

ADVANCED EXCEL

FOR LIFELONG LEARNERS



Expectations

Ready to become an Excel expert? Our Advanced Excel Class is the final piece of the puzzle. Building on the knowledge gained in the Basic and Intermediate classes, you'll delve into PivotTables, advanced data analysis, and data protection. Learn to analyze data like a pro, perform complex calculations, and secure your workbooks. By the end of this three-hour session, you'll have the skills to impress with your Excel powers.

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MICROSOFT EXCEL: ADVANCED

IMPORT DATA

Data for analysis is frequently imported into spreadsheets, commonly from downloaded files. These files are often in CSV (Comma Separated Values)¹ format, a straightforward text format easily opened with basic text editors like Notepad or more sophisticated programs such as Excel.

ACTIVITY 1: IMPORT DATA

1. Start *Excel* and click **NEW → BLANK WORKBOOK**.
2. Click **FILE → SAVE AS → BROWSE**.
3. Navigate to the desired file location and save it with the name *Pivot*.
4. Click **DATA → GET & TRANSFORM → FROM TEXT/CSV**.
5. Navigate to *30-Data.csv*.
6. Click **IMPORT**.
7. Excel will start a wizard to import the CSV data. Since Excel correctly determined the type of data being imported, click **LOAD**.
8. Close the *Queries & Connections* panel by clicking the **X** in the top right corner of that panel.
9. Right-click the *30-Data* tab and choose **RENAME** from the pop-up menu.
10. Enter *Sales Data* as the new name for this tab.
11. Delete the *Sheet1* tab.
12. Save the workbook

INTRODUCTION TO PIVOTTABLES

Pivot tables² are a popular analytical tool for dynamically summarizing data, valued for their customizability and power. They allow easy shifting of data between rows and columns, hence the name 'pivot'. Also known as contingency tables or cross-tabs, pivot tables are commonly used in reports to present tabular data.

- 1 **CSV** (Comma Separated Values): A file format for storing tabular data, where each field is separated by a comma.
- 2 **Pivot Table**: An interactive table in spreadsheet programs like Excel, used to summarize and analyze data, allowing users to rearrange and filter information.

CREATE PIVOT TABLES FOR DATA ANALYSIS

Follow these steps to create a new pivot table from the *Sales Data* worksheet.

ACTIVITY 2: CREATE A PIVOT TABLE

1. Click **A1**.
2. Click **INSERT → TABLES → PIVOTTABLE**.
3. Ensure *New Worksheet* is selected as the location of the new pivot table.
4. Click **OK**.
5. A pivot table is created on a new worksheet. Rename that sheet *Sales Pivot*.
6. Move the *Sales Pivot* worksheet to the right of *Sales Data*.

ACTIVITY 3: SET UP A PIVOT TABLE

1. Drag and drop *Location* in the Field List to the Rows area.
2. Drag and drop *Product Line* in the Field List to the Rows area under *Location*.
3. Drag and drop *Weekly Sales* in the Field List to the Values area.
4. Click and drag *Product Line* from the Rows area to the Columns area.

ACTIVITY 4: USE TOTALS IN A PIVOT TABLE

1. Click the **↓** (down arrow) in *Sum of Weekly Sales* in the Values area.
2. Select **VALUE FIELD SETTINGS**.
3. Change *Custom Name* to *Average Sales*.
4. Select **AVERAGE**.
5. Click **OK**.
6. The average is displayed in seven decimal places, but only two are needed.
7. Click the **↓** (down arrow) in *Average Sales* in the Values area.
8. Select **VALUE FIELD SETTINGS**.
9. Click the **NUMBER FORMAT** button.
10. Choose **NUMBER** and set 2 decimal places (the default setting).
11. Click **OK** two times.
12. Right-click on **G5** (the first *Grand Total* cell).
13. Select **SORT → SORT LARGEST TO SMALLEST**.

ACTIVITY 5: USE CALENDAR DATA

1. Click **A1** in the *Sales Data* worksheet.
2. Click **INSERT → TABLES → PIVOTTABLE**.
3. Click **NEW WORKSHEET**.
4. Click **OK**.
5. Rename the new worksheet *Annual Pivot* and move it to the right of *Sales Pivot*.
6. Click **DATE** in the Field List.
7. Drag *Weekly Sales* from the Field List to Values.
8. Click the plus sign beside the month names in the table to drill down to weeks and days.
9. Drag *Location* from the Field List to Columns.
10. Save the worksheet.

ACTIVITY 6: SORT AND FILTER A PIVOT TABLE

1. To filter the data, click the **↓** (down arrow) to the right of the *Row Labels* headers on the pivot table. Click to include only **JAN**, **FEB**, and **MAR**.
2. Click the **↓** (down arrow) to the right of the *Row Labels* header on the pivot table. Click **SELECT ALL**.
3. Click the **↓** (down arrow) to the right of the *Column Labels* header on the pivot table. Click **SORT Z TO A**. Observe that the locations are now sorted in reverse alphabetical order.
4. Click the **↓** (down arrow) to the right of the *Column Labels* header on the pivot table. Click **SORT A TO A** to return the table to its default sort order.
5. Save the workbook.
6. Click **A5**.
7. To delete *Days* from the date, click **PIVOTTABLE ANALYZE → GROUP → GROUP FIELD**.
8. Click **DAYS** to unselect it. *Months* should be the only Grouping variable left.
9. Click **OK**.
10. Drag *Product Line* from the Field List to the Filters area.
11. Click the **↓** (down arrow) in **B1**
12. Select **BOOKS**.

13. Click **OK**. Notice that the pivot table is instantly updated to include only sales of books.
14. Click the **↓** (down arrow) in **B1**.
15. Select **ALL**.
16. Click **OK**.
17. Save the workbook.

ACTIVITY 7: USE A RECOMMENDED PIVOT TABLE

1. Click **A1** in the *Sales Data* worksheet.
2. Click **INSERT → TABLES → RECOMMENDED PIVOT TABLES**.
3. Excel will analyze the data and create several recommended pivot tables. Click the first recommended pivot table, **SUM OF WEEKLY SALES BY LOCATION**.
4. Click **OK**.
5. Excel creates the pivot table in a new worksheet. Name that worksheet *Sales By Location*. Move *Sales By Location* to the right of *Annual Pivot*.
6. Save the workbook.

CREATE A PIVOT CHART

One of the strengths of creating a pivot table is that the table can be used to create a chart and as the table is modified, the chart is also automatically adjusted. Follow these directions to explore the power of pivot charts.

ACTIVITY 8: CREATE A PIVOT CHART

1. Click **A1** in the *Sales Data* worksheet.
2. Click **INSERT → CHARTS → PIVOT CHART**.
3. In the *Create PivotChart* popup, ensure **NEW WORKSHEET** is selected.
4. Click **OK**.
5. Rename the pivot chart worksheet to *Sales By Product Line*.
6. Move *Sales By Product Line* to the right of *Sales By Location*.
7. In the Field List, select **LOCATION** and **WEEKLY SALES**.
8. In the Field List, uncheck **LOCATION** and select **PRODUCT LINE**.
9. On the chart, click the **↓** (down arrow) beside *Product Line* and check only **BOOKS**.
10. On the chart, click the **↓** (down arrow) beside *Product Line* and check **SELECT ALL**.

11. Click **DESIGN** → **TYPE** → **CHANGE CHART TYPE**.
12. Select **PIE CHART**.
13. Click **OK**.
14. Click the **±** sign at the top right of the pie chart and then click **DATA LABELS**.
15. In the Values area, click **SUM OF WEEKLY SALES** → **VALUE FIELD SETTINGS** → **NUMBER** → **FORMAT**.
16. Click **NUMBER**.
17. Specify **0** decimal places and check **USE 1000 SEPARATOR (,)**.
18. Click **OK**.
19. Click **OK**.
20. Click off the chart so it is no longer selected, and then right-click on the **CHART TITLE**.
21. Select **EDIT TEXT** from the popup menu.
22. Enter *Sales By Location* as the chart title.
23. Other chart elements can be changed using the *Design* tab.
24. Save and close the workbook.

ADVANCED DATA ANALYSIS

SOLVER FOR WHAT-IF ANALYSIS

The Excel Solver³ is an advanced tool used for forecasting and optimizing solutions for intricate business challenges. In this case, the *PeopleMover Transportation Company* aims to use Solver in a spreadsheet to identify the optimal mix of motor coaches for a contract.

As an Add-in⁴, Solver is integrated into Excel but requires activation before use. This is a one-time process; if Solver is already active, this step can be omitted from the exercise.

ACTIVITY 9: ACTIVATE THE SOLVER ADD-IN

1. Click **FILE**.
2. Click **OPTIONS** at the bottom of the left-hand menu.
3. **Excel Solver:** A tool within Excel used for optimization and solving complex problems, such as finding the best combination of elements under given constraints.
4. **Add-in:** An additional software component that can be added to a program to extend its functionality. In this case, the Solver is an Excel add-in.

3. Click **ADD-INS**.
4. Select **EXCEL ADD-INS**.
5. Click **Go**.
6. Click the checkbox beside **SOLVER ADD-IN**.
7. Click **OK**.
8. Notice that there is a new Solver button at **DATA → ANALYZE**.

ACTIVITY 10: LOAD THE SOLVER DATA FILE

1. Click **FILE → OPEN → BROWSE**.
2. Navigate to *31-Data* and click **OPEN**.
3. Click **FILE → SAVE AS → BROWSE**.
4. Navigate to the desired file location and save it with the name *Solver*.

ACTIVITY 11: USE PEOPLE-MOVER

1. Click **DATA → ANALYZE → SOLVER**.
2. In the *Set Objective* box, click the selector button and then click **B12** to select it. Note: since cell *B12* has a name, the Solver may display the name *Ttl_Cost* instead of *B12*.
3. For *To*, Select **MIN** so the Solver looks for the minimum cost.
4. For *By Changing Variable Cells*, enter **E6:E9** to change the number of coaches.
5. Click **ADD** beside the *Subject to the Constraints* box.
6. Specify **E6<=D6** so the coaches allotted do not exceed those on hand, and click **ADD**.
7. Specify that **E6** must be an **INT** since partial coaches are impossible.
8. Click **OK**. Note that the Solver will display the cell names: *Del_Altd* means *Deluxe Allotted* and *Del_OH* means *Deluxe On Hand*.
9. Add constraints for *Large* (cell **E7**), *Mid-Size* (cell **E8**), and *Mini* (cell **E9**) coaches like those for the *Deluxe* coach.
10. Add a constraint that **B11>=B15** since all riders need to have a seat on a coach.
11. When completed, the *Constraints* box should have the requirements illustrated on the right.
12. Check the box for **MAKE UNCONSTRAINED VARIABLES NON-NEGATIVE** since a negative number of coaches or riders is impossible.
13. For *Select a Solving Method*, use the default: *GRG Nonlinear*.

```

Del_Altd <= Del_OH
Del_Altd = integer
Lar_Altd <= Lar_OH
Lar_Altd = integer
Mid_Altd <= Mid_OH
Mid_Altd = integer
Min_Altd <= Min_OH
Min_Altd = integer
Ttl_Cap >= Trip_Riders

```

14. Click **SOLVE**.
15. Click **OK** on the *Solver Results* dialog box.
16. Save and close the workbook.

SCENARIO MANAGER FOR MULTIPLE SCENARIOS

Excel users often adjust variables in a worksheet to observe different outcomes. For instance, a business owner might analyze "best case" and "worst-case" scenarios and then compare the results. This method of exploring various possibilities in Excel is known as creating a scenario.⁵

ACTIVITY 12: USE THE SCENARIO MANAGER

1. Click **FILE → OPEN → BROWSE**.
2. Navigate to *32-Data* and click **OPEN**.
3. Click **FILE → SAVE AS → BROWSE**.
4. Navigate to the desired file location and save it with the name *Scenario*.
5. Click **DATA ⇒ FORECAST ⇒ WHAT-IF ANALYSIS ⇒ SCENARIO MANAGER**.
6. Click **ADD** in the *Scenario Manager* box.
7. Enter these values in the *Add Scenario* box.
 - A) Scenario Name: *Current*. The first scenario will be the current budget and will work as a baseline for the other scenarios.
 - B) Changing Cells: **B6:B7, B17:B26**. These are the cells that the user can change for each scenario.
 - C) Comment: *Baseline budget*, a brief description of the scenario's purpose.
 - D) Prevent Changes: **CHECKED** to protect the changing cell values.
 - E) Hide: **UNCHECKED** so the changing cells are visible.
8. Click **OK**.
9. The *Scenario Values* box will pop up. This is where changeable values are entered.
10. Click **OK** since none of the values will be changed.
11. The *Scenario Manager* will pop up. There is one scenario named *Current*.
12. Click **ADD** to create a new scenario.
13. Enter *Vacation* for the scenario name and *Vacation budget* as a comment.

⁵ **Scenario:** A feature in Excel that allows users to create and save different sets of values, or scenarios, to explore and compare various outcomes.

14. Click **OK**.
15. Change these values: *Clothing, 0; Gifts, 0; Transportation, 800*.
16. Click **OK**.
17. Select **VACATION** and click **SHOW** in the *Scenario Manager* box.
18. Select **CURRENT** and click **SHOW** in the *Scenario Manager* box.
19. Click **ADD** in the *Scenario Manager*.
20. Name the new scenario *Home Improvement* and enter *Bathroom remodel* as a comment.
21. Click **OK**.
22. Change these values: *Clothing, 0; Dining Out, 0; Gifts, 0; Groceries, 500; Subscriptions, 100*.
23. Click **OK**.
24. Select **CURRENT** and click **SHOW** in the *Scenario Manager* box.
25. Click **ADD** in the *Scenario Manager*.
26. Enter *Classes* for the scenario name and *Career training* as a comment.
27. Click **OK**.
28. Change these values: *Dining Out, 0; Gifts, 0; Shopping, 0; Transportation, 1000; Utilities, 600*.
29. Click **OK**.
30. Each of the four scenarios can be viewed by clicking its name and **SHOW**.
31. Click **SUMMARY** in the *Scenario Manager* box.
32. Select the **SCENARIO SUMMARY** radio button.
33. The result cell, **B29**, is the best reporting option.
34. Click **OK**.
35. Save and close the workbook.

WORK WITH DATA

LINK SHEETS AND SUMMARY DATA

ACTIVITY 13: GROUP WORKSHEETS

1. Click **FILE → OPEN → BROWSE**.
2. Navigate to *33-Data* and click **OPEN**.

3. Click **FILE → SAVE AS → BROWSE**.
4. Navigate to the desired file location and save it with the name *Summary*.
5. Click the *Summary* worksheet tab to activate it.
6. Click **B5**.
7. Type `=SUM(`. (Make sure to type the open parentheses.)
8. Click the *Elm_Street_Store* worksheet.
9. Hold **SHIFT** down and click the *Willow_Lane_Store* worksheet.
10. Click **B7** (this will be on the *Elm_Street_Store* worksheet) and tap **ENTER**. Cell **B5** on the *Summary* worksheet should display 104,720. The formula bar should show the following: `=SUM(Elm_Street_Store:Willow_Lane_Store!B7)`.
11. For another 3-D sum, click **B6**.
12. Type `=SUM(`. (Make sure to type the open parentheses.)
13. Click the *Elm_Street_Store* worksheet.
14. Hold **SHIFT** down and click the *Willow_Lane_Store* worksheet.
15. Click **B8** (this will be on the *Elm_Street_Store* worksheet) and tap **ENTER**. Cell **B6** on the *Summary* worksheet should display 188,960.
16. Auto fill **B6** to **B7:B9**.
17. Click **A11**.
18. Enter *Grand Total*.
19. Click **B11** and enter `=sum(B5:B9)`.
20. Save the workbook.

PROTECT WORKSHEETS AND WORKBOOKS

When managing a spreadsheet, it's often important to lock⁶ specific cells to prevent accidental modifications. This step ensures data integrity and maintains the spreadsheet's intended functionality.

ACTIVITY 14: PROTECT WORKSHEETS

1. Select **A5:A9**. These are the only cells that users should be able to modify.
2. Click **HOME ⇒ CELLS ⇒ FORMAT ⇒ LOCK CELL**. When locked, the cell lock icon will not be enclosed in a square.

- 6 **Locking Cells:** A feature in Excel used to prevent editing or altering of specific cells within a spreadsheet, typically used to protect data or formulas from unintended changes.

3. Click cell **A1**.
4. Click **HOME ⇒ CELLS ⇒ FORMAT ⇒ PROTECT SHEET**.
5. On the Protect Sheet dialog box, check *Protect worksheet and contents of locked cells*.
6. Uncheck all options except *Select Unlocked Cells*.
7. Click **Ok**.
8. Notice that now the mouse cannot click in any cell except **A5 : A9**.
9. Click **HOME ⇒ CELLS ⇒ FORMAT ⇒ UNPROTECT SHEET**.
10. Select **A5 : A9**.
11. Click **HOME ⇒ CELLS ⇒ FORMAT ⇒ LOCK CELL**. When unlocked, the cell lock icon will be enclosed in a square.
12. Save and close the workbook.

Another option for securing a spreadsheet is to password-protect the entire workbook, which prevents it from being opened without the correct password. To do this, open the workbook and go to *Review → Protect → Protect Workbook*. However, be cautious: once a password is set, it cannot be bypassed, so it's crucial not to forget it.

EXPORT DATA

Exporting data from Excel in different formats can be vital. Consider this scenario: You're analyzing a spreadsheet, but not everyone uses Excel. Maybe colleagues use other software, or you need to upload data to a specific program. Exporting to formats like CSV, PDF, or XML ensures accessibility on various platforms. Formats like PDF also allow data sharing while preventing alterations. Mastering export options broadens your capabilities.

Here are brief descriptions for several popular file types.

- **XLS**: Excel's older proprietary format, less advanced than XLSX.
- **XLSX**: Microsoft's current Excel format, feature-rich and widely used.
- **ODS**: Open Document Spreadsheet, compatible with programs like LibreOffice.
- **CSV**: Simple, text-based format for tabular data, easy to import/export.
- **XML**: eXtensible Markup Language, versatile for structured data, often used in web data transmission.
- **PDF**: Portable Document Format, read-only, preserves layout for printing.

To export a workbook in a different format, click *File → Save As* and then choose the desired format from the drop-down menu.

FUN FACTS

Excel is much more than just rows and columns. Here are a few interesting tidbits about Excel.

1. **The Easter Egg Game:** Older versions of Excel included hidden Easter eggs. One of the most famous was a flight simulator in Excel 97. Just a little "egg-stra" fun!
2. **Cell Overload:** Excel worksheets can technically hold over 17 billion cells. That's more cells than there are people on Earth!
3. **The 15-Digit Limit:** Excel can only handle 15 significant digits in a single cell. Anything more, and it rounds off or replaces with zeros. So, maybe don't use Excel to calculate intergalactic distances!
4. **Excel Music:** Someone actually used Excel to compose a music! You can hear the music and the composer's explanation at his blog. Talk about a harmonious relationship between math and music. <https://technabob.com/blog/2019/12/06/making-music-with-microsoft-excel/>
5. **Excel Art:** Tatsuo Horiuchi, a 73-year-old Japanese artist, creates impressive still-life art using only Excel as his canvas. Examples of his work and a brief explanation of how he makes them can be found at <https://www.demilked.com/73-year-old-excel-paintings-tatsuo-horiuchi/>.
6. **First Mouse Requirement:** The first version of Excel was designed for the Macintosh and was one of the first software that required a mouse.

EXTRA PRACTICE

To practice these skills, complete this employee analysis.

ACTIVITY 15: OPEN THE DATA FILE

1. Start Excel and click **NEW → BLANK WORKBOOK**.
2. Click **FILE → SAVE AS → BROWSE**.
3. Navigate to the desired file location and save it with the name **EMPLOYEE**.
4. Click **DATA → GET & TRANSFORM → FROM CSV**.
5. Navigate to *34-Data.csv*.
6. Click **IMPORT**.
7. Click **LOAD**.
8. Close the *Queries & Connections* panel.
9. Delete *Sheet1*.
10. Rename the *34-Data* tab to *Employee-Data*.

11. Save the Workbook.

Question 1: What is the average salary for each role?

ACTIVITY 16: FIND THE AVERAGE SALARY

1. Create a pivot table on a new worksheet and name that worksheet *Avr Salary*. Move the worksheet to the right of *Employee-Data*.
2. List the roles in the business (like Accounting and Associate), the number of people and average salary for each role. Hint: the *Role* field should be dragged to both the Rows and Values areas.
3. The *Salary* field should be changed from sum to average, and it should also be formatted as currency with two decimal places.
4. Right-click **C4** and sort the list to make the highest salary first.
5. Save the workbook.

Question 2: What is the average age of the employees when broken down by sex and marital status?

ACTIVITY 17: FIND THE AVERAGE AGE

1. Click **A1** in the *Employee-Data* worksheet and create a pivot table on a new worksheet.
2. Name the worksheet *Avr Age* and move it to the right of *Avr Salary*.
3. The pivot table should list the average age by *marital status* (rows) and *sex* (columns).
4. The average age should be renamed *Average Age* and formatted as a number with zero decimal places.
5. Click **D4**.
6. Using the formula bar, change the value to *Avr Age*.
7. Save the workbook.

Question 3: How many employees have been hired each year since 2007?

ACTIVITY 18: FIND EMPLOYEE LONGEVITY

1. Click **A1** in the *Employee-Data* worksheet and create a pivot table on a new worksheet.
2. The worksheet should be named *Year Hired* and moved to the right of *Avr Age*.
3. The pivot table should list the employee count by year hired. (Hint: count the *username* field since each employee has a unique username.)

4. The *username* field should be labeled Count.
5. The hired field should display only years, not quarters or months.
6. The list should be sorted by year, with 2007 first (this is the default).
7. Save the workbook.

Question 4: How many employees work in each role?

ACTIVITY 19: CHART ROLE COUNTS

1. Click **A1** in the *Employee-Data* worksheet and create a pivot chart on a new worksheet.
2. The worksheet should be named Count By Role Chart and moved to the right of *Year Hired*.
3. The pivot table should show the count by role. (Hint: count the *username* field since each employee has a unique username.)
4. The *Count of username* field should be labeled Count By Role.
5. Change the chart title to Count By Role.
6. The data should be sorted such that the role with the most employees (Associate) should be first.
7. Save the workbook.

SUMMARY

You've now explored many powerful Excel features for analyzing data and solving complex problems. From pivot tables to Solver, these tools offer immense capabilities. Don't let them gather virtual dust - put your new skills to work! Continue honing your Excel mastery. Implement what you've learned in real-world situations, whether personal finance, academic projects, or business tasks. The more you practice, the more Excel excellence you'll achieve. Keep this handout for reference as you progress on your journey to Excel expertise!

