COMP1000 / Spreadsheets – Week 2 Review

- Plot chart
  - Column chart/bar chart/pie chart
- Customize chart
  - Chart style/labels/titles
  - Add trendline
- Create table
  - Create table/apply different style/print table
- Sort/filter data

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Excel Comprehensive Chapter 5 Subtotals, Pivot Tables, PivotCharts

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Objectives

- Group and ungroup data
- Subtotal data
- Create a PivotTable
- Change the values field
- Modify a PivotTable
- Sort, filter, and slice a PivotTable
- Create a calculated field
- Format a PivotTable
- Create a PivotChart

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Group and Ungroup Data

- Group rows or columns of related data into an outline
- Expand or collapse groups depending on your focus
- Excel will not create an outline or group data if the dataset does not contain a formula

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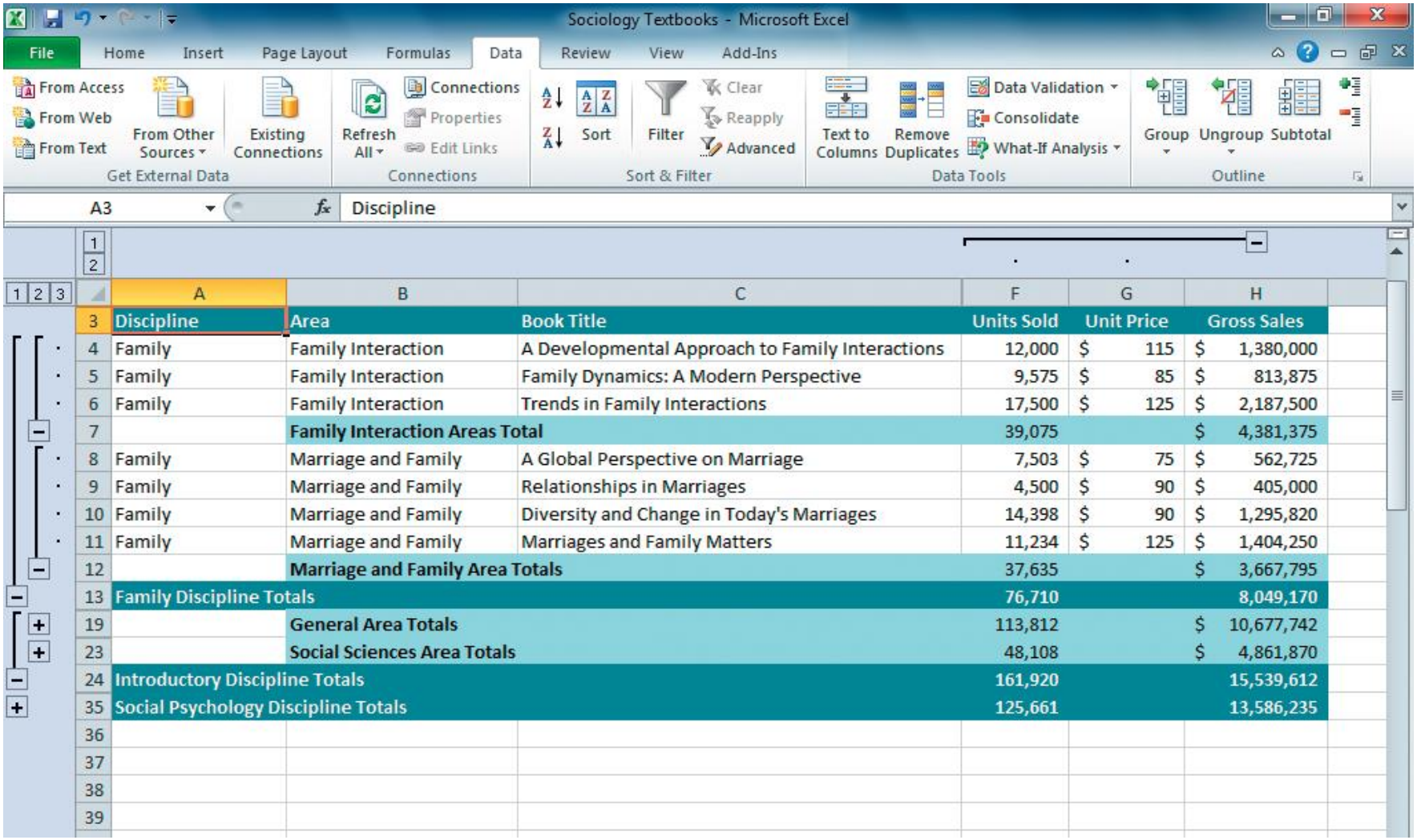
Group and Ungroup Data



Discipline	Area	Book Title	Units Sold	Unit Price	Gross Sales
Family	Family Interaction	A Developmental Approach to Family Interactions	12,000	$ 115	$ 1,380,000
Family	Family Interaction	Family Dynamics: A Modern Perspective	9,575	$ 85	$ 813,875
Family	Family Interaction	Trends in Family Interactions	17,500	$ 125	$ 2,187,500
	Family Interaction Areas Total		39,075		$ 4,381,375
Family	Marriage and Family	A Global Perspective on Marriage	7,503	$ 75	$ 562,725
Family	Marriage and Family	Relationships in Marriages	4,500	$ 90	$ 405,000
Family	Marriage and Family	Diversity and Change in Today's Marriages	14,398	$ 90	$ 1,295,820
Family	Marriage and Family	Marriages and Family Matters	11,234	$ 125	$ 1,404,250
	Marriage and Family Area Totals		37,635		$ 3,667,795
Family Discipline Totals			76,710		8,049,170
	General Area Totals		113,812		$ 10,677,742
	Social Sciences Area Totals		48,108		$ 4,861,870
Introductory Discipline Totals			161,920		15,539,612
Social Psychology Discipline Totals			125,661		13,586,235

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Subtotal Data

- Use Subtotal command to insert subtotal rows at each designated field change in a sorted range of data
  - Subtotals calculated using summary functions
  - Grand totals displayed after each group
  - Additional levels of subtotals can be inserted

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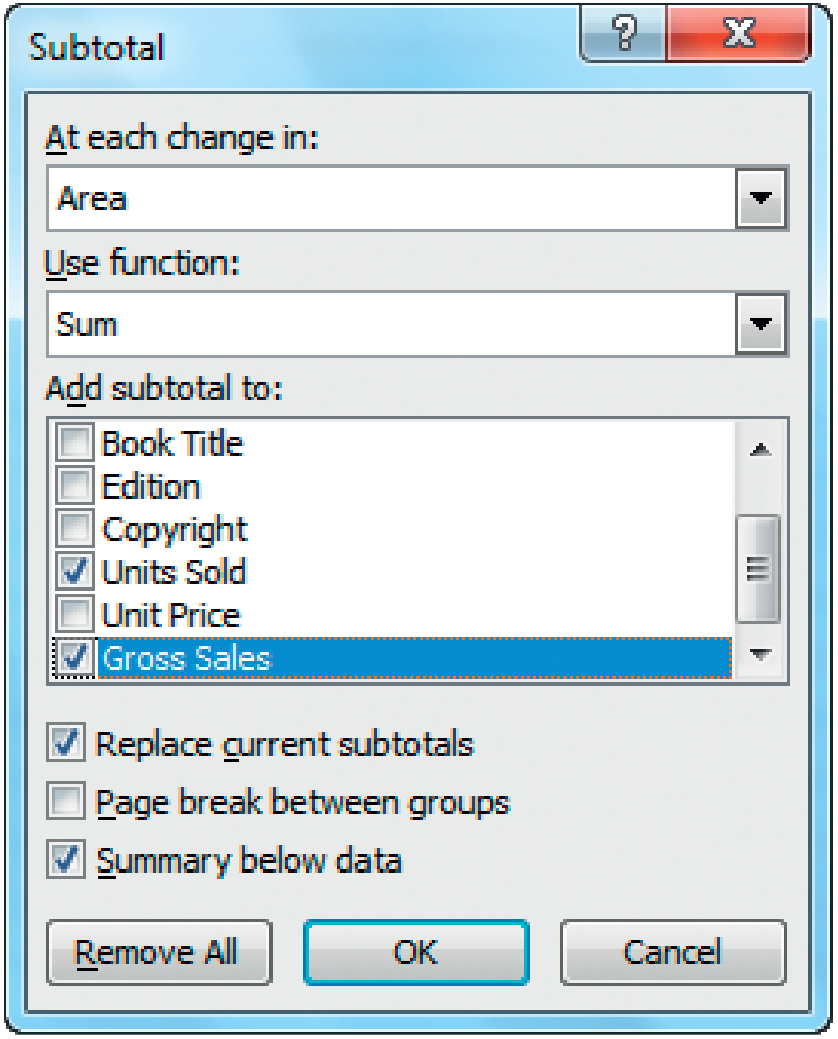
Subtotal Data



- Demonstration Outline
- Sort the data.
- Subtotal the data.
- Second subtotal.
- Collapse/expand subtotals.
- Outline / collapse data.

- Demo uses *e05h1sociology.xlsx* - available on COMP1000 home page (week 3 notes).

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Create a PivotTable

- A PivotTable allows you to summarize, analyze, and explore large amounts of data
- Data can be dynamically arranged to view it from different angles
- One column must have duplicate values to create categories for organizing and summarizing data
- Another column must have numeric values
- Create a PivotTable by clicking PivotTable in the Tables group on the Insert tab

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Pivot table Overview

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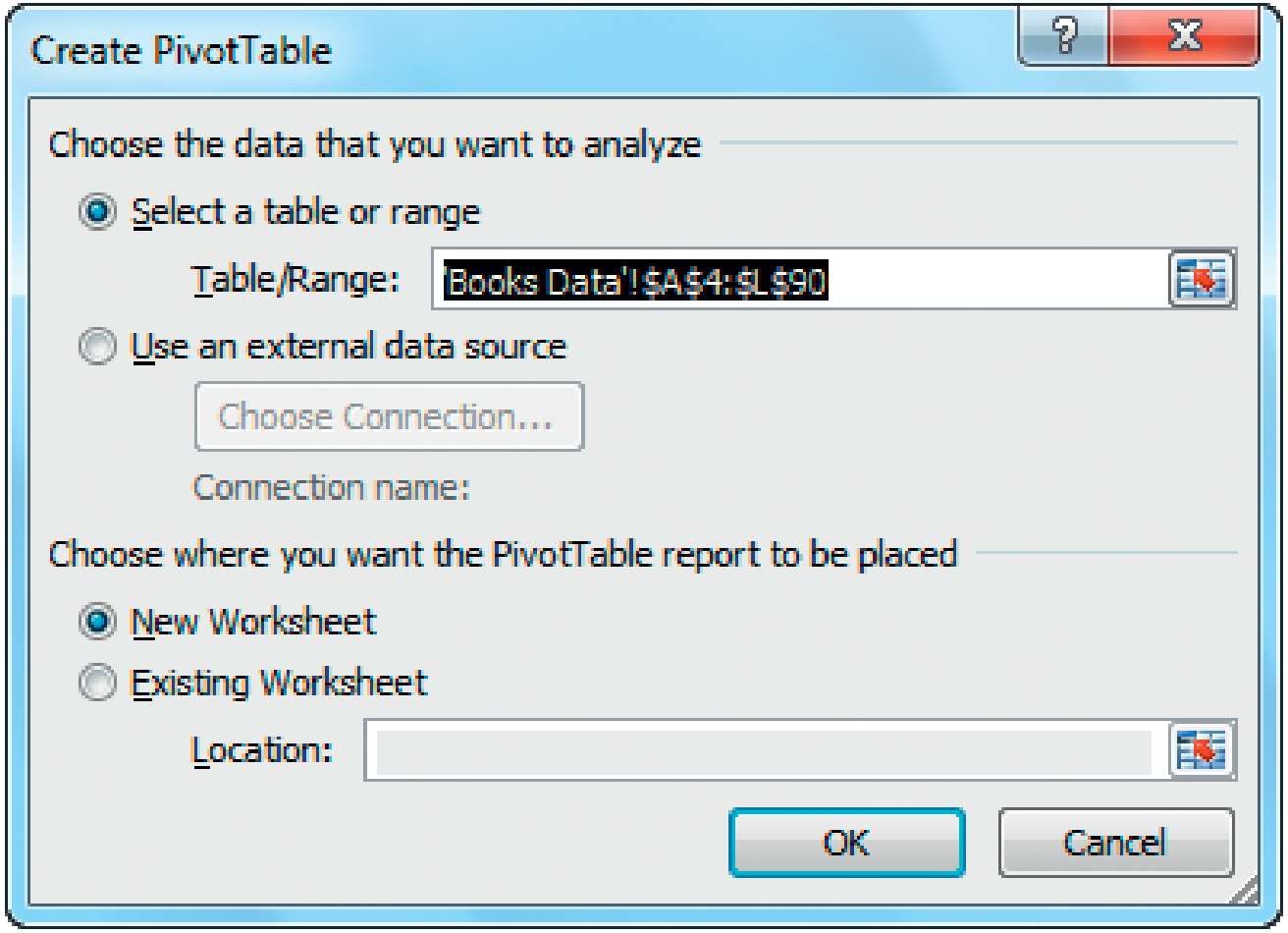
Create a PivotTable



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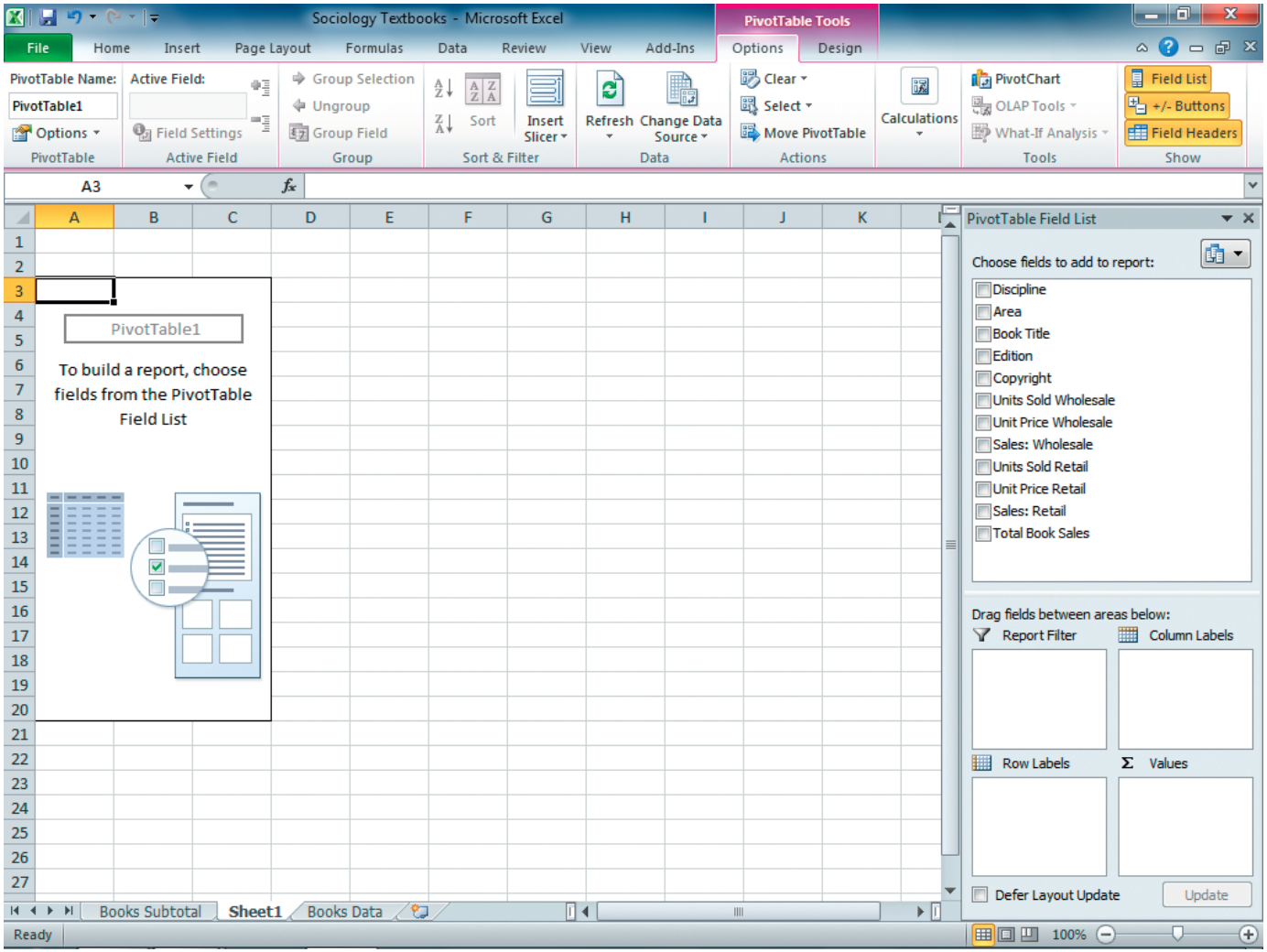
Create a PivotTable



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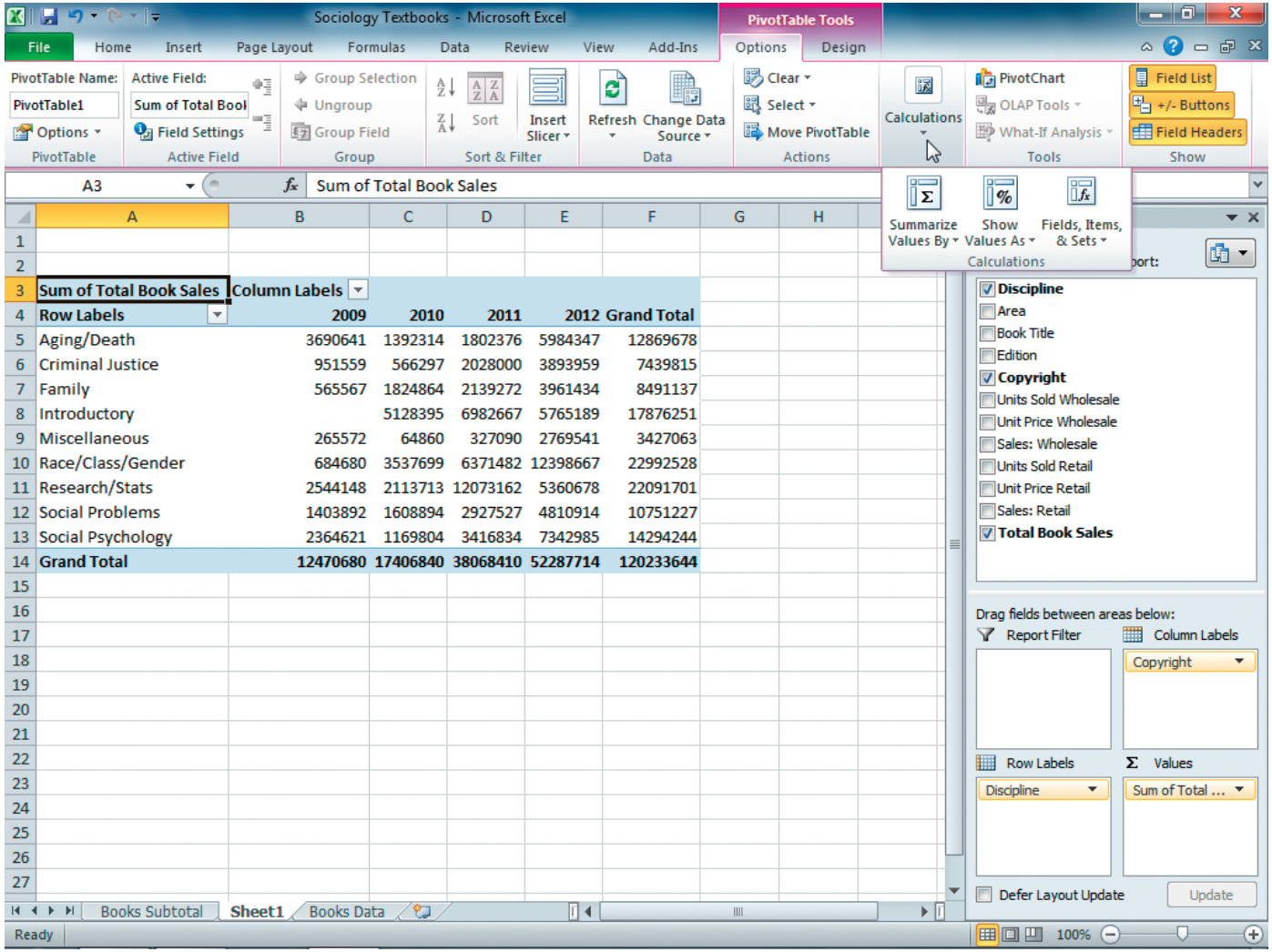
Create a PivotTable



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PivotTable Demo Overview

- (open worksheet &) create empty table
- Add row labels; add values; add columns
- Customize row and column names
- Update data sheet and then refresh PivotTable

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PivotTable Step-by-Step

- Open e05h1sociology; save with a different name;
- Books Data worksheet; click in data; then Insert/Tables/PivotTable;
- Range should be A4:L90, New Worksheet; click OK;
- Enter Book Analysis in PivotTable name box, ribbon top-left;
- Change the name of the current worksheet to PivotTable;
- Go to PivotTable Fields list (at right); check Discipline in "Choose fields to add to report" – data is text so by default it goes in Row Labels. Or you could drag it there instead of checking the box.
- Click Total Book Sales – data is numeric, by default it goes in Σ Values;
- Drag Edition to Column Labels (what happens if you just click it?)
- Drag Copyright to below Discipline in Row Labels area.

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PivotTable Step-by-Step 2

- Click Edition arrow in Column Labels area; select Remove Field;
- Drag Copyright field to Column Labels area;
- Click Options/Calculations/Summarize Values By/More options…
- "Sales by Discipline" in Custom Name box; click Number format;
- Click Accounting; 0 decimal places; OK;
- Click cell A4; type Discipline; Enter;
- Cell B3; type Copyright Year; Enter;
- Centre headings in range B4:F4.
- Click Books Data worksheet tab; click J1; change to 125%; Enter;
- Click PivotTable worksheet tab; Click Options/Data/Refresh
- Save workbook.

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Change the Values Field

- Select the function used to calculate summary statistics
- Default is:
  - Sum for values
  - Count for text fields
- Specify a custom column heading
- Apply number formatting

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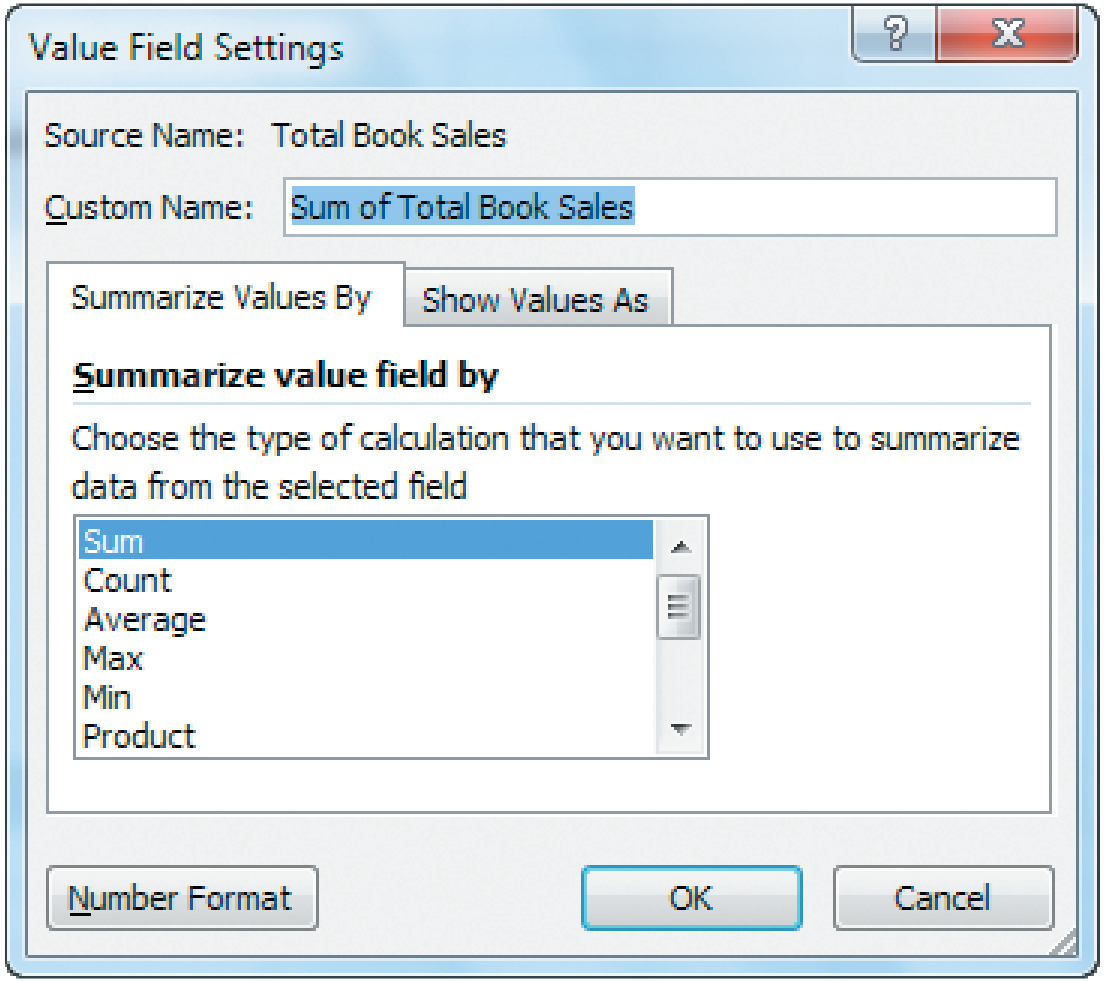
Change the Values Field



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Modify a PivotTable

- Add, remove, or rearrange fields to get a different perspective on the data
- Be careful not to make the data overwhelming with too many details
- Excel does not automatically update PivotTables: if the underlying data is changed, you refresh the PivotTable by PivotTable Tools/Options/Data/Refresh

Demo:modify

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Sort, Filter, and Slice a PivotTable

- PivotTable data can be sorted.
  - Default order is alphabetical by row label text
- To quickly rearrange data, click in a cell in the column you want to sort, and then click Sort Smallest to Largest (Sort A to Z for text) or Sort Largest to Smallest (Sort Z to A for text) in the Sort & Filter group on the Options tab.
- For specialized sorting, click Sort in the Sort & Filter group on the Options tab.
  - If you click in a row label or column label first, you get a dialog box with slightly different options from those you get if you click on a value first

Demo:sort

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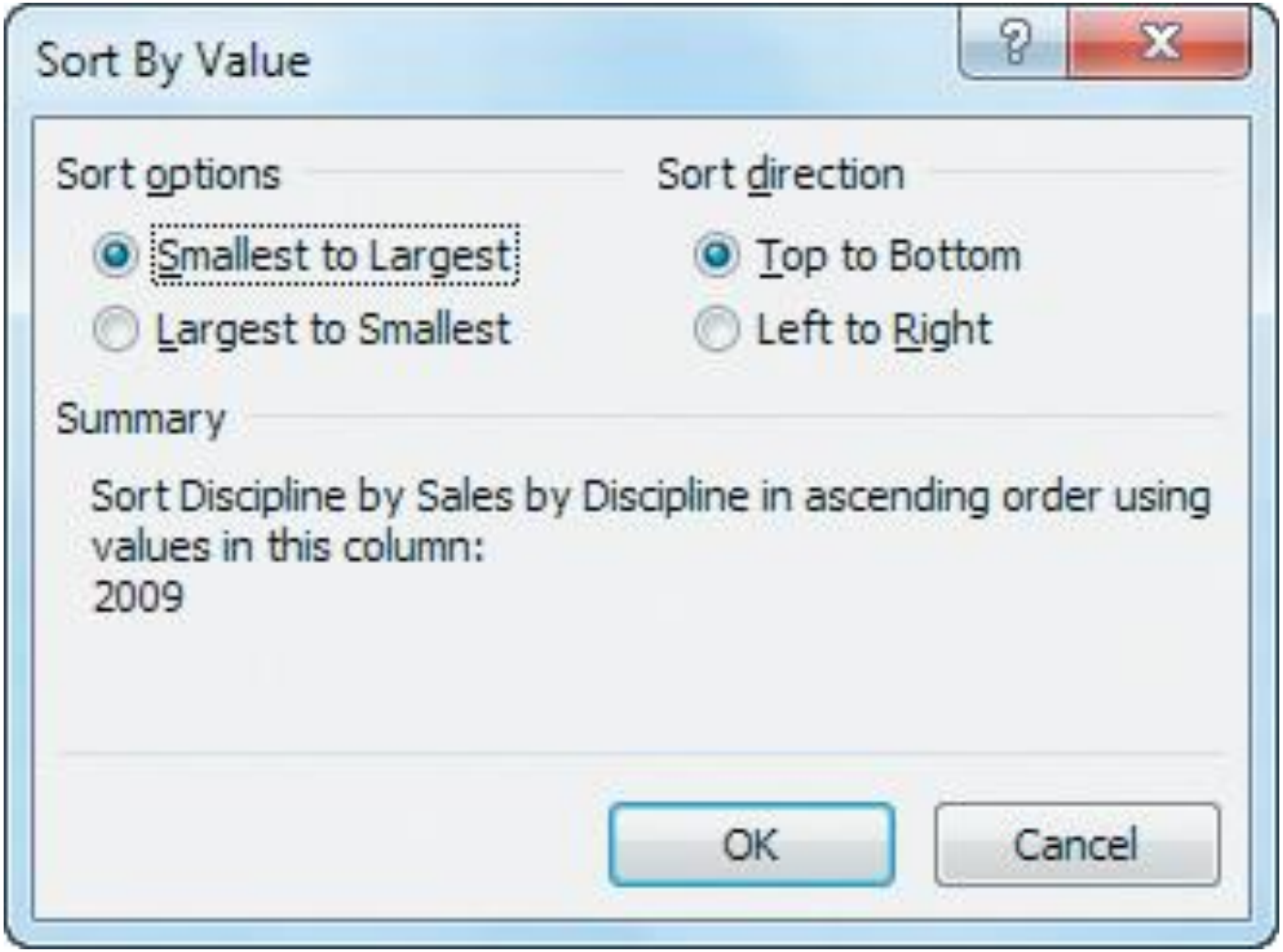
Sort, Filter, and Slice a PivotTable



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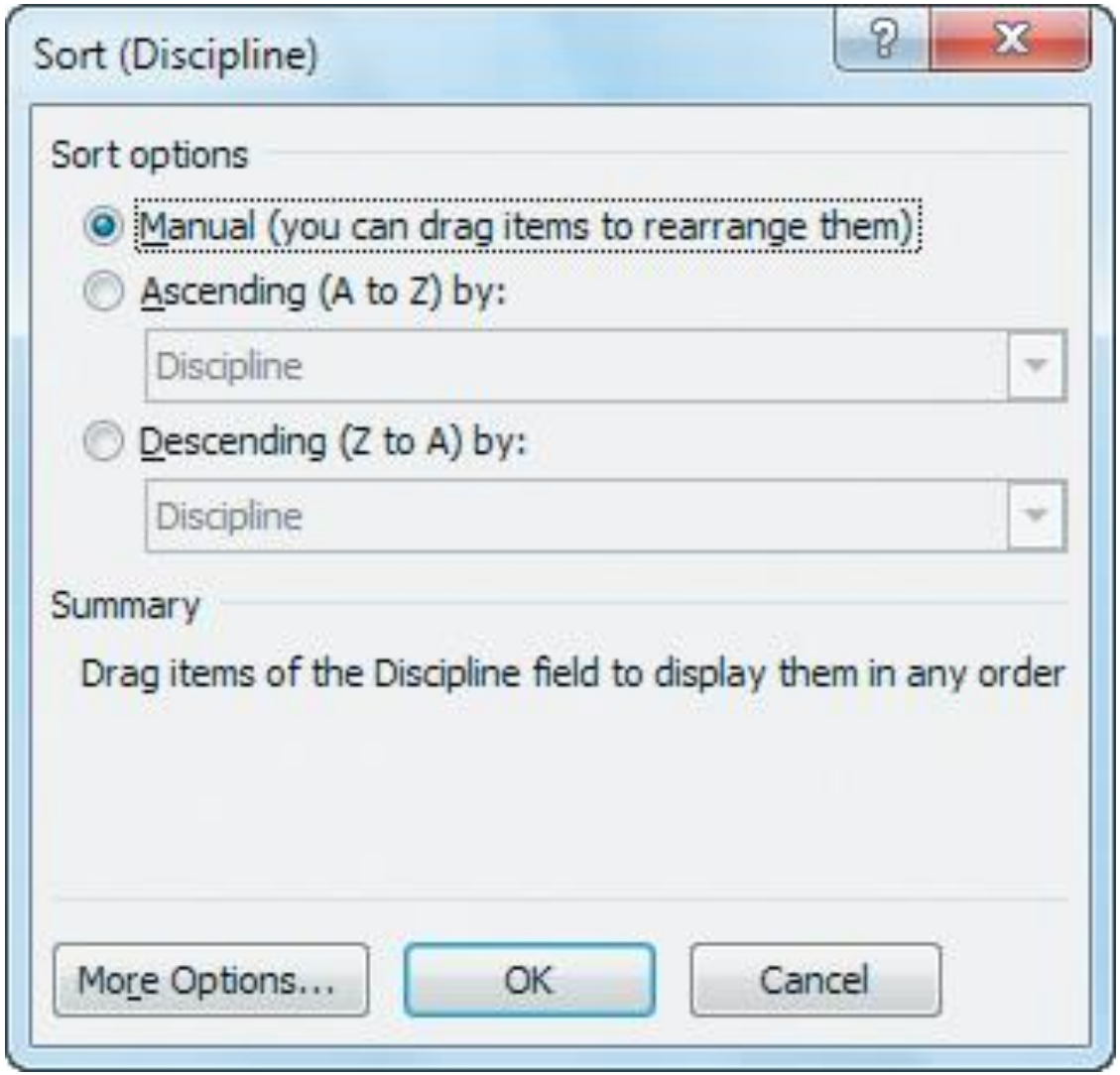
Sort, Filter, and Slice a PivotTable



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Sort, Filter, and Slice a PivotTable

- Apply filters to show a subset of data in a PivotTable
- Two types of filters:
  - A report filter sets the overall conditions for aggregating data
  - A group filter filters out data based on a row or column category
- Filter by one or multiple items, as well as by entering a search condition

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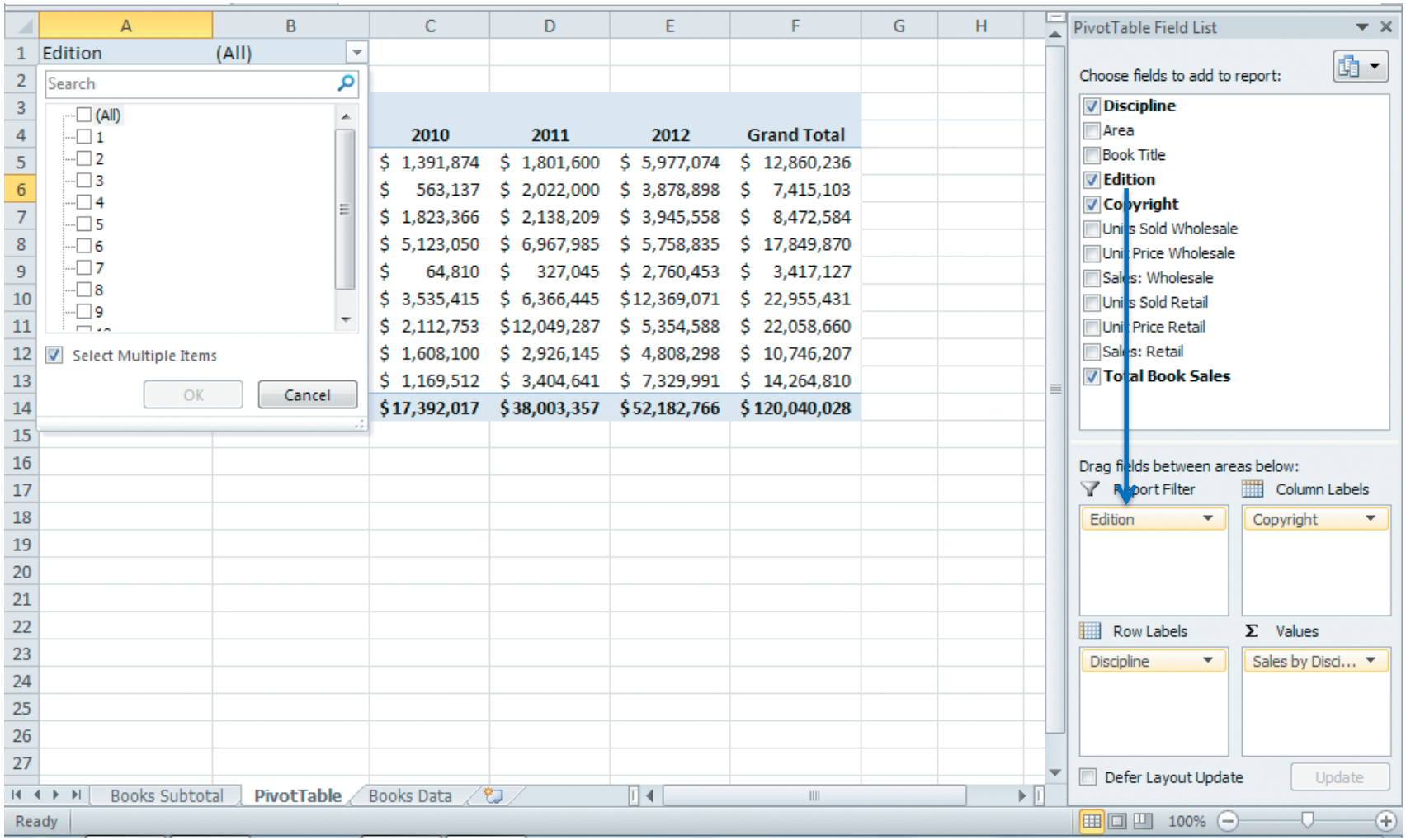
Sort, Filter, and Slice a PivotTable



- Report Filter: to select one or more Editions to display.
- Drag Edition to Report Filter box, then click on arrow in B1.

Demo:filter

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Sort, Filter, and Slice a PivotTable

- Use slicers to filter data in a PivotTable
- Slicers:
  - Are graphical
  - Provide buttons that you can click for quick filtering
  - Indicate the current filtering state
- To insert slicer, click the Options tab, click the Insert Slicer button in the Sort & Filter group, click one or more field check boxes for which you want to create a slicer, and then click OK
- To use slicer, click a button to filter data

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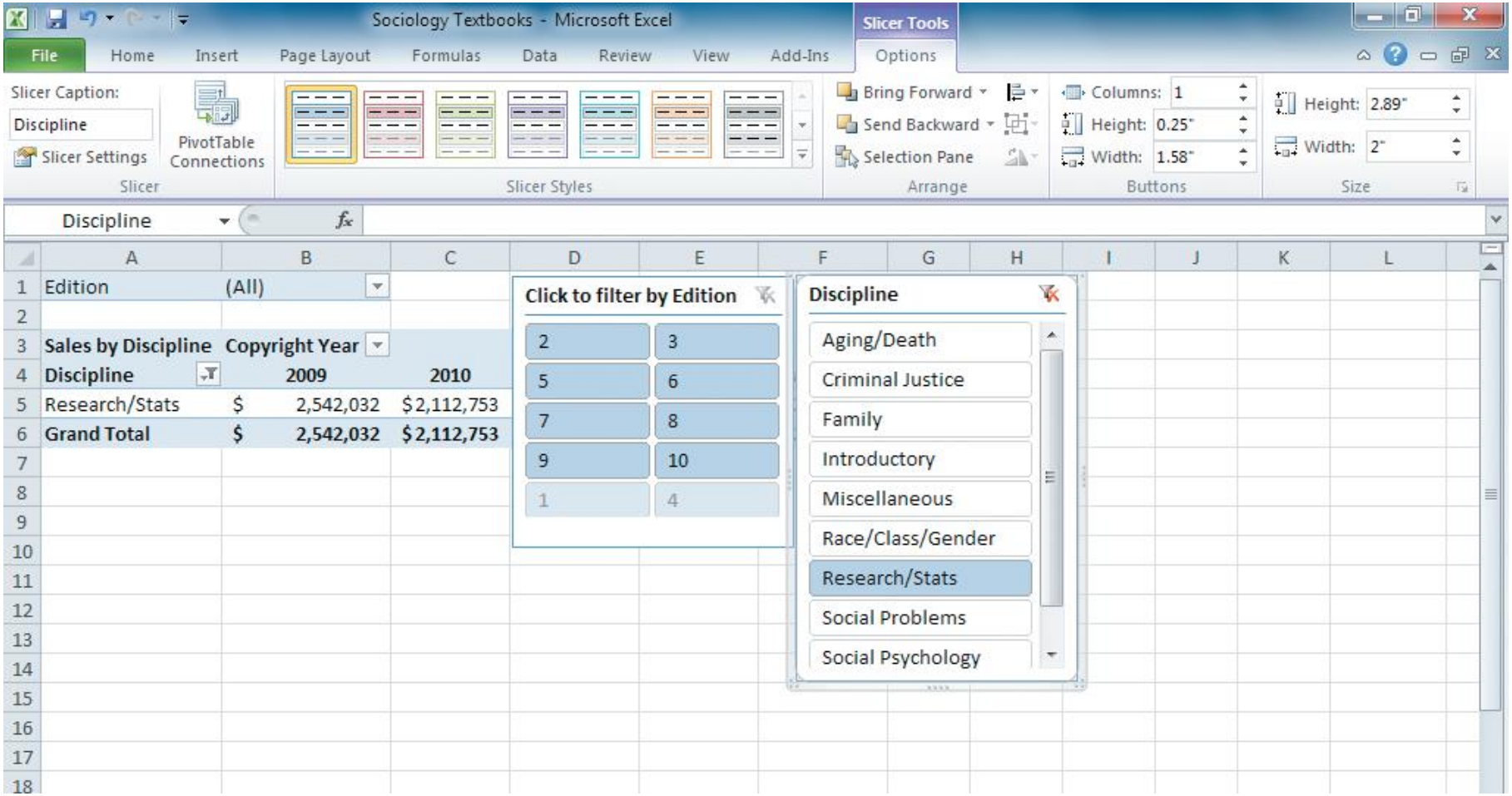
Sort, Filter, and Slice a PivotTable



Demo:slice

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Create a Calculated Field

- Calculated field:
  - Is a user-defined field
  - Does not exist in the original dataset
- Use basic arithmetic operations, but not cell references or range names
- Click in PivotTable, Click Options/Calculations/Fields, Items & Sets/Calculated Field. Type a name for the new field in the Name box. In the Formula box, enter the formula for the field, e.g. Click Sales from the Fields list, then type *0.12, to calculate 12% of Sales. Finally, click Add

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Create a Calculated Field

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Format a PivotTable

- Basic formatting applied to PivotTables:
  - Primary row labels formatted in bold
  - Subtotals are bold
- Use PivotTable Tools Design tab to apply a PivotTable style and control:
  - Font color
  - Fill color
  - Bolding
  - Border lines

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Format a PivotTable

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Create a PivotChart

- A PivotChart is a graphical representation of data in a PivotTable.
- You can create a PivotChart from a PivotTable or at the same time you create a PivotTable.
- Creating and customizing PivotCharts is similar to the methods used on regular charts.
- A PivotChart is interactive, meaning changes made in the associated PivotTable are immediately reflected in the PivotChart.

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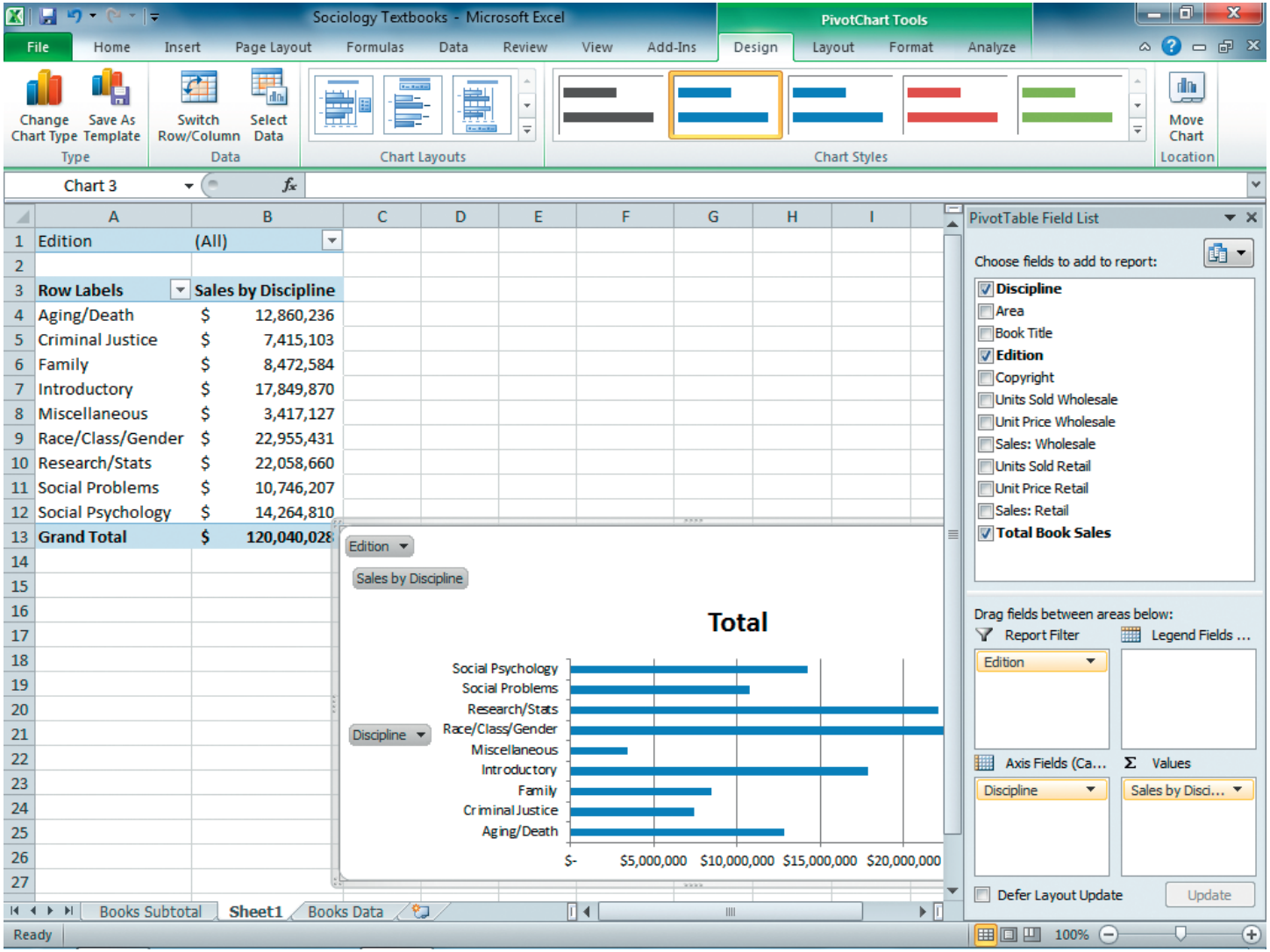
Create a PivotChart



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PivotChart Demo Outline

- Apply a PivotTable style
- Create a PivotChart
- Change and enhance a PivotChart

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Summary

- In this chapter, you learned about the tools that help you manage large amounts of data and translate that data into useful information. These include:
  - Creating and modifying a PivotTable.
  - Sorting, filtering, and slicing a PivotTable.
  - Creating a PivotChart.

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Excel Comprehensive
Chapter 6
What-if Analysis

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Objectives

- Create a one-variable data table
- Create a two-variable data table
- Describe ‘iteration’ in Excel
- Identify an input value with Goal Seek
- Use Scenario Manager
- Generate scenario summary reports
- Load the Solver Add-in
- Optimize results with Solver

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Overview

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Create a One-Variable Data Table

- What-if analysis — allows you to see how changing variables impacts calculated results
- A variable — a value that can be changed to see how it affects other values
- A one-variable data table — a data analysis tool that provides various results based on changing one variable
- A substitution value — replaces the original value of a variable in a data table

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Create a One-Variable Data Table

1. List substitution values in the left column or first row
2. Enter formulas in the first row or left column (whichever was not used above)
3. Create the one-variable data table
4. Format the results of the data table
5. Create custom number formats to disguise the formulas as headings

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Create a One-Variable Data Table

To complete a one-variable data table:

1. Select entire table starting in the blank cell in the top-left corner
2. Click What-If Analysis in the Data Tools group on the Data tab and select Data Table
3. Enter address of the cell to be changed in the Data Table dialog box
4. Click OK

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Create a One-Variable Data Table

E4 | f_x {=TABLE(,B4)}

	A	B	C	D	E	F	G	H
1	Input Area			One-Variable Data Table: APR				
2	Cost of Car	$ 25,000.00			Calculated Results for Each APR			
3	Down Payment	$ 5,000.00			$ 372.86	$ 22,371.62	$ 2,371.62	
4	APR	4.50%		5.0%	377.42467	22645.48037	2645.480373	
5	No. Years for Loan	5		5.5%	382.02324	22921.39461	2921.394606	
6	Payments Per Year	12		6.0%	386.65603	23199.36184	3199.361835	
7				6.5%	391.32296	23479.37786	3479.377862	
8	Output Area			7.0%	396.02397	23761.43825	3761.438248	
9	Amount of Loan	$ 20,000.00		7.5%	400.75897	24045.53831	4045.538315	
10	Periodic Rate	0.38%		8.0%	405.52789	24331.67315	4331.673146	
11	No. Payment Periods	60		8.5%	410.33063	24619.83759	4619.837592	
12	Monthly Payment	$ 372.86		9.0%	415.1671	24910.02627	4910.026272	
13	Total to Repay Loan	$ 22,371.62						
14	Total Interest Paid	$ 2,371.62						

Demo:autoloan

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Create a Two-Variable Data Table

- A two-variable data table — a data analysis tool that provides results based on changing two variables
- Creating a two-variable data table — similar to creating a one variable data table; however, you are limited to comparing one result.
- Recommendations include:
  - Use the top row for one variable's substitution values
  - Use the first column for the other variable's values
  - Apply a custom number format to the formula cell in the top-left cell

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Create a Two-Variable Data Table

E4 | {=TABLE(B3,B4)}

	A	B	C	D	E	F	G	H
1	Input Area			Two-Variable Data Table: APR and Down Payment				
2	Cost of Car	$ 25,000.00			Monthly Payments			
3	Down Payment	$ 5,000.00		APR	$ 5,000.00	$ 7,500.00	$10,000.00	
4	APR	4.50%		5.0%	$ 377.42	$ 330.25	$ 283.07	
5	No. Years for Loan	5		5.5%	$ 382.02	$ 334.27	$ 286.52	
6	Payments Per Year	12		6.0%	$ 386.66	$ 338.32	$ 289.99	
7				6.5%	$ 391.32	$ 342.41	$ 293.49	
8	Output Area			7.0%	$ 396.02	$ 346.52	$ 297.02	
9	Amount of Loan	$ 20,000.00		7.5%	$ 400.76	$ 350.66	$ 300.57	
10	Periodic Rate	0.38%		8.0%	$ 405.53	$ 354.84	$ 304.15	
11	No. Payment Periods	60		8.5%	$ 410.33	$ 359.04	$ 307.75	
12	Monthly Payment	$ 372.86		9.0%	$ 415.17	$ 363.27	$ 311.38	
13	Total to Repay Loan	$ 22,371.62						
14	Total Interest Paid	$ 2,371.62						

Demo:autoloan

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Identify an Input Value with Goal Seek

- Goal Seek — a tool when you know the desired end result but not the value needed to meet the goal
- Enables you to work backwards to solve a problem
- Excel can enter the input value in the variable cell

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Goal seek overview

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Goal Seek Demo

- Suppose we want to borrow money from a bank to buy a car
- We plan to pay $600 per month
- We want to know how much could we borrow.

Demo:goalseek

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Goal Seek – another example

- Suppose we want to solve an equation like $4x^3 + 12x^2 - 64x + 16 = 0$
- In Excel, you can plot the graph and estimate the roots.
- You can also use Goal Seek to find more exact roots.

Demo:equation

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Use Scenario Manager

- Scenarios take detailed sets of input values and determine possible results
- Scenario Manager enables you to define and manage up to 32 scenarios
- Scenarios are maintained separately for each worksheet in a workbook

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Scenario Demo Outline

- Create a scenario
- Create more scenarios
- Generate/format a scenario report

Demo:scenario

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Load the Solver Add-in

- Solver – a separate program that must be installed or added in to Excel
- Once loaded – appears in the Analysis group on the Data tab
- Solver manipulates variables based on constraints to find the optimal solution to a problem

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Load the Solver Add-in

To load Solver:

1. Click the File tab, and then select Options
2. Click Add-Ins
3. Click the Manage arrow, select Excel Add-ins, and then click Go to open the Add-Ins dialog box
4. Click the Solver Add-in check box in the Add-Ins available list and click OK

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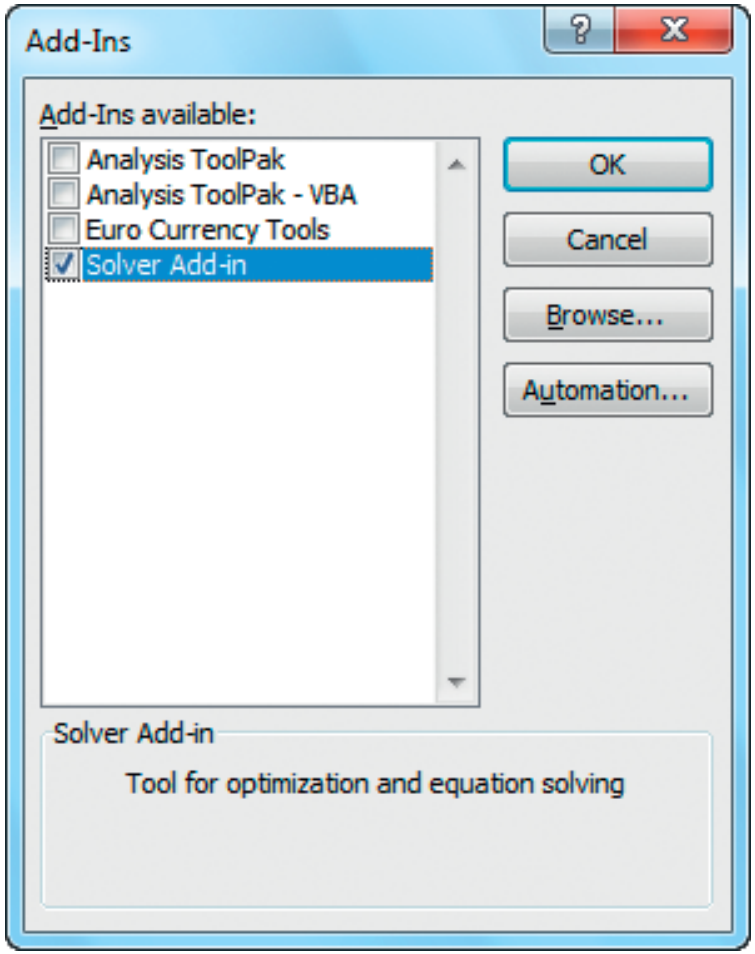
Load the Solver Add-in



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Optimize Results With Solver

- Solver requires three types of info:
  - ***Objective cell*** contains a formula-based value that you want to optimize that relates directly or indirectly to the changing cells and constraints
  - ***Changing cells*** are the cells whose values are adjusted until the constraints are satisfied
  - ***Constraints*** specify the restrictions

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Optimize Results With Solver

To specify the objective and changing cells:

1. Click Solver in the Analysis group on the Data tab to open the Solver Parameters dialog box
2. Enter the cell containing the formula for which you want to optimize its value in the Set Objective box
3. Click an option in the To section to specify what type of value you need to find for the target cell (such as Max, Min, or Value Of with a specified value)
4. Enter the cell references that contain variables in the By Changing Variable Cells box

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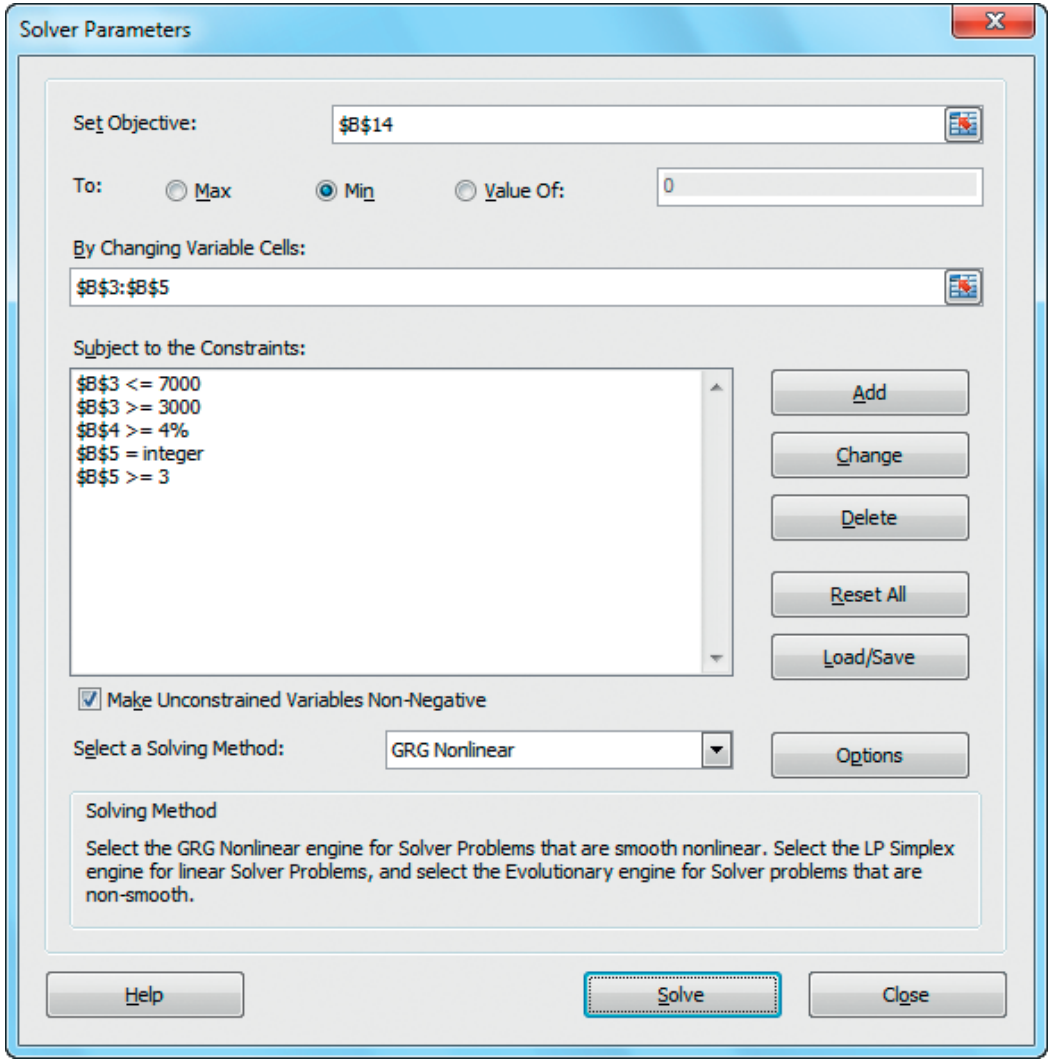
Optimize Results With Solver



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Optimize Results With Solver

To specify the constraints:

1. Click Add to the right of the Subject to the Constraints list to open the Add Constraint dialog box
2. Enter the cell reference, the operator to test the cell references, and the constraint the cell needs to match (such as the down payment must be less than or equal to $7,000)
3. Click OK to add the constraint and return to the Solver Parameters dialog box, or click Add to add the constraint and create another constraint

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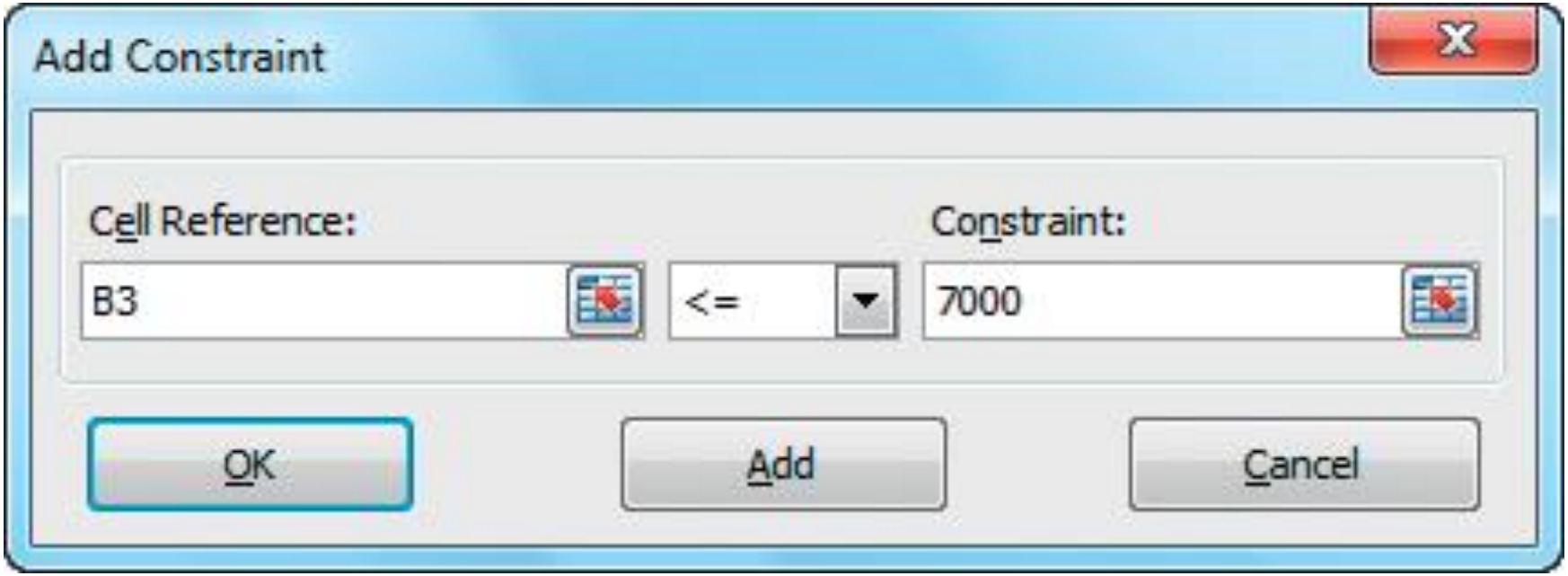
Optimize Results With Solver



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Optimize Results With Solver

- Solver uses an iterative process to find an optimal solution
- A summary report can be generated if a solution is found
- The report specifies:
  - ***Binding Constraints*** which are rules that Solver enforced to reach the target value
  - ***Nonbinding Constraints*** do not restrict the target value found

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Demo – Coffee shop

- Suppose you have a coffee shop
- You sell regular coffee, latte, and Mocha.
- The price and cost of each type is different.
- You have limited materials (milk, cups etc.)
- You want to find how to maximize your profit.

Demo:solver

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Summary

- In this chapter, you learned that what-if analysis is the process of changing the values in cells to see how those changes will affect the outcome of formulas on the worksheet. You can:
  - Create a one- or two- variable data table.
  - Use Goal Seek.
  - Use Scenario Manager.
  - Generate scenario summary reports.
  - Optimize results with Solver.

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Objectives

- Work with grouped worksheets
- Manage windows and workspaces
- Insert hyperlinks
- Insert a 3-D formula
- Link workbooks

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Work with Grouped Worksheets

- Create worksheets with identical structure and formatting in the same workbook when data is similar but:
  - Time periods differ
  - Company locations differ
- Grouping selecting two or more worksheets so you can perform the same action at the same time
- When worksheets are grouped:
  - Worksheet tabs display a white background color
  - [Group] appears in the title bar

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Work with Grouped Worksheets

Heartland Department Store:2 [Group]

	A	B	C	D	E
1	Heartland Department Store				
2	Department	January	February	March	Dept. Totals
3	Men's Clothing	$ 135,202.56	$ 173,538.77	$ 51,552.99	$ 360,294.32
4	Children	109,141.06	145,219.36	72,074.22	326,434.64
5	Fragrances	47,924.66	43,132.20	38,339.73	129,396.59
6	House, Bed, Bath	78,130.28	83,699.02	88,045.57	249,874.87
7	Jewelry	102,466.88	63,705.49	137,926.10	304,098.47
8	Shoes	74,849.81	125,634.90	46,936.17	247,420.88
9	Women's Clothing	167,349.29	50,926.39	111,380.65	329,656.33
10	Monthly Totals	$ 715,064.54	$ 685,856.13	$ 546,255.43	$ 1,947,176.10
11					
12					
13					

Qtr1 Qtr2 Qtr3 Qtr4 Yearly Totals

Heartland Department Store:1 [Group]

	A	B	C	D	E
1	Heartland Department Store				
2	Department	October	November	December	Dept. Totals
3	Men's Clothing	$ 121,414.35	$ 154,184.90	$ 80,357.96	$ 355,957.21
4	Children	95,279.10	44,864.99	47,180.43	187,324.51
5	Fragrances	17,666.95	15,703.96	14,133.56	47,504.46
6	House, Bed, Bath	167,081.16	132,765.22	137,815.40	437,661.77
7	Jewelry	101,435.31	167,057.75	146,396.90	414,889.96
8	Shoes	39,469.68	165,291.40	100,645.82	305,406.90
9	Women's Clothing	43,242.61	142,457.04	167,377.64	353,077.29
10	Monthly Totals	$ 585,589.15	$ 822,325.24	$ 693,907.71	$ 2,101,822.10
11					
12					
13					

Qtr1 Qtr2 Qtr3 Qtr4 Yearly Totals

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Work with Grouped Worksheets

- To group:
  - All worksheets: Right-click and then click Select All Sheets
  - Adjacent Worksheets: Click the first worksheet tab, press and hold Shift, and then click the last worksheet tab
- To ungroup:
  - Click any unselected worksheet tab
  - Right-click any selected worksheet tab, and then click Ungroup Sheets

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Work with Grouped Worksheets

- Grouping worksheets improves productivity by letting you perform the following tasks on each worksheet at the same time:
  - Data Entry
  - Structural Changes
  - Formatting
  - Page Layouts
  - Printing

Demo:group

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Work with Multiple Workbook

- Hide/unhide
- Split: horizontal split/vertical split/cross split
- Compare two workbooks
  - Switch windows
  - Arrange all
  - Side by side

Demo:multipleworkbook

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Work with Multiple Worksheets

- Compare two worksheets in the same workbook
  - New Window
  - View/new window/

Demo:multipleworksheet

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Insert Hyperlinks

- A hyperlink — an electronic marker that connects to a(n):
  - Specific cell in the same workbook
  - Specific cell in a different workbook
  - Existing file
  - Web page
  - E-mail address

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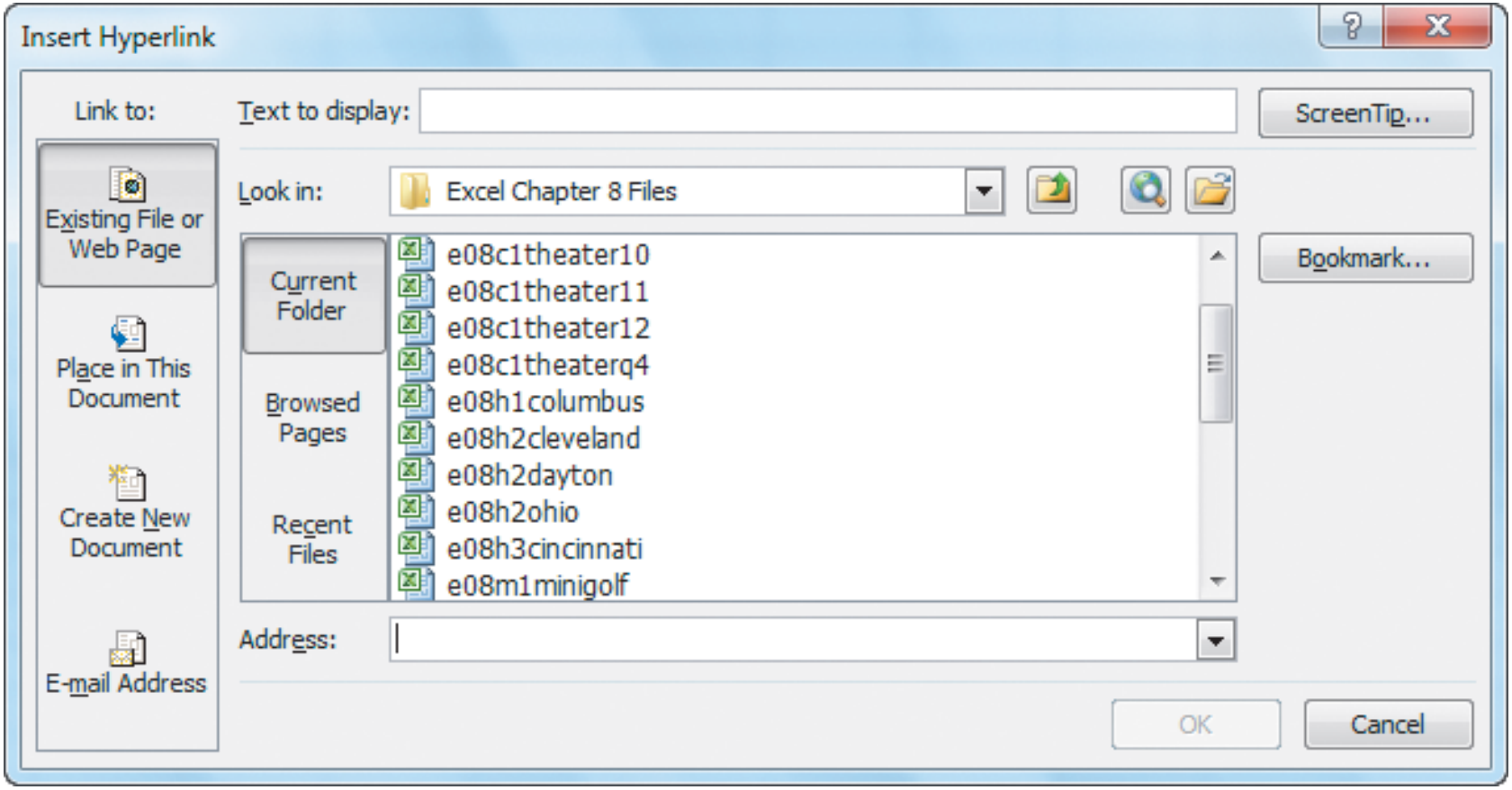
Insert Hyperlinks



Demo:multipleworksheet

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Insert a 3-D Formula

- To consolidate data from several worksheets:
  - Use a worksheet reference
  - Create a 3-D formula
  - Link data

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Insert a 3-D Formula

CUMPRINC =SUM('Qtr1:Qtr4'!E3

	A	B	C	D	E
1		Heartland Department Store			
2	Department	January	February	March	Dept. Totals
3	Men's Clothing	$135,202.56	$173,538.77	$ 51,552.99	$360,294.32
4	Children	SUM(number1, [number2], ...)	.36	72,074.22	326,434.64
5	Fragrances	47,924.66	43,132.20	38,339.73	129,396.59
6	House, Bed, Bath	78,130.28	83,699.02	88,045.57	249,874.87
7	Jewelry	102,466.88	63,705.49	137,926.10	304,098.47
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9	Women's Clothing	167,349.29	50,926.39	111,380.65	329,656.33
10	Monthly Totals	$715,064.54	$685,856.13	$546,255.43	$1,947,176.10
11					
12					

Qtr1 Qtr2 Qtr3 Qtr4 Yearly Totals

Point 120%

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Link Workbooks

- Consolidate data by linking workbooks
  - Do not move or rename workbooks after creating a link
- Benefit of linked workbooks a change made in one workbook (source file) is updated in the other workbook (destination file)

Demo:linkworkbook

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Link Workbooks

- When you link files, you establish an external reference:
  - Similar to a worksheet reference
  - Must include the workbook name, including the extension, between brackets
  - Default is that absolute cell references are created
  - =[Cleveland.xlsx]'Qtr3'A1 creates a link to cell A1 in the Qtr3 worksheet in the Cleveland workbook.

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Link Workbooks

- Excel displays formulas with external references in two ways:
  - When the source workbook is open, the file name, worksheet, and cell reference display
  - When the source workbook is closed, the full path displays

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Summary

- In this chapter, you learned to manage multiple worksheets and consolidate data.

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Macros and VBA

- **Macro —** a set of instructions that tells Excel a sequence of steps to perform

- File formats that support macros include:
  - **Excel Macro-Enabled Workbook (.xlsm)**

- Good for automating routine but often-repeated tasks
- (VBA slides based on Material by Geoff Whale)

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Create a Macro

- **Macro Recorder —** an Excel tool for recording a sequence of steps. (These are stored in the VBA programming language).
- Remember:
  - It records *every* action taken, so…
  - Practice the steps before recording
  - Make them broadly applicable
- Use the correct cell references
  - Relative, absolute, or mixed

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Use the Macro Recorder

Access the Macro Recorder by either:

- View tab: contains the Macros group with the Macros command
- Developer tab (when displayed)
- Status bar, which can display the Macro recording button …

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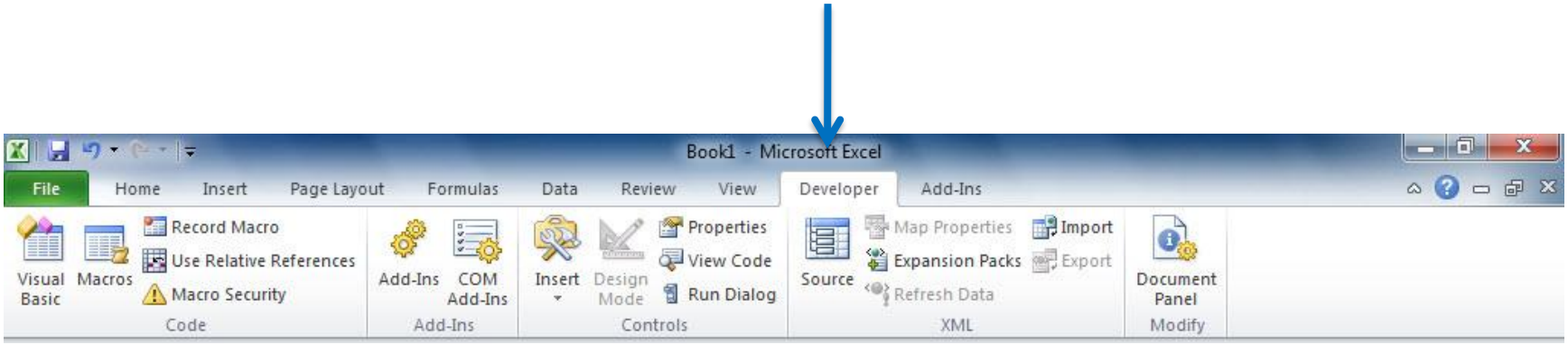
To Display the Developer Tab



To display the Developer tab:

- Click File / Options / Customize Ribbon / Developer check box / OK

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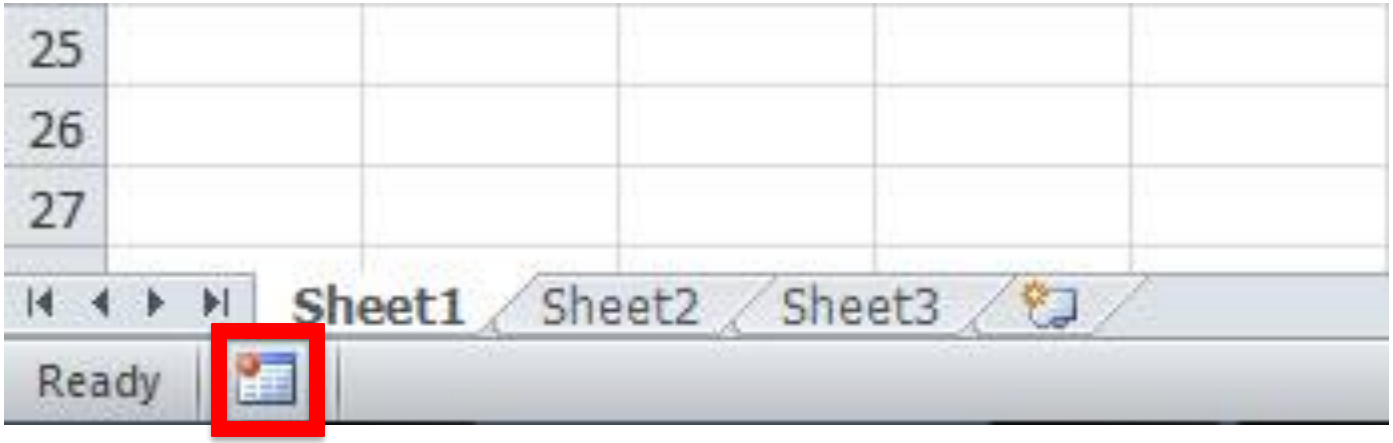
To Add Macro Recording to the Status Bar



To add the Macro Recording icon to the status bar:

- Right-click the status bar
- Click Macro Recording
- Click outside the menu to close it.

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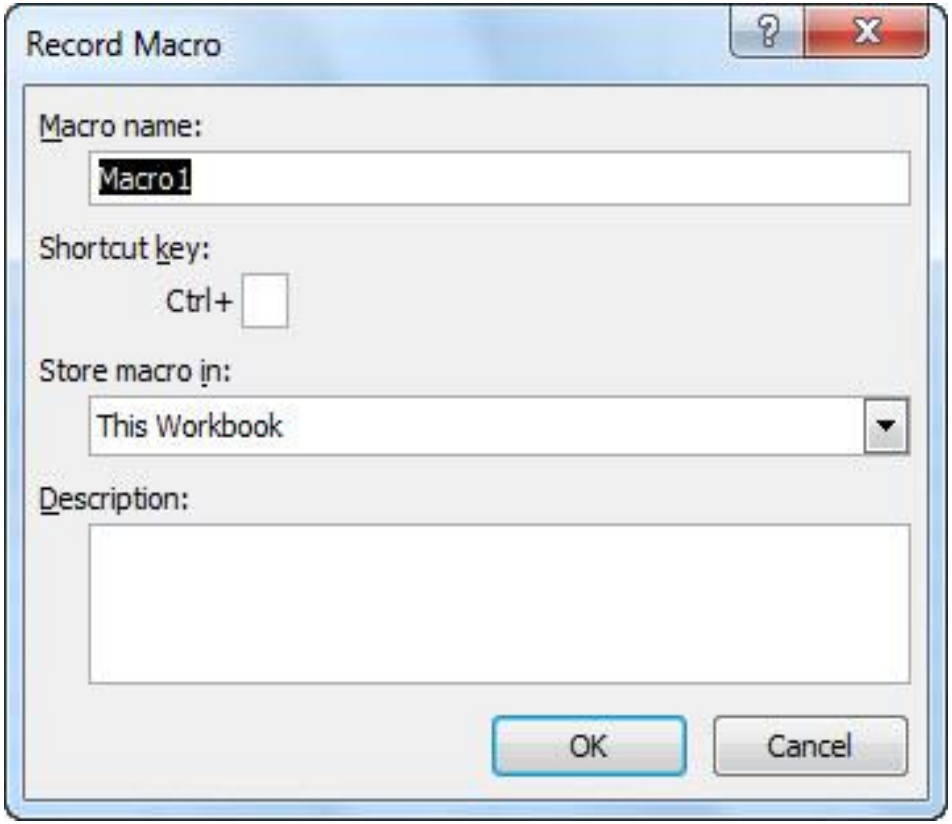
To Record a Macro

1. Click the View tab
2. Click the Macros arrow in the Macros group
3. Select Record
4. Type a name for the macro
5. Type a keyboard shortcut if desired



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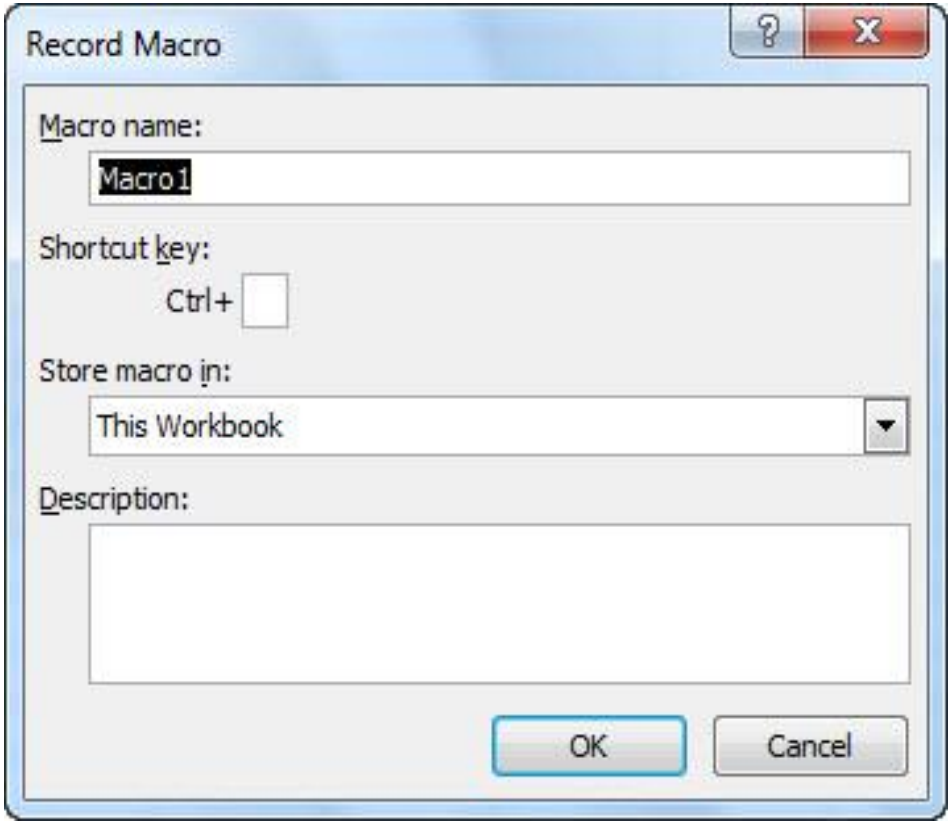
Recording a Macro (continued)

6. Click "Store macro in" arrow and select a location
7. Type a description and purpose
8. Click OK
9. Perform the commands
10. Click View tab, Macros in the macros group, and then Stop Recording



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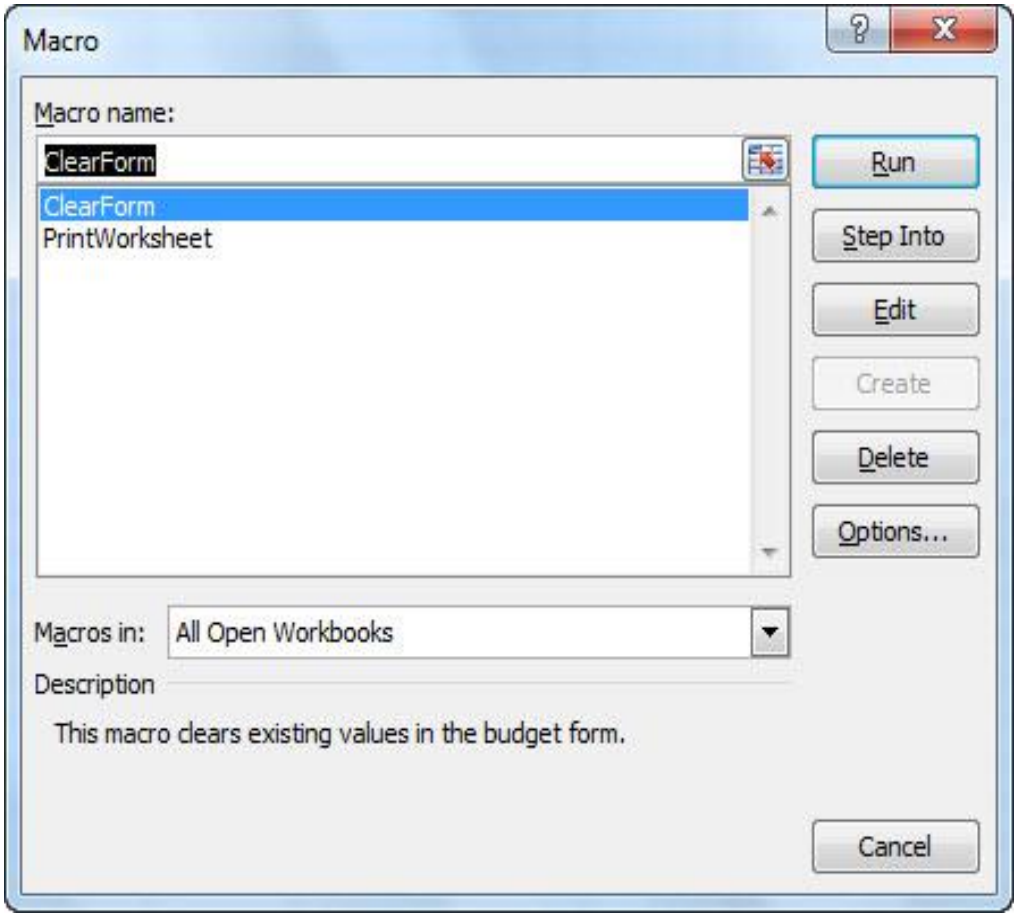
Run a Macro

To run a macro:

1. Select the location where you will test the macro
2. Click the View tab
3. Click the Macros arrow in the Macros group
4. Select View Macros
5. Select the macro
6. Click Run



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Example Macro – Multiple Formatting Steps

- Select a non-empty cell (or similar) so you can monitor the changes as you record the macro.
- Start Macro recording (e.g. with status bar icon).
- Name it FormatCell, shortcut ctrl+Shift+F, OK.
- Bold the cell, centre the cell, change its background to yellow and its text colour to red, choose fontsize 16, and font Garamond.
- Stop Macro recording.
- Click Developer/Code/Macros, select FormatCell and click Edit.
- Admire the VBA code. There's a lot of it. ☹

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Inspecting the Code in the VBA Editor

```
Sub FormatCell()
'
' FormatCell Macro
' Put text in bold, centre it, use yellow background, red te
'
' Keyboard Shortcut: Ctrl+Shift+F
'
    Selection.Font.Bold = True
    With Selection
        .HorizontalAlignment = xlCenter
        .VerticalAlignment = xlBottom
        .WrapText = False
        .Orientation = 0
        .AddIndent = False
        .IndentLevel = 0
        .ShrinkToFit = False
        .ReadingOrder = xlContext
        .MergeCells = False
    End With
    With Selection.Interior
        .Pattern = xlSolid
        .PatternColorIndex = xlAutomatic
        .Color = 65535
        .TintAndShade = 0
        .PatternTintAndShade = 0
    End With
    With Selection.Font
        .Color = -16776961
        .TintAndShade = 0
    End With
    With Selection.Font
        .Name = "Calibri"
        .Size = 16
        .Strikethrough = False
        .Superscript = False
        .Subscript = False
        .OutlineFont = False
        .Shadow = False
```

At left is part of the VBA code from the Macro Recorder. Bits that actually matter are boxed in blue. Below is a simplified version of the same code.

```
Option Explicit

Sub FormatCell()
'
' FormatCell Macro
' Put text in bold, centre it, use yellow background, red te
'
' Keyboard Shortcut: Ctrl+Shift+F
'
    Selection.Font.Bold = True
    Selection.HorizontalAlignment = xlCenter
    Selection.Interior.Color = 65535
    Selection.Font.Color = -16776961
    Selection.Font.Size = 16
    Selection.Font.Name = "Garamond"
End Sub
```

The red arrow shows how .Color = 65535 (i.e. yellow) shows up in the simplified version.

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Mid-exam and Final exam

- Two parts:
  - Multiple choice
  - Practical operations
- Knowledge (practical operations)
  - Basic operations like add/delete row/column, change color/size, add a total row
  - Basic functions like IF/COUNTIF/VLOOKUP/PMT
  - Plot charts
  - What-if analysis

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