# Excel: Data Management

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**Abstract:** This document introduces users to using Microsoft Excel to manage information in lists. This handout explains how to use Excel's list, data forms, filtering, and subtotals features, as well as how to manage windows and link data and/or formulas. It is used in conjunction with the *Excel: Data Management* workshop.

## Contents

# Introduction

Microsoft Excel has many capabilities that make it suitable for use as a data management tool. By entering data into a spreadsheet in a list format, users can take advantage of these capabilities, which include sorting, grouping, filtering, summarizing, and subtotaling.

# Objectives

The goal of this workshop is to use the list capabilities of the Excel program. After today's workshop, participants will be able to:

- Sort a data list.
- Filter a data list according to criteria.
- Extract data list information.
- Use the subtotal function.
- Adjust the spreadsheet windows.

# Prerequisites

It is assumed that the participants in this workshop have either taken the *Excel: Introduction* workshop or have equivalent skills.

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# Using Excel lists

An Excel *list* provides features designed to make it easy to manage and analyze groups of related data in a worksheet. Essentially a basic database, an Excel list may be used to:

- Search or query to find specific data
- Sort data alphabetically and numerically by rows or columns in ascending or descending order
- Extract subsets of the data based on defined criteria
- Perform statistical calculations on the data for analysis and decision-making
- Print data organized for specific purposes

# *Creating a List*

## Set Up the List Data

After deciding on the design for a list, set up the list by entering the data according to the following guidelines:

***List size***: A list can be as large as an entire worksheet, but it is best to put only one list on a worksheet. In addition, make sure that there is a blank column and blank row between the list and any other data on the worksheet. (This is not absolutely necessary, but allows Excel to select the list automatically when appropriate.) The list itself should not contain blank rows or columns.

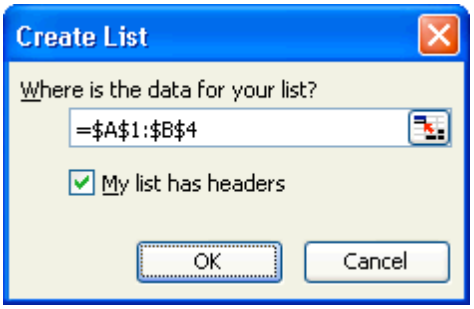
***Header row***: The top row of the list should consist of *headers*, names for the columns in the list. A header may contain a maximum of 255 characters. Each header should be unique.

***Capitalization***: Use either uppercase or lowercase letters. Excel ignores capitalization when searching a list.

***Formulas***: Data in list columns may include formulas that calculate values from others in the list.

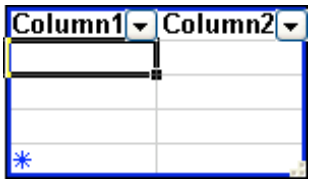
## Make it an Excel List

1. Click any cell in the list.
2. Click the **Data** menu, point to **List**, and click **Create List**.




*The Create List dialog box*

3. Confirm that the range reference indicated in the **Create List** window is correct, and that the **My list has headers** checkbox is checked if your data has a header row (as recommended above), or cleared if it does not.
4. Click **OK**.




*An Excel list*

The range of cells designated as a list gains a number of features:

- A dark blue *border* outlines the list.
- *AutoFilter buttons* appear in every column in the list (in the header row), enabling you to quickly sort or filter your data. (See *AutoFilter*, page 9.)
- The *insert row*, denoted by the asterisk, is added. Typing information in this row adds data to the list, and the list will automatically resize to accommodate it.
- The *resize handle*, in the lower right corner of the border, can be dragged to modify the size of the list.

In addition, the **List** toolbar appears.


*The List toolbar*

# Sorting

After a list is created, Excel can organize or format the information quickly. Sorting organizes the data in a list alphabetically, numerically, chronologically or in any order you want. Sorting rearranges the rows according to the contents of the column by which the sort is performed. It is also possible to sort multiple fields as well as data within a single column.

**Note:** If you sort data within a single column, it only sorts the data in that column. It will **not** rearrange the rows. This may have undesirable effects.

## *To perform a Simple Sort*

There are several ways to sort the entire list by a single column. Here are two of the simplest.

### Using the Standard Toolbar

1. Click any cell in the column by which you want to sort.
2. Click either the **Sort Ascending** button or the **Sort Descending** button in the **Standard** toolbar.

*The Sort Ascending and Sort Descending toolbar buttons*

### Using the AutoFilter Buttons

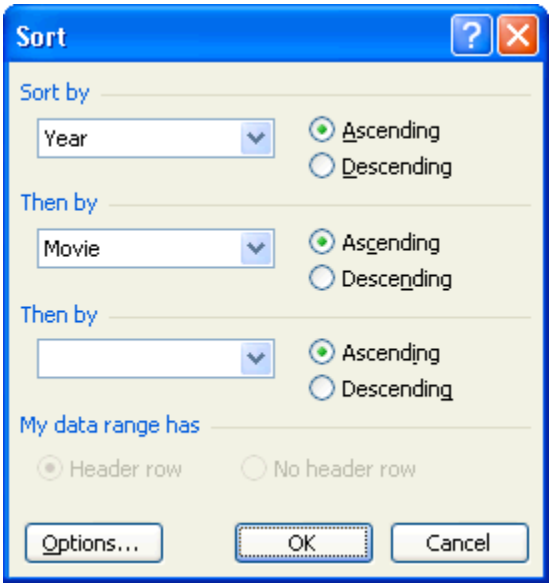
1. Click the AutoFilter button in the header of the column by which you want to sort.

*An AutoFilter button*

2. Click either **Sort Ascending** or **Sort Descending** at the top of the scrolling menu.

## *To Sort by Multiple Columns*

1. Select a single cell in the list.
2. Click the **Data** menu and choose **Sort**
   *or*
   click **List** on the **List** toolbar and choose **Sort**.




*Multiple column sort*

3. Click the down arrow next to the **Sort by** input box to choose the primary sort column.
4. Next select whether the sort should be ascending or descending by clicking the radio buttons to the right of the column selection.
5. Repeat steps #3 and #4, using the **Then by** boxes to define secondary and tertiary sort criteria if necessary.
6. Click **OK**.

# Data Forms

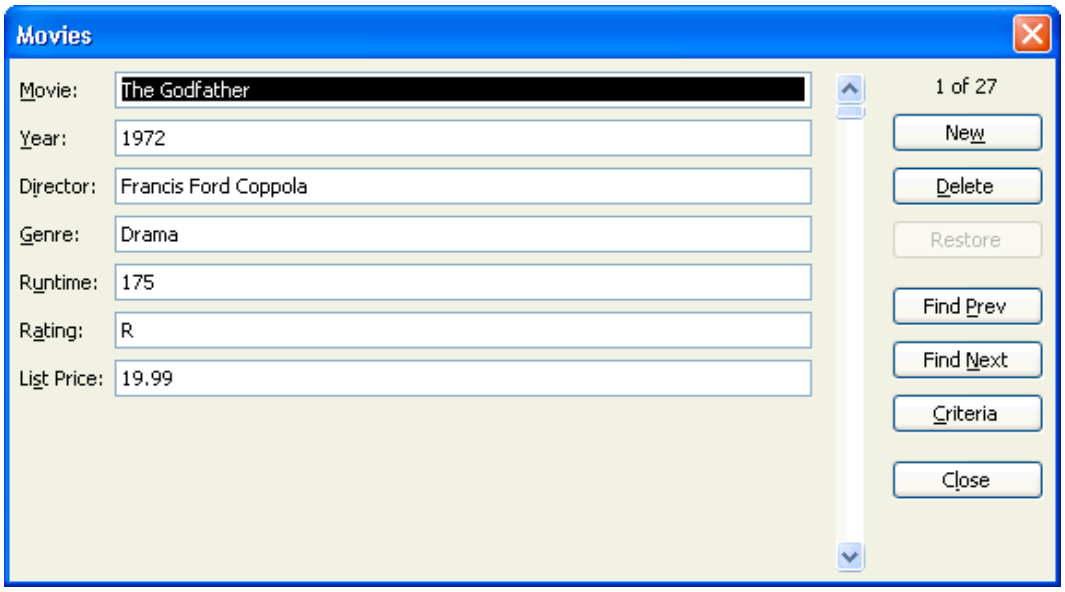
Excel has a built in form feature that enables you to input data into a list. The data form displays all of your column labels in a single dialog box, with a blank space beside each label for you to fill in data for a new column. You can enter new data, find rows based on cell contents, update existing data, and delete rows from the list.

A data form can make data entry easier than typing across the columns when you have a wide list with more columns than will fit on the screen at one time, or when a list is so long that you have to scroll down to access the insert row.

# *Adding Data Using the Data Form*

To add records using the **Form**, you can do the following:

1. Click somewhere within your data list.
2. Click the **Data** menu and choose **Form**.




*A data form*

3. A data form will open and you'll see the first row, or *record*, from your list in the form.
4. To add a record to the list, click the **New** button and enter the information.
5. To move from field to field, press the Tab key.
6. Once you've finished entering the new record, you can press Enter to enter another new record or you can click the **Close** button to close the form.

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**Note:** The **Delete** button will permanently delete the record that is displayed in the form. If you click this button, you will **not** be able to use **Undo** to retrieve the record.

The **Restore** button restores all the fields to blank if you are **entering** a record and decide you don't want it. It will also restore an existing record if you changed the record information, but have **not moved off the record**.

If you have fields that are based on formulas, such as a **Total** column, you will not be able to enter any data into that field in the form. It will appear grayed out.

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# *Finding Records Using Criteria*

You can also use the data form to find records that meet certain criteria. For instance, you could find all employees that contribute at least $2000 a year to their retirement plan.

1. Click anywhere in your list.
2. Click the **Data** menu and click **Form**.
3. Click the **Criteria** button.
4. When you do this, all of the fields will become blank and the word **Criteria** will appear above the **New** button.
5. Enter the comparison criteria into the form.
6. Click the **Find Next** button to find the first record that meets your criteria. Continue to click **Find Next** until you have found the record(s) you want.

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**Note:** You can also use the **Find Previous** button if you want to go back up your list.

You **cannot** use this form to modify existing records when using the criteria feature.

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## Types of Criteria

Criteria can be a string of characters that you want to match or an expression involving a comparison operator. Here are the different operators you can use and what they mean:

| Operator | Meaning |
|---|---|
| > | Greater than |
| < | Less than |
| >= | Greater than or equal to |
| <= | Less than or equal to |
| * | Wildcard takes the place of as many characters as needed |

If you enter criteria into more than one field, Excel will use an implied **and**, which means that the record must meet all of the criteria to be shown.

Click the **Form** button to return to the display of all records.

# Filtering Data

One way of showing data from a list that meets certain conditions is by using *filters*. Filtering extracts data from the list by identifying the subset of the data that satisfies the criteria you choose. There are two ways to filter data in Excel, **AutoFilter** and **Advanced Filter**.

# AutoFilter

A quick way to filter data in a list is by using AutoFilter. This filter automatically provides certain criteria that can be used to extract a subset of data.

AutoFilter is automatically enabled for Excel lists (see *Creating a List*, page 4). (Otherwise, it can be enabled by clicking the **Data** menu, pointing to **Filter**, and clicking **AutoFilter**.)

*An AutoFilter button*

To filter the list, click an AutoFilter button and choose a value from the scrolling menu. Only rows having the selected value in the filter column will be displayed. The arrow in the AutoFilter button for the column you chose and the numbers of the rows will both turn blue to indicate that what you're seeing is a filtered subset of the list.

You can select other criteria from the AutoFilter buttons of other columns. Continuing to do this creates an "and" condition, meaning that, in order for a row to show, it must meet the criteria for all of the columns in which you applied a filter.

To display all of your data again, click the AutoFilter button of the column you had set criteria for and choose **(All)**. If you chose more than one criterion, you can click the **Data** menu, point to **Filter**, and choose **Show All**.

# Advanced Filters

Sometimes you might find the need to create more specialized filters that use the operators "or" or "and" and look for multiple criteria from several columns. **Advanced Filters** can help you accomplish this. To create this type of filter, you have to do two things: (1) set up the criteria and (2) execute the filter.

## Setting up the Criteria

The first thing to do before filtering a list of data is to set up the criteria range, a range of cells *outside your list* that specifies the comparison criteria. The criteria range consists of at least two things:

- Duplicates of the list column name(s) on which you're imposing restrictions (criteria).
- The criteria that must be met in order for the row not to be filtered out.

There are different types of criteria that you can use for filters, and you can always use more than one column and criterion. The following lists several examples and shows different ways of setting up the criteria in your worksheet.

## *Criteria with Operators*

There are many different operators you can use when creating criteria, such as greater than (>), less than (<), greater than or equal to (>=), less than or equal to (<=), and any combination of those. In this example, not only are operators being used, but the implied ***and*** operator is also used because all of the criteria appear on the same row.

| Genre | Runtime | Runtime |
|---|---|---|
| Action | >90 | <120 |

## *And*

Sometimes you might find you need to find records that meet more than one criterion. Anytime you place criteria on the same row, Excel uses the implied ***and*** operator. The picture shown above represents the use of ***and***. In order not to be filtered out by these criteria, records must be of Genre "Action" ***and*** must have a Runtime value between 90 and 120 (i.e., greater than 90 ***and*** less than 120).

The following criteria also use ***and***. Records must be of Genre "Comedy" ***and*** must have an "R" Rating.

| Genre | Rating |
|---|---|
| Comedy | R |

## *Or*

Another option is to search for records that meet any of multiple criteria that you choose. This is useful when you want to search for multiple records that don't necessarily have to meet the same criteria. We can modify the previous example to use an ***or*** instead of an ***and***.

| Genre | Rating |
|---|---|
| Comedy | |
| | R |

Notice that while the criteria and column names remained the same, the way in which the criteria were created was changed. Instead of the criteria being on the same row, the criteria were placed on different rows. This informs Excel that records should not be filtered out if they are of Genre "Comedy" ***or*** have an "R" Rating.

## *Complex Criteria*

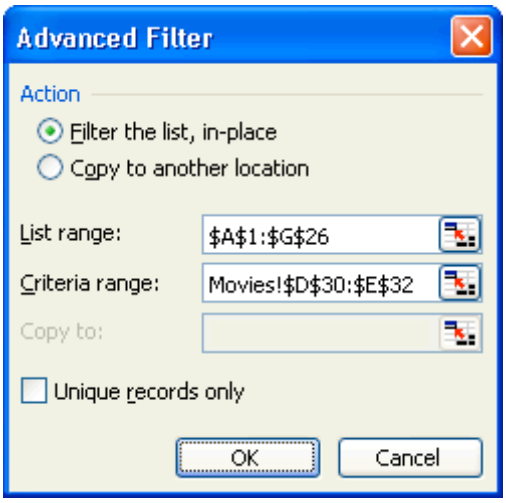
There might be times when you need to use both ***and*** and ***or*** combinations in your criteria range. For example, we may wish to see Westerns that are shorter than 90 minutes and Dramas that are shorter than 2 hours. In our criteria range, that would look like this:

| Genre | Runtime |
|---|---|
| Western | <90 |
| Drama | <120 |

We can interpret this as follows: in order for a record not to be filtered out, it must be (1) a Western shorter than 90 minutes ***or*** (2) a Drama shorter than 120 minutes.

## Executing the Filter

Once you've set up the criteria range, you're now ready to execute the filter.




*The Advanced Filter dialog box*

1. Click anywhere in your list. Click the **Data** menu, point to **Filter**, and choose **Advanced Filter**.
   a. **List range:** This is the list and will appear as an absolute reference.
   b. **Criteria range:** This is the criteria range that you set up before going through the advanced filter. To specify the criteria range, first click in the **Criteria range** field, then select the range in the worksheet that contains the criteria. This range will appear as an absolute reference.
   c. **Action:** The default action is to filter the list in place. You can instead choose to copy the list to a different location. If you choose this option, you'll need to click in the **Copy to** field, then click on the cell within the same worksheet where you want the information to start.

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**Note:** If you choose to copy the filtered list to a different location, it must be in the same worksheet that the original list is in. You **cannot** copy the filtered list to a different worksheet.

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2. Click **OK**.

If you chose to filter the list in place, any rows that don't meet the criteria you specified will be hidden. The number(s) of the row(s) that does (do) meet the criteria will turn blue.

If you chose to copy the rows that meet the criteria to another location, each that meets the criteria you set will be copied.

If you filtered in place and want to return to the original list, click the **Data** menu, point to **Filter**, and choose **Show All**. If you copied the filtered list, simply delete the range that contains the records.

## *Special Features for Filtered Lists*

There are many different reasons to filter a list of data. Here are just a few:

- Charting only data that meets certain criteria.
- Using functions, such as AutoSum, or other types of calculations.
- Printing only filtered data.
- Formatting only data that meets certain criteria.
- Deleting only those records.

# Totals and Subtotals

## *Total Row*

Click the **Toggle Total Row** button in the **List** toolbar (or click the **Data** menu, point to **List**, and click **Total Row**), and a total row is added to the bottom of your list.


*The Toggle Total Row button*

If the rightmost column contains numeric data, Excel automatically adds the data in that column. You can click any cell within the total row to **Sum** its column—or choose instead to display any of a number of other aggregate functions, including:

- **Average**: the average of the values
- **Count**: the number of data values
- **Count Nums**: the number of data values that are numbers
- **Max**: the largest value
- **Min**: the smallest value
- **StdDev**: an estimate of the standard of deviation of a population, where the sample is a subset of the entire population
- **Var**: an estimate of the variance of a population, where the population is all of the data to be summarized

Just pick the function you want from the drop-down list that appears when you click the total row cell. (You can choose **None** if you don't want any aggregate value for a column.)

## *Subtotals*

Excel's **Subtotals** feature quickly summarizes data within a list. Based upon the data you select, Excel can automatically calculate both subtotals and grand totals. Subtotals are based on organized, sorted groups of data.

**Note:** Unfortunately, the **Subtotals** feature does not work with formally designated lists (those marked with a blue border). Before applying the **Subtotals** feature to an Excel list, you must first convert it to an ordinary range by clicking the **Data** menu, pointing to **List**, and clicking **Convert to Range**.

Doing so will:

- remove the blue border
- enable the **Subtotals** feature
- disable the insert row
- disable the total row

## Organizing Data for Subtotals

Before using subtotals, the data to analyze *must* be sorted in some fashion (see *Sorting*, page 5). This is necessary because the subtotals feature of Excel calculates summary data (i.e., subtotals) based on groups of contiguous rows. By sorting, we create these groups in our list. For example, consider a list of employees where each employee record has a **Department** field and a **Retirement Plan** field. If you want to know how many employees are in each department, you prepare for using subtotals by sorting by the **Department** field to group the departments together. Once you've sorted the information and groups are formed, you're ready to use the subtotal feature to count the number of employees in each group (in this case, department).

When you create your primary subtotal, the sort column you specify as your primary sort must be the column on which you want to base your subtotals.

**Note:** That does **not** mean the subtotal must be *added* to that column. It means that for the **At each change in:** field, you must use the column name that you sorted by.

Using the above example, the column to which you would apply the subtotal would be the **Department** column. The number of times the department name appears would tell you how many people work in each department. The calculation that is to be performed is one of counting, and because of this, you would use the **Count** function.

If you want to subtotal more than one column, use the second and third level sort options to organize the list into secondary and tertiary groups.

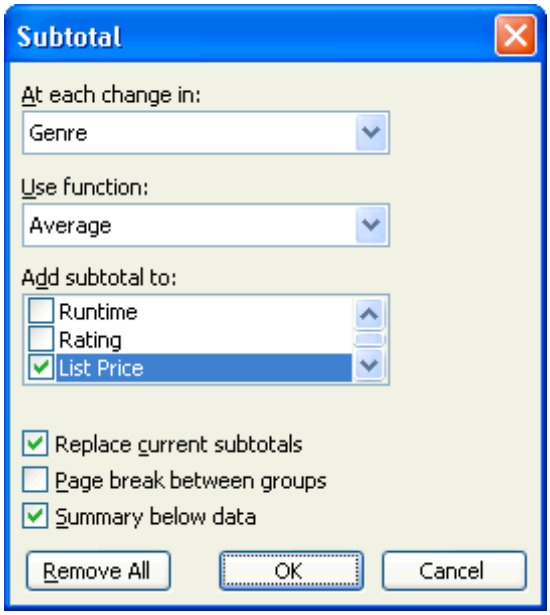
Using the above example, you could count not only how many people are in each department, but also how many people in a particular department use a specific retirement plan. To do this, you would set the primary sort on **Department** with a secondary sort on **Retirement Plan** before using the subtotal feature. The first subtotal would be based on the **Department** field. The second subtotal would be based on the **Retirement Plan** field, and would **not** replace the first one.

## Displaying a Subtotal

Once you've organized your data by at least a primary sort, you're ready to use Excel's subtotal feature.

1. Select a cell within your list.
2. Click the **Data** menu, point to **List**, and click **Convert to Range**. (See the note on page 13.)
3. Click the **Data** menu and click **Subtotals**.




*The Subtotal dialog box*

4. In the **At each change in** field, click on the drop down arrow and select the field that is your primary sort.
5. In the **Use function** field, click on the drop down arrow and choose which function you want to use. This is the summary function you'd like to calculate on your data.
6. To determine which values to calculate using the function you selected, check one or more fields in the **Add subtotal to** field.
7. By default, **Replace current subtotals** and **Summary below data** are checked. If you want the summary (total for each group) to appear first and the details for each record appear next, uncheck the **Summary below data** box. If want to print each group on a separate page, check **Page break between groups**.
8. Once you've selected your options, click **OK**.

### *Nested Subtotals*

You can have multiple levels of subtotals, subtotals for smaller groups, within your primary (original) subtotals groups. If you want another subtotal inside of the one you just did, go back through steps #3 through #7, but for the **At each change in** field, choose the secondary sorted field. Also, make sure that you *uncheck* **Replace current subtotals** so it doesn't replace the one you previously did. These are called **nested subtotals**.

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | **Movie** | **Year** | **Director** | **Genre** | **Runtime** | **Rating** | **List Price** |
| 2 | Star Wars: Episode V - The Empire Strikes Back | 1980 | Irvin Kershner | Action | 129 | PG | $49.98 |
| 3 | Star Wars | 1977 | George Lucas | Action | 125 | PG | $49.98 |
| 4 | | | | | **PG Count** | 2 | |
| 5 | The Lord of the Rings: The Return of the King | 2003 | Peter Jackson | Action | 251 | PG-13 | $29.98 |
| 6 | The Lord of the Rings: The Fellowship of the Ring | 2001 | Peter Jackson | Action | 208 | PG-13 | $29.98 |
| 7 | The Lord of the Rings: The Two Towers | 2002 | Peter Jackson | Action | 223 | PG-13 | $29.98 |
| 8 | | | | | **PG-13 Count** | 3 | |
| 9 | Raiders of the Lost Ark | 1981 | Steven Spielberg | Action | 115 | R | $69.98 |
| 10 | | | | | **R Count** | 1 | |
| 11 | | | | **Action Average** | | | $43.31 |
| 16 | | | | **Comedy Average** | | | $27.47 |
| 32 | | | | **Drama Average** | | | $25.56 |
| 41 | | | | **Thriller Average** | | | $21.57 |
| 46 | | | | **Western Average** | | | $21.48 |
| 47 | | | | | **Grand Count** | 27 | |
| 48 | | | | **Grand Average** | | | $28.61 |

*An example of nested subtotals*

## *Using More Than One Summary Function on a Column*

You can calculate the values within a column using more than one function. For example, you may want to sum a column and also count the number of values in that same column.

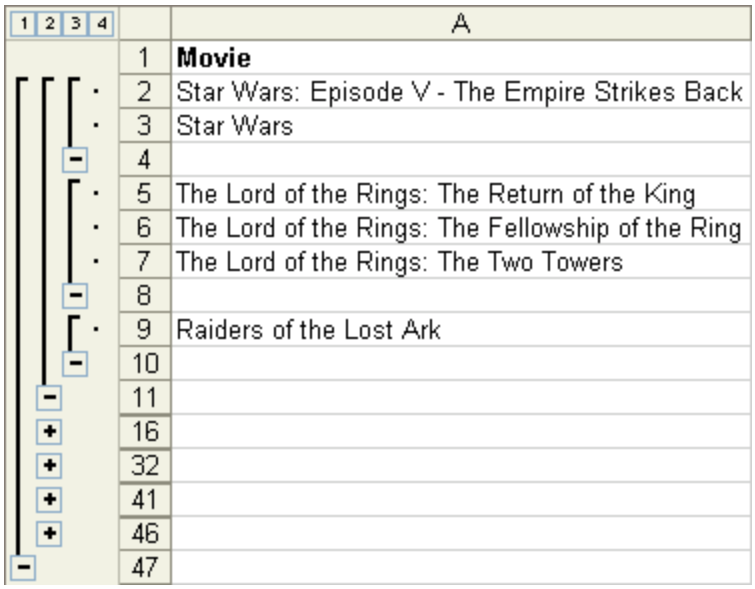
To use more than one summary function on one column,

1. Click the **Data** menu and click **Subtotals**.
2. Select the first function in the **Use function** field.
3. Click **OK**.
4. Click the **Data** menu again and click **Subtotals**.
5. Select another function in the **Use function** field.
6. *Clear* the **Replace current subtotals** check box.
7. Click **OK**.

You can repeat this procedure to calculate using additional functions.

## *Subtotal Outlines*

When you subtotal, rows are added to display the subtotals, and the data list is organized in outline format. At the top left, level markers allow you to quickly collapse all items at or below a given level At the left, outline markers allow you to expand (+) and collapse (-) individual groups.



| | A |
|---|---|
| 1 | **Movie** |
| 2 | Star Wars: Episode V - The Empire Strikes Back |
| 3 | Star Wars |
| 4 | |
| 5 | The Lord of the Rings: The Return of the King |
| 6 | The Lord of the Rings: The Fellowship of the Ring |
| 7 | The Lord of the Rings: The Two Towers |
| 8 | |
| 9 | Raiders of the Lost Ark |
| 10 | |
| 11 | |
| 16 | |
| 32 | |
| 41 | |
| 46 | |
| 47 | |

*Expanded and collapsed subtotal outline groups*

- To expand individual groups, click the plus sign (+) for the group at the left of the spreadsheet window.
- To collapse individual groups click the minus sign (-) for the group at the left of the spreadsheet window.
- To display only the grand totals, click the **1** at the top left of the spreadsheet window.
- To display all levels of the outline, click the largest number at the top left of the spreadsheet window.
- To display only subtotals of the outline, click the **2** (or additional numbers) at the top left of the spreadsheet window.

### *Removing Subtotals*

To remove subtotals from your list:

1. Click on the **Data** menu and click **Subtotals**.
2. Click the **Remove All** button.

# Managing Windows

## *Multiple Windows*

Every document is viewed in a window. There can be many windows for the same document open on the screen or there can be one window for each of several documents opened at the same time. When working with a list and using the **Advanced Filter**, it may be convenient to view the criteria in one window and the list in another.

To open another window for the same document:

1. Make sure that the window for the worksheet is active.
2. From the **Window** menu, choose **New Window**. Excel uses the same worksheet name for both the windows but adds a number to the name.

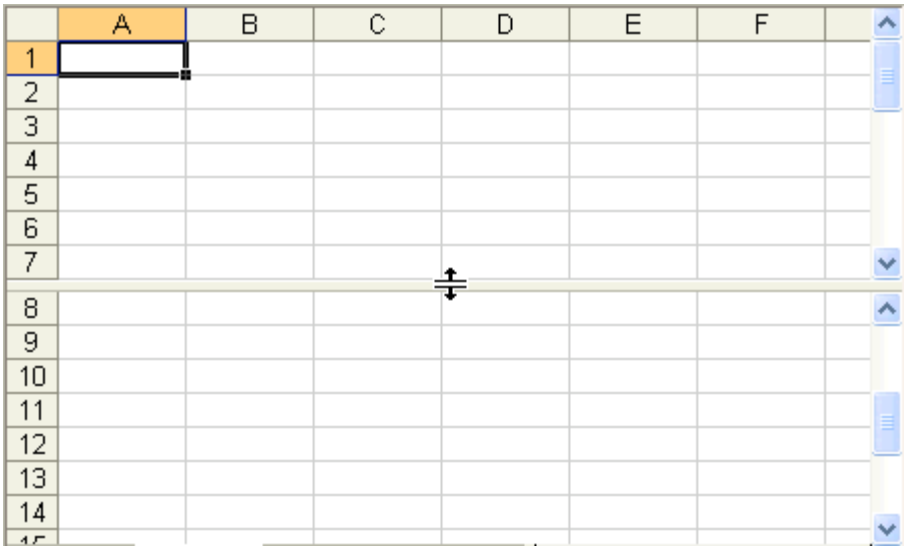
To activate a window, click anywhere in the window. All the windows that are currently available are listed in the **Window** menu. Choosing any of these names can also activate the window.

To move a window, drag it by its title bar.

**Note:** If the document title bar is not visible, click the **Restore Window** button by the menu bar to create a moveable window.

## *Splitting Windows*

Rather than creating another window and scrolling each independently, a single window can be split into panes by dragging either of the split bars to another location. Split bars are located directly above the up arrow button on the vertical scroll bar, and directly right of the right arrow button on the horizontal scroll bar. After splitting a window, its pane size may be changed by dragging the split bar.




*A horizontal split bar*

Remove a horizontal split by dragging the split bar to the top or bottom edge of the window. Remove a vertical split by dragging the split bar to the left or right edge of the window.

## *Freezing Panes*

You can also lock cells so that they never scroll out of view by freezing panes. For example, you could freeze the header row of your list to keep it visible as you scroll.

1. To lock rows, select the row below where you want the split to appear.

   To lock columns, select the column to the right of where you want the split to appear.

   To lock both rows and columns, click the cell below and to the right of where you want the split to appear.

2. On the **Window** menu, click **Freeze Panes**.

To unlock cells, click **Unfreeze Panes** on the **Window** menu.

## Linking Data

If you want to link one cell or range to another between worksheets, one way to do this is by using the **Paste Special** dialog box.

1. Select the data you want to copy.
2. Use any of the available methods to copy the data to the clipboard (e.g., **Copy** command on the **Edit** menu, **Copy** button on the **Standard** toolbar, Ctrl-C keystroke).
3. Access the worksheet where you want to link to the data and select the appropriate cell.
4. Click the **Edit** menu and click **Paste Special**.
5. Click the **Paste Link** button in the **Paste Special** dialog box that appears.
6. The worksheet displays the value of the copied cell or range. Note however the formula in the formula bar: it displays the *3-D reference* to the copied cell or range.

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**Note:** Linked cells are updated when the workbook that contains the linked cell is opened.

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## Getting Additional Help

The Help Desk provides consulting and Q&A help in a variety of ways:

785/864-0200
question@ku.edu
www.ku.edu/~helpdesk

*Last Update: 01/29/2006*