charles	\$ 4,280	\$ 7,501	\$ 3,951	\$ 1,824	\$ 7,644	\$ 7,282	\$ 1,786	\$ 4,828	\$ 8,327	\$ 3,769	\$ 6,708	\$ 3,654	\$ 61,554			
9	David	\$ 1,475	\$ 1,506	\$ 1,238	\$ 1,792	\$ 1,327	\$ 2,492	\$ 2,100	\$ 1,684	\$ 1,598	\$ 2,666	\$ 2,552	\$ 2,039	\$ 22,469			
10	Emma	\$ 2,608	\$ 2,306	\$ 3,724	\$ 3,322	\$ 4,499	\$ 2,358	\$ 3,663	\$ 3,654	\$ 2,544	\$ 3,692	\$ 5,005	\$ 3,269	\$ 40,344			
11	Frank	\$ 3,456	\$ 4,248	\$ 3,760	\$ 3,563	\$ 3,382	\$ 3,288	\$ 2,313	\$ 2,938	\$ 3,626	\$ 4,461	\$ 2,228	\$ 3,681	\$ 40,944			
12	Grace	\$ 6,979	\$ 5,915	\$ 6,102	\$ 1,838	\$ 1,646	\$ 6,619	\$ 1,770	\$ 6,019	\$ 2,291	\$ 4,336	\$ 5,597	\$ 2,315	\$ 51,427			
13	Heather	\$ 1,930	\$ 1,602	\$ 7,400	\$ 6,446	\$ 4,457	\$ 6,027	\$ 5,710	\$ 7,951	\$ 7,267	\$ 6,715	\$ 3,268	\$ 5,920	\$ 64,693			
14	Irma	\$ 1,814	\$ 2,428	\$ 1,592	\$ 1,915	\$ 1,523	\$ 2,473	\$ 1,492	\$ 2,798	\$ 2,570	\$ 2,438	\$ 2,977	\$ 2,700	\$ 26,720			
15	Joan	\$ 5,656	\$ 4,168	\$ 2,502	\$ 7,927	\$ 7,528	\$ 3,158	\$ 5,439	\$ 6,948	\$ 8,360	\$ 7,132	\$ 5,892	\$ 4,309	\$ 69,019			
16	Kay	\$ 4,572	\$ 6,103	\$ 7,129	\$ 2,879	\$ 4,494	\$ 8,521	\$ 7,445	\$ 4,262	\$ 6,634	\$ 8,130	\$ 2,174	\$ 7,525	\$ 69,868			
17	Linda	\$ 5,311	\$ 7,380	\$ 1,897	\$ 5,736	\$ 7,267	\$ 5,505	\$ 6,464	\$ 6,584	\$ 3,426	\$ 6,870	\$ 5,171	\$ 7,562	\$ 69,173			
18	Max	\$ 1,082	\$ 4,404	\$ 5,274	\$ 1,903	\$ 7,196	\$ 4,135	\$ 2,936	\$ 1,091	\$ 2,807	\$ 4,097	\$ 1,370	\$ 4,516	\$ 40,811			
19	Nancy	\$ 5,261	\$ 4,742	\$ 7,706	\$ 4,557	\$ 4,627	\$ 8,021	\$ 8,391	\$ 7,759	\$ 2,969	\$ 3,053	\$ 5,625	\$ 8,644	\$ 71,355			
20	Olivia	\$ 7,030	\$ 2,395	\$ 1,108	\$ 2,310	\$ 5,071	\$ 8,376	\$ 4,728	\$ 2,852	\$ 5,790	\$ 2,232	\$ 8,221	\$ 6,912	\$ 57,025			
21	Paul	\$ 2,144	\$ 5,865	\$ 2,192	\$ 5,688	\$ 6,071	\$ 7,697	\$ 4,837	\$ 4,214	\$ 1,660	\$ 3,374	\$ 8,596	\$ 7,755	\$ 60,093			
22	Quentin	\$ 5,069	\$ 3,096	\$ 3,341	\$ 2,355	\$ 3,964	\$ 2,586	\$ 2,270	\$ 2,867	\$ 5,034	\$ 4,089	\$ 4,655	\$ 4,551	\$ 43,877			
23	Raina	\$ 7,690	\$ 5,318	\$ 2,905	\$ 8,582	\$ 5,654	\$ 6,927	\$ 4,403	\$ 6,290	\$ 7,362	\$ 7,250	\$ 6,873	\$ 5,454	\$ 74,708			
24	Steve	\$ 2,253	\$ 3,384	\$ 3,808	\$ 2,151	\$ 3,262	\$ 8,076	\$ 6,282	\$ 2,610	\$ 1,792	\$ 6,734	\$ 7,930	\$ 2,500	\$ 50,782			
25	Trinity	\$ 8,544	\$ 7,295	\$ 2,119	\$ 6,744	\$ 7,220	\$ 4,523	\$ 3,018	\$ 6,971	\$ 2,172	\$ 5,860	\$ 3,045	\$ 5,987	\$ 63,498			
26	Ulrike	\$ 3,950	\$ 6,019	\$ 6,678	\$ 4,234	\$ 4,794	\$ 1,800	\$ 3,175	\$ 7,352	\$ 6,075	\$ 2,349	\$ 4,575	\$ 2,291	\$ 53,292			
27	Victor	\$ 4,881	\$ 5,021	\$ 2,085	\$ 3,521	\$ 3,189	\$ 2,063	\$ 3,095	\$ 3,125	\$ 2,807	\$ 2,241	\$ 2,254	\$ 2,807	\$ 37,089			
28	William	\$ 2,779	\$ 2,111	\$ 1,988	\$ 1,715	\$ 2,528	\$ 2,166	\$ 1,375	\$ 2,266	\$ 1,752	\$ 1,945	\$ 1,129	\$ 2,154	\$ 23,908			
29	Average	\$ 4,304	\$ 4,430	\$ 3,988	\$ 3,694	\$ 4,744	\$ 4,836	\$ 3,872	\$ 4,576	\$ 4,333	\$ 4,300	\$ 4,682	\$ 4,712				

Note:
Data includes only sales by full-time salespeople employed the entire year

Text within a text box or shape is independent of the worksheet content

Shapes can be simple, such as lines, circles, or squares; or more complex, such as stars, hearts, and arrows. You can enter text inside a shape, and apply formatting effects to both the shape and the text. You format both text boxes and shapes by using commands on the Format tool tab for Drawing Tools.



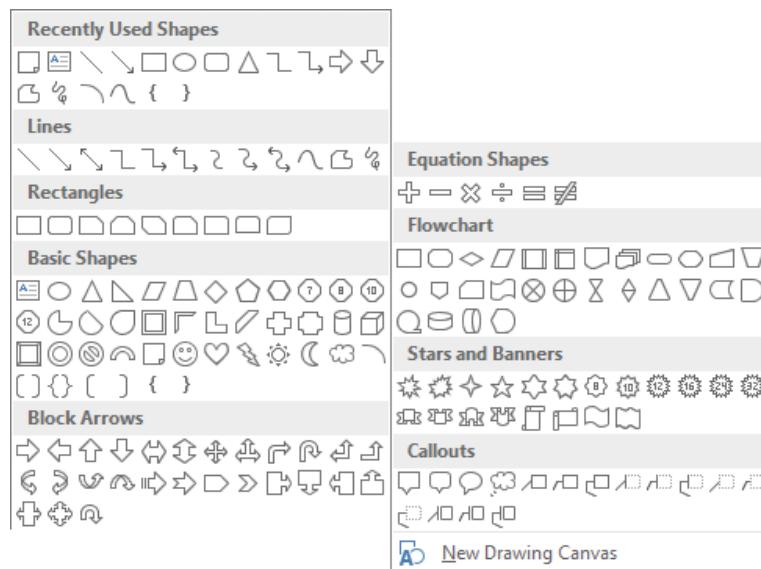
Easily apply formatting that matches the color scheme of other workbook elements

To insert a text box on a worksheet

1. On the **Insert** tab, in the **Text** group, click **Text Box**.
2. In the worksheet, click to insert a small (one character) text box that expands when you enter text, or drag to draw the text box the size that you want.
3. Enter or paste the text you want to display in the text box.

To draw a shape

1. On the **Insert** tab, in the **Illustrations** group, click the **Shapes** button.



More than 150 shapes are available as starting points for a custom shape

2. In the **Shapes** gallery, click the shape you want, and then do one of the following:
 - Click anywhere on the page to insert a standard-size shape.
 - Drag anywhere on the page to draw a shape of the size and aspect ratio that you want.

Tip To draw a shape with a 1:1 aspect ratio (equal height and width), hold down the Shift key while dragging.

To add text to a shape

- Click the shape to select it, and then enter the text.
- Right-click the shape, click **Add Text** or **Edit Text**, and then enter the text.

To format a selected text box or shape

- To change the shape, on the **Format** tool tab, in the **Insert Shapes** group, click **Edit Shape**, click **Change Shape**, and then click the shape you want.
- To change the shape fill, outline, or effects, on the **Format** tool tab, use the formatting options in the **Shape Styles** group.
- To rotate the shape, on the **Format** tool tab, in the **Arrange** group, click **Rotate Objects**, and then click the rotation option you want.

To resize a text box or shape

- Click the text box or shape to select it, and then do any of the following:
 - Drag the top or bottom sizing handle to change the height.
 - Drag the left or right sizing handle to change the width.
 - Drag a corner sizing handle to change the width and height and maintain the aspect ratio.
 - On the **Format** tool tab, in the **Size** group, enter or select the **Height** and **Width** dimensions.
 - On the **Format** tool tab, in the **Size** group, click the dialog box launcher. In the **Format Object** dialog box that opens, select the **Lock aspect ratio** check box if you want to maintain the aspect ratio, and then enter or select the height or width.

To format text in a text box or shape

- Select the text box or shape. On the **Format** tool tab, use the formatting options in the **WordArt Styles** group.
- Select the text, and then use the formatting options on the **Mini Toolbar** or in the **Font** group on the **Home** tab.

Insert images

You can enhance workbook content by adding an image, perhaps a company logo, a product image, or an image that represents the concept you want to convey to the workbook viewer.

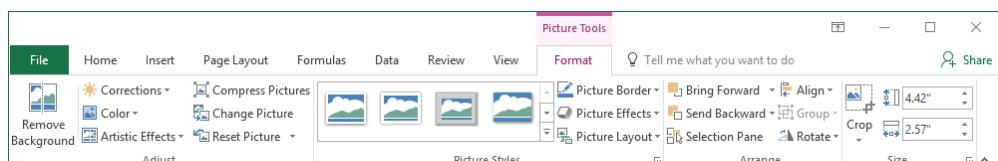
	A	C	D	E	F	G	H
1	Name	Price					
2	Ambrosia	50.00					
3	American Pitcher Plant	28.00					
4	Anacharis	8.75					
5	Anemone	112.00					
6	Anise	11.30					
7	Austrian Pine	72.00					
8	Autumn Crocus	75.00					
9	Baby's Breath	29.25					
10	Beautybush	16.50					
11	Beebalm	16.50					
12	Begonias	37.90					
13	Blackberries	31.50					
14	Bladderwort	16.95					
15	Bulb planter	13.90					
16	Butterworts	28.00					



Add a product image to a worksheet that you will use as a catalog page

After you insert an image in a document, you can modify it in many ways. For example, you can crop or resize a picture, change the picture's brightness and contrast, recolor it, apply artistic effects to it, and compress it to reduce the size of the document containing it. You can apply a wide range of preformatted styles to a picture to change its shape and orientation, in addition to adding borders and picture effects.

You format images by using commands on the Format tool tab for Pictures.



You can format an image in Excel in the same ways that you do in PowerPoint or Word

To insert a picture on a worksheet

1. On the **Insert** tab, in the **Illustrations** group, click the **Pictures** button.
2. In the **Insert Picture** dialog box, browse to and click the file you want. Then do one of the following:
 - Click **Insert** to insert the picture into the worksheet.
 - In the **Insert** list, click **Link to File** to insert a picture that will update automatically if the picture file changes.
 - In the **Insert** list, click **Insert and Link** to insert a picture that you can manually update if the picture file changes.

To apply artistic effects to a selected picture on a worksheet

- On the **Format** tool tab, in the **Adjust** group, click **Artistic Effects**, and then in the gallery, click the effect you want to apply.

To apply a style to a selected picture on a worksheet

- On the **Format** tool tab, in the **Picture Styles** group, expand the **Quick Styles** gallery, and then click the style you want to apply.

Or

1. On the **Format** tool tab, click the **Picture Styles** dialog box launcher.
2. In the **Format Picture** pane, on the **Fill & Line** and **Effects** pages, choose the options that you want to apply.

To change the size and/or shape of a selected picture on a worksheet

- Drag its sizing handles.
- On the **Format** tool tab, in the **Size** group, change the **Height** and **Width** settings.
- On the **Format** tool tab, click the **Size** dialog box launcher. Then on the **Size & Properties** page of the **Format Picture** pane, change the **Height**, **Width**, and **Scale** settings.

To move a picture on a worksheet

- Drag the picture to a new location.

To copy a picture to a new location on a worksheet

- Hold down the **Ctrl** key and drag the picture to the second location.

To format a selected picture

- Use the commands in the **Adjust** group on the **Format** tool tab to remove the picture background; adjust the sharpness, brightness, and contrast; apply artistic effects; and compress the picture to minimize the file size.
- Use the commands in the **Picture Styles** group on the **Format** tool tab to apply preconfigured combinations of effects or to apply a border, shadow, reflection, glow, soft edge, beveled edge, or three-dimensional effect.
- Use the commands in the **Arrange** group on the **Format** tool tab to control the relationship of the picture to the sheet and to other pictures on the sheet, and to rotate or flip the picture.
- Use the commands in the **Size** group on the **Format** tool tab to change the picture height and width and to crop the picture manually, to a specific aspect ratio, to a shape, or to fill or fit a specific space.

Provide alternative text for accessibility

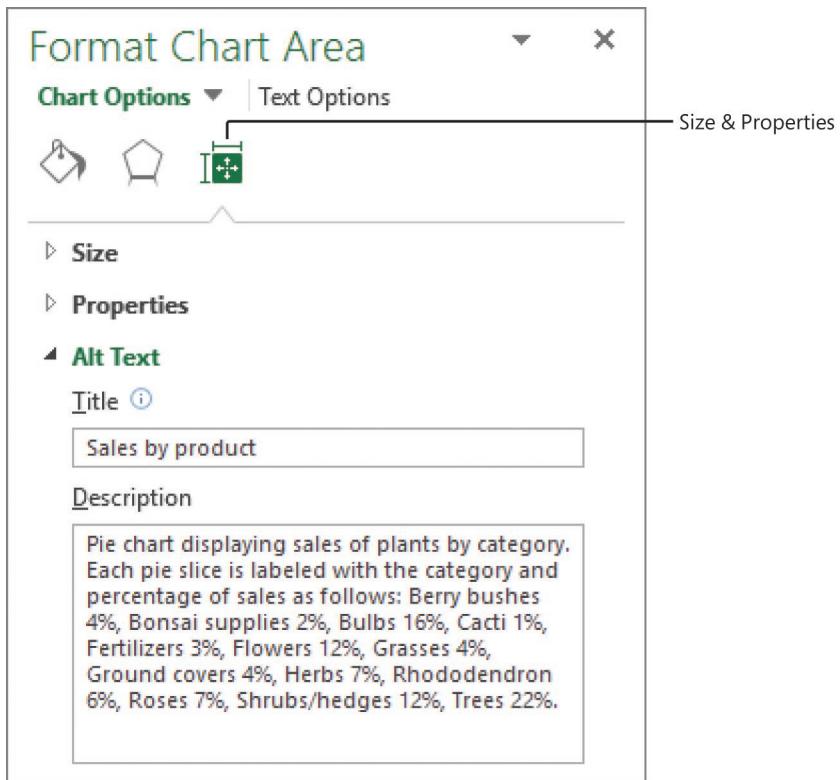
Alternative text (also referred to as *alt text*) is descriptive text assigned to an Excel table, chart, image, or other object that either might not show up correctly on the page or might not be available to screen reading software. The alternative text provides readers with information about the object content or purpose. In a PDF file, for example, if your content includes alternative text, a reader can point to an image on the screen to display a description of the image.

You assign alternative text to an object as an object property. You can assign both a title and a description to an image.

To add alternative text to an object

1. Do one of the following:
 - Right-click the chart area of a chart, and then click **Format Chart Area**.
 - Right-click a text box or shape, and then click **Format Shape**.
 - Right-click an image, and then click **Format Picture**.

2. In the **Format Object** pane, click the **Size & Properties** button, and then click the **Alt Text** heading to display the input boxes, if they aren't already visible.
3. In the **Title** box, enter a short title for the object. People who use screen reading software will hear the title first and can then choose whether to have the description read.
4. In the **Description** box, enter a description that provides the information you intend for a reader to get from looking at the object.



Alt text provides a text description of a visual object

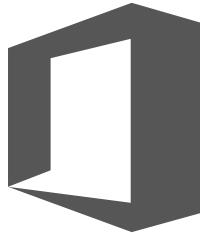
Excel saves your changes in the object properties.

Objective 5.3 practice tasks

The practice file for these tasks is located in the **MOSExcel2016\Objective5** practice file folder. The folder also contains a result file that you can use to check your work.

- Open the **Excel_5-3a** workbook, display the **Summary** sheet, and do the following:
 - Insert the **Excel_5-3b** logo in the upper-left corner of the sheet.
 - Insert a text box on the sheet. Configure the text box to be three inches wide and three inches high, and align it below the heading "Our Prediction."
 - Insert the content of the **Excel_5-3c** text file into the text box. Format the text in 20-point orange Candara font, and center it in the text box.
 - Add alternative text to the logo, using the title Company logo and the description Cartoon image of a person wearing an airplane costume.
- Save the **Excel_5-3a** workbook.
- Open the **Excel_5-3_results** workbook. Compare the two workbooks to check your work.
- Close the open workbooks.

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