Egbert Jeschke, Helmut Reinke, Sara Unverhau,
Eckehard Pfeifer, Bodo Fienitz, and Jens Bock

Microsoft

Microsoft® Excel® 2010 Formulas & Functions

INSIDE OUT

- The ultimate, in-depth reference
- Hundreds of timesaving solutions
- Supremely organized, packed with expert advice

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eBOOK + SAMPLE FILES
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INSIDE OUT

Conquer Microsoft® Excel® formulas and functions—from the inside out!

Intermediate/Advanced

You're *beyond* the basics, so dive right in and really put Excel formulas and functions to work! This supremely organized reference packs hundreds of timesaving solutions, troubleshooting tips, and workarounds. It's all muscle and no fluff. Discover how the experts increase their data analysis capabilities using Excel 2003, 2007, and 2010—and challenge yourself to new levels of mastery.

- Customize Excel formulas using 350+ built-in functions
- Create reusable formulas for common calculations
- Learn smarter ways to calculate date and time values
- Systematically search worksheets with lookup and reference functions
- Perform advanced calculations using mathematical, statistical, and financial functions
- Build complex formulas by nesting one function inside of another
- Analyze profit margins and more with new functions in Excel 2010
- Develop your own functions with Microsoft Visual Basic® for Applications (VBA)

Your book + sample files—ready to download!

- **Sample Excel files**—available at http://go.microsoft.com/FWLink/?Linkid=229604. See the Introduction for more information.
- **Fully searchable companion eBook.** See the instruction page at the back of the book.

About the Authors

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[*Recommended*]

Microsoft Office/ Microsoft Excel

Microsoft® Office

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Microsoft® Excel® 2010 Formulas & Functions Inside Out

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Contents at a Glance

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Introduction

In the beginning there was the idea....The proposal to write about every single Microsoft Excel function with interesting and comprehensible examples came from Helmut Reinke—and everyone on the team agreed. "Yes, this is what Excel users need—a comprehensive reference book with all of the functions." That was eight years ago, and the enthusiasm hasn't diminished.

At the beginning of this year, the idea to translate our reference book into English arose. And what could we say? There they were again: the same enthusiasm as in 2007, and along with it the tremendous task of translation. But we have persevered, and now we are really proud and happy to present to you the first edition of our function book in English. Since we wrote the German edition, a couple of small Excel revolutions took place: A few years ago, Excel 2007 was launched with many new properties and possibilities. For a year and a half now, we also have had Excel 2010 at our disposal, which includes even more new possibilities. We will address them partially in this book.

We hope that you, dear reader, will welcome this concept, and that this reference work will give you many ideas and support you when needed.

Who This Book Is For

Functions are the most powerful tools in Excel. Our goal is to give readers an understanding of every single function with the aid of plausible examples so that everyone can be capable of realizing the inexhaustible possibilities.

So this book is aimed at everyone who is interested in working with Excel—whether you are a beginner or a power user and whether you are using Excel privately or for business. We want to make readers with little experience familiar with the functions so that they will find meaningful scenarios for using them. But we also want to address the reader who is more familiar with Excel, and so we provide several scenarios to help that reader move to the next level of knowledge.

Do you want to calculate the probability of winning the lottery? Do you have to provide a meaningful report of your company's annual sales? No problem. Let's get started.

Assumptions About You

We make a basic assumption that you are generally experienced in working with Microsoft Office and know a few Excel basics. We do not spend time explaining the user interface of Excel and the buttons on the ribbon.

If you are an experienced Excel user, you can just skim over Chapter 1, "Solving Problems with Functions," and Chapter 2, "Using Functions and PowerPivot." If you are not so experienced, we hope to give you an idea of the general possibilities offered by Excel. We hope that the many pages you have in front of you will be helpful to you. Use them to your advantage, and if you like the book, please don't keep your opinion to yourself. Write to us and let us know what you like about it, and especially what we should improve.

We promise that we will be here for you if you have questions or are running into problems. You can write to us at: *info@mindbusiness.de*.

How This Book Is Organized

All the functions have been tested in Microsoft Office Excel 2000 through Excel 2010. With the exception of characteristics specific to Excel 2007 and Excel 2010, most descriptions can even be used with Excel 97. Where necessary, we added comments regarding the particularities of the different versions.

The book is divided into four sections.

Introducing Formulas and Functions in Excel

The first section contains Chapters 1 through 4. They describe working with Excel, provide a general introduction to using Excel 2010, and give you a first look at formulas and functions. For beginners and experts alike, we have outlined the use of formulas and table functions with all the important notes, instructions, tips, and tricks.

Because we consider the Excel 2010 PowerPivot add-in quite extraordinary, we have introduced it briefly in this section. It has relatively little to do with spreadsheet functions, but we still wanted to acquaint you with it.

Creating Your Own Solutions in Excel

Chapter 5, "Functions in Special Operations," and Chapter 6, "Custom Functions," show that you can do a lot more with most functions than just use them in a worksheet. You can create and program your own functions.

Chapter 5 provides examples for using special functions in names and conditional formatting, as well as for validity and data checks. We hope you will find many ideas and clues for your own Excel solutions here.

Chapter 6 introduces you to programming in Excel. You can create any custom functions in Excel and then use them just like the built-in functions.

Functions

Chapters 7 through 17 provide the descriptions of the main Excel functions:

- Chapter 7, "Date and Time Functions"
- Chapter 8, "Text and Data Functions"
- Chapter 9, "Logical Functions"
- Chapter 10, "Lookup and Reference Functions"
- Chapter 11, "Information Functions"
- Chapter 12, "Statistical Functions"
- Chapter 13, "Database Functions"
- Chapter 14, "Cube Functions" (new in Excel 2007)
- Chapter 15, "Financial Functions"
- Chapter 16, "Mathematical and Trigonometry Functions"
- Chapter 17, "Engineering Functions"

Appendices

This book includes three appendices: Appendix A and Appendix B list the functions alphabetically and categorically (respectively), and Appendix C explains what is new in Excel 2007 and Excel 2010.

And now we wish you lots of success for your work with Microsoft Excel!

Features and Conventions Used in This Book

This book uses special text and design conventions to make it easier for you to find the information you need.

Text Conventions

Convention	Meaning
Abbreviated commands for navigating the ribbon	For your convenience, this book uses abbreviated commands. For example, "Click Home, Insert, Insert Cells" means that you should click the Home tab on the ribbon, then click the Insert button, and finally click the Insert Cells command.
Boldface type	**Boldface** indicates text that you type.
Initial Capital Letters	The first letters of the names of tabs, dialog boxes, dialog box elements, and commands are capitalized. Example: the Save As dialog box.
Italicized type	*Italicized* type indicates new terms.
Plus sign (+) in text	Keyboard shortcuts are indicated by a plus sign (+) separating key names. For example, Ctrl+Alt+Delete means that you press the Ctrl, Alt, and Delete keys at the same time.

Design Conventions

INSIDE OUT **An example of an "Inside Out" heading**

These are the book's signature tips. In these tips, you get the straight scoop on what's going on with the software—inside information about why a feature works the way it does. You'll also find handy workarounds to deal with software problems.

Sidebar

Sidebars provide helpful hints, timesaving tricks, or alternative procedures related to the task being discussed.

See Also **Cross-references point you to locations in the book that offer additional information about the topic being discussed.**

CAUTION!

Cautions identify potential problems that you should look out for when you're completing a task or that you must address before you can complete a task.

Note

Notes offer additional information related to the task being discussed.

Certain parts of the text are specially marked to draw your attention to important comments. We have used the following categories:

Category	Meaning
Note	Additional information about this topic that's worth knowing
Important	Makes you aware of facts you must know and keep in mind
Tip	Tips and tricks regarding the current context

Your Companion eBook

The eBook edition of this book allows you to:

- Search the full text
- Print
- Copy and paste

To download your eBook, please see the instruction page at the back of this book.

Using the Sample Files

You'll find the sample files that are used in this book at:

http://www.microsoftpressstore.com/title/9780735658028

Important

The Microsoft Excel 2010 software is not available from this website. You should purchase and install that software before using this book.

Tip

Microsoft offers special updates and file converters for opening an Excel 2007 and Excel 2010 workbook in a previous Excel versions (97–2003). If the converters are not installed with the Office update, you might be prompted to install them when opening an Excel 2007 or Excel 2010 workbook.

After you install the updates and the converter, you can open Excel 2007 and Excel 2010 workbooks. You can edit and save the workbooks. However, the new features and formats of Excel 2007 and Excel 2010 are not displayed in previous Excel versions. You will find detailed information at the following Microsoft website: *http://office.microsoft.com/en-us/excel/HA100775611031.aspx*

You should also read the information that is provided for the sample files in each chapter.

The following table lists the names of the sample files that are used in the book. Because some users who are working with older Excel versions (Excel 2000 through Excel 2003) might not be able to open the new file formats of Excel 2007 and Excel 2010 (.xlsx, .xlsm, and so on), the sample files are provided in both formats: .xls (Excel 97 through Excel 2003) and .xlsx (Excel 2007 and Excel 2010).

Important

When you open a sample file in Excel and then close Excel, you can save the file in the same format or in a different format. By default, Excel offers the standard format again. However, if you choose the standard format (*.xlsx), Excel will display a message box that contains the information that you are going to save your work as a macro-free workbook. You should click No and save your work in a macro-enabled file type (*.xlsm).

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
Chapter01	Excel_Example.xls or Excel_Example.xlsx	Chapter01 folder
	Excel_Pivot_Data.xls or Excel_Pivot_Data.xlsx	Chapter01 folder
Chapter02	InformationFunctions.xls or InformationFunctions.xlsx	Chapter02 folder
	Date_Time.xls or Date_Time.xlsx	Chapter02 folder
	Text_Data.xls or Text_Data.xlsx	Chapter02 folder

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	DifferentialCalculation.xls or DifferentialCalculation.xlsx	Chapter02 folder
	Lookup.xls or Lookup.xlsx	Chapter02 folder
	Practice_Statistics.xls or Practice_Statistics.xlsx	Chapter02 folder
	DBFunction empty.xls or DBFunction empty.xlsx	Chapter02 folder
	Practice_Database.xls or Practice_Database.xlsx	Chapter02 folder
	Financial mathematics.xls or Financial mathematics.xlsx	Chapter02 folder
	Math.xls or Math.xlsx	Chapter02 folder
Chapter03	Arithmetic Operators	Chapter03.xls or Chapter03.xlsx
	Priority	Chapter03.xls or Chapter03.xlsx
	Comparison Operators	Chapter03.xls or Chapter03.xlsx
	Text Operator	Chapter03.xls or Chapter03.xlsx
	Relative Reference	Chapter03.xls or Chapter03.xlsx
	Absolute Reference	Chapter03.xls or Chapter03.xlsx
	Mixed Reference	Chapter03.xls or Chapter03.xlsx
	Array Formula	Chapter03.xls or Chapter03.xlsx
Chapter05	Fct_Names	Chapter05_Names.xls or Chapter05_Names.xlsx
	Comparison	Chapter05_CF.xls or Chapter05_CF.xlsx
	Training	Chapter05_Names.xls or Chapter05_Names.xlsx
	Weekend	Chapter05_CF.xls or Chapter05_CF.xlsx
	Holidays	Chapter05_CF.xls or Chapter05_CF.xlsx
	Accident1, Accident2	Chapter05_CF.xls or Chapter05_CF.xlsx
	Print Layout	Chapter05_CF.xls or Chapter05_CF.xlsx
	Top3	Chapter05_CF.xls or Chapter05_CF.xlsx
	Empty	Chapter05_CF.xls or Chapter05_CF.xlsx
	Credit	Chapter05_CF.xls or Chapter05_CF.xlsx
	Groups	Chapter05_CF.xls or Chapter05_CF.xlsx
	Subtotals	Chapter05_CF.xls or Chapter05_CF.xlsx
	Depending list, Paygrouplist	Chapter05_DV.xls or Chapter05_DV.xlsx
	Duplicates	Chapter05_DV.xls or Chapter05_DV.xlsx
	Completed	Chapter05_DV.xls or Chapter05_DV.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
Chapter06	Circle	Geometry.xls or Geometry.xlsm
	Fundamentals	Geometry.xls or Geometry.xlsm
	Quadrilateral	Geometry.xls or Geometry.xlsm
	Sector of a circle	Geometry.xls or Geometry.xlsm
Chapter07	WORKDAY	Date_Time.xls or Date_Time.xlsx
	WORKDAY.INTL	Date_Time.xlsx
	Practice	Date_Time.xls or Date_Time.xlsx
	YEARFRAC	Date_Time.xls or Date_Time.xlsx
	DATEDIF	Date_Time.xls or Date_Time.xlsx
	DATE	Date_Time.xls or Date_Time.xlsx
	DATEVALUE	Date_Time.xls or Date_Time.xlsx
	EDATE	Date_Time.xls or Date_Time.xlsx
	TODAY	Date_Time.xls or Date_Time.xlsx
	YEAR	Date_Time.xls or Date_Time.xlsx
	NOW	Date_Time.xls or Date_Time.xlsx
	WEEKNUM	Date_Time.xls or Date_Time.xlsx
	MINUTE	Date_Time.xls or Date_Time.xlsx
	MONTH	Date_Time.xls or Date_Time.xlsx
	EOMONTH	Date_Time.xls or Date_Time.xlsx
	NETWORKDAYS	Date_Time.xls or Date_Time.xlsx
	NETWORKDAYS.INTL	Date_Time.xlsx
	SECOND	Date_Time.xls or Date_Time.xlsx
	HOUR	Date_Time.xls or Date_Time.xlsx
	DAY	Date_Time.xls or Date_Time.xlsx
	DAYS360	Date_Time.xls or Date_Time.xlsx
	WEEKDAY	Date_Time.xls or Date_Time.xlsx
	TIME	Date_Time.xls or Date_Time.xlsx
	TIMEVALUE	Date_Time.xls or Date_Time.xlsx
Chapter08	ASC	Text_Data.xls or Text_Data.xlsx
	BAHTTEXT	Text_Data.xls or Text_Data.xlsx
	CODE	Text_Data.xls or Text_Data.xlsx
	DOLLAR	Text_Data.xls or Text_Data.xlsx
	REPLACE	Text_Data.xls or Text_Data.xlsx
	FIXED	Text_Data.xls or Text_Data.xlsx
	FIND	Text_Data.xls or Text_Data.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	TRIM	Text_Data.xls or Text_Data.xlsx
	UPPER	Text_Data.xls or Text_Data.xlsx
	PROPER	Text_Data.xls or Text_Data.xlsx
	EXACT	Text_Data.xls or Text_Data.xlsx
	LOWER	Text_Data.xls or Text_Data.xlsx
	LEN	Text_Data.xls or Text_Data.xlsx
	LEFT	Text_Data.xls or Text_Data.xlsx
	RIGHT	Text_Data.xls or Text_Data.xlsx
	CLEAN	Text_Data.xls or Text_Data.xlsx
	SEARCH	Text_Data.xls or Text_Data.xlsx
	T	Text_Data.xls or Text_Data.xlsx
	MID	Text_Data.xls or Text_Data.xlsx
	TEXT	Text_Data.xls or Text_Data.xlsx
	CONCATENATE	Text_Data.xls or Text_Data.xlsx
	SUBSTITUTE	Text_Data.xls or Text_Data.xlsx
	VALUE	Text_Data.xls or Text_Data.xlsx
	REPT	Text_Data.xls or Text_Data.xlsx
	CHAR	Text_Data.xls or Text_Data.xlsx
Chapter09	Samples	Logical_values.xls or Logical_values.xlsx
	Properties and Interpretation	Logical_values.xls or Logical_values.xlsx
	IF	Logical_values.xls or Logical_values.xlsx
Chapter10	Address.xls or Address.xlsx	Chapter10 folder
	Offset.xls or Offset.xlsx	Chapter10 folder
	References.xls or References.xlsx	Chapter10 folder
	Misc	References.xls or References.xlsx
	Index	References.xls or References.xlsx
	MTRANS	References.xls or References.xlsx
	exampleRTD.xls, exampleRTD.xlsx, or exampleRTD.xlsm, exampleRTD.dll	Chapter10 folder
	Column-Row	References.xls or References.xlsx
	LOOKUP	Lookups.xls or Lookups.xlsx
	test.doc or test.docx	Chapter10 folder
	VLOOKUP	Lookups.xls or Lookups.xlsx
	MATCH	Lookups.xls or Lookups.xlsx
	HLOOKUP	Lookups.xls or Lookups.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
Chapter11	Misc	Informations.xls or Informations.xlsm
	Error	Informations.xls or Informations.xlsm
	Info	Informations.xls or Informations.xlsm
	IS-functions	Informations.xls or Informations.xlsm
	ISEVEN	Informations.xls or Informations.xlsm
	ISODD	Informations.xls or Informations.xlsm
	NA	Informations.xls or Informations.xlsm
	Cell	Informations.xls or Informations.xlsm
Chapter12	INTERCEPT	Regression.xls or Regression.xlsx
	RSQ	Regression.xls or Regression.xlsx
	BETAINV or BETA.INV	Probability.xls or Probability.xlsx
	BETADIST or BETA.DIST	Probability.xls or Probability.xlsx
	BINOM.INV	Probability.xlsx
	BINOMDIST or BINOM.DIST	Probability.xls or Probability.xlsx
	CHIINV or CHI.INV	Probability.xls or Probability.xlsx
	CHISQ.INV or CHISQ.INV.RT	Probability.xlsx
	CHITEST or CHI.TEST or CHISQ.TEST	Probability.xls or Probability.xlsx
	CHIDIST or CHISQ.DIST or CHISQ.DIST.RT	Probability.xls or Probability.xlsx
	CRITBINOM	Probability.xls or Probability.xlsx
	EXPONDIST or EXPON.DIST	Probability.xls or Probability.xlsx
	FINV or F.INV or F.INV.RT	Probability.xls or Probability.xlsx
	FISHER	Probability.xls or Probability.xlsx
	FISHERINV or FISHER.INV	Probability.xls or Probability.xlsx
	FTEST or F.TEST	Probability.xls or Probability.xlsx
	FDIST or F.DIST or F.DIST.RT	Probability.xls or Probability.xlsx
	GAMMAINV or GAMMA.INV	Probability.xls or Probability.xlsx
	GAMMALN	Probability.xls or Probability.xlsx
	GAMMALN.PRECISE	Probability.xls or Probability.xlsx
	GAMMADIST or GAMMA.DIST	Probability.xls or Probability.xlsx
	GEOMEAN	Average.xls or Average.xlsx
	TRIMMEAN	Average.xls or Average.xlsx
	ZTEST or Z.TEST	Probability.xls or Probability.xlsx
	HARMEAN	Average.xls or Average.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	Web access	WEBACCESS.xls or WEBACCESS.xlsx
	COUNT	Count.xls or Count.xlsx
	COUNTA	Count.xls or Count.xlsx
	COUNTBLANK	Count.xls or Count.xlsx
	FREQUENCY	Count.xls or Count.xlsx
	HYPGEOMDIST or HYPGEOM.DIST	Probability.xls or Probability.xlsx
	LARGE	Count.xls or Count.xlsx
	SMALL	Count.xls or Count.xlsx
	CONFIDENCE or CONFIDENCE.NORM	Probability.xls or Probability.xlsx
	CONFIDENCE.T	Probability.xls or Probability.xlsx
	CORREL	Probability.xls or Probability.xlsx
	COVAR	Regression.xls or Regression.xlsx
	COVARIANCE.P	Regression.xls or Regression.xlsx
	COVARIANCE.S	Regression.xls or Regression.xlsx
	KURT	Symmetry.xls or Symmetry.xlsx
	LOGINV or LOGNORM.INV	Probability.xls or Probability.xlsx
	LOGNORMDIST or LOGNORM.DIST	Probability.xls or Probability.xlsx
	MAX&MIN	Count.xls or Count.xlsx
	MAXA&MINA	Count.xls or Count.xlsx
	MEDIAN	Average.xls or Average.xlsx
	AVEDEV	Variance.xls or Variance.xlsx
	AVERAGE	Average.xls or Average.xlsx
	AVERAGEA	Average.xls or Average.xlsx
	AVERAGEIF	Average.xls or Average.xlsx
	AVERAGEIFS	Average.xlsx
	MODE or MODE.SNGL	Average.xls or Average.xlsx
	MODE.MULT	Average.xlsx
	NEGBINOMDIST or NEGBINOM.DIST	Probability.xls or Probability.xlsx
	NORMINV or NORM.INV	Probability.xls or Probability.xlsx
	NORMSINV or NORM.S.INV	Probability.xls or Probability.xlsx
	NORMDIST, NORMSDIST or NORM.DIST or NORM.S.DIST	Probability.xls or Probability.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	PEARSON	Regression.xls or Regression.xlsx
	POISSON or POISSON.DIST	Probability.xls or Probability.xlsx
	PERCENTILE	Average.xls or Average.xlsx
	PERCENTILE.INC or PERCENTILE.EXC	Average.xlsx
	PERCENTRANK	Average.xls or Average.xlsx
	PERCENTRANK.INC or PERCENTRANK.EXC	Average.xlsx
	QUARTILE	Average.xls or Average.xlsx
	QUARTILE.INC or QUARTILE.EXC	Average.xlsx
	RANK	Count.xls or Count.xlsx
	RANK.EQ	Count.xlsx
	RANK.AVG	Count.xlsx
	LINEST	Regression.xls or Regression.xlsx
	LOGEST	Regression.xls or Regression.xlsx
	FORECAST	Regression.xls or Regression.xlsx
	SKEW	Symmetry.xls or Symmetry.xlsx
	STDEV or STDEV.S	Variance.xls or Variance.xlsx
	STDEVA	Variance.xlsx
	STDEVP or STDEV.P	Variance.xls or Variance.xlsx
	STDEVPA	Variance.xlsx
	STANDARDIZE	Probability.xls or Probability.xlsx
	SLOPE	Regression.xls or Regression.xlsx
	STEYX	Probability.xls or Probability.xlsx
	DEVSQ	Regression.xls or Regression.xlsx
	TINV or T.INV or T.INV.2T	Probability.xls or Probability.xlsx
	TREND	Regression.xls or Regression.xlsx
	TTEST or T.TEST	Probability.xls or Probability.xlsx
	TDIST or T.DIST or T.DIST.2T	Probability.xls or Probability.xlsx
	T.DIST.RT	Probability.xlsx
	VAR or VAR.S	Variance.xls or Variance.xlsx
	VARA	Variance.xls or Variance.xlsx
	VARP or VAR.P	Variance.xls or Variance.xlsx
	VARPA	Variance.xls or Variance.xlsx
	GROWTH	Regression.xls or Regression.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	PERMUT	Probability.xls or Probability.xlsx
	PROB	Probability.xls or Probability.xlsx
	WEIBULL or WEIBULL.DIST	Probability.xls or Probability.xlsx
	COUNTIF	Count.xls or Count.xlsx
	COUNTIFS	Count.xlsx
Chapter13	Raw data	DBFUNCTION_empty.xls or DBFUNCTION_empty.xlsx
	DCOUNT	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DCOUNTA	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DGET	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DMAX or DMIN	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DAVERAGE	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DPPRODUCT	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DSTDEV	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DSTDEVP	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DSUM	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DVAR	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	DVARP	DBFUNCTION2.xls or DBFUNCTION2.xlsx
	GETPIVOTDATA	DBFUNCTION2.xls or DBFUNCTION2.xlsx
Chapter14	Cube Test.cub	Use the offline cube file to test the cube functions without Microsoft Analysis Services
	offline cubeTest.xlsx	This workbook contains the example applications for the cube functions
	offLine.odc	Use the office data connection file to access data through workbook connections
	offLine.oqy	Use the office data connection file to access data through Microsoft Query

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
Chapter15	AMORDEGRC	Depreciation Calculation.xls or Depreciation Calculation.xlsx
	AMORLINC	Depreciation Calculation.xls or Depreciation Calculation.xlsx
	ACCRINT	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	ACCRINTM	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	Bill of Exchange	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	PV	Compound Interest Calculation.xls or Compound Interest Calculation.xlsx; Repayment Calculation.xls or Repayment Calculation.xlsx; Annuity Calculation.xls or Annuity Calculation.xlsx
	SYD	Depreciation Calculation.xls or Depreciation Calculation.xlsx
	Treasury Bonds	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	DURATION	Price Calculation.xls or Price Calculation.xlsx
	EFFECT	Compound Interest Calculation.xls or Compound Interest Calculation.xlsx
	DDB	Depreciation Calculation.xls or Depreciation Calculation.xlsx
	DB	Depreciation Calculation.xls or Depreciation Calculation.xlsx
	IRR	Investment Calculation.xls or Investment Calculation.xlsx
	ISPMT	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	PRICE	Price Calculation.xls or Price Calculation.xlsx
	SLN	Depreciation Calculation.xls or Depreciation Calculation.xlsx
	MDURATION	Price Calculation.xls or Price Calculation.xlsx
	NPV	Investment Calculation.xls or Investment Calculation.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	DOLLARFR	Other.xls or Other.xlsx
	DOLLARDE	Other.xls or Other.xlsx
	MIRR	Investment Calculation.xls or Investment Calculation.xlsx
	YIELD	Price Calculation.xls or Price Calculation.xlsx
	YIELDMAT	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	PMT	Annuity Calculation.xls or Annuity Calculation.xlsx
	TBILL	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	ODDFPRICE	Price Calculation.xls or Price Calculation.xlsx
	ODDFYIELD	Price Calculation.xls or Price Calculation.xlsx
	ODDLPRICE	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	ODDLYIELD	Simple Interest Calculation.xls or Simple Interest Calculation.xlsx
	VDB	Found in Depreciation Calculation.xls or Depreciation Calculation.xlsx
	XIRR	Investment Calculation.xls or Investment Calculation.xlsx
	XNPV	Investment Calculation.xls or Investment Calculation.xlsx
	RATE	Compound Interest Calculation.xls or Compound Interest Calculation.xlsx; Annuity Calculation.xls or Annuity Calculation.xlsx
	PRICE and YIELD	Price Calculation.xls or Price Calculation.xlsx
	FV	Compound Interest Calculation.xls or Compound Interest Calculation.xlsx; Annuity Calculation.xls or Annuity Calculation.xlsx; Repayment Calculation.xls or Repayment Calculation.xlsx
	FVSCHEDULE	Compound Interest Calculation.xls or Compound Interest Calculation.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	NPER	Compound Interest Calculation.xls or Compound Interest Calculation.xlsx; Annuity Calculation.xls or Annuity Calculation.xlsx; or Repayment Calculation.xls or Repayment Calculation.xlsx
Chapter16	AGGREGATE.xlsx	Chapter16 folder
	ARRAY_FUNCTION	Chapter16.xls or Chapter16.xlsx
	ARRAY_FUNCTION2	Chapter16.xls or Chapter16.xlsx
	ATAN2	Chapter16.xls or Chapter16.xlsx
	COMBIN	Chapter16.xls or Chapter16.xlsx
	Data&Chart and Example	ACosH.xls or ACosH.xlsx
	Data&Chart	ASinH.xls or ASinH.xlsx
	Data&Chart	ATanH.xls or ATanH.xlsx
	Data&Chart and Example	CosH.xls or CosH.xlsx
	Data&Chart and Distribution	SinH.xls or SinH.xlsx
	Data&Chart and Water waves	TanH.xls or TanH.xlsx
	EXP	Chapter16.xls or Chapter16.xlsx
	EXP_LOG_LN	Chapter16.xls or Chapter16.xlsx
	FACT	Chapter16.xls or Chapter16.xlsx
	FLOOR	Chapter16.xls or Chapter16.xlsx
	GCD_LCM	Chapter16.xls or Chapter16.xlsx
	LOG_LN	Chapter16.xls or Chapter16.xlsx
	MOD	Chapter16.xls or Chapter16.xlsx
	POWER	Chapter16.xls or Chapter16.xlsx
	PRODUCT	Chapter16.xls or Chapter16.xlsx
	PRODUCT_SUM	Chapter16.xls or Chapter16.xlsx
	RAND	Chapter16.xls or Chapter16.xlsx
	ROMAN	Chapter16.xls or Chapter16.xlsx
	ROUND	Chapter16.xls or Chapter16.xlsx
	ROUNDUP	Chapter16.xls or Chapter16.xlsx
	Seriessum	Seriessum.xls or Seriessum.xlsx
	SIGN	Chapter16.xls or Chapter16.xlsx
	SIN_COS	Chapter16.xls or Chapter16.xlsx
	SQRT	Chapter16.xls or Chapter16.xlsx

Chapter Folder	Workbook/Worksheet Name	Location and/or Description
	SUBTOTAL	Chapter16.xls or Chapter16.xlsx
	SUBTOTAL2	Chapter16.xls or Chapter16.xlsx
	SUMIF	Chapter16.xls or Chapter16.xlsx
	SUMIFS	Chapter16.xls or Chapter16.xlsx
	SUMIFS2	Chapter16.xls or Chapter16.xlsx
	SUMPRODUCT	Chapter16.xls or Chapter16.xlsx
	SUMXY	Chapter16.xls or Chapter16.xlsx
	trigon	Chapter16.xls or Chapter16.xlsx
Chapter 17	Binary	Numbers.xls or Numbers.xlsx
	Decimal	Numbers.xls or Numbers.xlsx
	Hexadecimal	Numbers.xls or Numbers.xlsx
	Octal	Numbers.xls or Numbers.xlsx
	Sheet1	Convert.xls or Convert.xlsx
	Complex	Complex.xls or Complex.xlsm
	BESSEL I and Chart	Bessel_I.xls or Bessel_I.xlsx
	BESSEL J and Chart	Bessel_J.xls or Bessel_J.xlsx
	Bessel K and Chart	Bessel_K.xls or Bessel_K.xlsx
	Bessel Y and Chart	Bessel_Y.xls or Bessel_Y.xlsx
	Data and Chart	Gauss.xls or Gauss.xlsx
	Sheet1	Delta.xls or Delta.xlsx
	Longjump	GESTEP.xls or GESTEP.xlsx

Acknowledgments

In this introduction we would like to thank our editors Kenyon Brown and Thomas Braun-Wiesholler at O'Reilly Media and Kathy Krause at Online Training Solutions, Inc. (OTSI) for their inspiration, patience, and effort. The first edition of this book we published eight years ago in German for Microsoft Excel users in Germany, Austria, and Switzerland. Now we are proud to present you with our book translated into English. It was a great experience to transfer all of the chapters and sample files to readers in the United States and all over the world. Sometimes it was easy because we could remove the German-specific and European-specific topics. Other times it was challenging to find the U.S. analogy for some topics and samples. None of us is a native speaker, but with the great teamwork of the O'Reilly translators and editors, we learned a lot.

We have tried to bring you substantiated descriptions, practical examples, and solutions in all chapters, and to present the wide range of material without errors. Whether we have succeeded in fulfilling our own requirements is up to you to decide. We are realists and know that a book like this can always be improved in spite of all our efforts. We are therefore looking forward to receiving your critiques, suggestions, and notes.

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CHAPTER 1

Solving Problems with Functions

This chapter introduces Microsoft Excel and its functions. There are more practical examples with detailed function descriptions in Chapters 7 to 17 of this book.

First you will become familiar with Excel 2010, because there have been some notable changes since Excel 2007. Even if you are already using Excel 2010, you should be able to find some interesting points and suggestions.

Introducing the New Functions in Excel 2010

Microsoft Excel 2010 includes several new functions, many of which are introduced in the following Profit Margin example. Calculating a profit margin is important for price calculations and for planning operating results. By calculating the profit margin, you can build a decision-oriented cost accounting system.

Scenario and Goals

The Contoso, Ltd. company wants to evaluate and analyze its profit margins, focusing on overall percentages and variances. After you complete this example, you should be able to perform the following actions in Excel:

- Automatically fill in a month series and create your own fill styles
- Enter formulas
- Work with tables and style sheets

- Format cells
- Add and format graphics and charts
- Create a PivotTable and PivotChart

Sample Files

Use the Profit margin, Namerows, and Table profit margin worksheets in the Excel_Example.xls or Excel_Example.xlsx sample file. The sample files are found in the Chapter01 folder. For more information about the sample files, see the section titled "Using the Sample Files" on page xxiii.

The New Way to Work with Data, Formulas, and Functions

In this section, you will learn how to effectively work with Excel 2010 and explore the new possibilities.

Creating the Month Data Series

To quickly create a list of all months of the year, perform the following steps:

1. Select File/New and click Create to open an empty Excel workbook.
2. Enter the following text in columns A2 through E2 (see Figure 1-1):
   - **Month** (A2)
   - **Purchase** (B2)
   - **Sales** (C2)
   - **Profit margin** (D2)

	A	B	C	D
1				
2	**Month**	**Purchase**	**Sales**	**Profit margin**

Figure 1-1 Naming the table columns.

3. To enter the names of the months, you will use the fill feature. Start by entering **January** in cell A3.

4. Select cell A3 and point to the small square in the lower-right corner of the selected cell, the fill handle (see Figure 1-2). The mouse pointer changes to a black crosshair pointer.

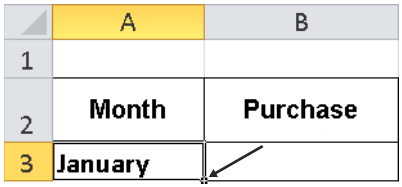

Figure 1-2 The fill handle for extending the data series.

5. Drag the crosshairs into cell A14. While you drag the crosshairs down, you will see the names of the months in the preview (see Figure 1-3).

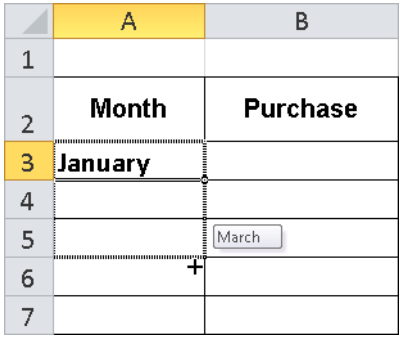

Figure 1-3 The months are added by using the fill handle.

6. Release the mouse button in cell A14 to display all months from January through December (see Figure 1-4).

	A
1	
2	Month
3	January
4	February
5	March
6	April
7	May
8	June
9	July
10	August
11	September
12	October
13	November
14	December

Figure 1-4 The names of the months are automatically filled in.

Creating an Individual Data Series

This feature can be used to fill rows or columns; it works for weekdays, months, and dates. To fill a number series, fill in the first two numbers in the sequence manually, select the two completed cells, and then drag the fill handle. The function can also be useful if you want to create your own data or AutoFill series. For example, if you don't want to enter a list of sales managers over and over again, you can define your own AutoFill list:

1. Click the last sheet tab at the bottom of the workbook, which is the one with the new sheet symbol, to open a new sheet. Alternatively, you can press the Ctrl+F11 key combination.

2. Enter **Sales manager** in a free cell.

3. Enter the names of the sales managers in the cells below the Sales manager title (see Figure 1-5).

	A
1	Sales manager
2	Jay Hamlin
3	Lori Penor
4	Ben Andrews
5	Michael Patten
6	Roxanne Kenison
7	Chris Sells

Figure 1-5 Creating a custom data series.

4. Select the range containing the names.

5. Click the File tab and select Options (see Figure 1-6).

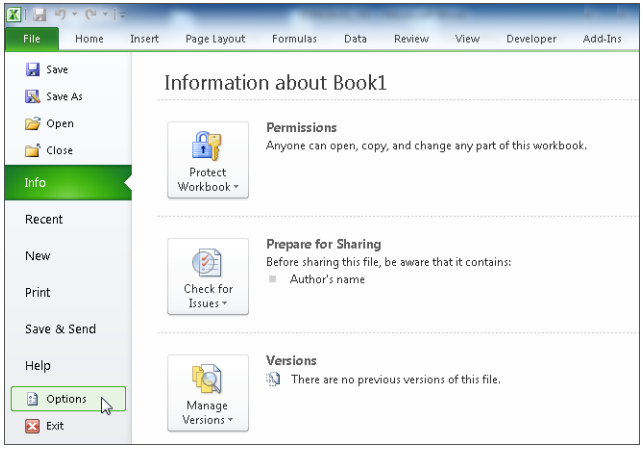

Figure 1-6 Selecting Excel options.

6. In the Excel Options dialog box, select the Advanced category and click Edit Custom Lists in the General section (see Figure 1-7).

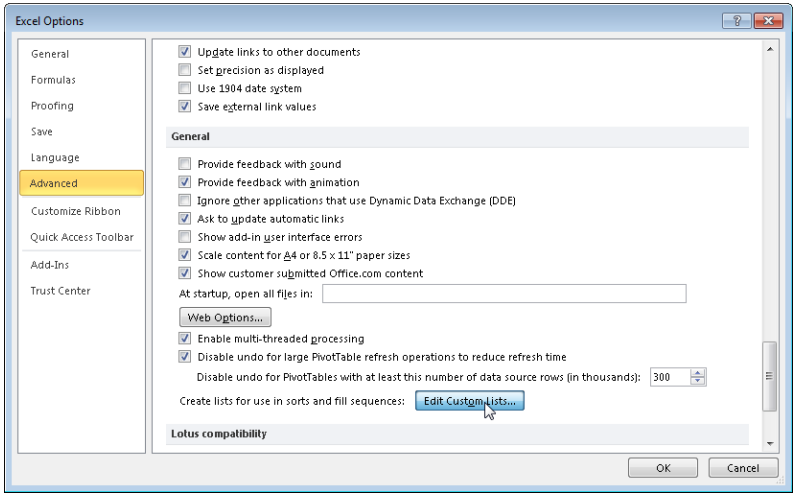

Figure 1-7 Opening frequently used lists.

> **Tip**
>
> **In Excel 2003, the Excel options are located in the Custom menu. In Excel 2007, you can access the options from the Microsoft Office button, and in Excel 2010 they are on the File tab. Click Excel Options or Options, respectively.**

7. Make sure that the cell reference for the selected list is displayed in the Import List From Cells field, and click Import (see Figure 1-8).

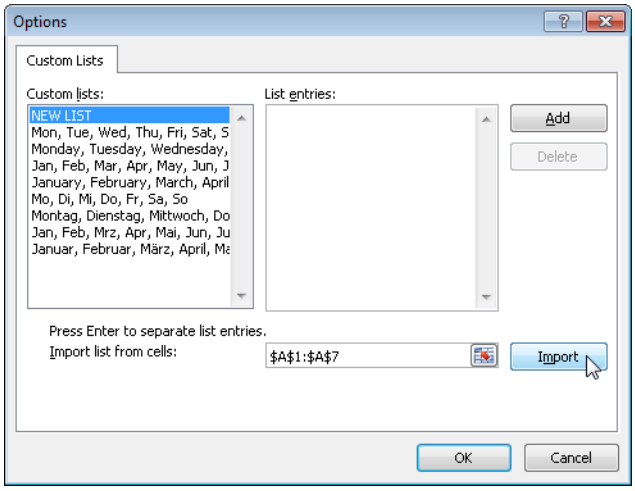

Figure 1-8 Specifying the cell range to be imported.

The elements in the selected list are added to the List Entries field (see Figure 1-9).

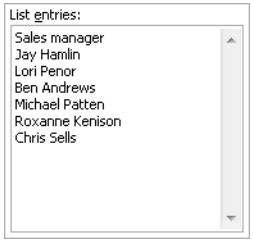

Figure 1-9 The list entries are added.

8. Click OK twice.

Now you have to enter only the name of one sales manager in a cell and drag the fill handle in the desired direction to generate the list of the sales managers on any spreadsheet. The series is created automatically.

This strategy gives you almost unlimited possibilities for creating a data series.

Entering Test Data Fast

Now let's return to the scenario described earlier in the chapter, in the section titled "Scenario and Goals." To complete the table with sales and purchase values, you need a set of sample data so that you can create and check the example. A convenient way to do this is to generate a set of random data by using the RANDBETWEEN() function.

1. Select cell B3 in the Excel sheet that contains the table you created previously.
2. Enter the following function: **=RANDBETWEEN(1000,500000)**. The values 1000 and 500000 indicate the minimum and maximum values and are divided by the comma (see Figure 1-10).

	A	B
1		
2	**Month**	**Purchase**
3	**January**	=RANDBETWEEN(1000,500000)
4	**February**	
5	**March**	

Figure 1-10 Working with formulas.

3. Press the Enter key. A random number from 1,000 through 500,000 appears in the cell (see Figure 1-11).

	A	B
1		
2	**Month**	**Purchase**
3	**January**	178314

Figure 1-11 The RANDBETWEEN function calculates a random value.

4. Select the cell and double-click the fill handle. The Purchase column is automatically filled through December (see Figure 1-12).

	A	B	C
1			
2	Month	Purchase	Sales
3	January	178314	
4	February	100419	
5	March	181190	
6	April	60947	
7	May	66849	
8	June	57386	
9	July	2957	
10	August	4410	
11	September	183933	
12	October	102958	
13	November	172501	
14	December	83044	

Figure 1-12 Values are added within seconds.

5. Edit the table however you want.

Converting Formula Results into Fixed Values

To ensure that the random values in the Purchase and Sales columns don't change, create a permanent copy of the entries by performing the following steps:

1. Select the cells in the Purchase column from January through December.
2. Point to the right edge of the selected column. The pointer changes into an arrow.
3. Click the right mouse button and drag the selection to the right and back. The movement is illustrated by a dashed line (see Figure 1-13).

	A	B	C
1			
2	Month	Purchase	Sales
3	January	178,314.00	
4	February	100,419.00	
5	March	181,190.00	
6	April	60,947.00	
7	May	66,849.00	
8	June	5 C3:C14	
9	July	2,957.00	
10	August	4,410.00	
11	September	183,933.00	
12	October	102,958.00	
13	November	172,501.00	
14	December	83,044.00	

Figure 1-13 The selected values are moved to the right and back.

Tip Use the Paste Values icon

If you are working with Excel 2010, there is an easier way to copy the values. Copy the values in the Purchase column, and then paste them by opening the Paste menu and clicking the Paste Values icon (see Figure 1-14).

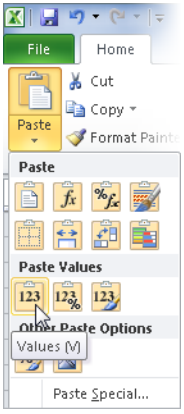

Figure 1-14 The Paste Values icon.

4. When the selection is back in the original position, release the mouse button and select Copy Here As Values Only in the shortcut menu (see Figure 1-15).

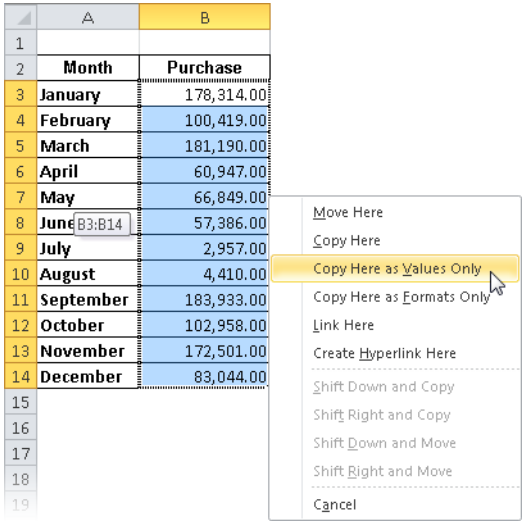

Figure 1-15 Converting numbers into fixed values.

The random values in the column are now fixed values and not formula-generated.

5. Repeat these steps and those in the section titled "Entering Test Data Fast" for the values in the Sales column, after you generate a fixed set of random values there, too.

Formatting Numeric Values

To format the numeric values in the Purchase and Sales columns as currency values, perform the following steps:

1. Select the cells B3 to C14.

2. Click the Accounting Number Format button in the Number group on the Home Tab (see Figure 1-16).

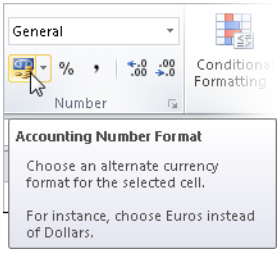

Figure 1-16 Formatting numbers as dollar values.

The selected values are automatically displayed as decimal numbers with two decimal places, in the currency format (see Figure 1-17).

	A	B	C
1			
2	**Month**	**Purchase**	**Sales**
3	**January**	$ 178,314.00	$ 219,572.00
4	**February**	$ 100,419.00	$ 205,043.00
5	**March**	$ 181,190.00	$ 385,835.00
6	**April**	$ 60,947.00	$ 201,285.00
7	**May**	$ 66,849.00	$ 213,776.00
8	**June**	$ 57,386.00	$ 397,653.00
9	**July**	$ 2,957.00	$ 283,100.00
10	**August**	$ 4,410.00	$ 334,551.00
11	**September**	$ 183,933.00	$ 247,343.00
12	**October**	$ 102,958.00	$ 362,121.00
13	**November**	$ 172,501.00	$ 340,069.00
14	**December**	$ 83,044.00	$ 379,739.00

Figure 1-17 The numbers are displayed as dollar amounts.

Calculating Profit Margin

To calculate the profit margin, do the following:

1. Click in cell D3 and subtract the Purchase amount from the Sales amount. To do this, enter an equal sign (=) in cell D3, click in cell C3, enter a minus sign (–) and then click in cell B3 (see Figure 1-18).

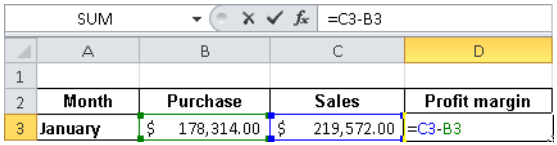

Figure 1-18 Subtracting values.

2. Press the Enter key.

3. Double-click the fill handle to calculate the profit margin through December (see Figure 1-19).

	A	B	C	D
1				
2	**Month**	**Purchase**	**Sales**	**Profit margin**
3	**January**	$ 178,314.00	$ 219,572.00	$ 41,258.00
4	**February**	$ 100,419.00	$ 205,043.00	$ 104,624.00
5	**March**	$ 181,190.00	$ 385,835.00	$ 204,645.00
6	**April**	$ 60,947.00	$ 201,285.00	$ 140,338.00
7	**May**	$ 66,849.00	$ 213,776.00	$ 146,927.00
8	**June**	$ 57,386.00	$ 397,653.00	$ 340,267.00
9	**July**	$ 2,957.00	$ 283,100.00	$ 280,143.00
10	**August**	$ 4,410.00	$ 334,551.00	$ 330,141.00
11	**September**	$ 183,933.00	$ 247,343.00	$ 63,410.00
12	**October**	$ 102,958.00	$ 362,121.00	$ 259,163.00
13	**November**	$ 172,501.00	$ 340,069.00	$ 167,568.00
14	**December**	$ 83,044.00	$ 379,739.00	$ 296,695.00

Figure 1-19 The profit margin is calculated for all months.

Formatting Data as a Table

In Excel 2007 and Excel 2010, a selection of preset table formats can be readily accessed from the ribbon.

1. Select the cells containing the entire table (A2:D14).

2. On the Home tab, click the Format As Table button in the Style group and select one of the table layouts shown in Figure 1-20.

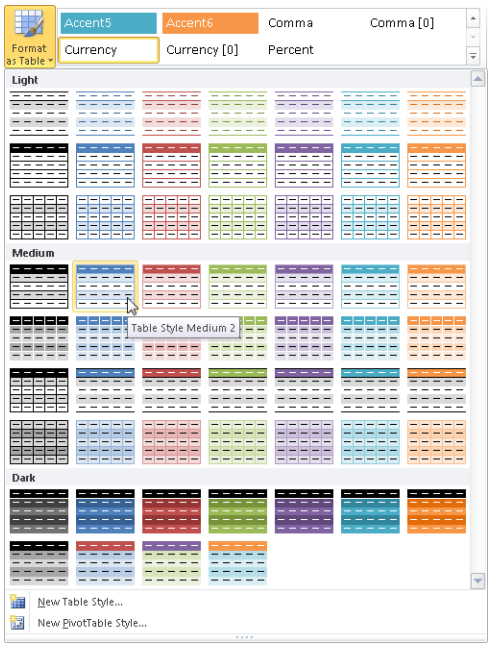

Figure 1-20 Table formats in Excel 2007 and Excel 2010.

3. The Create Table dialog box shows the range to be formatted (see Figure 1-21). Click OK.

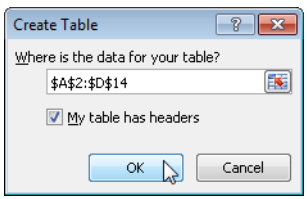

Figure 1-21 Confirming the table range to be formatted.

The table is formatted in the selected layout (see Figure 1-22).

	A	B	C	D
1				
2	Month	Purchase	Sales	Profit margin
3	January	$ 178,314.00	$ 219,572.00	$ 41,258.00
4	February	$ 100,419.00	$ 205,043.00	$ 104,624.00
5	March	$ 181,190.00	$ 385,835.00	$ 204,645.00
6	April	$ 60,947.00	$ 201,285.00	$ 140,338.00
7	May	$ 66,849.00	$ 213,776.00	$ 146,927.00
8	June	$ 57,386.00	$ 397,653.00	$ 340,267.00
9	July	$ 2,957.00	$ 283,100.00	$ 280,143.00
10	August	$ 4,410.00	$ 334,551.00	$ 330,141.00
11	September	$ 183,933.00	$ 247,343.00	$ 63,410.00
12	October	$ 102,958.00	$ 362,121.00	$ 259,163.00
13	November	$ 172,501.00	$ 340,069.00	$ 167,568.00
14	December	$ 83,044.00	$ 379,739.00	$ 296,695.00

Figure 1-22 Formatting tables in only a few steps.

After you have formatted the data as a table, you can use the filter options that have been placed in the table header.

INSIDE OUT

Format data as a table for added functionality

Formatting data as a table provides a convenient way to arrange the information neatly and concisely and also provides access to additional table features.

Calculating Profit Margin as a Percentage

This section explains how to calculate the profit margin as a percentage for the full year. To do this, perform the following steps:

1. Select cell D15, which is below the profit margin for December.
2. On the Home tab, in the Editing group, click the AutoSum button (see Figure 1-23).

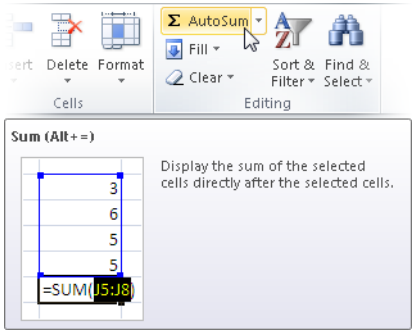

Figure 1-23 Calculating the sum with one mouse click.

The sum is automatically calculated and displayed in the Profit Margin column (see Figure 1-24).

	A	B	C	D
1				
2	**Month**	**Purchase**	**Sales**	**Profit margin**
3	**January**	$ 178,314.00	$ 219,572.00	$ 41,258.00
4	**February**	$ 100,419.00	$ 205,043.00	$ 104,624.00
5	**March**	$ 181,190.00	$ 385,835.00	$ 204,645.00
6	**April**	$ 60,947.00	$ 201,285.00	$ 140,338.00
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10	**August**	$ 4,410.00	$ 334,551.00	$ 330,141.00
11	**September**	$ 183,933.00	$ 247,343.00	$ 63,410.00
12	**October**	$ 102,958.00	$ 362,121.00	$ 259,163.00
13	**November**	$ 172,501.00	$ 340,069.00	$ 167,568.00
14	**December**	$ 83,044.00	$ 379,739.00	$ 296,695.00
15				**$ 2,375,179.00**
16				

Figure 1-24 Simplified calculation options with table formatting.

Tip Choose calculations options

Did you notice the arrow to the right of the sum field? Click the arrow to open a menu, select one of the different options, and view the result (see Figure 1-25).

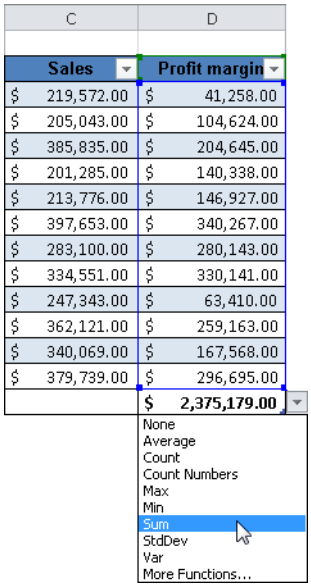


Figure 1-25 The calculation options for table ranges.

3. Create the profit margin percentage in the column next to the Profit Margin column. When you enter the text in column E, the table formatting is automatically extended to the additional column (see Figure 1-26).

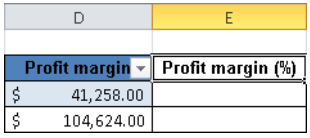


Figure 1-26 Adding columns to the table.

4. Press the Enter key. The column is added to the table automatically and inherits the table layout (see Figure 1-27).

D	E
Profit margin 1	Profit margin (%)
$ 41.258,00	
$ 104.624,00	

Figure 1-27 New columns are automatically adjusted to the table layout.

5. To calculate the profit margin as a percentage for January, click cell E3 (Profit Margin (%) column, January row).

6. The formula is "the profit margin of January divided by the total profit margin." To enter this in the cell, click cell D3 after the equal sign, type a forward slash, and then click cell D15 (see Figure 1-28).

SUM =[@[Profit margin]]/D15

	A	B	C	D	E
1					
2	Month	Purchase	Sales	Profit margin	Profit margin (%)
3	January	$ 178,314.00	$ 219,572.00	$ 41,258.00	=[@[Profit margin]]/
4	February	$ 100,419.00	$ 205,043.00	$ 104,624.00	D15
5	March	$ 181,190.00	$ 385,835.00	$ 204,645.00	0.09
6	April	$ 60,947.00	$ 201,285.00	$ 140,338.00	0.06
7	May	$ 66,849.00	$ 213,776.00	$ 146,927.00	0.06
8	June	$ 57,386.00	$ 397,653.00	$ 340,267.00	0.14
9	July	$ 2,957.00	$ 283,100.00	$ 280,143.00	0.12
10	August	$ 4,410.00	$ 334,551.00	$ 330,141.00	0.14
11	September	$ 183,933.00	$ 247,343.00	$ 63,410.00	0.03
12	October	$ 102,958.00	$ 362,121.00	$ 259,163.00	0.11
13	November	$ 172,501.00	$ 340,069.00	$ 167,568.00	0.07
14	December	$ 83,044.00	$ 379,739.00	$ 296,695.00	0.12
15				$ 2,375,179.00	

Figure 1-28 In Excel 2007 and Excel 2010, formulas include table values.

7. Press the Enter key to confirm. Because the data has been formatted as a table, the formula entered is automatically applied to all cells in the Profit Margin (%) column (see Figure 1-29).

	D	E
	Profit margin	Profit margin (%)
	$ 41,258.00	0.02
	$ 104,624.00	0.04
	$ 204,645.00	0.09
	$ 140,338.00	0.06
	$ 146,927.00	0.06
	$ 340,267.00	0.14
	$ 280,143.00	0.12
	$ 330,141.00	0.14
	$ 63,410.00	0.03
	$ 259,163.00	0.11
	$ 167,568.00	0.07
	$ 296,695.00	0.12
	$ 2,375,179.00	

Figure 1-29 The formula is applied to all cells in the column.

8. Select the numeric values in the Profit Margin (%) column, and click the Percent Style button in the Number group on the Home Tab (see Figure 1-30).

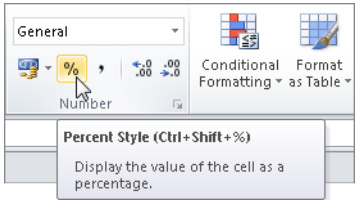


Figure 1-30 Numbers are displayed as percentages.

The values are now displayed as percentages (see Figure 1-31).

E
Profit margin (%)
2%
4%
9%
6%
6%
14%
12%
14%
3%
11%
7%
12%

Figure 1-31 The profit margins as percentages.

Applying Conditional Formatting

To make data easier to interpret, use the conditional formatting feature to automatically format the data. With conditional formats, values are selected if they meet certain criteria, and the cell range is formatted accordingly. Conditional formats visually highlight the distribution and variation of data.

With regard to our example, the condition could be "Format in green all cells in the Profit Margin column that contain a value of at least $200,000." To enter this format, perform the following steps:

1. Select the cell range in the Profit Margin column.
2. Click the Conditional Formatting button in the Style group on the Home tab, and then click New Rule (see Figure 1-32).

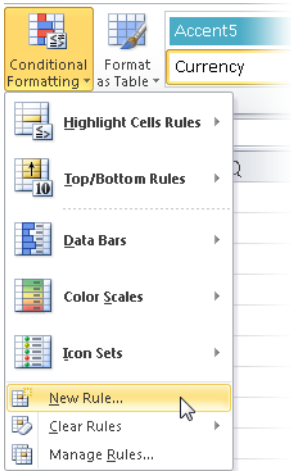


Figure 1-32 Creating a new rule.

3. In the New Formatting Rule dialog box, under Select A Rule Type, select Format Only Cells That Contain.
4. Specify the settings in the Edit The Rule Description pane. Select Cell Value and Greater Than Or Equal To in the list boxes.
5. Enter the value **200000** in the third field (see Figure 1-33).

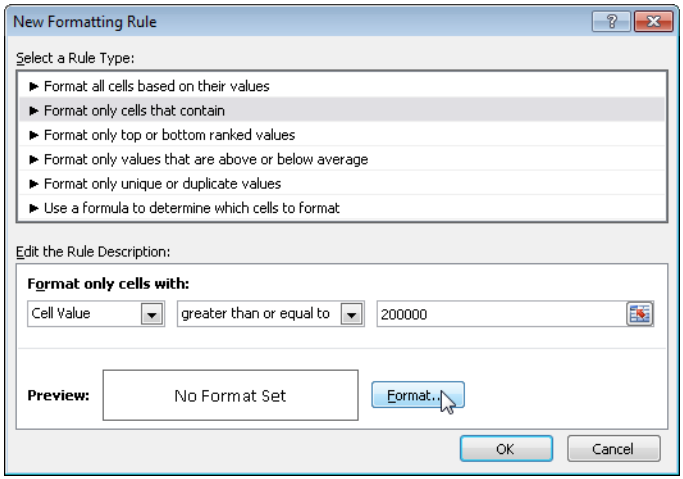


Figure 1-33 Defining the formatting rule.

6. Click the Format button.

7. Click the Fill tab of the Format Cells dialog box, and select a background color (see Figure 1-34).

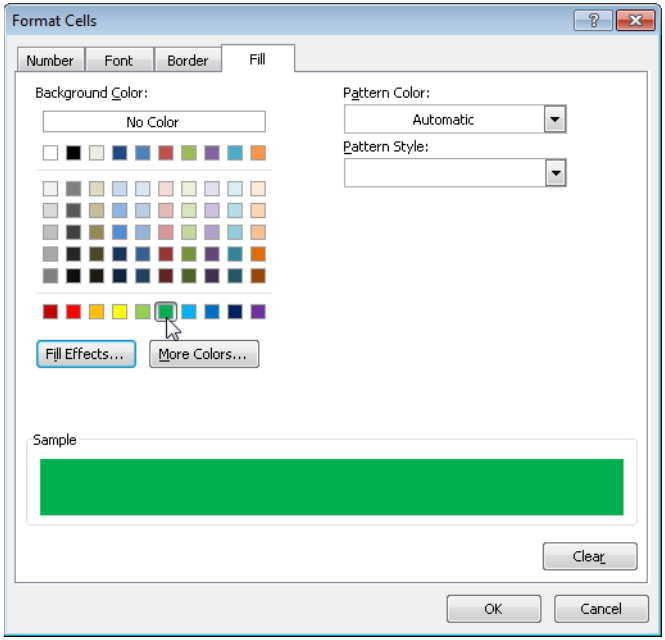


Figure 1-34 The condition is displayed in color.

8. Click OK twice to confirm your selection. The values in the Profit margin column are displayed in the color you selected if the condition is met (see Figure 1-35).

	A	B	C	D
1				
2	**Month**	**Purchase**	**Sales**	**Profit margin**
3	**January**	$ 178,314.00	$ 219,572.00	$ 41,258.00
4	**February**	$ 100,419.00	$ 205,043.00	$ 104,624.00
5	**March**	$ 181,190.00	$ 385,835.00	$ 204,645.00
6	**April**	$ 60,947.00	$ 201,285.00	$ 140,338.00
7	**May**	$ 66,849.00	$ 213,776.00	$ 146,927.00
8	**June**	$ 57,386.00	$ 397,653.00	$ 340,267.00
9	**July**	$ 2,957.00	$ 283,100.00	$ 280,143.00
10	**August**	$ 4,410.00	$ 334,551.00	$ 330,141.00
11	**September**	$ 183,933.00	$ 247,343.00	$ 63,410.00
12	**October**	$ 102,958.00	$ 362,121.00	$ 259,163.00
13	**November**	$ 172,501.00	$ 340,069.00	$ 167,568.00
14	**December**	$ 83,044.00	$ 379,739.00	$ 296,695.00

Figure 1-35 Values meeting the condition have a green background.

You can use conditional formatting to automatically display the values in your table in different colors to give them significant visual impact.

You can also use other color fill options or an icon set to format cells. Conditions can apply to text, numeric, date, or time values, as well as to values that fall below or above the average.

Data bars are also a quick way to visually highlight values in tables (see Figure 1-36).

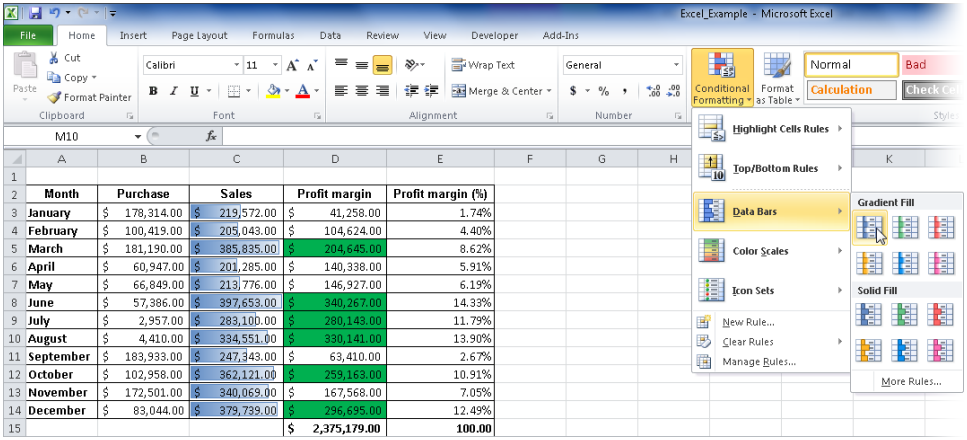


Figure 1-36 Using formats to highlight numeric values.

There are many different options to choose from.

Tip Apply conditional formats to highlight data

In Excel 2007 and Excel 2010, conditional formats have improved significantly (see Figure 1-37). Now you can add not only colors but also arrows, traffic lights, and other icons. This functionality is also referred to as KPI (Key Performance Indicators).

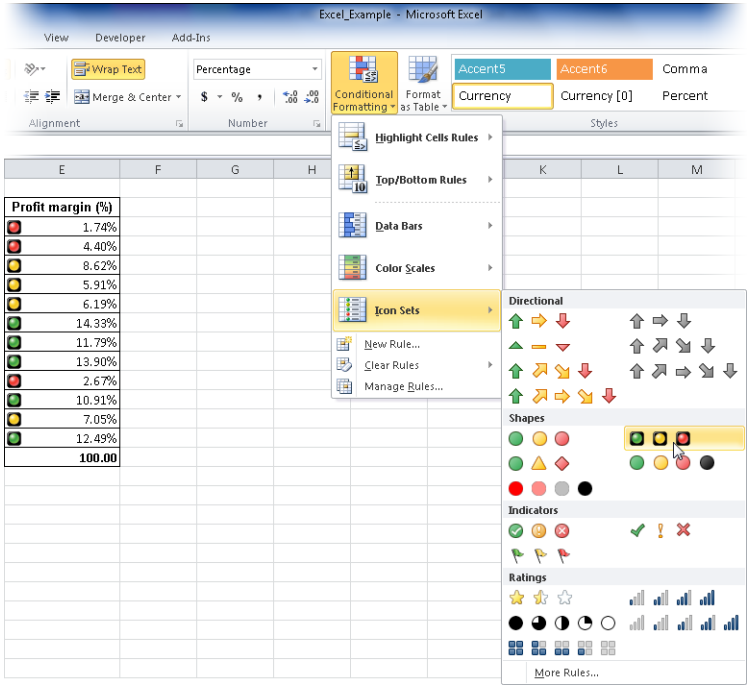


Figure 1-37 New elements for conditional formats in Excel 2007 and Excel 2010.

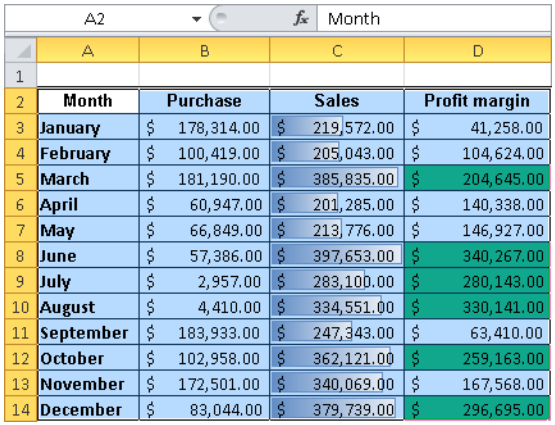
Creating Meaningful Charts

Sometimes it is useful to display data in a chart instead of in a table. In Excel 2007 and Excel 2010, the options for creating bar charts, pie charts, and other charts have been enhanced.

Creating a Column Chart

To convert our example table into a simple but informative column chart, perform the following steps:

1. Select the table cells starting from Month to the profit margin December (see Figure 1-38).



	A	B	C	D
1				
2	Month	Purchase	Sales	Profit margin
3	January	$ 178,314.00	$ 219,572.00	$ 41,258.00
4	February	$ 100,419.00	$ 205,043.00	$ 104,624.00
5	March	$ 181,190.00	$ 385,835.00	$ 204,645.00
6	April	$ 60,947.00	$ 201,285.00	$ 140,338.00
7	May	$ 66,849.00	$ 213,776.00	$ 146,927.00
8	June	$ 57,386.00	$ 397,653.00	$ 340,267.00
9	July	$ 2,957.00	$ 283,100.00	$ 280,143.00
10	August	$ 4,410.00	$ 334,551.00	$ 330,141.00
11	September	$ 183,933.00	$ 247,343.00	$ 63,410.00
12	October	$ 102,958.00	$ 362,121.00	$ 259,163.00
13	November	$ 172,501.00	$ 340,069.00	$ 167,568.00
14	December	$ 83,044.00	$ 379,739.00	$ 296,695.00

Figure 1-38 Selecting a value to create a chart.

2. On the Insert tab in the Chart group, click the Column button and select the first chart under 2D Column (see Figure 1-39).

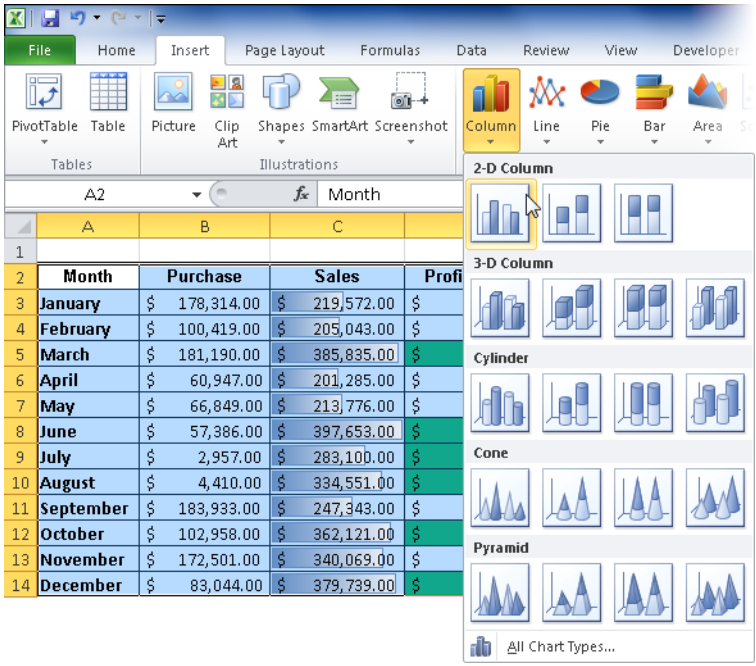


Figure 1-39 Selecting the chart format.

The chart is immediately displayed on your Excel sheet (see Figure 1-40).

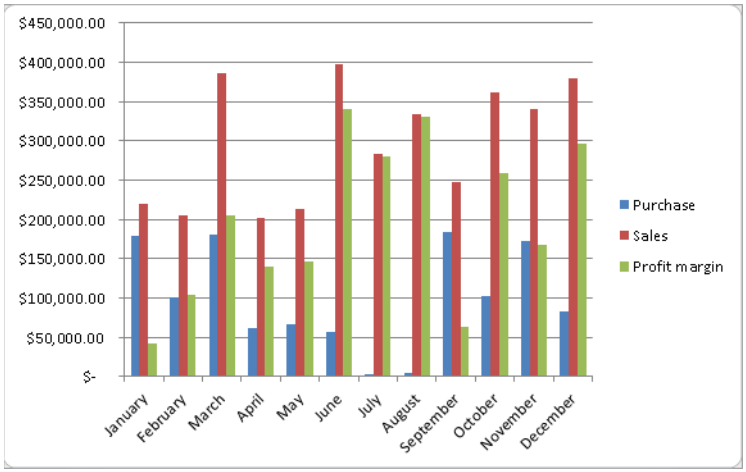


Figure 1-40 The data displayed as a chart.

In the same way you created a column chart, you can create a 2D, 3D, or line chart (see Figure 1-41). To do this, select a chart format by clicking the Line button to open the menu.

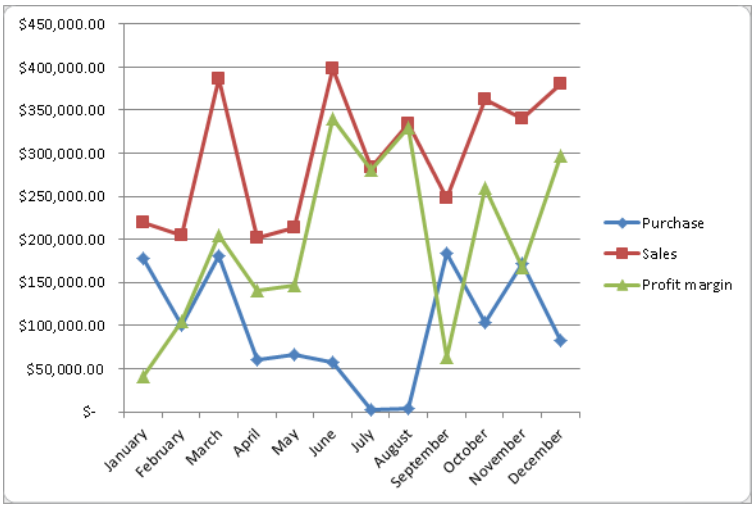


Figure 1-41 Another view of the chart.

Creating a Pie Chart

To display the values in the Profit Margin column by month, you can use a pie chart. Do the following:

1. Select the cells containing values in the Months and Profit Margin columns. To select only these two columns, first select the Months column. Then press the Ctrl key and select the Profit Margin column. Both columns are selected (see Figure 1-42).

	A	B	C	D
1				
2	**Month**	**Purchase**	**Sales**	**Profit margin**
3	**January**	$ 178,314.00	$ 219,572.00	$ 41,258.00
4	**February**	$ 100,419.00	$ 205,043.00	$ 104,624.00
5	**March**	$ 181,190.00	$ 385,835.00	$ 204,645.00
6	**April**	$ 60,947.00	$ 201,285.00	$ 140,338.00
7	**May**	$ 66,849.00	$ 213,776.00	$ 146,927.00
8	**June**	$ 57,386.00	$ 397,653.00	$ 340,267.00
9	**July**	$ 2,957.00	$ 283,100.00	$ 280,143.00
10	**August**	$ 4,410.00	$ 334,551.00	$ 330,141.00
11	**September**	$ 183,933.00	$ 247,343.00	$ 63,410.00
12	**October**	$ 102,958.00	$ 362,121.00	$ 259,163.00
13	**November**	$ 172,501.00	$ 340,069.00	$ 167,568.00
14	**December**	$ 83,044.00	$ 379,739.00	$ 296,695.00

Figure 1-42 Selecting only certain columns of the list.

2. Click the Pie button to open the menu, and select the first chart type under 3D Pie (see Figure 1-43).

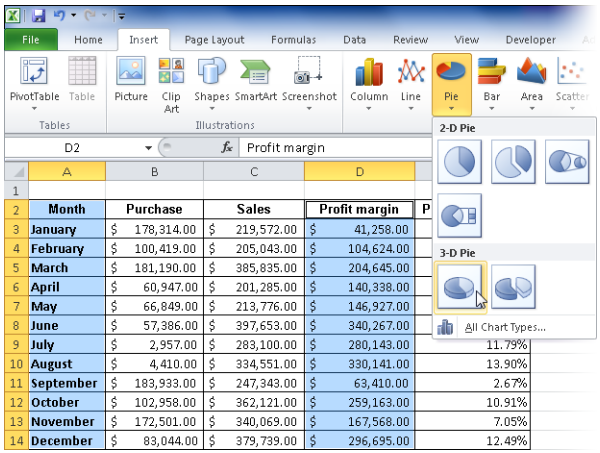


Figure 1-43 Selecting a pie chart.

The pie chart is displayed immediately (see Figure 1-44).

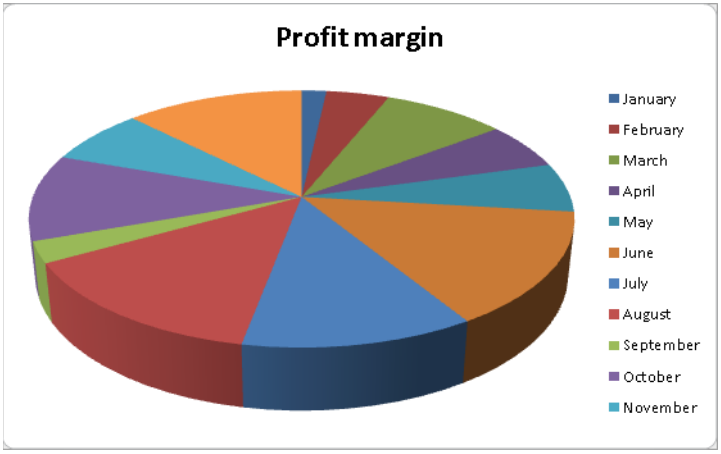


Figure 1-44 The pie chart shows the profit margin.

Formatting a Chart

Excel 2010 provides many formatting options you can use to emphasize values in pie charts.

Do the following:

1. Click the frame of the chart.

   The Chart Tools contextual tab opens. On this tab, you can choose between the available formatting options (see Figure 1-45).

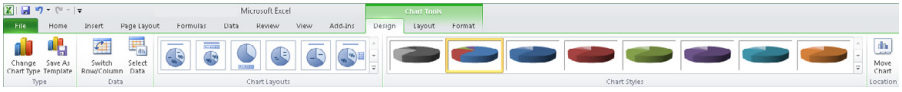


Figure 1-45 The Chart Tools tab in Excel 2010 for editing charts.

2. With these tools, you can select any of the format options. For example, click Layout 6 in the Chart Layouts section (see Figure 1-46).

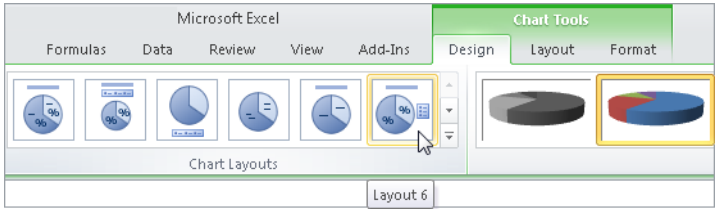


Figure 1-46 Changing the chart layout.

Layout 6 displays your pie chart with percentages, or values (see Figure 1-47).

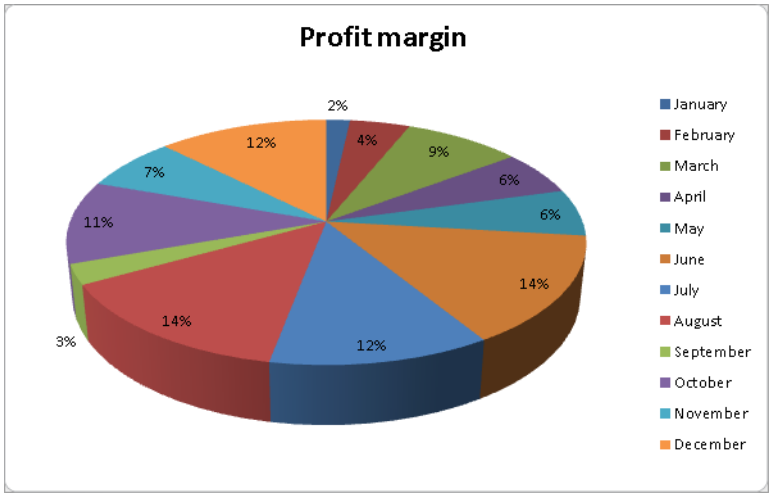


Figure 1-47 The settings of the selected chart layout are applied.

3. With the chart formats, you can also adjust the chart colors. Just click one of the available formats (see Figure 1-48).

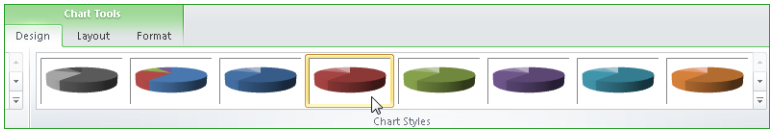


Figure 1-48 Using chart formats to adjust the color.

The color of the chart changes according to your selection (see Figure 1-49).

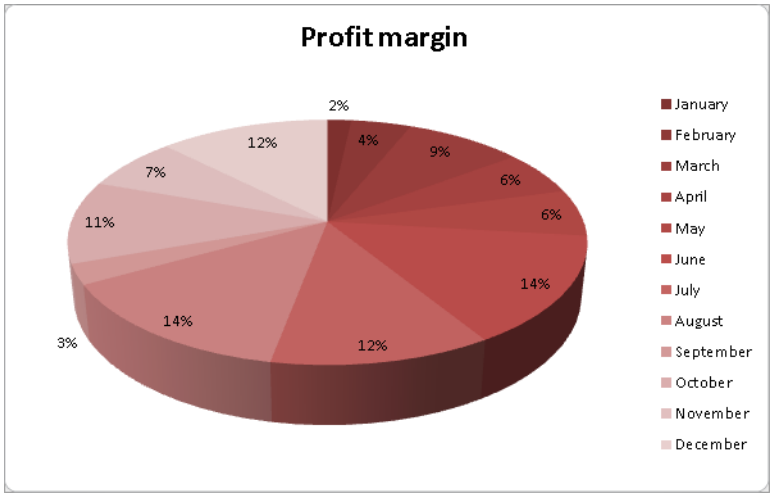


Figure 1-49 The selected chart colors are applied.

4. In Excel 2010—as in Excel 2007 and Excel 2003—more chart format options are available in the shortcut menu of the selected chart. Right-click the chart to open the menu, and then select Format Data Labels or Format Data Series to change the format of your chart (see Figure 1-50).

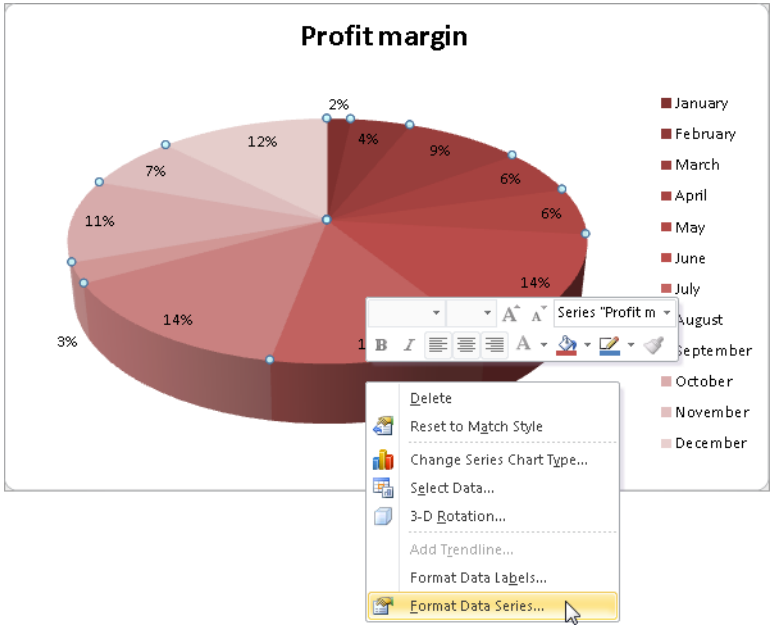


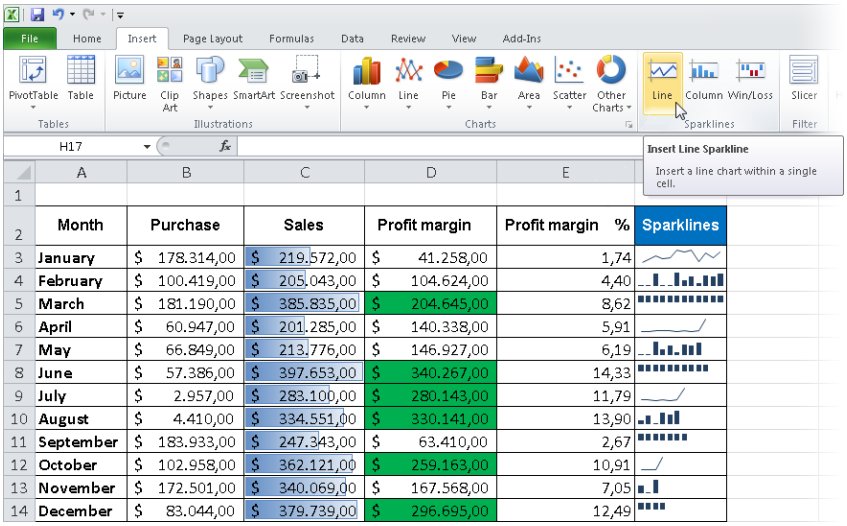
Figure 1-50 Additional formatting options.

In Excel 2010, working with charts is a lot easier. The options for editing and formatting are more extensive, and fully formatted charts can be created with just a few clicks.

INSIDE OUT

Use sparklines to graphically represent values

Check out the new sparklines in Excel 2010. These "word graphics" illustrate values by using miniature line, bar, or profit-and-loss charts. Sparklines illustrate numeric values so that the values can be interpreted more easily (see Figure 1-51).



	A	B	C	D	E	
1						
2	Month	Purchase	Sales	Profit margin	Profit margin %	Sparklines
3	January	$ 178.314,00	$ 219.572,00	$ 41.258,00	1,74	
4	February	$ 100.419,00	$ 205.043,00	$ 104.624,00	4,40	
5	March	$ 181.190,00	$ 385.835,00	$ 204.645,00	8,62	
6	April	$ 60.947,00	$ 201.285,00	$ 140.338,00	5,91	
7	May	$ 66.849,00	$ 213.776,00	$ 146.927,00	6,19	
8	June	$ 57.386,00	$ 397.653,00	$ 340.267,00	14,33	
9	July	$ 2.957,00	$ 283.100,00	$ 280.143,00	11,79	
10	August	$ 4.410,00	$ 334.551,00	$ 330.141,00	13,90	
11	September	$ 183.933,00	$ 247.343,00	$ 63.410,00	2,67	
12	October	$ 102.958,00	$ 362.121,00	$ 259.163,00	10,91	
13	November	$ 172.501,00	$ 340.069,00	$ 167.568,00	7,05	
14	December	$ 83.044,00	$ 379.739,00	$ 296.695,00	12,49	

Figure 1-51 Values illustrated by the new sparklines.

Working with PivotTables

PivotTables help you arrange and consolidate data into well-defined tables. With a PivotTable, you can easily generate cross-tabulations and analyze information by rotating and moving column and row selections and by filtering. The original data remains unchanged, and the PivotTable is quickly generated even with large amounts of data. In Excel 2007 and Excel 2010, PivotTable data can also easily be displayed as a PivotChart.

Tip

A PivotTable is useful for quickly obtaining summary information from long lists or large amounts of data.

Creating a PivotTable

Sample Files

Use the Basic data worksheet in the Excel_Pivot_Data.xls or Excel_Pivot_Data.xlsx sample file. The sample files are found in the Chapter01 folder. For more information about the sample files, see the section titled "Using the Sample Files" on page xxiii.

To create a PivotTable, perform the following steps:

1. Open the Excel_Pivot_Data.xlsx file from the sample files.
2. In the table, select the cell range for which you want to create the PivotTable. In this case, select cell A1 (Customer Name) through cell J100 (Total Price), or select the entire table by pressing Ctrl+A from anywhere within the table.
3. On the Insert tab, in the Table group, click the arrow on the PivotTable button and select PivotTable (see Figure 1-52).

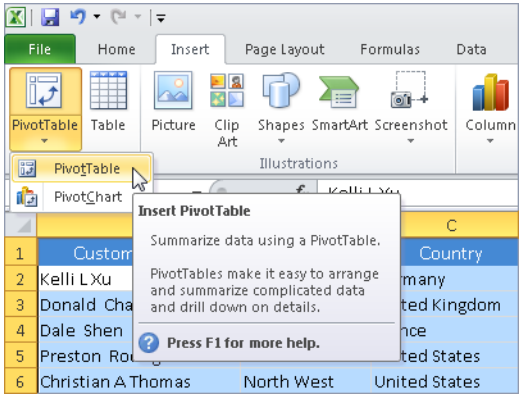


Figure 1-52 Creating a PivotTable.

Tip Find Pivot functions on the Insert tab

In Excel 2003, the Pivot functions were located on the File menu. In Excel 2007 and Excel 2010, you can open the Pivot functions by clicking a button on the Insert tab. The functions open in a separate tool window as soon as you start creating a PivotTable.

Because you have already selected the data, the PivotTable range is displayed in the Select Table Or Range box in the PivotTable dialog box.

4. Select an option under Choose Where You Want The PivotTable Report To Be Placed. Selecting the New Worksheet option is recommended (see Figure 1-53).

5. Click OK. The PivotTable framework is displayed.

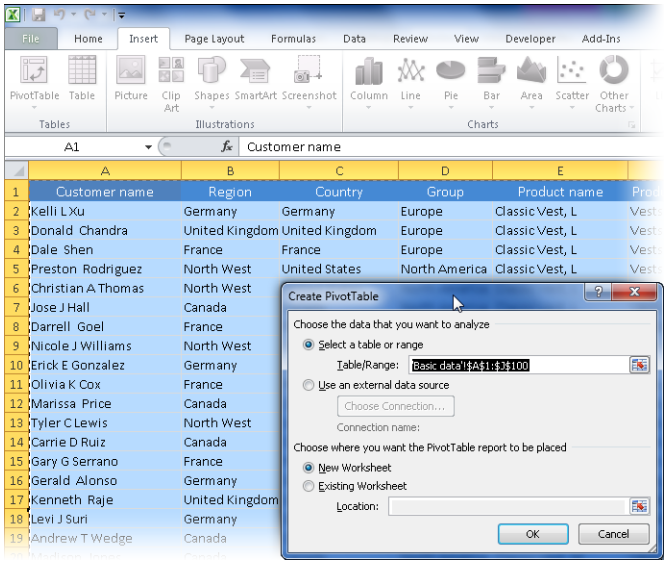


Figure 1-53 Choosing where to place the PivotTable.

An empty PivotTable report is added, in this case in a new worksheet, and the PivotTable field list is displayed. In this list, you can select fields, create a layout, and change the PivotTable report.

You can also use the PivotTable tools on the PivotTable Tool contextual tab, which you can access from the ribbon (see Figure 1-54).

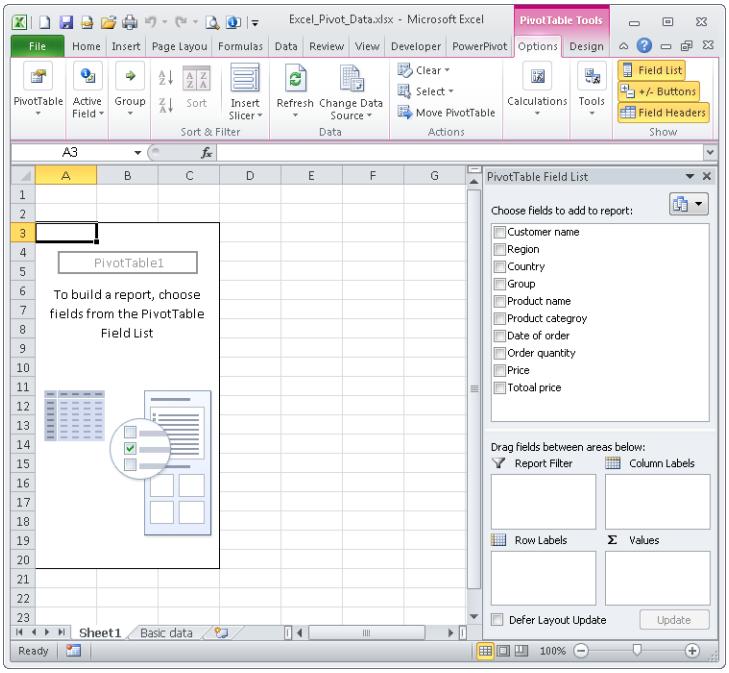


Figure 1-54 The PivotTable layout.

Using a PivotTable

The following example illustrates the functionality of a PivotTable. Assume that you want to find out in which country the most orders for gloves are placed. For this you need the PivotTable fields Country, Product Category, and Order Quantity.

Follow these steps:

1. Select the Country, Product Category, and Order Quantity check boxes in the PivotTable field list.

   After you have enabled the fields, the associated data are automatically positioned in the default range of the layout, but you can move the fields to any position (see Figure 1-55).

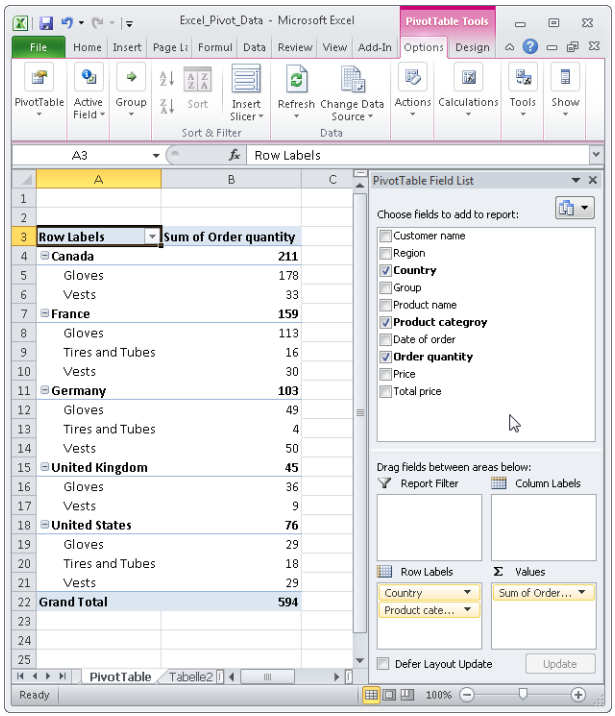


Figure 1-55 The fields in the standard report.

2. Because you want to view the order quantity for gloves per country, you should move the Product Category column into the Report Filter area. This will allow you to filter by country. Drag the Product Category field into the Report Filter area within the PivotTable field list (see Figure 1-56).

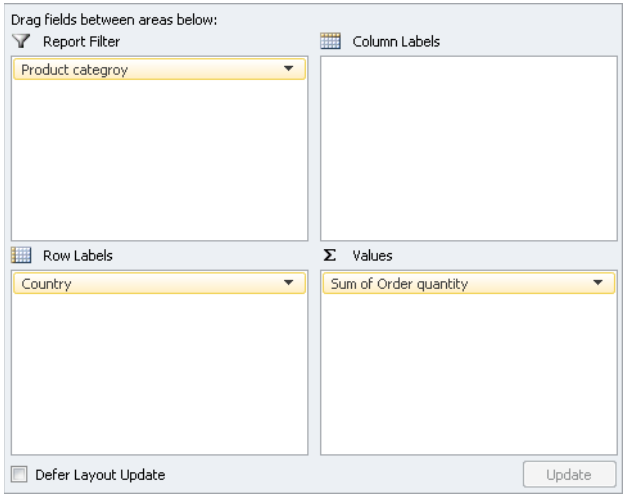


Figure 1-56 Moving fields by dragging.

As soon as you release the mouse button, the data is arranged in the PivotTable (see Figure 1-57).

	A	B
1	Product categroy	(All)
2		
3	**Row Labels**	**Sum of Order quantity**
4	Canada	211
5	France	159
6	Germany	103
7	United Kingdom	45
8	United States	76
9	**Grand Total**	**594**

Figure 1-57 The newly arranged fields.

3. In the (All) list, select Gloves and click OK (see Figure 1-58).

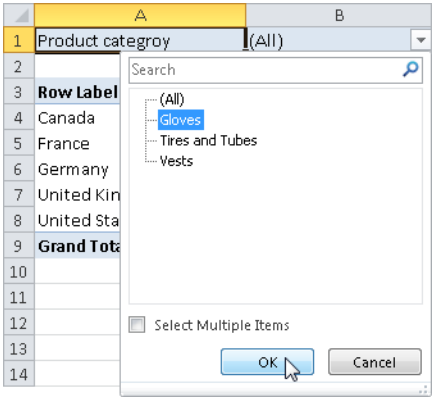


Figure 1-58 Select Gloves from the list so that only the result for gloves will be displayed.

Only the order quantities for gloves in the individual countries are displayed (see Figure 1-59). Canada is the frontrunner!

	A	B
1	Product categroy	Gloves
2		
3	**Row Labels**	**Sum of Order quantity**
4	Canada	178
5	France	113
6	Germany	49
7	United Kingdom	36
8	United States	29
9	**Grand Total**	**405**

Figure 1-59 Getting meaningful results with only a few clicks.

Note

Don't worry if a report is not what you were expecting. With Excel, you can try various options to see how the data looks in different formats by rearranging the data, moving data, or even starting again.

Using PivotCharts: Graphical Pivot

The new user interface also makes it easier to create PivotCharts. All filter enhancements for PivotTables are also available for PivotCharts. There are special PivotChart tools and short-cut menus you can use to create a PivotChart to analyze the data within a chart.

You can change the layout and the format of charts or the chart elements in the same way you make changes for Pivot Tables. Unlike in previous Excel versions, in Excel 2007 and Excel 2010, the chart format is maintained if you change the PivotChart.

Creating a PivotChart

Creating a chart for a PivotTable takes only seconds. Use the previous PivotTable example to practice. Do the following:

1. Click in the PivotTable, and select the PivotTable Tools contextual tab above the default tab (see Figure 1-60).

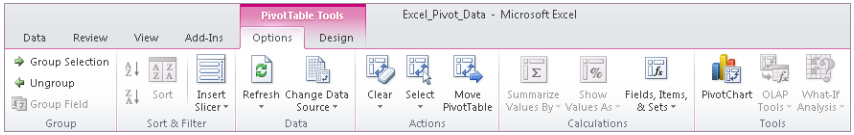


Figure 1-60 Working with PivotTable tools.

2. In the Tools group, click the PivotChart button (see Figure 1-61). The Insert Chart dialog box opens. The first layout under Column is selected (see Figure 1-62).

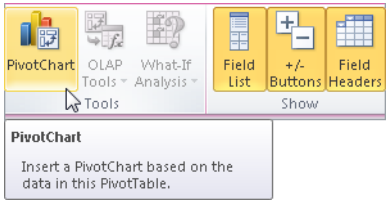


Figure 1-61 Creating a chart from PivotTable data.

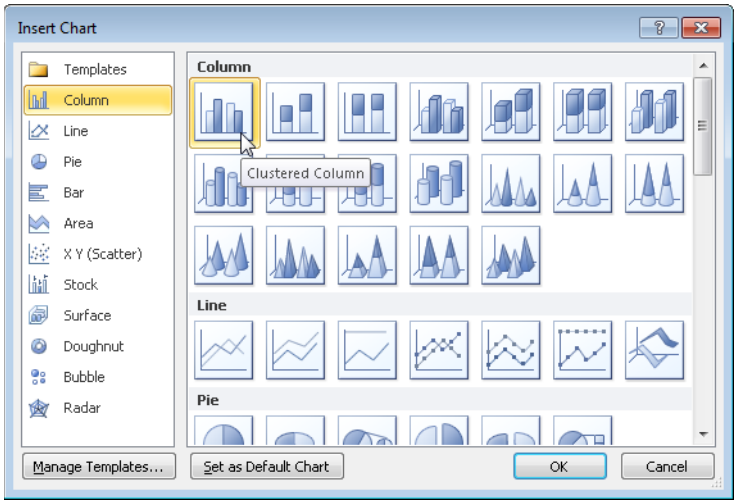


Figure 1-62 Selecting the chart format.

3. Keep this setting and click OK. The chart and a PivotChart filter range are displayed (see Figure 1-63).

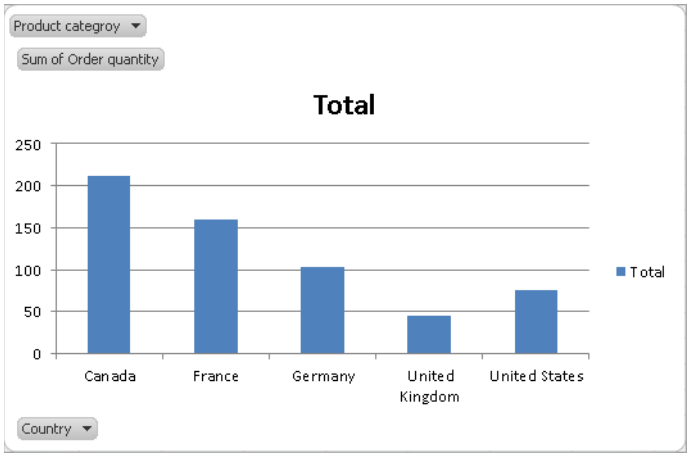


Figure 1-63 The PivotChart is created.

4. As soon as you change the filter, the chart also changes. In the Country list, select Germany and click OK (see Figure 1-64).

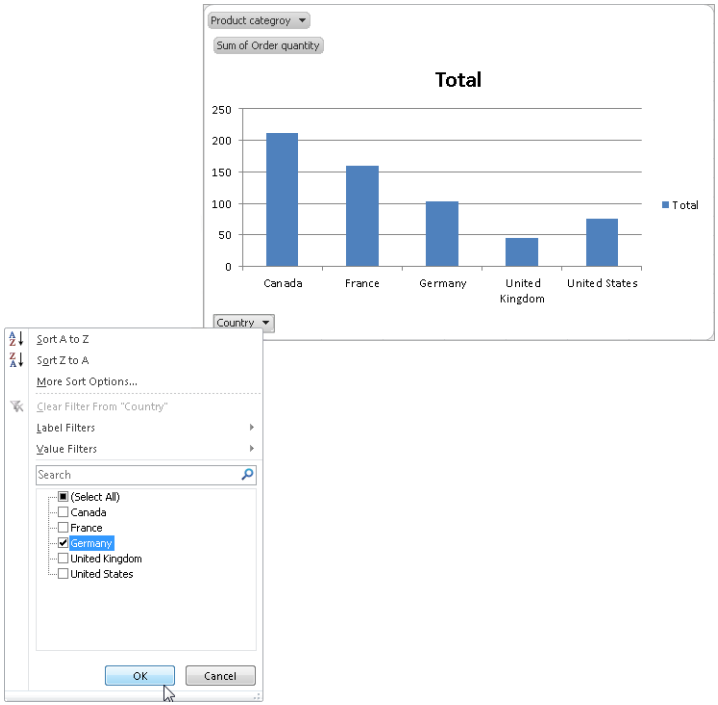


Figure 1-64 Selecting a filter.

The chart changes automatically, and the corresponding values are displayed (see Figure 1-65).

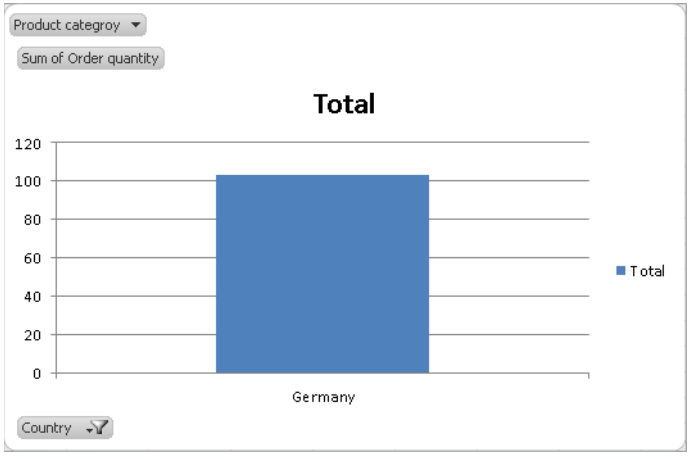


Figure 1-65 The chart changes depending on the Pivot data.

Changing the Original Data

PivotTables and PivotCharts change dynamically: If a value changes in the original data, the PivotTable and the associated chart also change. Try it out:

1. In the original data, increase the order quantity for gloves in Germany in any row (see Figure 1-66).

	A	B	C	D	E	F	G	H
37	Alexandra E Washington	Canada	Canada	North America	Half-Finger Gloves, L	Gloves	11.05.11	6
38	Cassidy Washington	United Kingdom	United Kingdom	Europe	Half-Finger Gloves, L	Gloves	04.05.11	1
39	Elijah Alexander	Canada	Canada	North America	Half-Finger Gloves, L	Gloves	29.04.11	2
40	Bruce G Suri	Germany	Germany	Europe	Half-Finger Gloves, L	Gloves	28.03.11	2568

Figure 1-66 Changing the original data.

2. Go back to the PivotTable and open the PivotTable Tools contextual tab.

3. On the Analyze tab, in the Data group, click the Refresh button (see Figure 1-67).

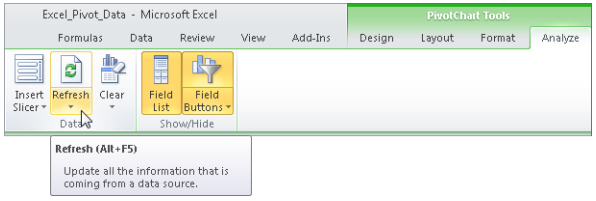


Figure 1-67 Applying changes to the original data by clicking Refresh.

The PivotTable as well as the PivotChart are automatically updated (see Figure 1-68).

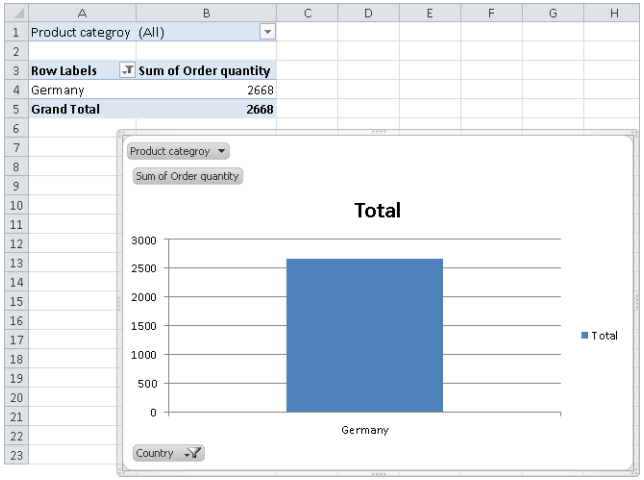


Figure 1-68 The values are updated.

Note

You can change additional settings for PivotCharts: Select a chart element and open the shortcut menu (see Figure 1-69).

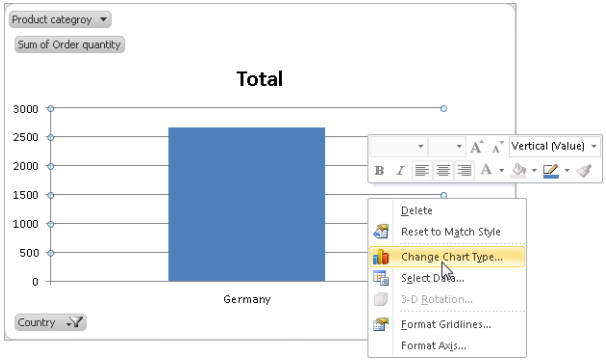


Figure 1-69 The shortcut menu allows quick access to the settings.

CHAPTER 14

Cube Functions

Cube functions were introduced in Microsoft Excel 2007. They are used with connections to external SQL data sources and provide analysis tools. Data cubes are multidimensional sets of data that can be stored in a spreadsheet, providing a means to summarize information from the raw data source. A cube is different from queries in Microsoft Access or Microsoft SQL Server because the data in a cube is already grouped in hierarchies, and calculated measures are saved in the cube. This offers two advantages to the user: Summary information is readily available, and most of the heavy-duty calculations are performed on the server. The user does not have to spend much time consolidating the data in Excel. However, you cannot use calculated fields or elements for a PivotTable.

To use cube functions, you must be working with data that is available in one of these two forms:

- Through a connection to a SQL Server Analysis Services data source
- In an offline cube in the user's local file system

These conditions limit the usefulness of cube functions. So that you will be able to work through some examples, the sample files accompanying this book include offline cube and data connection files for the example outlined in Chapter 2, "Using Functions and PowerPivot."

Note

You can create and change an offline cube (a file with the extension .cub) in Excel.

First, you must establish a connection to the Analysis Services by using Microsoft Query (on the Data Tab, Query External Data/From Other Source/From Microsoft Query), or by using the Data Connection Assistant (on the Insert Tab, select PivotTable/Use External Data Source). Then click the OLAP Tools button, as shown in Figure 14-1, to open the

Offline OLAP Settings dialog box. (OLAP stands for *online analytical processing*.) Click the Create Offline Data File button to create the cube, and follow the step-by-step instructions.

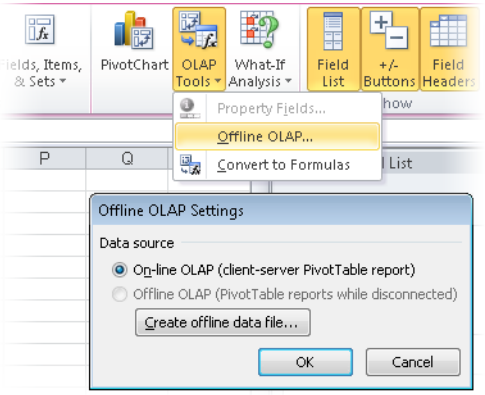


Figure 14-1 Creating an offline cube.

However, you will have to change the sample data connection files (they have either the extension .odc for a workbook connection, or .oqy for Microsoft Query) because the path to a database must be the full path. Use Windows Notepad to change the paths as follows:

```
Data Source='X:\Documents\Chp14\Book\CubeTest.cub';
   Location='X:\Documents\Chp14\Book\CubeTest.cub';
```

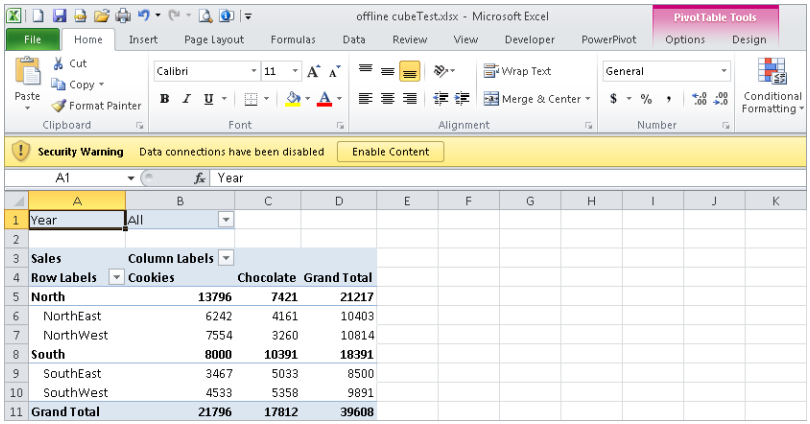
Sample Files

Use the offline cubeTest.xlsx sample file. This sample file and the additional files are found in the Chapter14 folder. For more information about the sample files, see the section titled "Using the Sample Files" on page xxiii.

The prepared sample workbook serves as a guide. To avoid unnecessary errors when modifying this sample, perform the following steps to create your own workbook:

1. On the Insert tab, select PivotTable/Use External Data Source. (You can search for additional elements and use the existing data connection files.)
2. Create the layout and include the content from the data source.
3. Use the cube functions.

When you open a workbook with data connections and use the default Excel settings, you have to explicitly allow these connections (click the Enable Content button, as shown in Figure 14-2). When you activate a document in Excel 2010, the document is trusted and you don't have to confirm the activation again until the trusted document is reset in the Trust Center.



	A	B	C	D	E	F	G	H	I	J	K
1	Year	All									
2											
3	**Sales**	**Column Labels**									
4	**Row Labels**	**Cookies**	**Chocolate**	**Grand Total**							
5	**North**	**13796**	**7421**	**21217**							
6	NorthEast	6242	4161	10403							
7	NorthWest	7554	3260	10814							
8	**South**	**8000**	**10391**	**18391**							
9	SouthEast	3467	5033	8500							
10	SouthWest	4533	5358	9891							
11	**Grand Total**	**21796**	**17812**	**39608**							

Figure 14-2 The security warning that is shown when Excel is accessing external data.

Note

If you select Convert To Formulas from the OLAP Tools menu (see Figure 14-1, shown earlier in this chapter), Excel converts part of the PivotTable or the entire PivotTable into an unformatted table with the same content as the PivotTable. The advantage of this is that the entire layout (columns and rows) is fixed. You can also include filters.

If you are familiar with formulas, you can create individual structures similar to Pivot-Tables that allow for flexible data evaluation.

The descriptions of the functions throughout the rest of this chapter refer to the example in Chapter 2. The example uses two store groups named North and South, which sell sweets (chocolate and cookies) from the years 2008 through 2011. Each store group consists of two stores. Table 14-1 describes the functions.

Table 14-1 **Overview of the Cube Functions**

Function	Description
CUBEKPIMEMBER()	Returns the requested property for a Key Performance Indicator (KPI) of a cube
CUBEMEMBER()	Returns a member of the cube
CUBEMEMBERPROPERTY()	Returns the requested property (attribute) for a cube member
CUBERANKEDMEMBER()	Returns the *n*-th ranked member of a set
CUBESET()	Defines a set of members to create a subcube
CUBESETCOUNT()	Returns the number of items in a set
CUBEVALUE()	Returns the aggregated value from a data cube

CUBEKPIMEMBER()

Syntax CUBEKPIMEMBER(*connection*,*kpi_name*,*kpi_property*,*caption*)

Definition This function returns a Key Performance Indicator (KPI) property and displays the KPI name in the cell.

Arguments

- ***connection* (required)** A string with the name of the workbook connection to the cube. After you enter the first quotation mark, the existing context-sensitive data connections are displayed (see Figure 14-4, shown later in this chapter in the description of CUBEMEMBER()).
- ***kpi_name* (required)** Specifies the name of the KPI in the cube.
- ***kpi_property* (required)** A KPI consists of several components that are specified by using an integer (see Table 14-2).

Table 14-2 **Integers for the Third Argument of the CUBEKPIMEMBER() Function**

Integer	MDX expression	Description
1	*[KPIValue]*	Actual value
2	*[KPIGoal]*	Target value
3	*[KPIStatus]*	State of the KPI at a specific moment in time
4	*[KPITrend]*	Measure of the value over time
5	*[KPIWeight]*	Relative importance assigned to the KPI
6	*[KPICurrentTimeMember]*	Temporal context for the KPI

- ***caption* (optional)** A string displayed in the cell instead of the caption of the KPI components in the cube.

Background

> **Note**
> **In the cell containing the function, the message #GETTING_DATA temporarily appears while the data is being queried.**

Error values and messages provide information about incorrect or missing entries:

- If the connection name is not a valid workbook connection, the CUBEKPIMEMBER() function returns the `#NAME?` error.
- If the OLAP server (or the offline cube) is not available, you get an error message. The content of the affected cell doesn't change.
- CUBEKPIMEMBER() returns the `#N/A` error value when *kpi_name* or *kpi_property* is invalid.
- CUBEKPIMEMBER() might return the `#N/A` error when the connection to the data source is interrupted and cannot be re-established

You can combine CUBEKPIMEMBER() with CUBEVALUE(). Specify CUBEKPIMEMBER() as the second argument or reference for CUBEVALUE().

Example In this example, a KPI named *average* is saved in the cube. This cube calculates the average of the sales and the total number of sales as integers. Both values are also saved as measures in the cube but cannot be used to calculate fields in the PivotTable. The target value (goal) is $1,500. Figure 14-3 shows the example for cookies.

	A	B	C	D
1	Year	All		
2				
3	**Sales**	**Column Labels**		
4	**Row Labels**	**Cookies**	**Chocolate**	**Grand Total**
5	**North**	**13796**	**7421**	**21217**
6	NorthEast	6242	4161	10403
7	NorthWest	7554	3260	10814
8	**South**	**8000**	**10391**	**18391**
9	SouthEast	3467	5033	8500
10	SouthWest	4533	5358	9891
11	**Grand Total**	**21796**	**17812**	**39608**
12				

Figure 14-3 The KPI average.

The formula

```
=CUBEKPIMEMBER("offline","average",1)
```

displays the word *average*. The formula

```
=CUBEVALUE("offline",CUBEKPIMEMBER("offline","average",1))
```

returns `1453` (the rounded average of all sales). In the second formula, you can enter a reference to the cell containing the first formula as the second argument. To get the target value of the average, use the formula

```
=CUBEVALUE("offline",CUBEKPIMEMBER("offline","average",2))
```

The value of 2 in the last argument is important, because it indicates, in this case, the target value.

You can use the cell containing the formula to create cell captions. The real content of the cell is more informative, as shown by using the CUBEVALUE() function.

See Also **All other cube functions, GETPIVOTDATA()**

CUBEMEMBER()

Syntax CUBEMEMBER(*connection*,*member_expression*,*caption*)

Definition This function returns a member (cell) from a cube. Use CUBEMEMBER() to validate that the member exists and to pass the member to other functions through a cell reference.

Arguments

- ***connection* (required)** The text string name of the workbook connection to the cube, in quotation marks. When you are entering the connection, after you type the first quotation mark, existing context-sensitive data connections are displayed (see Figure 14-4).

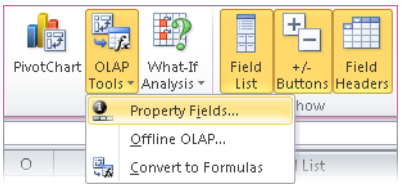


Figure 14-4 Context sensitivity helps you enter formulas.

- ***member_expression* (required)** Defines the position of a member in the cube based on a multidimensional expression (MDX). The expression can be entered directly or it can be referenced in a cell. You can also use tuples in expressions.
- ***caption* (optional)** A string displayed in the cell instead of the caption of the member in the cube. If a tuple is used, the function returns the caption of the last member in the tuple.

Background When you use CUBEMEMBER() as an argument for another cube function, the MDX expression instead of the displayed value is used in the argument.

> **Note**
> **In the cell containing the function, the message #GETTING_DATA temporarily appears while the data is being queried.**

Error values and messages provide information about incorrect or missing entries:

- If the connection name is not a valid workbook connection, the CUBEMEMBER() function returns the `#NAME?` error.
- If the OLAP server (or the offline cube) is not available, you get an error message. The content of the affected cell doesn't change.
- If at least one member within the tuple is invalid, the CUBEMEMBER() function returns the `#VALUE!` error.
- If *member_expression* is longer than 255 characters, the CUBEMEMBER() function returns the `#VALUE!` error.
- CUBEMEMBER() returns the `#N/A` error when:
  - The *member_expression* syntax is incorrect.
  - The member specified in the MDX query doesn't exist in the cube.
  - The tuple is invalid because there is no intersection for the specified values.
  - The set contains at least one member with a different dimension from the other members.
- CUBEMEMBER() may also return the `#N/A` error when the connection to the data source is interrupted and cannot be re-established.

Example So that you can gain a better understanding of the use of the functions in this section, take a close look at the PivotTable in Figure 14-5.

	A	B	C	D	E
1	Year	All			
2					
3		Column Labels			
4		Cookies			
5	Row Labels	Sales	Sales Count	Average	Average Goal
6	**North**	**13796**	**8**	**1724**	**1500**
7	NorthEast	6242	4	1560	1500
8	NorthWest	7554	4	1888	1500
9	**South**	**8000**	**7**	**1143**	**1500**
10	SouthEast	3467	3	1156	1500
11	SouthWest	4533	4	1133	1500
12	**Grand Total**	**21796**	**15**	**1453**	**1500**
13					

Figure 14-5 The candy sales PivotTable used to demonstrate the cube functions.

The formula

```
=CUBEMEMBER("offLine","[Products].[Product].[All].[Cookies]")
```

looks for a single cell and returns the Cookies member which has the caption we looked for. If you use the tuple

```
=CUBEMEMBER("offLine",
   "([Stores].[Store].[All].[NorthEast],[Products].[All].[Cookies],
   [Years].[2009])")
```

the result is `2009` (the cookie sales in the year 2009 in the NorthEast store). If you use

```
=CUBEMEMBER("offLine",
   "([Stores].[Group].[All].[North],[Stores].[Store].[All].[NorthEast]")
```

to find an empty intercept, you get the `#N/A` error. To display the word *total*, enter

```
=CUBEMEMBER("offLine","[Products].[Product].[All]","total")
```

You can use the cell containing the formula to create cell captions. The actual content of the cell is more informative if it refers to the cells with the CUBEMEMBER() entries.

See Also **All other cube functions, GETPIVOTDATA()**

CUBEMEMBERPROPERTY()

Syntax CUBEMEMBERPROPERTY(*connection*,*member_expression*,*property*)

Definition This function returns the property of a member from the cube. Use CUBEMEMBERPROPERTY() to validate that a member exists within the cube and to return the property for this member as a value.

Arguments

- ***connection* (required)** A string with the name of the workbook connection to the cube. After you enter the first quotation mark, the existing context-sensitive data connections are displayed (see Figure 14-4, shown earlier).
- ***member_expression* (required)** Defines the position of a member in the cube based on an MDX. The expression can be entered directly or can be in a cell that is referenced. You can also use tuples in expressions.
- ***property* (required)** The name of the property for which you want to return the value.

> **Note**
> **For a PivotTable that retrieves data from a cube, use the PivotTable tools to find out whether a member has properties (see Figure 14-6).**

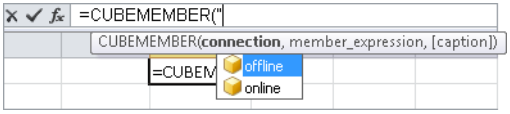


Figure 14-6 Checking whether cube members have properties—not all members do.

Background In the example in this section, the stores have the Group property with the possible values North or South (shown previously in Figure 14-5).

In the cell containing the function, the message #GETTING_DATA temporarily appears while the data is being queried.

Error values and messages provide information about wrong or missing entries:

- If the connection name is not a valid workbook connection, the CUBEMEMBERPROPERTY() function returns the `#NAME?` error.
- If the OLAP server (or the offline cube) is not available, you get an error message. The content of the affected cell doesn't change.

- If the *member_expression* syntax is incorrect, or if the member specified by *member_expression* doesn't exist in the cube, the CUBEMEMBERPROPERTY() function returns the `#N/A` error.
- CUBEMEMBERPROPERTY() might return the `#N/A` error when the connection to the data source is interrupted and cannot be re-established

Example As previously mentioned, the stores in the PivotTable have the Group properties North and South. The formula

```
=CUBEMEMBERPROPERTY("offline","[Stores].[Store].[All].[NorthEast]","group")
```

returns `North`, and the formula

```
=CUBEMEMBERPROPERTY("offline","[Stores].[Store].&[3]","group")
```

returns `South`. This example uses the position number of the store in the list instead of the store name.

See Also **All other cube functions, GETPIVOTDATA()**

CUBERANKEDMEMBER()

Syntax CUBERANKEDMEMBER(*connection*,*set_expression*,*rank*,*caption*)

Definition This function returns the *n*-th member in a set.

Arguments

- ***connection* (required)** A string with the name of the workbook connection to the cube. After you enter the first quotation mark, the existing context-sensitive data connections are displayed (see Figure 14-4, shown earlier).
- ***set_expression* (required)** Defines the number of members in the cube based on an MDX. The expression can be entered directly or can be in a cell that is referenced. You can also use tuples in expressions.
- ***rank* (required)** An integer indicating the position of a member in the set.
- ***caption* (required)** A string displayed in the cell instead of the caption of the member in the cube. If a tuple is used, the function returns the caption of the last member in the tuple.

Background

> **Note**
> **In the cell containing the function, the message #GETTING_DATA temporarily appears while the data is being queried.**

Error values and messages provide information about incorrect or missing entries:

- If the connection name is not a valid workbook connection, the CUBERANKEDMEMBER() function returns the `#NAME?` error.
- If the OLAP server (or the offline cube) is not available, you get an error message. The content of the affected cell doesn't change.
- If *set_expression* is longer than 255 characters, the CUBERANKEDMEMBER() function returns the `#VALUE!` error.
- CUBERANKEDMEMBER() returns the `#N/A` error when:
  - The *set_expression* syntax is incorrect.
  - The set specified in the MDX query doesn't exist in the cube.
- CUBERANKEDMEMBER() might return the `#N/A` error when the connection to the data source is interrupted and cannot be re-established.

Example If you reference a cell in the formula

```
=CUBERANKEDMEMBER("offline",B9,1)
```

that returns the store set with

```
=CUBESET("offline","[Stores].[Store].Children", "all store
   sales",2,"[Measures].[Sale]")
```

the result is `NorthEast`. This store has the most sales for all products and in all years. The nested formula

```
=CUBERANKEDMEMBER("offLine",CUBESET("offLine","([Stores].[Store].[All].[NorthEast],
   [Years].Children)","all sales",2;"[Measures].[Sales]"),3)
```

calculates the year with the least sales for this store (position 3): `2011`.

See Also **All other cube functions, GETPIVOTDATA()**

CUBESET()

Syntax CUBESET(*connection*,*set_expression*,*caption*,*sort_order*,*sort_by*)

Definition This function returns a calculated set of members by sending a set expression to the cube on the server, which creates the set and then returns that set to Excel. The content of the cell and the actual value of the cell are different.

Arguments

- ***connection* (required)** A string with the name of the workbook connection to the cube. After you enter the first quotation mark, the existing context-sensitive data connections are displayed (see Figure 14-4, shown earlier).
- ***set_expression* (required)** Defines the number of elements in the cube based on an MDX. The expression can be entered directly or can be in a cell that is referenced. You can also use tuples in expressions.
- ***caption* (optional)** A string displayed in the cell instead of the caption of the member in the cube. If a tuple is used, the function returns the caption of the last member in the tuple.
- ***sort_order* (optional)** The type of sorting; the values are integers that affect the treatment of the fifth argument, *sort_by* (see Table 14-3). The formulas are context-sensitive (see Figure 14-7).

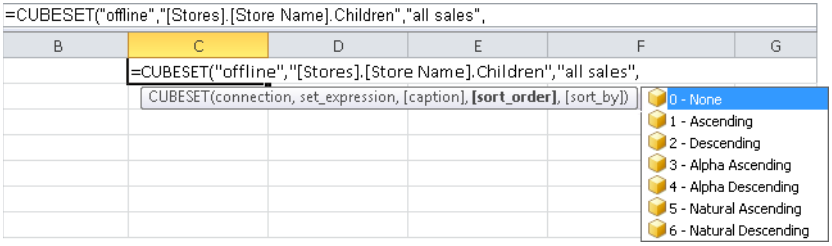


Figure 14-7 Tooltips show the choices for the CUBESET() function.

Table 14-3 **Integers for the Fourth Argument of the CUBESET() Function**

Integer	Description	Impact on the Fifth Argument
0	Leaves the set in the existing order in the cube	Ignored
1	Sorts the set in ascending order by *sort_by*	Required
2	Sorts the set in descending order by *sort_by*	Required
3	Sorts the set in ascending alphabetical order	Ignored

Integer	Description	Impact on the Fifth Argument
4	Sorts the set in descending alphabetical order	Ignored
5	Sorts the set in natural ascending order	Ignored
6	Sorts the set in natural descending order	Ignored

The default value of the fourth argument is 0. An alphabetical sorting for a set of tuples is based on the last element in the tuple. You will find more information about the different sort orders in the SQL Analysis Services Help.

- ***sort_by* (optional)** The *sort_by* argument depends on the fourth argument and defines the values in the set that is sorted. If *sort_by* is not provided but *sort_order* requires *sort_by*, the function returns the `#VALUE!` error.

Background When you use CUBESET() as an argument for another cube function, the set instead of the displayed value is used in the argument.

> **Note**
> **In the cell containing the function, the message #GETTING_DATA temporarily appears while the data is being queried.**

Error values and messages provide information about incorrect or missing entries:

- If the connection name is not a valid workbook connection, the CUBESET() function returns the `#NAME?` error.
- If the OLAP server (or the offline cube) is not available, you get an error message. The content of the affected cell doesn't change.
- If *set_expression* is longer than 255 characters, the CUBESET() function returns the `#VALUE!` error.
- CUBESET() returns the `#N/A` error when:
  - The *set_expression* syntax is incorrect.
  - The set specified in the MDX query doesn’t exist in the cube.
  - The set contains at least one member with a different dimension from the other members.
- CUBESET() might return the `#N/A` error when the connection to the data source is interrupted and cannot be re-established.

Example The formula

```
=CUBESET("offline","[Stores].[Store].Children",
   "all store sales",2,"[Measures].[Sale]")
```

returns the sorted set of all stores based on the sales (all products and years). The store with the largest sale is listed first.

You can use the cell containing the formula to create cell labels. The actual content of the cell is more informative if it refers to the cells with the CUBESET() entries.

See Also **All other cube functions, GETPIVOTDATA()**

CUBESETCOUNT()

Syntax CUBESETCOUNT(*set*)

Definition This function returns the number of members in a set.

Argument

- ***set* (required)** A set defined with the CUBESET() function or a reference to the cell containing members of the cube

Background The result of this function is an integer. If the argument causes an error, this error is also returned as the result.

> **Note**
> **In the cell containing the function, the message #GETTING_DATA temporarily appears while the data is being queried.**

Example In the CUBESETCOUNT() function, if you reference a cell that returns the sorted set of the stores like

```
=CUBESET("offline","[Stores].[Store].Children", "all store sales",2,"[Measures].
[Sale]")
```

the result will be 4. You get the same result if you pass this formula as an argument. The keyword *Children* is not context sensitive.

See Also **All other cube functions, GETPIVOTDATA()**

CUBEVALUE()

Syntax CUBEVALUE(*connection*,*member_expression1*,*member_expression2*,...)

Definition This function returns the value of a member (cell) from a cube.

Arguments

- ***connection* (required)** A string with the name of the workbook connection to the cube. After you enter the first quotation mark, the existing context-sensitive data connections are displayed (see Figure 14-4, shown earlier).
- ***member_expression1* (required) and *member_expression2* (optional)** At least one and up through 255 expressions that define the position of a member in the cube based on an MDX. The expression can be entered directly or can be in a cell that is referenced. You can also use tuples in expressions. Alternatively, *member_expression* can be a set defined with the CUBESET() function. If no measure is specified in *member_expression*, the default measure for that cube is used.

  Because the argument can be repeated, you can define intersections. You can also use tuples.

Background When you use CUBEVALUE() as an argument for another cube function, the MDX expression instead of the displayed value is used in the argument.

> **Note**
> **In the cell containing the function, the message #GETTING_DATA temporarily appears while the data is being queried.**

Error values and messages provide information about wrong or missing entries:

- If the connection name is not a valid workbook connection, the CUBEVALUE() function returns the `#NAME?` error.
- If the OLAP server (or the offline cube) is not available, you get an error message. The content of the affected cell doesn't change.
- If at least one member within the arguments or the tuple is invalid, the CUBEVALUE() function returns the `#VALUE!` error.
- If *member_expression* is longer than 255 characters, the CUBEVALUE() function returns the `#VALUE!` error.

- CUBEVALUE() returns the #N/A error when:
  - The *member_expression* syntax is incorrect.
  - The member specified in the MDX query doesn't exist in the cube.
  - The tuple is invalid because there is no intersection for the specified values.
  - The set contains at least one member with a different dimension from the other members.
- CUBEVALUE() might return the #N/A error when the connection to the data source is interrupted and cannot be re-established

The formula

```
=CUBEVALUE("offLine","[Measures].[GrossSales]","[Stores].[Store].[All].
   [NorthEast]"," [Years].[Year].[All].[2009]","[Products].[Product].
   [All].[Cookies]")
```

calculates the gross sales for cookies in the store NorthEast in the year 2009: $1,856.40. You get the same result if you use a tuple (the arguments of the previous formula are enclosed in parentheses):

```
=CUBEVALUE("offline","([Measures].[GrossSales],[Stores].[Store].[All].[NorthEast],
   [Years].[Year].[All].[2009],[Products].[Product].[All].[Cookies])")
```

If you enter the formula

```
=CUBEMEMBER("offLine","[Products].[Product].[All].[Cookies]")
```

in cell B3, the formula

```
=CUBEVALUE("offline",B3)
```

returns the total sales for cookies: $21,796.

You can also use the examples for the CUBEKPIMEMBER() function. The formula

```
=CUBEVALUE("offline",CUBERANKEDMEMBER("offline",CUBESET("offline","[Stores]
   .[Store].Children","all store sales",2;"[Measures].[sale]"),1))
```

returns $10,814 for the total sales of the best store (NorthEast).

See Also **All other cube functions, GETPIVOTDATA()**

Sample Files

Use the offline cubeTest.xlsx sample file. This sample file and the additional files are found in the Chapter14 folder. For more information about the sample files, see the section titled "Using the Sample Files" on page xxiii.

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About the Authors

In this book you will find our combined experience from working with Microsoft Excel on a daily basis in corporate management, software training, statistics, database projects, and programming. Here is who we are:

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