

A Brain-Friendly Guide

Head First Excel

Explore your
data with
pivot tables



Visualize data
with charts
and graphs



Sort, zoom, and
filter worksheets



Nest formulas for
complex operations



Organize your
information



Make
calculations
across
worksheets

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Michael Milton

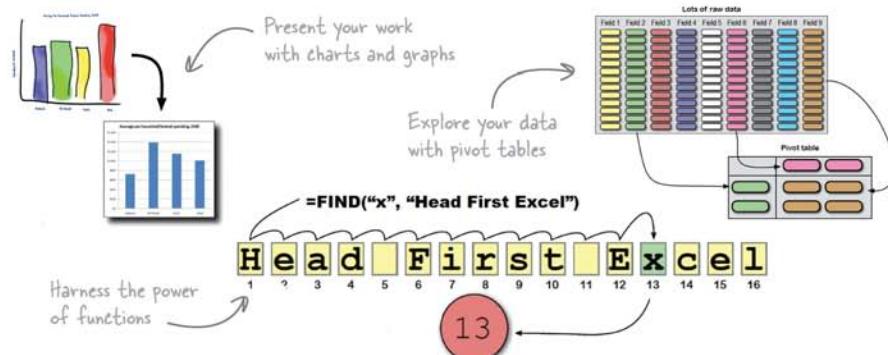
Head First Excel

Windows Applications/Excel

What will you learn from this book?

Do you use Excel for simple lists but get lost when it comes to functions? Would you like to be able to do something useful with all that data, like a real Excel power user? *Head First Excel* will revolutionize the way you use information in your life, taking your spreadsheet skills from rudimentary to sophisticated. You'll see how to incorporate Excel into every aspect of your workflow, from making calculations across a number of worksheets and performing exploratory analysis with pivot tables, to optimizing outcomes with Goal Seek and presenting your conclusions with polished data visualizations.

Whether you're completely new to Excel or a more experienced user looking to make Excel work better for you, *Head First Excel* will help you organize your information, think through complex data problems, and present analysis elegantly.



What's so special about this book?

We think your time is too valuable to waste struggling with new concepts. Using the latest research in cognitive science and learning theory to craft a multi-sensory learning experience, *Head First Excel* uses a visually rich format designed for the way your brain works, not a text-heavy approach that puts you to sleep.

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"Unlock your Excel superpowers with Michael Milton's *Head First Excel*. Excel's many features can seem intimidating; Michael cuts through the complexity and teaches you to bend Excel to your will."

Bill Mietelski,
Software engineer

"Like other Head First books, *Head First Excel* is an approachable mix of knowledge, business situations, and humor. Need to create formulas? Need to make reports, charts, or pivot tables? *Head First Excel* gives you the goods to help you excel at Excel!"

Ken Bluttman,
www.kenbluttman.com

"*Head First Excel* shows how to fully utilize some of the best features Excel has to offer to improve productivity and data analysis skills."

Anthony Rose,
President, Support Analytics

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Advance Praise for *Head First Excel*

“*Head First Excel* is awesome! Like other Head First books, it’s a very approachable mix of knowledge, business situations, and humor. Not only do you learn all you need to know about Excel, but you also get to learn some real business lingo and smarts as well. Need to create formulas? Need to make reports, charts, or pivot tables? This is the book for you. *Head First Excel* gives you the goods and will help you excel at Excel!”

— **Ken Bluttman, www.kenbluttman.com**

“*Head First Excel* shows how to fully utilize some of the best features Excel has to offer to improve productivity and data analysis skills. If I’ve been using Excel for over 10 years and still found many useful topics, so can you, regardless of your experience level.”

— **Anthony Rose, President, Support Analytics**

“Do you use Excel to keep lists and calculate the occasional budget? Would you like to dive deeper and learn how Excel can give you an edge in your daily workflow? Unlock your Excel superpowers with Michael Milton’s *Head First Excel*. You’ll learn to create data visualizations and design spreadsheets that make your point and get you noticed. Discover how to easily audit complex formulas written by others, so you can quickly validate (or call ‘B.S.’ on) their calculations. Build models that optimize your business and/or finances based on all possible scenarios. Excel’s many features can seem intimidating; Michael cuts through the complexity and teaches you to bend Excel to your will.”

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Praise for other *Head First* books

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“Beyond the engaging style that drags you forward from know-nothing into exalted Java warrior status, *Head First Java* covers a huge amount of practical matters that other texts leave as the dreaded ‘exercise for the reader.’ It’s clever, wry, hip and practical—there aren’t a lot of textbooks that can make that claim and live up to it while also teaching you about object serialization and network launch protocols.”

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IBM Almaden Research Center (and teaches Artificial Intelligence at
Stanford University)**

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—**Ken Arnold, former senior engineer at Sun Microsystems
Coauthor (with James Gosling, creator of Java),
*The Java Programming Language***

“I feel like a thousand pounds of books have just been lifted off of my head.”

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“Just the right tone for the geeked-out, casual-cool guru coder in all of us. The right reference for practical development strategies—gets my brain going without having to slog through a bunch of tired, stale professor-speak.”

—**Travis Kalanick, founder of Scour and Red Swoosh
Member of the MIT TR100**

“There are books you buy, books you keep, books you keep on your desk, and thanks to O’Reilly and the Head First crew, there is the penultimate category, Head First books. They’re the ones that are dog-eared, mangled, and carried everywhere. *Head First SQL* is at the top of my stack. Heck, even the PDF I have for review is tattered and torn.”

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—**Cory Doctorow, co-editor of Boing Boing
Author, *Down and Out in the Magic Kingdom* and
*Someone Comes to Town, Someone Leaves Town***

Praise for other *Head First* books

“I received the book yesterday and started to read it...and I couldn’t stop. This is definitely très ‘cool.’ It is fun, but they cover a lot of ground and they are right to the point. I’m really impressed.”

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— **Ken Goldstein, Executive Vice President, Disney Online**

“I ♥ *Head First HTML with CSS & XHTML*—it teaches you everything you need to learn in a ‘fun coated’ format.”

— **Sally Applin, UI designer and artist**

“Usually when reading through a book or article on design patterns, I’d have to occasionally stick myself in the eye with something just to make sure I was paying attention. Not with this book. Odd as it may sound, this book makes learning about design patterns fun.

“While other books on design patterns are saying, ‘Bueller... Bueller... Bueller,’ this book is on the float belting out ‘Shake it up, baby!’”

— **Eric Wuehler**

“I literally love this book. In fact, I kissed this book in front of my wife.”

— **Satish Kumar**

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Head First Programming

Head First Excel



Michael Milton

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Head First Excel

by Michael Milton

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Author of Head First Excel



Michael Milton

When **Michael Milton**'s friends were programming in BASIC and playing Leisure Suit Larry back in the 80s, he was creating charts in SuperCalc.

His career has consisted mainly of helping people out by showing up with the right spreadsheet at the right moment, and he hopes that after reading *Head First Excel*, you'll have the same experience.

When he's not in the library or the bookstore, you can find him running, taking pictures, brewing beer, or blogging at michaelmilton.net.

Table of Contents (Summary)

	Intro	xxv
1	Introduction to formulas: <i>Excel's real power</i>	1
2	Visual design: <i>Spreadsheets as art</i>	29
3	References: <i>Point in the right direction</i>	59
4	Change your point of view: <i>Sort, zoom, and filter</i>	89
5	Data types: <i>Make Excel value your values</i>	117
6	Dates and times: <i>Stay on time</i>	141
7	Finding functions: <i>Mine Excel's features on your own</i>	169
8	Formula auditing: <i>Visualize your formulas</i>	197
9	Charts: <i>Graph your data</i>	227
10	What if analysis: <i>Alternate realities</i>	251
11	Text functions: <i>Letters as data</i>	279
12	Pivot tables: <i>Hardcore grouping</i>	309
13	Booleans: <i>TRUE and FALSE</i>	331
14	Segmentation: <i>Slice and dice</i>	357
i	Leftovers: <i>The Top Ten Things (we didn't cover)</i>	383
ii	Install Excel's Solver: <i>The Solver</i>	391

Table of Contents (the real thing)

Intro

Your brain on Excel. Here you are trying to *learn* something, while here your *brain* is doing you a favor by making sure the learning doesn't *stick*. Your brain's thinking, "Better leave room for more important things, like which wild animals to avoid and whether naked snowboarding is a bad idea." So how do you trick your brain into thinking that your life depends on knowing spreadsheets?

Who is this book for?	xxvi
We know what you're thinking	xxvii
Metacognition	xxix
Here's what YOU can do to bend your brain into submission	xxxii
Read Me	xxxii
The technical review team	xxxiv
Acknowledgments	xxxv

Introduction to formulas

Excel's real power

1

We all use Excel to keep lists.

And when it comes to lists, Excel does a great job. But the real Excel ninjas are people who have mastered the world of formulas. Using data well is all about executing the **calculations** that will tell you what you need to know, and **formulas** do those calculations, molding your data into something useful and illuminating. If you know your formulas, you can really make your numbers *sing*.

Can you live it up on the last night of your vacation?	2
Here's what you budgeted and what you spent	3
Excel is great for keeping records...	4
Formulas work with your data	5
References keep your formulas working even if your data changes	11
Check your formulas carefully	14
Refer to a bunch of cells using a range	15
Use SUM to add the elements in a range	15
When you copy and paste a formula, the references shift	21
Excel formulas let you drill deep into your data	26
Everyone has plenty of cash left for a food-filled night in New York City!	27



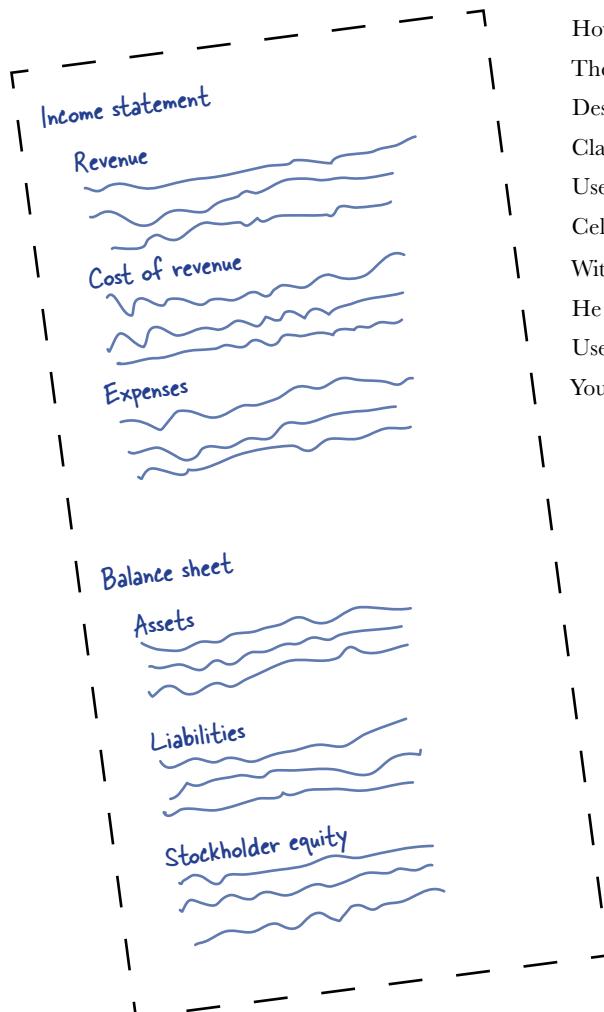
visual design

Spreadsheets as art

2

Most people usually use Excel for page layout.

A lot of formula-writing masters, who are familiar with just how powerful Excel can be, are shocked that people “just” use the software for showing information with a grid. But Excel, especially in its more recent versions, has become quite handy as a page layout tool. You’re about to get comfortable with some important and not-so-obvious Excel tools for serious visual design.



CRMFreak needs to present their financials to analysts	30
The dollar sign is part of your cell's formatting	35
How to format your data	36
The boss approves!	39
Design principle: keep it simple	40
Clash of the design titans...	41
Use fonts to draw the eye to what is most important	42
Cell styles keep formatting consistent for elements that repeat	46
With your cell styles selected, use Themes to change your look	47
He likes it, but there's something else...	50
Use proximity and alignment to group like things together	53
Your spreadsheet is a hit!	57

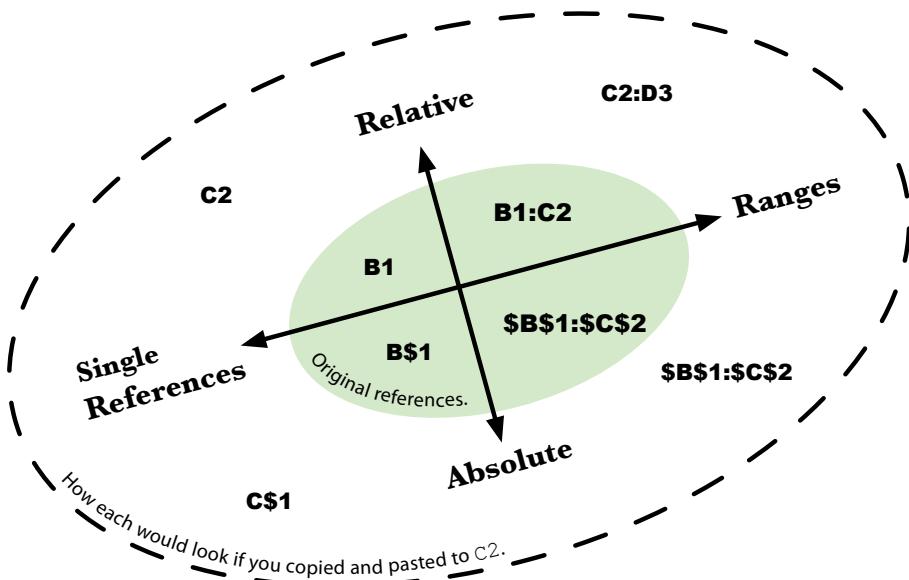
3

references

Point in the right direction**A formula is only as good as its references.**

No matter how creative and brilliant your formula is, it won't do you much good if it does not point to the correct data. It's easy to get references right for short, individual formulas, but once those formulas get long and need to be copied, the chance of reference mistakes increases dramatically. In this chapter, you'll exploit **absolute and relative references** as well as Excel's advanced new **structured reference** feature, ensuring that no matter how big and numerous your references are, your formulas will stay tight and accurate.

MIN returns the lowest number in a series	64
Let Excel fill in ranges by starting your formula and using your mouse	67
Excel got the right answer using a more sophisticated reference	68
Use absolute references to prevent shifting on copy/paste	73
Absolute references give you a lot of options	75
Named ranges simplify your formulas	76
Excel's Tables make your references quick and easy	82
Structured references are a different dimension of absolute reference	83
Your profitability forecasts proved accurate	88



4

change your point of view

Sort, zoom, and filter

The details of your data are tantalizing.

But only if you know *how* to look at them. In this chapter, you'll forget about formatting and functions and just focus on how to change your perspective on your data. When you are exploring your data, looking for issues to investigate, the **sort**, **zoom**, and **filter** tools offer surprising versatility to help you get a grip on what your data contains.

Political consultants need help decoding their fundraising database	90
Find the names of the big contributors	91
Sort changes the order of rows in your data	92
Sorting shows you different perspectives on a large data set	95
See a lot more of your data with Zoom	103
Your client is impressed!	106
Filters hide data you don't want to see	107
Use Filter drop boxes to tell Excel how to filter your data	108
An unexpected note from the Main Campaign...	109
The Main Campaign is delighted with your work	112
Donations are pouring in!	115

Sort by donation

E	F	G
ZIP	Description	
10012	\$ 50,000	
10012	\$ 10,000	
20817	\$ 10,000	
06511	\$ 10,000	
78723	\$ 10,000	
34234	\$ 10,000	
06511	\$ 5,000	
20817	\$ 5,000	
10012	\$ 5,000	
10012	\$ 5,000	
10012	\$ 5,000	
96210	\$ 5,000	
10012	\$ 5,000	
10012	\$ 5,000	
10012	\$ 5,000	
06511	\$ 5,000	
20817	\$ 3,000	
96210	\$ 3,000	
34234	\$ 5,000	
96210	\$ 5,000	
10012	\$ 5,000	
10012	\$ 5,000	
10012	\$ 5,000	
78723	\$ 5,000	
10012	\$ 5,000	
06511	\$ 5,000	
10012	\$ 3,000	
10012	\$ 5,000	
10012	\$ 5,000	
10012	\$ 5,000	

Sort by ZIP

C	E	F
Name	ZIP	Bonuses
ra	06511	\$ 10,000
bry	06511	\$ 3,000
n	06511	\$ 3,000
ay	06511	\$ 5,000
son	06511	\$ 3,000
na	06511	\$ 3,000
lb	06511	\$ 3,000
pine	06511	\$ 2,500
lee	06511	\$ 2,500
lynn	06511	\$ 2,500
rad	06511	\$ 2,500
am	06511	\$ 2,000
l	06511	\$ 2,000
m	06511	\$ 1,000
yan	06511	\$ 1,000
ie	06511	\$ 1,000
i	06511	\$ 1,000
as	06511	\$ 1,000
y	06511	\$ 1,000
ur	06511	\$ 1,000
hael	06511	\$ 1,000
juin	06511	\$ 1,000
pon	06511	\$ 1,000
lynn	06511	\$ 1,000
	06511	\$ 1,000

Sort by name

C	D
Last Name	First Name
Abbott	Connie
Abbott	Ingrid
Abbott	Kaylie
Abbott	Rashad
Acevedo	Alina
Acevedo	Dante
Acevedo	Jeremiah
Acevedo	Natalie
Acosta	Alan
Acosta	Dayemi
Acosta	Jaylin
Adams	Diamond
Adams	Hana
Adams	Jayce
Adams	Jaylen
Adkins	Levitt
Adkins	Alvin
Adkins	Braxton
Adkins	Coby
Adkins	Darby
Adkins	Harina
Aguilar	Dax
Aguilar	Iabelle
Aguilar	Mary
Aguilar	Meghan
Aguilar	Owen
Aguirre	Carlo
Aguirre	Sergio
Aguirre	Sloane

5

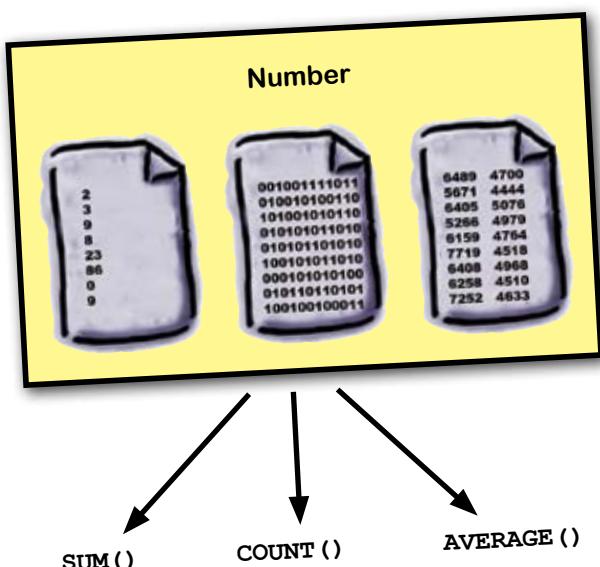
data types

Make Excel value your values

Excel doesn't always show you what it's thinking.

Sometimes, Excel will show you a number but think of it as text. Or it might show you some text that it sees as a number. Excel will even show you data that is neither number nor text! In this chapter, you're going to **learn how to see data the way Excel sees it**, no matter how it's displayed. Not only will this knowledge give you greater control over your data (and fewer "What the #\$\$%! is going on?" experiences), but it will also help you unlock the whole universe of formulas.

Your doctor friend is on a deadline and has broken data	118
Somehow your average formula divided by zero	121
Data in Excel can be text or numbers	122
The doctor has had this problem before	125
You need a function that tells Excel to treat your text as a value	126
A grad student also ran some stats...and there's a problem	132
Errors are a special data type	135
Now you're a published scientist	140



dates and times

Stay on time

6

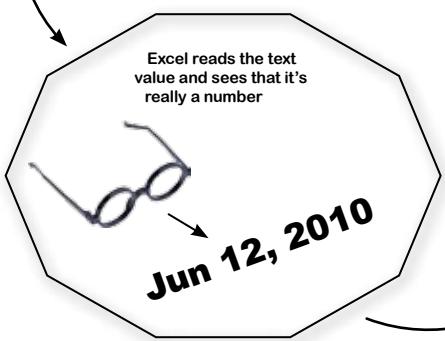
Dates and times in Excel are hard.

Unless you understand *how Excel represents them internally*. All of us at one point or another have had to do calculations involving these types of figures, and this chapter will give you the **keys to figuring out** how many days, months, years, and even seconds there are between two dates. The simple truth is that dates and times are a really **special case** of the data types and formatting that you already know. Once you master a couple of basic concepts, you'll be able to use Excel to **manage scheduling flawlessly**.

Do you have time to amp up your training for the Massachusetts Marathon?	142
<code>VALUE()</code> returns a number on dates stored as text	146
Excel sees dates as integers	147
Subtracting one date from another tells you the number of days between the two dates	148
When subtracting dates, watch your formatting	152
Looks like you don't have time to complete training before a 10K	153
Coach has a better idea	154
<code>DATEDIF()</code> will calculate time between dates using a variety of measures	156
Coach is happy to have you in her class	161
Excel represents time as decimal numbers from 0 to 1	162
Coach has an Excel challenge for you	165
You qualified for the Massachusetts Marathon	167

You give the formula your text.

=`VALUE(` **A4** `)`



The formula returns a number.

40341

7

finding functions

Mine Excel's features on your own

Excel has more functions than you will ever use.

Over many years and many versions, the program has accumulated specialized functions that are terribly important to the small group of people who use them.

That's not a problem for you. But what *is* a problem for you is the group of functions **that you don't know** but that **are useful in your work**. Which functions are we talking about? Only you can know for sure, and you're about to learn some tips and techniques to finding quickly the formulas you need to get your work done efficiently.

Should you rent additional parking?	170
You need a plan to find more functions	173
Excel's help screens are loaded with tips and tricks	174
Here's the convention center's ticket database for the next month	178
Anatomy of a function reference	183
The Dataville Convention Center COO checks in...	185
Functions are organized by data type and discipline	186
Your spreadsheet shows ticket counts summarized for each date	192
Box tickets for you!	195

Excellent!



formula auditing

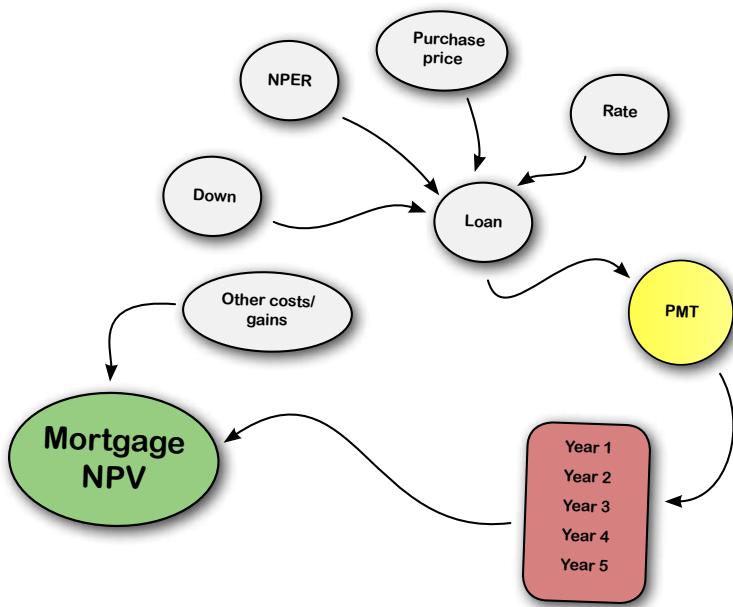
8

Visualize your formulas

Excel formulas can get really complicated.

And that is the point, right? If all you wanted to do was simple calculation, you'd be fine with a paper, pen, and calculator. But those complicated formulas can get unwieldy—especially ones written by other people, which can be almost impossible to decipher if you don't know what they were thinking. In this chapter, you'll learn to use a simple but powerful graphical feature of Excel called **formula auditing**, which will dramatically illustrate the flow of data throughout the *models* in your spreadsheet.

Should you buy a house or rent?	198
Use Net Present Value to discount future costs to today's values	202
The broker has a spreadsheet for you	205
Models in Excel can get complicated	206
Formula auditing shows you the location of your formula's arguments	208
Excel's loan functions all use the same basic elements	212
The PMT formula in the broker's spreadsheet calculates your monthly payment	213
Formulas must be correct, and assumptions must be reasonable	218
The broker weighs in...	222
Your house was a good investment!	225



charts

Graph your data

9

Who wants to look at numbers all the time?

Very often a nice graphic is a more engaging way to present data. And sometimes you have so much data that you actually can't see it all without a nice graphic.

Excel has extensive charting facilities, and if you just know where to click, you'll unlock the power to make charts and graphs to display your data with drama and lucidity.

Head First Investments needs charts for its investment report	228
Create charts using the Insert tab	231
Use the Design and Layout tabs to rework your chart	232
Your pie chart isn't going over well with the corporate graphic artist	236
You're starting to get tight on time...	247
Your report was a big success...	249



10

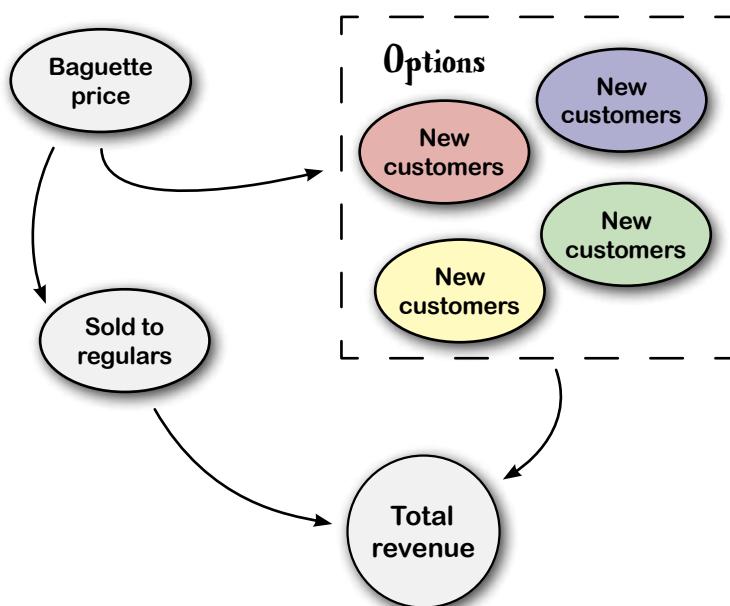
what if analysis

Alternate realities

Things could go many different ways.

There are all sorts of ***quantitative factors*** that can affect how your business will work, how your finances will fare, how your schedule will manage, and so forth. Excel excels at helping you model and manage all your *projections*, evaluating how changes in those factors will affect the variables you care about most. In this chapter, you'll learn about three key features—**scenarios**, **Goal Seek**, and **Solver**—that are designed to make assessing all your “what ifs” a breeze.

Should your friend Betty advertise?	252
Betty has projections of best and worst cases for different ad configurations	255
Scenarios helps you keep track of different inputs to the same model	258
Scenarios saves different configurations of the elements that change	259
Betty wants to know her breakeven	261
Goal Seek optimizes a value by trying a bunch of different candidate values	262
Betty needs you to add complexity to the model	266
Solver can handle much more complex optimization problems	267
Do a sanity check on your Solver model	272
Solver calculated your projections	276
Betty's best-case scenario came to pass...	277



text functions

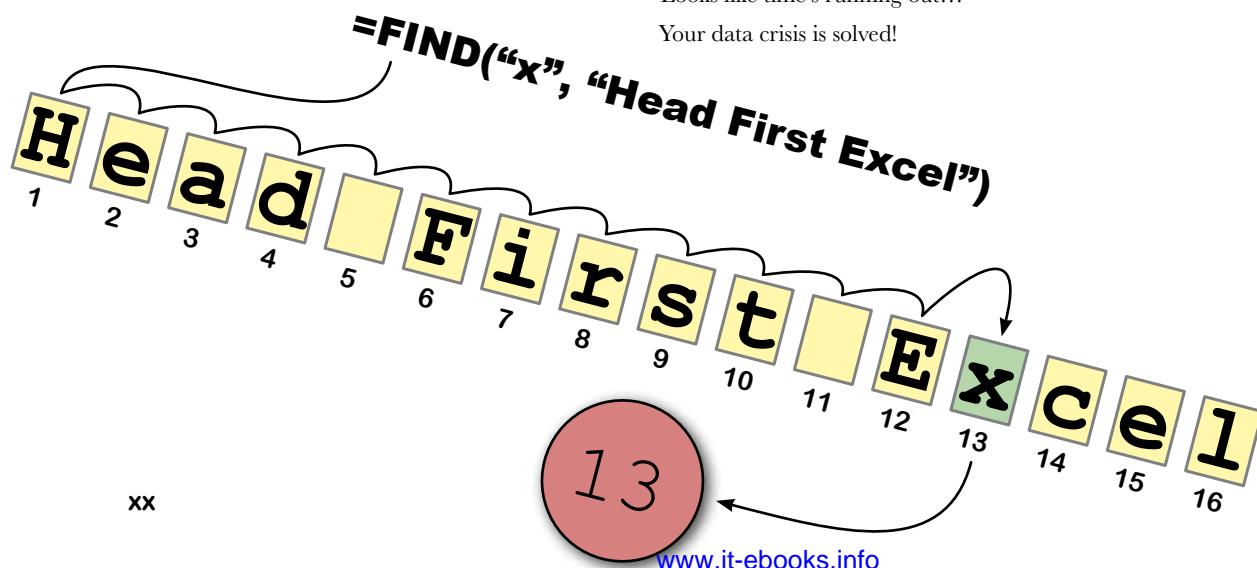
Letters as data**11**

Excel loves your numbers, but it can also handle your text.

It contains a suite of functions designed to enable you to manipulate **text data**.

There are many applications to these functions, but one that all data people must deal with is what to do with **messy** data. A lot of times, you'll receive data that isn't at all in the format you need it to be in—it might come out of a strange database, for example. Text functions shine at letting you pull elements out of messy data so that you can make analytic use of it, as you're about to find out....

Your database of analytic customers just crashed!	280
Here's the data	281
Text to Columns uses a delimiter to split up your data	282
Text to Columns doesn't work in all cases	285
Excel has a suite of functions for dealing with text	286
LEFT and RIGHT are basic text extraction functions	289
You need to vary the values that go into the second argument	291
Business is starting to suffer for lack of customer data	293
This spreadsheet is starting to get large!	297
FIND returns a number specifying the position of text	298
Text to Columns sees your formulas, not their results	302
Paste Special lets you paste with options	302
Looks like time's running out...	305
Your data crisis is solved!	308



12

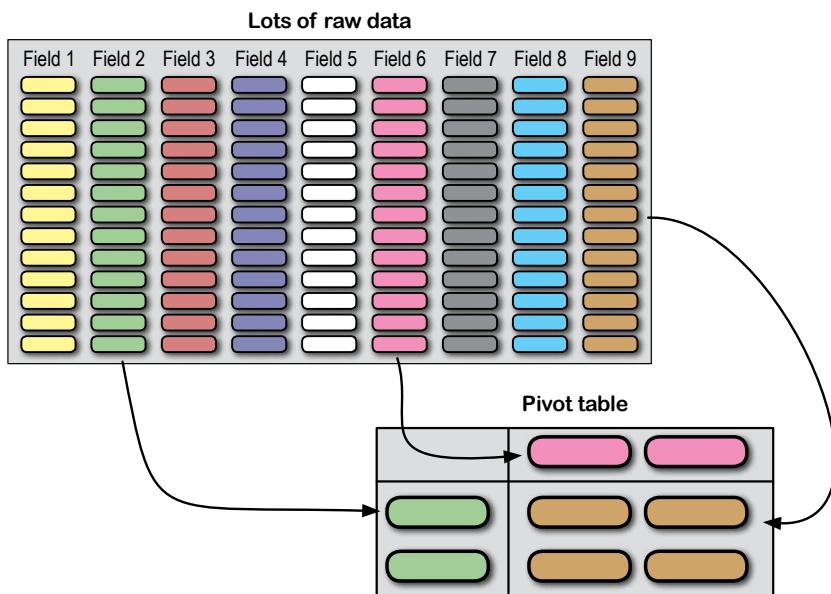
pivot tables

Hardcore grouping

Pivot tables are among Excel's most powerful features.

But what are they? And why should we care? For Excel newbies, pivot tables can also be among Excel's most *intimidating* features. But their purpose is quite simple: **to group data quickly** so that you can analyze it. And as you're about to see, grouping and summarizing data using pivot tables is ***much faster*** than creating the same groupings using formulas alone. By the time you finish this chapter, you'll be slicing and dicing your data in Excel faster than you'd ever thought possible.

Head First Automotive Weekly needs an analysis for their annual car review issue	310
You've been asked to do a lot of repetitive operations	313
Pivot tables are an incredibly powerful tool for summarizing data	314
Pivot table construction is all about previsualizing where your fields should go	316
The pivot table summarized your data way faster than formulas would have	320
Your editor is impressed!	322
You're ready to finish the magazine's data tables	326
Your pivot tables are a big hit!	330



13

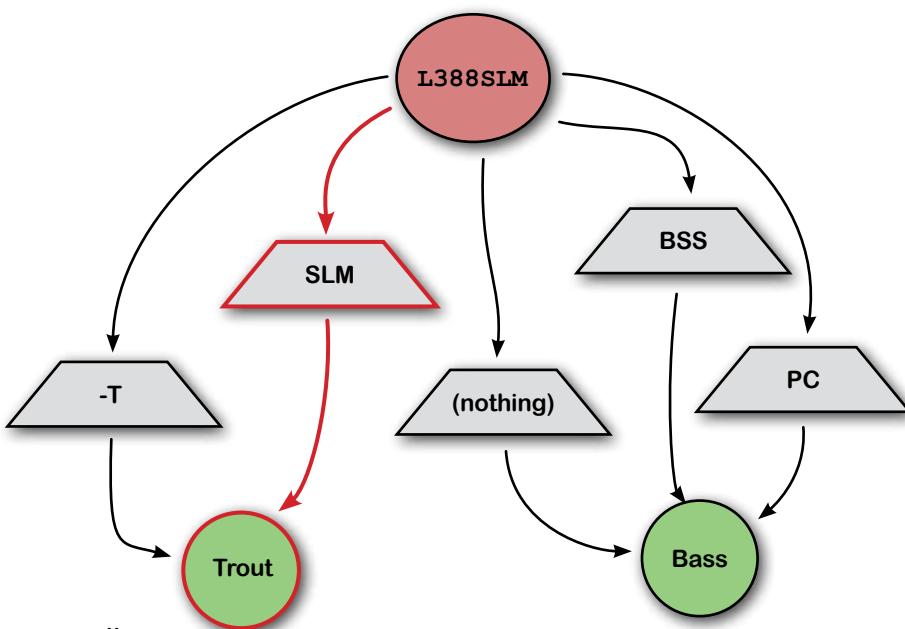
booleans

TRUE and FALSE

There's a deceptively simple data type available in Excel.

They're called **Boolean values**, and they're just plain ol' TRUE and FALSE. You might think that they are too basic and elementary to be useful in serious data analysis, but nothing could be further from the truth. In this chapter, you'll plug Boolean values into **logical formulas** to do a variety of tasks, from cleaning up data to making whole new data points.

Are fishermen behaving on Lake Dataville?	332
You have data on catch amounts for each boat	333
Boolean expressions return a result of TRUE or FALSE	334
IF gives results based on a Boolean condition	334
Your IF formulas need to accommodate the complete naming scheme	336
Summarize how many boats fall into each category	343
COUNTIFS is like COUNTIF, only way more powerful	346
When working with complex conditions, break your formula apart into columns	350
Justice for fishies!	356



segmentation

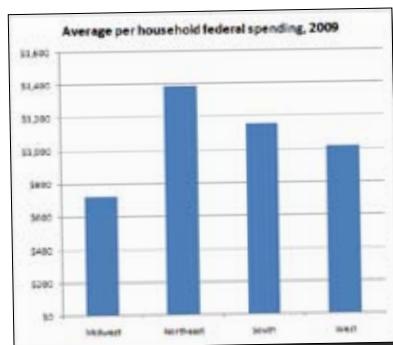
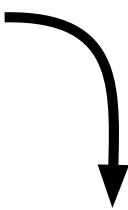
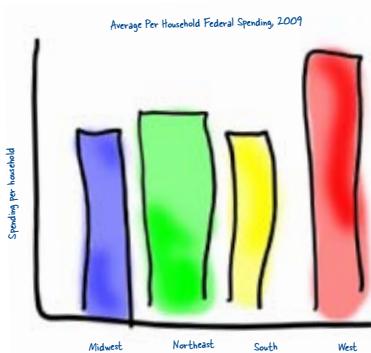
Slice and dice

14

Get creative with your tools.

You've developed a formidable knowledge of Excel in the past 13 chapters, and by now you know (or know how to find) most of the tools that fit your data problems. But what if your problems ***don't fit those tools***? What if you don't even have the data you need all in one place, or your data is divided into categories that don't fit your analytical objectives? In this final chapter, you'll use **lookup functions** along with some of the tools you already know to slice new **segments** out of your data and get really creative with Excel's tools.

You are with a watchdog that needs to tally budget money	358
Here's the graph they want	359
Here's the federal spending data, broken out by county	360
Sometimes the data you get isn't enough	363
Your problems with region are bigger	365
Here's a lookup key	366
VLOOKUP will cross-reference the two data sources	367
Create segments to feed the right data into your analysis	374
Geopolitical Grunts would like a little more nuance	376
You've enabled Geopolitical Grunts to follow the money trail...	380
Leaving town...	381
It's been great having you here in Dataville!	381



leftovers



The Top Ten Things (we didn't cover)

You've come a long way.

But Excel is a complicated program, and there's so much left to learn. In this appendix, we'll go over 10 items that there wasn't enough room to cover in this book, but should be high on your list of topics to learn about next.

#1: Data analysis	384
#2: The format painter	385
#3: The Data Analysis ToolPak	386
#4: Array formulas	386
#5: Shapes and SmartArt	387
#6: Controlling recalculation and performance tuning	388
#7: Connecting to the Web	389
#8: Working with external data sources	389
#9: Collaboration	390
#10: Visual Basic for Applications	390



install excel's solver

The Solver

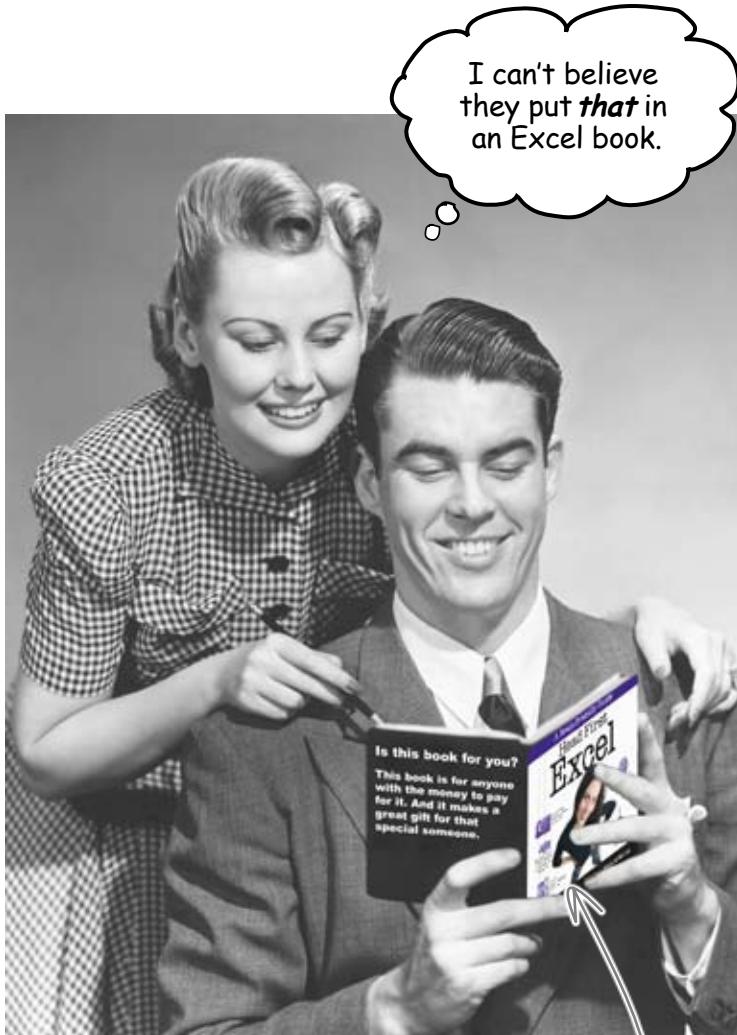
Some of the best features of Excel aren't installed by default.

That's right, in order to run the optimization from Chapter 10, you need to activate the **Solver**, an add-in that is included in Excel by default but not activated without your initiative.

Install Solver in Excel	392
-------------------------	-----

how to use this book

Intro



In this section we answer the burning question:
"So why DID they put that in an Excel book?"

Who is this book for?

If you can answer “yes” to all of these:

- ➊ Have you never used Excel at all, or used it a little but never done anything powerful with it?
- ➋ Do you have **basic** software skills like opening and closing files, and copying and pasting text?
- ➌ Do you prefer stimulating dinner party conversation to dry, dull, academic lectures?

this book is for you.

Who should probably back away from this book?

If you can answer “yes” to any of these:

- ➊ Have you already learned most of Excel’s functions but need a solid reference?
- ➋ Are you looking to do higher-level programming in Excel with macros and Visual Basic for Applications?
- ➌ Are you afraid to try something different? Would you rather have a root canal than mix stripes with plaid? Do you believe that a technical book can’t be serious if it anthropomorphizes Boolean functions and pivot tables?

this book is **not** for you.



[Note from marketing: this book
is for anyone with a credit card.]

We know what you're thinking

“How can *this* be a serious Excel book?”

“What’s with all the graphics?”

“Can I actually *learn* it this way?”

We know what your brain is thinking

Your brain craves novelty. It’s always searching, scanning, *waiting* for something unusual. It was built that way, and it helps you stay alive.

So what does your brain do with all the routine, ordinary, normal things you encounter? Everything it *can* to stop them from interfering with the brain’s *real* job—recording things that *matter*. It doesn’t bother saving the boring things; they never make it past the “this is obviously not important” filter.

How does your brain *know* what’s important? Suppose you’re out for a day hike and a tiger jumps in front of you, what happens inside your head and body?

Neurons fire. Emotions crank up. *Chemicals surge*.

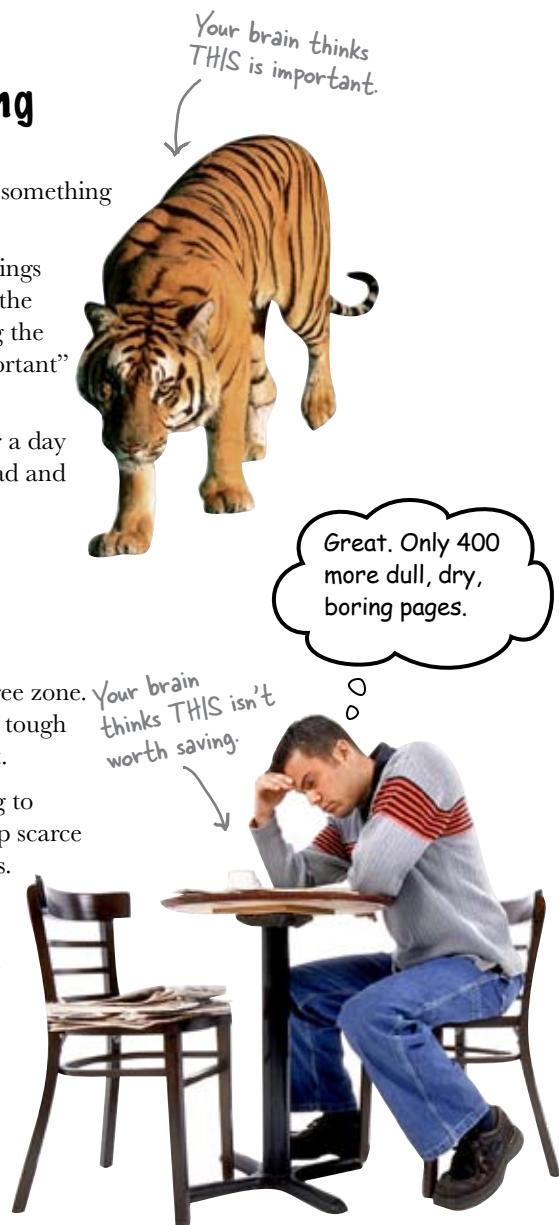
And that’s how your brain knows...

This must be important! Don’t forget it!

But imagine you’re at home, or in a library. It’s a safe, warm, tiger-free zone. You’re studying. Getting ready for an exam. Or trying to learn some tough technical topic your boss thinks will take a week, 10 days at the most.

Just one problem. Your brain’s trying to do you a big favor. It’s trying to make sure that this *obviously* non-important content doesn’t clutter up scarce resources. Resources that are better spent storing the really *big* things.

Like tigers. Like the danger of fire. Like how you should never have posted those “party” photos on your Facebook page. And there’s no simple way to tell your brain, “Hey brain, thank you very much, but no matter how dull this book is, and how little I’m registering on the emotional Richter scale right now, I really *do* want you to keep this stuff around.”

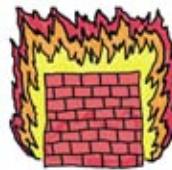


We think of a “Head First” reader as a learner.

So what does it take to *learn* something? First, you have to *get it*, then make sure you don’t *forget it*. It’s not about pushing facts into your head. Based on the latest research in cognitive science, neurobiology, and educational psychology, *learning* takes a lot more than text on a page. We know what turns your brain on.

Some of the Head First learning principles:

Make it visual. Images are far more memorable than words alone, and make learning much more effective (up to 89% improvement in recall and transfer studies). It also makes things more understandable. **Put the words within or near the graphics** they relate to, rather than on the bottom or on another page, and learners will be up to twice as likely to solve problems related to the content.



Use a conversational and personalized style. In recent studies, students performed up to 40% better on post-learning tests if the content spoke directly to the reader, using a first-person, conversational style rather than taking a formal tone. Tell stories instead of lecturing. Use casual language. Don’t take yourself too seriously. Which would you pay more attention to: a stimulating dinner party companion, or a lecture?



Get the learner to think more deeply. In other words, unless you actively flex your neurons, nothing much happens in your head. A reader has to be motivated, engaged, curious, and inspired to solve problems, draw conclusions, and generate new knowledge. And for that, you need challenges, exercises, and thought-provoking questions, and activities that involve both sides of the brain and multiple senses.

Get—and keep—the reader’s attention. We’ve all had the “I really want to learn this but I can’t stay awake past page one” experience. Your brain pays attention to things that are out of the ordinary, interesting, strange, eye-catching, unexpected. Learning a new, tough, technical topic doesn’t have to be boring. Your brain will learn much more quickly if it’s not.



Touch their emotions. We now know that your ability to remember something is largely dependent on its emotional content. You remember what you care about. You remember when you *feel* something. No, we’re not talking heart-wrenching stories about a boy and his dog. We’re talking emotions like surprise, curiosity, fun, “what the...?”, and the feeling of “I Rule!” that comes when you solve a puzzle, learn something everybody else thinks is hard, or realize you know something that “I’m more technical than thou” Bob from engineering *doesn’t*.

Metacognition: thinking about thinking

If you really want to learn, and you want to learn more quickly and more deeply, pay attention to how you pay attention. Think about how you think. Learn how you learn.

Most of us did not take courses on metacognition or learning theory when we were growing up. We were *expected* to learn, but rarely *taught* to learn.

But we assume that if you're holding this book, you really want to learn about Excel. And you probably don't want to spend a lot of time. If you want to use what you read in this book, you need to *remember* what you read. And for that, you've got to *understand* it. To get the most from this book, or *any* book or learning experience, take responsibility for your brain. Your brain on *this* content.

The trick is to get your brain to see the new material you're learning as Really Important. Crucial to your well-being. As important as a tiger. Otherwise, you're in for a constant battle, with your brain doing its best to keep the new content from sticking.

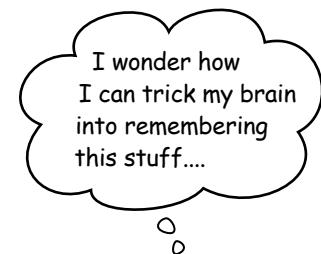
So just how **DO** you get your brain to treat Excel like it was a hungry tiger?

There's the slow, tedious way, or the faster, more effective way. The slow way is about sheer repetition. You obviously know that you *are* able to learn and remember even the dullest of topics if you keep pounding the same thing into your brain. With enough repetition, your brain says, "This doesn't *feel* important to him, but he keeps looking at the same thing *over* and *over* and *over*, so I suppose it must be."

The faster way is to do **anything that increases brain activity**, especially different *types* of brain activity. The things on the previous page are a big part of the solution, and they're all things that have been proven to help your brain work in your favor. For example, studies show that putting words *within* the pictures they describe (as opposed to somewhere else on the page, like a caption or in the body text) causes your brain to try to make sense of how the words and picture relate, and this causes more neurons to fire. More neurons firing = more chances for your brain to *get* that this is something worth paying attention to, and possibly recording.

A conversational style helps because people tend to pay more attention when they perceive that they're in a conversation, since they're expected to follow along and hold up their end. The amazing thing is, your brain doesn't necessarily *care* that the "conversation" is between you and a book! On the other hand, if the writing style is formal and dry, your brain perceives it the same way you experience being lectured to while sitting in a roomful of passive attendees. No need to stay awake.

But pictures and conversational style are just the beginning....



Here's what WE did:

We used **pictures**, because your brain is tuned for visuals, not text. As far as your brain's concerned, a picture really *is* worth a thousand words. And when text and pictures work together, we embedded the text *in* the pictures because your brain works more effectively when the text is *within* the thing the text refers to, as opposed to in a caption or buried in the text somewhere.

We used **redundancy**, saying the same thing in *different* ways and with different media types, and *multiple senses*, to increase the chance that the content gets coded into more than one area of your brain.

We used concepts and pictures in **unexpected** ways because your brain is tuned for novelty, and we used pictures and ideas with at least *some emotional content*, because your brain is tuned to pay attention to the biochemistry of emotions. That which causes you to *feel* something is more likely to be remembered, even if that feeling is nothing more than a little **humor, surprise, or interest**.

We used a personalized, **conversational style**, because your brain is tuned to pay more attention when it believes you're in a conversation than if it thinks you're passively listening to a presentation. Your brain does this even when you're *reading*.

We included more than 80 **activities**, because your brain is tuned to learn and remember more when you **do** things than when you *read* about things. And we made the exercises challenging-yet-do-able, because that's what most people prefer.

We used **multiple learning styles**, because *you* might prefer step-by-step procedures, while someone else wants to understand the big picture first, and someone else just wants to see an example. But regardless of your own learning preference, *everyone* benefits from seeing the same content represented in multiple ways.

We include content for **both sides of your brain**, because the more of your brain you engage, the more likely you are to learn and remember, and the longer you can stay focused. Since working one side of the brain often means giving the other side a chance to rest, you can be more productive at learning for a longer period of time.

And we included **stories** and exercises that present **more than one point of view**, because your brain is tuned to learn more deeply when it's forced to make evaluations and judgments.

We included **challenges**, with exercises, and by asking **questions** that don't always have a straight answer, because your brain is tuned to learn and remember when it has to *work* at something. Think about it—you can't get your *body* in shape just by *watching* people at the gym. But we did our best to make sure that when you're working hard, it's on the *right* things. That **you're not spending one extra dendrite** processing a hard-to-understand example, or parsing difficult, jargon-laden, or overly terse text.

We used **people**. In stories, examples, pictures, etc., because, well, because *you're* a person. And your brain pays more attention to *people* than it does to *things*.





Cut this out and stick it on your refrigerator.

Here's what YOU can do to bend your brain into submission

So, we did our part. The rest is up to you. These tips are a starting point; listen to your brain and figure out what works for you and what doesn't. Try new things.

1 Slow down. The more you understand, the less you have to memorize.

Don't just *read*. Stop and think. When the book asks you a question, don't just skip to the answer. Imagine that someone really *is* asking the question. The more deeply you force your brain to think, the better chance you have of learning and remembering.

2 Do the exercises. Write your own notes.

We put them in, but if we did them for you, that would be like having someone else do your workouts for you. And don't just *look* at the exercises. **Use a pencil.** There's plenty of evidence that physical activity *while* learning can increase the learning.

3 Read the “There are No Dumb Questions.”

That means all of them. They're not optional sidebars, **they're part of the core content!** Don't skip them.

4 Make this the last thing you read before bed. Or at least the last challenging thing.

Part of the learning (especially the transfer to long-term memory) happens *after* you put the book down. Your brain needs time on its own, to do more processing. If you put in something new during that processing time, some of what you just learned will be lost.

5 Talk about it. Out loud.

Speaking activates a different part of the brain. If you're trying to understand something, or increase your chance of remembering it later, say it out loud. Better still, try to explain it out loud to someone else. You'll learn more quickly, and you might uncover ideas you hadn't known were there when you were reading about it.

6 Drink water. Lots of it.

Your brain works best in a nice bath of fluid. Dehydration (which can happen before you ever feel thirsty) decreases cognitive function.

7 Listen to your brain.

Pay attention to whether your brain is getting overloaded. If you find yourself starting to skim the surface or forget what you just read, it's time for a break. Once you go past a certain point, you won't learn faster by trying to shove more in, and you might even hurt the process.

8 Feel something.

Your brain needs to know that this *matters*. Get involved with the stories. Make up your own captions for the photos. Groaning over a bad joke is *still* better than feeling nothing at all.

9 Get your hands dirty!

There's only one way to learn about Excel: get your hands dirty. And that's what you're going to do throughout this book. Excel is a skill, and the only way to get good at it is to practice. We're going to give you a lot of practice: every chapter has exercises that pose a problem for you to solve. Don't just skip over them—a lot of the learning happens when you solve the exercises. We included a solution to each exercise—don't be afraid to peek at the solution if you get stuck! (It's easy to get snagged on something small.) But try to solve the problem before you look at the solution. And definitely get it working before you move on to the next part of the book.

Read Me

This is a learning experience, not a reference book. We deliberately stripped out everything that might get in the way of learning whatever it is we're working on at that point in the book. And the first time through, you need to begin at the beginning, because the book makes assumptions about what you've already seen and learned.

Excel mastery is about rocking out with formulas.

A lot of books on Excel are little more than fancy restatements of the Help files that give as much weight to formulas as they do to all of Excel's other features. The thing is, the people who are the most skillful users of Excel are the ones who really, really know formulas. So this book was written to have you constantly using and learning new functions to make your formulas powerful.

This book uses Excel 2007 for Windows, but you can use other versions of Excel.

Excel 2007 for Windows was notable for its major user interface redesign, but it also included features like **structured references** that are really useful. So useful, in fact, that some of those features made it into *Head First Excel*, even though not everyone has upgraded yet. But even if you haven't upgraded, don't sweat it: you can just skip over those sections and not have too much trouble, because...

Most of the important stuff you need to know about Excel has been in the software for years.

There are some formulas and features that are new to Excel 2007 and 2010, but the basics of formulas are old school. So don't sweat it if you're not ready to drop the cash to upgrade (although you should eventually).

Excel 2008 for Mac doesn't have all the features of Excel 2007 for Windows.

You'd think that the 2008 software would have everything the 2007 software has and more, right? Well, not really. While **Excel 2008 for Mac** came out after Excel 2007 for Windows, there's still spotty support for some of the new Excel 2007 features. It'll all get ironed out in future versions of Excel for Mac, we're sure!

You can download data in both .xlsx and .xls format.

In this book there are a lot of situations where you'll need to download data in order to do the exercise. Suppose you're using an early version of Excel that doesn't read the newer **.xlsx** file format that's used most frequently in *Head First Excel*. It's no problem: just download the file using the **.xls** extension. Both versions of the files are on the O'Reilly website, but remember that a lot of the newer Excel features will be absent from the .xls versions.

The activities are NOT optional.

The exercises and activities are not add-ons; they're part of the core content of the book. Some of them are to help with memory, some are for understanding, and some will help you apply what you've learned. **Don't skip the exercises.** The crossword puzzles are the only thing you don't *have* to do, but they're good for giving your brain a chance to think about the words and terms you've been learning in a different context.

The redundancy is intentional and important.

One distinct difference in a Head First book is that we want you to *really* get it. And we want you to finish the book remembering what you've learned. Most reference books don't have retention and recall as a goal, but this book is about *learning*, so you'll see some of the same concepts come up more than once.

The book doesn't end here.

We love it when you can find fun and useful extra stuff on book companion sites. You'll find extra stuff on networking at the following URL:

<http://www.headfirstlabs.com/books/hfexcel/>

The Brain Power exercises don't have answers.

For some of them, there is no right answer, and for others, part of the learning experience of the Brain Power activities is for you to decide if and when your answers are right. In some of the Brain Power exercises, you will find hints to point you in the right direction.

The technical review team

Tony Rose

Bill Mietelski



Ken Bluttman



Technical reviewers:

Bill Mietelski is a software engineer and a three-time Head First technical reviewer. He can't wait to run a data analysis on his golf stats to help him win on the links.

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Ken Bluttman is the author of over a dozen computer and other nonfiction titles. His "other career" is working as a web developer. Visit Ken at www.kenbluttman.com.

Acknowledgments

My editor:

Brian Sawyer edited *Head First Excel* and is a creative, generous, and fun guy to work with. This book and *Head First Data Analysis* benefited immeasurably from his input and guidance. Thank you for all that you do, Brian.

The O'Reilly Team:

Brett McLaughlin's vision and input have left an indelible mark on the Head First series and on my writing. His work is much appreciated. **Karen Shaner** provided logistical support for this book, most of which was invisible to me but all of which is greatly appreciated.

Roger Magoulas provided some useful advice, along with the data set that was excerpted in Chapter 14.

The **technical review team** was a tremendous help. I am very grateful that this book has the endorsement of these supportive experts.

My family:

A very special thank you goes to my father, also known as **Michael Milton**, who introduced me to spreadsheets. He and I have passed spreadsheets back and forth over the years and have enjoyed learning Excel together.

My wife, **Julia**, is a tolerant person who has supported me through two (!) Head First books and has listened to more speeches about data analysis than any spouse should have to. Thank you, Julia.

Also indispensable has been the support of the rest of my family, **Elizabeth, Sara, Gary, and Marie**. Thank you all!



Brian Sawyer



Mike Sr.



Julia Burch

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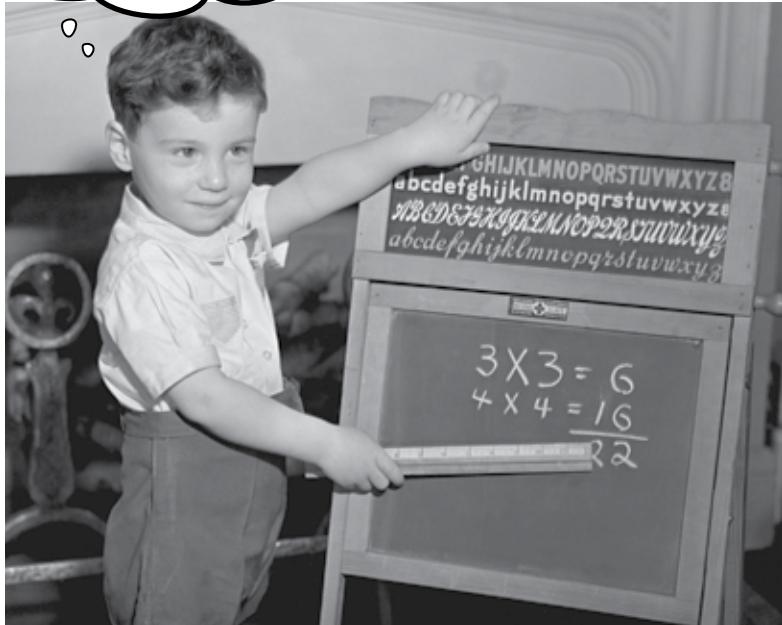
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1 introduction to formulas

Excel's real power

As soon as I get out
of here, I'm totally going
to get a computer to solve
this sort of problem.



We all use Excel to keep lists.

And when it comes to lists, Excel does a great job. But the real Excel ninjas are people who have mastered the world of formulas. Using data well is all about executing the **calculations** that will tell you what you need to know, and **formulas** do those calculations, molding your data into something useful and illuminating. If you know your formulas, you can really make your numbers *sing*.

Can you live it up on the last night of your vacation?

It's your last night in New York City on a vacation you've taken with your friends Bob and Sasha. You've had a great time and really enjoyed the city.

But you've also spent plenty of money, and now the three of you want to see if you have enough left to go to a nice restaurant on your last night.



Here's what you budgeted and what you spent

You've been handling expenses by having only one of you pay at a time. Instead of splitting up every check at every restaurant, you all figured you'd settle up later.

Now you need to settle up and decide whether you have any more money left in your **budget** for a big meal.

This is how much you decided you wanted to spend on food.

Your NYC food budget:
\$400



I spent \$61. Can we keep better records this time?



I spent \$296.



Sharpen your pencil

1

What approach would you take to splitting up your expenses?

.....
.....
.....

2

How would you record your calculations?

.....
.....
.....



1

What approach would you take to splitting up your expenses?

You could go through each check and try to split them all up, but that would be

kind of a pain. An easier approach would be just to divide everyone's bill by three.

That way you have a good estimate of each person's share of each bill.

2

How would you record your calculations?

Why not try using Excel? You could do it with paper or in an email, but since you

probably want Excel to do calculations for you anyway, you can also use Excel to

keep a record.

Here are some basic approaches...
your answers might be different.

Excel is great for keeping records...

People often use Excel to keep permanent records of their data. The program is a great way to take a snapshot of your data and thinking at a certain point in time.

With your budgeting calculations set up in an Excel spreadsheet, you'll be able to show your friends exactly how you came to your conclusions about how you should split up the expenses.

You can keep track of this sort of stuff forever using Excel spreadsheets.

The image shows three overlapping Microsoft Excel windows. The top window is titled 'Budget - Microsoft Excel' and contains a single row of data: Person (You) and Budget (\$400). The middle window is titled 'Bills - Microsoft Excel' and contains a single row of data: Person (Bob) and Budget (\$350). The bottom window is titled 'Sheet1 - Microsoft Excel' and contains a single row of data: Person (Sasha) and Budget (\$850). All three windows have the standard Microsoft Office ribbon menu bar at the top.

	A	B	C	D
1	Person	Budget		
2	You	\$400		
3	Bob	\$350		
4	Sasha	\$850		

You never know when you'll need to go back and check your stats.

...but Excel is at its most powerful when you use it to crunch numbers.

Formulas work with your data

To add up and divide what you spent, you use **formulas**.

Say you want to **add together** the totals from the two bills on the right. Here's the formula you'd use.

This is a formula.

= 66 + 116

The plus is for addition.

Here are your bills.

The equals sign tells Excel to expect a formula.

Excel has a large variety of formulas you can use to make calculations, from basic addition to highly specialized engineering and statistical tools.

Here are two of your restaurant bills.

Tom's Restaurant

Coffee	\$2
Coffee	\$2
Coffee	\$2
Big Breakfast	\$14
Eggs & Bacon	\$15
Pancakes	\$13
Fruit cup	\$6
Tip	\$12
Total	\$66

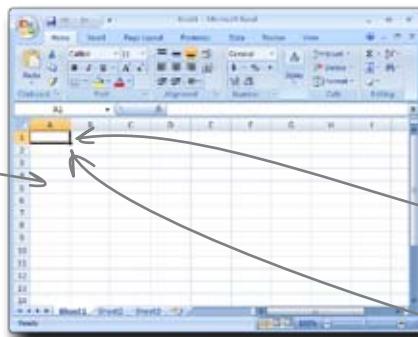
Lupa

Salad	\$7
Baccala	\$20
Frutti di Mare	\$19
Olives	\$6
Bagna Cauda	\$20
Spaghetti alla Carbonara	\$15
Eggplant Parm	\$8
Tip	\$21
Total	\$116



Exercise

Open Excel and write the formula that adds up the total you all spent together. Remember, Bob spent \$61 and Sasha spent \$296. **You** spent \$332.



Each box on the grid is called a "cell."

Be sure to watch what happens here in the formula bar.

Type your formula in cell A1.

Remember to use the = sign.



Exercise Solution

You just typed a formula to calculate how much you and your friends spent in total. What did you find?

You aren't limited to adding two numbers; you can add as many numbers as you like.

When you type the formula, you can see the output both inside this cell and inside the formula bar.

A screenshot of Microsoft Excel showing a formula being entered into cell A1. The formula is =61+296+332. The cell A1 contains the result 689, and the formula bar at the top also displays the formula =61+296+332. Three arrows point from handwritten text to the screenshot: one from 'What you spent' to the formula bar, one from 'What Bob spent' to cell A1, and one from 'What Sasha spent' to the formula bar.

When you press Return, cell A1 shows the calculated answer...

A screenshot of Microsoft Excel showing the calculated result. Cell A1 now contains the value 689, and the formula bar still shows the formula =61+296+332. An arrow points from the handwritten text '...but if you highlight cell A1 again, the formula bar shows the formula you wrote.' to the formula bar.

...but if you highlight cell A1 again, the formula bar shows the formula you wrote.

Now you just need to split up the grand total among the three of you.

And that means dividing the \$689 total you spent by three. What symbol will you use to make this calculation?

* WHO DOES ? WHAT? *

Match each operation on the left with the formulas that implement the operation on the right.

Addition  **= 66 + 116**

Subtraction  **= 332 / 2**

Division  **= 400 * 10**

Multiplication  **= 400 - 400 * 0.2**



Exercise

Write the formula to split up the total you spent (\$689) among the three of you.

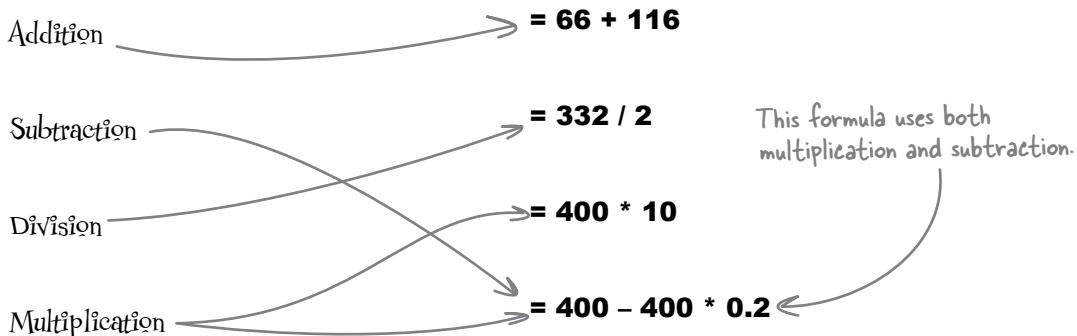
Put your formula here.

Have you spent less than your budget?

[Book1] - Microsoft Excel			
Normal Page Layout View Window			
A B C D			
1	689		
2			
3			
4			
5			
6			

* WHO DOES? WHAT? SOLUTION *

Match each operation on the left with the formulas that implement the operation on the right.



Exercise Solution

You wrote a formula to calculate \$689 split three ways. What value did Excel return?

$$= 689 / 3$$

Here's the formula.

The forward slash symbol represents division.

Have you spent less than your budget?

Yes! My budget was \$400, so it looks like I spent only a little over half.

A screenshot of Microsoft Excel showing a spreadsheet with one row of data. Cell A1 contains the number 689. Cell A3 contains the formula $=689/3$, which has been evaluated to 229.667. The formula bar at the top also displays $=689/3$. The ribbon menu is visible at the top.

	A	B	C	D
1	689			
2				
3	229.667			
4				
5				
6				
7				

Looks like Bob forgot a receipt...



Nice, Bob. It looked like we had everything figured out, but now that he left out something from his total, we're going to have to go back and fix our numbers.

Maybe he's right: instead of getting totals from Bob and Sasha, we should just take a look at all the receipts. The total you find might be more accurate that way. On the other hand, that could be even *more* work....

look at the receipts

Your friends sent you all the receipts

Bob and Sasha sent you all their receipts. Combined with your own receipts, the final list looks like this.



Bob had left out this meal.

A	B	C	D
1	Meal	Total	
2	1	\$ 66	
3	2	\$ 116	
4	3	\$ 27	
5	4	\$ 123	
6	5	\$ 61	
7	6	\$ 50	
8	7	\$ 163	
9	8	\$ 95	
10	9	\$ 38	
11			
12			
13			

The three of you
ate nine meals.

We have to rerun the calculations?
What a pain! That means if we get
more data we have to go digging into
a bunch of formulas. That sucks....

Here is the total amount you
all spent on each meal.



References keep your formulas working even if your data changes

You don't have to write your formula like this:

=66+116+27+123+61+50

This formula just keeps going....

This formula is hard to read, and even more importantly, it's hard to change if a data point turns out to be wrong.

Instead of writing a long string of numbers like this, you can use **references**. References are a shorthand that Excel uses to look for values. For example, if you tell Excel to look at the reference B2, it will return the value 66, because that's what it finds at B2.

The reference for the value of the first bill is B2.

	A	B
1	Meal	Total
2		\$ 66
3		\$ 116
4		\$ 27
5		\$ 123
6		\$ 61
7		\$ 50
8		\$ 163
9		\$ 95
10		\$ 38
11		



Exercise

Write the formula that adds your bills together using references.

.....

Then write a formula to split that value three ways.

.....

Write the formulas you use in the blanks.

.....

Write a formula to determine whether you are still under budget and, if so, by how much.

.....



Exercise Solution

Write the formula that adds your bills together using references.

=B2+B3+B4+B5+B6+B7+B8+B9+B10

This expression calculates the corrected total amount you spent, which is \$739.

Did you notice how the colors in your references conveniently match the colors in column B?

A	B	C	D	E	F
1 Meal	Total				
2	\$ 66				
3	\$ 116				
4	\$ 27				
5	\$ 123				
6	\$ 61				
7	\$ 50				
8	\$ 163				
9	\$ 95				
10	\$ 38				

Then write a formula to split that value three ways.

=E3/3

This formula takes the value you just calculated and divides it by three.

Your actual references might be different, depending on where you decided to put your formulas.

Be sure to create text labels for your formulas, so you know what they mean when you look at them later!

A	B	C	D	E	F
1 Meal	Total				
2	\$ 66				
3	\$ 116				
4	\$ 27				
5	\$ 123				
6	\$ 61				
7	\$ 50				
8	\$ 163				
9	\$ 95				
10	\$ 38				

Write a formula to determine whether you are still under budget and, if so, by how much.

=400-E5

I'm still under my budget of \$400.

This is what you have left to spend.

A	B	C	D	E	F
1 Meal	Total				
2	\$ 66				
3	\$ 116				
4	\$ 27				
5	\$ 123				
6	\$ 61				
7	\$ 50				
8	\$ 163				
9	\$ 95				
10	\$ 38				



Sasha came up with her own formula, but when she ran it she got a different answer from yours. Here's her formula:

$$=(B2+B3+B4+B5+B6+B7+B9+B10)/3$$

And here's the answer she received from it.

\$192



Sharpen your pencil

How is Sasha's formula different from your formulas? Why do you think she got a different answer?

.....
.....
.....
.....



Sasha wrote a different formula from you and came up with a different answer. How do you account for the difference?

Hers is different because, instead of separating the operations into formulas, she tried to add the bills together and then split them into three in the same formula. And it looks like her formula would have worked, except that she forgot to add cell B8 to the mix.

Check your formulas carefully

One really important skill for Excel users is the ability to go back and look carefully at formulas that have been already written. Formulas might look complex and long, but that doesn't mean that they're *correct*.

Be patient when you look at formulas and pay close attention to their references. One small mistake will usually create a false result.

Here is a corrected version of Sasha's formula.

$$=(B2+B3+B4+B5+B6+B7+B8+B9+B10)/3$$

This formula's result matches yours.

If there is a mistake in the formula, everything will turn out wrong!

 A screenshot of Microsoft Excel showing a table of meal expenses. Column A is labeled "Meal" and column B is labeled "Total". Row 1 contains the headers. Rows 2 through 10 list individual meals with their respective totals. Row 3 has a note "My share" and cell E3 contains the value "\$ 246". The table is set against a background of a man thinking.

A	B	C	D	E
1	Meal	Total		
2	1	\$ 66		
3	2	\$ 116	My share	\$ 246
4	3	\$ 27		
5	4	\$ 123		
6	5	\$ 61		
7	6	\$ 50		
8	7	\$ 163		
9	8	\$ 95		
10	9	\$ 38		

That formula may be right, but it's still really long. It'd be nice to tighten it up.

Your result might also be \$246.33, depending on your number format.



Refer to a bunch of cells using a range

You can point to a list of references in Excel using a **range**. A range is simply two references with a colon between them, and the colon tells Excel to look at every cell in between those two references.

For example, say you want your formula to do something to this list of references.

B2, B3, B4, B5, B6, B7, B8, B9, B10

Here's the range.

By placing a colon between B2 and B10, you tell Excel to look at those two cells and everything in between.

B2:B10

This colon tells Excel to evaluate every cell from B2 to B10.

Use SUM to add the elements in a range

In order to make your ranges work, you need to pass them to formulas that know what to do with them. You can use the **SUM function** to add together all the cells in your range.*

=SUM(B2:B10)

This SUM formula adds together all the cells in the range B2:B10.

A formula's arguments are the ranges or values you put between the parentheses.

Most functions consist of a word followed by parentheses that contain one or more **arguments**. They often need arguments in order to know where to look to get the data they need to evaluate.



Exercise

*SUM is a “function,” and the real implementation of a function (like `=SUM(B2 : B10)`) is a “formula.”

Inside your spreadsheet, rewrite the formula that calculates each person's share using a range and the SUM function.



Exercise Solution

You just wrote your first SUM formula. What happened?

Here's the formula that adds the bills together and divides them by three.

Excel evaluates the SUM function first and then divides it by three.

=SUM(B2:B10)/3

This formula is much easier to read and understand.

A	B	C	D	E	F
1	Meal	Total			
2	1	\$ 66			
3	2	\$ 116		My share	\$ 246
4	3	\$ 27			
5	4	\$ 123			
6	5	\$ 61			
7	6	\$ 50			
8	7	\$ 163			
9	8	\$ 95			
10	9	\$ 38			
11					
12					

Your answer is the same as it was when you added together the references individually...

...except now you have a formula that's much easier to manage.

You could add together thousands of numbers using SUM and ranges!

Bob and Sasha wonder whether we've been taking the right approach...

From: Sasha
To: You and Bob
Subject: A question of fairness

Hey you two,

You know, I've been thinking about how we're splitting up the checks and all.

It seems like splitting them evenly would work well only if we all spent about the same. But there are a number of times when I know I spent more than either of you, so if we split those checks three ways, you'd really be paying for me.

Since we really do want to be fair, shouldn't we split up the restaurant bills item by item, so that we each only pay for exactly what we ordered?

—S

From: Bob
To: You and Sasha
Subject: Re: A question of fairness

Amigos,

I hear what you're saying, Sasha. It does seem fair. But splitting the checks evenly three ways is certainly an easier calculation. I wouldn't be able to crunch those numbers in Excel.

But then again it appears we have some sort of spreadsheet whiz as a travelling companion. Maybe they can work some magic and sort everything out as precisely as you want. Ya think?

The Bobster

How would you go about splitting up all the bills?

divide up the checks

Your friends agree: split the checks individually

Since you're going to the trouble to create a spreadsheet for your dining expenses, you might as well go ahead and break each check down individually. This approach will give the most equitable results.

Here are the receipts for the meals **you** bought yourself.

Tom's Restaurant		
You	Coffee	\$2
Bob	Coffee	\$2
Sasha	Coffee	\$2
You	Big Breakfast	\$14
Bob	Eggs & Bacon	\$15
Sasha	Pancakes	\$13
Sasha	Fruit cup	\$6
	Tip	\$12
	Total	\$66

Each of you had coffee.

Split each tip three ways.

Lupa		
You	Salad	\$7
Sasha	Baccala	\$20
Bob	Frutti di Mare	\$19
Sasha	Olives	\$6
Sasha	Bagna Cauda	\$20
You	Spaghetti alla Carbonara	\$15
Bob	Eggplant Parm	\$8
	Tip	\$21
	Total	\$116

Split this wine order three ways.

Taco Chulo		
	Brooklyn	
Sasha	Quesadilla	\$9
You	Tacos	\$5
Bob	Chile con Queso	\$7
	Tip	\$6
	Total	\$27

Split each tip three ways.

CHINESE MIRCH NEW YORK CITY		
Bob	WINE	\$24.00
Sasha	DATE PANCAKE	\$ 6.00
Bob	SWEET CORN SOUP	\$ 6.00
You	CRISPY OKRA	\$11.00
Sasha	SZECHUAN VEGETABLES	\$15.00
You	CHICKEN CURRY	\$19.00
You	HOT & SOUR SOUP	\$ 4.00
Sasha	FRIED BANANA	\$10.00
Bob	CHICKEN DUMPLING	\$ 7.00
	TIP	\$21.00
	TOTAL:	\$123.00



Exercise

Here is a spreadsheet to help you split up the expenses for the restaurant bills you paid for.

- Fill in the blanks for **Bob** and **Sasha** using the values on the facing page.

First, sum only the amounts for each meal for Bob and Sasha.

Load this!

[www.headfirstlabs.com/books/hfexcel/
hfe_ch01_your_tab.xls](http://www.headfirstlabs.com/books/hfexcel/hfe_ch01_your_tab.xls)

The meals you purchased				
Meal	Total	Bob's Share	Sasha's Share	Your Share
1	\$ 66			
2	\$ 116			
3	\$ 27			
4	\$ 123			

- Now, write a formula to calculate your share of meal #1. Instead of adding elements from the facing page, just subtract what Bob and Sasha spent from the total.
- Select the formula you just wrote in cell E4 and copy/paste it for meals 2–4. What happens? Look at the references for each result.

Put your subtraction formula here.



Exercise Solution

You just calculated the breakdown for each bill you paid. What did you find?

- 1** Fill in the blanks for **Bob** and **Sasha** using the values on the facing page.

Here's one of the formulas you just wrote, which is for Bob's bill at Tom's Restaurant.

$$=2+15+12/3$$

Coffee

Eggs & Bacon

This is the value for the tip, which needs to be split into three.

Here is the result.

1 The meals you purchased					
Meal	Total	Bob's Share	Sasha's Share	Your Share	
1	\$ 66	\$ 21	\$ 25	\$ 20	
2	\$ 116	\$ 34	\$ 53	\$ 29	
3	\$ 27	\$ 9	\$ 11	\$ 7	
4	\$ 123	\$ 39	\$ 50	\$ 34	

- 2** Now, write a formula to calculate your share of meal #1. Instead of adding elements from the facing page, just subtract what Bob and Sasha spent from the total.

Use this formula.

$$=B4-C4-D4$$

The formula goes here.

- 3** Select the formula you just wrote in cell E4 and copy/paste it for meals 2–4. What happens? Look at the references for each result.

When you copied and pasted the formula, Excel updated the references for each position.

$$=B7-C7-D7$$

$$=B5-C5-D5$$

$$=B6-C6-D6$$

When you copy and paste a formula, the references shift

This feature of formulas is really useful because you can write **just one formula** to do a whole lot of different stuff.

You wrote just one formula here...

	A	B	C	D	E
1	The meals you purchased				
2					
3	Meal	Total	Bob's Share	Sasha's Share	Your Share
4	1	\$ 66	\$ 21	\$ 25	\$ 20
5	2	\$ 116	\$ 34	\$ 53	\$ 29
6	3	\$ 27	\$ 9	\$ 11	\$ 7
7	4	\$ 123	\$ 39	\$ 50	\$ 34
8					
9					

...but Excel was able to transform it into similar formulas by shifting the references.

It actually would not have taken you long to write three more similar formulas to calculate your share of the meals you bought. But what if, instead of four meals, you'd bought **a hundred or a thousand** meals? In that case, being able to copy formulas with automatic reference shifting would be a big help.



So how are we going to figure out who owes what to whom?



Long Exercise

Here are summaries of what each of you spent.

Load this!

[www.headfirstlabs.com/
books/hfexcel/
hfe_ch01_all_tabs.xls](http://www.headfirstlabs.com/books/hfexcel/hfe_ch01_all_tabs.xls)

Write your new
values down here.

The screenshot shows a Microsoft Excel window with three tables of data:

1 The meals you purchased

Meal	Total	Bob's Share	Sasha's Share	Your Share
1	\$ 66	\$ 21	\$ 25	\$ 20
2	\$ 116	\$ 34	\$ 53	\$ 29
3	\$ 27	\$ 9	\$ 11	\$ 7
4	\$ 123	\$ 39	\$ 50	\$ 34

8 The meals Bob purchased

Meal	Total	Bob's Share	Sasha's Share	Your Share
5	\$ 61	\$ 19	\$ 18	\$ 24
6	\$ 50	\$ 17	\$ 16	\$ 17

13 The meals Sasha purchased

Meal	Total	Bob's Share	Sasha's Share	Your Share
7	\$ 163	\$ 75	\$ 51	\$ 37
8	\$ 95	\$ 47	\$ 20	\$ 28
9	\$ 38	\$ 19	\$ 12	\$ 7

Below these three tables on your spreadsheet, write the formulas to answer these questions. Be sure to put text labels in the cells next to each formula to remind you what they mean.

1 Write the formula that shows what you spent on Bob.

2 Write the formula that shows what Bob spent on you.

3 Using the above two formulas, write a formula that shows what Bob owes you.

4 Write the formulas to show what Sasha owes you.

5 Write the formulas to show what Sasha owes Bob.

6 Now how are you doing relative to your budget of \$400?
.....

LONG Exercise SOLUTION

1 The meals you purchased						
Meal	Total	Bob's Share	Sasha's Share	Your Share		
1	\$ 66	\$ 21	\$ 25	\$ 20		
2	\$ 116	\$ 34	\$ 53	\$ 29		
3	\$ 27	\$ 9	\$ 11	\$ 7		
4	\$ 123	\$ 39	\$ 50	\$ 34		
7						

=SUM(C3:C6)

8 The meals Bob purchased						
Meal	Total	Bob's Share	Sasha's Share	Your Share		
5	\$ 61	\$ 19	\$ 18	\$ 24		
6	\$ 50	\$ 17	\$ 16	\$ 17		
12						

=SUM(E10:E11)

13 The meals Sasha purchased						
Meal	Total	Bob's Share	Sasha's Share	Your Share		
7	\$ 163	\$ 75	\$ 51	\$ 37		
8	\$ 95	\$ 47	\$ 20	\$ 28		
9	\$ 38	\$ 19	\$ 12	\$ 7		
18						

=C19-C20

19 You spent on Bob \$ 103						
20 Bob spent on you \$ 41						
21 Bob owes you \$ 62						
22						
23	You spent on Sasha	\$ 139				
24	Sasha spent on you	\$ 72				
25	Sasha owes you	\$ 67				
26						
27	Bob spent on Sasha	\$ 34				
28	Sasha spent on Bob	\$ 141				
29	Sasha owes Bob	\$ (107)				
30						
31	You have left	\$ 197				

The parentheses mean that this is a negative number, which means that Bob actually owes Sasha.

Don't forget to label your new formulas!

The formulas down here are similar.

Below these three tables on your spreadsheet, write the formulas to answer these questions. Be sure to put text labels in the cells next to each formula to remind you what they mean.

- 1 Write the formula that shows what you spent on Bob.

=SUM(C3:C6)

These are pretty straightforward SUM formulas.

- 2 Write the formula that shows what Bob spent on you.

=SUM(E10:E11)

- 3 Using the above two formulas, write a formula that shows what Bob owes you.

=C19-C20

This formula just subtracts what Bob spent on you from what you spent on Bob.

- 4 Write the formulas to show what Sasha owes you.

=SUM(D3:D6)

=SUM(E15:E17)

=C23-C24

- 5 Write the formulas to show what Sasha owes Bob.

=SUM(D10:D11)

=SUM(C15:C17)

=C27-C28

These groups of formulas go through the same motions with different combinations of people.

- 6 Now how are you doing relative to your budget of \$400?

=400-SUM(E15:E17)-SUM(E10:E11)-SUM(E3:E6)

Subtract the total amount you spent from your budget.

=400-SUM(E15:E17,E10:E11,E3:E6)

Alternatively, you can place commas between ranges for a more concise SUM formula.

Looks like you're in good shape!

I have \$197 left!

Excel formulas let you drill deep into your data

You can use spreadsheets as a hugely powerful tool with formulas. You might want to run a simple calculation, or you might need to build a really elaborate system of formulas to help you find the answers you need.

Simple

You started off here with a simple formula.

Slick

Here you added together the costs of the meals individually.

Super-sophisticated!

In this spreadsheet you broke everything down to a really fine level.

No matter which approach you choose to take, Excel is ready with the formulas you need to get the job done.

Everyone has plenty of cash left for a food-filled night in New York City!

Your friends loved your spreadsheet and used it to figure out how they are doing relative to their own budgets. The verdict: everyone has plenty of money left.

With \$197 burning a hole in **your** pocket, you are ready for a crazy night out with your friends in one of the most exciting cities in the world!



2 visual design

Spreadsheets as art

The calculations work, but the spreadsheet just doesn't have the look. I'd better call Louis Vuitton....

You know, Excel has some pretty solid formatting tools built in!



Most people usually use Excel for page layout.

A lot of formula-writing masters, who are familiar with just how powerful Excel can be, are shocked that people "just" use the software for showing information with a grid. But Excel, especially in its more recent versions, has become quite handy as a page layout tool.

You're about to get comfortable with some important and not-so-obvious Excel tools for serious visual design.

CRMFreak needs to present their financials to analysts

Because CRMFreak is a publicly traded company and is heavily influenced by what Wall Street analysts have to say about them, it's really important that they do a good job with their public financial statements.

The CEO needs you to format CRMFreak's **income statement**, using your Excel skills to make the formulas work correctly and provide an elegant presentation.



Let's take a look at
CRMFreak's data....



Exercise

Here's CRMFreak's *income statement* data for the past year. What is their net income?

- 1 Write a formula to calculate **Total revenue** (cell B7), adding together the elements in the Revenue section.

.....

Write the formulas
you use in the blanks.



- 2 Write a formula to calculate the **Total cost of revenues** (cell B12), adding together the elements in the Cost of revenues section.

.....



Load this!

[www.headfirstlabs.com/books/hfexcel/
income_statement.xlsx](http://www.headfirstlabs.com/books/hfexcel/income_statement.xlsx)

- 3 Write a formula to calculate the **Gross profit** (cell B14), subtracting the Total cost of revenues from the Total revenue.

.....

- 4 Write a formula to calculate the **Total expenses** (cell B20), adding together the elements in the Expenses section.

.....

- 5 Finally, write a formula to calculate the **Net income** (cell B22), subtracting the Gross profit from the Total expenses.

.....

A	B
1	CRMFreak Income Statement
2	All numbers are in thousands of dollars
3	
4	Revenue
5	Subscriptions and support 317
6	Licensing 24
7	Total revenue <input type="text"/>
8	
9	Cost of revenues
10	Subscriptions and support 42
11	Licensing 25
12	Total cost of revenues
13	
14	Gross profit
15	
16	Expenses
17	Research and development 33
18	Marketing and sales 151
19	General and administrative 48
20	Total expenses
21	
22	Net income
23	



Exercise Solution

You just wrote a bunch of formulas to calculate CRMFreak's net income. What did you find?

- 1 Write a formula to calculate **Total revenue** (cell B7), adding together the elements in the Revenue section.

$=\text{SUM}(B5:B6)$

- 2 Write a formula to calculate the **Total cost of revenues** (cell B12), adding together the elements in the Cost of revenues section.

$=\text{SUM}(B10:B11)$

- 3 Write a formula to calculate the **Gross profit** (cell B14), subtracting the Total cost of revenues from the Total revenue.

$=B7-B12$

- 4 Write a formula to calculate the **Total expenses** (cell B20), adding together the elements in the Expenses section.

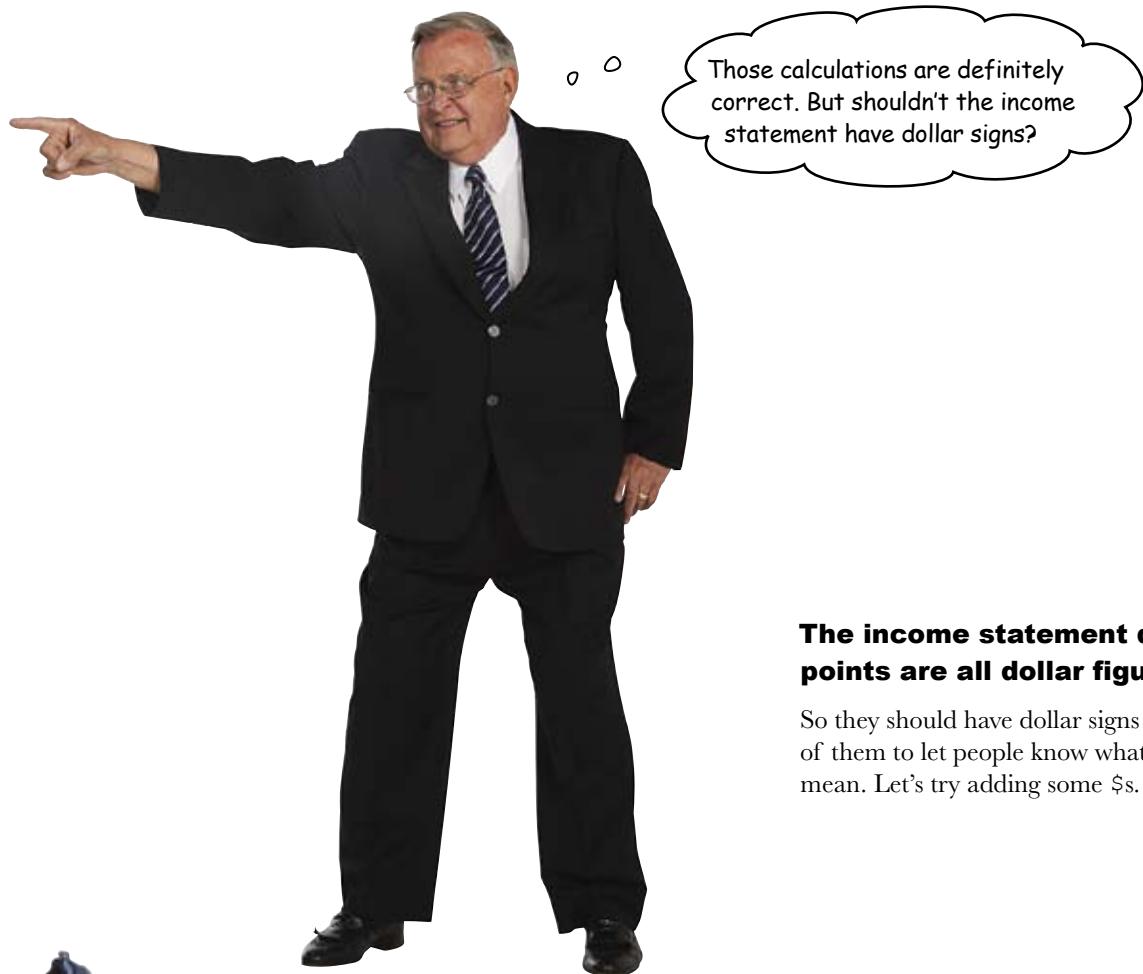
$=\text{SUM}(B17:B19)$

- 5 Finally, write a formula to calculate the **Net income** (cell B22), subtracting the Gross profit from the Total expenses.

$=B14-B20$

Here are your new formulas.

A	B	C
1 CRMFreak Income Statement		
2 All number are in thousands of dollars		
3		
4 Revenue		
5 Subscriptions and support	317	
6 Licensing	24	
7 Total revenue	341	(1)
8		
9 Cost of revenues		
10 Subscriptions and support	42	
11 Licensing	25	
12 Total cost of revenues	67	(2)
13		
14 Gross profit	274	(3)
15		
16 Expenses		
17 Research and development	33	
18 Marketing and sales	151	
19 General and administrative	48	
20 Total expenses	232	(4)
21		
22 Net income	42	(5)
23		



The income statement data points are all dollar figures.

So they should have dollar signs in front of them to let people know what they mean. Let's try adding some \$s.



Exercise

The numbers in the income statement need to have dollar signs.

- 1 Add a dollar sign in front of the numbers in cells B5 and B6 by double-clicking each cell and then editing it. What happens? What does the formula bar say?

-
- 2 Add a dollar sign in front of the formula you created in B7. What happens?

.....

.....



Exercise Solution

What happened when you tried to add the \$ symbol to some values and formula?

1

Add dollar signs in front of the numbers in cells B5 and B6 by double-clicking each cell and then editing it. What happens? What does the formula bar say?

When I press Enter, dollar signs show

*up inside the cells, but the signs aren't
in the formula bar.*

The dollar signs are inside these cells...

...but they don't show up
inside the formula bar.

B6	f _x	24
1 CRMFreak Income Statement	A	B
2 All numbers are in thousands of dollars		C
3		
4 Revenue		
5 Subscriptions and support		\$317
6 Licensing		\$24
7 Total revenue		341

2

Add a dollar sign in front of the formula you created in B7. What happens?

*It looks like the formula doesn't
calculate, and several other formulas
that refer to B7 are now messed up.*

This formula doesn't appear to be calculating a return value any more.

This cell is a total wreck.

Now these formulas are all messed up.

The return values look like some sort of error.

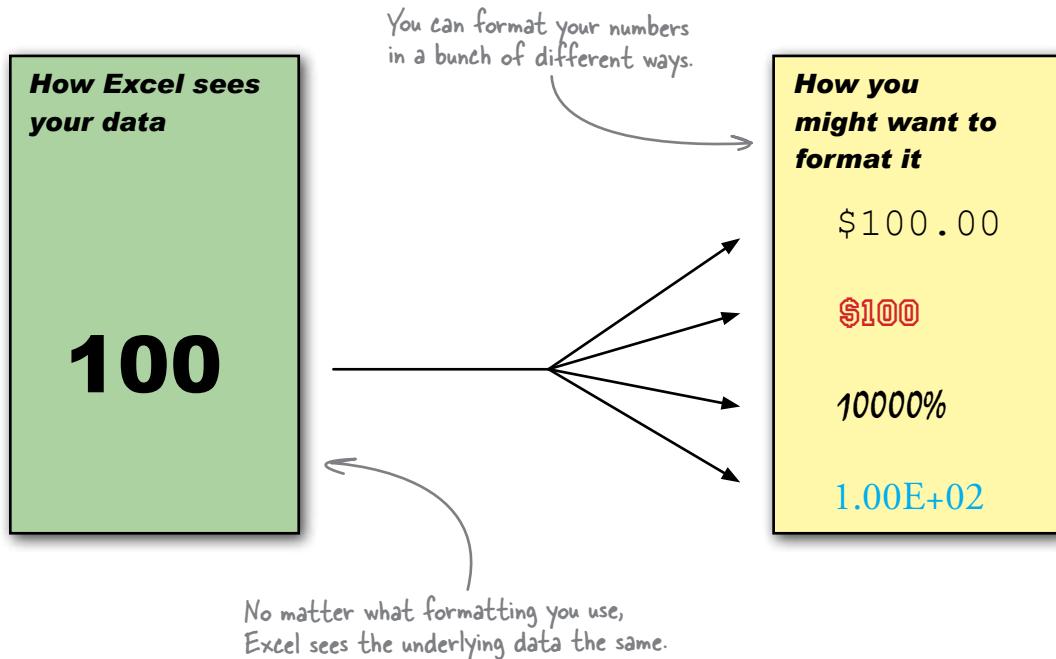
Better click Undo three times so we can try all this again.

B7	f _x	\$=SUM(B5:B6)
1 CRMFreak Income Statement	A	B
2 All numbers are in thousands of dollars		C
3		
4 Revenue		
5 Subscriptions and support		\$317
6 Licensing		\$24
7 Total revenue		\$=SUM(B5:B6)
8		
9 Cost of revenues		
10 Subscriptions and support		42
11 Licensing		25
12 Total cost of revenues		67
13		
14 Gross profit		#VALUE!
15		
16 Expenses		
17 Research and development		33
18 Marketing and sales		151
19 General and administrative		48
20 Total expenses		232
21		
22 Net income		#VALUE!
23		

The dollar sign is part of your cell's formatting

When you put dollar signs in front of the numbers in cells B5 and B6, Excel **applied currency formatting** to those cells. The dollar signs did not show up inside the formula bar, because Excel continued to see the actual values of those cells as 317 and 24.

Your data is different from its formatting, and typing dollar signs in front of numbers is just one way of telling Excel to apply currency formatting to your data.



On the other hand, when you tried to type a dollar sign into the **formula** in cell B7, Excel didn't understand that you wanted to apply currency formatting. Excel thought you were changing the formula to plain text, which is why the formula stopped working.

In order to change a formula from general formatting to currency formatting, you need to do something *different* from typing the dollar sign into the cell itself.



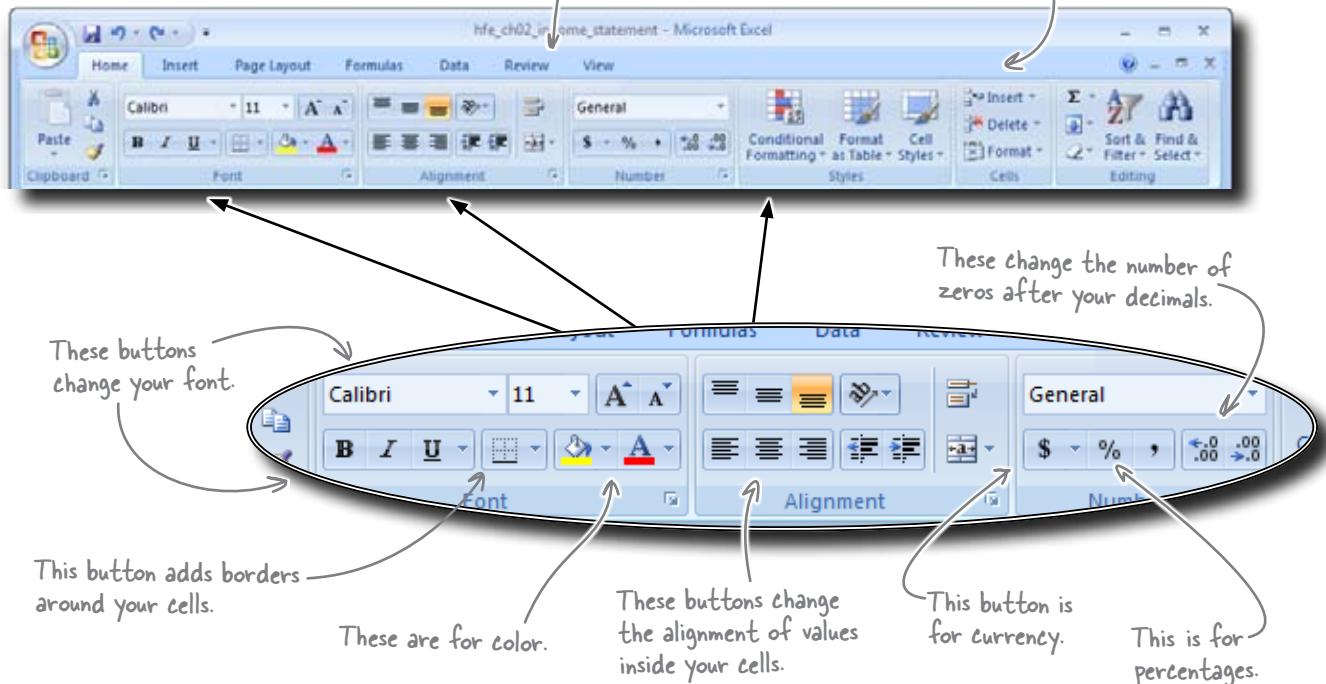
How would you go about applying currency formatting to your cells, aside from typing dollar signs into the cells themselves?

How to format your data

In order to format your cells the way you want, select those cells and then choose formatting options on the Home tab of the Ribbon.

This up here is called the "Ribbon."

Tip: Double-click on one of these tabs to hide the Ribbon for more screen space.



there are no
Dumb Questions

Q: So the formulas you write completely ignore the formatting choices you make?

A: Not entirely. Excel does try to figure out how to format your formula's cells by looking at the arguments in your function. If, for example, you wanted to use the SUM function to add a bunch of numbers that were already formatted as currency, Excel would automatically apply that formatting to the cell where you put your formula.

Q: What if I wanted to use SUM to add a number that was formatted as currency with a number that didn't have any formatting?

A: In that case, Excel would have no way of knowing what the calculation meant and would have the formula output display without any formatting.

Q: That's kind of confusing. It's like Excel has different rules for formatting things automatically depending on the context.

A: You could say that, but what's important is that you take control of your spreadsheet's formatting early. When Excel's automatic formatting works for you automatically, that's great, but it's important to remember that formatting is a **design choice** you make to create a more readable and useful spreadsheet.



Using the buttons on the Ribbon, make all the cells in column B have currency formatting. Be sure to press the button to eliminate the zeros after the decimal point (and press Undo if you make a mistake!).

Select all the cells in column B by clicking the letter B here.

	B
1	CRMFreak Income Statement
2	All numbers are in thousands of dollars
3	
4	Revenue
5	Subscription and support
6	Licensing
7	Total revenue
8	
9	Cost of revenues
10	Subscriptions and support
11	Licensing
12	Total cost of revenues
13	
14	Gross profit
15	
16	Expenses
17	Research and development
18	Marketing and sales
19	General and administrative
20	Total expenses
21	
22	Net income
23	

Then, click the buttons to apply the formatting attributes you want to use.

Don't forget you can click Undo if you make a mistake.



Exercise Solution

Were you able to apply currency formatting to the values in column B?

You pressed the button to apply currency formatting.

Then, you pressed this button twice to remove the zeros after the decimal place.

The screenshot shows a Microsoft Excel spreadsheet titled "CRMFreak Income Statement". The data is organized into two columns: A (Labels) and B (Values). Column A includes rows for company name, unit, revenue, cost of revenues, expenses, and net income. Column B contains numerical values with dollar signs and commas as thousands separators. The first few rows are as follows:

1	CRMFreak Income Statement
2	All numbers are in thousands of dollars
3	
4	Revenue
5	Subscriptions and support \$ 317
6	Licensing \$ 24
7	Total revenue \$ 341
8	
9	Cost of revenues
10	Subscriptions and support \$ 42
11	Licensing \$ 25
12	Total cost of revenues \$ 67
13	
14	Gross profit \$ 274
15	
16	Expenses
17	Research and development \$ 33
18	Marketing and sales \$ 151
19	General and administrative \$ 48
20	Total expenses \$ 232
21	
22	Net income \$ 42
23	

These numbers look much more professional and accurate.

The boss approves!



Wait a second. That spreadsheet is hideous! It appears that he wrecked your work, visually speaking. Worst of all, **gaudy design undermines your credibility with your audience.** You need some serious design principles to guide you away from a mess like this....

Design principle: keep it simple

The analysts who are trying to assess the health of CRM Freak are **not interested in being dazzled**.

What they want to do is to be able to make the best decisions about CRM Freak's data as they can.

Which of these spreadsheets do you think will do the best job of facilitating that sort of thinking?

This one is plain and unadorned.

A	B	C
1 CRM Freak Income Statement		
2 All numbers are in thousands of dollars		
3		
4 Revenue		
5 Subscriptions and support	\$ 317	
6 Licensing	\$ 24	
7 Total revenue	\$ 341	
8		
9 Cost of revenues		
10 Subscriptions and support	\$ 42	
11 Licensing	\$ 25	
12 Total cost of revenues	\$ 67	
13		
14 Gross profit	\$ 274	
15		
16 Expenses		
17 Research and development	\$ 33	
18 Marketing and sales	\$ 151	
19 General and administrative	\$ 48	
20 Total expenses	\$ 232	
21		
22 Net income	\$ 42	
23		
24		
25		
26		
27		

Here is the one that the CEO did.

A	B	C
1 CRM Freak Income Statement		
2 <i>All numbers are in thousands of dollars</i>		
3		
4 Revenue		
5 Subscriptions and support	\$ 317	
6 Licensing	\$ 24	
7 Total revenue	\$ 341	
8		
9 Cost of revenues		
10 Subscriptions and support	\$ 42	
11 Licensing	\$ 25	
12 Total cost of revenues	\$ 67	
13		
14 Gross profit	\$ 274	
15		
16 Expenses		
17 Research and development	\$ 33	
18 Marketing and sales	\$ 151	
19 General and administrative	\$ 48	
20 Total expenses	\$ 232	
21		
22 NET INCOME	\$ 42	
23		
24		
25		
26		
27		

The spreadsheet on the right has excessive formatting that *gets in the way* of your ability to understand the data. The spreadsheet on the left is very simple, but perfectly **clear**.

Keeping it simple makes for better thinking about data.

Both spreadsheets have the same data.

Clash of the design titans...

Jim: No, no, no! You have to have colors in a spreadsheet like that. Maybe the boss didn't get it exactly right, but people expect something more than the plain Jane stuff that has no formatting.

Joe: Fool! There can be no distraction. When someone is looking at a spreadsheet, they need to have the utmost concentration and never be seduced by silly formatting.

Frank: Guys, isn't there a middle ground here? Maybe a little formatting can help, but one should take it easy and not go overboard?

Jim: Joe's just off his rocker here. I know that when I use spreadsheets, I need to use colors and fonts and boxes to help me keep track of what I'm looking at. Using color is part of the way I think about data.

Joe: Nonsense. You just *think* you're using the colors to help you think about data. You're really just pretending to do good thinking. If you knew better you'd see that numbers have no color.

Frank: Now, Joe, that's out of line. If Jim wants to use colors to help him think through his spreadsheet, that's totally fine. Everyone thinks differently.

Joe: There is no reason Jim should torment us with his "colorful" ideas.

Frank: You have a point there. Just because you feel the need to highlight a bunch of stuff on your spreadsheets, Jim, doesn't mean that you should assume that everyone else thinks that way, too.

Jim: [Mumbling something unkind about Joe....] I like colors. Colors are nice.

Frank: Well maybe if we find a way to use fonts and colors with taste and restraint we can get a result that all of us can appreciate....



How do you use fonts and colors with taste and restraint?

Use fonts to draw the eye to what is most important

The font panel is the first place many people look to set the formatting for their document. Let's see how the font panel works.

Start by selecting the cell you want to format.

Click these buttons to make the text bold and italic.

Click the paint bucket to fill the cell with color.

Click this button to add a bottom border.

Row	Column	Content	Type
1	A	CRMFreak Income Statement	Text
2	A	All number are in thousands of dollars	Text
3	A		Blank
4	A	Revenue	Text
5	B	Subscriptions and support	Text
6	B	Licensing	Text
7	B	Total revenue	Text
8	B		Blank
9	B	Cost of revenues	Text

When you work with these tools, be sure to remember to use them only to the extent that they **help your readers organize their thinking** about the data. Anything more than that runs the risk of distracting them from the main event: the data.



Using one or more of the elements on the left, change your spreadsheet's formatting to draw the eye to key elements. Remember, less is more.

Select cells and use these design elements to draw the eye to what's most important.

The screenshot shows an Excel spreadsheet titled "hfe_ch02_income statement - Microsoft Excel". The ribbon is visible at the top with tabs like Home, Insert, Page Layout, Formulas, Data, Review, and View. The 'Editing' tab is highlighted. The main area displays an income statement with rows numbered 1 through 27. The data includes revenue from subscriptions and licensing, costs of revenues, gross profit, and various expenses like research and development, marketing, and general admin. Row 24 is selected, indicated by a yellow background and a black border around cell B24. The formula bar shows "B24". The bottom of the screen shows the standard Excel ribbon tabs (Home, Insert, Page Layout, etc.) and the status bar which says "Ready".

	A	B	C	D	E	F	G	H	I	J	K
1	CRMFreak Income Statement										
2	All number are in thousands of dollars										
3											
4	Revenue										
5	Subscriptions and support	\$	317								
6	Licensing	\$	24								
7	Total revenue	\$	341								
8											
9	Cost of revenues										
10	Subscriptions and support	\$	42								
11	Licensing	\$	25								
12	Total cost of revenues	\$	67								
13											
14	Gross profit	\$	274								
15											
16	Expenses										
17	Research and development	\$	33								
18	Marketing and sales	\$	151								
19	General and administrative	\$	48								
20	Total expenses	\$	232								
21											
22	Net income	\$	42								
23											
24											
25											
26											
27											



Exercise Solution

You just applied some formatting to your CRMFreak income statement. Were you successful?

You might have come up with slightly different results, which is fine.

This title is a little larger than the rest of the text.

It's also bold and italic.

These little headings can just be bold.

Here are some borders that separate the totals.

A	B
1	<i>CRMFreak Income Statement</i>
2	All numbers are in thousands of dollars
3	
4	Revenue
5	Subscriptions and support \$ 317
6	Licensing \$ 24
7	Total revenue \$ 341
8	
9	Cost of revenues
10	Subscriptions and support \$ 42
11	Licensing \$ 25
12	Total cost of revenues \$ 67
13	
14	Gross profit \$ 274
15	
16	Expenses
17	Research and development \$ 33
18	Marketing and sales \$ 151
19	General and administrative \$ 48
20	Total expenses \$ 232
21	
22	Net income \$ 42
23	
24	
25	



**You're only just getting started
with Excel's formatting features.**

And when it comes to simple, push-button formatting, Excel has a much more powerful feature that ties together everything you've been doing so far into a single, elegant interface.

This feature gives you more speed and flexibility along with access to the visual acumen of a professional designer. It's called **cell styles.***

* Cell styles are fully supported in Excel 2007 for Windows and later, but as of this writing, their support in Mac versions of Excel is spotty. Go figure.

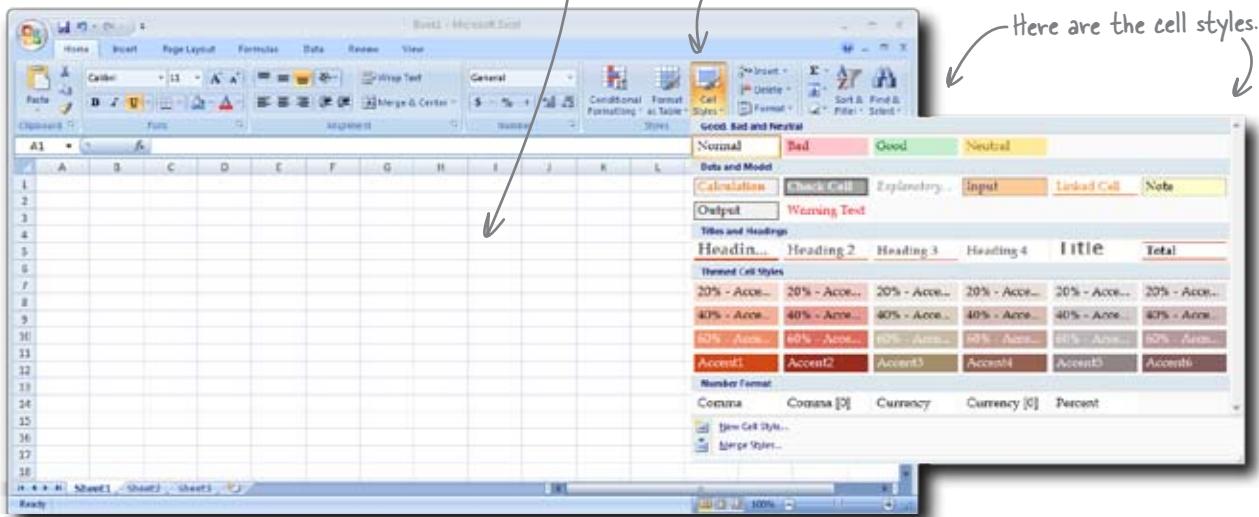
Cell styles keep formatting consistent for elements that repeat

You'll usually have several headings in your spreadsheets, and you'll want those headings to look the same. Styles let you tell Excel which cells are headings and *then* what you want the **formatting** of those headings to be.

And styles aren't just for headings: you can use them for **any elements that repeat**. They're especially handy if you want, say, to change the look of all your **Totals**. Instead of finding each one, you can just change the style, and all the cells with that style will incorporate that change.

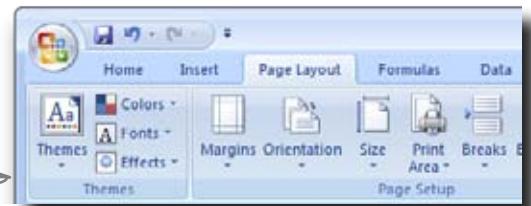
To take styles for a spin, select the cells you want to affect and then select a style with the Cell Styles button under the Home tab.

	A	B	C
1	CRMFreak Income Statement		
3		All number are in thousands of dollars	
4	Revenue		
5	Subscriptions and support	\$ 317	
6	Licensing	\$ 24	
7	Total revenue	\$ 341	
8			
9	Cost of revenues		
10	Subscriptions and support	\$ 42	
11	Licensing	\$ 25	
12	Total cost of revenues	\$ 67	
13			
14	Gross profit	\$ 274	
15			
16	Expenses		
17	Research and development	\$ 33	
18	Marketing and sales	\$ 151	
19	General and administrative	\$ 48	
20	Total expenses	\$ 232	
21			
22	Net income	\$ 42	
23			



With your cell styles selected, use Themes to change your look

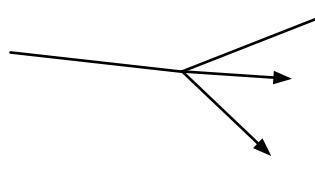
Once you've told Excel which cell styles match up with your data, then the fun can really begin. Head on over to the Themes button group under the Page Layout tab and play around with the prepackaged themes and font/color configurations. Which looks appeal to you?



These buttons read your cell styles and can change your formatting in a bunch of quick and easy ways.

Your original data.

CRMFreak Income Statement	
All numbers are in thousands of dollars	
Revenue	
Subscriptions and support	\$ 317
Licensing	\$ 26
Total revenue	\$ 343
Cost of revenue	
Subscriptions and support	\$ 47
Licensing	\$ 23
Total cost of revenue	\$ 67
Gross profit	\$ 276
Expenses	
Research and development	\$ 23
Marketing and sales	\$ 111
General and administrative	\$ 46
Total expenses	\$ 179
Net income	\$ 107



Some of your cell style-based design options.

CRMFreak Income Statement	
All numbers are in thousands of dollars	
Revenue	
Subscriptions and support	\$ 317
Licensing	\$ 26
Total revenue	\$ 343
Cost of revenue	
Subscriptions and support	\$ 47
Licensing	\$ 23
Total cost of revenue	\$ 67
Gross profit	\$ 276
Expenses	
Research and development	\$ 23
Marketing and sales	\$ 111
General and administrative	\$ 46
Total expenses	\$ 179
Net income	\$ 107



Exercise

Assign the cell styles listed on the facing page to your CRMFreak income statement data.

- Click on each cell and select the relevant style. You'll have to play around with the Heading styles to make sure that the cell borders extend into column B and that the sizing of the heading is correct.
- Go to Page Layout > Themes and try out a few of the configurations. Which is your favorite?

Load this!

www.headfirstlabs.com/books/hfexcel/hfe_ch02_income_statement_styles.xlsx

Here is a clean version of your spreadsheet.

CRMFreak Income Statement	
All numbers are in thousands of dollars	
Revenue	
Subscriptions and support	\$ 317
Licensing	\$ 26
Total revenue	\$ 343
Cost of revenue	
Subscriptions and support	\$ 47
Licensing	\$ 23
Total cost of revenue	\$ 67
Gross profit	\$ 276
Expenses	
Research and development	\$ 23
Marketing and sales	\$ 111
General and administrative	\$ 46
Total expenses	\$ 179
Net income	\$ 107



Exercise Solution

You assigned cell styles and themes to your income statement data. Do you like how it looks now?

Here's an example spreadsheet...your own probably looks different, depending on what you chose.

This is Explanatory Text.

These cells are really important, so they're assigned the style 40% - Accent 2.

These cells have a color that makes them stand out.

A	B	C	D
1	CRMFreak Income Statement		
2	All numbers are in thousands of dollars		
3			
4	Revenue		
5	Subscriptions and support	\$ 317	
6	Licensing	\$ 24	
7	Total revenue	\$ 341	
8			
9	Cost of revenues		
10	Subscriptions and support	\$ 42	
11	Licensing	\$ 25	
12	Total cost of revenues	\$ 67	
13			
14	Gross profit	274	
15			
16	Expenses		
17	Research and development	\$ 33	
18	Marketing and sales	\$ 151	
19	General and administrative	\$ 48	
20	Total expenses	\$ 232	
21			

This is the Title.

Rows 4, 9, and 16 are assigned heading Heading 3.

Cells B4, B9, and B16 are also assigned to Heading 3 so that they have the correct cell border.

Rows 7, 12, and 20 have the Total style.

^{there are no} Dumb Questions

Q: A while back, you said something about the design elements in the themes being “professional.” What did you mean?

A: The prepackaged themes have been carefully selected so that the colors and fonts all complement each other. The choice of font (or “type”) and color in documents is a really big deal for people who take visual design seriously, and it’s convenient that Excel has built-in design options that are likely to look good.

Q: I’ve heard a lot of people complain about how ugly writing and spreadsheets and slide shows look when they’re made in Microsoft Office, but this looks like Microsoft has made it pretty easy to employ good visual design.

A: While it’s always been *possible* to create visually well-designed documents in Microsoft Office programs, it’s not always been easy. Some of the templates in previous versions of the software are indeed ugly, and sometimes you’ve really had to work hard to make your documents look good. But Microsoft has become progressively more sensitive to people’s need to have good design, and recent versions of Office show it.

Q: So are some of the same themes that I’ve been seeing in Excel available in other Office programs, like Word or PowerPoint?

A: Yes! And integration throughout Office is precisely the idea. If you make use of styles everywhere you can, you’ll have no trouble having consistent visual integration across all your documents.

Q: Are there limitations to what I can do in Excel in terms of visual design?

A: There are loads of features you’ll find in graphic design programs that you won’t find in Excel. But even when it comes to making drawings, Excel is surprisingly powerful for a number-crunching program. If you have a specialized design objective, you should still poke around under the Page Layout tab before reaching for your graphic design program.

Q: What if I don’t like any of the color configurations that Excel offers? Can I make up my own themes?

A: Absolutely. Making your own theme would be a great idea if your business already has its own design standards—official corporate fonts and colors. Under these circumstances, the benefits of using styles and themes in Excel would be immense.

Let's see what the
boss thinks about
your work....

He likes it, but there's something else...



The boss wants more than just a pretty income statement. He wants you to add a balance sheet to your spreadsheet, integrate the new elements visually, and make sure it all fits on a *single page*. Better start thinking about how you're going to accomplish all that!



Here are small versions of the CRM Freak income statement and balance sheet. How would you lay them out?

Draw your answer here.

CRM Freak Income Statement	
All numbers are in thousands of dollars	
Revenue	\$ 348
Subscriptions and support	\$ 247
Licensing	\$ 71
Total revenue	\$ 348
Cost of revenues	
Subscriptions and support	\$ 42
Licensing	\$ 29
Total cost of revenues	\$ 62
Gross profit	\$ 286
Expenses	
Research and development	\$ 33
Marketing and sales	\$ 130
General and administrative	\$ 48
Total expenses	\$ 211
Total operating income	\$ 75

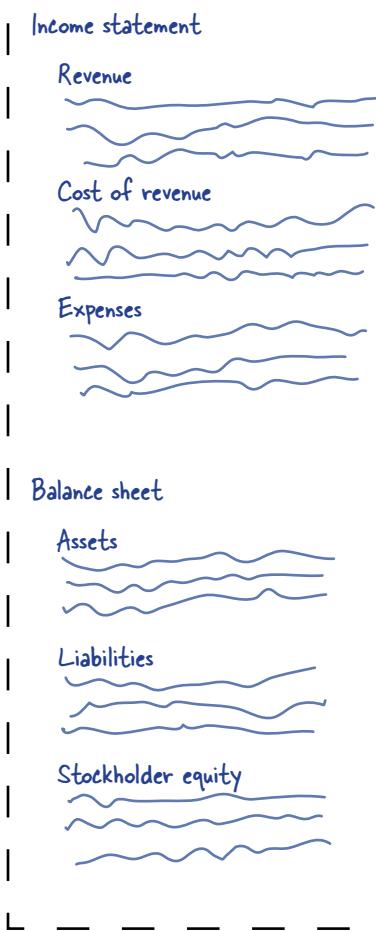
Here's the income statement
you've been working on.

CRM Freak Balance Sheet	
All numbers are in thousands of dollars	
Assets	
Cash and cash equivalents	\$ 52
Marketable securities	429
Accounts receivable	293
Deferred commissions	63
Deferred income taxes	64
Prepaid	16
Fees assets	85
Goodwill	49
Other	66
Total	
Liabilities	
Accounts payable	202
Deferred revenue	653
Long-term liabilities	22
Total	
Stockholders' equity	
Controlling interest	759
Non-controlling interest	31
Total	

Here is your new
balance sheet data.



What do your CRMFreak draft financial statements look like?



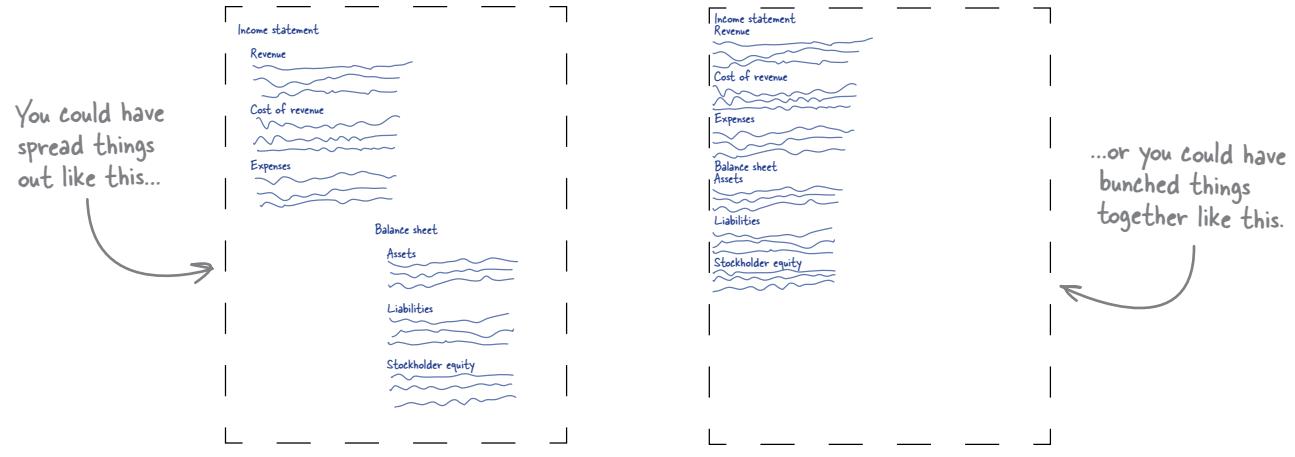
Here's one way it might look.

CRMFreak Income Statement	
All numbers are in thousands of dollars	
4	Revenues
5	Subscriptions and support \$ 217
6	Learning \$ 21
7	Total revenue \$ 338
8	
9	Cost of revenues
10	Subscriptions and support \$ 42
11	Learning \$ 29
12	Total cost of revenues \$ 62
13	
14	Gross profit \$ 276
15	
16	Expenses
17	Research and development \$ 33
18	Marketing and sales \$ 130
19	General and administrative \$ 48
20	Total expenses \$ 211
21	

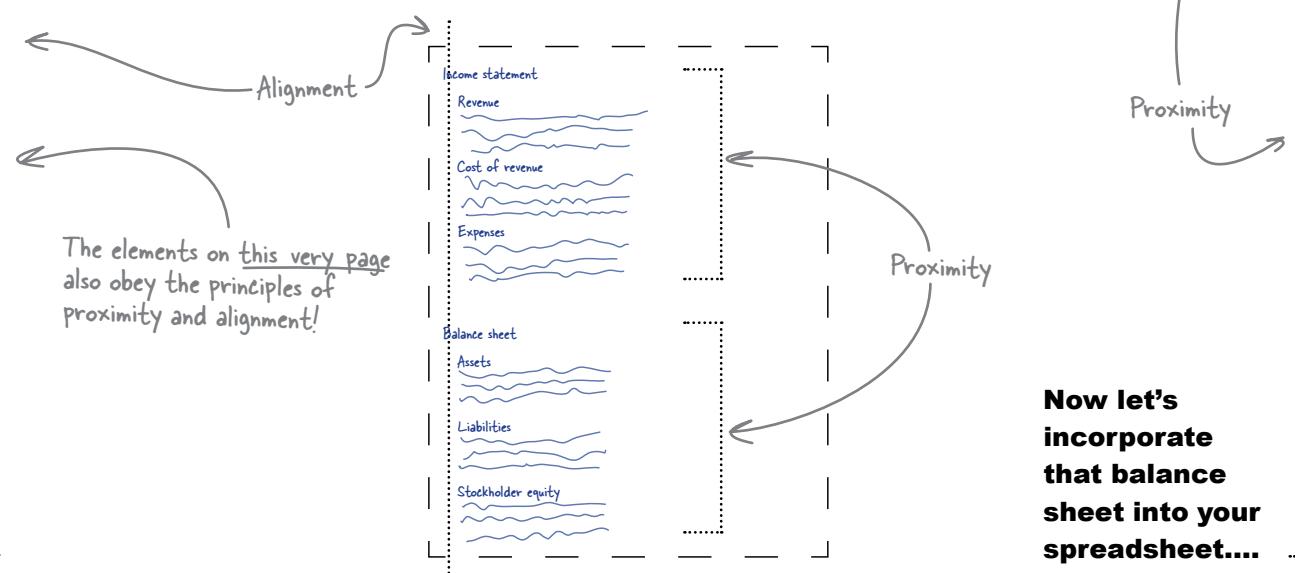
CRMFreak Balance Sheet	
All numbers are in thousands of dollars	
3	
4	Assets
5	Cash and cash equivalents \$12
6	Marketable securities 429
7	Accounts receivable 293
8	Deferred commissions 63
9	Deferred income taxes 64
10	Prepaid 38
11	Fixed assets 85
12	Goodwill 49
13	Other 66
14	Total 1,429
15	
16	Liabilities
17	Accounts payable 202
18	Deferred revenue 653
19	Long-term liabilities 22
20	Total 877
21	
22	Stockholder's equities
23	Controlling interest 729
24	Non-controlling interest 11
25	Total 740
26	

Use proximity and alignment to group like things together

Why doesn't your drawing look like one of these spreadsheets?



You probably didn't draw your spreadsheet that way because you intuitively grasp the fundamental visual design principles of **proximity** and **alignment**. By bunching like elements together and keeping all your elements in alignment with each other, you make your document more readable and usable.



Now let's incorporate that balance sheet into your spreadsheet....



Long Exercise

1

- Copy the data in **hfe_ch02_balance_sheet.xlsx** and paste it below your income statement. Save it all to a file called **financials.xlsx**.

Looks like there are some formulas missing.

1	CRMFreak Balance Sheet
2	All number are in thousands of dollars
3	
4	Assets
5	Cash and cash equivalents 532
6	Marketable securities 439
7	Accounts receivable 293
8	Deferred commissions 63
9	Deferred income taxes 64
10	Prepays 36
11	Fixed assets 85
12	Goodwill 49
13	Other 66
14	Total
15	
16	Liabilities
17	Accounts payable 202
18	Deferred revenue 653
19	Long-term liabilities 22
20	Total
21	
22	Stockholder's equities
23	Controlling interest 739
24	Noncontrolling interest 11
25	Total
26	

Load this!
www.headfirstlabs.com/books/hfexcel/hfe_ch02_balance_sheet.xlsx

Here's what the balance sheet looks like.

When you paste the data, be sure that the elements in both the income statement and the balance sheet are grouped and aligned correctly.

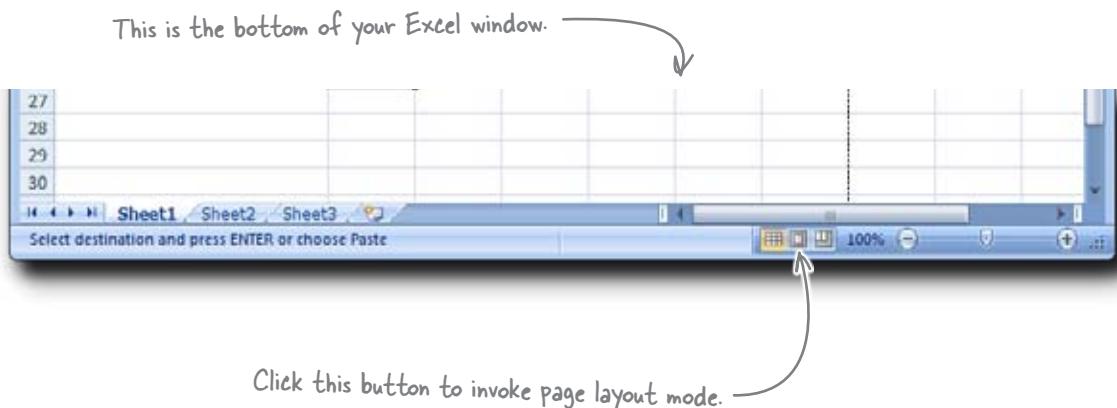
2

- Write formulas to total the Assets, Liabilities, and Stockholder's equity, and then apply the cell styles to the balance sheet.

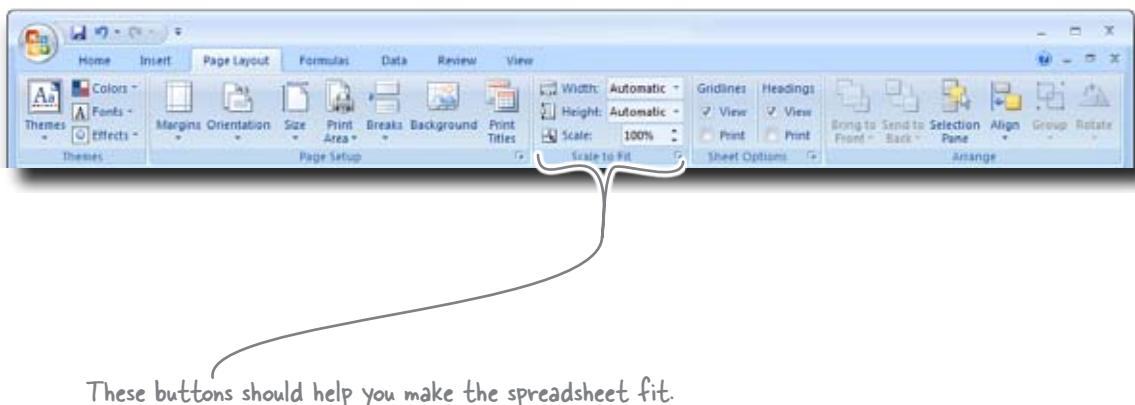
Use this button to apply the cell styles.



- 3 Switch to page layout mode to see how your spreadsheet will look on the printed page.



- 4 Does it fit on one page? If not, scale it down on the page layout bar.



LONG Exercise SOLUTION



You just incorporated a balance sheet into your spreadsheet, added some formulas, and formatted the whole thing. What was the result?

Be sure to add some spacing to separate the balance sheet and income statement.

The cell styles make incorporating new information into your visual design a snap.

The screenshot shows a Microsoft Excel spreadsheet titled "Financials - Microsoft Excel". It contains two tables: "CRMFreak Income Statement" and "CRMFreak Balance Sheet".

CRMFreak Income Statement
(All numbers are in thousands of dollars)

Revenue	
Subscriptions and support	\$ 317
Licensing	\$ 24
Total revenue	\$ 341
Cost of revenues	
Subscriptions and support	\$ 42
Licensing	\$ 75
Total cost of revenues	\$ 117
Gross profit	\$ 224
Expenses	
Research and development	\$ 33
Marketing and sales	\$ 131
General and administrative	\$ 68
Total expenses	\$ 232
Net income	\$ 42

CRMFreak Balance Sheet
(All numbers are in thousands of dollars)

Assets	
Cash and cash equivalents	\$ 155
Marketable securities	\$ 49
Accounts receivable	\$ 195
Deferred compensation	\$ 43
Deferred revenue taxes	\$ 44
Impacts	\$ 36
Fixed assets	\$ 63
Goodwill	\$ 49
Other	\$ 44
Total	\$ 1,417
Liabilities	
Accounts payable	\$ 262
Deferred revenue	\$ 475
Long-term liabilities	\$ 22
Total	\$ 759
Stockholders' equity	
Controlling interest	\$ 729
Noncontrolling interest	\$ 11
Total	\$ 730

You need to bring the scale down on your spreadsheet a little to get it all to fit on the page.

This spreadsheet is all ready to print!

Your spreadsheet is a hit!

CRMFreak used your spreadsheet as part of the materials they made available to stock analysts, and the critical consensus has been overwhelmingly positive.

Important Wall Street analyst

That's an exquisitely professional presentation. The spreadsheet is well designed and makes my job as an interpreter much easier.

Here's what your boss had to say....

From: CEO, CRMFreak
To: You
Subject: Your work product

Dear Head First,

I was delighted but not the least bit surprised by your excellent work with our financial statements. You handled the formula work with grace and crafted a sophisticated yet crystal-clear presentation.

It was truly a *tour de force* and I am confident it played a large role in the favorable reviews we received from the analysts this season.

The only thing to do with talent like yours is to give it more responsibility with bigger jobs. Expect to see bigger challenges with bigger rewards very soon!

—CEO



3 references

Point in the right direction



A formula is only as good as its references.

No matter how creative and brilliant your formula is, it won't do you much good if it does not point to the correct data. It's easy to get references right for short, individual formulas, but once those formulas get long and need to be copied, the chance of reference mistakes increases dramatically. In this chapter, you'll exploit **absolute and relative references** as well as Excel's advanced new **structured reference** feature, ensuring that no matter how big and numerous your references are, your formulas will stay tight and accurate.

Your computer business is in disarray

As the boss of Ace Computer Manufacturing, you know how critical it is to maintain your profit margins in the volatile and competitive business of selling computers.

You need to get on top of your supply chain: **are you marking up your computers enough to make a profit?** You need to take control of your data to figure it out.





Here are last quarter's costs and sales for low-end computers. The figures below list the cost and revenue for a single computer. Calculate the profit margin on this configuration. How profitable is a single sale of this model?

Load this!

www.headfirstlabs.com/books/hfexcel/hfe_ch03_low_end_computer.xlsx

To calculate the **Total cost**, add the cost of the components.

To calculate the **Gross profit margin**, subtract the total cost by the sale price and divide the whole thing by the sale price.

Fill in this formula...

Sale price is the amount you charge for your computers at retail.

...and this formula!

This is what a customer would pay for your computer.

Computer Profitability Forecast		
Looking at today's pricing for each unit sold		
Low-end computers		
Item	Cost	
Memory	\$ 68.00	
Motherboard	\$ 238.00	
Hard disk	\$ 65.00	
Total cost		
Sale price	\$ 420.00	
Gross profit margin		

Gross profit margin is equal to:

$$\frac{\text{Revenue} - \text{Cost of Sales}}{\text{Revenue}}$$

This is B11.
This is cell B9.

Bonus: Format this figure as a percentage by clicking the "%" icon under the Home tab.



Exercise Solution

You created the formulas to calculate the total cost and the gross profit margin. What did you find?

This formula calculates the cost of sale to produce one low-end computer.

This one's pretty straightforward.

$=\text{SUM}(\text{B6:B8})$

It's just a basic SUM.

Here's the gross profit margin.

This one is a little more complicated.

$=(\text{B11}-\text{B9})/\text{B11}$

Use parentheses to keep the difference between total cost and sale price in the numerator.

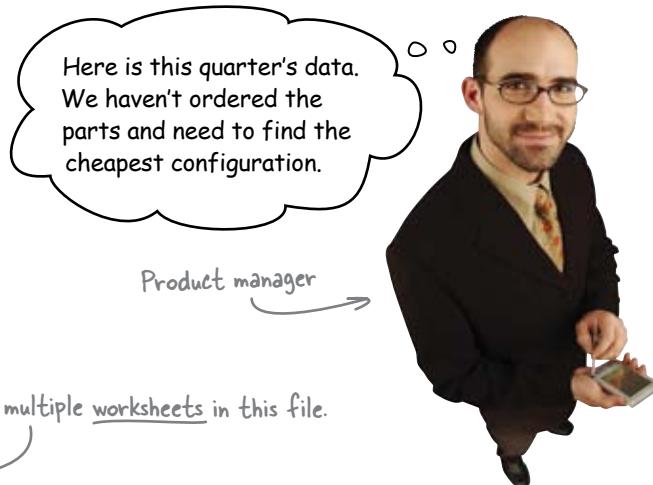
1 Computer Profitability Forecast		
2 Looking at today's pricing for each unit sold		
3		
4 Low-end computers		
5 Item		Cost
6 Memory	\$	68.00
7 Motherboard	\$	238.00
8 Hard disk	\$	65.00
9 Total cost	\$	371.00
10		
11 Sale price	\$	420.00
12		
13 Gross profit margin		11.67%
14		
15		
16		
17		

Your **gross profit margin for low-end computers is 11.67%**. That's not bad at all nowadays! So far, so good.

Your production manager has a spreadsheet with costs

In the computer industry, component prices are always changing, so in order to ensure that you're getting a healthy margin on the computers you sell, you need to make sure you're getting the best deal you can.

If you bought the **least expensive acceptable parts**, how much would the resulting configuration cost?



Load this!
[www.headfirstlabs.com/books/hfexcel/
hfe_ch03_low_end_forecast.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch03_low_end_forecast.xlsx)

There are multiple worksheets in this file.

1 Computer Profitability Forecast			
2 Looking at next quarter's pricing for each unit sold			
3			
4 Low-end computers			
5 Item	Cost		
6 Memory			
7 Motherboard			
8 Hard disk			
9 Total cost			
10			
11 Sale price			
12			
13 Gross profit margin			
14			
15			
16			
17			

1 Low-End Memory Wholesale Prices			
2			
3	ID	Vendor	Model
4	1	MicroMiniMax	A-2341
5	2	Parts 'R' Us	E2320B
6	3	Parts 'R' Us	PU-8755
7	4	MicroMiniMax	E2320A
8	5	MicroMiniMax	B-8532
9	6	Jorge's Electronic Parts	PU-8755
10	7	Parts 'R' Us	E2320A
11	8	Jorge's Electronic Parts	B-8532
12	9	Krazy Komputer Kastle	B-8532
13	10	MicroMiniMax	E2320B
14	11	Jorge's Electronic Parts	B-8533
15	12	Parts 'R' Us	PU-8754a
16	13	Krazy Komputer Kastle	B-8533
17	14	MicroMiniMax	B-8533
18	15	Parts 'R' Us	PU-8754
19	16	Krazy Komputer Kastle	PU-8755
20			
21			

Use these tabs to select different worksheets.
 Spreadsheet files are also called "workbooks."

You need a function to find the lowest price on the memory worksheet.

MIN returns the lowest number in a series

When you have a range of numbers and want to figure out what is the smallest number in that range, use the MIN function.

=MIN(

...and then returns...

The smallest number in the list

\$63.00

Fill in these parentheses with a range.

b3 is the smallest number in this list.

	A	B	C	D	E
1	Low-End Memory Wholesale Prices				
2	ID	Vendor	Model	Price	
3	4	1 MicroMiniMax	A-2341	\$ 66.00	
4	5	2 Parts 'R' Us	E2320B	\$ 65.00	
5	6	3 Parts 'R' Us	PU-8755	\$ 64.00	
6	7	4 MicroMiniMax	E2320A	\$ 64.00	
7	8	5 MicroMiniMax	B-8532	\$ 64.00	
8	9	Jorge's Electronic Parts	PU-8755	\$ 63.00	
9	10	7 Parts 'R' Us	E2320B	\$ 63.00	
10	11	8 Jorge's Electronic Parts	B-8532	\$ 66.00	
11	12	9 Krazy Komputer Kastle	B-8532	\$ 64.00	
12	13	10 MicroMiniMax	E2320B	\$ 65.00	
13	14	11 Jorge's Electronic Parts	B-8533	\$ 65.00	
14	15	12 Parts 'R' Us	PU-8754	\$ 63.00	
15	16	13 Krazy Komputer Kastle	B-8533	\$ 66.00	
16	17	14 MicroMiniMax	B-8533	\$ 66.00	
17	18	15 Parts 'R' Us	PU-8754	\$ 65.00	
18	19	16 Krazy Komputer Kastle	PU-8755	\$ 63.00	
19	20				

And, in case you hadn't guessed it already, the function that tells you the *largest* number in a list is MAX.

What you need to do now is write MIN formulas to find **the lowest cost for each of these components** and see how much your low-end computer configuration will cost this quarter. Using that information, you'll be able to forecast your profitability.

You're going to fill in these blanks with MIN formulas.

	A	B
1	Computer Profitability Forecast	
2	Looking at next quarter's pricing for each unit sold	
3	4	Low-end computers
4	5	Item
5	6	Memory
6	7	Motherboard
7	8	Hard disk
8	9	Total cost
9	10	



Let's start by looking at memory. We need a formula that will return the lowest amount we can pay for memory.

Here's the memory data we want to refer to.

- 1 If you write your formula the way you've been writing formulas, how will your formula know which sheet to refer to for the data?
-
.....
.....
.....
.....

Low-End Memory Wholesale Prices			
ID	Vendor	Model	Price
1	MicroMiniMax	A-2341	\$ 66.00
2	Parts 'R' Us	E2320B	\$ 65.00
3	Parts 'R' Us	PU-8755	\$ 64.00
4	MicroMiniMax	E2320A	\$ 64.00
5	MicroMiniMax	B-8532	\$ 64.00
6	Jorge's Electronic Parts	PU-8755	\$ 63.00
7	Parts 'R' Us	E2320A	\$ 63.00
8	Jorge's Electronic Parts	E-8532	\$ 66.00
9	Krazy Komputer Kastle	B-8532	\$ 64.00
10	MicroMiniMax	E2320B	\$ 65.00
11	Jorge's Electronic Parts	B-8533	\$ 65.00
12	Parts 'R' Us	PU-8754a	\$ 63.00
13	Krazy Komputer Kastle	B-8533	\$ 66.00
14	MicroMiniMax	B-8533	\$ 66.00
15	Parts 'R' Us	PU-8754	\$ 65.00
16	Krazy Komputer Kastle	PU-8755	\$ 63.00

Computer Profitability Forecast	
Looking at next quarter's pricing for each unit sold	
4	Low-end computers
5	Item
6	Memory
7	Motherboard
8	Hard disk
9	Total cost
10	
11	Sale price
12	
13	Gross profit margin
14	
15	
16	
17	

Here's where we want the formula.

- 2 How would you design a reference to ensure that the correct sheet is being pointed to?
-
.....
.....
.....



You just grappled with the question of how to refer to cells across worksheets. What did you conclude?

1

If you write your formula the way you've been writing formulas, how will your formula know which sheet to refer to for the data?

The formula wouldn't know where to find the data. The range we want is D4 : D19, but it has to be on the LowMem sheet. We don't want data from that range on other sheets.

	A	B	C	D
1	Computer Profitability Forecast			
2	Looking at next quarter's pricing for each unit sold			
3				
4	Low-end computers			
5	Item	Cost		
6	Memory			
7	Motherboard			
8	Hard disk			
9	Total cost			
10				
11	Sale price			
12				
13	Gross profit margin			
14				
15				
16				
17				

2

How would you design a reference to ensure that the correct sheet is being pointed to?

The reference would definitely have to have the name of the worksheet baked into it.

Something like this: LowMem-D4 : D19.

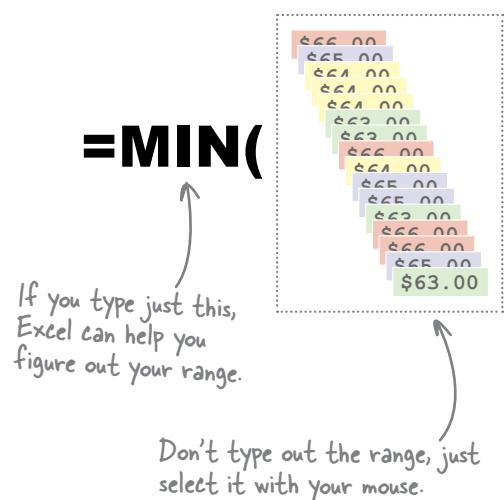
Let's see if Excel can help figure out these ranges....

Info.chd_low_end_forecast - Microsoft Excel				
	A	B	C	
1	A20			
2				
3	1 Low-End Memory Wholesale Prices			
4	ID	Vendor	Model	Price
5	1	MicroMiniMax	A-2341	\$ 66.00
6	2	Parts 'R' Us	E2320B	\$ 65.00
7	3	Parts 'R' Us	PU-8755	\$ 64.00
8	4	MicroMiniMax	E2320A	\$ 64.00
9	5	MicroMiniMax	B-8532	\$ 64.00
10	6	Jorge's Electronic Parts	PU-8755	\$ 63.00
11	7	Parts 'R' Us	E2320A	\$ 63.00
12	8	Jorge's Electronic Parts	B-8532	\$ 66.00
13	9	Krazy Komputer Kastle	B-8532	\$ 64.00
14	10	MicroMiniMax	E2320B	\$ 65.00
15	11	Jorge's Electronic Parts	B-8533	\$ 65.00
16	12	Parts 'R' Us	PU-8754a	\$ 63.00
17	13	Krazy Komputer Kastle	B-8533	\$ 66.00
18	14	MicroMiniMax	B-8533	\$ 66.00
19	15	Parts 'R' Us	PU-8754	\$ 65.00
20	16	Krazy Komputer Kastle	PU-8755	\$ 63.00
21				

Let Excel fill in ranges by starting your formula and using your mouse

Excel does indeed have a syntax for pointing to ranges that exist on worksheets *other* than the worksheet where your function resides. And you're about to learn that syntax. But not from this book.

Instead, Excel's going to show you. One **handy trick** in writing formulas with arguments that involve cell ranges is to start writing a formula, getting to the argument of your function where you want to put the range but *not typing anything*:



Now, instead of typing the reference, just **use your mouse to select the data you want**. Go ahead and click on a different worksheet (or even a different workbook) and select your data with the mouse. Excel will fill in the range for you.

Finally, type a comma for your next argument or a) symbol to end your formula and press Enter.

Start typing this formula on your summary sheet.

Do this!

If you type just this, Excel can help you figure out your range.

Don't type out the range, just select it with your mouse.

Then use your mouse to select the data on the LowMem sheet.

hfe_ch03_low_end_forecast - Microsoft Excel

Home Insert Page Layout Formulas Data Review View

SUM =MIN

A B C D

1 Computer Profitability Forecast

2 Looking at next quarter's pricing for each unit sold

3

4 Low-end computers

5 Item

6 Memory

7 Motherboard

8 Hard disk

9 Total cost

10

11 Sale price

12

13 Gross profit margin

14

15

16

17

18

Summary LowMem LowMem LowMem

Edit

What happens?

Excel got the right answer using a more sophisticated reference

When you use the mouse to select the data you want your MIN formula to evaluate, Excel automatically fills in the range for that data, even if the data is on a different worksheet.

Here's how Excel describes the range for memory prices you want to evaluate.

=MIN(LowMem!D4:D19)

Excel added this element.

No word on which sheet this range refers to.

=MIN(D4:D19)

Here's your selection of the memory price data.

...except that in this case it adds the LowMem! element, which tells Excel to evaluate the range D4 : D19 on the LowMem worksheet. So far, we haven't included an element to describe which worksheet we want to reference, and Excel has taken that to mean that we want to reference the same worksheet where we've put our formula.

This is the lowest price for memory.

Now filling in the lowest prices for the rest of the components will be a snap!

Here's Excel building your reference for you as you select it.

ID	Vendor	Model	Price
1	MicroMini/Max	A-2341	\$ 66.00
2	Parts 'R' Us	E2320B	\$ 65.00
3	Parts 'R' Us	PU-8755	\$ 64.00
4	MicroMini/Max	E2320A	\$ 64.00
5	MicroMini/Max	B-8532	\$ 64.00
6	Jorge's Electronic Parts	PU-8755	\$ 63.00
7	Parts 'R' Us	E2320A	\$ 63.00
8	Jorge's Electronic Parts	B-8532	\$ 66.00
9	Krazy Komputer Kastle	B-8532	\$ 64.00
10	MicroMini/Max	E2320B	\$ 65.00
11	Jorge's Electronic Parts	B-8533	\$ 65.00
12	Parts 'R' Us	PU-8754A	\$ 63.00
13	Krazy Komputer Kastle	B-8533	\$ 66.00
14	MicroMini/Max	B-8533	\$ 66.00
15	Parts 'R' Us	PU-8754	\$ 65.00
16	Krazy Komputer Kastle	PU-8755	\$ 63.00

Item	Cost
Memory	\$ 63.00
Motherboard	
Hard disk	
Total cost	
Sale price	
Gross profit margin	



You know everything you need to know to complete the rest of this spreadsheet and forecast the profitability of low-end computers for next quarter.

1

Using the MIN function and pointing to the hard disk (LowHDs) and motherboard (LowBds) pricing worksheets, calculate what is the lowest price you can get for these components.

2

Type in the formula to calculate your new cost total in B9.

3

Your sales team has determined that the highest competitive price you can charge your customers is \$390. Fill that value into cell B11.

4

Calculate your new gross profit margin.

A	B	C	D
1 Computer Profitability Forecast			
2 Looking at next quarter's pricing for each unit sold			
3			
4 Low-end computers			
5 Item	Cost		
6 Memory	\$ 63.00		
7 Motherboard			New total here.
8 Hard disk			
9 Total cost			
10			
11 Sale price			
12			
13 Gross profit margin			
14			
15			
16			
17			
18			

Calculate your
new gross
profit margin.

Type in a projected
\$390 sale price of
your computer here.

Make sure it's formatted correctly by pressing
the "%" button under the Home tab.



Exercise Solution

You just projected your profitability for low-end computers, given your component costs, for the next quarter. Do you expect a profit?

Here are the formulas that calculate your spreadsheet.

=MIN(LowBds!D4:D10)

=MIN(LowHDs!D4:D14)

=SUM(B6:B8)

=(B11-B9)/B11

Looks like your profit on this low-end configuration will be 11%.

Computer Profitability Forecast	
Looking at next quarter's pricing for each unit sold	
Low-end computers	
Item	Cost
Memory	\$ 63.00
Motherboard	\$ 224.00
Hard disk	\$ 60.00
Total cost	\$ 347.00
Sale price	\$ 390.00
Gross profit margin	11%



Geek Bits

A quick way to select *all* the numbers in column D for your MIN formula: you can type `MIN (LowBds ! D : D)`. If there are other elements in the column, such as text or blank spaces, Excel will just ignore them.

Nice work.

Looks like you'll have a handy profit per unit this quarter. Now all we have to do is sell them....

Things just got even better...

This email just came across the wire.

From: Purchasing
To: The Boss
Subject: Just scored a sweet discount!

Hey Boss,

One of the new guys has just persuaded all our vendors to give us a 5% discount for this quarter. You might want to incorporate the good news into your projections.

—Purchasing

Sweet! That definitely means that the computers you sell will earn a higher profit margin. Better calculate to see how much.



Exercise

Load this!

[www.headfirstlabs.com/books/hfexcel/
hfe_ch03_low_end_discounted.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch03_low_end_discounted.xlsx)

The 5% discount is typed into this cell.

	A	B	C	D
1	Computer Profitability Forecast			
2	Looking at next quarter's pricing for each unit sold			
3				
4	Discount		5%	
5				
6	Low-end computers			
7	Item	Cost	Discounted	
8	Memory	\$ 63.00		
9	Motherboard	\$ 224.00		
10	Hard disk	\$ 60.00		
11	Total cost	\$ 347.00		
12				
13	Sale price	\$ 390.00		
14				
15	Gross profit margin		11%	
16				
17				
18				

- In cell C8, type a formula that references cells B4 and B8 to subtract a 5% discount from the memory cost.

- Copy your new formula and paste it to calculate the motherboard and hard disk costs.

What happens?



Exercise Solution

You just tried to write formulas to calculate a discounted cost of memory, hard disks, and motherboards. Let's see how it went....

- Refine your spreadsheet to incorporate the discount to memory.

This is a pretty straightforward formula.

B8 refers to the
memory cost.

B4 refers to the
5% discount.

$$= B8 - B8 * B4$$

	A	B	C	D
1	Computer Profitability Forecast			
2	Looking at next quarter's pricing for each unit sold			
3				
4	Discount		5%	
5				
6	Low-end computers			
7	Item	Cost	Discounted	
8	Memory	\$ 224.00	\$ 59.85	
9				
10	Hard disk	\$ 60.00		
11	Total cost	\$ 347.00		
12				
13	Sale price	\$ 390.00		
14				
15	Gross profit margin	11%		
16				
17				
18				

- Copy your new discount formula for the hard disk.

This reference doesn't
point to the discount.

$$= B10 - B10 * B6$$

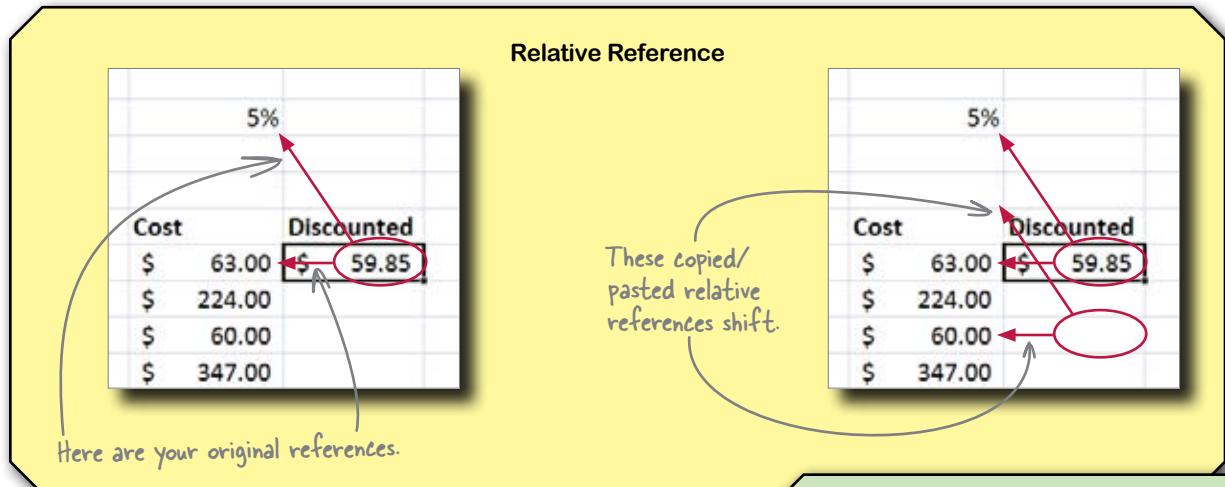
These values can't be right!

	A	B	C	D
1	Computer Profitability Forecast			
2	Looking at next quarter's pricing for each unit sold			
3				
4	Discount		5%	
5				
6	Low-end computers			
7	Item	Cost	Discounted	
8	Memory	\$ 63.00	\$ 59.85	
9		\$ 224.00	\$ 224.00	
10	Hard disk	\$ 60.00	\$ 60.00	
11	Total cost	\$ 347.00		
12				
13	Sale price	\$ 390.00		
14				
15	Gross profit margin	11%		
16				
17				
18				

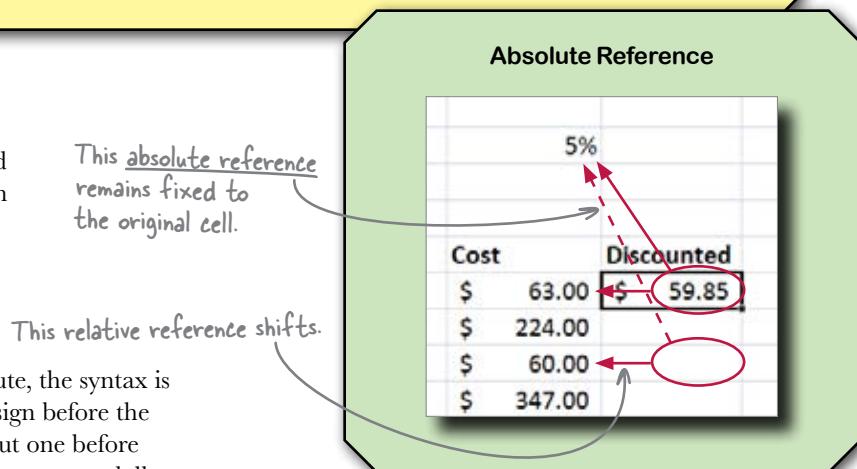
Use absolute references to prevent shifting on copy/paste

You've thus far been using **relative references** in your formulas...

...and when you copy and paste them, relative references shift in proportion to the original formula.



But sometimes you want a reference to stay *fixed* no matter where you copy and paste it. In that case, you need to use an **absolute reference**.



To tell Excel to make a reference absolute, the syntax is to add dollar signs. If you put a dollar sign before the column, the row can shift, and if you put one before the row, the column can shift, and if you use two dollar signs, the reference will stay totally fixed.

\$B\$2

Hold the row.

Hold the column.

If you wanted to hold the column but not the row, you'd only put a dollar sign in front of the B.



Exercise

Rewrite your memory discount formula to include an absolute reference to cell B4. Copy that formula and paste it for the motherboard and hard disk costs.

Your profit margin is now even higher...

With your corrected formula using absolute references, you were able to copy and paste to your motherboard and hard disk fields, showing your discounted component costs.

Here is your absolute reference:

=B11-B11*B\$4

You could also have written \$B\$4.

Copying cell C8 and pasting to cell C11 would normally shift the reference in that cell from B4 to B7—a shift in rows. To prevent the row from shifting, put a \$ in front of the 4 in your reference.

You can also put a \$ in front of the B in your reference, but it won't make a difference, because copying cell C8 to cell C11 wouldn't cause a shift in column references anyway.

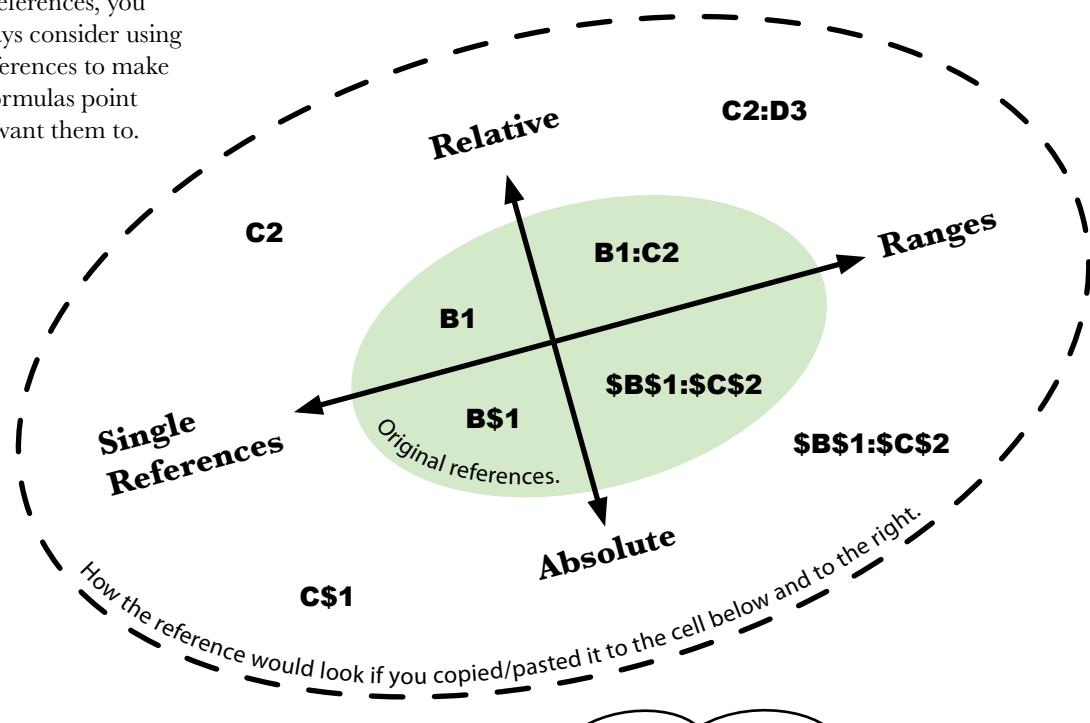
1 Computer Profitability Forecast		
2 Looking at next quarter's pricing for each unit sold		
4 Discount	5%	
6 Low-end computers		
7 Item	Cost	Discounted
8 Memory	\$ 63.00	\$ 59.85
9 Motherboard	\$ 224.00	\$ 212.80
10 Hard disk	\$ 60.00	\$ 57.00
11 Total cost	\$ 347.00	\$ 329.65
12		
13 Sale price	\$ 390.00	\$ 390.00
14		
15 Gross profit margin	11%	15%
16		
17		
18		

Your profit is now higher.

Looks like you're going to get to pay yourself a **big dividend** this quarter, assuming that sales go well....

Absolute references give you a lot of options

Depending on where you think you might need to copy your references, you should always consider using absolute references to make sure your formulas point where you want them to.



Those dollar signs are starting to make the reference hard to read.
Can't the formula just say in plain language what you want to evaluate?

It can indeed. As important as references are, they can become unwieldy once your formulas get long and numerous. If your references start to confuse you, you can turn to a powerful feature of Excel called **named ranges**....

Named ranges simplify your formulas

This reference takes a moment to understand.

\$B\$2

You will often have to go back and check where references are pointing, just to jog your memory.

Even if you wrote it yourself, chances are, in the future you'll forget its meaning and have to go back and forth to make sure you know where the reference is pointing. This formula takes a **long** time to understand.

=SUM(\$B2,C4:D8)*M75

A formula like this can be a real bear to check.

When you used **named ranges**, you can replace those references with a plain-language name of your choosing.

You can actually use words like these as references in your formulas.

Assign names to your ranges...

\$B\$2

\$C1

discount

cost

And once you name your ranges, which by the way are **by definition absolute references**, you can drop them right into your formulas.

...and simplify your formulas.

= cost - cost * discount

This could be a real formula using named ranges.

Isn't this easier to read and understand?



Exercise

Let's try out named ranges by incorporating one into your discount calculation formula. Instead of making the discount value reference B\$4, let's make it just `discount`.

1

- Give your discount value the name `discount`. To do this, select cell B4 and then highlight and delete the reference at the top left. In that blank, type `discount`.

Highlight this blank here,
replace the reference text
with the word `Discount`,
and then press Enter.

Rewrite your memory formula.

Then copy/paste it to these cells.

Computer Profitability Forecast		
Looking at next quarter's pricing for each unit sold		
Item	Cost	Discounted
Memory	\$ 63.00	\$ 59.85
Motherboard	\$ 224.00	\$ 212.80
Hard disk	\$ 60.00	\$ 57.00
Total cost	\$ 347.00	\$ 329.65
Sale price	\$ 390.00	\$ 390.00
Gross profit margin	11%	15%

2

- Rewrite the memory formula using your new named range.

3

- Copy and paste your new formula to overwrite the old motherboard and hard disk discount formulas.



Exercise Solution

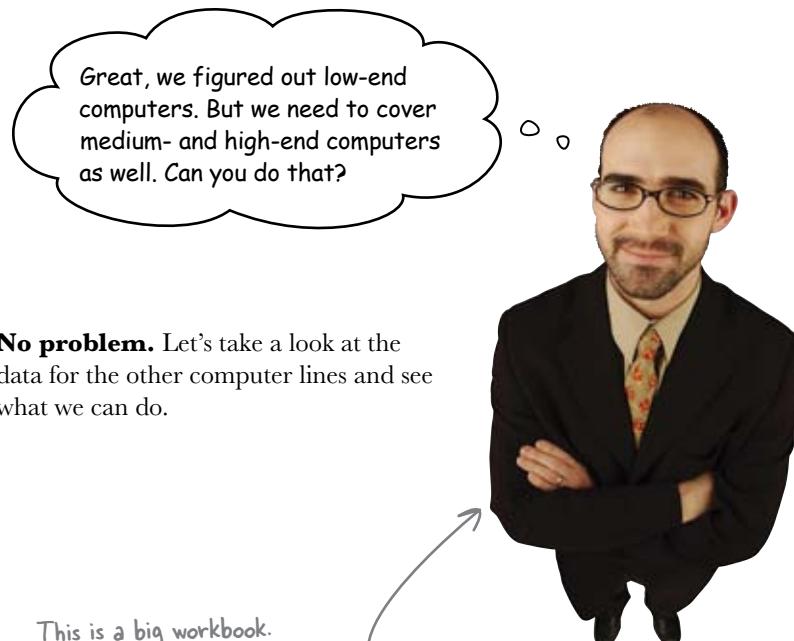
You just took named ranges for a spin for the first time. Did you find that they simplified your formula?

$$=B10-B10*\text{discount}$$

Here's your new formula.

This is your named range.

1 Computer Profitability Forecast				
2 Looking at next quarter's pricing for each unit sold				
3				
4 Discount	5%			
5				
6 Low-end computers				
7 Item	Cost	Discounted		
8 Memory	\$ 63.00	\$ 59.85		
9 Motherboard	\$ 224.00	\$ 212.80		
10 Hard disk	\$ 60.00	\$ 57.00		
11 Total cost	\$ 347.00	\$ 329.65		
12				
13 Sale price	\$ 390.00	\$ 390.00		
14				
15 Gross profit margin	11%	15%		
16				
17				
18				



This is a big workbook.

• Product manager

Load this!

www.headfirstlabs.com/books/hfexcel/
hfe ch03 all pcs.xlsx

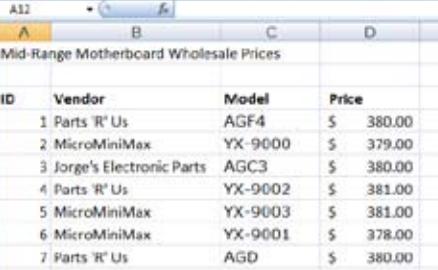
File Home Insert Page Layout Formulas Data Review View

A17 A B C D E F G

1 Computer Profitability Forecast
 2 Looking at next quarter's pricing for each unit sold
 3
 4 Discount %
 5
 6
 7 Item Low-end Discounted Mid-range Discounted High-end Discounted
 8 Memory \$ 63.00 \$ 59.85
 9 Motherboard \$ 224.00 \$ 212.80
 10 Hard disk \$ 60.00 \$ 57.00
 11 Total cost \$ 347.00 \$ 329.65
 12
 13 Sale price \$ 390.00 \$ 390.00
 14
 15 Gross profit margin 11% 15%
 16
 17
 18
 19
 20
 21
 22
 23
 24

Summary Metrics Mathematics Word-Flow Mathematics High-Value Mathematics

Ready 11%



The screenshot shows an Excel spreadsheet titled "Me_ch01_all_pcts - Microsoft Excel". The table has columns labeled A through E. Row 1 contains the header "Mid-Range Motherboard Wholesale Prices". Rows 2 and 3 are blank. Row 4 contains the data: "1 Parts 'R' Us AGF4 \$ 380.00". Row 5 contains "2 MicroMiniMax YX-9000 \$ 379.00". Row 6 contains "3 Jorge's Electronic Parts AGC3 \$ 380.00". Row 7 contains "4 Parts 'R' Us YX-9002 \$ 381.00". Row 8 contains "5 MicroMiniMax YX-9003 \$ 381.00". Row 9 contains "6 MicroMiniMax YX-9001 \$ 378.00". Row 10 contains "7 Parts 'R' Us AGD \$ 380.00". Row 11 is blank. Row 12 contains a redacted value. Rows 13 through 19 are also blank.

Mid-Range Motherboard Wholesale Prices				
1	A	B	C	D
2				
3	ID	Vendor	Model	Price
4	1	Parts 'R' Us	AGF4	\$ 380.00
5	2	MicroMiniMax	YX-9000	\$ 379.00
6	3	Jorge's Electronic Parts	AGC3	\$ 380.00
7	4	Parts 'R' Us	YX-9002	\$ 381.00
8	5	MicroMiniMax	YX-9003	\$ 381.00
9	6	MicroMiniMax	YX-9001	\$ 378.00
10	7	Parts 'R' Us	AGD	\$ 380.00
11				
12				
13				
14				
15				
16				
17				
18				
19				

There are seven different worksheets here!

Lots of data, lots of formulas to write.

With all this data, you'd have to write a ton of formulas

It could take you quite a while to come up with this.

Here are all the formulas you'd
need if you did it the long way.

=MIN(LowBds!D:D)

=SUM(E8:E10)

=MIN(HighBds!D:D)

=D8-D8*discount

=SUM(D8:D10)

=MIN(LowHDs!D:D)

=D9-D9*discount

=MIN(LowHDs!D:D)

=D10-D10*discount

=(D13-D11)/D13

=SUM(G8:G10)

=SUM(F8:F10)

=(G13-G11)/G13

=(E13-E11)/E13

=(F13-F11)/F13

All these formulas are a mess.

If only there were a shortcut....

Having more named ranges would be a help.

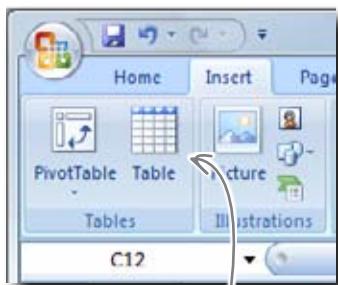
Your formulas would certainly be easier to read. But going through a whole bunch of cells and ranges and naming them individually takes a lot of time, too!



Excel's Tables make your references quick and easy

When you click inside your data and click **Table** under the Insert tab, Excel gives you all sorts of options, including *automatically generated range names*. Once you've created your table, you can use a special syntax called **structured references** to simplify your range names.* Here's how you make a table.

- Select your data, then head over to the Insert tab and click **Table**.



Click here

This new formatting shows you that your data is now a recognized table.

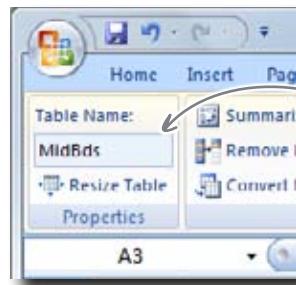
Easy, right? And you don't have to worry about making your references point to sheets anymore, since Excel knows how to find your table in a workbook using the structured reference.

If you don't like the formatting of the table, you can select a different style under the Design tab.

* Structured references are another one of those Excel 2007 and later-only features. It'll come to Mac eventually.

This is a structured reference.
=MIN(MidBds[Price])
 The column is in brackets.
 Here's where the structured reference points.

- Change your table name from Table1 to something more meaningful.



Under the Design tab, name your table here.

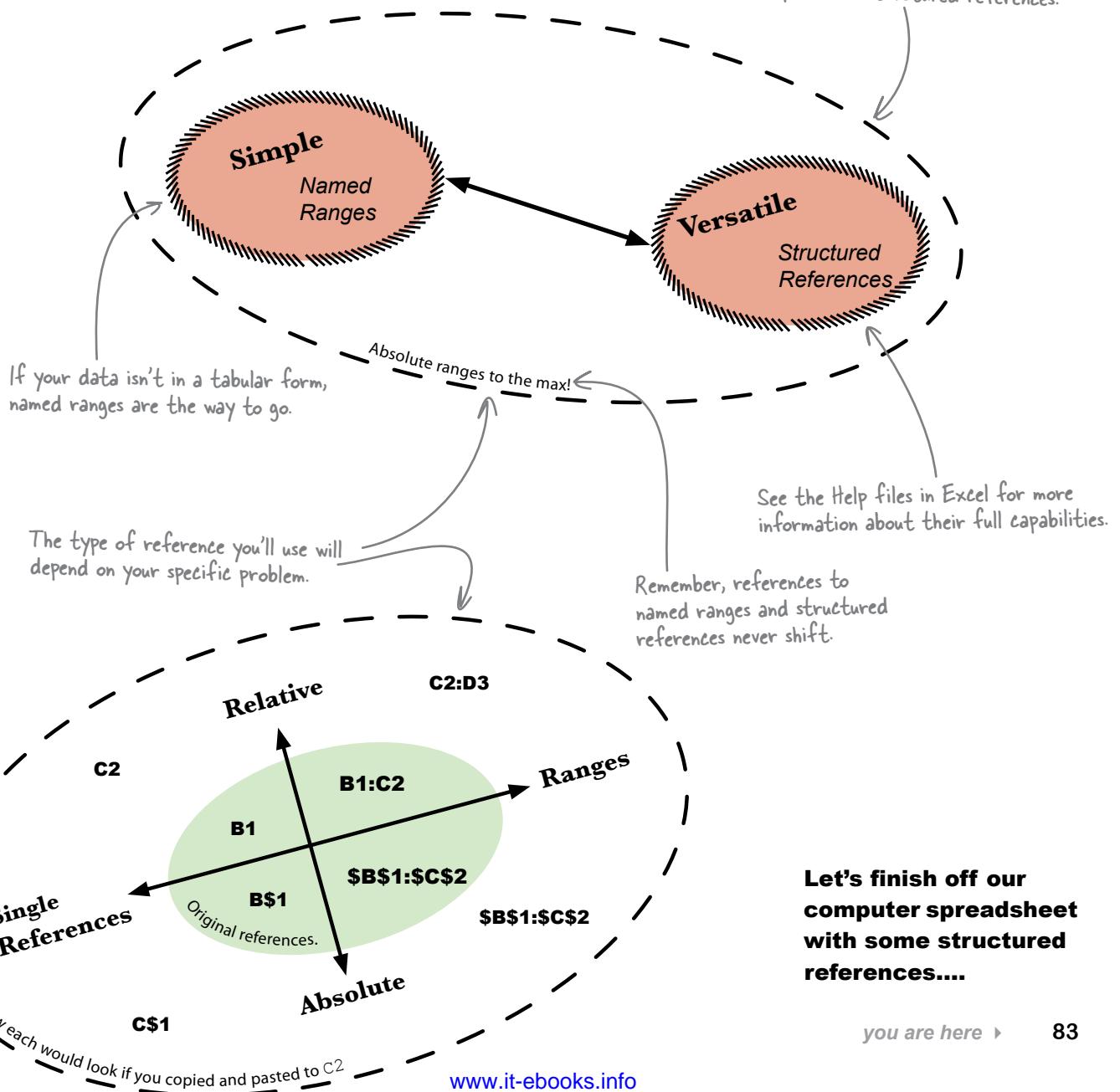
- Now you have a table! Go ahead and start using it for structured references.

ID	Vendor	Model	Price
Mid-Range Motherboard Wholesale Prices			
1	Parts R' Us	AGF4	\$ 380.00
2	MicroMinimax	YX-9000	\$ 379.00
3	Jorge's Electronic Parts	AGC3	\$ 380.00
4	Parts R' Us	YX-9002	\$ 381.00
5	MicroMinimax	YX-9003	\$ 381.00
6	MicroMinimax	YX-9001	\$ 378.00
7	Parts R' Us	AGD	\$ 380.00

Structured references are a different dimension of absolute reference

Between the \$A\$1 style of references that you've learned and the references that you can name, you've spanned a broad universe of possibilities for referring to your data inside of formulas.

We're only going to scratch the surface of the power of structured references.





Long Exercise

Finalize your profitability projections. Using tables and structured references, calculate the profitability forecast of your mid-range and high-end computer models.

1

- Assign your new price sheets as tables. For each table that describes a component, create a table using the button under the Insert tab. Make sure you give them each a name!

Create a table for your mid-range memory.



ID	Vendor	Model	Price
1	Krazy Komputer Kastle	FU-0000	\$ 71.00
2	MicroMinimax	C-8540	\$ 70.00
3	Jorge's Electronic Parts	C-8530	\$ 71.00
4	MicroMinimax	FU-9040	\$ 72.00
5	MicroMinimax	C-8570	\$ 71.00
6	Krazy Komputer Kastle	E5000A	\$ 71.00
7	MicroMinimax	C-8550	
8	Parts 'R Us	FU-9030	
9	Krazy Komputer Kastle	E5000B	
10	Jorge's Electronic Parts	C-8560	
11	Parts 'R Us	FU-9010	
12	Parts 'R Us	E5500A	
13	MicroMinimax	C-8590	\$ 73.00
14	Parts 'R Us	C-8580	\$ 71.00
15	Parts 'R Us	E5500B	\$ 71.00
16	Jorge's Electronic Parts	FU-0020	\$ 71.00

2

- Using the same approach as for evaluating low-end PCs, calculate the minimum costs for each component. This time, use **structured references** in your formula.

Here's one already completed for you.

Item	Low-end	Discounted	Mid-range	Discounted	High-end	Discounted
Memory	\$ 63.00	\$ 59.85				
Motherboard	\$ 224.00	\$ 212.80	\$ 378.00			
Hard disk	\$ 60.00	\$ 57.00				
Total cost	\$ 347.00	\$ 329.65				
Sale price	\$ 390.00	\$ 390.00				
Gross profit margin		15%	15%			

3

- Calculate expected profit margins for the other products. Use the sale prices below, and fill in the necessary formulas in row 15.

Your sale prices

Mid-range: \$600

High-end: \$4,000

Put your sale
prices on
this row.

	A	B	C	D	E	F	G
1	Computer Profitability Forecast						
2	Looking at next quarter's pricing for each unit sold						
3							
4	Discount		5%				
5							
6							
7	Item	Low-end	Discounted	Mid-range	Discounted	High-end	Discounted
8	Memory	\$ 63.00	\$ 59.85				
9	Motherboard	\$ 224.00	\$ 212.80	\$ 378.00			
10	Hard disk	\$ 60.00	\$ 57.00				
11	Total cost	\$ 347.00	\$ 329.65				
12							
13	Sale price	\$ 390.00	\$ 390.00				
14							
15	Gross profit margin		11%	15%			
16							
17							
18							

Put your profit margins on this row.



LONG Exercise SOLUTION

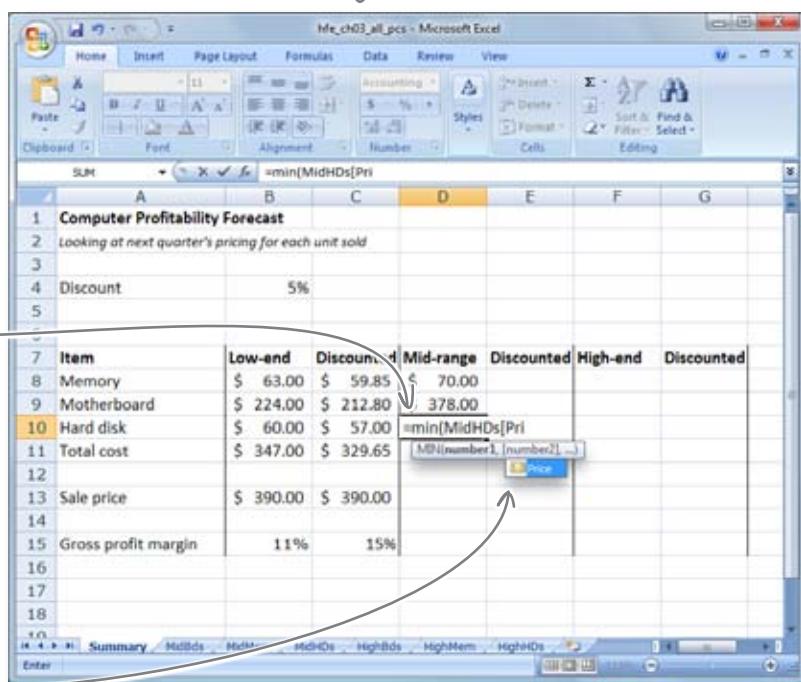
How profitable are your mid-range and high-end computers?

- 1 Assign your new price sheets as tables. For each table that describes a component, create a table using the button under the Insert tab. Make sure you give them each a name!
- 2 Using the same approach you had for evaluating low-end PCs, calculate the minimum costs for each component. This time, use **structured references** in your formula.
- 3 Calculate expected profit margins for the other products. Use the sale prices below, and fill in the necessary formulas in row 15.

Once your structured references are set up, writing formulas is a snap.

Did you notice that Excel tries to help you figure out which structured reference you're looking for?

Just press down-arrow and tab if Excel correctly starts to fill out your reference name.



Item	Low-end	Discounted	Mid-range	Discounted	High-end	Discounted
Memory	\$ 63.00	\$ 59.85	\$ 70.00			
Motherboard	\$ 224.00	\$ 212.80	\$ 238.00			
Hard disk	\$ 60.00	\$ 57.00	\$ 65.00			
Total cost	\$ 347.00	\$ 329.65	\$ 373.00			
Sale price	\$ 390.00	\$ 390.00				
Gross profit margin		11%	15%			

Use your named range to incorporate the discount.

Item	Low-end	Discounted	Mid-range	Discounted	High-end	Discounted
Memory	\$ 63.00	\$ 59.85	\$ 70.00	\$ 66.50	\$ 93.00	\$ 88.35
Motherboard	\$ 224.00	\$ 212.80	\$ 378.00	\$ 359.10	\$ 2,847.00	\$ 2,704.65
Hard disk	\$ 60.00	\$ 57.00	\$ 94.00	\$ 89.30	\$ 189.00	\$ 179.55
Total cost	\$ 347.00	\$ 329.65	\$ 542.00	\$ 514.90	\$ 3,129.00	\$ 2,972.55
Sale price	\$ 390.00	\$ 390.00	\$ 600.00	\$ 600.00	\$ 4,000.00	\$ 4,000.00
Gross profit margin		11%	15%	10%	14%	22%
						26%

Use the same formulas for price and profit that you used recently.

Item	Low-end	Discounted	Mid-range	Discounted	High-end	Discounted
Memory	\$ 63.00	\$ 59.85	\$ 70.00	\$ 66.50	\$ 93.00	\$ 88.35
Motherboard	\$ 224.00	\$ 212.80	\$ 378.00	\$ 359.10	\$ 2,847.00	\$ 2,704.65
Hard disk	\$ 60.00	\$ 57.00	\$ 94.00	\$ 89.30	\$ 189.00	\$ 179.55
Total cost	\$ 347.00	\$ 329.65	\$ 542.00	\$ 514.90	\$ 3,129.00	\$ 2,972.55
Sale price	\$ 390.00	\$ 390.00	\$ 600.00	\$ 600.00	\$ 4,000.00	\$ 4,000.00
Gross profit margin		11%	15%	10%	14%	22%
						26%

This high-end profitability is looking hot!

Your profits are looking fantastic....

Your profitability forecasts proved accurate

Business is great, and your sales guys are happier than ever!



4 change your point of view

Sort, zoom, and filter



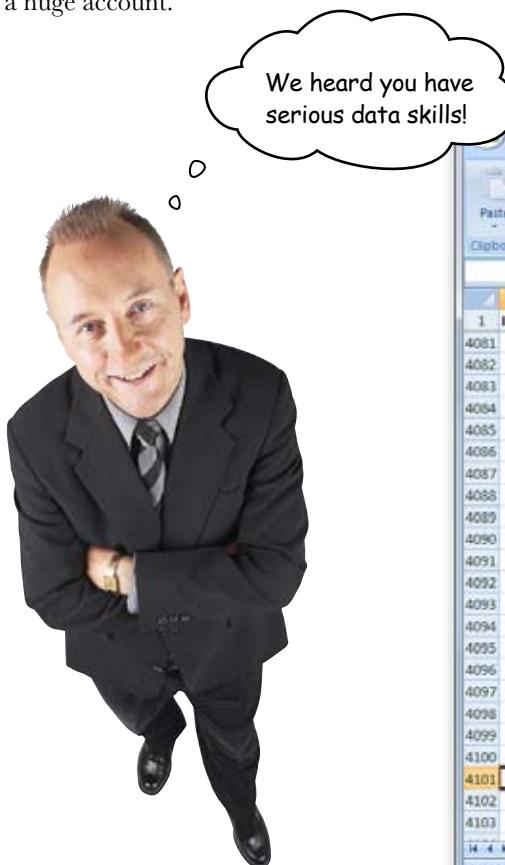
The details of your data are tantalizing.

But only if you know *how* to look at them. In this chapter, you'll forget about formatting and functions and just focus on how to change your perspective on your data. When you are exploring your data, looking for issues to investigate, the **sort, zoom, and filter** tools offer surprising versatility to help you get a grip on what your data contains.

Political consultants need help decoding their fundraising database

The Main Campaign is working for the Dataville mayor and wants to solicit his supporters for money.

Your client is a super-intense, super-demanding politico. But the good news is that the data is pretty clean (that's always a relief!), and if you can help this group **organize their contributor list**, you'll have scored a huge account.



Here is their data.

ID	Date	Last Name	First Name	ZIP	Donation
4081	3152	10/6/2009	Cook	Jaslyn	20817 \$ 500
4082	2194	7/13/2009	Galloway	Toby	10012 \$ 100
4083	867	3/18/2009	Hickman	Eddie	34234 \$ 10
4084	1200	4/15/2009	Newton	Elaina	10012 \$ 250
4085	3935	12/16/2009	Noel	Paige	20817 \$ 150
4086	1254	4/19/2009	Aiston	Lennon	78723 \$ 200
4087	4007	12/23/2009	Patrick	Mala	10012 \$ 250
4088	1931	6/18/2009	Vaughn	Gina	60603 \$ 100
4089	366	2/3/2009	Hobbs	Gunnar	78723 \$ 500
4090	2678	8/26/2009	Wall	April	60603 \$ 100
4091	2127	7/8/2009	Whitaker	Alden	90210 \$ 5,000
4092	980	3/28/2009	Casey	Logan	10012 \$ 250
4093	3451	11/1/2009	Hutchinson	Brittany	10012 \$ 250
4094	2710	8/28/2009	Langley	Oscar	78723 \$ 100
4095	2427	8/4/2009	Stanton	Abby	34234 \$ 150
4096	1844	6/12/2009	Floyd	Talia	78723 \$ 500
4097	404	2/7/2009	Hooper	Walter	78723 \$ 300
4098	1997	6/25/2009	Robbins	Abrial	78723 \$ 100
4099	747	3/9/2009	Tyler	Jakob	06511 \$ 3,000
4100	1140	4/9/2009	Ratliff	Audrina	06511 \$ 200
4101	3672	11/22/2009	Ortiz	Sage	10012 \$ 50
4102					
4103					

The data is a list of their contributors' donations from the past year. And while the data is of a high quality, at over 4,000 rows, there's quite a lot of it!

4,100 is a lot of records!

Find the names of the big contributors

Getting in touch with their most passionate (that is, most generous!) contributors is a big deal. The small fries are important, but before anything else, the Main Campaign needs to get in touch with the big contributors.

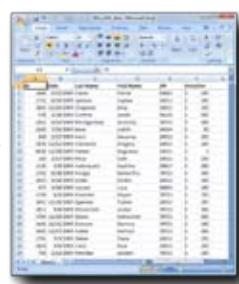


Sharpen your pencil

Take a look at your data. How could you change your perspective on it to show you the top donors?

Load this!

[www.headfirstlabs.com/books/hfexcel/
hfe_ch04_data.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch04_data.xlsx)



Here's your data from the previous page.



Maybe you could put all the big donors up here...

How did you decide you might change perspective on this data to show you the top donors?

If you had the data ordered by donation

amount, you could see the big donors at the top.

...and put the little donors down here.

That way, you'd be able to group the big contributors together.

ID	Date	Last Name	First Name	ZIP	Donation
1	1886	6/15/2009 Carter	Pierre	60001	\$ 100
2	2732	8/30/2009 Jackson	Caylee	10012	\$ 100
3	3602	11/16/2009 Chapman	Amy	10012	\$ 250
4	970	3/28/2009 Guthrie	Jakob	90219	\$ 300
5	2543	8/15/2009 Montgomery	Serenity	78723	\$ 300
6	3905	7/23/2009 Bean	Judith	34234	\$ 50
7	628	2/27/2009 Kent	Savanna	10012	\$ 250
8	3926	12/15/2009 Clements	Gregory	10012	\$ 100
9	4024	12/24/2009 Parker	Augustus	10012	\$ 5
10	183	1/1/2009 Moss	Cale	10012	\$ 250
11	1119	4/9/2009 Valenzuela	Audrina	20817	\$ 200
12	2762	8/26/2009 Hodge	Samantha	78723	\$ 300
13	3023	9/24/2009 Greer	Emilio	10012	\$ 100
14	917	1/24/2009 Jayne	Lucy	60001	\$ 100
15	1779	6/2/2009 Kricheldorf	Kayden	78723	\$ 750
16	3651	11/20/2009 Spencer	Tucker	10012	\$ 250
17	2811	9/6/2009 McCormick	Jaidyn	78723	\$ 300
18	3704	11/26/2009 Slater	Nehemiah	78723	\$ 300
19	3445	10/31/2009 Dickson	Gemma	78723	\$ 200
20			Wynonna	78723	\$ 200
21	2781	9/3/2009 Slater	Tiana	10012	\$ 250
22	2814	9/6/2009 Irvin	Riya	10012	\$ 250
23	795	3/13/2009 Mendez	Jaeden	78723	\$ 100
24					

Sort changes the order of rows in your data

The **Sort** buttons are a useful tool that enables you to reshuffle the order of the rows in your data. The Sort buttons can be found under the Data tab of the Ribbon.

Here is the Ascending Sort button.

Here is the Descending Sort button.

To *sort ascending* means to order your data from first to last or smallest to largest, and to *sort descending* means to do the opposite.

There are many occasions where you'll want to use Sort to change the order of your data, but Sort is especially useful when you're looking at data for the first time and trying to get a feel for what's in it.



The plain ol' Sort button lets you do more sophisticated sorting.



Exercise

Let's sort your data to group all the big contributors together.

1

- Select any cell in the column you want to sort by.
Since you want to sort by donation here, you'd pick the Donation column.

You want to sort by donation, so put your cursor in this column.

A	B	C	D	E	F	G
ID	Date	Last Name	First Name	ZIP	Donation	
1880	6/15/2009	Center	Pitney	90603	\$ 100	
2073	8/10/2009	ackson	Caylene	10813	\$ 100	
2864	11/14/2009	Chapman	Amy	10813	\$ 250	
978	3/29/2009	Chene	Jakob	90613	\$ 500	
2541	8/15/2009	Montgomery	Sankathy	70723	\$ 100	
2305	7/23/2009	Dean	Jaymi		\$ 50	
616	3/27/2009	Kurt	Seawright	10813	\$ 200	
2925	12/15/2009	Clements	Gregory	10813	\$ 100	
4034	12/14/2009	Farber	Augustus	10813	\$ 5	
185	1/13/2009	Moss	Cale	10813	\$ 250	
1139	4/9/2009	Valenzuela	Audrina	20613	\$ 200	
2702	8/28/2009	Hodge	samantha	70723	\$ 100	
3029	9/24/2009	Greer	Emilio	10813	\$ 100	
947	1/24/2009	Joyner	Lucky	90603	\$ 100	
2729	6/2/2009	Knowles	Keyton	70723	\$ 750	
5401	11/10/2009	Niemeyer	Tucker	10813	\$ 250	
2811	9/6/2009	Mozzecanick	Jardyn	70723	\$ 300	
3704	11/25/2009	Slater	Noheemiah	70723	\$ 500	
3448	10/11/2009	Cheskin	Genesha	70723	\$ 100	
3945	12/17/2009	Fuller	Kathrym	70723	\$ 300	
2781	9/3/2009	Matur	Tiana	20713	\$ 250	
2818	9/5/2009	Inoue	Rya	10813	\$ 250	
795	3/18/2009	Mosley	Iarden	70723	\$ 100	

Sort by this field in a way that will send the larger donors up to the top of the list.

2

- Click one of the Sort buttons to sort your data. Which button should you press to get big donors up top: Ascending or Descending?



Exercise Solution

Were you able to bring all the big contributors to the top of your list through sorting?

- Select a cell in the column you want to sort by.

Any old cell will do.

You can also select the whole column, and Excel will ask you whether you want it to sort just that column or the entire table.

Press the Sort Descending button.

- Sort the data. Which button should you press to get big donors up top?

Now your top donors are up top!

Excel guesses the contours of your table. It uses the column headings.

	A	B	C	D	E	F
1	ID	Date	Last Name	First Name	ZIP	Donation
2	2963	9/20/2009	Benjamin	Thomas	10012	\$ 50,000
3	307	1/28/2009	Swanson	Carlos	20817	\$ 10,000
4	213	1/20/2009	Ingram	Alaina	06511	\$ 10,000
5	1841	6/12/2009	Gould	Amya	78723	\$ 10,000
6	1345	4/29/2009	Joyner	Alec	34234	\$ 10,000
7	3865	12/11/2009	Short	Antonio	06511	\$ 5,000
8	3855	12/10/2009	Richardson	Jacoby	20817	\$ 5,000
9	1534	5/16/2009	White	Yusuf	10012	\$ 5,000
10	3789	12/4/2009	Gibson	Howard	06511	\$ 5,000
11	1279	4/22/2009	Faulkner	Garrett	78723	\$ 5,000
12	1498	5/13/2009	Lawrence	Gina	20817	\$ 5,000
13	3159	10/7/2009	Guy	Susan	10012	\$ 5,000
14	3285	10/18/2009	Hoffman	Trevon	06511	\$ 5,000
15	2848	9/9/2009	Bernard	Dayton	34234	\$ 5,000
16	2332	7/26/2009	Stevens	Odin	20817	\$ 5,000
17	1715	5/31/2009	Frederick	Immanuel	10012	\$ 5,000
18	3123	10/4/2009	Noel	Lee	06511	\$ 5,000
19	1896	6/16/2009	Stein	Kaelyn	78723	\$ 5,000
20	177	1/17/2009	Singleton	Skylar	34234	\$ 5,000
21	1755	6/4/2009	Leblanc	Denisse	20817	\$ 5,000
22	3134	10/5/2009	Morton	Ryder	10012	\$ 5,000
23	695	3/5/2009	Britt	Gilberto	06511	\$ 5,000
24	1221	4/17/2009	Decker	Kaylie	34234	\$ 5,000

All the small donors are way down at the bottom of the list now.

Sorting shows you different perspectives on a large data set

When you look at data for the first time, it's a good idea to sort by different columns to look for visible patterns.

When exploring your data, it never hurts to try sorting by a bunch of columns.

Sort by donation

ZIP	Donation
10012	\$ 50,000
10012	\$ 10,000
20817	\$ 10,000
06511	\$ 10,000
78723	\$ 10,000
34234	\$ 10,000
06511	\$ 5,000
20817	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
90210	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
06511	\$ 5,000
20817	\$ 5,000
90210	\$ 5,000
34234	\$ 5,000
90210	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
78723	\$ 5,000
10012	\$ 5,000
06511	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000
10012	\$ 5,000

Sort by zip

Last Name	ZIP	Donation
ra	06511	\$ 10,000
iby	06511	\$ 5,000
n	06511	\$ 5,000
ey	06511	\$ 5,000
son	06511	\$ 5,000
na	06511	\$ 3,000
ib	06511	\$ 3,000
pine	06511	\$ 2,500
lee	06511	\$ 2,500
lisyn	06511	\$ 2,500
rad	06511	\$ 2,500
ian	06511	\$ 2,500
o	06511	\$ 2,000
in	06511	\$ 2,000
iyah	06511	\$ 1,000
ie	06511	\$ 1,000
i	06511	\$ 1,000
f	06511	\$ 1,000
as	06511	\$ 1,000
y	06511	\$ 1,000
tur	06511	\$ 1,000
l	06511	\$ 1,000
hael	06511	\$ 1,000
quin	06511	\$ 1,000
son	06511	\$ 1,000
i	06511	\$ 1,000
Hynn	06511	\$ 1,000
	06511	\$ 750

Sort by name

C	D
Abbott	Corinne
Abbott	Ingrid
Abbott	Kaylie
Abbott	Rashad
Acevedo	Alma
Acevedo	Dante
Acevedo	Jeremiah
Acevedo	Natalie
Acosta	Alan
Acosta	Deyami
Acosta	Jaylin
Adams	Diamond
Adams	Hana
Adams	Jayce
Adams	Jaylan
Adams	Lewis
Adkins	Alvin
Adkins	Braxton
Adkins	Coby
Adkins	Danny
Adkins	Hanna
Aguilar	Dax
Aguilar	Isabelle
Aguilar	Mary
Aguilar	Meghan
Aguilar	Owen
Aguirre	Carlo
Aguirre	Sergio
Aguirre	Sloane



Watch it!

Excel can figure out which columns are in your table... usually.

If Excel doesn't sort all your columns together, it can wreck your database.

Always save your data first and check it after sorting to make sure you and Excel got it right.

You never know what you might see when you look at your data from different perspectives.

Let's see what the Main Campaign has to say about this newly organized data....



That shows me who the big donors are, but not where they are. Could you sort by zip code and then by donation size? That way, I could look at donation-sorted sublists grouped by zip.

Here's what even more organized data would look like.

All the records are sorted by zip...

A	B	C	D	E	F	G
ID	Date	Last Name	First Name	ZIP	Donation	
95	3986	12/20/2009	Boyer	Raven	06511	\$ 20
96	2549	8/15/2009	Harrington	Annie	06511	\$ 20
97	2255	7/18/2009	Gray	Jamarcus	06511	\$ 20
98	3634	11/18/2009	Hale	Kaydence	06511	\$ 10
99	111	1/11/2009	Washington	Jeremy	06511	\$ 10
100	1020	3/31/2009	Terrell	Josh	06511	\$ 5
101	11	1/1/2009	Albert	Charlie	06511	\$ 5
102	2963	9/20/2009	Benjamin	Thomas	10012	\$ 50,000
103	307	1/28/2009	Swanson	Carlos	10012	\$ 10,000
104	3789	12/4/2009	Gibson	Howard	10012	\$ 5,000
105	1279	4/22/2009	Faulkner	Garrett	10012	\$ 5,000
106	3159	10/7/2009	Guy	Susan	10012	\$ 5,000
107	3285	10/18/2009	Hoffman	Trevon	10012	\$ 5,000
108	2848	9/9/2009	Bernard	Dayton	10012	\$ 5,000
109	1755	6/4/2009	Leblanc	Denisse	10012	\$ 5,000
110	3134	10/5/2009	Morton	Ryder	10012	\$ 5,000
111	695	3/5/2009	Britt	Gilberto	10012	\$ 5,000
112	99	1/10/2009	Santos	Tyrell	10012	\$ 5,000
113	3434	10/31/2009	Holland	Kody	10012	\$ 5,000
114	1772	6/6/2009	Dominguez	Jakavia	10012	\$ 5,000

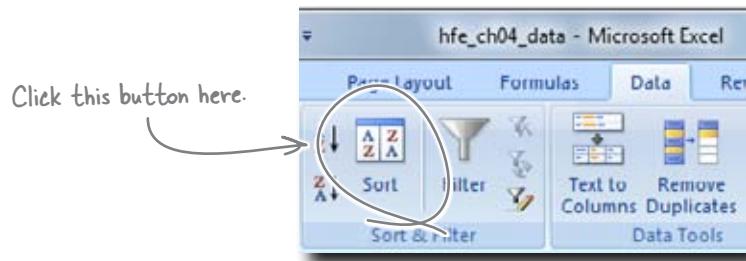
Your client from the Main Campaign

...and then they're sorted again, but this time by donation.

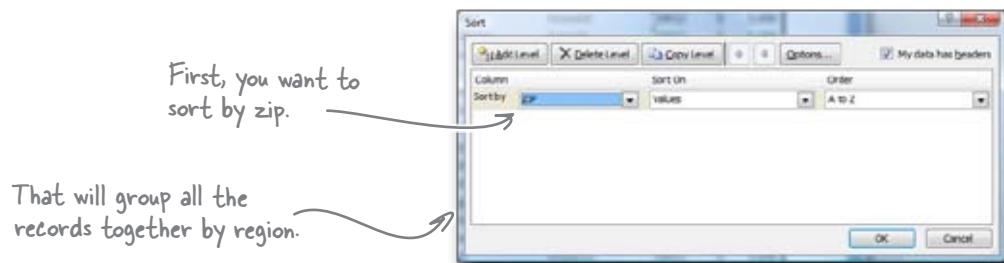


Let's see if we can fulfill the client's request: first to sort the data by zip code, and *then* to sort it by donation. This sort will enable us to look at the biggest givers by grouping them by geography.

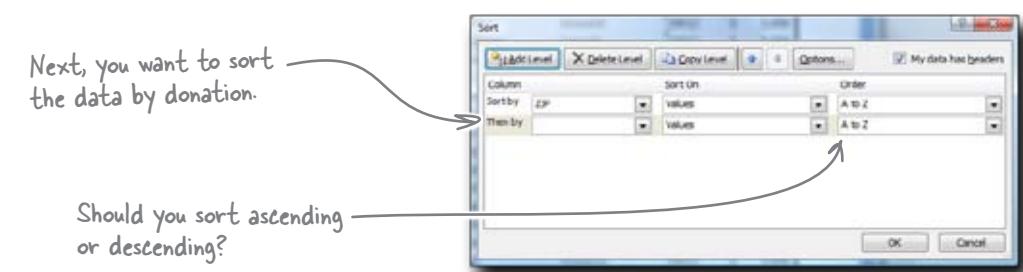
- 1 To execute this new and more complex sort, start by clicking the big Sort button. (Be sure your cursor is inside your data table first.)



- 2 In the dialog that pops up, start by telling Excel to sort your data by zip.



- 3 Now click **Add Level** and add a new level to sort by donation. You may receive a warning dialog box...just do what you think is best.





Exercise Solution

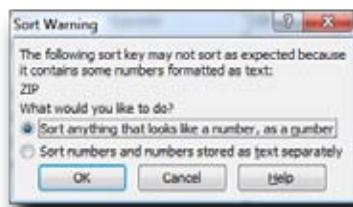
Were you able to sort the data by zip and then donation?

- 1 To execute this new and more complex sort, start by clicking the big Sort button. (Be sure your cursor is inside your data table first.)
- 2 In the dialog that pops up, start by telling Excel to sort your data by zip.
- 3 Now click **Add Level** and add a new level to sort by donation. You may receive a warning dialog box...just do what you think is best.

Here is your newly sorted data!

Now you can look at the top donors from each zip code.

You probably received this warning dialog box.



Excel needs to store zips as text, because if zips were numbers, Excel would get rid of the 0 in 06511.

A	B	C	D	E	F
ID	Date	Last Name	First Name	ZIP	Donation
2	1841 6/12/2009	Gould	Amya	06511	\$ 10,000
3	3855 12/10/2009	Richardson	Jacoby	06511	\$ 5,000
4	2332 7/26/2009	Stevens	Odin	06511	\$ 5,000
5	2455 8/7/2009	Woodard	Carley	06511	\$ 5,000
6	2333 7/26/2009	Chaney	Branson	06511	\$ 5,000
7	1123 4/27/2009		Briana	06511	\$ 3,000
8	747 3/9/2009	Tyler	Jakob	06511	\$ 3,000
9	2288 7/22/2009	Rogers	Antoine	06511	\$ 2,500
10	2371 7/29/2009	Battle	Emilee	06511	\$ 2,500
11	3780 12/3/2009	Harrison	Madelyn	06511	\$ 2,500
12	653 3/2/2009	Giles	Conrad	06511	\$ 2,500
13	2681 4/27/2009	Williamson	Gillian	06511	\$ 2,500
14	3217 10/12/2009	Morton	Julio	06511	\$ 2,000
15	1642 5/25/2009	Bradley	Jillian	06511	\$ 2,000
16	1145 4/10/2009	Curtis	Saniyah	06511	\$ 1,000
17	524 2/17/2009	Booker	Jamie	06511	\$ 1,000
18	1095 4/6/2009	Sanchez	Diya	06511	\$ 1,000
19	3646 11/20/2009	Mullins	Laila	06511	\$ 1,000
20	1500 5/13/2009	Gay	Dallas	06511	\$ 1,000
21	2236 7/17/2009	Pruitt	Tomy	06511	\$ 1,000
22	3018 9/24/2009	Juarez	Arthur	06511	\$ 1,000
23	3028 9/25/2009	Dawson	Kira	06511	\$ 1,000
24	432 1/10/2009	Brown	Michael	06511	\$ 1,000
25	2381 7/30/2009	Scott	Joaquin	06511	\$ 1,000
26	360 2/2/2009	Garner	Lawson	06511	\$ 1,000
27	3100 10/2/2009	Francis	Luka	06511	\$ 1,000
28	1810 6/9/2009	Gordon	Jocelynn	06511	\$ 1,000
29	1042 4/2/2009	Wolfe	Iris	06511	\$ 1,000
30	2982 9/21/2009	Gonzales	Ari	06511	\$ 750
31	1474 5/11/2009	Williams	Emanuel	06511	\$ 750
32	3843 12/9/2009	Long	Roderick	06511	\$ 750
33	1473 5/11/2009	Butler	Edgar	06511	\$ 750
34	2009 6/26/2009	Mayo	Natalia	06511	\$ 750

^{there are no} Dumb Questions

Q: What do some of those other options mean inside of the Sort dialog box?

A: There are lots of different ways you can sort besides alphabetizing text and sorting numbers from smallest to largest or vice versa. For example, you can sort by color.

Q: Why would I want to sort by color?

A: Very often people will highlight cells in their spreadsheet to be different colors, and you'll see long spreadsheets that have various elements highlighted. If you'd like to group those elements together, you can sort by color.

Q: Is it good formatting practice to highlight cells by color? It seems like that would be an alternative to sorting in terms of drawing your eye to various parts of the spreadsheet.

A: Generally there are better ways to tag data than highlighting cells. You can sort by color, but most formulas can't read your cells' formatting. So if you want to tag interesting cells, it's better to add a column and insert your own text or Boolean functions (which you'll learn about later on).

Q: So we can sort by color. What else?

A: Under the Order drop box, you can set up a Custom List. Custom lists enable you to create any arbitrary sorting you want. So if Excel doesn't automatically sort your data in exactly the way you need it to, you can create a custom list that shows exactly how you need that data sorted.

Q: How big of a problem is it when Excel sorts one column but not another?

A: It can be terrible. Think about what would happen with this data: each donation amount is tied to a specific person, so if you changed the order of the donations but kept the order of people the same, you wouldn't know who gave what anymore.

Q: That sounds awful.

A: It happens. And it's indeed awful.

Q: How do I avoid it?

A: This is a reminder of a very important principle of dealing with data: always keep copies of your original data. Once you've done an analysis of the data, it's always a good idea to check your data against the original to make sure that nothing weird happened.

Q: That sounds true, but it's not very reassuring. How do I avoid a screwed-up sort?

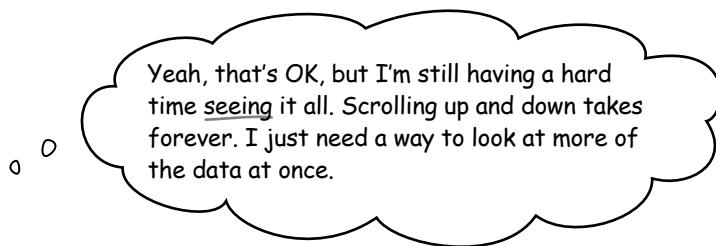
A: Sorting is another place where the Tables feature you learned about in Chapter 2 comes in handy. If you define your data set as a table, then you are being really explicit with Excel about the dimensions of your data.

Q: So then Excel always knows what data is in my table, and it won't accidentally just sort a single column.

A: Exactly. You don't have to define your data as a table in order to sort it correctly, but for the uber-paranoid the Table feature is the way to go.

Nice work on sorting that data.

Now you can see how many large donations fall into each zip. Let's see what the client thinks....



Looking at the data is a good thing.

It's a nonobvious but important part of data analysis, and your client is right to want to be able to see the data better, not just group it correctly. What should you do?

Your client

Scrolling all the way from the top to the bottom can take a long time...

ID	Date	Last Name	First Name	ZIP	Donation
1	6/12/2009	Gould	Amya	06511	\$ 10,000
2	12/16/2009	Kichacion	Jacoby	06511	\$ 5,000
3	7/26/2009	Stevens	Odin	06511	\$ 5,000
4	8/7/2009	Woodland	Carley	06511	\$ 5,000
5	7/26/2009	Charney	Branson	06511	\$ 5,000
6	4/8/2009	Mayer	Branna	06511	\$ 3,000
7	5/3/2009	Tyler	Jakob	06511	\$ 3,000
8	7/23/2009	Rogers	Antoine	06511	\$ 2,500
9	7/23/2009	Battle	Emilee	06511	\$ 2,500
10	12/3/2009	Harrison	Madilynn	06511	\$ 2,500
11	5/3/2009	Giles	Conrad	06511	\$ 2,500
12	6/3/2009	Williamson	Gillian	06511	\$ 2,500
13	10/12/2009	Morton	Julio	06511	\$ 2,000
14	5/25/2009	Bradley	Jillian	06511	\$ 2,000
15	4/18/2009	Curtis	Saniyah	06511	\$ 1,000
16	2/17/2009	Booker	James	06511	\$ 1,000
17	4/8/2009	Sánchez	Diva	06511	\$ 1,000
18	11/26/2009	Mullins	Laila	06511	\$ 1,000
19	5/13/2009	Gay	Dallas	06511	\$ 1,000
20	2/17/2009	Pruett	Tony	06511	\$ 1,000

ID	Date	Last Name	First Name	ZIP	Donation
4002	10/22/2009	Woods	Dorian	90210	\$ 100
4003	10/22/2009	Morrison	Erika	90210	\$ 300
4005	7/3/2009	Fernando	Fernando	90210	\$ 100
4006	1/13/2009	Lara	Amara	90210	\$ 100
4007	11/1/2009	Richmond	Adalynn	90210	\$ 300
4008	6/8/2009	Braden	Braden	90210	\$ 200
4009	5/26/2009	Briggs	Joanne	90210	\$ 250
4010	8/7/2009	Deacon	Courtney	90210	\$ 100
4011	4/29/2009	York	Benjamin	90210	\$ 200
4012	5/1	Winters	Hazekiah	90210	\$ 200
4093	5/25/2009	Alamrah	Alamrah	90210	\$ 100
4094	4/1/2009	Rowland	Quincy	90210	\$ 100
4095	12/9/2009	McLain	Kyle	90210	\$ 100
4096	10/16/2009	Quinn	Trinity	90210	\$ 50
4097	1/18/2009	Coffey	Colt	90210	\$ 20
4098	1/18/2009	Gutiérrez	Chasity	90210	\$ 10
4099	3/6/2009	Graves	Billy	90210	\$ 5
4100	8/25/2009	Bellomy	Ximena	90210	\$ 5
4101	6/18/2009	Barlow	Tanayah	90210	\$ 5

...and a long scroll is a great way to lose track of the big picture about your data.



What do you think of each of these solutions? Is it a good idea? Is one of them the best?

- 1** Use formulas to create summaries of the data.

.....
.....
.....

- 2** Get a really big monitor.

.....
.....
.....

- 3** Delete records you don't need.

.....
.....
.....

- 4** Zoom out.

.....
.....
.....



What can you do to help your client get a better perspective on the big picture of the data?

- 1 Use formulas to create summaries of the data.

I can do this, but it isn't really what the client is asking for. Formulas and their results might be illuminating, but they take you away from actually looking at the data.

- 2 Get a really big monitor.

This is a great idea! It would be great to be able to see a few thousand legible spreadsheet cells on the screen at once. Problem is, big monitors can get expensive, and that's probably not a reasonable response to the client.

- 3 Delete records you don't need.

No way. This is just asking for trouble. If I really can't find a way to get the right visualization of your data, I can use summaries based on formulas. Deleting records is the fastest way to lose all perspective on the data.

- 4 Zoom out.

Zooming out is a great idea. Sometimes you need to look at the forest, and sometimes you need to look at the trees. Zooming will let us do it.

Zooming in and out on data is something that spreadsheet ninjas do all the time.

See a lot more of your data with Zoom

Sometimes you need to focus on a small part of your data. Why not zoom way in?

Here's your spreadsheet at 400% zoom.

Maybe you need to think really hard about Jada Luna!

	C	Last Name	First Name
1	344	Miles	Shayla
345	Luna	Jada	
346	Boyd	Malakai	
347	Nicholson	Cynthia	
348	Powers	Jensen	

Sometimes you need to focus on the big picture. In that case, zoom way out.

This is your spreadsheet zoomed out to 25%.

If you look closely, you can see quite a lot.

Column A	Column B	Column C	Column D	Column E	Column F	Column G	Column H	Column I	Column J
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Getting the big picture through zooming out is **not about straining your eyes** (if you feel your eyes strain, you should be zooming in!). It's about looking at as much of the whole picture of your data as you can see at once. To zoom, click the View tab to get to the Zoom button.



Exercise

1

Zoom out to see all your data.

2

Poke around a little. What zip has the most big donors?

Exercise Solution



Were you able to get a better perspective on the data after zooming way out?

Microsoft Excel - hfe_ch04_data - Microsoft Excel

Home Insert Page Layout Formulas Data Review View

A93 f_x 2398

1	ID	Date*	Last Name*	First Name*	ZIP	Destination							
	A	B	C	D	E	F	G	H	I	J	K	L	M
92	2406	3/14/2009	Berry	Ruid	76511	\$ 100							
93	2393	7/13/2009	Hiner	Madeleine	76511	\$ 50							
94	3447	10/13/2009	Ertor	Tritian	76511	\$ 20							
95	3986	12/20/2009	Baylor	Rivuen	76511	\$ 20							
96	2549	8/15/2009	Harrington	Annie	76511	\$ 20							
97	2255	7/18/2009	Gray	Jamarcus	76511	\$ 20							
98	3634	11/18/2009	Hale	Kaydence	76511	\$ 10							
99	111	1/11/2009	Washington	Jeremy	76511	\$ 10							
100	1020	3/13/2009	Terrill	Jarh	76511	\$ 5							
101	11	1/14/2009	Albert	Charlis	76511	\$ 5							
102	2963	9/26/2009	Benjamin	Thomar	70012	\$ 50,000							
103	307	1/28/2009	Susanna	Carilar	70012	\$ 10,000							
104	3789	12/14/2009	Gibran	Hauard	70012	\$ 5,000							
105	1279	4/22/2009	Faulkner	Garrett	70012	\$ 5,000							
106	3159	10/7/2009	Guy	Suran	70012	\$ 5,000							
107	3285	10/18/2009	Haffman	Trevan	70012	\$ 5,000							
108	2448	9/4/2009	Bernard	Deytan	70012	\$ 5,000							
109	1755	6/4/2009	Leklanc	Denire	70012	\$ 5,000							
110	3134	10/5/2009	Martian	Ryder	70012	\$ 5,000							
111	695	3/5/2009	Britt	Gilberto	70012	\$ 5,000							
112	99	1/10/2009	Santur	Tyrell	70012	\$ 5,000							
113	2434	10/13/2009	Halland	Kady	70012	\$ 5,000							
114	1772	6/6/2009	Daminoquez	Jakayla	70012	\$ 5,000							
115	2712	8/29/2009	Walker	Izakella	70012	\$ 5,000							
116	3833	12/8/2009	Knapp	Gradualupe	70012	\$ 5,000							
117	3027	4/25/2009	Casper	Cristina	70012	\$ 5,000							
118	610	2/25/2009	Kramer	Camryn	70012	\$ 5,000							
119	2835	9/8/2009	Cachran	Stirley	70012	\$ 5,000							
120	2380	7/30/2009	Woodard	Calton	70012	\$ 5,000							
121	709	3/6/2009	Warkman	Haylie	70012	\$ 5,000							
122	567	2/24/2009	Aquine	Valentina	70012	\$ 5,000							
123	3286	10/18/2009	Webb	Halley	70012	\$ 3,000							
124	1738	6/24/2009	Nebert	Farshad	70012	\$ 3,000							
125	1611	5/22/2009	Ruiz	Matiar	70012	\$ 3,000							
126	486	2/14/2009	Berg	Exequiel	70012	\$ 3,000							
127	1499	5/12/2009	Pugh	Zochariah	70012	\$ 3,000							
128	1652	5/25/2009	Cohen	Andley	70012	\$ 3,000							
129	1547	5/17/2009	Stanley	Amiah	70012	\$ 3,000							
130	1168	4/13/2009	Zamora	Karly	70012	\$ 3,000							
131	2408	10/25/2009	Hubbard	Giuliana	70012	\$ 3,000							
132	2162	7/19/2009	Peck	Jaylen	70012	\$ 3,000							

Zip 10012 appears to have
the most large donors!

123	1591	5/24/2009	Houell	Anna	\$10012	\$ 3,000
134	3016	9/24/2009	French	Albert	\$10012	\$ 3,000
135	3744	1/13/2009	Baker	Izayah	\$10012	\$ 3,000
136	3268	10/17/2009	McCarthy	Baron	\$10012	\$ 2,500
137	3150	10/6/2009	Shepard	Marcus	\$10012	\$ 2,500
138	1132	4/9/2009	Berry	Aleena	\$10012	\$ 2,500
139	811	3/15/2009	Dillard	Nick	\$10012	\$ 2,500
140	732	3/8/2009	Watts	Heidi	\$10012	\$ 2,500
141	55	1/6/2009	Macdon	Colleen	\$10012	\$ 2,500
142	3814	12/6/2009	Weir	Sunny	\$10012	\$ 2,500
143	2721	8/30/2009	Bender	Cesar	\$10012	\$ 2,500
144	1788	6/7/2009	Kinney	Jasmine	\$10012	\$ 2,500
145	3881	12/12/2009	Carter	Campbell	\$10012	\$ 2,500
146	2326	10/22/2009	O'Brien	Ramy	\$10012	\$ 2,500
147	2596	11/15/2009	Dunlap	Turkan	\$10012	\$ 2,500
148	679	3/4/2009	Mendoza	Katelyn	\$10012	\$ 2,500
149	1640	5/25/2009	Daniels	Jaquline	\$10012	\$ 2,000
150	298	11/27/2009	Bird	Franco	\$10012	\$ 2,000
151	749	3/9/2009	Watkins	Mareli	\$10012	\$ 2,000
152	1653	5/26/2009	DeLaruz	Kendra	\$10012	\$ 2,000
153	3191	10/10/2009	Harrington	Gina	\$10012	\$ 2,000
154	1267	4/24/2009	Hable	Brian	\$10012	\$ 2,000
155	34	1/4/2009	Knight	Darnell	\$10012	\$ 2,000
156	286	1/24/2009	Ray	Amiya	\$10012	\$ 2,000
157	2550	8/16/2009	Raberto	Jordin	\$10012	\$ 2,000
158	1641	5/25/2009	March	Karter	\$10012	\$ 2,000
159	2067	7/22/2009	Lynch	Vincent	\$10012	\$ 2,000
160	2316	7/25/2009	Fleming	Kareem	\$10012	\$ 2,000
161	3269	10/17/2009	Callahan	Mahammed	\$10012	\$ 2,000
162	2317	7/25/2009	Snyder	Alfredo	\$10012	\$ 2,000
163	4086	12/3/2009	Marshall	Karren	\$10012	\$ 2,000
164	2439	8/6/2009	Dawhorty	Autumn	\$10012	\$ 2,000
165	2866	12/11/2009	Dickerson	Jordan	\$10012	\$ 2,000
166	1192	4/15/2009	Taurean	Anitra	\$10012	\$ 2,000
167	598	2/25/2009	Mandy	Sophie	\$10012	\$ 2,000
168	3288	10/18/2009	Zimmerman	Eith	\$10012	\$ 2,000
169	925	2/24/2009	Maynor	Kendrick	\$10012	\$ 2,000
170	1094	4/15/2009	Schmidt	Howard	\$10012	\$ 2,000
171	913	3/23/2009	Wilkin	Kadence	\$10012	\$ 2,000
172	3113	10/13/2009	Sweeney	Alina	\$10012	\$ 1,500
173	2432	8/5/2009	Mcmillian	Haley	\$10012	\$ 1,500
174	1193	4/15/2009	Preston	Theora	\$10012	\$ 1,500
175	2597	1/16/2009	Santiago	Abbie	\$10012	\$ 1,500
176	3734	1/24/2009	Suarez	Addiyn	\$10012	\$ 1,500
177	3907	12/14/2009	Zimmerman	Jasmine	\$10012	\$ 1,500
178	2311	7/24/2009	Maynard	Kareem	\$10012	\$ 1,500
179	3519	11/8/2009	Jahantan	Caridy	\$10012	\$ 1,500
180	3224	1/30/2009	Baker	Bailey	\$10012	\$ 1,500
181	1418	5/6/2009	Baker	Daniela	\$10012	\$ 1,500

Ready

Your client is impressed!



That is just what we're looking for. Good job. I believed in your abilities and I can see that I was right. Now I have a more specific question for you. I really just want to look at the big donors (say, people who've given \$1,000 or more) in zip code 78723. Let me see what you can come up with.

Looks like Mr. Demanding is impressed!

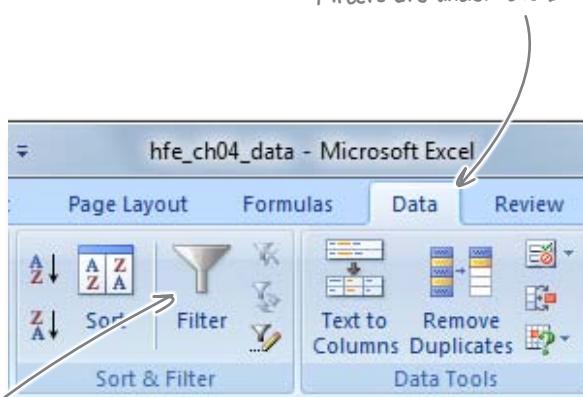
Without running any sort of function or doing any sort of formatting, you were able to sort and zoom your way to a greater clarity about his data.

But now he wants to focus on just one subset of the data. You know you can't just **delete** the data he doesn't want to focus on. How can you look at just the data he wants without changing the rest of the data?

Filters hide data you don't want to see

Sorting and zooming have given you a rich big-picture perspective, but sometimes you want to look at just a slice of data. Try clicking on the **Filter** button.

Filters are under the Data tab on the Ribbon.



This little funnel represents the Filter.

Filters are convenient because they give you a way to **hide the data you don't want to see**. It's still very much there; it's just conveniently out of the way. And just as with sorting, when you're exploring a new data set for the first time, it's a great idea to run filters to look at various subsets of the data.



Select a cell in the column you want to filter and click Filter. What happens?

Use Filter drop boxes to tell Excel how to filter your data

When you click on the Filter button, Excel puts a drop box on every column in your data table.

Click one of these to activate the Filter drop box for that column.

ID	Date	Last Name	First Name	ZIP	Donation
1841	6/12/2009	Gould	Amy	06511	\$ 10,000
3855	12/10/2009	Richardson	Jacoby	06511	\$ 5,000
2332	7/26/2009	Stevens	Cedric	06511	\$ 5,000
2455	8/7/2009	Woodard	Carley	06511	\$ 5,000
2335	7/26/2009	Smalley	Bramon	06511	\$ 5,000
1121	4/8/2009	Mayer	Briana	06511	\$ 3,000
747	3/9/2009	Tyler	Jakob	06511	\$ 3,000
2288	7/22/2009	Rogers	Antoine	06511	\$ 2,500
2371	7/29/2009	Battle	Emilee	06511	\$ 2,500
3780	12/3/2009	Harris	Madison	06511	\$ 2,500
653	3/2/2009	Giles			
2681	4/27/2009	Williamson			
3217	10/12/2009	Morton			
1642	5/25/2009	Bradley			
1145	4/10/2009	Curtis			
524	2/17/2009	Booker			
1095	4/6/2009	Sanchez			
3646	11/20/2009	Mullins			
1500	5/13/2009	Gay			
2236	7/17/2009	Pruitt			

When you click on one of the drop boxes, Excel gives you a bunch of options for filtering the data based on the data in that column.

You tell Excel to sort from inside the Filter drop box.

These values are a complete list of all the different pieces of data in the ZIP column.

Uncheck "Select All" to reset the filter so that nothing is selected.

Each of the seven zip codes represented in your data set are listed in the Filter drop box for ZIP. Because they're all checked, Excel is showing all of them. But you only want to see 78723....

The screenshot shows the Microsoft Excel ribbon at the top with the 'Data' tab selected. Below the ribbon, a data table is displayed with columns for ID, Date, Last Name, First Name, ZIP, and Donation. A filter icon is visible in the header row of the ZIP column. A callout arrow points from the text 'You tell Excel to sort from inside the Filter drop box.' to the filter icon. Another callout arrow points from the text 'These values are a complete list of all the different pieces of data in the ZIP column.' to the list of ZIP codes in the filter dialog. A third callout arrow points from the text 'Uncheck "Select All" to reset the filter so that nothing is selected.' to the 'Select All' checkbox in the filter dialog. The filter dialog box is open over the data table, showing the following list of ZIP codes:

- Select All
- 06511
- 10012
- 20817
- 34234
- 60603
- 78723
- 90210

At the bottom of the dialog are 'OK' and 'Cancel' buttons.

An unexpected note from the Main Campaign...

Yikes...they're cracking the whip!

From: Main Campaign
To: Head First
Subject: 78723

Dear Head First,

Something you should know about political campaigns: we move fast. Everything we do is due yesterday.

What I'm saying is, we need that 78723 data subset now. For real, *right now*.

—M.C.

Better get that database back to them right away....



Your client wants to see a list that contains only people who live in the 78723 zip code and who gave \$1,000 or more. Use filters to create that list.

1

Tell Excel to filter by zip 78723. With the Filter drop box activated for the ZIP field, uncheck the Select All box so that none of the zips are selected. Then select the 78723 zip and press OK.

This one is easy.

2

Apply **another** filter that shows only people with donations of \$1,000 or more. Select the Donation filter drop box and then the options that you believe will show you only the individuals you want to see.

This one's a little trickier.



Exercise Solution

Were you able to apply the filters that show only people from zip 78723 who gave \$1,000 or more?

1

Tell Excel to filter by zip 78723. With the Filter drop box activated for the ZIP field, uncheck the Select All box so that none of the zips is selected. Then select the 78723 zip and press OK.

Here's what your filter should look like to make the screen show only 78723.

Your data has now gone from showing everything to showing only 78723.

You can see your filter is working by looking at the blue row numbers.

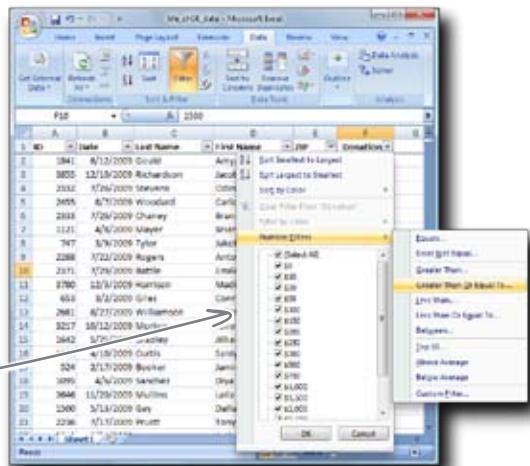
ID	Date	Last Name	First Name	ZIP	Donation
1	8/12/2009	Gould	Richard	78723	\$ 10,000
2	11/10/2009	Hicks	Richardson	78723	\$ 3,000
3	7/26/2009	Stevens	Sherry	78723	\$ 3,000
4	8/7/2009	Woodard	Shirley	78723	\$ 3,000
5	7/26/2009	Cherry	Sherri	78723	\$ 3,000
6	4/8/2009	Mayer	Shirley	78723	\$ 3,000
7	4/7/2009	Tyler	Shirley	78723	\$ 3,000
8	7/22/2009	Rogers	Shirley	78723	\$ 3,000
9	7/29/2009	Bailey	Shirley	78723	\$ 3,000
10	xpm	Hammond	Shirley	78723	\$ 3,000
11	5/2/2009	Giles	Shirley	78723	\$ 3,000
12	8/27/2009	Williams	Shirley	78723	\$ 3,000
13	10/12/2009	Morton	Shirley	78723	\$ 3,000
14	5/25/2009	Bradley	Shirley	78723	\$ 3,000
15	4/10/2009	Curtis	Shirley	78723	\$ 3,000
16	3/17/2009	Booker	Shirley	78723	\$ 3,000
17	4/8/2009	Sanchez	Shirley	78723	\$ 3,000
18	11/20/2009	Mullins	Shirley	78723	\$ 3,000
19	5/13/2009	Goy	Shirley	78723	\$ 3,000
20	7/17/2009	Fruit	Shirley	78723	\$ 3,000

ID	Date	Last Name	First Name	ZIP	Donation
102	4/7/2009	Meadows	Laurie	60669	\$ 10
104	2/16/2009	Afford	McMurry	60669	\$ 10
105	4/6/2009	Sims	samuel	60669	\$ 10
107	6/2/2009	Jennings	Alyssandra	60669	\$ 10
108	6/2/2009	Jordan	Amir	60669	\$ 10
109	4/1/2009	Elton	Melony	60669	\$ 10
110	9/1/2009	Wright	Ananya	60669	\$ 10
111	8/26/2009	Quinn	Ryan	60669	\$ 10
112	11/16/2009	James	Savannah	60669	\$ 10
113	4/26/2009	Joiner	Alice	78723	\$ 10,000
114	4/17/2009	Decker	Kaylie	78723	\$ 3,000
115	1/21/2009	Dockor	Kaylee	78723	\$ 3,000
116	7/31/2009	Hearn	jeremiah	78723	\$ 3,000
117	2/2/2009	Berry	stanley	78723	\$ 3,000
118	11/2/2009	Compton	Mavenski	78723	\$ 3,000
119	1/2/2009	Crane	knail	78723	\$ 3,000
120	1/2/2009	Levert	Derrick	78723	\$ 3,000
121	4/1/2009	Robbins	Dominic	78723	\$ 3,000
122	11/2/2009	Kerr	Dominic	78723	\$ 3,000
123	10/8/2009	Patrick	Isabella	78723	\$ 2,000
124	2/1/2009	Farmer	Isidore	78723	\$ 2,000
125	7/27/2009	Joiner	Ivory	78723	\$ 2,000
126	10/2/2009	Brayden	Jaylen	78723	\$ 2,000
127	10/2/2009	Wiley	Kyleian	78723	\$ 2,000
128	3/2/2009	Serge	Isayah	78723	\$ 2,000
129	1/2/2009	Arnold	Sharon	78723	\$ 2,000
130	6/16/2009	Clanton	Shanel	78723	\$ 2,000
131	8/1/2009	Hooper	Sienna	78723	\$ 2,000
132	10/8/2009	Hage	Nathaniel	78723	\$ 2,000
133	7/6/2009	Harvey	Sabrina	78723	\$ 2,000
134	2/18/2009	Wolfe	Acelyn	78723	\$ 2,000

2

- Apply **another** filter that shows only people with donations of \$1,000 or more. Select the Donation filter drop box and then the options that you believe will show you only the individual you want to see.

You need to select the Number Filter to add your Donation parameters.



When you select Greater Than or Equal To, this dialog pops up.

Now your filter is complete.

All of the data is still there, but it's hidden!

ID	Date	Last Name	First Name	ZIP	Donation (\$)
1052	1/3/2009	Joyner	Alex	76723	\$ 10,000
1029	1/12/2009	Decker	Kaylie	76723	\$ 3,000
1054	7/31/2009	Heath	Jeremiah	76723	\$ 1,000
1055	4/22/2009	Berry	Stanley	76723	\$ 1,000
1056	11/27/2009	Conpton	Maverick	76723	\$ 1,000
1057	5/5/2009	Orane	Khalid	76723	\$ 1,000
1058	12/1/2009	Lewis	Demick	76723	\$ 1,000
1059	4/13/2009	Robbins	Dawn	76723	\$ 1,000
1060	1/27/2009	Kerr	Martha	76723	\$ 1,000
1061	10/30/2009	Patrick	Padra	76723	\$ 2,000
1062	3/11/2009	Tanner	Sydney	76723	\$ 2,000
1063	3/27/2009	Cunningham	Bryallen	76723	\$ 2,000
1064	10/2/2009	Wiley	Rowan	76723	\$ 2,000
1065	1/23/2009	Berger	Izayah	76723	\$ 2,000
1066	1/28/2009	Arnold	Sharon	76723	\$ 2,000
1067	1/16/2009	Dalton	Chanel	76723	\$ 2,000
1068	6/17/2009	Hooper	Edwin	76723	\$ 2,000
1069	5/14/2009	Page	Nathaniel	76723	\$ 2,000
1070	7/1/2009	Havry	Sabrina	76723	\$ 2,000
1071	6/29/2009	Wolfe	Aldyn	76723	\$ 2,000

The Main Campaign is delighted with your work



This is kind of ambiguous.

A guy named Alex who's a big giver? There could be tons of people in the database named Alex! This could be like finding a needle in a haystack. Except that we have a potent tool: filters.

there are no Dumb Questions

Q: What ever happened to writing formulas? It seems like all this sorting, zooming, and filtering is really just a prelude to writing formulas, which is the real meat of data analysis.

A: It'd be better to say that good thinking about data is the substance of data analysis, not writing formulas or any other feature of Excel or any other software.

Q: So where do sort/zoom/filter and formulas fit into data analysis?

A: Sorting, zooming, and filtering are great tools to use to get a sense of what is inside data that you are looking at for the first time. Sometimes you just need a better perspective on your data, and the way to get at that perspective is literally to look at the data in a bunch of different ways.

Q: So once I want to start drawing conclusions about data, I'm probably not going to need sort/zoom/filter so much, right?

A: Your mileage may vary. It may be that your specific problem really needs nothing besides the perspective that these visualization tools give you. Or it may be that you need to create a model that summarizes and manipulates the data once you've gotten the perspective you need.

Q: So that is where formulas come in?

A: Yes. Formulas, in their most general sense, take data as arguments and return new data. If your analytic goals aren't met by simply changing your point of view on the data, chances are you'll need to hit the data with some formulas to achieve the manipulation or summary that you need.

Q: Still, it's kind of cool just how much you can do with these visualization tools.

A: Definitely. Don't just accept without question the default zoom amount of Excel or the ordering of the data for analysis you receive. You can use sorting, zooming, and filtering to change up your perspective in a big way, enabling you to understand your data better.



This client request is a toughie. Your client found a big donor named Alex, or so he thinks. Can you find this mysterious "Alex"?

1 Clear your old filter. To do this, click the Filter button twice: first to eliminate the filter, and second to start a new filter.

2 Use your filter to find Alex! What do you find?

.....
.....
.....

Hint: There's no one named Alex in the data. Do what you need to do to help your client!



Exercise Solutions

Were you able to dig up this mysterious donor?

- 1 Clear your old filter. To do this, click the Filter button twice: first to eliminate the filter, and second to start a new filter.
 - 2 Use your filter to find Alex!

There's no Alex, but there's Alec, Alejandro, and Alessandro. All of

them are small givers, except for one of them. There's an Alec who's a

\$10,000 donor. He must be the one!

What you see here depends on the specific filter you created.

hfe_ch04_data - Microsoft Excel

The screenshot shows the Microsoft Excel ribbon with the 'Data' tab selected. Under the 'Data' tab, the 'Sort & Filter' group is active, with the 'Filter' button highlighted. The main worksheet area displays a data table with columns: ID, Date, Last Name, First Name, ZIP, and Donation. A filter icon is visible next to the first row of data. The status bar at the bottom indicates 'Ready' and '13 of 4100 records found'.

	A	B	C	D	E	F
1	ID	Date	Last Name	First Name	ZIP	Donation
37	3899	12/13/2009	Reid	Alejandro	10012	\$ 300
214	2291	7/22/2009	Crawford	Alec	34234	\$ 250
541	518	2/16/2009	Simon	Alec	10012	\$ 250
738	1777	6/6/2009	Harrison	Alec	10012	\$ 250
802	33	1/3/2009	Barr	Alec	20817	\$ 5
1159	1345	4/29/2009	Joyner	Alec	78723	\$ 10,000
1393	2136	7/8/2009	Collins	Alec	60603	\$ 100
1471	563	2/20/2009	Gross	Alessandro	10012	\$ 100
1630	643	2/28/2009	Weeks	Alejandro	10012	\$ 10
1751	2575	8/18/2009	Mitchell	Alexzander	10012	\$ 100
2393	905	3/22/2009	Fuller	Alec	20817	\$ 250
2507	3402	10/27/2009	Dennis	Alessandro	10012	\$ 250
3164	3045	9/26/2009	Carpenter	Alec	10012	\$ 250
4102						
4103						
4104						
4105						

Here's our man.

Your own screen may look different.

Donations are pouring in!

The Main Campaign was able to get in touch with Alec, and the lists you isolated have proven to be really valuable for the Dataville mayor's fundraising efforts!

From: Dataville Mayor
To: Head First
Subject: Nice job with the data

Dear Head First,

As I kicked off my campaign I was frankly somewhat surprised to discover all my top donors fully organized and taken care of. In the past, this has been like herding cats.

I asked the Main Campaign what they'd done differently this year to achieve such expedient and efficient results. Their answer was that you'd done it.

I've suggested to the Main Campaign that they send all my campaign's data work to you. It's quite a lot, but you've shown that you can handle it. Congratulations.

—The Dataville Mayor

Great work!

This is what you had hoped for!

5 data types

Make Excel value your values



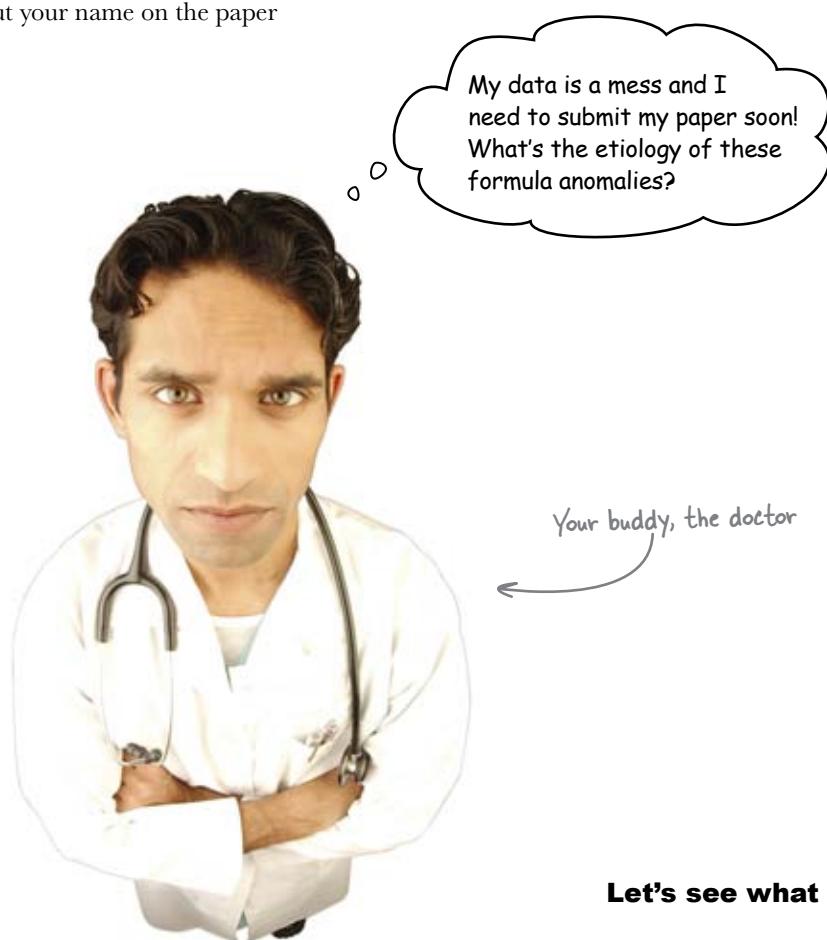
Excel doesn't always show you what it's thinking.

Sometimes, Excel will show you a number but think of it as text. Or it might show you some text that it sees as a number. Excel will even show you data that is neither number nor text! In this chapter, you're going to **learn how to see data the way Excel sees it**, no matter how it's displayed. Not only will this knowledge give you greater control over your data (and fewer "What the #\\$%! is going on?" experiences), but it will also help you unlock the whole universe of formulas.

Your doctor friend is on a deadline and has broken data

He's just completed a landmark study that evaluates the effectiveness of a drug on a patient's white blood cell counts, and his results are going to be really important for clinical practice.

But there's a problem. His data is exhibiting **weird behaviors** that prevent him from using formulas. Can you fix his data for him? If you help, he'll put your name on the paper he publishes.



Let's see what the problem is....



Exercise

Let's start off by trying to get the average white blood cell count for the pre-treatment control group. Load the data and see if you can use the AVERAGE () function to calculate the average.

Load this!

www.headfirstlabs.com/books/hfexcel/hfe_ch05_white_blood_cells.xlsx

Before treatment		After treatment	
Control	Experiment	Control	Experiment
4079	4782	4700	6489
4626	4609	4444	5671
4592	5366	5076	6405
4116	4381	4979	5266
4880	4849	4764	6159
5373	4104	4518	7719
4416	3989	4968	6408
5041	5269	4510	6258
5125	5181	4633	7252
4831	4891	4244	6520
3927	4315	5628	5430
4774	4288	4433	5399
4687	3982	4452	7651
4635	5362	4042	4450
5018	3912	5066	6302
5233	4681	4030	5683
5006	5264	4374	5516
4062	4565	4020	5890
3911	4921	4293	6986
3979	4013	4607	5791
4059	4478	4577	6870
5079	5209	4358	5997
5676	4412	5149	5198
3734	4525	3720	6449
4413	5284	3805	5554
4102	5286	4554	6958
3855	4966	4430	5115
4067	4980	5757	6459
5033	4621	4838	6347
4327	4919	4706	6524



Exercise Solution

You just attempted to use the AVERAGE () function to get the average white blood cell count of the control group before treatment. What happened?

Before treatment		After treatment			
		Control	Experiment	Control	Experiment
1					
2	Control	Experiment			
3	4079	4782	4700	6489	
4	4626	4609	4444	5671	
5	4592	5366	5076	5405	
6	4116	4381	4979	5266	
7	4880	4849	4764	6159	
8	5373	4104	4518	7719	
9	4416	3989	4968	6408	
10	5041	5269	4510	6258	
11	5125	5181	4633	7252	
12	4831	4891	4244	6520	
13	3927	4315	5628	5430	
14	4774	4288	4433	5399	
15	4687	3982	4452	7651	
16	4635	5362	4042	4450	
17	5018	3912	5066	6302	
18	5233	4681	4030	5683	
19	5006	5264	4374	5516	
20	4062	4565	4020	5890	
21	3911	4921	4293	6986	
22	3979	4013	4607	5791	
23	4059	4478	4577	6870	
24	5079	5289	4358	5997	
25	5676	4412	5149	5198	
26	3734	4525	3720	6449	
27	4413	5284	3805	5554	
28	4102	5286	4554	6958	
29	3855	4966	4430	5115	
30	4867	4988	5757	6459	
31	5033	4621	4838	6347	
32	4327	4919	4706	6524	
33					
34		#DIV/0!			
35					
36					

Click on the help button
to get some assistance.

Here's your formula.

This isn't the average!

What is it?!

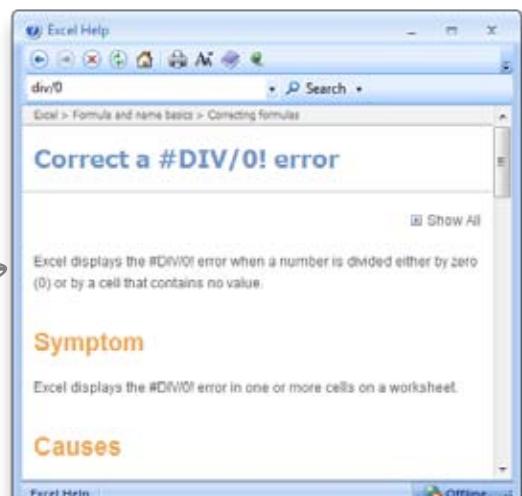
The formula returned an error.

Excel evaluated the argument, didn't like it, and spat out a #DIV/0! error. But what is that error, and what does it mean? Click on the exclamation mark next to cell A34 to find out.

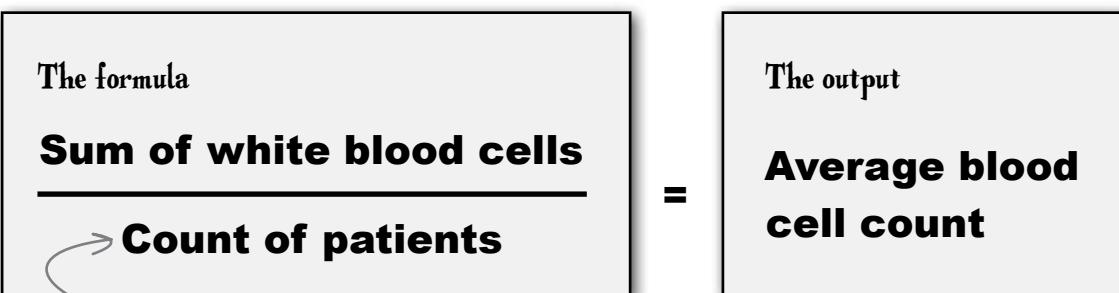
Somehow your average formula divided by zero

The help screen for the error you receive will tell you the kinds of things that are causing that error. Sometimes there are a bunch of possible reasons you're getting the error, and you need to rule some out in order to figure out which reason is in effect.

This is what #DIV/0! means.



Under the hood, Excel is using the AVERAGE () formula like this. For some reason, Excel sees "Count of patients" as equal to 0.



Somehow Excel sees this value as zero!



This makes no sense!
Clearly there are numbers there. Why would Excel count zero numbers?!?

See?!? Numbers!

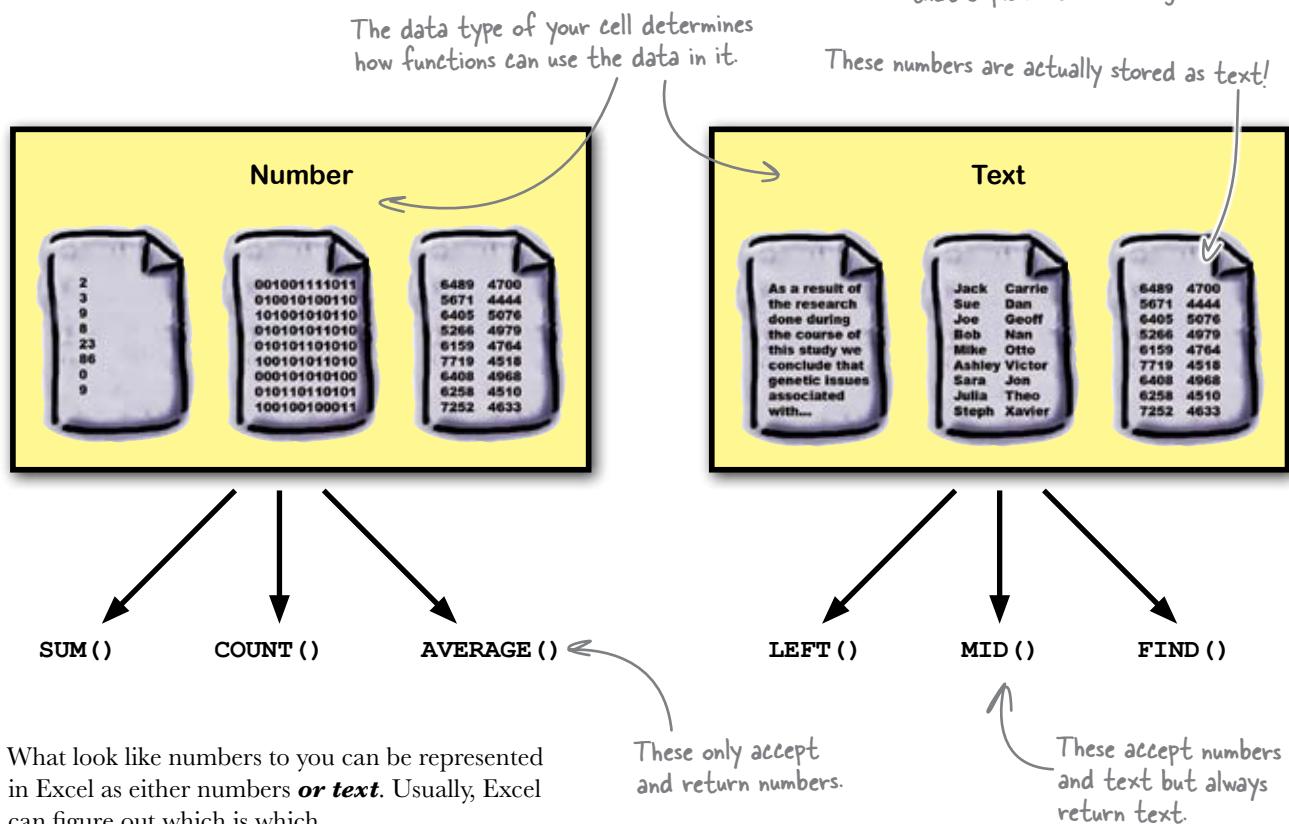
	A	B
1	Before treatment	
2	Control	Experiment
3	4079	1782
4	4626	4609
5	4592	5366
6	4116	4381
7	4880	4049

Maybe these green triangles have something to do with this weirdness.

Data in Excel can be text or numbers

The problem in this case is that even though your data consists of numbers, inside the spreadsheet those numbers have the wrong **data type**. Excel uses data types to distinguish among different types of data, and sometimes Excel gets data type assignments wrong.

Here, Excel has assigned the data type **text** to your blood cell counts when it should have assigned the type **number**. This has big implications for how Excel uses the data.



When you type something like this...

1.012

...Excel will recognize it and internally represent it as a number.

Sometimes, when you load data that looks like the numbers, Excel thinks it's text.

Pool Puzzle

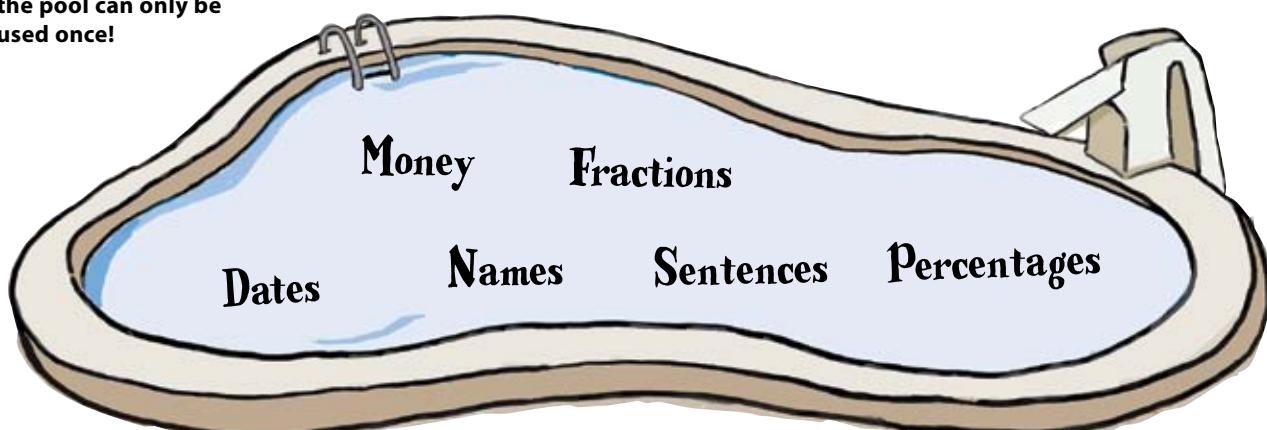


Your **job** is to take data types from the pool and place them into the blank lines in the Text and Number boxes. You may **not** use the same data type more than once. Your **goal** is to figure out how Excel needs to represent data internally.

Text

Number

Note: Each thing from the pool can only be used once!



Pool Puzzle Answers



You just classified a bunch of different
types of data as Text or Numbers.
What did you find?

Text

Sentences

Names

Number

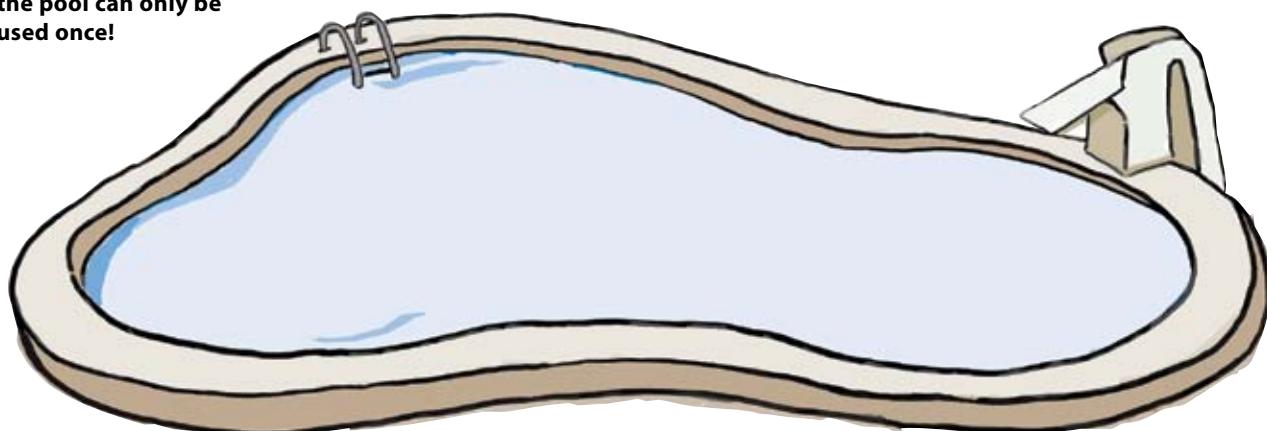
Money

Fractions

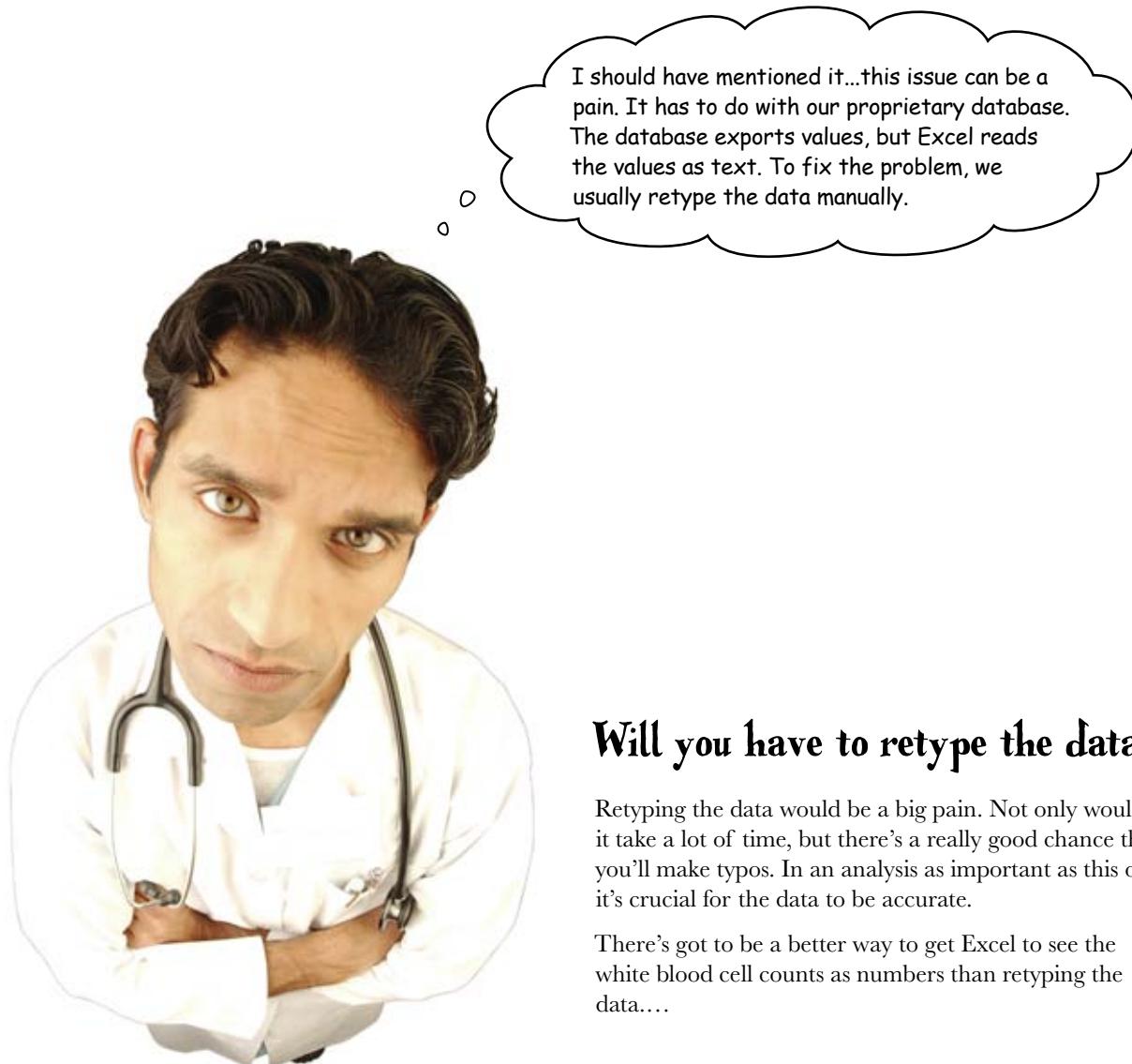
Dates

Percentages

Note: Each thing from
the pool can only be
used once!



The doctor has had this problem before



I should have mentioned it...this issue can be a pain. It has to do with our proprietary database. The database exports values, but Excel reads the values as text. To fix the problem, we usually retype the data manually.

Will you have to retype the data?

Retyping the data would be a big pain. Not only would it take a lot of time, but there's a really good chance that you'll make typos. In an analysis as important as this one, it's crucial for the data to be accurate.

There's got to be a better way to get Excel to see the white blood cell counts as numbers than retyping the data....

You need a function that tells Excel to treat your text as a value

Excel has functions to do all sorts of stuff, including turning text into values. You just need to pick the right function.

You need a function that enables you to do this.

You give the function your text.

=FUNCTION()



We still need to figure out which function will actually do this....

Excel reads the text value and sees that it's really a number.



The formula returns a number.

	A	B	C	D	E	F	G
1	Before treatment		After treatment				
2	Control	Experiment	Control	Experiment			
3	5670	4732	5100	5109			
4	5426	4629	5444	5671			
5	5426	5396	5076	5405			
6	5256	5236	5076	5266			
7	5116	5031	5170	5266			
8	4880	4889	4764	5159			
9	5273	5194	5138	5710			
10	5416	5039	5068	5408			
11	5043	5269	4530	5258			
12	5128	5181	4623	5252			
13	4871	5091	4244	5520			
14	5927	4315	5620	5430			
15	4774	4788	5433	5399			
16	2487	5987	5452	5751			
17	4835	5397	5042	4458			
18	5018	5917	5266	5102			
19	5233	4881	5430	5583			
20	5008	5294	5124	5516			
21	4062	4959	5020	5890			
22	5911	4921	5293	5968			
23	5979	5013	5607	5791			
24	4659	4478	4577	5370			
25	5079	5239	4358	5997			
26	5676	4412	5149	5198			
27	5724	4525	5220	5449			
28	4413	5284	5005	5354			
29	4502	5280	5554	5958			
30	3855	4996	5430	5115			
31	4867	4938	5357	5459			
32	5023	4921	5030	5347			
33	4227	4919	5706	5524			
34							

You need to take all these text values and convert them to number values.

What function will do this for you?



These functions are all related to data types. Some tell you about the data type of a cell, and some return values that change a cell's data type. Match each function to what it does.

VALUE

Returns a value that says whether a cell has something in it besides text.

TEXT

Tells you whether the data type of a cell is text.

ISREF

Converts a value to text.

TYPE

Tells you the data type of a cell.

ISTEXT

Returns the value of a cell regardless of whether a cell's data type is "value."

ISBLANK

Tells you whether the cell in the formulas argument is a reference.

ISNONTEXT

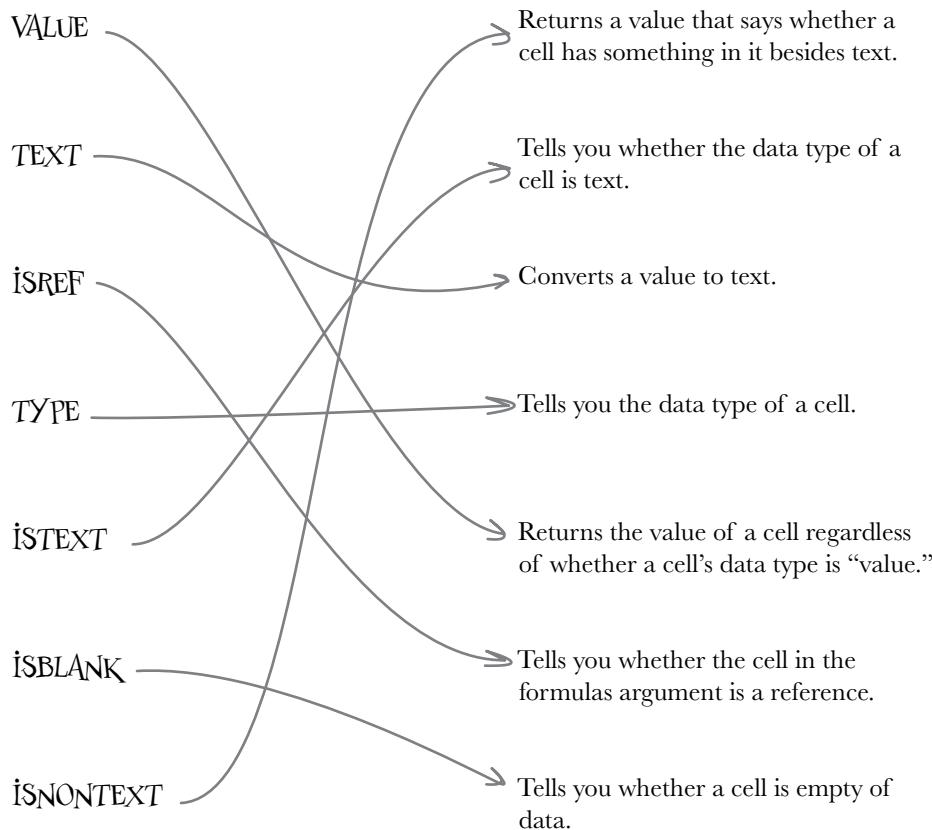
Tells you whether a cell is empty of data.

Which function will convert your text to numbers?

Write your answer here.

* WHO DOES WHAT? SOLUTION *

Each of these functions relates to data types. What did you determine that each does?



Which function will convert your text to numbers?

Definitely the VALUE() function!

Let's take VALUE () for a spin....



Exercise

Convert your text numbers to values. Get the average white blood cell count.

Fill columns F through I with `VALUE()` formulas that refer to A3:D32.

	A	B	C	D	E	F	G	H	I	J
1	Before treatment		After treatment							
2	Control	Experiment	Control	Experiment						
3	4079	4782	4700	6489						
4	4626	4609	4444	5671						
5	4592	5366	5076	6405						
6	4116	4381	4979	5266						
7	4880	4849	4764	6159						
8	5373	4104	4518	7719						
9	4416	3989	4968	6408						
10	5041	5269	4510	6258						
11	5125	5181	4633	7252						
12	4831	4891	4244	6520						
13	3927	4315	5628	5430						
14	4774	4288	4433	5399						
15	4687	3982	4452	7651						
16	4635	5362	4042	4450						
17	5018	3912	5066	6302						
18	5233	4681	4030	5683						
19	5006	5264	4374	5516						
20	4062	4565	4020	5890						
21	3911	4921	4293	6986						
22	3979	4013	4607	5791						
23	4059	4478	4577	6870						
24	5079	5289	4358	5997						
25	5676	4412	5149	5198						
26	3734	4525	3720	6449						
27	4413	5284	3805	5554						
28	4102	5286	4554	6958						
29	3855	4966	4430	5115						
30	4867	4988	5757	6459						
31	5033	4621	4838	6347						
32	4327	4919	4706	6524						
33										

Write formulas down here to get the average for each column.



Exercise Solution

Were you able to create formulas to tell Excel to represent the text values as numbers, and then get the average for each group?

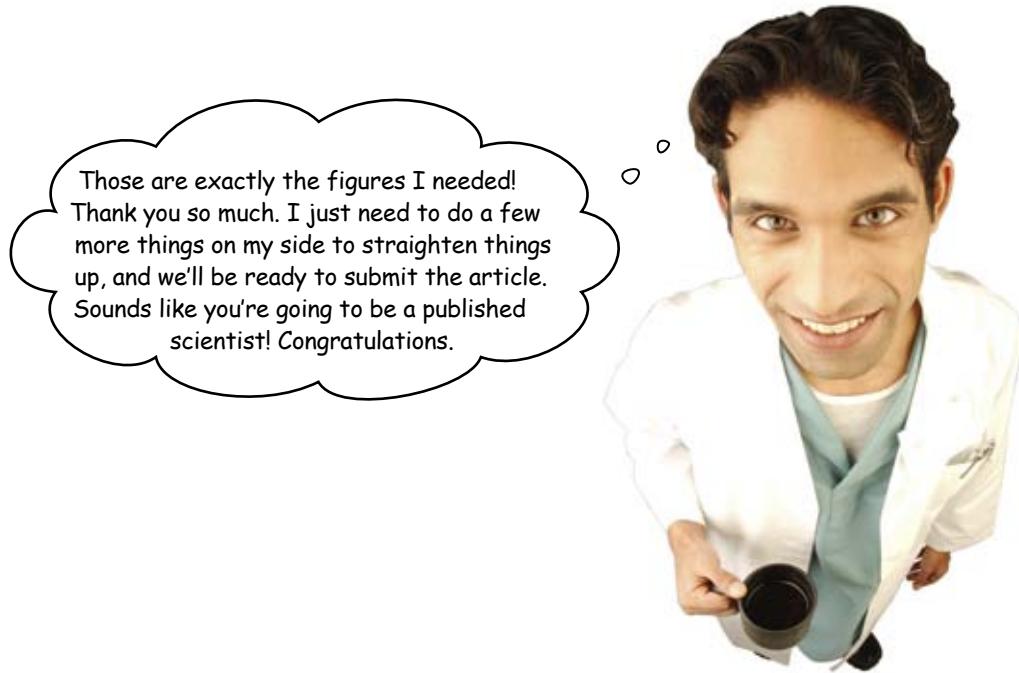
This cell has the formula =VALUE (A3).

	A	B	C	D	E	F	G	H	I	J
1	Before treatment		After treatment							
2	Control	Experiment	Control	Experiment		4079	4782	4700	6489	
3	4079	4782	4700	6489		4079	4782	4700	6489	
4	4626	4609	4444	5671		4626	4609	4444	5671	
5	4592	5366	5076	6405		4592	5366	5076	6405	
6	4116	4381	4979	5266		4116	4381	4979	5266	
7	4880	4849	4764	6159		4880	4849	4764	6159	
8	5373	4104	4518	7719		5373	4104	4518	7719	
9	4416	3989	4968	6408		4416	3989	4968	6408	
10	5041	5269	4510	6258		5041	5269	4510	6258	
11	5125	5181	4633	7252		5125	5181	4633	7252	
12	4831	4891	4244	6520		4831	4891	4244	6520	
13	3927	4315	5628	5430		3927	4315	5628	5430	
14	4774	4200	4433	5399		4774	4288	4433	5399	
15	4687	3982	4452	7651		4687	3982	4452	7651	
16	4635	5362	4042	4450		4635	5362	4042	4450	
17	5018	3912	5066	6302		5018	3912	5066	6302	
18	5233	4601	4030	5603		5233	4601	4030	5603	
19	5006	5264	4374	5516		5006	5264	4374	5516	
20	4062	4565	4020	5890		4062	4565	4020	5890	
21	3911	4921	4293	6986		3911	4921	4293	6986	
22	3979	4013	4607	5791		3979	4013	4607	5791	
23	4059	4478	4577	6870		4059	4478	4577	6870	
24	5079	5289	4358	5997		5079	5289	4358	5997	
25	5676	4412	5149	5198		5676	4412	5149	5198	
26	3734	4525	3720	6449		3734	4525	3720	6449	
27	4413	5204	3805	5554		4413	5204	3805	5554	
28	4102	5286	4554	6958		4102	5286	4554	6958	
29	3855	4966	4430	5115		3855	4966	4430	5115	
30	4867	4988	5757	6459		4867	4988	5757	6459	
31	5033	4621	4038	6347		5033	4621	4038	6347	
32	4327	4919	4706	6524		4327	4919	4706	6524	
33										
34					Average	4581.867	4716.4	4589.167	6157.2	
35										
36										

This cell has the formula =VALUE (C15).

Here you go!

These are the averages
you've been looking for!



there are no Dumb Questions

Q: When is changing data types likely to be an issue for me?

A: Chances are, you're most likely to experience it when you load data into Excel that has been exported from another system, like a relational database.

Q: So Excel generally does a good job at figuring out my data types when I type data into my spreadsheet?

A: Definitely. Excel is really smart at looking at what you type and assigning the correct data type. What's really important for you to know is that the visual representation of your data—how it looks and how it's formatted—doesn't necessarily tell you how Excel is representing the data internally.

Q: Why couldn't AVERAGE () automatically recognize my numbers as numbers even if their data type is text?

A: For all Excel knew, you *meant* for the white blood cell counts to have the data type text. While it's not terribly common, there are cases where you need numerical values to be stored as text, and Excel doesn't want to recast those values back to numbers if you have intentionally specified that they are text.

Q: Are numbers and text the only types of data I can use?

A: There are others. For example, the Boolean data type, which you'll learn about later in this book, gives you two options: TRUE and FALSE. Some of the functions you just saw, like ISTEXT (), return values that are of data type Boolean.

Q: What about the weird-looking error that the AVERAGE () formula returned? It certainly doesn't look like a number, or a Boolean, or text. It's like errors are their own thing entirely.

A: That's a reasonable intuition. Do you think that error values should have their own data type? While you're chewing on that question, let's take a closer look at errors....

A grad student also ran some stats...and there's a problem

Thought you were off the hook, didn't you?
Just as soon as your friend set off to do some work on his own, his grad student messed up the spreadsheet again. Oh, the agony of being an Excel guru!



Let's take a look at those formulas....



There are lots of errors in this spreadsheet. Let's take them one at a time, looking at the formulas that generated the errors. What do you think the errors mean?

	A	B	C	D	E
25	5676	4412	5149	5198	
26	3734	4525	3720	6449	
27	4413	5284	3005	5554	
28	4102	5286	4554	6958	
29	3855	4966	4430	5115	
30	4867	4988	5757	6459	
31	5033	4621	4838	6347	
32	4327	4919	4706	6524	
33					
34					
35	Before treatment				
36		Average Reading	Standard Deviation		
37	Control	#REF!	#NAME?		
38	Experiment	4716.4	#NAME?		
39					
40	After treatment				
41		Average Reading	Standard Deviation		
42	Control	4589.1667	#NAME?		
43	Experiment	6157.2	#NAME?		
44					
45	Change				
46		Average Reading	Standard Deviation		
47	Control	#REF!	#VALUE!		
48	Experiment	1440.8	#NAME?		
49					
50					

[www.headfirstlabs.com/books/hfexcel/
hfe_ch05_modified.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch05_modified.xlsx)

Load this!

Here's the new data.

Look at all those errors...
what a mess!

Write your answers here.

#VALUE!

#REF!

#NAME?



Exercise Solution

You studied each of the errors closely. What do you think the errors mean?

	A	B	C	D	E
25	5676	4412	5149	5198	
26	3734	4525	3720	6449	
27	4413	5284	3005	5554	
28	4102	5286	4554	6958	
29	3855	4966	4430	5115	
30	4867	4988	5757	6459	
31	5033	4621	4838	6347	
32	4327	4919	4706	6924	
33					
35	Before treatment				
36		Average Reading	Standard Deviation		
37	Control	#REF!	#NAME?		
38	Experiment	4716.4	#NAME?		
39					
40	After treatment				
41		Average Reading	Standard Deviation		
42	Control	4589.1667	#NAME?		
43	Experiment	6157.2	#NAME?		
44					
45	Change				
46		Average Reading	Standard Deviation		
47	Control	#REF!	#VALUE!		
48	Experiment	1440.8	#NAME?		
49					
50					

The formula with the #VALUE! error points to this cell and probably is looking for a number rather than text.

#NAME? pops up when you type a formula name that doesn't exist.

If SD() isn't the right name for the standard deviation function, what is?

#REF! often happens when you paste a copied formula and some of its references point outside of the spreadsheet.

This function returns #REF! because it points to cell B37, which contains that error.

#VALUE!

It looks like this formula received text when it was looking for a value. Specifically, the cell C36 is in the formula, even though it's text.

#REF!

There's something wrong with the reference here. The =AVERAGE (#REF!) formula in cell B37 is all wrong.

#NAME?

The help says #NAME? means "The formula uses a custom function that is not available." Maybe the standard deviation formula has a different name?

Errors are a special data type

The designers of Excel made errors their own special data type. And by giving errors their own data type, they made it possible to create a number of formulas that handle errors specifically.

Errors are a big deal in Excel. Understanding how they work is critical to developing tight, functional spreadsheets.

Errors have a data type all to their own.

#DIV/0!

Here's a formula that definitely won't work.

=50/0

Excel returns an error.

This is not a text, a number, or a Boolean.

A bunch of errors and functions, in full costume, are playing a party game, "Who am I?" They'll give you a clue. You try to guess who they are, based on what they say. Assume they always tell the truth about themselves. Fill in the blanks to the right to identify the attendees.

Tonight's attendees:

IFERROR()

ISERR()

#N/A!

ERROR.TYPE()

Who am I?



Name

I return different values depending on whether my argument is an error or not.

I return a number to you that specifies what *sort* of error you've passed to me as an argument.

You get me when you forget to enter a required argument into a function.

I tell you whether my argument is an error or not.

A bunch of errors and functions, in full costume, are playing a party game, “Who am I?” They’ll give you a clue . You try to guess who they are, based on what they say. Assume they always tell the truth about themselves. Fill in the blanks to the right to identify the attendees.

Tonight’s attendees:

IFERROR()

#N/A!

ISERR()

ERROR.TYPE()

Who am I?



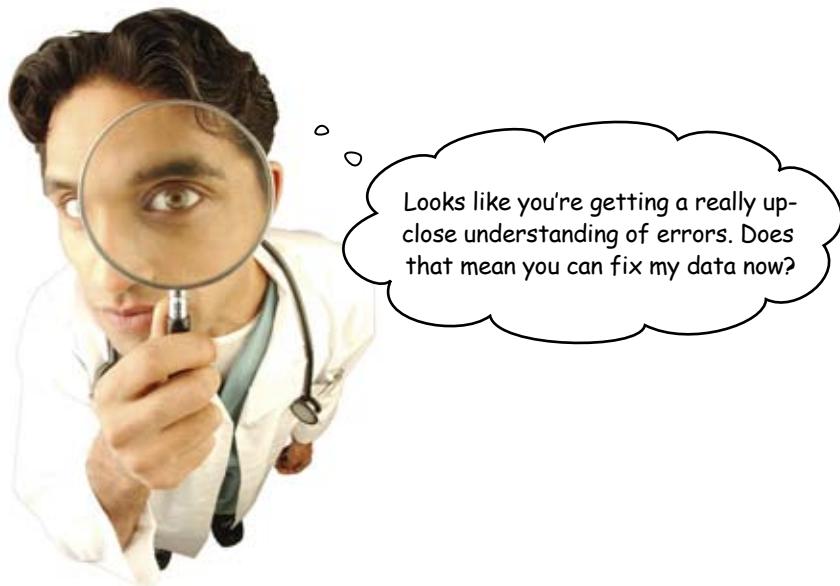
Name

IFERROR()

ERROR.TYPE()

#N/A!

ISERR()





Long Exercise

There are a bunch of problems with this spreadsheet, but you know what you need to know to correct them all at once. For each error, look at the formula and correct it.

Go through each of these formulas and see whether you can fix the error.

	A	B	C	D	E
25	5676	4412	5149	5198	
26	3734	4525	3720	6449	
27	4113	5284	3805	5551	
28	4102	5286	4554	6958	
29	3855	4966	4430	5115	
30	4067	4900	5757	6459	
31	5033	4621	4838	6347	
32	4327	4919	4706	6524	
33					
34					
35	Before treatment				
36		Average Reading	Standard Deviation		
37	Control	#REF!	#NAME?		
38	Experiment	4716.4	#NAME?		
39					
40	After treatment				
41		Average Reading	Standard Deviation		
42	Control	4589.1667	#NAME?		
43	Experiment	6157.2	#NAME?		
44					
45	Change				
46		Average Reading	Standard Deviation		
47	Control	#REF!	#VALUE!		
48	Experiment	1440.0	#NAME?		
49					
50					

SD() is not the standard deviation formula...see if you can find the correct formula name in the Help files.



The doctor gave you a pretty big spreadsheet project. How did it all work out?

Let's start with the formula in cell B37.

Change the argument from #REF! to a proper range.

	B	C	D	E
24	5079	5289	4358	5997
25	5676	4412	5149	5198
26	3734	4525	3720	6449
27	4413	5284	3805	5554
28	4102	1286	4554	6958
29	3855	966	4430	5115
30	4867	4988	5757	6459
31	5033	4.21	4838	6347
32	4327	4919	4706	6524
33				
34				
35	Before treatment			
36	Average Reading	Standard Deviation		
37	Control	4581.8667	#NAME?	
38	Experiment	4716.4	#NAME?	
39				
40	After treatment			
41	Average Reading	Standard Deviation		
42	Control	4589.1667	#NAME?	
43	Experiment	6157.2	#NAME?	
44				
45	Change			
46	Average Reading	Standard Deviation		
47	Control	7.3	#VALUE!	
48	Experiment	1440.3	#NAME?	
49				

Now we have a good average.

The Help files show that the formula for standard deviation is actually STDEV().

Plus, the formula down here loses its error, since it refers to the now-corrected cell B37.

	A	B	C	D	E	
26	3734	4525	3720	6449		
27	4413	5284	3805	5554		
28	4102	5286	4554	6958		
29	3855	4966	4430	5115		
30	4867	4988	5757	6459		
31	5033	4621	4838	6347		
32	4327	4919	4706	6524		
33						
34						
35	Before treatment					
36		Average Reading	Standard Deviation			
37	Control	4581.8667	515.7197			
38	Experiment	4716.4	461.5975			
39						
40	After treatment					
41		Average Reading	Standard Deviation			
42	Control	4589.1667	468.0199			
43	Experiment	6157.2	759.6636			
44						
45	Change					
46		Average Reading	Standard Deviation			
47	Control	7.3	47.699801			
48	Experiment	1440.8	-298.0661			
49						
50						
51						

Post Grad Modification

The change in standard deviation for the Experiment group is now correct, but the change for Control still needed to be fixed.

The error on the old formula happens because it refers to cell C36.

Now you're a published scientist

From: Doctor
To: Head First
Subject: Your excellent data work

Dear Head First,

I want to thank you so much for all your help with our data project.

If it had not been for you, we would have had to retype a bunch of data, probably making mistakes, and we never would have gotten to the bottom of all our formula errors.

Thank you, Head First!

—Dr.

Nice work!

Leeches like you've never seen them
They really suck... hematomas!

Music
We review Mastodon's *Blood Mountain*

Teen vampire chick flicks
An opportunity to promote healthy blood?

DATAVILLE JOURNAL OF HISTOPATHOLOGY

Head First Finds White Blood Cell Count Increase

New drug promises to help millions of immunocompromised patients

34 7 8 3 9 999

TODAY

6 dates and times

Stay on time



I think there's space on my calendar,
but could you repeat that time again
in "mm/dd/yyyy hh:mm:ss.0"?

Dates and times in Excel are hard.

Unless you understand *how Excel represents them internally*. All of us at one point or another have had to do calculations involving these types of figures, and this chapter will give you the **keys to figuring out** how many days, months, years, and even seconds there are between two dates. The simple truth is that dates and times are a really **special case** of the data types and formatting that you already know. Once you master a couple of basic concepts, you'll be able to use Excel to **manage scheduling flawlessly**.

Do you have time to amp up your training for the Massachusetts Marathon?

You're an avid runner who is ready to make the transition to an **elite** status, pursuing more prestigious, competitive, and difficult races. Specifically, you think you're ready for the **Massachusetts Marathon**.

Or rather, you could be ready with the right training program. Elite running is all about scheduling your practices and races so that you're at the right level of fitness at the right time. Luckily, you have a trainer friend who wants to help.

Could this program be your ticket to an elite running status?

I have a 10-week training program that will get you in shape for a 10K. We could then use your 10K time as a benchmark for your marathon goals.

Better take a look at the schedules to make sure her program fits with a 10K race.





Exercise

Once you finish the training program, you'll be ready for a 10K race. Is there a 10K race you could do that takes place shortly after the training program?

Here are the dates of upcoming 10Ks. You'll use these dates to calculate whether there's a race in the right time frame. But first, let's make the dates more legible.

- ➊ Under the Number > General drop box, reformat the dates so they look like this: 06/03/10.
- ➋ Using the Custom Sort... dialog box, sort your dates so that they'll be in chronological order.

This data shows the upcoming races.

Load this!

[www.headfirstlabs.com/books/hfexcel/
hfe_ch06_10K_races.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch06_10K_races.xlsx)

Upcoming 10K races in Dataville	
	Date
4	Oct 23, 2010
5	Nov 6, 2010
6	Jun 12, 2010
7	Jul 3, 2010
8	Jul 31, 2010
9	Jun 26, 2010
10	Nov 20, 2010
11	
12	
13	
14	

Click on the drop box here.

What happens?



Exercise Solution

You just attempted to reformat and sort your dates. What happened?

	A	B	C	D
1	Upcoming 10K races in Dataville			
2				
3	Date			
4	Oct 23, 2010			
5	Nov 6, 2010			
6	Jun 12, 2010			
7	Jul 3, 2010			
8	Jul 31, 2010			
9	Jun 26, 2010			
10	Nov 20, 2010			
11				

1

Under the Number > General drop box, reformat the dates so they look like this: 06/03/10.

Nothing happens when you try to change the date format.

Why might that be?



2

Using the Custom Sort... dialog box, sort your dates so that they'll be in chronological order.

Wow...Excel sees text, but it thinks it might be a number?

Something fishy is going on here!

Go ahead and click OK, and it'll sort correctly.



Maybe Excel thinks that the dates are text. Try the ISTEXT() function to see.

If you run the ISTEXT() function on any of the cells containing your date data, the TRUE value the function returns shows that the date is indeed **text**.

	A	B
1	Upcoming 10K races in Dataville	
2		
3	Date	
4	Jun 12, 2010	
5	Jun 26, 2010	TRUE
6	Jul 3, 2010	
7	Jul 31, 2010	
8	Oct 23, 2010	
9	Nov 6, 2010	
10	Nov 20, 2010	
11		
12		

Here's the ISTEXT() formula.

The TRUE value means that the dates are text.

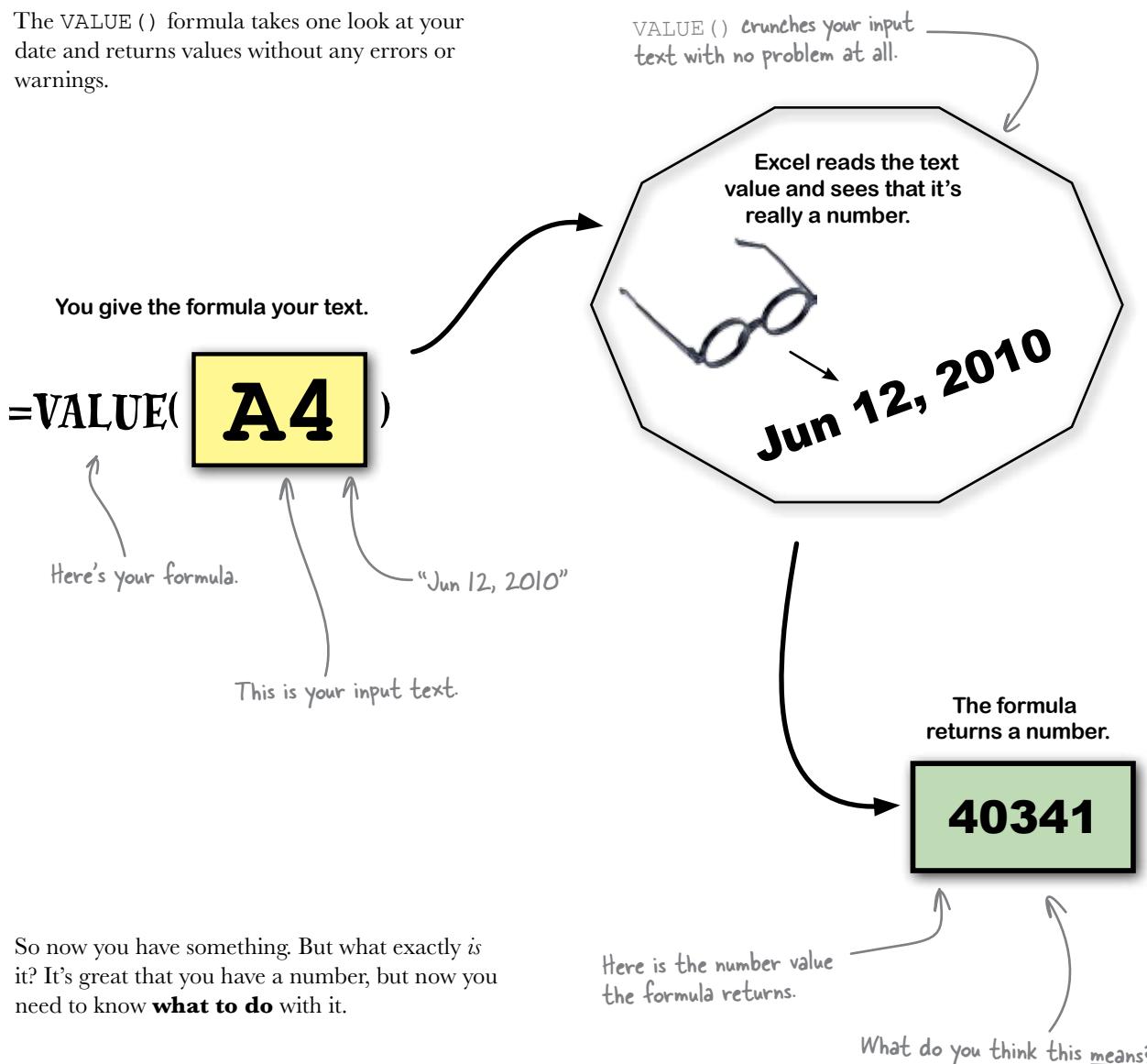
You know what to do when you have a numerical value that needs to be converted from text! And while the dates here aren't simple integers, they're still numbers of a sort. Why not try running the VALUE() function on them? Maybe Excel can figure out that they're dates.

Do this!

Try writing VALUE() formulas in a new column. What happens?

VALUE() returns a number on dates stored as text

The VALUE () formula takes one look at your date and returns values without any errors or warnings.



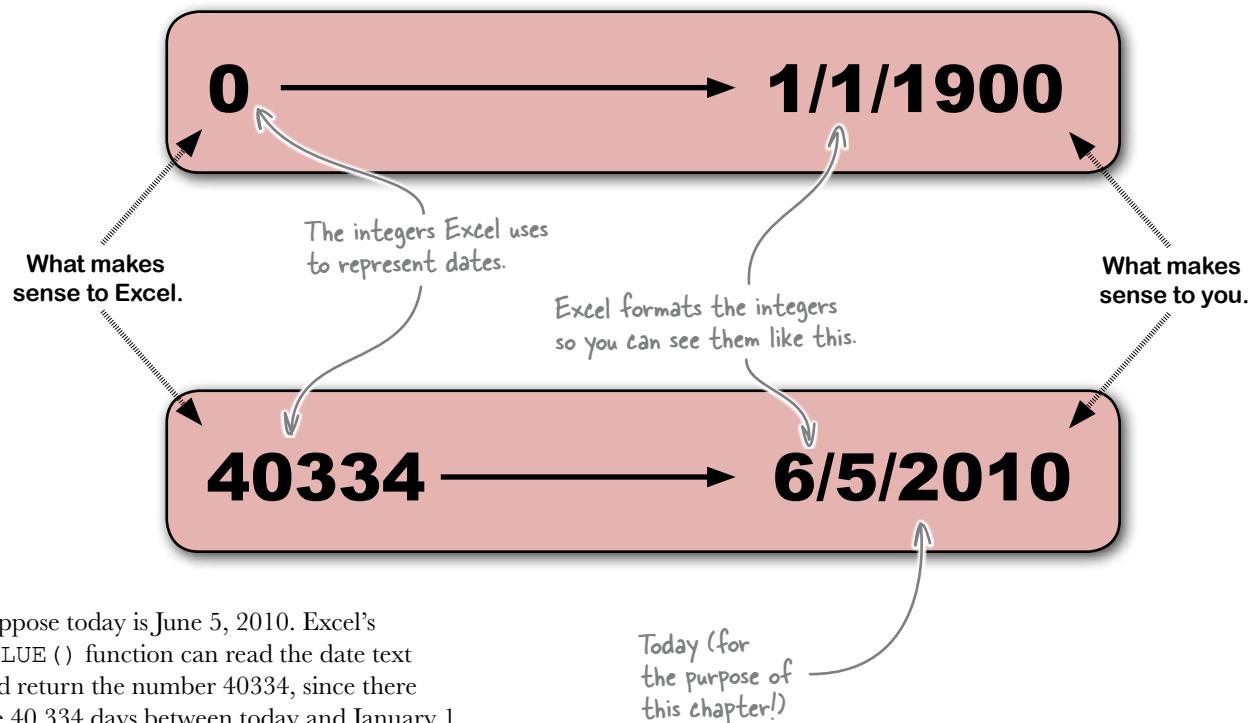
So now you have something. But what exactly *is* it? It's great that you have a number, but now you need to know **what to do** with it.

Why would Excel return a five-digit number in response to your date text?

Excel sees dates as integers

In Excel, a date is just an integer. Excel for Windows defines the integer 0 as January 1, 1900,* so the integer 1000 represents 1,000 days after January 1, 1900.

* The first date in Excel 2008 for Mac is actually 1/1/1904, but Excel can convert between the two behind the scenes.



Suppose today is June 5, 2010. Excel's `VALUE()` function can read the date text and return the number 40334, since there are 40,334 days between today and January 1, 1900.

This is how Excel deals with dates: by converting them to integers, even though Excel applies **formatting** to the dates so that you can read them.



You usually need `VALUE()` only when you're importing certain data.

If you simply type in a date, Excel almost always can figure out what you mean and return the correct integer date representation while keeping your formatting straight.

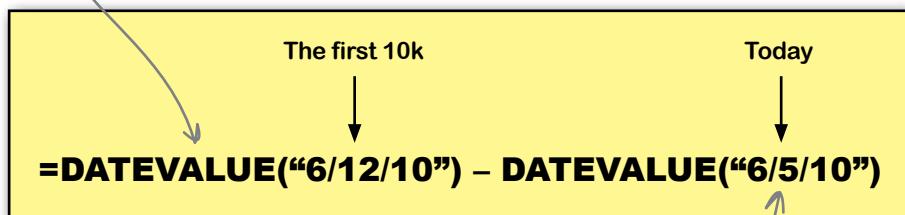


If you subtract one date from another, what would the resulting number *mean*?

Subtracting one date from another tells you the number of days between the two dates

Let's say you want to find out how many days there are between today and the date of the first 10K. Here's a formula you might use:

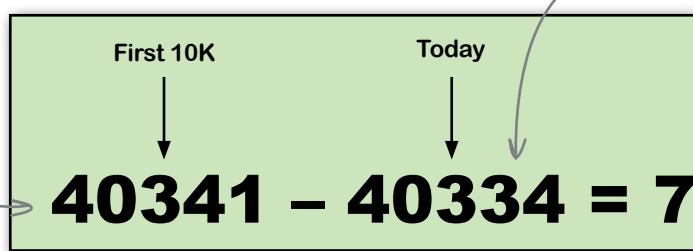
DATEVALUE() converts date text
to a number inside of a formula.



When you refer to date values already in other cells and when you use the DATEVALUE() formula, Excel sees your date values as simple integers. And since each number represents a count of days, subtracting one from the other shows the amount of days between the two dates.

If you already have your date values in another cell, you can use a reference rather than DATEVALUE.

Here are Excel's numbers.



Excel really calculates the difference between dates using integers.

It's really not that complicated. Now that you've gotten the hang of how Excel deals with dates, you're ready to start running some calculations of your own.

There are seven days between today and 6/12/10.



Using your knowledge about how Excel represents dates, whip your 10K spreadsheet into shape and figure out how many days each race is from today.

- 1 Fill column B with formulas using the VALUE () function to make Excel return the integer representation of your dates.

- 2 Reformat the dates in column B to **look** like dates, not integers.

- 3 Sort the dates so that the earliest is first.

- 4 Under your **Days From Now** column in cell C4, write this formula:

=B4-DATEVALUE ("6/5/10")

DATEVALUE () returns the integer corresponding to date text.

You need to use this function, since Excel can't convert from text to date integers inside of formulas unless you tell it to.

- 5 Copy this formula and paste it to cells C5 :C10.

Add these column headers.

	A	B	C
1	<i>Upcoming 10K races in Dataville</i>		
2			
3	Date	Date Value	Days From Now
4	Jun 12, 2010		
5	Jun 26, 2010		
6	Jul 3, 2010		
7	Jul 31, 2010		
8	Oct 23, 2010		
9	Nov 6, 2010		
10	Nov 20, 2010		
11			
12			
13			

Put your answers here.



Exercise Solution

You just ran a bunch of operations to try to calculate the numbers of days between today and the 10K races you might do after training. What happened?

1

- Fill column B with formulas using the VALUE () function to make Excel return the integer representation of your dates.

 $=\text{VALUE}(\text{A}10)$

Use the VALUE() function.

No problem here.

	A	B	C
1	Upcoming 10K races in Dataville		
2	Date		Date Value Days From Now
3	Jun 12, 2010	40341	40341
4	Jun 26, 2010	40355	40355
5	Jul 3, 2010	40362	40362
6	Jul 31, 2010	40390	40390
7	Oct 23, 2010	40474	40474
8	Nov 6, 2010	40488	40488
9	Nov 20, 2010	40502	40502
10			
11			
12			
13			
14			
15			
16			

2

- Reformat the dates in column B to **look** like dates, not integers.

3

- Sort the dates so that the earliest is first.

Again, looking good.

These are integers representing dates that have now been formatted to look like the dates they represent.

	A	B	C
1	Upcoming 10K races in Dataville		
2	Date		Date Value Days From Now
3	Jun 12, 2010	6/12/2010	40341
4	Jun 26, 2010	6/26/2010	40355
5	Jul 3, 2010	7/3/2010	40362
6	Jul 31, 2010	7/31/2010	40390
7	Oct 23, 2010	10/23/2010	40474
8	Nov 6, 2010	11/6/2010	40488
9	Nov 20, 2010	11/20/2010	40502
10			
11			
12			

=B4-DATEVALUE ("6/5/10")

- 4 Under your **Days From Now** column in cell C4, write this formula:

=B4-DATEVALUE ("6/5/10")

Hey, that's a date!

	Date	Date Value	Days From Now
1	Upcoming 10K races in Dataville		
2			
3	Date	Date Value	Days From Now
4	Jun 12, 2010	6/12/2010	1/7/1900
5	Jun 26, 2010	6/26/2010	
6	Jul 3, 2010	7/3/2010	
7	Jul 31, 2010	7/31/2010	
8	Oct 23, 2010	10/23/2010	
9	Nov 6, 2010	11/6/2010	
10	Nov 20, 2010	11/20/2010	
11			
12			
13			

- 5 Copy this formula and paste it into cells C5:C10.

We need the number of days.

The values in column C have a weird formatting.

These values are formatted like dates, but they should look like plain integers.



What if the answers are correct...they're just formatted wrong?

=B10-DATEVALUE ("6/5/10")

	Date	Date Value	Days From Now
1	Upcoming 10K races in Dataville		
2			
3	Date	Date Value	Days From Now
4	Jun 12, 2010	6/12/2010	1/7/1900
5	Jun 26, 2010	6/26/2010	1/21/1900
6	Jul 3, 2010	7/3/2010	1/28/1900
7	Jul 31, 2010	7/31/2010	2/25/1900
8	Oct 23, 2010	10/23/2010	5/19/1900
9	Nov 6, 2010	11/6/2010	6/2/1900
10	Nov 20, 2010	11/20/2010	6/16/1900
11			
12			
13			

Do this!

Try formatting your answers in General.

When subtracting dates, watch your **formatting**

When you wrote your date subtraction formula, Excel based the format of its return value on the format of the cells that went into the arguments of the formula.

No problem, just reformat your formulas to **General**.

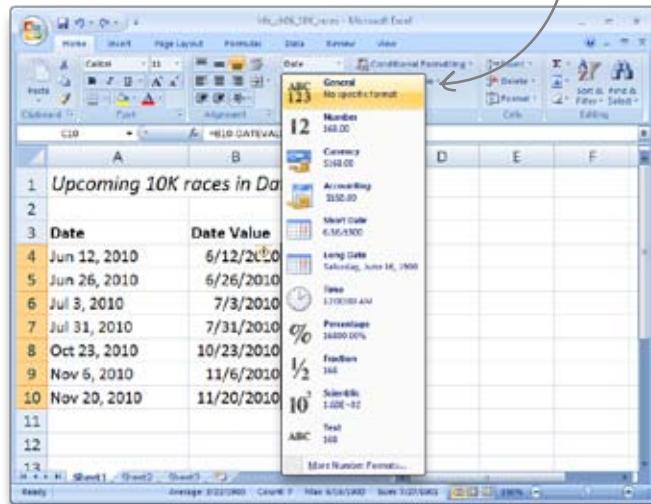
Inside your spreadsheet, these two values are in the Date format.

$$6/12/10 - 6/5/10 = 7$$

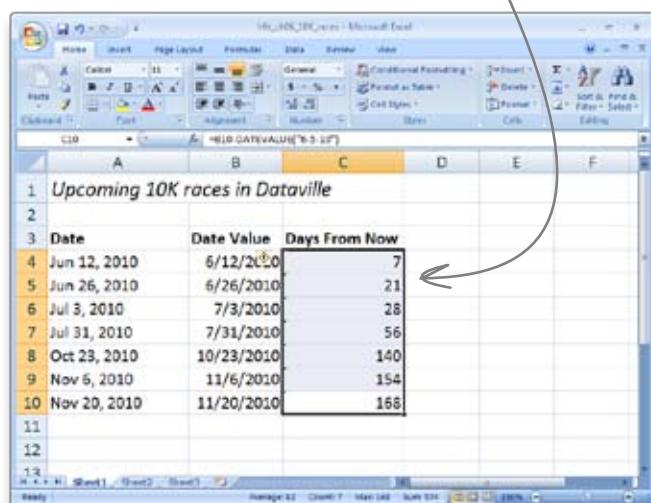
This value, on the other hand, should be in the General format.

There are seven days between today and June 12, and 7 is the value that Excel returns. Once you change the formatting from Date to General, you can see your answer.

Just click here to put a selection
into the General format.



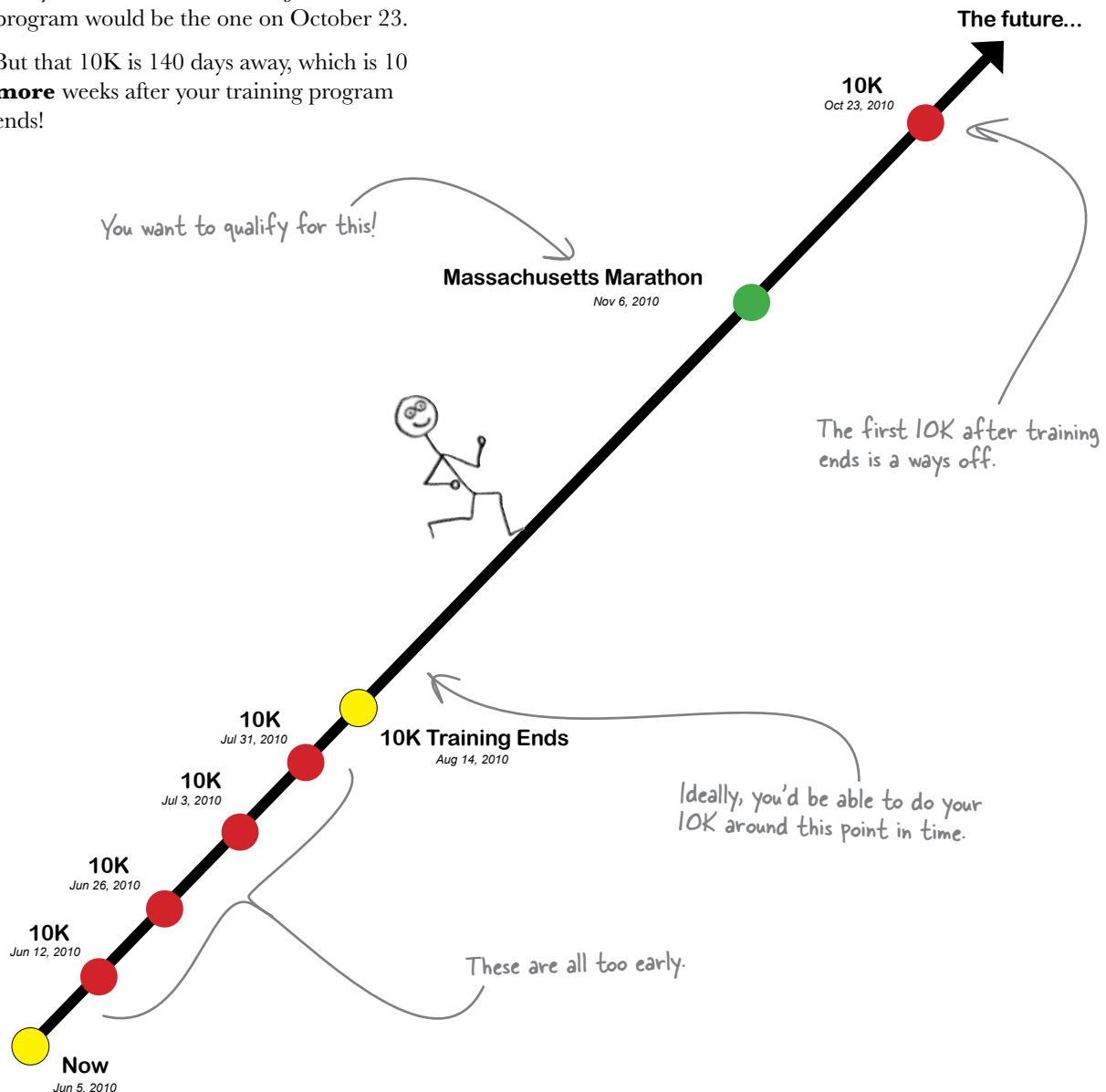
This is exactly how you want your day calculation results to look.



Looks like you don't have time to complete training before a 10K

Your date calculations present some discouraging news. Since the training program is 10 weeks, or 70 days, the first 10K you would be able to do *after* the program would be the one on October 23.

But that 10K is 140 days away, which is 10 **more** weeks after your training program ends!



Coach has a better idea



Now you just need to see whether the Dataville Marathon takes place within the 4-month time frame....



Let's see if Excel has anything else.

Most people who need to do date computations are going to need more power than counting days through simple arithmetic provides. It makes sense that Excel would have more versatile formulas....

DATEDIF() will calculate time between dates using a variety of measures

It's an old-school, little-known, strangely undocumented but very powerful function. With DATEDIF(), you specify a start date, an end date, and then a text constant that represents the unit you want to use.

This last argument is a special text constant.

You can guess how these two arguments work.

=DATEDIF(start date, end date, interval)

Choose from one of Excel's six predetermined text strings to instruct the formula to use the scale you want.

Here is an example of DATEDIF() in action. In this case, the "y" text constant tells Excel to ascertain the number of years between the two dates, and in the next exercise you'll look at your other options.

Here's DATEDIF()

A screenshot of Microsoft Excel showing a table with four rows. Row 1 contains the text "The first lunar landing" and the date "7/20/1969". Row 2 contains the text "Today" and the date "6/5/2010". Row 3 is empty. Row 4 contains the text "Years since the first lunar landing" and the value "40". The formula bar shows the formula =DATEDIF(B1,B2,"y"). The Excel ribbon is visible at the top, and the status bar at the bottom right shows "Ready" and "200%".

	A	B
1	The first lunar landing	7/20/1969
2	Today	6/5/2010
3		
4	Years since the first lunar landing	40
5		
6		



Different text constants result in different measures for DATEDIF(). Which is which? Draw arrows to link the text constants with the right behavior.

Text constant**DATEDIF() behavior**

m

The number of months between the dates, ignoring days and years.

d

The number of whole years between the dates.

y

The number of days between the dates, ignoring months and years.

ym

The number of days between the dates, ignoring the years.

yd

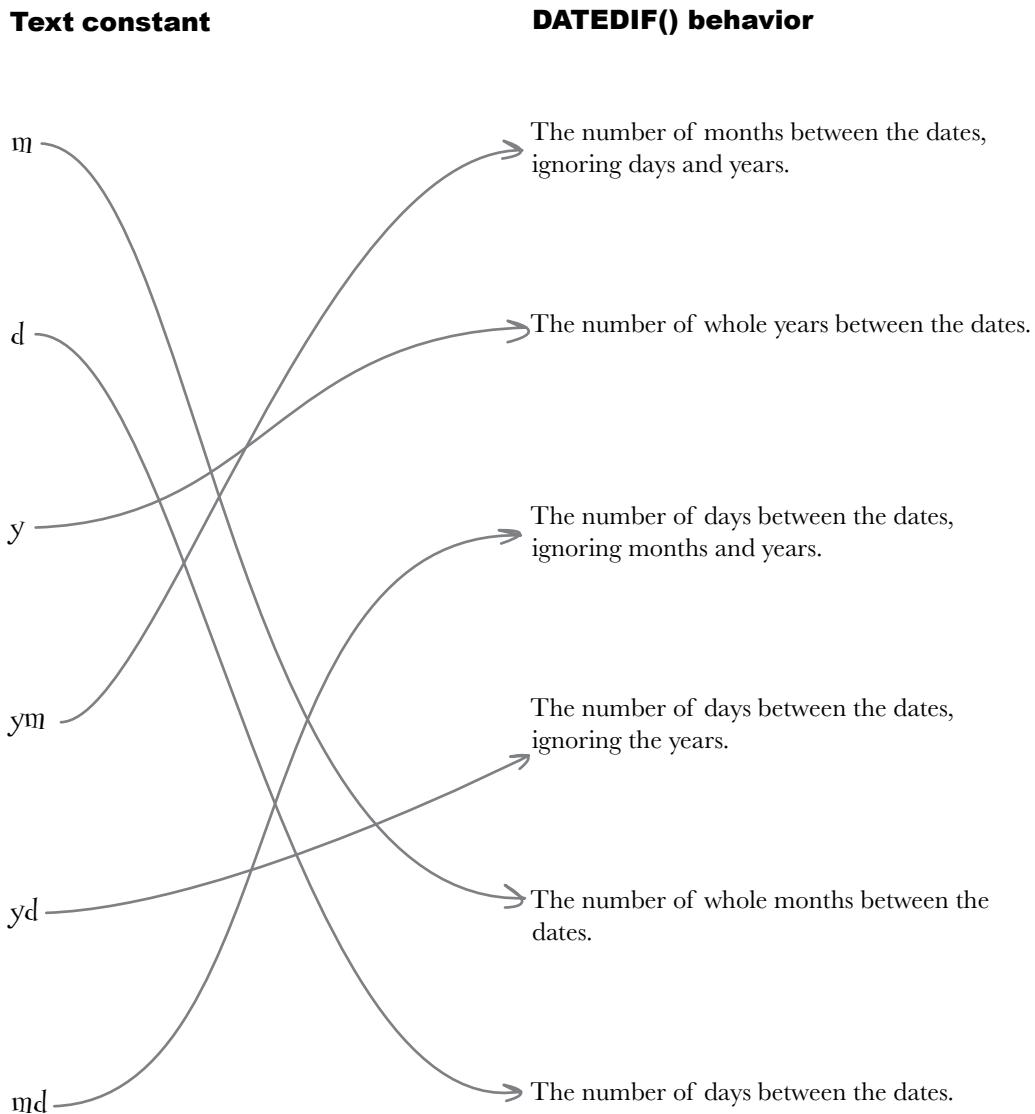
The number of whole months between the dates.

md

The number of days between the dates.

* WHO DOES WHAT? SOLUTION *

Different text constants result in different measures for DATEDIF().
Which is which?



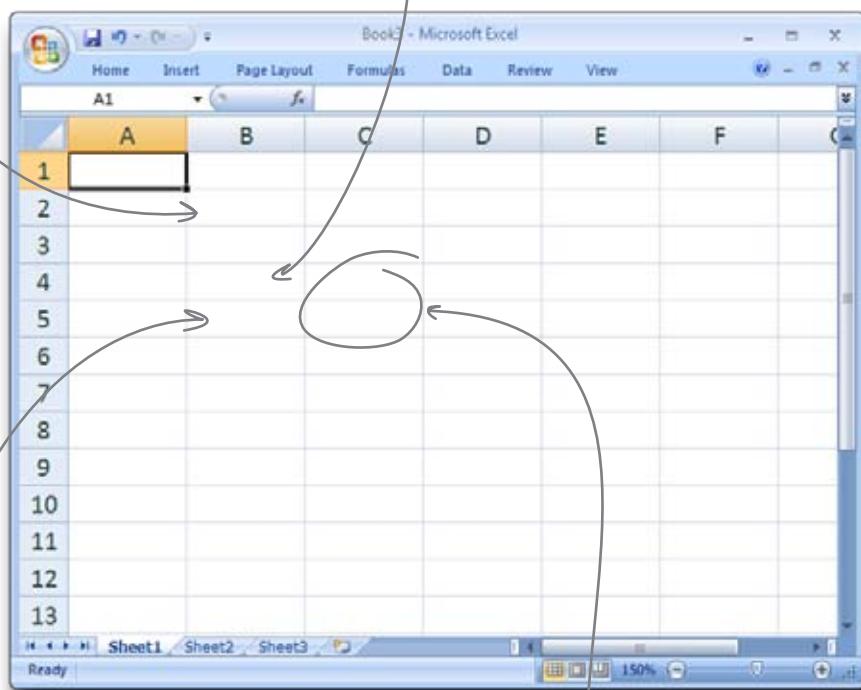


Exercise

Now write a DATEDIF () function to see whether your class is finished in time for the two upcoming Massachusetts qualifying marathons: the Bitburg Marathon and the Dataville Marathon.

In this cell, type the date for today, 6/5/2010.

Here, type the date for the Bitburg Marathon, 9/25/2010.



Here, type the date for the Dataville Marathon, 11/6/2010.

In these cells, write DATEDIF () formulas that calculate how many months there are between today and the marathons.

Be sure to give each cell of data a text label!



Exercise Solution

If you start a 4-month marathon training class, will you have time to do either the Bitburg or the Dataville Marathons, which are qualifiers for the Massachusetts Marathon?

Use the "m" text constant in your DATEDIF() formula.

Don't forget to use an absolute reference to point to today's date.

A	B	C
1		
2 Today	6/5/2010	
3		
4	Date	Months away
5 Bitburg Marathon	9/25/2010	3
6 Dataville Marathon	11/6/2010	5
7		
8		
9		
10		
11		
12		
13		

"m" tells DATEDIF() to calculate the number of months between.

Since the training program is 4 months, the Bitburg Marathon is out of the question.

The Dataville Marathon is 5 months away, so you'll be finished with your program by then.

If you do well on the Dataville Marathon, you're off to Massachusetts!

You have time!

Coach is happy to have you in her class



Great. You need to hit a 3 hour and 30 minute Dataville Marathon time to qualify. I can't remember how that breaks down for each mile, but as long as your 5K pace is no more than 10% higher than the 3:30 marathon pace, we should be able to get you where you need to be.

Your 5K pace is 8:30—eight minutes and thirty seconds per mile. What's the pace of a 3:30 marathon? If you run a marathon in three hours and thirty minutes, how long would it take you on average to run each mile? You need to do a **time calculation**.



If Excel represents days as **integers**, how do you think Excel represents hours, seconds, and minutes?

Excel represents time as decimal numbers from 0 to 1

When you type a time into your spreadsheet, Excel displays that time as a value like what you see on the left.

But what you're really looking at is a decimal number between from 0 to 1 that's **formatted** to look like a time.

Time	Excel's representation
12:00 AM	→ 0
2:24 AM	→ 0.1
1:13:26 PM	→ 0.551
18:00	→ 0.75
11:59:59 PM	→ 0.9999843

These figures are what you type into Excel.

These numbers are how Excel represents your times internally.

And if you are doing really heavy time computations, you can have Excel's decimal numbers go all the way to **thousands of a second** (sorry, if you want to count nanoseconds, you'll just have to use regular decimal numbers and remember what they mean).

**Let's determine
our pace using time
calculations in Excel.**



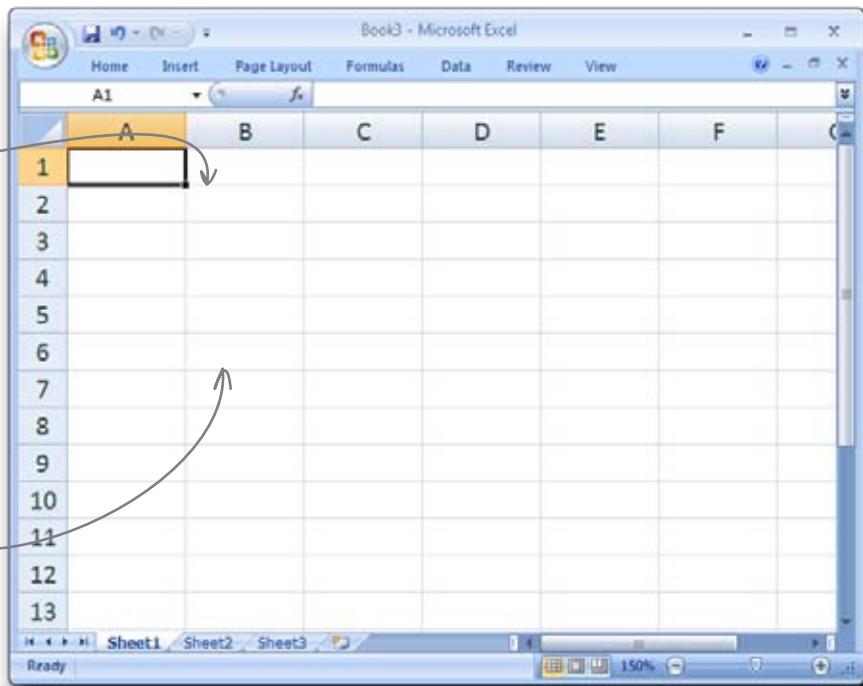
Your coach wants to know whether your current running pace is where it needs to be to make you a strong candidate for qualifying for Massachusetts. Are you within 10% of the 8:30 mile pace?

- ➊ In Excel, divide the 3:30:00 marathon goal time by 26.2 to get your target pace.

- ➋ Is your normal pace of 8:30 within 10% of your marathon target pace?
Add 10% to your marathon target pace to find out.

Put your answers here.

Be sure to label your numbers with text!





Exercise Solution

You just ran some calculations to determine whether your current pace is an adequate starting point for your marathon training. Is it?

- ① In Excel, divide the 3:30:00 marathon goal time by 26.2 to get your target pace.

When you type in a time value, Excel automatically recognizes it.

Your target pace is 8:01 minutes per mile.

	A	B	C	D	E
1					
2	Goal time	3:30:00			
3	Target pace	0:08:01			
4					
5					
6					
7					
8					

- ② Is your normal pace of 8:30 within 10% of your marathon target pace? Add 10% to your marathon target pace to find out.

$$=B3+B3*0.1$$

Here's the formula you need.

$$\mathbf{B3 + B3 * 0.1}$$

Your 8:30 pace is inside the 10% range.

	A	B	C	D	
1					
2	Goal time	3:30:00			
3	Target pace	0:08:01			
4					
5	Target pace + 10%	0:08:49			
6					
7					
8					

You're good to go!

Coach has an Excel challenge for you

Your coach has sent you a funny number. Dates are numbers to the left of the decimal point, and times are numbers to the right of the decimal point, so what about values with numbers on *both sides* of the decimal point?

This is a date and a time all in one value!

Date

From: Coach
To: Head First
Subject: Our first practice

Dear Head First,

You know, I'm an Excel buff, too. Dates and times can be tricky, so good for you for learning how to use them. Here's an Excel date/time challenge for you.

Show up to your first practice at

40336.20833

—Coach

Time

That number is a date and a time combined together into the **same value!** Better type this number into Excel and reformat it to see when you should show up for the first practice!

Combine a date and a time into the same value by having digits before and after the decimal point.



1

Open your spreadsheet and type 40336.20833 into a blank cell.

2

Click on the More Number Formats area of the data formatting drop box on the Ribbon and convert your cell to a m/d/y h:mm format.

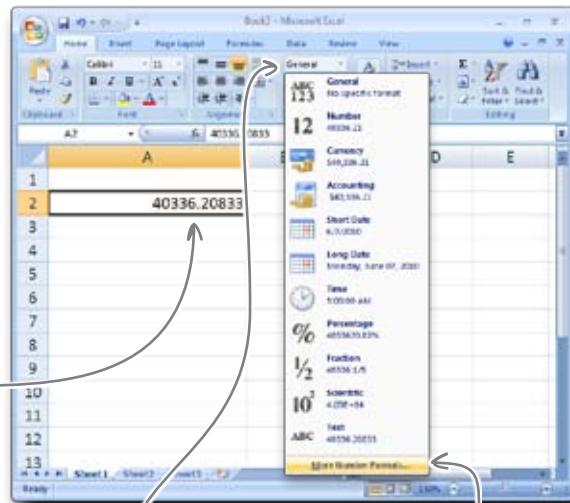


Exercise Solution

At what time did you determine you need to show up to your first practice?

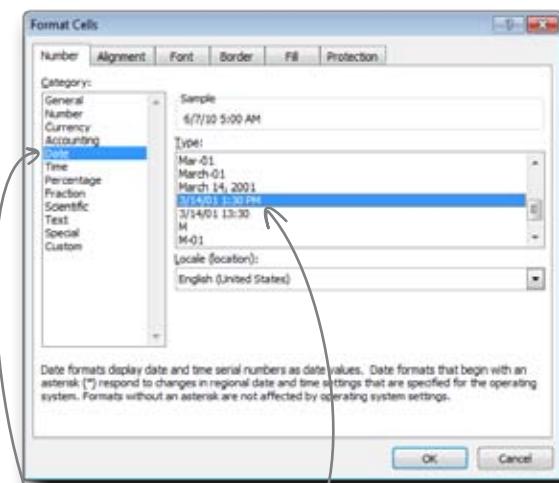
- 1 Open your spreadsheet and type 40336.20833 into a blank cell.
- 2 Click on the More Number Formats area of the data formatting drop box on the Ribbon and convert your cell to a m/d/y h:mm format.

Type the number into a cell.



Click on the data
formatting drop box.

Click this item.

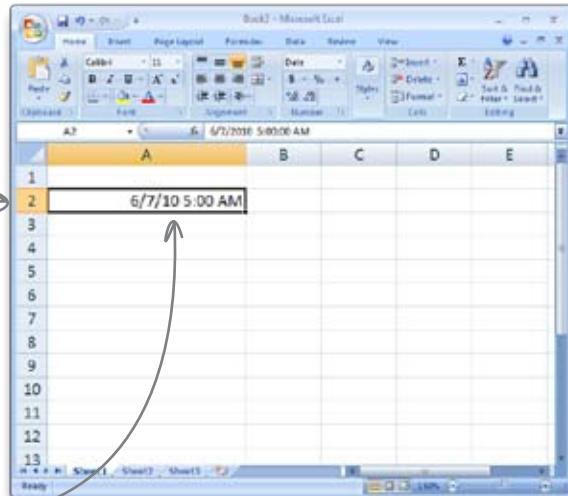


Select this date/
time format.

Click OK.

Here's the date and time
of your first practice!

That's this Monday, bright and early! —



You qualified for the Massachusetts Marathon

Elite running is all about effective planning, and with the help of your coach, not to mention your impressive Excel-savvy, you ran a 3:30 Dataville Marathon and qualified for Massachusetts!



7 finding functions

Mine Excel's features on your own



Excel has more functions than you will ever use.

Over many years and many versions, the program has accumulated specialized functions that are terribly important to the small group of people who use them. That's not a problem for you. But what *is* a problem for you is the group of functions **that you don't know** but that **are useful in your work**. Which functions are we talking about? Only you can know for sure, and you're about to learn some tips and techniques to finding quickly the formulas you need to get your work done efficiently.

Should you rent additional parking?

You're in charge of the Dataville Convention Center parking program. They do a big entertainment business in Dataville, but they have a problem. If they are expecting more than 1,000 ticket buyers to attend an event, they need to rent more parking spaces.

In the upcoming month, are they expecting more than 1,000 attendees for any of their events? Your challenge is to find out using their ticket sales data, and you'll get free box seats to your favorite shows if you can set up a workflow.

Here's their ticket sales spreadsheet for the coming month, which you'll load in a few moments.

Each line of this spreadsheet represents a single ticket sold.

It's a long spreadsheet: there are over 7,000 rows.

This is important stuff!

	A	B	C	D	E
1	TicketID	EventID	Date		
2	1	101	6/5/2010		
3	2	101	6/5/2010		
4	3	101	6/5/2010		
5	4	101	6/5/2010		
6	5	101	6/5/2010		
7	6	101	6/5/2010		
8	7	101	6/5/2010		
9	8	101	6/5/2010		
10	9	101	6/5/2010		
11	10	101	6/5/2010		
12	11	101	6/5/2010		
13	12	101	6/5/2010		
14	13	101	6/5/2010		
15	14	101	6/5/2010		
16	15	101	6/5/2010		
17	16	101	6/5/2010		
18	17	101	6/5/2010		

Let's still assume that 6/5/2010 is today.



You need formulas to count tickets sold for each day in this month's weekends.



Function Review

Here are all the functions you've learned so far. What do they do?

SUM

Tells you which in a range of numbers is smallest.

MIN

Tells you whether a cell is of data type text.

AVERAGE

Converts text into an integer that represents a date.

VALUE

Gives you the mean of a range of numbers.

ISTEXT

Returns the standard deviation of a range.

STDDEV

Converts text to numbers.

DATEVALUE

Adds numbers together.

DATEDIF

Returns the difference between dates using a metric you specify.

Write your answer here.



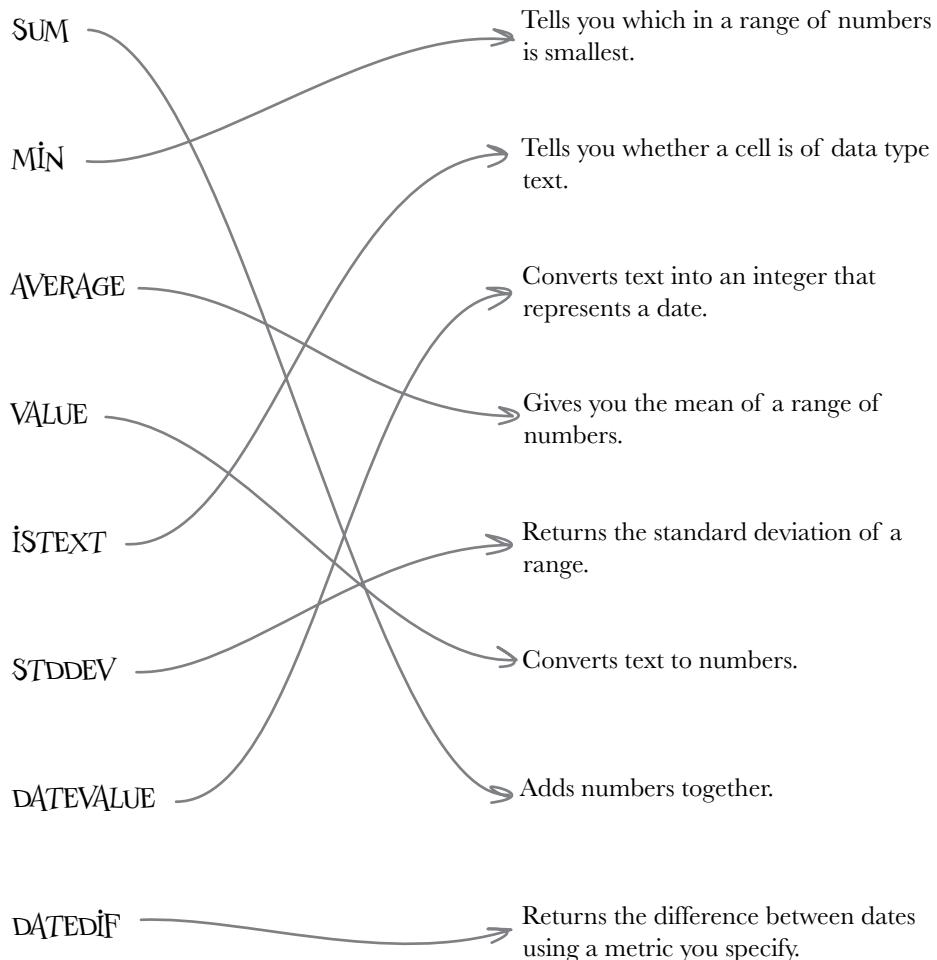
Can any of these formulas help you solve your parking prediction problem?

.....
.....



Function Review

Here are all the functions you've learned so far. What do they do?



Can any of these formulas help you solve your parking prediction problem?

Unfortunately, no. None of them has the ability to count anything, much less the tickets in the data we're going to receive.

You need a plan to find more functions

Finding and learning new functions in Excel is one of the core skills you need to develop. Excel has hundreds of functions, and it would take forever for you to read through all of them every time you wanted to learn a new formula.

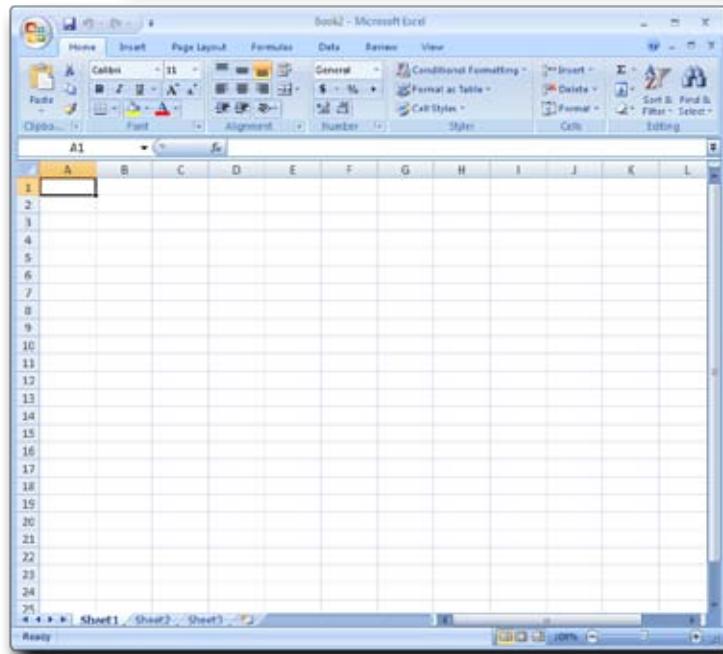
It could take a long time to learn all these.

Here's all of 'em!

ABS	COMBIN	DEGREES	GAMMAINV	ISERR	N	RANDBETWEEN	SUMXMY2
ACCRINT	COMPLEX	DELTA	GAMMALN	ISERROR	NA	RANK	SYD
ACCRINTM	CONCATENATE	DEV90	GCD	ISEVEN	NEGBINOMDIST	RATE	T
ACOS	CONFIDENCE	DGET	GEOMEAN	ISLOGICAL	NETWORKDAYS	RECEIVED	TAN
ACOSH	CONVERT	DISC	GESTEP	ISNA	NOMINAL	REGISTER.ID	TANH
ADDRESS	CORREL	DMAX	GETPIVOTDATA	ISNONTEXT	NORMDIST	REPLACE,	TBILLEQ
AMORDEGRC	COS	DMIN	GROWTH	ISNUMBER	NORMINV	REPT	TBILPRICE
AMORLINC	COSH	DOLLAR	HARMEAN	ISODD	NORMSDIST	RIGHT,	TBILYIELD
AND	COUNT	DOLLARDE	HEX2BIN	ISPMT	NORMSINV	ROMAN	TDIST
AREAS	COUNTA	DOLLARFR	HEX2DEC	ISREF	NOT	ROUND	TEXT
ASC	COUNTBLANK	DPRODUCT	HEX2OCT	ISTEXT	NOW	ROUNDDOWN	TIME
ASIN	COUNTIF	DSTDEV	HLOOKUP	JIS	NPER	ROUNDUP	TIMEVALUE
ASINH	COUNTIFS	DSTDEV.P	HOUR	KURT	NPV	ROW	TINV
ATAN	COUPDAYBS	DSTLUP	HYPERLINK	LARGE	OCT2BIN	ROWS	TODAY
ATAN2	COUPDAYS	DURATION	HYPEOMDIST	LCM	OCT2DEC	RSQ	TRANSPOSE
ATANH	COUPDAYSNC	DVAR	IF	LEFT,	OCT2HEX	RTD	TREND
AVERAGE	COURPNCD	DVARP	IFERROR	LEN,	ODD	SEARCH,	TRIM
AVERAGE	COUNPNM	EDATE	IMABS	LINEST	ODDFPRICE	SECOND	TRIMMEAN
AVERAGEA	COPPCD	EFFECT	IMAGINARY	LN	ODDFIELD	SERIESSUM	TRUE
AVERAGEIF	COVAR	EMONTH	IMARGUMENT	LOG	ODDLPRICE	SIGN	TRUNC
AVERAGEIFS	CRITBINOM	ERF	IMCONJUGATE	LOG10	ODDLYIELD	SIN	TTEST
BETAHTEXT	CUBEPKMEMBER	ERFC	IMCOS	LOGEST	OFFSET	SINH	TYPE
BESSELI	CUBE MEMBER	ERROR.TYPE	IMDIV	LOGIN	OR	SKEW	UPPER
BESSELJ	CUBE MEMBER	EUROCONVERT	IMEXP	LOGNORMDIST	PEARSON	SLN	VALUE
BESSELK	PROPERTY	EVEN	IMLN	LOOKUP	PERCENTILE	SLOPE	VAR
BESSELY	CUBE RANKED	EXACT	IMLOG10	LOWER	PERCENTRANK	SMALL	VARA
BETADIST	MEMBER	EXP	IMLOG2	MATCH	PERMUT	SQL.REQUEST	VARP
BETAINV	CUBESSET	EXPONDIST	IMPOWER	MAX	PHONETIC	SQRT	VARPA
BIN2DEC	CUBESETCOUNT	FACT	IMPRODUCT	MAXA	Pi	SQRTPI	VDB
BIN2HEX	CUBEVALUE	FACTDOUBLE	IMREAL	MDETERM	PMT	STANDARDIZE	VLOOKUP
BIN2OCT	CUMPIMT	FALSE	IMSIN	MDURATION	POISSON	STDEV	WEEKDAY
BINOMDIST	CUMPRINC	FDIST	IMSQRT	MEDIAN	POWER	STDEVA	WEEKNUM
CALL	DATE	FIND,	IMSUB	MIN,	PPMT	STDEV.P	WEIBULL
CEILING	DATEVALUE	FINV	IMSUM	MINA	PRICE	STDEVP.A	WORKDAY
CELL	DAVERAGE	FISHER	INDEX	MINA	PRICEDISC	STEYX	XIRR
CHAR	DAY	FISHERINV	INDIRECT	MINUTE	PRICEMAT	SUBSTITUTE	XNPV
CHIDIST	DAYS360	FIXED	INFO	MINVERSE	PROB	SUBTOTAL	YEAR
CHINV	DB	FLOOR	INT	MIRR	PRODUCT	SUM	YEARFRAC
CHITEST	DCOUNT	FORECAST	INTERCEPT	MMULT	PROPER	SUMIF	YIELD
CHOOSE	DCOUNTA	FREQUENCY	INTRATE	MOD	PV	SUMIFS	YIELDDISC
CLEAN	DOB	FTEST	IPMT	MODE	QUARTILE	SUMPRODUCT	YIELDMAT
CODE	DEC2BIN	FV	IRR	MONTH	QUOTIENT	SUMSQ	ZTEST
COLUMN	DEC2HEX	FVSCHEDULE	IS	MROUND	RADIANS	SUMX2MY2	
COLUMNS	DEC2OCT	GAMMADIST	ISBLANK	MULTINOMIAL	RAND	SUMX2PY2	

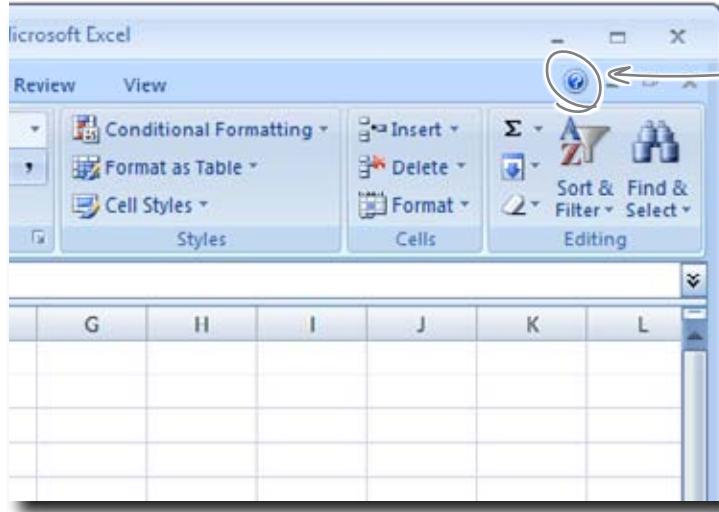
Do this!

Click the blue button on the top right to get help on Excel functions.



Excel's help screens are loaded with tips and tricks

To get help on any of Excel's scads of scads of formulas, start by clicking the help button on the top right of the Excel screen.



Click on the help button here.

This window pops up as a result.

It used to be that you'd never look at the documentation for Excel or any other computer program. No matter whether it was on the printed page or on computer help screens, it was hard to read and poorly written.

Those days are over for Excel. The current generation of help documentation is written to be understood by **real, live human beings** like you. In fact, it's so useful that you should dip into the docs occasionally just to explore the new features, not just for when you're looking for a specific formula.

The evolution of Excel documentation

Then

Hard-to-read fat manual

Hard-to-read thin manual and
hard-to-read help screens

Hard-to-read help screens

Well-written and useful help screens!

Now

Sharpen your pencil

Here's a closer look at Excel's main help page, the page you get when you click on the blue help button. Let's explore it.

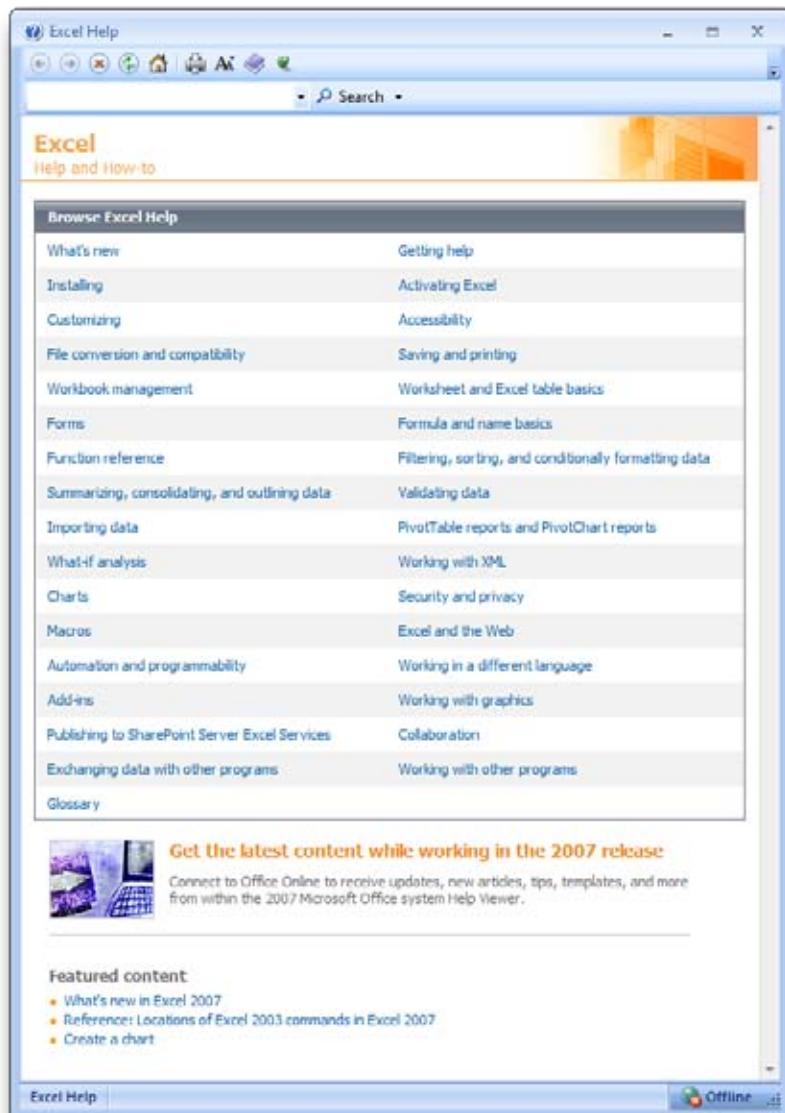
1

Circle the topics you've already become familiar with.

2

Circle the topic that will help you find the functions you need.

Different versions of Excel have slightly different lists, so yours might not look exactly like this.



Sharpen your pencil Solution

Upon closer inspection, what did you learn when you looked at the main help page?

- 1 Circle the topics you've already become familiar with.

Probably worth checking out if you've become accustomed to a previous version of Excel.

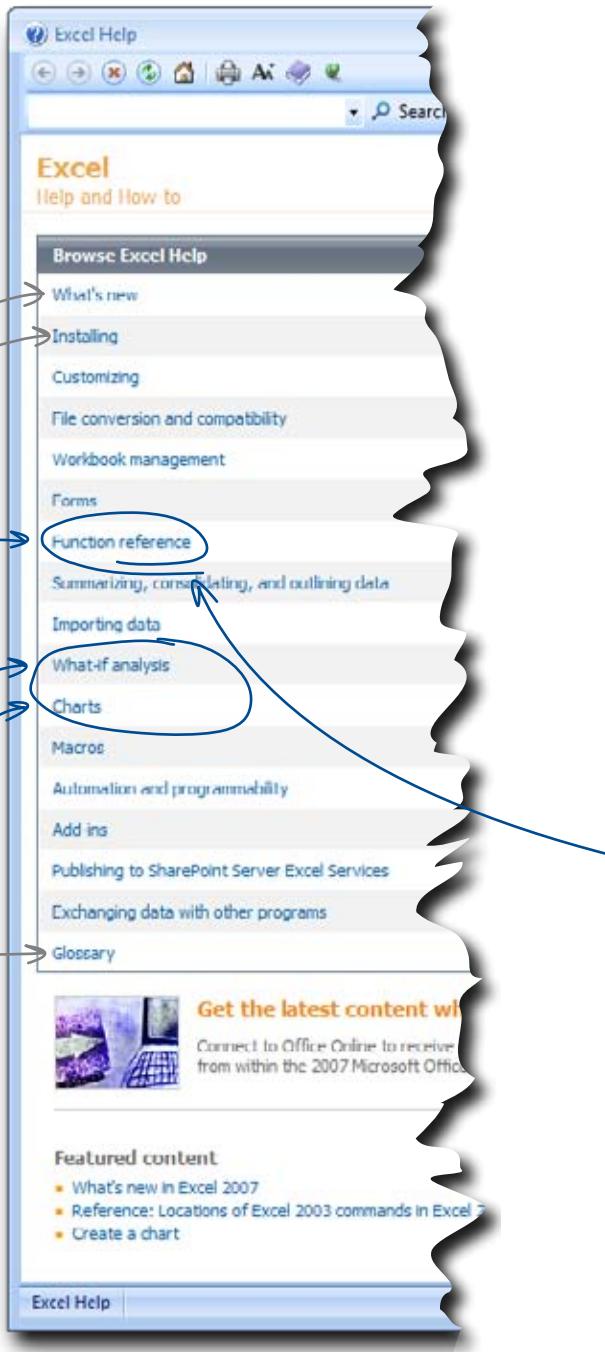
Hopefully you've gotten past this part.

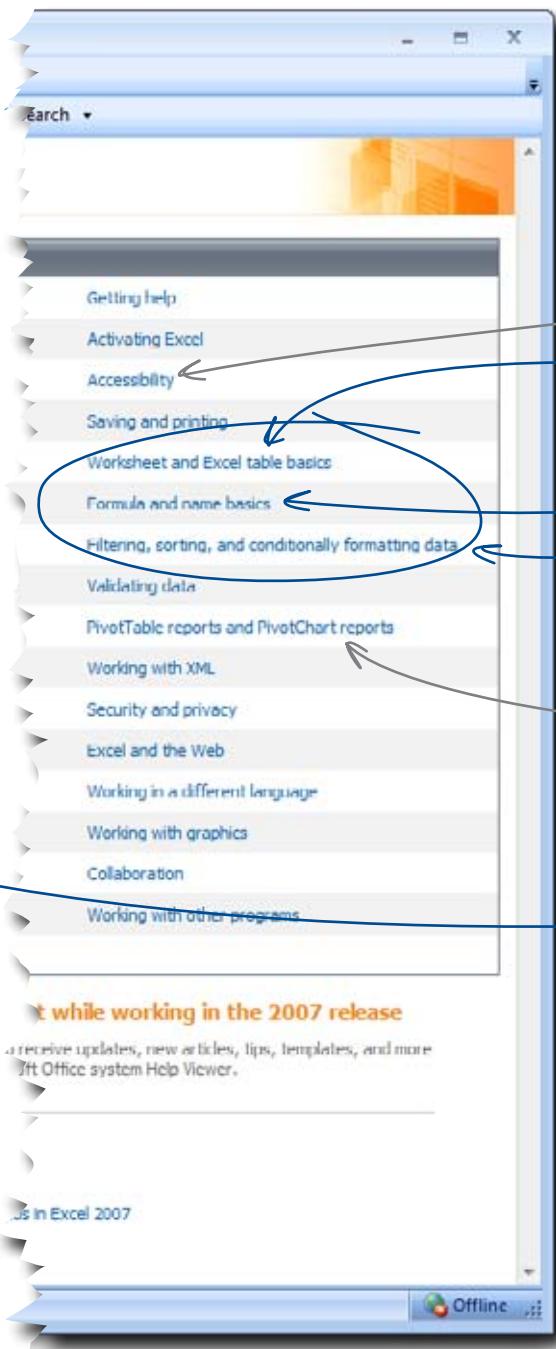
The functions we've already learned are in here.

There's a chapter on this coming up.

All over this one!

This could be useful to look up terminology.





Lots of useful keyboard shortcuts in here.

Mastered this subject!

And this one, too.

I've done filtering and sorting.

Got a chapter on this coming up, too!

2

Circle the topic that will help you find the functions you need.

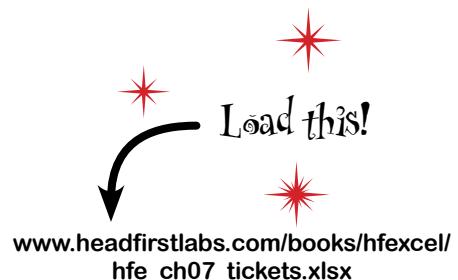
We need to look at the Function Reference to find the new function we need.



“Function reference”...this is what you need. Click on it, then on “List of worksheet functions (by category).”

Here's the convention center's ticket database for the next month

Each record represents a single ticket sold for a single event on a single date. Your task is to take this ticket data and see which days will have more than 1,000 visitors to the Dataville Convention Center.



This data set is already set up into a table, so you can use structured references.

If you scroll down, you'll see that this is a really big spreadsheet.

This data has only weekend ticket sales, because attendance never comes close to exceeding 1,000 on weekdays. What you need to do is create a list of weekend days for the remainder of the month and then count the number of tickets sold for each of those days.

A screenshot of Microsoft Excel showing a table named "Tickets". The table has three columns: "TicketID", "EventID", and "Date". The data consists of 18 rows, each containing a value for TicketID (from 1 to 18), EventID (all 101), and Date (all 6/5/2010). The table is formatted with alternating row colors. The "Table" tab is selected in the ribbon, and the "Design" tab is also visible. The status bar at the bottom shows "Ready" and "150%".

	A	B	C	D	E
1	TicketID	EventID	Date		
2	1	101	6/5/2010		
3	2	101	6/5/2010		
4	3	101	6/5/2010		
5	4	101	6/5/2010		
6	5	101	6/5/2010		
7	6	101	6/5/2010		
8	7	101	6/5/2010		
9	8	101	6/5/2010		
10	9	101	6/5/2010		
11	10	101	6/5/2010		
12	11	101	6/5/2010		
13	12	101	6/5/2010		
14	13	101	6/5/2010		
15	14	101	6/5/2010		
16	15	101	6/5/2010		
17	16	101	6/5/2010		
18	17	101	6/5/2010		



Exercise

We need to summarize ticket sales for weekend shows for the remainder of the month. First, let's create a table that lists the weekend days in this month.

- ➊ Create a new sheet in your document by clicking the “new sheet” tab. Double-click on your new sheet’s tab, and rename the sheet Summary.
- ➋ Generate a series of numbers that represent the weekend days of this month. Follow the example below and the instructions in the annotations.

The number 5 represents today, a Saturday, the fifth day of June 2010.

In this cell, type a formula to add 1 day to today, creating the day for tomorrow.

In this cell, type a formula to add 7 days to today, creating the day for next Saturday.

Copy and paste the formulas you just created in these cells to represent the remaining Saturdays and Sundays of this month.

	A	B	C	D
1	Day			
2		5		
3				
4	6			
5	7			
6	8			
7	9			
8	10			
9	11			



Exercise Solution

You just endeavored to create a list of numbers representing the remaining weekend days of this month. How'd it go?

- 1 Create a new sheet in your document by clicking the “new sheet” tab. Double-click on your new sheet’s tab, and rename the sheet Summary.
- 2 Generate a series of numbers that represent the weekend days of this month.

Here just add 1 to cell A2.

=A2+1

A	B	C	D
1 Day			
2	5		
3	6		
4			
5			
6			
7			
8			
9			
10			
11			

When you copy the formulas,
the references shift to give
you the days you need.

A	B	C	D
1 Day			
2	5		
3	6		
4	12		
5	13		
6	19		
7	20		
8	26		
9	27		
10			
11			

If the 27th is a Sunday, it's the
last weekend day of the month.

A	B	C	D
1 Day			
2	5		
3	6		
4	12		
5			
6			
7			
8			
9			
10			
11			

In this case, add
7 to cell A2.

=A2+7

Now let's make some proper date values out of these numbers.



Exercise

The problem is, we don't yet have the formula to do it. Under the help screen, click "Function reference," then "List of worksheet functions (by category)," then "Date and time functions."

Take a look at these functions, and click on any that seem promising. Which one do you think you can use to build proper date values out of the day integers you've created, and why?

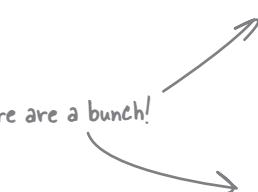
Write your answer here.

Function	Description
DATE	Returns the serial number of a particular date
DATEVALUE	Converts a date in the form of text to a serial number
DAY	Converts a serial number to a day of the month
DAYSD	Calculates the number of days between two dates based on a 360-day year
EDATE	Returns the serial number of the date that is the indicated number of months before or after the start date
EOMONTH	Returns the serial number of the last day of the month before or after a specified number of months
HOUR	Converts a serial number to an hour
MINUTE	Converts a serial number to a minute
MONTH	Converts a serial number to a month
NETWORKDAYS	Returns the number of whole workdays between two dates
NOW	Returns the serial number of the current date and time
SECOND	Converts a serial number to a second
TIME	Returns the serial number of a particular time
TIMEVALUE	Converts a time in the form of text to a serial number
TODAY	Returns the serial number of today's date
WEEKDAY	Converts a serial number to a day of the week
WEEKNUM	Converts a serial number to a number representing where the week falls numerically with a year
WORKDAY	Returns the serial number of the date before or after a specified number of workdays
YEAR	Converts a serial number to a year
YEARFRAC	Returns the year fraction representing the number of whole days between start_date and end_date

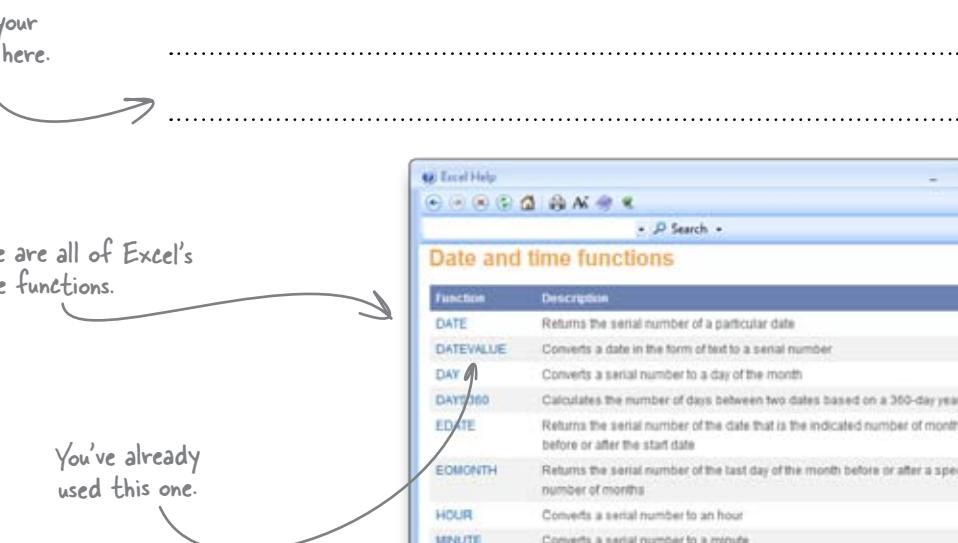
[Top of Page](#)

Engineering functions

There are a bunch!



You've already used this one.





Exercise Solution

You just inspected all of Excel's date functions at once. Did you find one that you think will enable you to create dates out of the numbers you entered to represent this month's weekend days?

The `DATE` formula is the one we want. If you look at the documentation, you can see that it takes three numeric values as its arguments, and we already have the numbers representing days. The numbers representing month and year are simply 6 and 2010!

This is the function we want to use.

Function	Description
<code>DATE</code>	Returns the serial number of a particular date
<code>DATEVALUE</code>	Converts a date in the form of text to a serial number
<code>DAY</code>	Converts a serial number to a day of the month
<code>DAYS360</code>	Calculates the number of days between two dates based on a 360-day year
<code>EDATE</code>	Returns the serial number of the date that is the indicated number of months before or after the start date
<code>EOMONTH</code>	Returns the serial number of the last day of the month before or after a specified number of months
<code>HOUR</code>	Converts a serial number to an hour
<code>MINUTE</code>	Converts a serial number to a minute
<code>MONTH</code>	Converts a serial number to a month
<code>NWORKDAYS</code>	Returns the number of whole workdays between two dates
<code>NOW</code>	Returns the serial number of the current date and time
<code>SECOND</code>	Converts a serial number to a second
<code>TIME</code>	Returns the serial number of a particular time
<code>TIMEVALUE</code>	Converts a time in the form of text to a serial number
<code>TODAY</code>	Returns the serial number of today's date
<code>WEEKDAY</code>	Converts a serial number to a day of the week
<code>WEEKNUM</code>	Converts a serial number to a number representing where the week falls numerically with a year
<code>WORKDAY</code>	Returns the serial number of the date before or after a specified number of workdays
<code>YEAR</code>	Converts a serial number to a year
<code>YEARFRAC</code>	Returns the year fraction representing the number of whole days between start_date and end_date

There's lots of interesting stuff here, but none of it is useful right now.

We could use `DATEVALUE()` if we had text, but we already have a number.

A bunch of these functions are for converting proper date numbers to something else.

Take a closer look at the docs for `DATE`....

Anatomy of a function reference

Here's the help window for the DATE function. The documentation for individual functions is really interesting and useful.

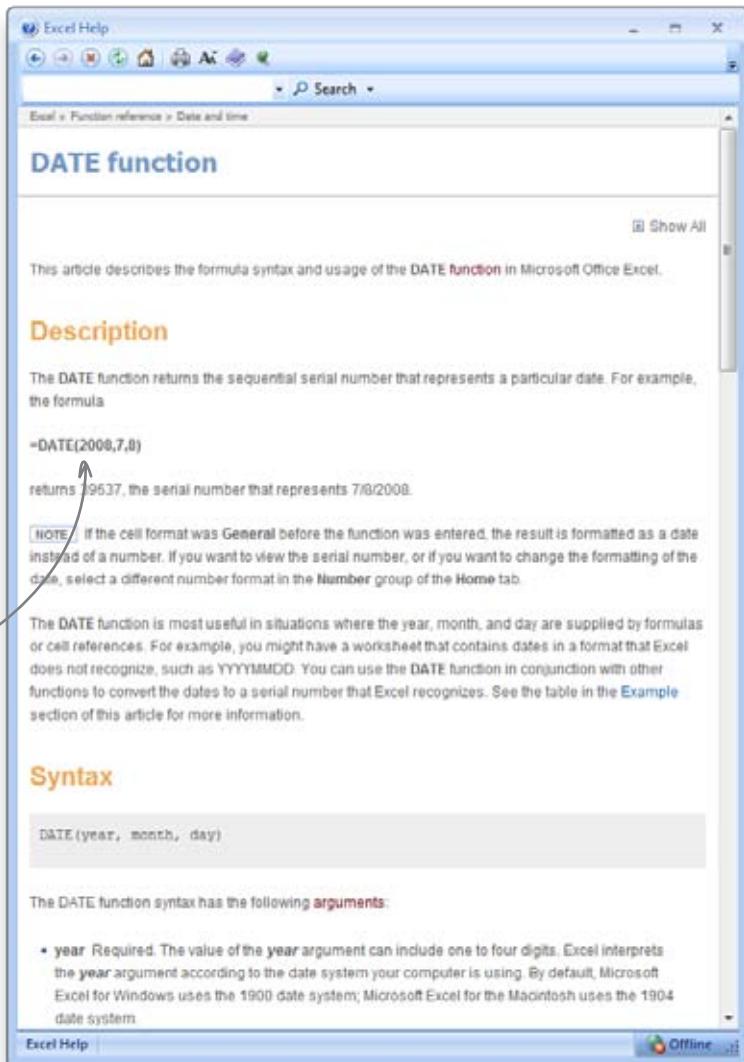
Not only can you use the docs to find out what functions do, but you can also use them to learn about functions' eccentricities—all the different types of arguments they accept and all the sorts of values they return, including explanations for why different errors might result from the same formula.

This is a precise specification of what the formula does.

Here's an example that's a lot like what we need to do (except you'll use references for the days, since you've already created them).

Here's how you use the function.

There's lots more specific stuff about how the function works if you scroll down.



Use the syntax to create a list of weekends with the DATE function on your spreadsheet.



Exercise Solution

Were you able to implement the date function in your spreadsheet to get real date values out of the integers you created to represent the days?

You can just type in the year, since it's the same for every formula.

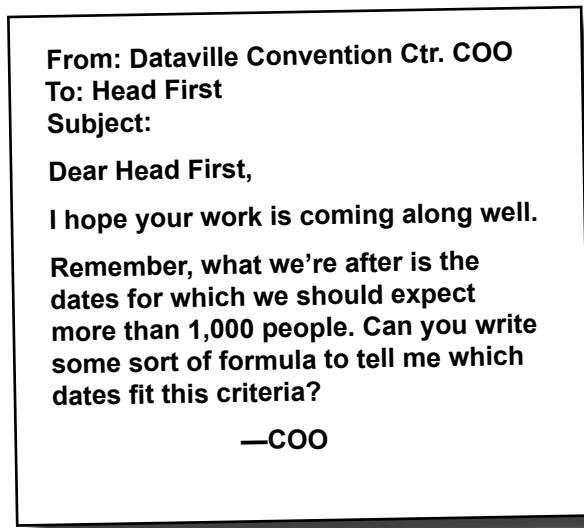
You can also just type in the month.

	A	B	C	D	E
1	Day	Date			
2		5 6/5/2010			
3		6 6/6/2010			
4		12 6/12/2010			
5		13 6/13/2010			
6		19 6/19/2010			
7		20 6/20/2010			
8		26 6/26/2010			
9		27 6/27/2010			
10					
11					
12					

Copy and paste the formula for each of your weekend days.

Nice work: you've got your dates!

The Dataville Convention Center COO checks in...



Add this column.

	A	B	C	D	E
1	Day	Date	Ticket Count		
2		5 6/5/2010			
3		6 6/6/2010			
4		12 6/12/2010			
5		13 6/13/2010			
6		19 6/19/2010			
7		20 6/20/2010			
8		26 6/26/2010			
9		27 6/27/2010			
10					
11					
12					

Better get your spreadsheet ready for this last figure and head back to the function reference to find the formula to do this.

You need to fill ticket counts into this column.

Functions are organized by data type and discipline

Now you're back in the function reference, looking for something that can count tickets for each date. Where to start? It was obvious when you had to build those dates: you just looked in the date category. But there's no "count ticket sales" category.

There are a bunch of different categories here.

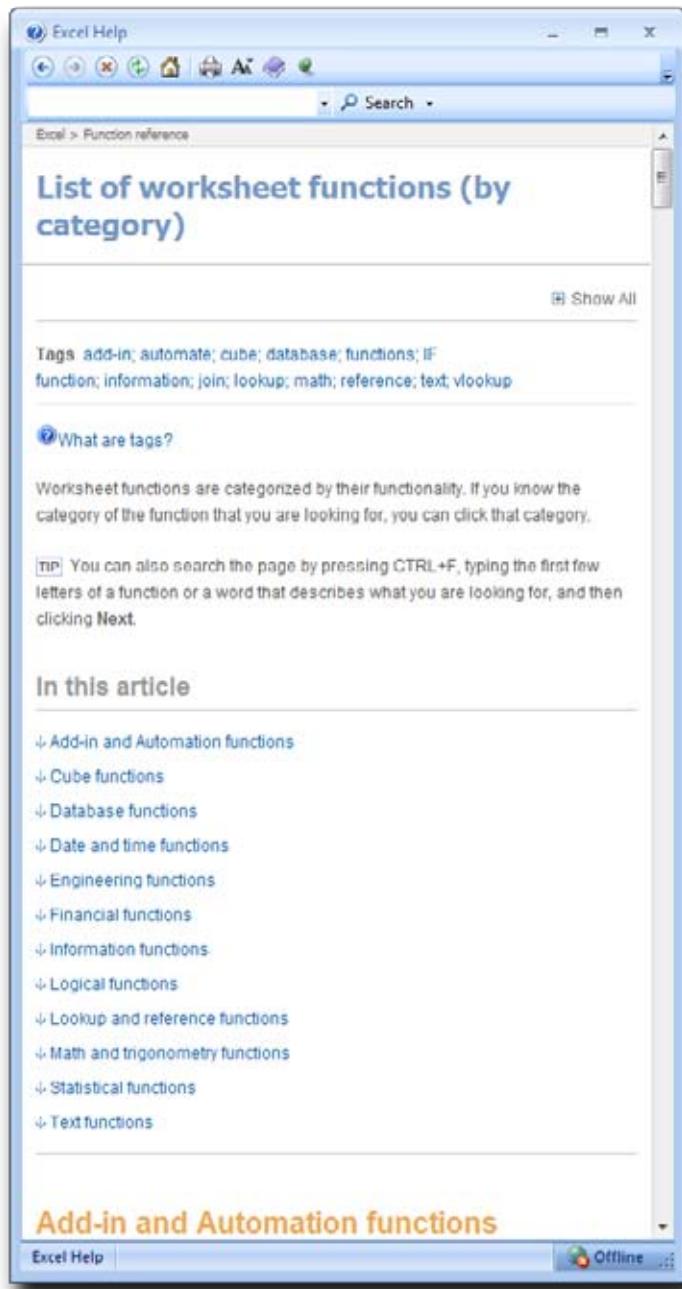


One of these fits our problem.



Here's the trick.

When searching for a function, pick a category first by thinking about your problem, and *then* inspect individual formulas in that category. That way, you'll avoid scanning hundreds of irrelevant formulas.



The screenshot shows the Microsoft Excel Help interface. The main title is "List of worksheet functions (by category)". Below it, a section titled "What are tags?" explains how users can search by functionality. A tip notes that pressing CTRL+F allows users to search by function name. The "In this article" sidebar lists categories such as Add-in and Automation functions, Cube functions, Database functions, Date and time functions, Engineering functions, Financial functions, Information functions, Logical functions, Lookup and reference functions, Math and trigonometry functions, Statistical functions, and Text functions. At the bottom of the list, the "Add-in and Automation functions" section is highlighted in orange. Handwritten annotations include a note "There are a bunch of different categories here." with an arrow pointing to the sidebar, and another note "One of these fits our problem." with an arrow pointing to the "Add-in and Automation functions" section.

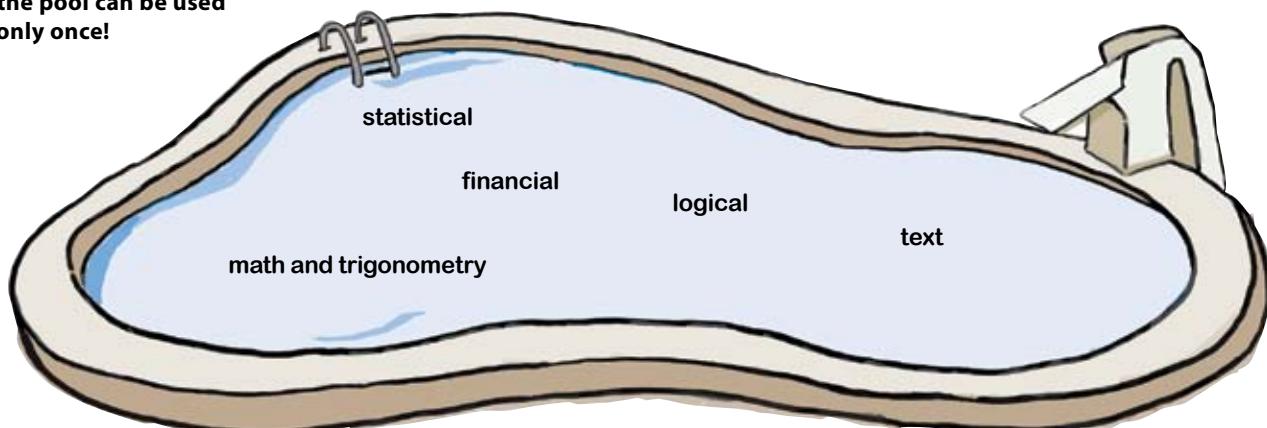
Pool Puzzle



Fill in the blanks with the category names from the pool.

- ➊ I use the _____ category to calculate how many payments I have left on my mortgage.
- ➋ The _____ category would help me extract the first name out of a cell that had first and last names.
- ➌ If I need to calculate sine and cosine, the _____ category is the place to go.
- ➍ Formulas that deal with TRUE/FALSE values are in the _____ category.
- ➎ The _____ category is what I need for counting instances of a date.

Note: Each thing from the pool can be used only once!



Pool Puzzle



Fill in the blanks with the category names from the pool.

- 1 I use the financial category to calculate how many payments I have left on my mortgage.

- 2 The text category would help me extract the first name out of a cell that had first and last names.

- 3 If I need to calculate sine and cosine, the math and trigonometry category is the place to go.

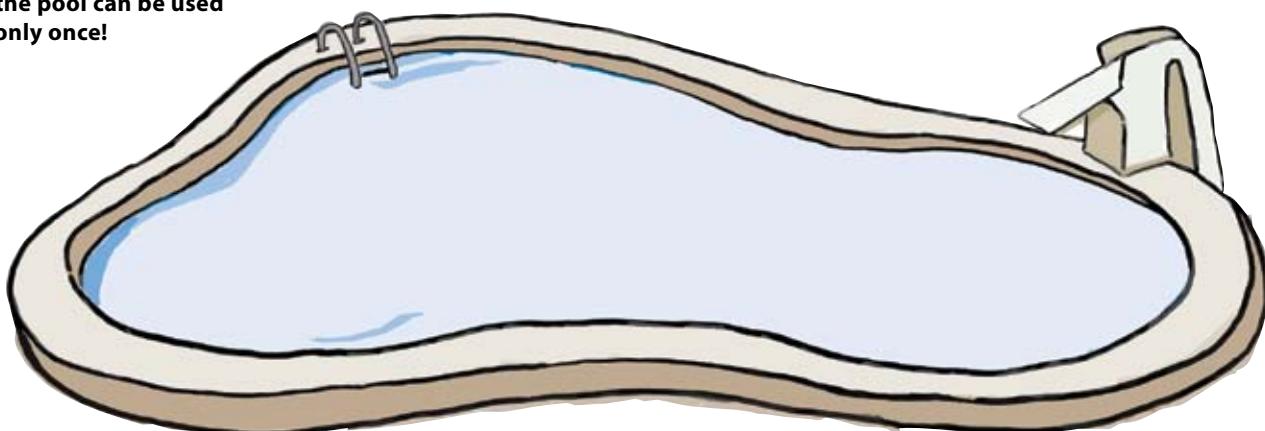
- 4 Formulas that deal with TRUE/FALSE values are in the logical category.

- 5 The statistical category is what I need for counting instances of a date.

Here's your parking problem.

Better take a look at the statistical functions!

Note: Each thing from the pool can be used only once!





Exercise

- 1 Under the statistical category, pick the function that will count instances of each date.

Take a look at all these functions.

- 2 Implement the function to say how much parking you'll need for each date.

You need a function that counts instances of the dates in this column...

...if they match each cell in this column.

TicketID	EventID	Date
1	101	6/5/2010
2	101	6/5/2010
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		

Day	Date	Ticket Count
2	5/6/2010	
3	6/6/2010	
4	12/6/2010	
5	13/6/2010	
6	19/6/2010	
7	20/6/2010	
8	26/6/2010	
9	27/6/2010	
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		

Function	Description
AVEDEV	Returns the average of the absolute deviations of data points from their mean
AVERAGE	Returns the average of its arguments
AVERAGEA	Returns the average of its arguments, including numbers, text, and logical values
AVERAGEIF	Returns the average (arithmetic mean) of all the cells in a range that meet a given criteria
AVERAGEIFS	Returns the average (arithmetic mean) of all cells that meet multiple criteria
BETADIST	Returns the beta cumulative distribution function
BETAINV	Returns the inverse of the cumulative distribution function for a specified beta distribution
BINOMDIST	Returns the individual term binomial distribution probability
CHIDIST	Returns the one-tailed probability of the chi-squared distribution
CHIINV	Returns the inverse of the one-tailed probability of the chi-squared distribution
CHITEST	Returns the test for independence
CONFIDENCE	Returns the confidence interval for a population mean
CORREL	Returns the correlation coefficient between two data sets
COUNT	Counts how many numbers are in the list of arguments
COUNTA	Counts how many values are in the list of arguments
COUNTBLANK	Counts the number of blank cells within a range
COUNTIF	Counts the number of cells within a range that meet the given criteria
COUNTIFS	Counts the number of cells within a range that meet multiple criteria
COVAR	Returns covariance, the average of the products of paired deviations
CRITBINOM	Returns the smallest value for which the cumulative binomial distribution is greater than or equal to a criterion value

Put your answers here.

Hint: You may want to look carefully at all the COUNT functions.



Exercise Solution

①

Under the statistical category, pick the function that will count instances of each date.

COUNTIFS is different but works similarly, so you could use it as well.

COUNTIF is the formula you want.

Here's an example.

You can use the range of dates in the ticket sales here.

You can use a reference to the date you want to count here.

The criterion is just the thing you want to count.

COUNTIF function

This article describes the formula syntax and usage of the COUNTIF function in Microsoft Office Excel.

Description

The COUNTIF function counts the number of cells within a range that meet a single criterion that you specify. For example, you can count all the cells that start with a certain letter, or you can count all the cells that contain a number that is larger or smaller than a number you specify. For example, suppose you have a worksheet that contains a list of tasks in column A, and the first name of the person assigned to each task in column B. You can use the COUNTIF function to count how many times a person's name appears in column B and, in that way, determine how many tasks are assigned to that person. For example:

```
=COUNTIF(B2:B25,"Nancy")
```

Note To count cells based on multiple criteria, see COUNTIFS function.

Syntax

```
COUNTIF(range, criteria)
```

The COUNTIF function syntax has the following arguments:

- range** Required. One or more cells to count, including numbers or names, arrays, or references that contain numbers. Blank and text values are ignored.
- criteria** Required. A number, expression, cell reference, or text string that defines which cells will be counted. For example, criteria can be expressed as 32, ">32", B4, "apples", or "32".

2

Implement the function to say how much parking you'll need for each date.

	A	B	C
1	Day	Date	Ticket Count
2	5	6/5/2010	700
3	6	6/6/2010	750
4	12	6/12/2010	1350
5	13	6/13/2010	800
6	19	6/19/2010	1550
7	20	6/20/2010	1900
8	26	6/26/2010	600
9	27	6/27/2010	0
10			
11			
12			
13			
14			
15			
16			

Here's the first argument: the range containing elements you want to count.

Here's the thing you want to count inside that range.

You can use any reference style you want to refer to the Tickets worksheet.

=COUNTIF(Tickets [Date] ,B2)
=COUNTIF(Tickets !C:C ,
Summary!B2)
=COUNTIF(Tickets !\$C\$2 :
\$C\$7651 ,Summary !B2)

These are all the same.

Now you have your totals for each date!

Your spreadsheet shows ticket counts summarized for each date

The COUNT family of formulas is a really versatile way to analyze repetitive elements in a list. The formulas enable you to get the size of a list, count the numbers in a list, count the blank cells in a list, and count based on multiple criteria.

You'll almost certainly have use for one or more of these formulas in the future, and when you do, you can just head over to the help docs and use your understanding of them to figure out which formula matches your problem.

This spreadsheet shows just what you need to know.

	A	B	C	D
1	Day	Date	Ticket Count	
2	5	6/5/2010	700	
3	6	6/6/2010	750	
4	12	6/12/2010	1350	
5	13	6/13/2010	800	
6	19	6/19/2010	1550	
7	20	6/20/2010	1900	
8	26	6/26/2010	600	
9	27	6/27/2010	0	
10				
11				
12				
13				
14				
15				
16				

From: Dataville Convention Ctr. COO

To: Head First

Subject:

Dear Head First,

Good, but...

Any chance you could show me *only* the list of dates that expect more than 1,000 people?

—COO

there are no Dumb Questions

Q: Now that I know how to look up functions, does this mean that I know all I need to know?

A: You're definitely well on your way to being an Excel master. A strong knowledge of how to use formulas is what really separates people who use Excel casually to keep lists and people who use it to make their data sing.

Q: I'm serious: how much about Excel is there left for me to know, if I know how to use the help screens to get functions?

A: In the remainder of the book, there are two more chapters (one on text data and one on Boolean data) that are about functions, and the other chapters are about other powerful features of Excel. But you've learned most of what you need to know to be good with formulas. What is left—for functions, at least—is mainly just figuring out which ones you need for your own work, and then the techniques you need to use to make them work well.

Q: What's the difference between knowing functions and using "techniques" with formulas?

A: This is where the magic happens with Excel—when you use formulas together in clever combinations to achieve your analytic goals. It's one thing to understand your problem, another to understand Excel functions, and another thing entirely to be clever when it comes to matching up the problem with Excel functions.

Q: Sounds like something that just needs practice and experimentation.

A: That's right. People who are good at Excel have generally spent a lot of time working and reworking their data in a bunch of different ways with a bunch of different formulas. It's only through that process that they discover the mind-blowing, clever solutions for the analysis of their own problems.

Q: So, practice, practice, practice.

A: And be aware of features and functions of Excel that you've never used before. You never know whether something will be useful for you unless you try it out.

Q: What about these pivot tables I've heard about? Are they a type of function?

A: Good question. Pivot tables are one of the most powerful features of Excel besides functions, and we haven't touched on them yet, even though they're coming up. But first, we need to clean up the Convention Center's data for the COO....



Exercise

Use an Excel feature you've learned to generate a list of days where expected attendance is greater than 1,000 people.



Exercise Solution

What Excel operation did you need to generate the list of dates where expected attendance is 1,000 or more?

Just use a filter!

Filters are a fast way to display only the data you want to see.

No problem here....

hfe_h07_tickets - Microsoft Excel

	A	B	C	D
1	Day	Date	Ticket Count	
4		12 6/12/2010	1350	
6		19 6/19/2010	1550	
7		20 6/20/2010	1900	
10				
11				
12	All the other data is still there—it's just hidden.			
13				
14				
15	These are the three dates for which they need to order parking.			
16				
17				
18				
19				
20				
21				

Tickets Summary

Ready 3 of 8 records found 150%

Box tickets for you!

Thanks to your diligent efforts, the convention center knows when it's going to need to order more parking. You've saved the convention center money and made spectators happy. Now to enjoy your reward....





Visualize your formulas

If only I had seen where this formula was taking us—downhill fast—I might have chosen a different one....



Excel formulas can get really complicated.

And that is the point, right? If all you wanted to do was simple calculation, you'd be fine with a paper, pen, and calculator. But those complicated formulas can get unwieldy—especially ones written by other people, which can be almost impossible to decipher if you don't know what they were thinking. In this chapter, you'll learn to use a simple but powerful graphical feature of Excel called **formula auditing**, which will dramatically illustrate the flow of data throughout the *models* in your spreadsheet.

buy or rent?

Should you buy a house or rent?

It's a perennial question. Both options have good reasons in their favor, and deciding which one is right for you is an important analytical project.

You need to develop a model to compare the cost of both options. You and your **better half** want to move in five years, which in some cases would be enough time to make financial sense for buying a house, but in some cases would not.

You could buy one of these...



...or you could rent a place
inside of one of these!



Your choice will have big financial
consequences in your life!

**It's important to
choose wisely.**



Let's run some basic numbers to see what sort of house you'd be able to afford if you did purchase a home. Use the PV (present value) function to calculate how much money you can borrow.

- 1 Take a look at the Help files under the PV function. How does the function work?

- 2 Using what you've learned about the PV function, implement it using the following assumptions about the hypothetical loan you want to take out.



BULLET POINTS

- Annual interest: 5%
- Term of loan: 30 years
- Monthly payment: \$1,500

- 3 What other information do you need to compare buying a house versus renting?

.....
.....
.....
.....



Exercise Solution

You just looked into the Excel Help files to learn about the PV function, and then you implemented it to calculate how large of a mortgage you could afford. What did you find?

1

- Take a look at the Help files under the PV function. How does the function work?

The rate is the interest for your loan.

NPER refers to the term of your loan—your agreement with the lender of how long you'll need to pay it off.

PMT refers to your expected periodic payment.

In this case, you expect to pay \$1,500 every month.

PV function

Returns the present value of an investment. The present value is the total amount that a series of future payments is worth now. For example, when you borrow money, the loan amount is the present value to the lender.

Syntax

`PV(rate,nper,pmt,[type])`

Rate is the interest rate per period. For example, if you obtain an automobile loan at a 10 percent annual interest rate and make monthly payments, your interest rate per month is 10%/12, or 0.83%. You would enter 10%/12, or 0.83%, or 0.0083, into the formula as the rate.

Nper is the total number of payment periods in an annuity. For example, if you get a four-year car loan and make monthly payments, your loan has 4*12 (or 48) periods. You would enter 48 into the formula for nper.

Pmt is the payment made each period and cannot change over the life of the annuity. Typically, pmt includes principal and interest but no other fees or taxes. For example, the monthly payments on a \$10,000, four-year car loan at 12 percent are \$263.33. You would enter -263.33 into the formula as the pmt. If pmt is omitted, you must include the fv argument.

2

- Using what you've learned about the PV function, implement it using the following assumptions about the hypothetical loan you want to take out.

Here's your PV formula.

Here's the total number of months in your 30-year loan.

=PV(B3/12,B4*12,B5)

This argument is the monthly interest rate.



BULLET POINTS

- Annual interest: 5%
- Term of loan: 30 years
- Monthly payment: \$1,500

Your spreadsheet with the PV function...

Your interest rate and loan term is in years, but your payment is monthly.

You need to convert the rate and term to months, so you're using the same unit.

This is how much you can borrow, given your assumptions.

What can I afford?	
Annual interest rate	5%
Loan term (years)	30
Payment (monthly)	\$1,500
Loan amount	(\$279,422.43)

- 3 What other information do you need to compare housing versus rent?

This PV calculation is really just a start. Once I've bought a house, that house is either going to rise or fall in value, so I need to know how my investment will look when I sell the house. Plus, I need to compare all those figures with some assumptions about what renting will cost me during the same period of time.



How would you compare the costs of renting and buying over time?

Use Net Present Value to discount future costs to today's values

You can use the NPV function to calculate the Net Present Value of the costs of your two options. NPV discounts future costs to today's dollars, enabling you to do an apples-to-apples comparison of renting and buying.

Whichever option costs less, given your assumptions, is the one you want to pursue.

Here's the syntax of NPV.

=NPV(rate, values)

The rate is the discount rate, which could be a bunch of different values depending on what you are modeling.

The values are the stream of cash flows that you want to discount.

Here's a simple example. Say someone paid you \$100 a year (with an annual 3% increase) for the next 5 years. NPV shows that **today** that stream of payments is worth \$500.

Book3 - Microsoft Excel									
		Home	Insert	Page Layout	Formulas	Data	Review	View	File
	B14								
5	This year	\$100.00							
6	Rate		3%						
7									
8	Year 1	\$103.00							
9	Year 2	\$106.09							
10	Year 3	\$109.27							
11	Year 4	\$112.55							
12	Year 5	\$115.93							
13									
14	NPV	\$500.00							
15									
16									

Here's an example of NPV.



Geek Bits: NPV

Aren't familiar with NPV? Here's the idea. Say you have a savings account with \$100 this year and 3% interest. \$100 **today** is worth \$103 **next year**. And *next year's* \$103 is worth \$100 **today**.

Now imagine you're the one paying the interest rather than your bank. Paying someone \$103 next year is the same as paying them \$100 today. Paying them \$106.09 in two years is also the same as paying them \$100 today.

If you add up all your future renting and buying costs **discounted** using NPV, you have a basis for comparing the two.



Let's take NPV for a spin. Here is an example of how your annual cash flows might look for renting an apartment and paying a mortgage.

Your task is to get the NPV of these two streams of costs. Use a **3.5% discount rate** to represent inflation.

Type these values into a spreadsheet, then get the NPV of each of these streams of cash.

This is the annual total amount you spend on rent.

This number is the annual payment for a mortgage.

Year	Rent	Mortgage
1	\$9,000	\$14,389
2	\$9,090	\$14,389
3	\$9,181	\$14,389
4	\$9,273	\$14,389
5	\$9,365	\$14,389

These values are all annual, so you don't have to convert to monthly payments here.

This figure represents a \$200,000 mortgage that lasts 30 years and has a 6% interest rate.



Exercise Solution

You just used NPV to compare renting and a mortgage under two sample scenarios. Which scenario is the least expensive?

Here is your formula.

=NPV(\$B\$3,C6:C10)

Use an absolute reference to make sure your formula stays fixed on cell B3 after you copy it.

Book1 - Microsoft Excel			
C12	B	C	D
<i>1 NPV of rent versus mortgage</i>			
2			
3	Discount	3.5%	
4			
5	Time	Rent	Mortgage
6	1	\$ 9,000	\$ 14,389
7	2	\$ 9,090	\$ 14,389
8	3	\$ 9,181	\$ 14,389
9	4	\$ 9,273	\$ 14,389
10	5	\$ 9,365	\$ 14,389
11			
12	NPV	\$41,427.96	\$64,967.09
13			
14			
15			

It looks like renting costs less than the mortgage...

Your NPV is correct, but you need a more complex model. Here's one I created....

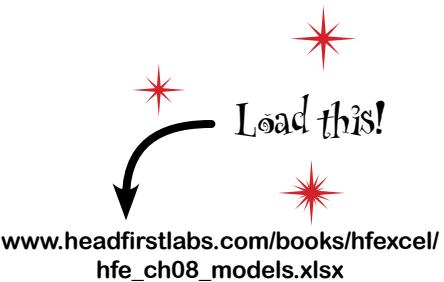
You can use the same formula for both of these cells.



...at least, renting costs less using these assumptions.

The broker has a spreadsheet for you

Her crack at the rent vs. buy problem is a lot more elaborate than the exercise you just completed, even though ultimately she's using a comparison of NPVs as well. Here's her spreadsheet.



This spreadsheet is a lot more complex.



This spreadsheet contains a much larger array of assumptions about how your calculation will work. And this is promising, since the world is complex and it's a good idea to think through all the variables in such an important decision.



How do you think this spreadsheet works?
Take a close look at the formulas.

Models in Excel can get complicated

You can define **models** in a number of ways, depending on what you're trying to do, but in Excel a “model” is a network of formulas designed to answer a question.

Models can get complicated, and it can be hard to sort them all out. Unless you can understand the workings of this particular model, how do you trust the real estate broker?

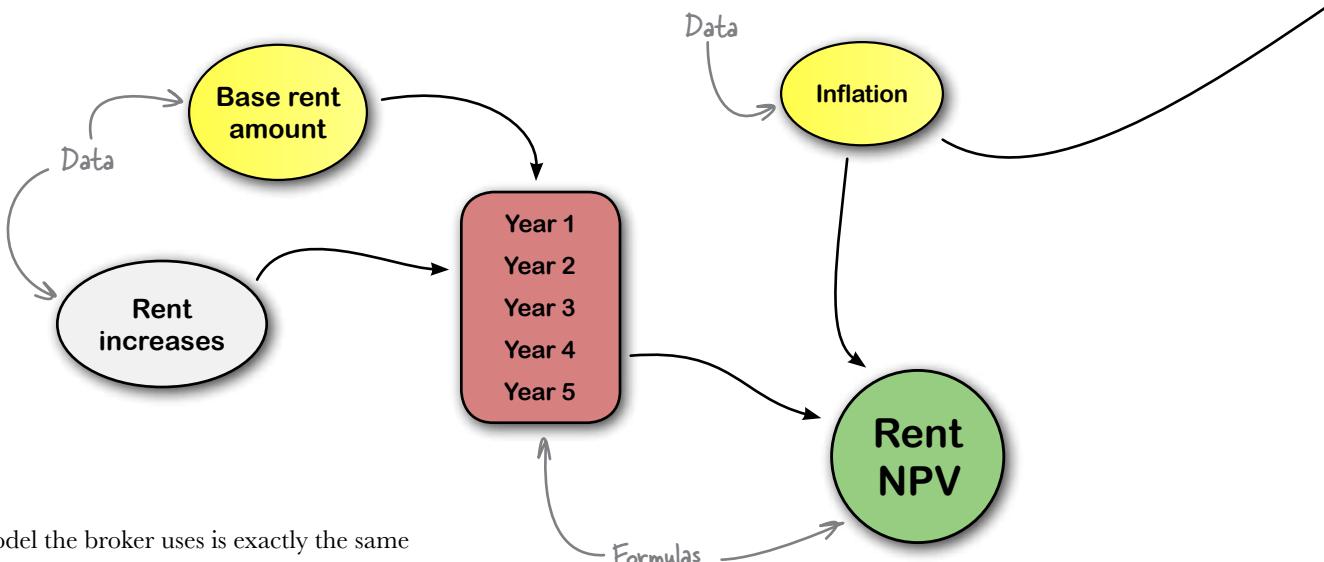
This spreadsheet shows models for calculating rent and mortgage NPVs.

The screenshot shows an Excel spreadsheet with the following data:

Basic assumptions					
Marginal tax rate	25%	Inflation	3.50%		
Rate of return	8%	Cap gain tax	10%		
Renting					
Ann rent increase	1%	Year	Annual Rent:		
Monthly	\$750	1	\$9,000		
		2	\$9,090		
		3	\$9,181		
		4	\$9,273		
Total rent	\$45,000	5	\$9,365		
Renting NPV	\$41,422.99				
Buying					
Purchase price	\$ 250,000	Loan	\$ 200,000		
Down	\$ 50,000	Mortgage rate	6%		
		Term (years)	30		
Annual appreciation	3%				
Year	Mortgage	Opo cost	Tax savings	Appreciation Cost	
1	\$ 14,389	\$ 3,600	\$ (2,083)	\$ (7,500)	\$ 7,506
2	\$ 14,389	\$ 3,859	\$ (2,045)	\$ (7,725)	\$ 7,578
3	\$ 14,389	\$ 4,137	\$ (2,905)	\$ (7,957)	\$ 7,664
4	\$ 14,389	\$ 4,435	\$ (2,863)	\$ (8,195)	\$ 7,766
5	\$ 14,389	\$ 4,754	\$ (2,817)	\$ (8,441)	\$ 7,885
Buying NPV	\$34,645.64				
Rent or buy? Buy					

Rent model

The rent model is like the mortgage model in that its spreadsheet representation consists of cells full of data that flow into formulas, which flow into more formulas.

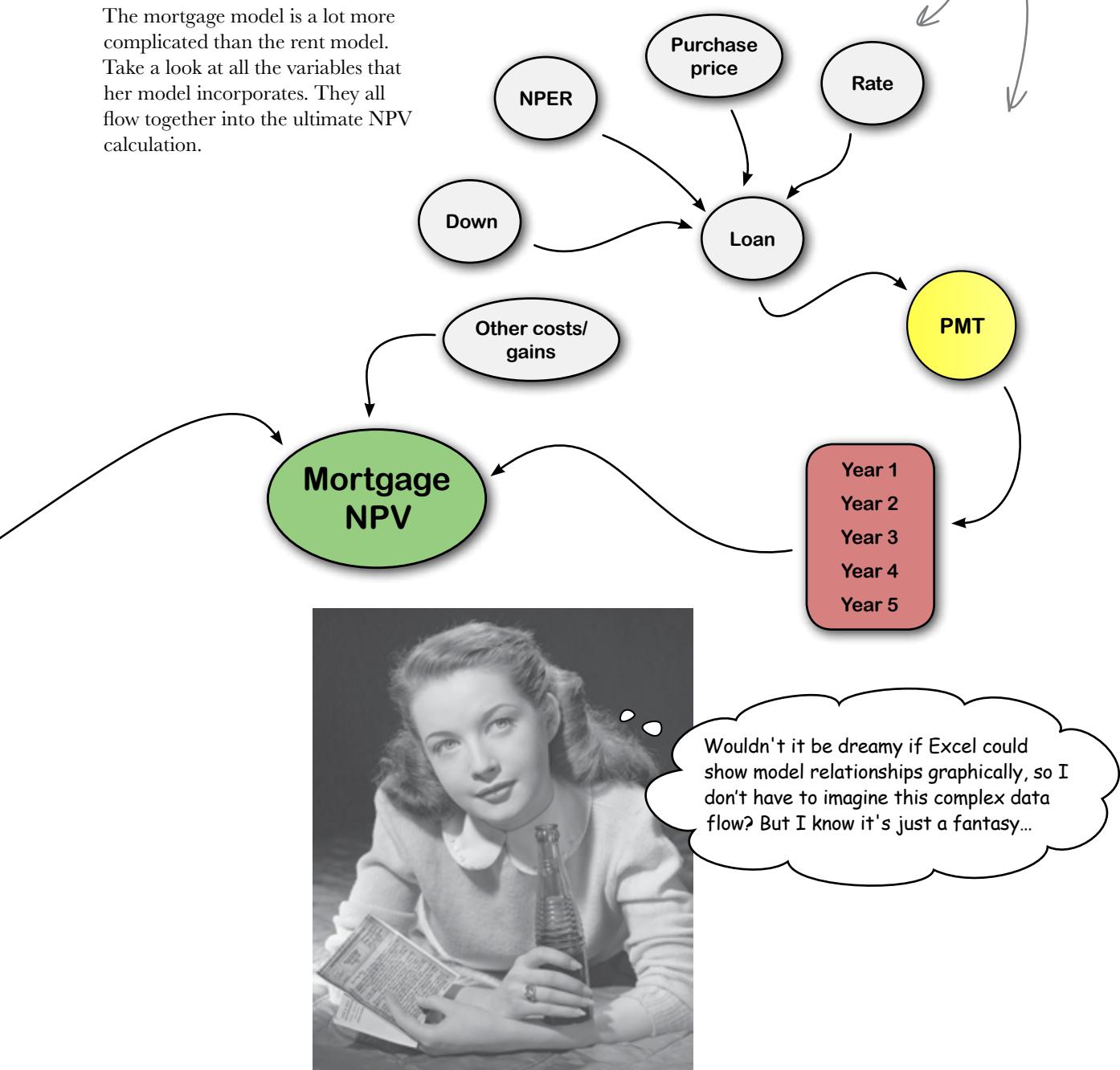


The model the broker uses is exactly the same calculation as the one you created to evaluate rent, although the specific assumptions she feeds into her model are slightly different from the ones you used.

Mortgage model

The mortgage model is a lot more complicated than the rent model. Take a look at all the variables that her model incorporates. They all flow together into the ultimate NPV calculation.

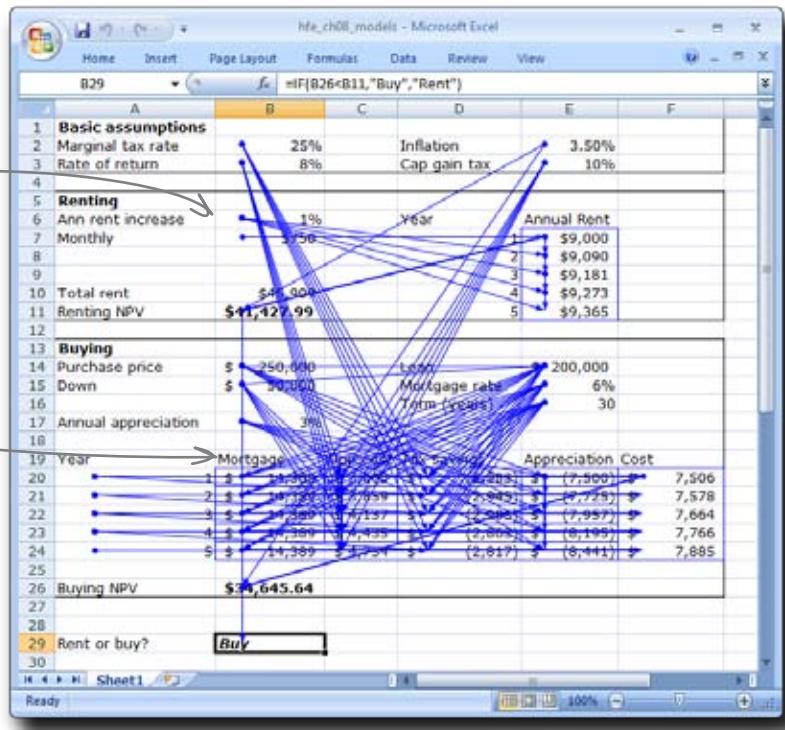
There are a whole lot of variables feeding into the mortgage model.



Formula auditing shows you the location of your formula's arguments

Formula auditing is an Excel feature that allows you to trace the flow of data through complex formulas. Here are the models you saw on the previous page, with arrows drawn by Excel.

These arrows show how data feeds through formulas into the rent/buy formula.

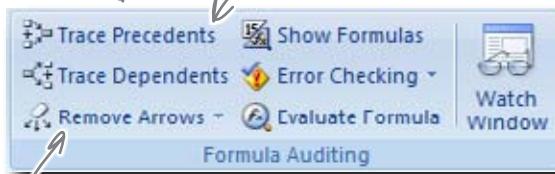


This network of arrows looks complicated, and it is—the model is complicated!

Try recreating these arrows yourself. Put your cursor on cell B29, and then click Trace Precedents until you see this grid. Can you see how data flows through the model?

The formula auditing buttons can be found under the formula tab.

Select a formula and click Trace Precedents to see which cells' data flows into it.



Click Remove Arrows to get rid of arrows you've created.

Let's take a close look at the rent model to see how its formulas work....



Exercise

Select the rent NPV formula in cell B11. This formula takes data from other formulas in the rent box, and you want to use formula auditing to see how those formulas work together.

Click Trace Precedents on cell B11 and on the formulas that feed into it.

	A	B	C	D	E	F
1	Basic assumptions					
2	Marginal tax rate	25%	Inflation		3.50%	
3	Rate of return	8%	Cap gain tax		10%	
4						
5	Renting					
6	Ann rent increase	1%	Year		Annual Rent	
7	Monthly	\$750		1	\$9,000	
8				2	\$9,090	
9				3	\$9,181	
10	Total rent	\$15,909		4	\$9,273	
11	Renting NPV	\$11,127.99		5	\$9,365	
12						
13	Buying					

This formula calculates the present value of five years of rent costs.

How are the formulas in these cells calculated?

How is this data involved?

Describe in words how the rent formulas flow information through the spreadsheet.

.....

.....

.....

.....

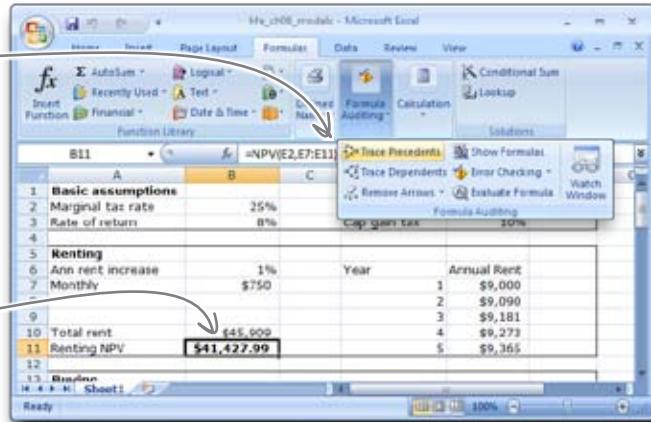


Exercise Solution

Were you able to use formula auditing to figure out how the rent model works?

Here's the Trace Precedents button being pressed.

The rent NPV is selected, so the audit will be of this formula.



Describe in words how the rent formulas flow information through the spreadsheet.

The NPV formula is pretty straightforward. It points to the cash flows from the Annual Rent

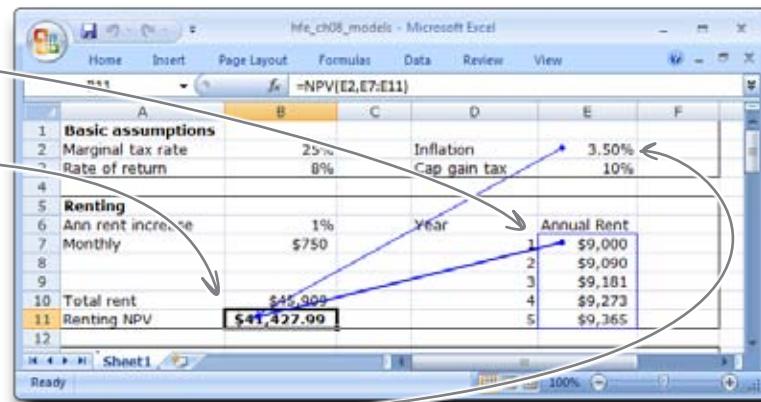
column and uses Inflation as the discount rate. As for the Annual Rent formula, Year 1 is the

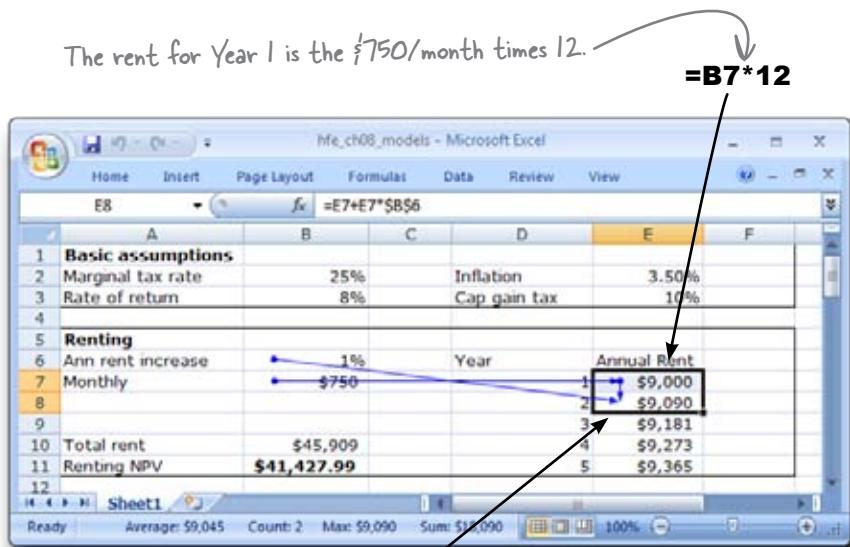
monthly rent (cell B7) times 12, and Year 2 adds an annual 1% increase (from cell B6) to the

previous year. Years 3 through 5 do the same thing.

The NPV formula points to the cash flows in the Annual Rent column...

...and to the 3.5% discount rate for inflation.





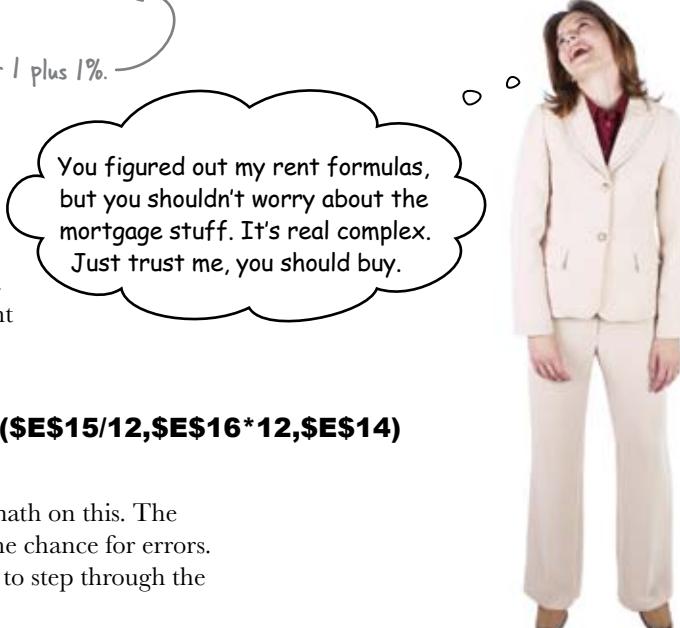
The rent for Year 2 is the rent for Year 1 plus 1%.

The mortgage model is really complex.
For example, take a look at the payment calculation from cell B20.

Yikes! $\rightarrow =-1*12*\text{PMT}(\$E\$15/12,\$E\$16*12,\$E\$14)$

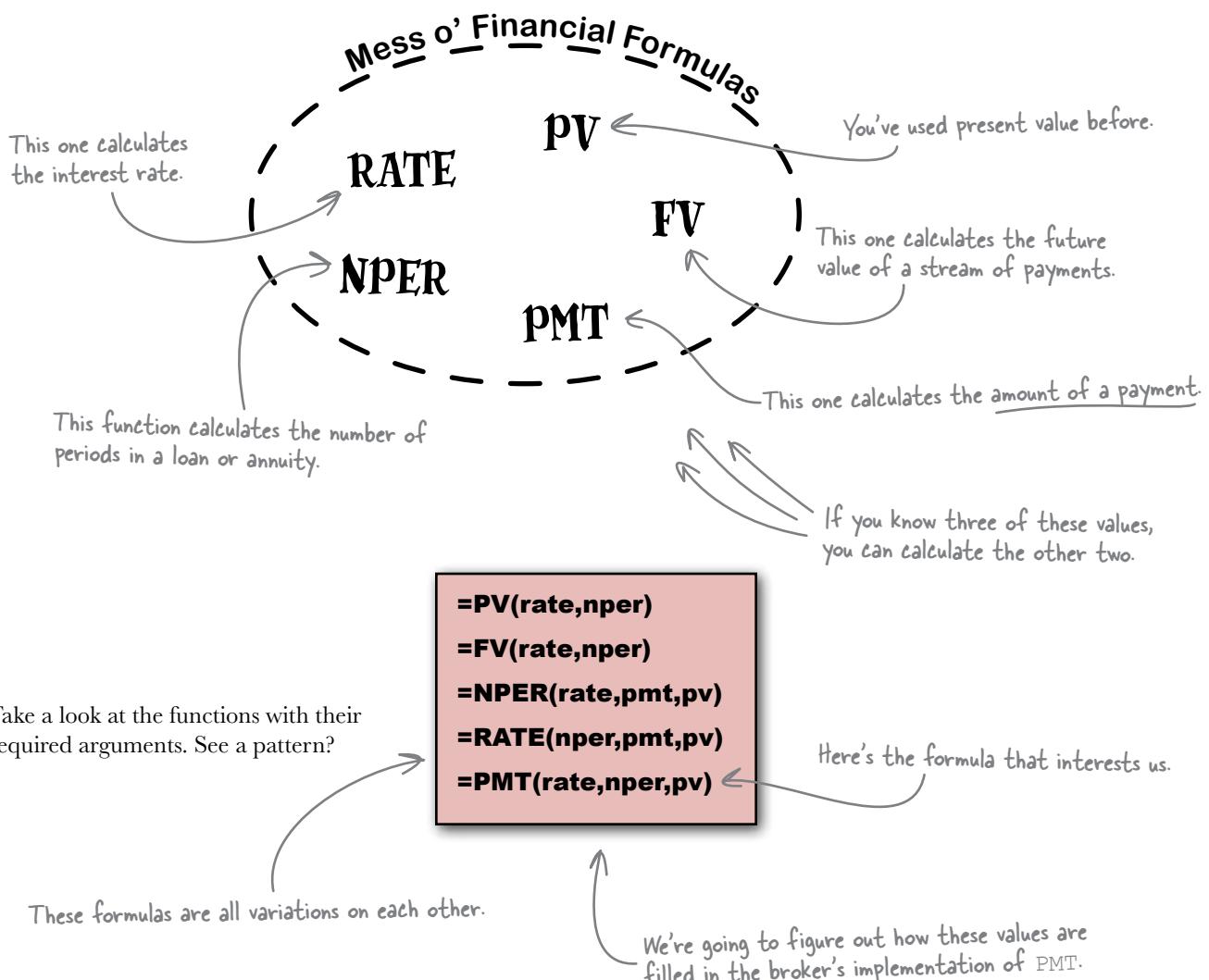
You should **definitely** check out the math on this. The more complex the model, the higher the chance for errors. Good thing you have formula auditing to step through the formula.

How do you think the PMT formula works?



Excel's loan functions all use the same basic elements

Excel has a bunch of financial functions, but the core functions are the ones that calculate loan values, payments, rates, and terms. The neat thing about these functions is that they take the same arguments—each other—so if you know a few, you can generally derive the others.



The PMT formula in the broker's spreadsheet calculates your monthly payment

When you click Trace Precedents on the mortgage amount calculation, you can see how the formula looks elsewhere on the spreadsheet for the RATE, NPER, and PV amounts.

$=-1*12*PMT($E$15/12,$E$16*12,$E$14)$

Here's the monthly interest rate.

Use formula auditing to see how the arguments of this formula are filled.

Here's the present value (PV).

Here's the term (NPER).

hfe_ch08_models - Microsoft Excel

B20 $-1*12*PMT($E$15/12,$E$16*12,$E$14)$

A	B	C	D	E	F
11 Renting NPV	\$11,427.99			5	\$9,365
12					
13 Buying					
14 Purchase price	\$ 250,000		Loan	\$ 200,000	
15 Down	\$ 50,000		Mortgage rate	6%	
16			Term (years)	30	
17 Annual appreciation	3%				
18					
19 Year	Mortgage	Opp cost	Tax savings	Appreciation	Cost
20 1	\$ 14,389	\$ 3,600	\$ (2,983)	\$ (7,500)	\$ 7,506
21 2	\$ 14,389	\$ 3,859	\$ (2,945)	\$ (7,725)	\$ 7,578
22 3	\$ 14,389	\$ 4,137	\$ (2,905)	\$ (7,957)	\$ 7,661
23 4	\$ 14,389	\$ 4,435	\$ (2,863)	\$ (8,195)	\$ 7,766
24 5	\$ 14,389	\$ 4,754	\$ (2,817)	\$ (8,441)	\$ 7,805
25					
26 Buying NPV	\$34,645.64				
27					

Sheet1

When the broker wrote this formula, she multiplied the result by 12 to make the calculation show the total mortgage amount for the year, and then she multiplied the amount by -1 to make it a positive number.

What about the rest of the real estate broker's formulas?



Long Exercise

Take a close look at the formulas the broker uses in her mortgage model. How do they work?
Write your answers in the blanks below.

You will need to use both formula auditing and the help screens to decode these formulas.

- 1 Use what you've learned so far to figure out how the "Tax savings" formula works.

Tax savings

=CUMIPMT(\$E\$15/12,\$E\$16*12,\$E\$14,1,A20*12,0)*\$B\$2

This one's a bear!

The screenshot shows a Microsoft Excel spreadsheet titled "hfe_ch08_models - Microsoft Excel". The spreadsheet contains data for a financial model comparing buying and renting a house. Key values include:

	A	B	C	D	E	F
11	Renting NPV	\$41,427.99			5	\$9,365
12						
13	Buying					
14	Purchase price	\$ 250,000		Loan	\$ 200,000	
15	Down	\$ 50,000		Mortgage rate	6%	
16				Term (years)	30	
17	Annual appreciation	3%				
18						
19	Year	Mortgage	Opp cost	Tax savings	Appreciation	Cost
20	1	\$ 14,389	\$ 3,600	\$ (2,983)	\$ (7,500)	\$ 7,506
21	2	\$ 14,389	\$ 3,859	\$ (2,945)	\$ (7,725)	\$ 7,578
22	3	\$ 14,389	\$ 4,137	\$ (2,905)	\$ (7,957)	\$ 7,664
23	4	\$ 14,389	\$ 4,435	\$ (2,863)	\$ (8,195)	\$ 7,766
24	5	\$ 14,389	\$ 4,754	\$ (2,817)	\$ (8,441)	\$ 7,885
25						
26	Buying NPV	\$31,615.61				
27						

At the bottom of the spreadsheet, the status bar shows "Ready" and "100%".

Write how you think these formulas work in the blanks.

- 2 Do the same for the “Opp cost” and “Appreciation” formulas.

Opp cost

$=\$B\$15*\$B\$3*(1-\$E\$3)$

Appreciation

$=-1*\$B\$17*\$B\14

hfe_ch08_models - Microsoft Excel						
Home Insert Page Layout Formulas Data Review View						
C20	B	C	D	E	F	G
11 Renting NPV	\$41,427.99			5	\$9,365	
12						
13 Buying						
14 Purchase price	\$ 250,000		Loan	\$ 200,000		
15 Down	\$ 50,000		Mortgage rate		6%	
16			Term (years)		30	
17 Annual appreciation	3%					
18						
19 Year	Mortgage	Opp cost	Tax savings	Appreciation	Cost	
20 1	\$ 14,389	\$ 3,600	\$ (2,983)	\$ (7,500)	\$ 7,506	
21 2	\$ 14,389	\$ 3,859	\$ (2,945)	\$ (7,725)	\$ 7,578	
22 3	\$ 14,389	\$ 4,137	\$ (2,905)	\$ (7,957)	\$ 7,664	
23 4	\$ 14,389	\$ 4,435	\$ (2,863)	\$ (8,195)	\$ 7,766	
24 5	\$ 14,389	\$ 4,754	\$ (2,817)	\$ (8,441)	\$ 7,885	
25						
26 Buying NPV	\$31,615.61					
27						



Long Exercise Solution

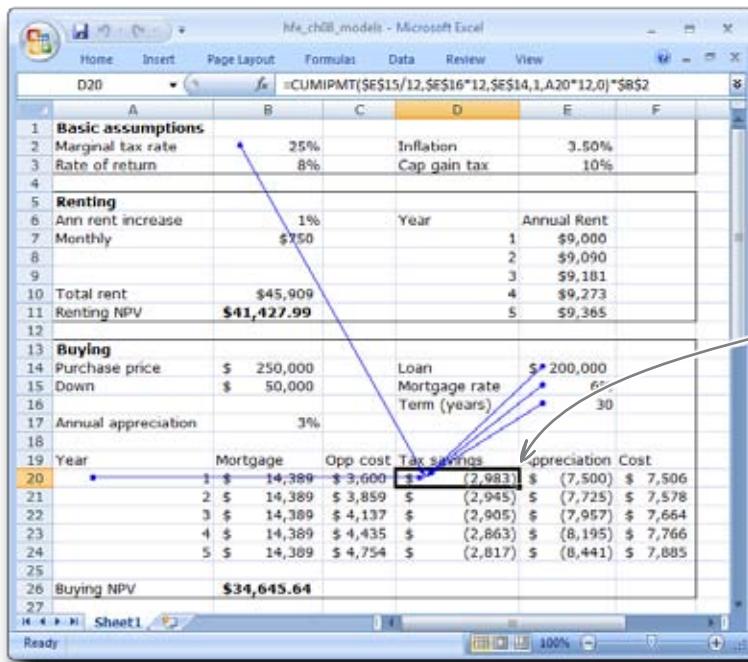
Were you able to use Excel tools to decode the Tax savings, Opp cost, and Appreciate formulas?

- 1 Use what you've learned so far to figure out how the "Tax savings" formula works.

Tax savings

=CUMIPMT(\$E\$15/12,\$E\$16*12,\$E\$14,1,A20*12,0)*\$B\$2

The CUMIPMT function calculates the amount of interest paid on a loan (or annuity) between two points in time. In this formula, CUMIPMT looks at assumptions about the size, interest rate, and term of the loan to calculate interest paid each year. Then the formula multiplies the amount of interest paid by your tax rate, which returns how much money you save in taxes.



Here's how data flows into the Tax savings formula.

2

Do the same for the “Opp cost” and “Appreciation” formulas.

Opp cost

$=\$B\$15*\$B\$3*(1-\$E\$3)$

Appreciation

$=-1*\$B\$17*\$B\14

The Opp cost formula adds together your down payment and your cumulative mortgage payment and then multiplies the amount by your after-tax rate of return. This is your “opportunity cost.” The Appreciation formula looks at the purchase price of your house and adds an annual rate of return. The Appreciation formula incorporates appreciation from the previous year into its calculation.

Basic assumptions				
Marginal tax rate	25%	Inflation	3.50%	
Rate of return	8%	Cap gain tax	10%	
Renting				
Ann. rent increase	1%	Year	Annual Rent	
Monthly	\$750			
		1	\$9,000	
		2	\$9,090	
		3	\$9,181	
		4	\$9,273	
Total rent:	\$45,000	5	\$9,365	
Renting NPV	\$41,427.99			
Buying				
Purchase price	\$ 250,000	Loan	\$ 200,000	
Down	\$ 50,000	Mortgage rate	6%	
		Term (years)	30	
Annual appreciation	3%			
Year	Mortgage	Opp. cost	Tax savings	Appreciation Cost
1	\$ 14,399	\$ 5,609	\$ (2,983)	\$ (7,500)
2	\$ 14,399	\$ 3,659	\$ (2,945)	\$ (7,578)
3	\$ 14,399	\$ 4,137	\$ (2,905)	\$ (7,664)
4	\$ 14,399	\$ 4,435	\$ (2,863)	\$ (7,664)
5	\$ 14,399	\$ 4,734	\$ (2,817)	\$ (8,441)
Buying NPV	\$34,645.64			

Buying				
14 Purchase price	\$ 250,000	Loan	\$ 200,000	
15 Down	\$ 50,000	Mortgage rate	6%	
16		Term (years)	30	
17 Annual appreciation	3%			
18				
19 Year	Mortgage	Opp. cost	Tax savings	Appreciation Cost
20 1	\$ 14,399	\$ 3,609	\$ (2,983)	\$ (7,500)
21 2	\$ 14,399	\$ 3,859	\$ (2,945)	\$ (7,578)
22 3	\$ 14,399	\$ 4,137	\$ (2,905)	\$ (7,664)
23 4	\$ 14,399	\$ 4,435	\$ (2,863)	\$ (7,664)
24 5	\$ 14,399	\$ 4,734	\$ (2,817)	\$ (8,441)
25 Buying NPV	\$34,645.64			

Here's the Appreciation formula.

The Opp cost formula draws from three sources.



Formulas must be correct, and assumptions must be reasonable

Models can get really complicated in Excel, and it always pays to do a sanity check to make sure that the formulas are written correctly and that the numbers that go into them are sensible.

Let's take a look at how the model works if you play around with the broker's assumptions.



Watch it!

Model complexity can obscure a host of ills.

It's easy to create an elaborate spreadsheet that flows data all over the place. It's really hard to devise a complex model that helps you make good real-world decisions. Always make sure you understand the models you use, especially the complex ones.



Here are a couple different scenarios designed to test the broker's model. What happens to your decision when you change the model's assumptions?

- 1 Say your loan interest is changed to 6.5% and the house appreciates at 1.5% per annum. Does that affect your decision to buy?

.....
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.....

- 2 Say it goes to 4% interest and 5% appreciation. What now?

.....
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- 3 What would you ask the real estate broker to help tease out her beliefs about the plausibility of her assumptions?

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.....
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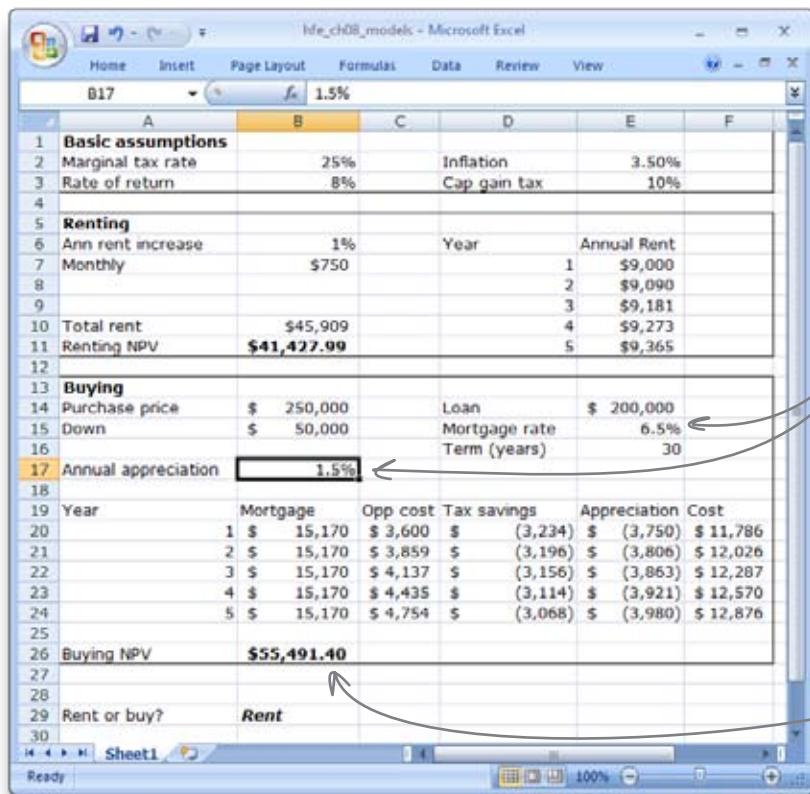
Sharpen your pencil Solution

You tinkered with some of the assumptions in the broker's model.
What did you learn about the model?

- 1 Say your loan interest is changed to 6.5% and the house appreciates at 1.5% per annum. Does that affect your decision to buy?

The cost for buying a house goes way up under this circumstance, for two reasons: one, the mortgage interest cost is a lot higher and two, the appreciation of the house isn't high enough to compensate for the increase in mortgage interest. Given the rent assumptions at the top of the spreadsheet, the NPV calculations show renting to be a clear winner.

Here are the two assumptions you changed.



hfe_ch08_models - Microsoft Excel					
Home Insert Page Layout Formulas Data Review View					
B17	1.5%	C	D	E	F
1 Basic assumptions					
2 Marginal tax rate	25%	Inflation		3.50%	
3 Rate of return	8%	Cap gain tax		10%	
5 Renting					
6 Ann rent increase	1%	Year		Annual Rent	
7 Monthly	\$750		1	\$9,000	
			2	\$9,090	
			3	\$9,181	
10 Total rent	\$45,909		4	\$9,273	
11 Renting NPV	\$41,427.99		5	\$9,365	
13 Buying					
14 Purchase price	\$ 250,000	Loan	\$ 200,000		
15 Down	\$ 50,000	Mortgage rate	6.5%		
16		Term (years)	30		
17 Annual appreciation	1.5%				
19 Year	Mortgage	Opp cost	Tax savings	Appreciation Cost	
20 1 \$ 15,170	\$ 3,600	\$ (3,234)	\$ (3,750)	\$ 11,786	
21 2 \$ 15,170	\$ 3,859	\$ (3,196)	\$ (3,806)	\$ 12,026	
22 3 \$ 15,170	\$ 4,137	\$ (3,156)	\$ (3,863)	\$ 12,287	
23 4 \$ 15,170	\$ 4,435	\$ (3,114)	\$ (3,921)	\$ 12,570	
24 5 \$ 15,170	\$ 4,754	\$ (3,068)	\$ (3,980)	\$ 12,876	
26 Buying NPV	\$55,491.40				
27					
28					
29 Rent or buy?	Rent				
30					
Sheet1					
Ready					

Now the NPV for buying costs is higher than the NPV for renting.

2

Say it goes to 4% interest and 5% appreciation. What now?

Here, interest goes down, and appreciation goes up. In this case, buying a house is a whole

lot more attractive than renting. In fact, you actually make money under this scenario,

which is what the negative NPV means. If you know that this scenario would come to pass,

buying would be a no-brainer. Too bad you don't have a crystal ball....

Here you're making money!

Basic assumptions				
Marginal tax rate	25%	Inflation	3.50%	
Rate of return	8%	Cap gain tax	10%	
Renting				
Ann rent increase	1%	Year	Annual Rent	
Monthly	\$750		1	\$9,000
			2	\$9,090
			3	\$9,181
Total rent	\$45,909		4	\$9,273
Renting NPV	\$41,427.99		5	\$9,365
Buying				
Purchase price	\$ 250,000	Loan	\$ 200,000	
Down	\$ 50,000	Mortgage rate	4.0%	
Annual appreciation	5.0%	Term (years)	30	
Year				
1	Mortgage	Opp cost	Tax savings	Appreciation Cost
1	\$ 11,458	\$ 3,600	\$ (1,084)	\$ (12,500) \$ 574
2	\$ 11,458	\$ 3,859	\$ (1,048)	\$ (13,125) \$ 244
3	\$ 11,458	\$ 4,137	\$ (1,911)	\$ (13,781) \$ (97)
4	\$ 11,458	\$ 4,435	\$ (1,872)	\$ (14,470) \$ (449)
5	\$ 11,458	\$ 4,754	\$ (1,031)	\$ (15,194) \$ (813)
Buying NPV	(-\$301.21)			
Rent or buy?				
	Buy			

3

What would you ask the real estate broker to help tease out her beliefs about the plausibility of her assumptions?

The broker wants to sell the house (wouldn't you, if you were a broker?), so you should be on guard for overly optimistic assumptions. Small changes in interest and appreciation rates make all the difference in which strategy is best for you. So the question for the broker is simply, "Why should I believe your assumptions?!"

The broker weighs in...





An email just came through from your better half talking about the assumptions you two should use for your modeling. And since your purchase of a home is a partnership, you'd better pay attention to those suggestions!

From: Better Half

To: You

Subject:

Hey You,

I've been doing a lot of thinking, and I think that we should use these assumptions. First off, let's go for the \$250,000 house.

I think that we should take out a loan for as little as possible, so let's put down \$100,000. That way, the present value of our loan will be just \$150,000.

The bank officer called and said that we qualify for a 30-year mortgage at 5% interest, and that's the best rate we've seen so far, so I think we should go with it.

And as for the amount we expect the house to appreciate...that's a tough one. The houses we're looking at have been in a pretty up-and-coming neighborhood, and unbiased experts are predicting 7% annual growth over the next five years. But I say we should project 3% just to be on the conservative side.

Love,

Your Better Half

Take these figures and plug them back into your spreadsheet. Using the NPV calculations, should you rent or buy?

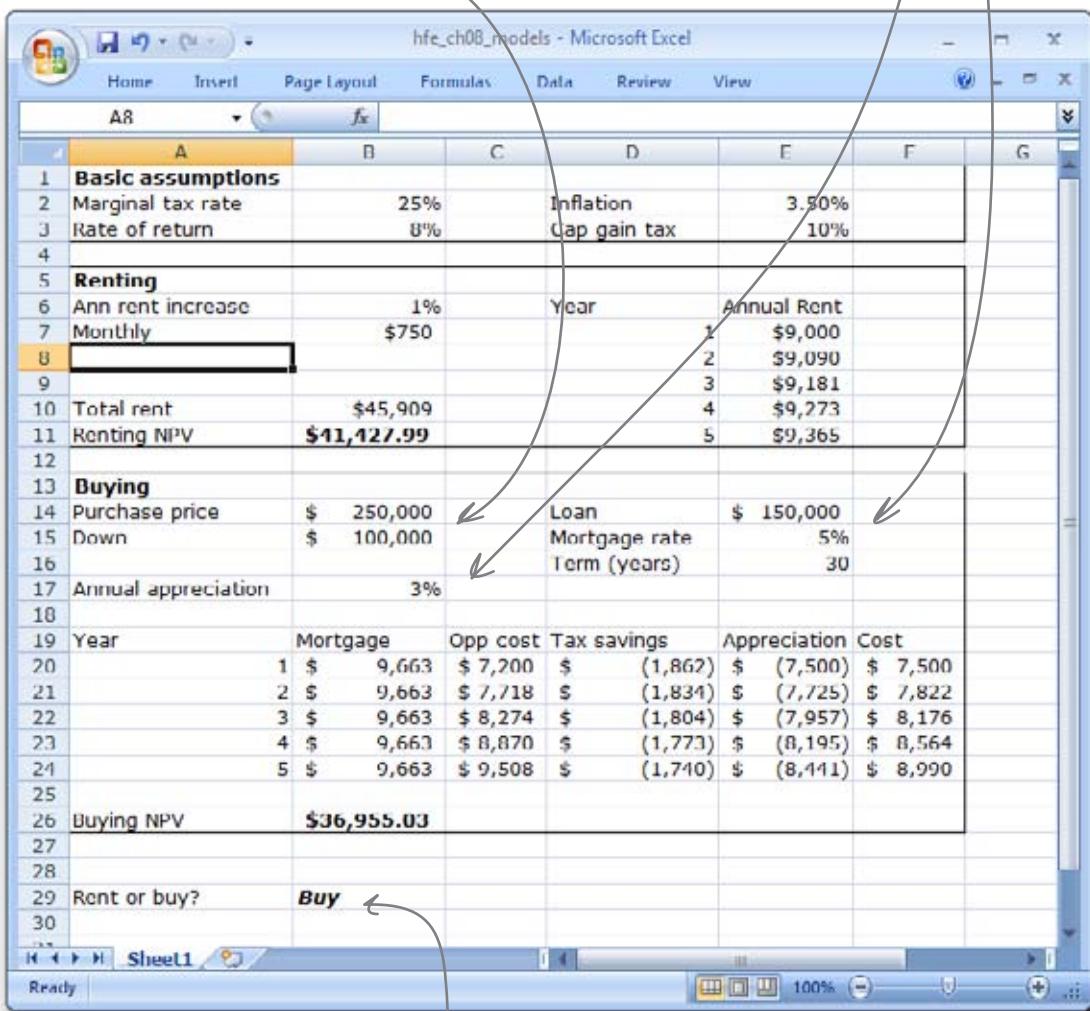


Exercise Solution

Your better half provided you with some model parameters for your rent vs. buy decision. What did your spreadsheet tell you to do?

Here's the new down payment.

Change these two cells as well.



Looks like a purchase is the way to go!

Your house was a good investment!

The purchase of a house is by no means a guaranteed way to make money, but because of your diligence in modeling your decision to buy the house, you and yours have done quite nicely.

Buying the house has definitely proven to be the better strategy.



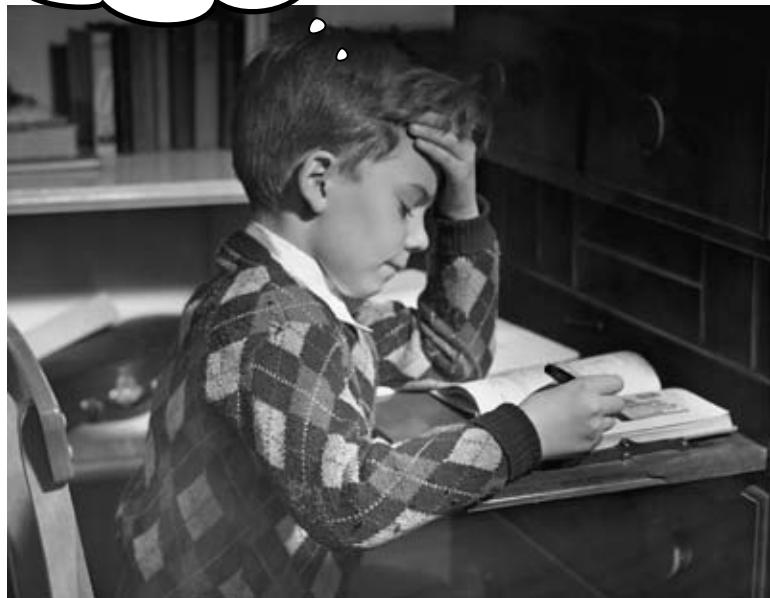
9 charts



Graph your data



All this arcane Excel code I have to write...what ever happened to drawing pictures?



Who wants to look at numbers all the time?

Very often a nice graphic is a more engaging way to present data. And sometimes you have so much data that you actually can't see it all without a nice graphic. Excel has extensive charting facilities, and if you just know where to click, you'll unlock the power to make charts and graphs to display your data with drama and lucidity.

Head First Investments needs charts for its investment report

There is a big presentation coming up for Head First Investment's **board of directors**. They have all the data compiled to show their performance over the last year, but they need some charts to make the data easier to read and understand. It's up to you to crank out some attractive charts.



This spreadsheet shows your company's investments.

Load this!

[www.headfirstlabs.com/books/hfexcel/
hfe_ch09_allocation.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch09_allocation.xlsx)

A screenshot of a Microsoft Excel window titled "hfe_ch09_allocation - Microsoft Excel". The spreadsheet contains the following data:

Current Asset Allocation			
Asset	Amount	%	
Long term government bonds	\$ 159,000	68%	
Domestic stock market	\$ 54,390	23%	
Emerging market stocks	\$ 20,100	9%	

Here's your
boss, the CEO.

This percentage column shows the allocation—the portion of the portfolio taken up by each investment.



Look at each chart type. Which is most appropriate to show portfolio allocation?

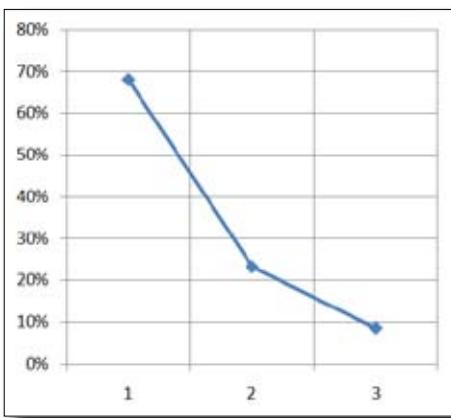
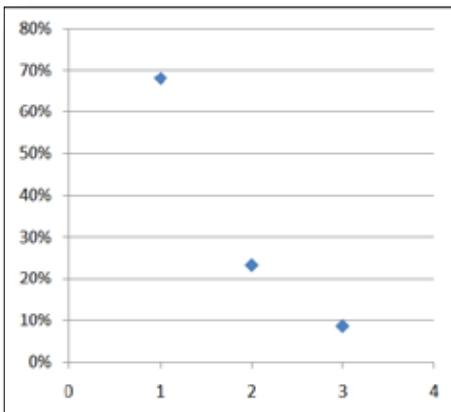
.....
.....
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.....

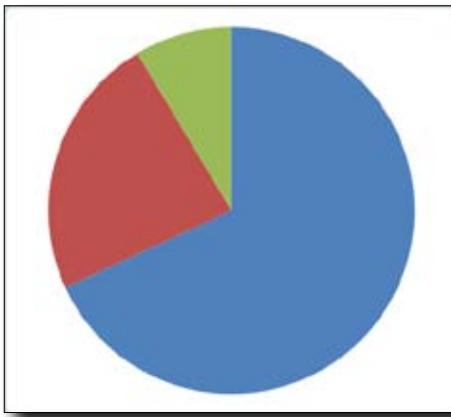
Write your thoughts about the suitability
of each chart type in these blanks.

.....
.....
.....

.....



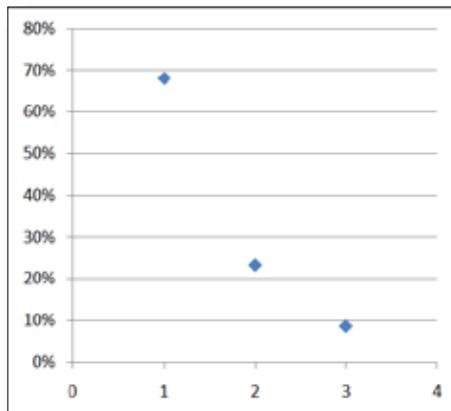
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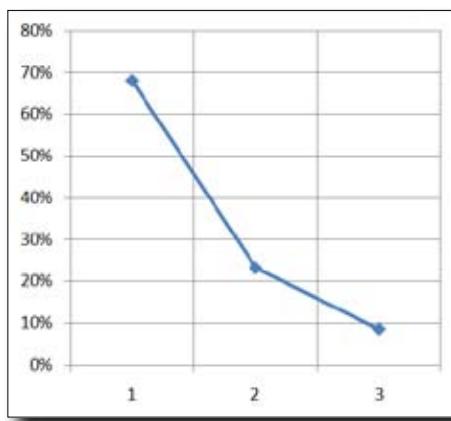
Sharpen your pencil Solution

Which chart did you conclude would be the most useful way of representing your company's portfolio visually?

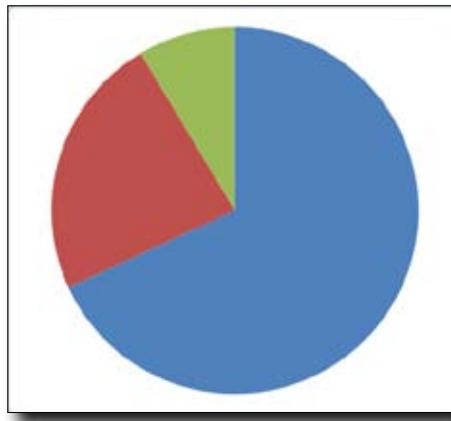
It looks like 1, 2, and 3 on the bottom here represent the different investments, and a dot represents the percentage for each. This isn't a very clear chart.



This chart has lines to connect the dots. That doesn't seem very useful either, because the line suggests a trend in the data, like what you'd have if one thing changed over time.



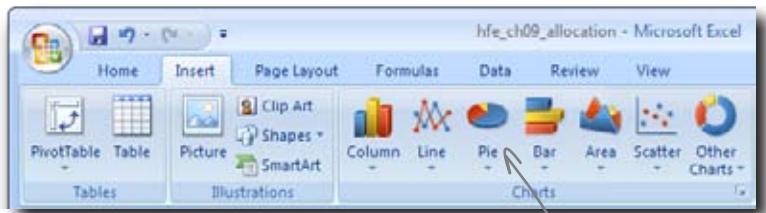
Here's the classic pie chart. This would definitely be a good place to start. The pie itself represents the portfolio, and each slice represents an asset.



Create charts using the Insert tab

Let's try creating one of those pie charts. Making charts in Excel is easy: just start by clicking on the Insert tab of the Ribbon. You'll find everything you need to get started.

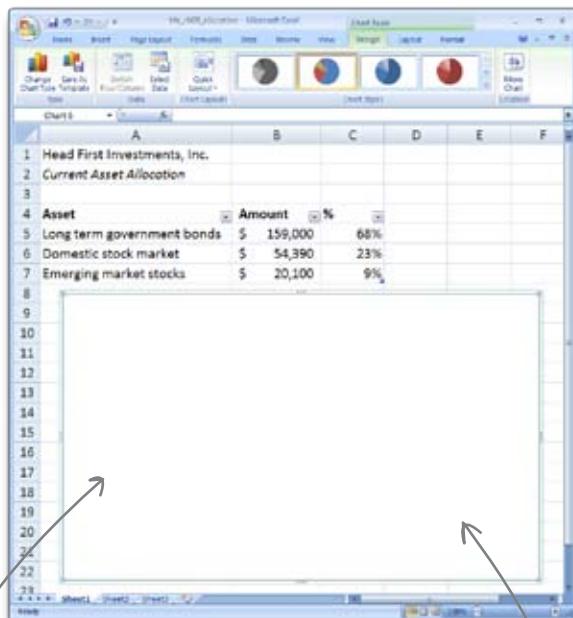
Make sure your data isn't selected.



- ① Make sure your cursor is **outside** **your data range** in a blank cell. Then insert a pie chart.

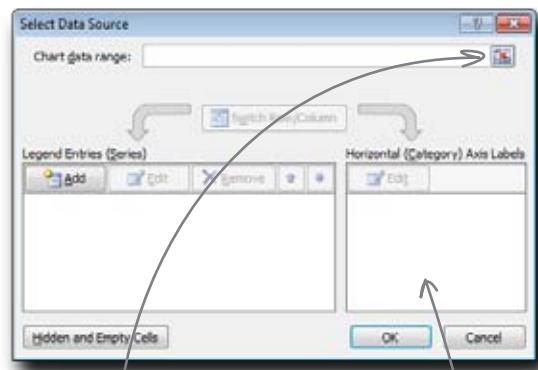
Click on the first option under this drop box.

- ② Next, click the Select Data button. Fill in your data range and axis labels.



You get a blank chart.

You might need to reposition this chart to see your data better.



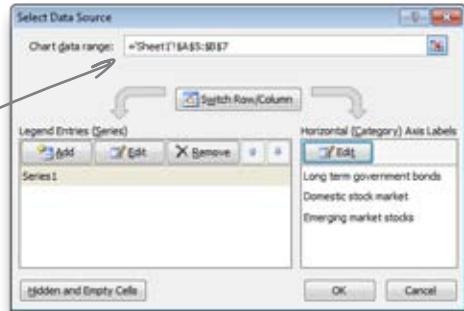
Click here to add your Amount data to the data range.

Click here to tell Excel how to name your categories.

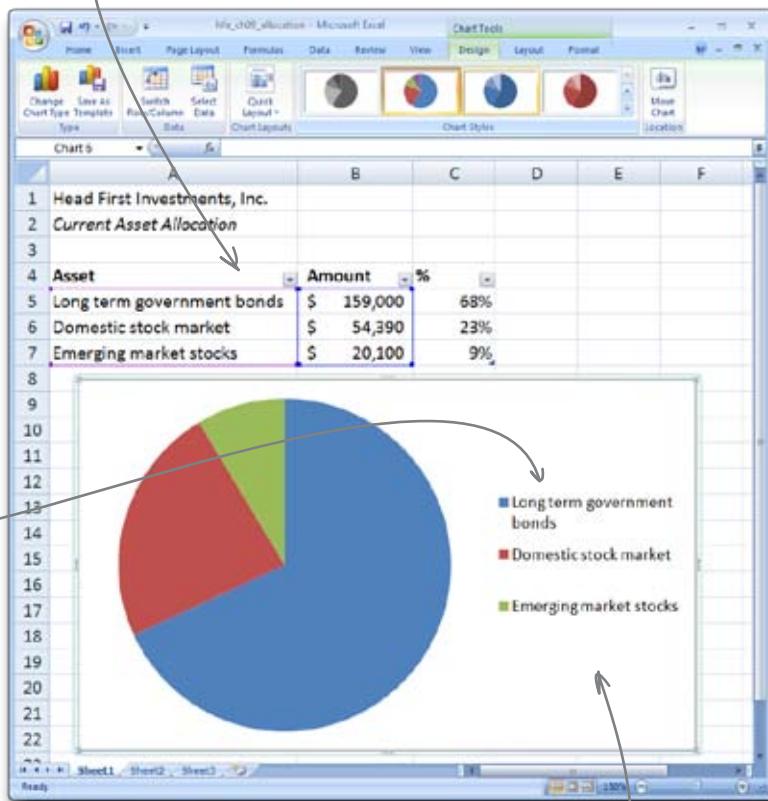
Use the Design and Layout tabs to rework your chart

Inserting a chart in Excel is only the beginning. Once your chart has been created, you'll always head to the Design and Layout tabs under Chart Tools to change elements in your chart like the titles and formatting.

You just hit the **Select Data** button under the Design tab to select your data and labels.



This range includes your data and labels.



This is the legend.

- Long term government bonds
- Domestic stock market
- Emerging market stocks

By default, Excel places your labels in the legend.



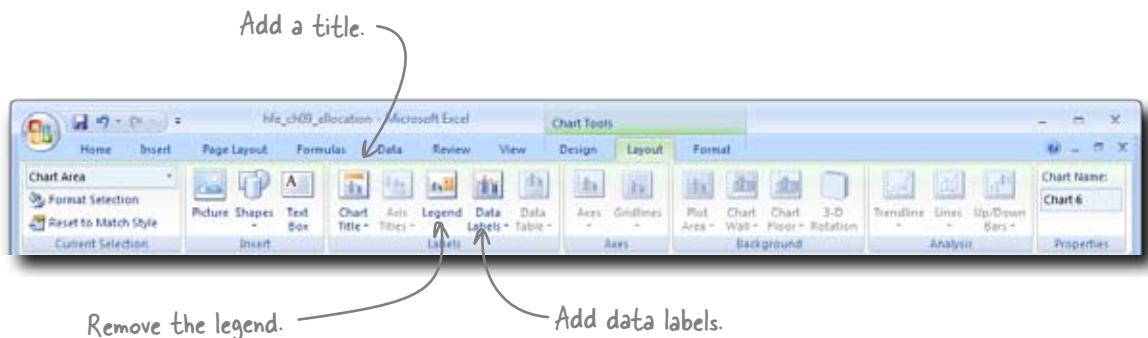
Exercise

Let's polish up your chart using the Design and Layout tabs.

- Using the far-right button on the Design tab, move the chart you created to its own sheet. This will clear up the sheet with your data.



- Now head over to the Layout tab. Click the Chart Title button to add a title.



- It'd be nice if your labels were actually next to the pie slices rather than in the legend, so let's get rid of the legend. Under the Layout tab, make the legend go away.
- Add data labels next to the pie slices. Once you've added them, right-click and select Format Data Labels to make sure they refer to the Category Name rather than the Values.
- Finally, increase the font size of all text elements in the chart to make them more readable. You can change the font size using the Home tab.



Exercise Solution

You just executed a variety of modifications to your pie chart's layout using the Design and Layout tabs. How do your results look?

- 1 Move the chart you created to its own sheet.
- 2 Add a title.
- 3 Get rid of the legend.
- 4 Add data labels next to the pie slices, making sure they refer to the Category Name rather than the Values.
- 5 Increase the font size of all text elements in the chart.

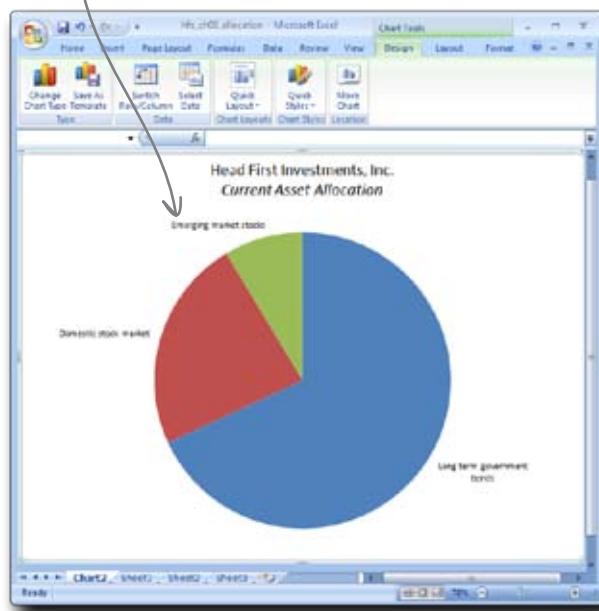


Here's your chart on its own sheet.

You needed to open this window to fix your axis labels.



Now your labels have moved from the legend to the pie slices.



there are no Dumb Questions

Q: That made sense, but it looks like there are a lot of different options in the chart menus. If I want to change just one thing, how do I know how to find it?

A: That's a great question, and there's a really simple trick. You can right-click on any of the components on your chart, so if you want to change an element of your chart, you can always just right-click on it to search for the menu item that will change that one thing.

Q: So when all else fails, if I want to change something on my chart, I should right-click and explore the menus?

A: That's exactly right.

Q: Are the charts that come with Excel pretty well designed? I mean, if I just go with the defaults, will I generally create pretty attractive, readable charts?

A: Yes and no. The graphic quality of Excel's built-in visualizations is greater than it's ever been. If you look at the Chart Styles under the Design tab, you can see a neat grid of design variations that you can quickly apply to your data. Excel has never been better.

Q: I'm sensing there's a "but" coming.

A: You sense correctly. The "but" is that no software can ever make your design decisions for you, especially when it comes to charts. The fact that your chart came built into Excel is not much help if your visualization is not analytically rigorous or useful.

Q: Is Excel the best spreadsheet charting tool available?

A: It depends on what you're trying to accomplish. If you have data and a problem that fits the built-in charts nicely, then Excel is probably the tool for you. If you need to do high-level, hardcore statistical visualizations, you might want to reach for a program like the open source statistical package R.

Q: What you're telling me is that I have to learn another piece of software?

A: Not necessarily! Recent versions of Excel are more powerful and versatile than ever, and Excel's features are more than most people need to manage their data. But it never hurts to be aware of other visualization options, and if you find yourself spending hours and hours trying to force Excel's charting features to create some chart that it wasn't designed to make, then you may want to investigate other graphing programs.

Q: Do people do that—use Excel to make charts that the Excel designers never thought to support?

A: A lot of people use Excel to do things that the original designers of spreadsheets never thought to support. And it's actually one of the coolest things about how people use Excel: users dream up features, then force Excel to implement them (even in weird ways sometimes), and later Microsoft picks them up and implements them in a user-friendly way.

Q: So what's the bottom line?

A: Learn Excel's features. As many as you can. Come up with creative ways to apply those features to your own problems. And if you find yourself spending a huge amount of time forcing Excel to solve your problems, consider the features of more full-fledged computer or statistical programming platforms like R or Python.

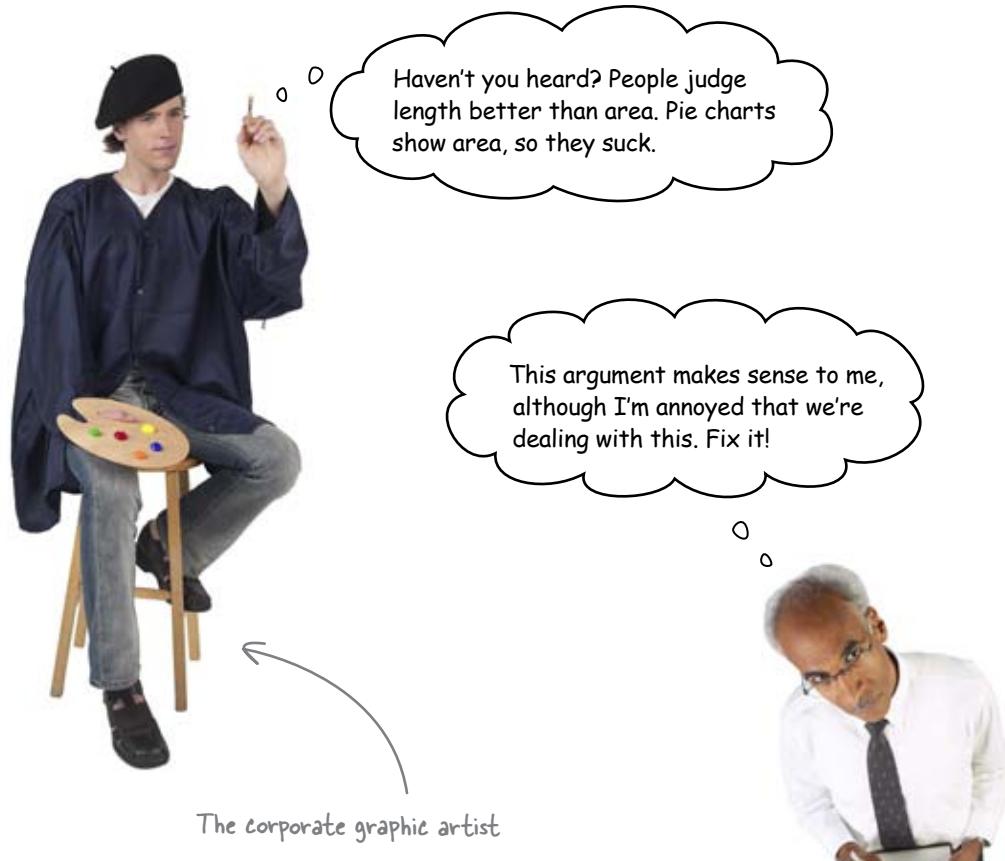
Q: Let's get back to charts. How do I know which chart to use with my data?

A: You're about to find out. Your client is almost certainly going to need you to create more charts for the big presentation....

Let's see what the boss thinks....

Your pie chart isn't going over well with the corporate graphic artist

Your pie chart has been passed around, and some guy you've never even dealt with is weighing in with a negative opinion.

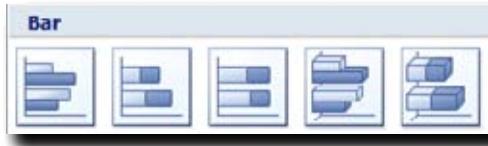


The artist is correct. This is a common critique of pie charts among people who care a lot about data visualizations, so you should probably try a different chart. But no worries: changing the chart type is a snap.

Let's take a look at some other chart types.

* WHO DOES ? WHAT? *

Match each Excel chart type to what it does. Which chart do you think would be an improvement over the pie chart?



Lets you plot two variables with the option of fitting a curve to the data points.



A way to plot financial instruments, showing high, low, and closing prices.



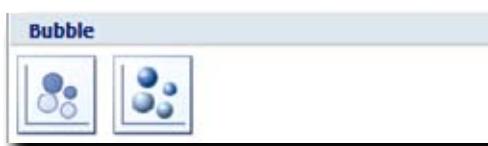
Basic comparison, using length and one or more variables.



A visualization that lets you add a third dimension of area to a scatterplot.



Charts for plotting data with three related variables.



Shows changing trends, generally over time.

* WHO DOES? WHAT? SOLUTION *

Match each Excel chart type to what it does. Which chart do you think would be an improvement over the pie chart?



Lets you plot two variables with the option of fitting a curve to the data points.



A way to plot financial instruments, showing high, low, and closing prices.



Basic comparison, using length and one or more variables.

This is the chart we should use!



A visualization that lets you add a third dimension of area to a scatterplot.



Charts for plotting data with three related variables.



Shows changing trends, generally over time.

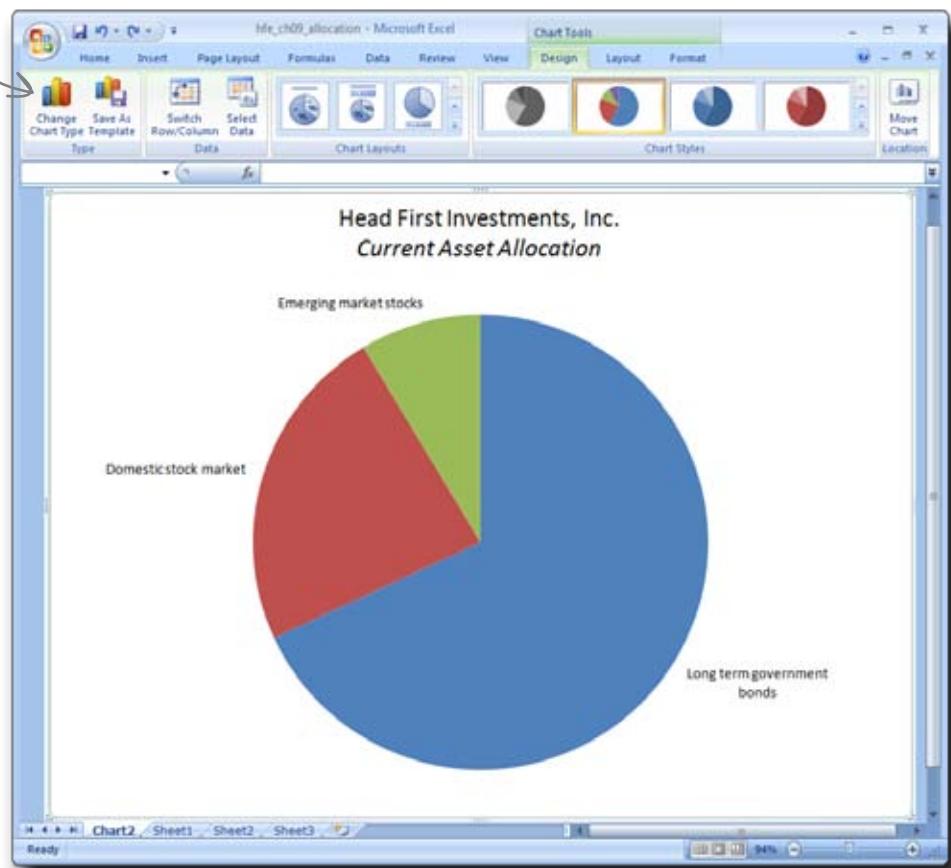


Exercise

Now that you've decided to change your pie chart to a bar chart, go ahead and make that change.

Click this button here.

Excel makes it easy to switch your chart type.



Do the labels update correctly? You might need to adjust the fonts.

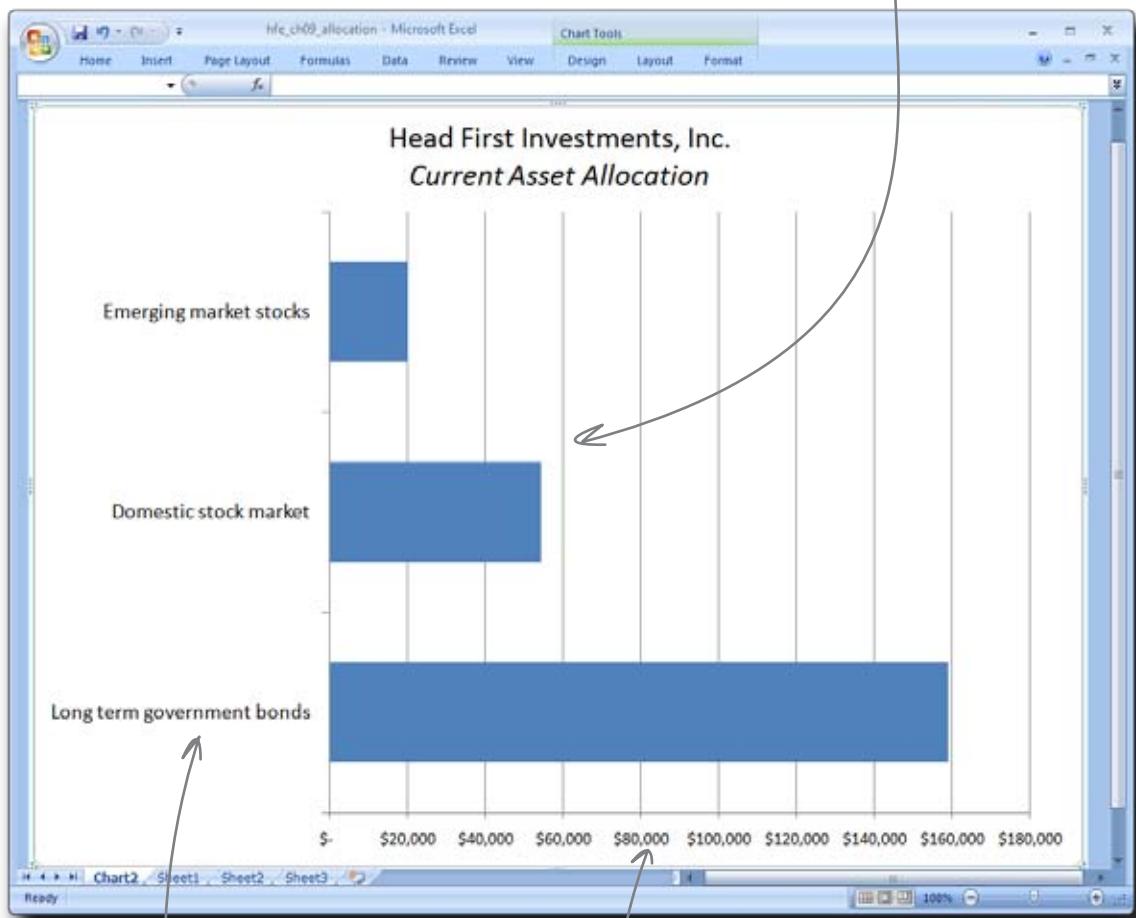
a new bar chart



Exercise Solution

You just changed your pie chart to a bar chart. How did the conversion go?

Excel remembers your data range.



You don't need to change your axis labels, either.

You might need to change the fonts to
make sure everything is in proportion.



Nice work! We're very pleased with this visualization. And I think it's time for you to take on a bigger project. Compare these two stocks in our portfolio using a time series line chart.



Exercise

Create a line chart to compare stock 1 and stock 2. Put your cursor inside your data range, and Excel will try to figure out which columns represent your data.

Which stock did better this year?

Load this!

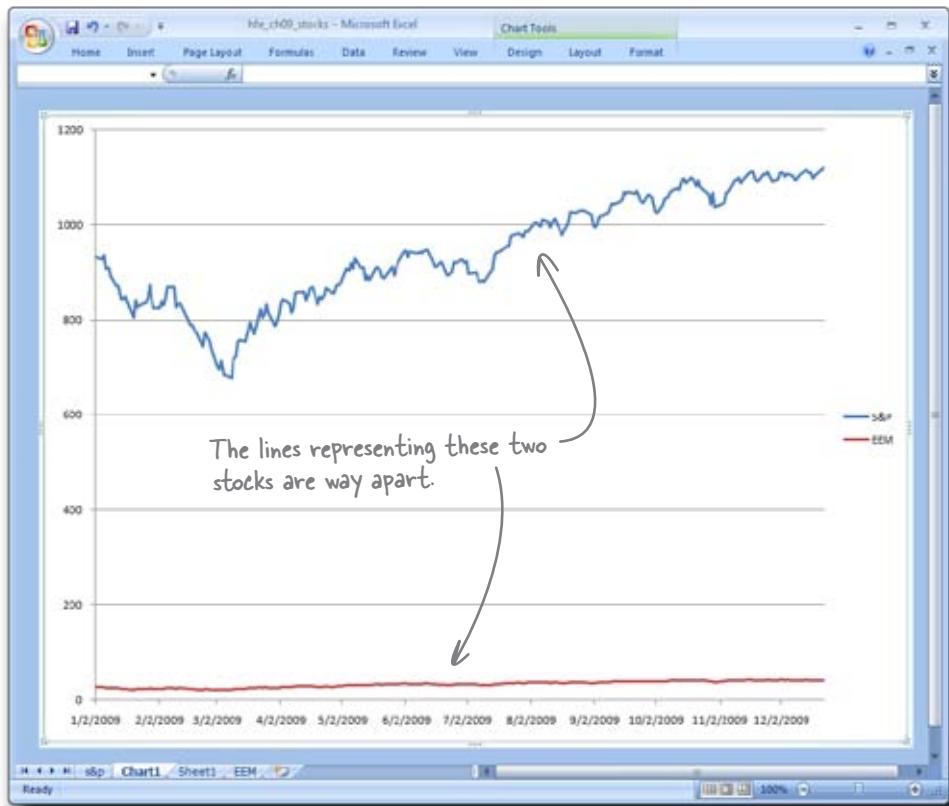
www.headfirstlabs.com/books/hfexcel/
hfe_ch09_stocks.xlsx

	Date	S&P	EEM
1	1/2/2009	931.8	26.16
2	1/5/2009	927.45	26.5
3	1/6/2009	934.7	27.1
4	1/7/2009	906.65	25.54
5	1/8/2009	909.73	25.43
6	1/9/2009	890.35	24.88
7	1/12/2009	870.26	23.83
8	1/13/2009	871.79	23.9
9	1/14/2009	842.62	22.74
10	1/15/2009	843.74	23
11	1/16/2009	850.12	23.25
12	1/20/2009	805.22	21.52
13	1/21/2009	840.24	22.69
14	1/22/2009	827.5	21.94



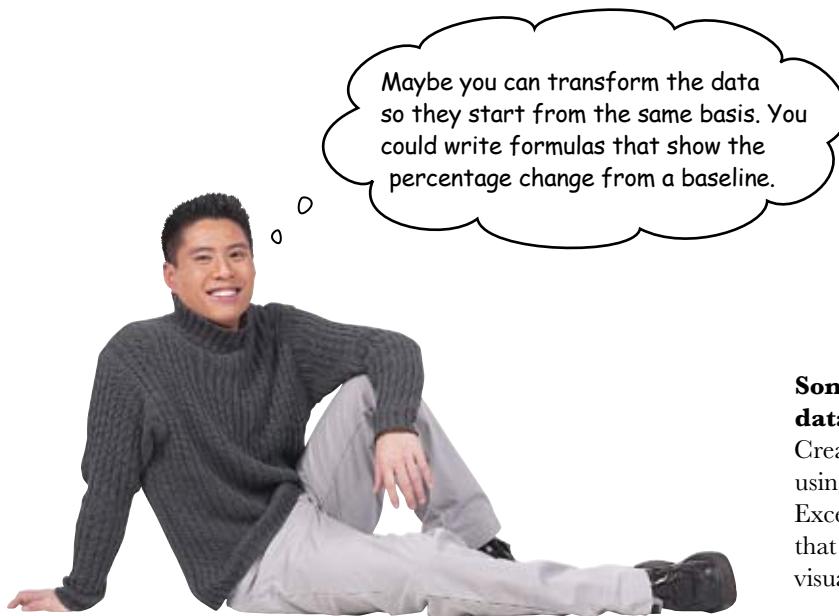
Exercise Solution

You just created a time chart to compare two stocks. Did Excel create a strong visualization?



Which stock did better this year?

It appears that Excel created the visualization correctly, but there's a problem. It's hard to tell which stock performed better, because they have such different values. The starting and ending price of the S&P index stock is way higher than that of the EEM stock. The stocks started from different places, so we might need to do something to the data to get a good comparison.



Sometimes you need to transform the data in order to graph it effectively.

Creating effective graphics isn't just about using the graphical manipulation features of Excel effectively. It's also about making sure that your data is prepped correctly for a good visualization.



Exercise

Write a formula to show a percentage change from Day 1 for each subsequent day.

For the first period, enter zero. For the second period, enter a formula that calculates the percentage change of the S&P from the first period.

Set up these zero basis columns.

	Date	S&P	EEM	S&P zero basis	EEM zero basis
1	1/2/2009	931.8	26.16	0.00%	0.00%
3	1/5/2009	927.45	26.5		
4	1/6/2009	934.7	27.1		
5	1/7/2009	906.65	25.54		
6	1/8/2009	909.73	25.43		
7	1/9/2009	890.35	24.88		
8	1/12/2009	870.26	23.83		
9	1/13/2009	871.79	23.9		
10	1/14/2009	842.62	22.74		
11	1/15/2009	843.74	23		
12	1/16/2009	850.12	23.25		
13	1/20/2009	805.22	21.52		
14	1/21/2009	840.24	22.59		
15	1/22/2009	827.5	21.94		
16	1/23/2009	831.95	22.22		

Format the columns as percentages to the hundredth decimal place.



Exercise Solution

You just transformed your data to show a percentage change from a zero basis rather than the original value. What did you find?

Here's the formula
you want to use.

$$=(B3-B2)/B2$$

The screenshot shows a Microsoft Excel spreadsheet titled "hfe_ch09_stocks - Microsoft Excel". The data starts with Date, S&P, and EEM columns. Columns D and E are labeled "S&P zero basis" and "EEM zero basis" respectively. The formula $= (B3-B2)/B2$ is entered in the formula bar. The cell D3, which contains the value "-0.47%", is highlighted with a red border. A callout bubble points to this cell with the text "Here's the formula you want to use." Another arrow points from the text "What did you find?" to the same cell D3.

	A	B	C	D	E
1	Date	S&P	EEM	S&P zero basis	EEM zero basis
2	1/2/2009	931.8	26.16	0.00%	0.00%
3	1/5/2009	927.45	26.5	-0.47%	
4	1/6/2009	934.7	27.1		
5	1/7/2009	906.65	25.54		
6	1/8/2009	909.73	25.43		
7	1/9/2009	890.35	24.88		
8	1/12/2009	870.26	23.83		
9	1/13/2009	871.79	23.9		
10	1/14/2009	842.62	22.74		
11	1/15/2009	843.74	23		
12	1/16/2009	850.12	23.25		
13	1/20/2009	805.22	21.52		
14	1/21/2009	840.24	22.69		
15	1/22/2009	827.5	21.94		
16	1/23/2009	831.95	22.22		

This formula shows that the value of the S&P on 1/5 was 0.47% less than it was on 1/2.

**Let's copy the formulas
and graph the data....**



Now that you've written a formula to show the percentage change for one unit of time, copy and paste the formula for all dates. Then graph your new data.

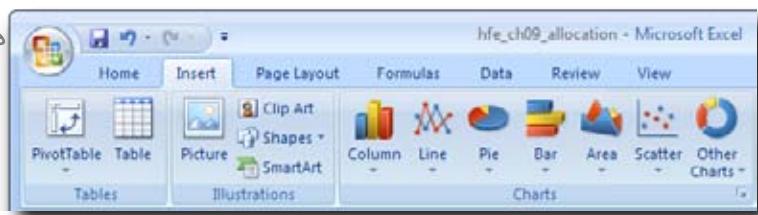
- Copy and paste the formula for both stocks. Make sure you add absolute references where necessary.

$$=(B3-B2)/B2$$

You'll need to add absolute references to make this formula copy correctly.

- Create a new time series line chart.

Head back over to the Insert tab to select the chart you want to create.



You'll want to pick one of these.



Hint: You might have to go back into the menu that tells Excel which data to select. You want Excel to select only your new data, not all four columns.



Exercise Solution

You just copied and pasted your new data transformation functions, and then you graphed them. How does your chart look now?

Here are your absolute references.

$$=(C3-C\$2)/C\$2$$

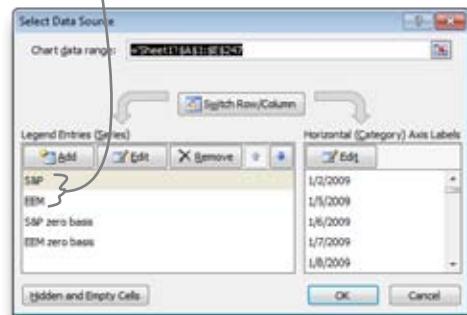
This reference makes sure that you're always comparing any given day's asset value with the original value from January 2.

Date	S&P	EEM	S&P zero basis	EEM zero basis
1/2/2009	931.8	26.16	0.00%	0.00%
1/5/2009	927.45	26.5	-0.47%	1.30%
1/6/2009	934.7	27.1		
1/7/2009	906.65	25.54		

The formula copies and pastes smoothly for all values.

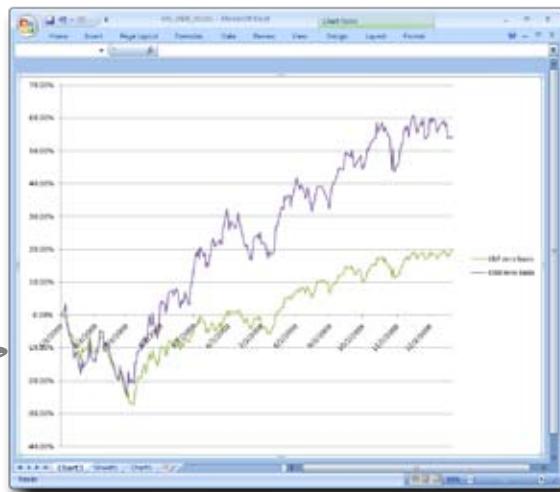
A	B	C	D	E
245	12/18/2009	1102.47	-40.35	18.32%
246	12/21/2009	1114.05	40.31	19.56%
247	12/22/2009	1118.02	40.39	19.98%
248				54.40%
249				

You need to remove these two data entries.



Here's your new chart.

Now it's easier to tell how the stocks performed relative to each other.



You're starting to get tight on time...

Better get your chart formatted for the big presentation....

From: CEO
To: Head First
Subject:

Dear Head First,

I hear the new chart is coming along well. Can you make sure it's really nicely formatted?

The board is a cantankerous bunch, and we need to make sure our data visualizations display the utmost professionalism.

Oh, and BTW, we need your chart really soon. Like yesterday.

I know you can handle this.

—CEO



Format your chart according to these parameters.

Exercise

1

Make this the title: *S&P versus EEM*.

2

Put the legend, which is currently on the right, at the bottom of the chart.

3

The date labels on the y-axis are kind of verbose and also get in the way of the lines. See whether you can fix that issue as well.



Exercise Solution

You just reformatted your new line chart. How did it turn out?

- 1 Make this the title: *S&P versus EEM*.
- 2 Put the legend, which is currently on the right, at the bottom of the chart.
- 3 The date labels on the y-axis are kind of verbose and also get in the way of the lines. See whether you can fix that issue as well.

Your visualization might look different.

Set the axis labels to "Low" to put them at the bottom.



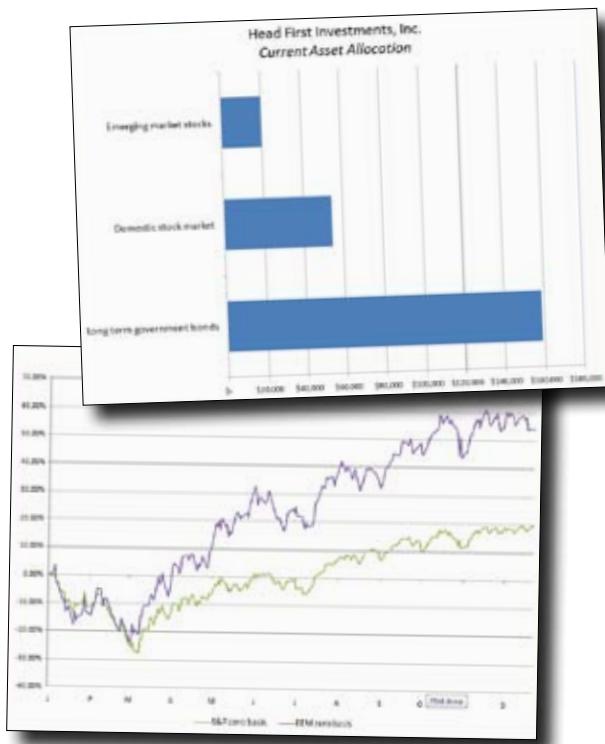
Select the "M" data format for the y-axis labels to show the first letter of the month's name.

The major units of the y-axis are fixed at 1 month.

Your report was a big success...

The two charts you created were a big hit among the board of directors. You made the data accessible and elegant through your graphical visualizations.

These were sharp-looking charts. Thank you very much!



10 what if analysis



Alternate realities



Things could go many different ways.

There are all sorts of **quantitative factors** that can affect how your business will work, how your finances will fare, how your schedule will manage, and so forth. Excel excels at helping you model and manage all your *projections*, evaluating how changes in those factors will affect the variables you care about most. In this chapter, you'll learn about three key features—**scenarios**, **Goal Seek**, and **Solver**—that are designed to make assessing all your “what ifs” a breeze.

Should your friend Betty advertise?

Betty sells the best baguettes in Dataville. But in spite of her renown, she is interested in expanding her business through advertising.

She'd like to add more customers to her already stable customer base. But ads can be expensive. Would advertising be worthwhile? She's enlisted you for help, and if your recommendations pay off, your baguettes will be on the house.





Here's Betty's weekly cash flow statement. You're going to use this spreadsheet as the basis for your projections about advertising costs and revenue. Rework this spreadsheet to accommodate blanks for **ad costs** and revenue from **baguettes sold to new customers**. Where would you put the new information?

Just make up dummy numbers to fill in the new blanks. You can use real numbers later.

Right-click on the row numbers to insert a new row.

Load this!
[www.headfirstlabs.com/books/hfexcel/
hfe_ch10_weekly_income.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch10_weekly_income.xlsx)

You need to update this formula to accommodate the number of new customer baguettes sold.

Your "Sold to new customers" blank should go somewhere in here.

This formula multiplies the price by the number of baguettes sold.

Costs from advertising should go somewhere in here.

A	B	C
1	Weekly sales	
2		
3	Baguette price	\$ 5
4	Sold to regulars	1000
5	Total revenue	\$ 5,000
6		
7	Fixed costs	\$ 4,500
8	Total costs	\$ 4,500
9		
10	Net income	\$ 500
11		
12		
13		
14		
15		
16		

Update this formula to incorporate the costs from your advertising.

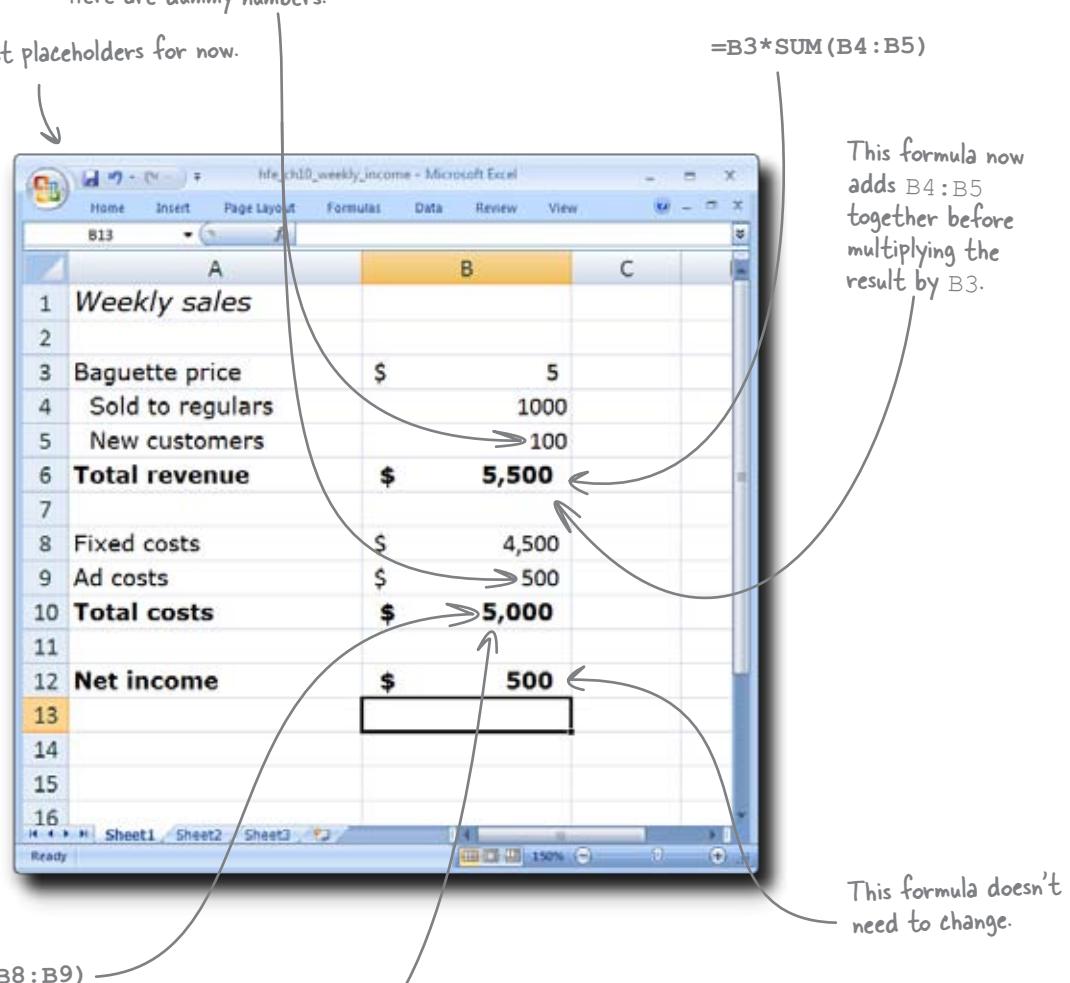


Exercise Solution

You just modified Betty's spreadsheet to incorporate figures for new customers and ad costs. How'd it go?

Here are dummy numbers.

They're just placeholders for now.



Betty has projections of best and worst cases for different ad configurations

Betty has already done some thinking about the best- and worst-case scenarios for both TV and magazine advertising. Here are what she takes to be the parameters of her decision.



Betty has projected best- and worst-case scenarios for TV and magazines.



TV is a different beast. It costs \$700 to advertise on TV, and the best case for TV is 350 new customers, while the worst case is no new customers.

Let's take one of those configurations and see how it affects net income. What does the spreadsheet say about the best case for magazine advertising?



Exercise

Use your spreadsheet model to implement the best case for magazine advertising.

Plug her assumptions into the blanks you created.

Does this scenario show a rise in net income?

.....
.....

A	B
Weekly sales	
3 Baguette price	\$ 5
4 Sold to regulars	1000
5 New customers	
6 Total revenue	\$ 5,000
7	
8 Fixed costs	\$ 4,500
9 Ad costs	
10 Total costs	\$ 4,500
11	
12 Net income	\$ 500
13	



Exercise Solution

You just looked at the best-case scenario for magazine advertising. Does it show any sort of advantage over the status quo?

Advertising costs are \$100.

Betty thinks that the best case would mean 200 new customers.

	A	B
1	<i>Weekly sales</i>	
2		
3	Baguette price	\$ 5
4	Sold to regulars	1000
5	New customers	200
6	Total revenue	\$ 6,000
7		
8	Fixed costs	\$ 4,500
9	Ad costs	\$ 100
10	Total costs	\$ 4,600
11		
12	Net income	\$ 1,400
13		

Revenue definitely goes up...

...but so do her costs.

This configuration is just the beginning.

Now you'll have to check out the other three scenarios.

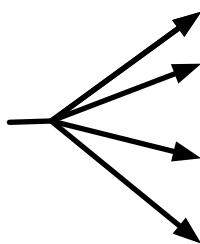
Does this scenario show a rise in net income?

There's a definite rise. Net income increases by almost \$900!

You need to evaluate all her scenarios

The best-case scenario for magazine advertising looks good, but is it the best? And what about the worst-case scenarios? In order to make this assessment, you're going to need to look at ***all*** of her projected possibilities.

Situation before ads	
1	Weekly sales
2	
3	Baguette price \$ 5
4	Sold to regulars 1000
5	New customers
6	Total revenue \$ 5,000
7	
8	Fixed costs \$ 4,500
9	Ad costs
10	Total costs \$ 4,500
11	
12	Net income \$ 500
13	



Worst TV	
1	Weekly sales
2	
3	Baguette price \$ 5
4	Sold to regulars 1000
5	New customers
6	Total revenue \$ 5,000
7	
8	Fixed costs \$ 5,000
9	Ad costs
10	Total costs \$ 5,000
11	
12	Net income \$ (500)
13	

Worst Magazine	
1	Weekly sales
2	
3	Baguette price \$ 5
4	Sold to regulars 1000
5	New customers
6	Total revenue \$ 5,000
7	
8	Fixed costs \$ 3,000
9	Ad costs
10	Total costs \$ 3,000
11	
12	Net income \$ 200
13	

Best Magazine	
1	Weekly sales
2	
3	Baguette price \$ 5
4	Sold to regulars 1000
5	New customers
6	Total revenue \$ 5,000
7	
8	Fixed costs \$ 1,000
9	Ad costs
10	Total costs \$ 1,000
11	
12	Net income \$ 4,000
13	

Best TV	
1	Weekly sales
2	
3	Baguette price \$ 5
4	Sold to regulars 1000
5	New customers
6	Total revenue \$ 5,000
7	
8	Fixed costs \$ 3,000
9	Ad costs
10	Total costs \$ 3,000
11	
12	Net income \$ 2,000
13	

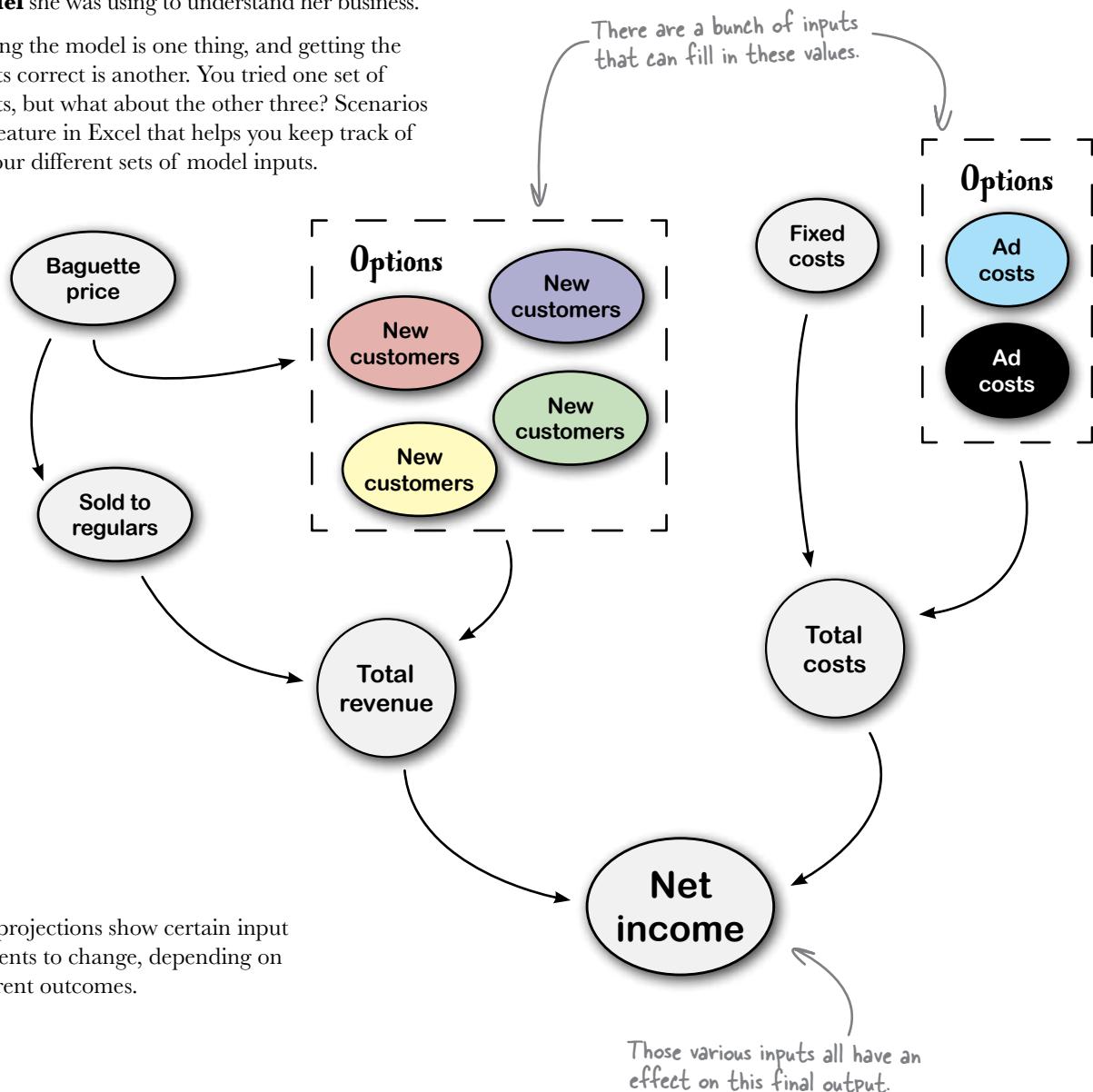


Wouldn't it be dreamy if we could elegantly and easily manage these scenarios inside Excel? But I know it's just a fantasy....

Scenarios helps you keep track of different inputs to the same model

When you refined Betty's cash flow model to accommodate an ad expense and the revenue that results from that advertising, you enhanced the **model** she was using to understand her business.

Having the model is one thing, and getting the inputs correct is another. You tried one set of inputs, but what about the other three? Scenarios is a feature in Excel that helps you keep track of all your different sets of model inputs.



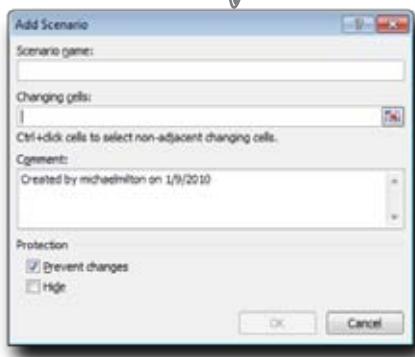
Her projections show certain input elements to change, depending on different outcomes.

Scenarios saves different configurations of the elements that change

To take the Scenarios feature for a spin, first you need to have your network of formulas (your model) set up. Next, head over to the What If Analysis button under the Data tab.



Here's the dialog box you see when you press the Add... button.



Click on **Scenario Manager...**, which takes you to this dialog box. Here you can name each of your scenarios and specify which cells change and what the values are for those cells in each scenario.



Implement each one of Betty's configurations using the Scenarios feature.

These are Betty's costs for Magazine and TV advertising.

	Cost
Magazine	\$100
TV	\$700

Here is what she sees as possible new customer counts for each medium.

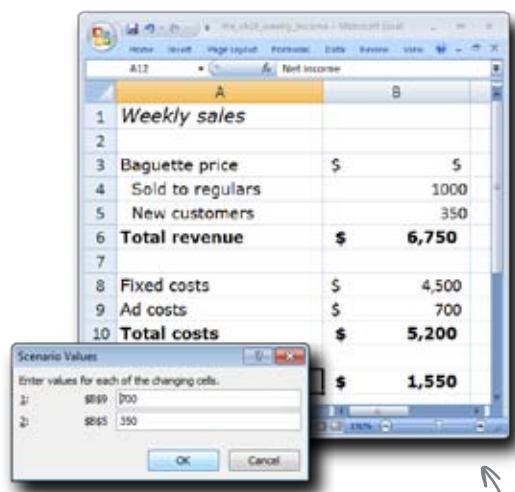
	Best	Worst
Magazine	200	20
TV	350	0



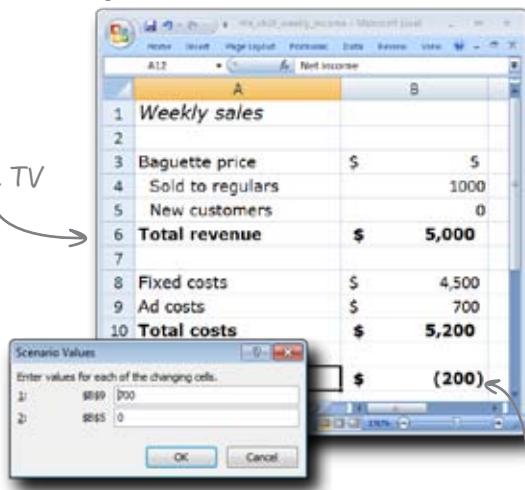
Exercise Solution

You just used Scenarios to implement each of Betty's four projected outcomes for her advertising investment. What did you find?

These scenarios show net income projections for different ad cost and customer count increases resulting from the ad.



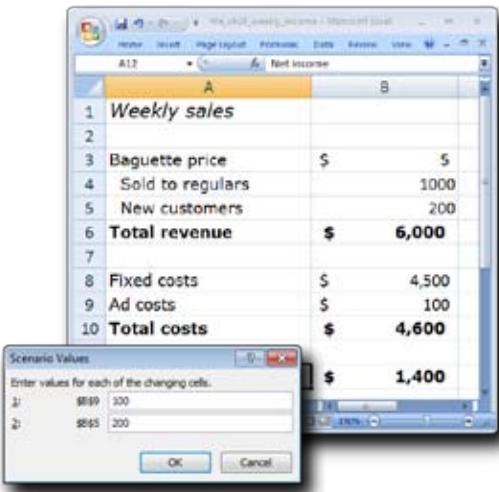
Worst TV



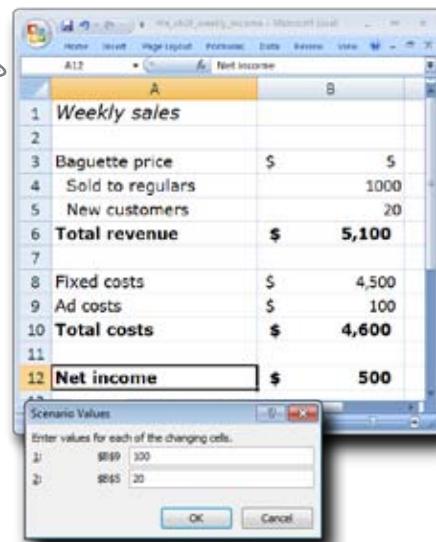
This scenario dips below \$0.

Best TV

Best magazine



Worst magazine



Betty wants to know her breakeven



oo

I gave you projections, but now tell me what my breakeven points are for each ad configuration. In other words, how many baguettes do I need to sell in order to recoup my investment on both TV and magazine ads?

You need to create some new scenarios.

But what are they? With the other four, she gave you the inputs. But now you need to do a calculation to find out how many new customers are needed to recoup her costs for TV and magazine ads.

A	B	C
1 Weekly sales		
2		
3 Baguette price	\$ 5	
4 Sold to regulars	1000	
5 New customers	20	
6 Total revenue	\$ 5,100	
7		
8 Fixed costs	\$ 4,500	
9 Ad costs	\$ 100	
10 Total costs	\$ 4,600	
11		
12 Net income	\$ 500	
13		
14 Return on ad		
15		
16		

You need to add this cell.

If this value is equal to zero, you're at the breakeven point for that type of advertising.

Do this!

Create a new cell in your spreadsheet called “**Return on ad**,” and fill this cell with a formula that subtracts your ad cost from your new customer revenue.

Goal Seek optimizes a value by trying a bunch of different candidate values

With your formula to calculate the amount of new money Betty brings in on top of the costs of her advertising, you're in a position to try to figure out the key variable you don't know: the number of new customers she needs to break even.

Add this formula to your spreadsheet.

=B3*B5-B9

You need to try a bunch of options in this cell...

Weekly sales		
1		
3	Baguette price	\$ 5
4	Sold to regulars	1000
5	New customers	20
6	Total revenue	\$ 5,100
7		
8	Fixed costs	\$ 4,500
9	Ad costs	\$ 100
10	Total costs	\$ 4,600
11		
12	Net income	\$ 500
13		
14	Return on ad	
15		

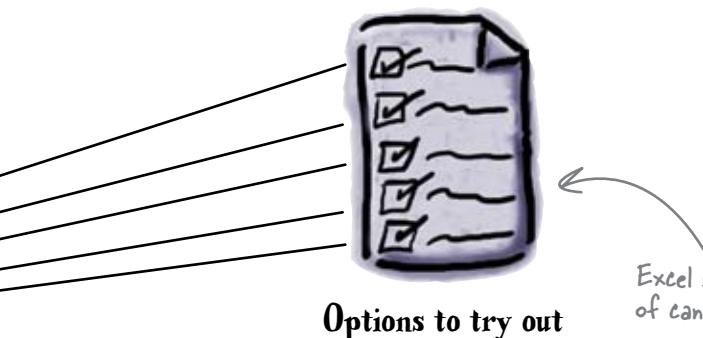
This amount will stay the same for magazine-based scenarios.

The question for breakeven is how many new customers set this value to zero.

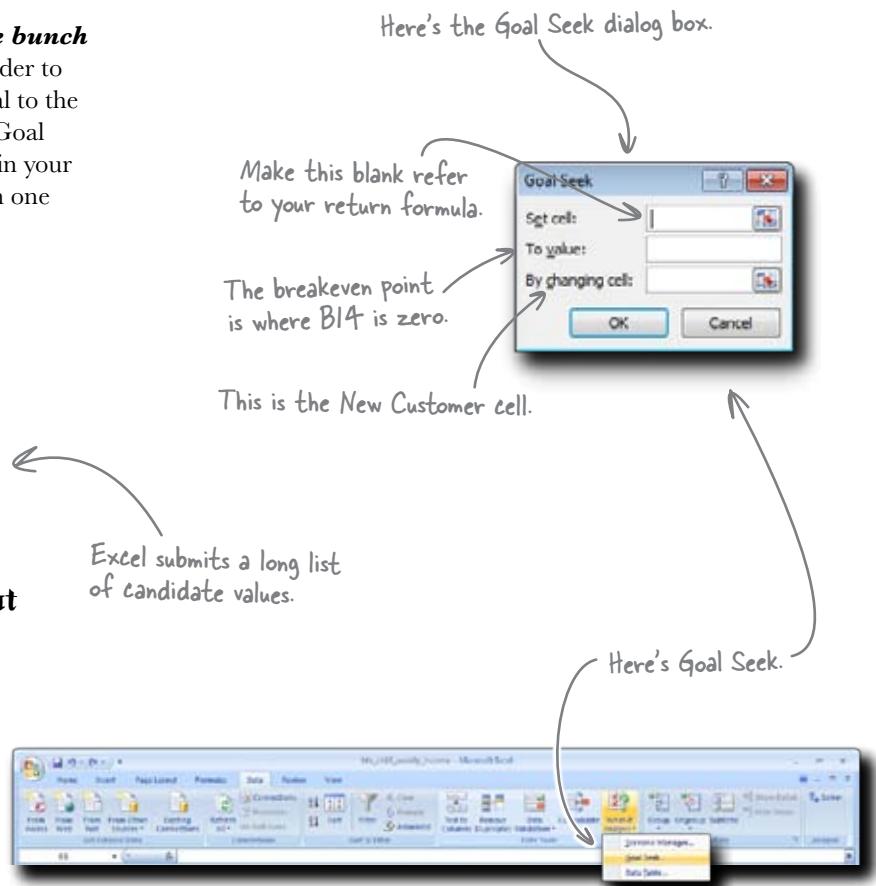
...to get a value of zero in this cell.

Goal Seek is the feature you need to set cell B5 (your new customer count) to the value that makes cell B14 (your return) equal to zero.

Goal Seek operates by **trying a whole bunch of different values in one cell** in order to get a formula in another cell to be equal to the value you want. In this case, you need Goal Seek to try a bunch of different values in your New Customers cell to figure out which one makes your return equal to zero.



To take Goal Seek for a spin, just hit the menu item under your Scenario Manager on the Data tab.



Find the breakeven new-customer count for TV and magazine ads.

- ➊ Add the new cell from the previous page. Its formula should be the amount of income from new customers minus the cost of the ad.
- ➋ Save each to a scenario. Do you need to run it for magazine ads?



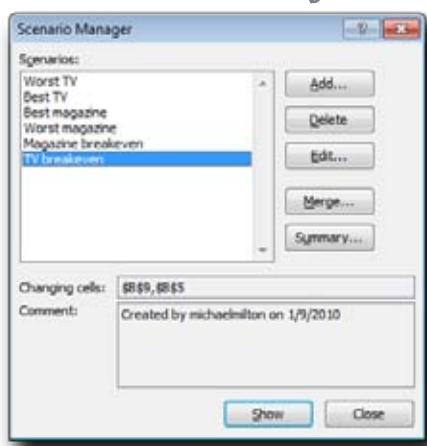
Exercise Solution

Here's how the Goal Seek dialog box should be filled out.



This will calculate the right number of new customers.

Here's how your Scenario Manager should look with your two new scenarios.



This is the magazine breakeven scenario.

	A	B	C
1 Weekly sales			
3 Baguette price	\$	5	
4 Sold to regulars		1000	
5 New customers		20	
6 Total revenue	\$	5,100	
8 Fixed costs	\$	4,500	
9 Ad costs	\$	100	
10 Total costs	\$	4,600	
12 Net income	\$	500	
14 Return on ad	\$	-	

You need 20 customers... the worst case!

This is the TV breakeven scenario.

	A	B	C
1 Weekly sales			
3 Baguette price	\$	5	
4 Sold to regulars		1000	
5 New customers		140	
6 Total revenue	\$	5,700	
8 Fixed costs	\$	4,500	
9 Ad costs	\$	700	
10 Total costs	\$	5,200	
12 Net income	\$	500	
14 Return on ad	\$	-	

You need 140 new customers to break even.

there are no Dumb Questions

Q: I'm wondering about the distinction here between "new customers" and "baguettes." What if you have one new customer who buys 50 baguettes? And what if your current customers buy more baguettes as a result of the advertising?

A: Good observation. The model we have right now assumes that each customer buys one baguette. That might not be true.

Q: So why not change the model to incorporate these details?

A: You could absolutely do that, and the question for you as an analyst is whether making your model that much more complex is worth the trouble.

Q: It doesn't seem like it'd be that much trouble.

A: It might not be that much trouble to incorporate the details you just mentioned, but there are many other details to reality that also are not incorporated into the model. If you think you should make your model more complex, you need to distinguish between the issues that affect your goals and those that do not.

Q: Sounds like the model itself is really important to get right.

A: Yes, absolutely. We're assuming that Betty's model and our modifications to it have been accurate enough. When you create your own models, you'll need to be really careful to make sure that you incorporate all the relevant variables, that those variables are all linked by the right formulas, and that the values you have for those variables are reasonable.

Q: Goal Seek seems like a nice feature, but it seems like there are other ways of making the same calculation.

A: Oh yeah?

Q: I think I could probably just create more formulas—maybe an ancillary model—to make the calculation we just did.

A: That's definitely true. Goal Seek is not the most powerful tool for optimization in Excel. You could certainly write formulas to calculate what you just found about the breakeven points for magazine and TV advertising.

Q: I could even write a couple of algebra equations and figure it out.

A: You sure could. The reason you'd use Goal Seek, though, is because it's fast and easy. Even once you learn more powerful tools, you'll still use Goal Seek just because it's so handy. The dialog box only has three places for you to enter information.

Q: Does Goal Seek always get the right answer?

A: If there is a single correct answer, Goal Seek can find it. But there's not always an answer to the question you're asking, and it just depends on the formulas in your model.

Q: What if I don't want to set a value to a specific number, I just want to get it as high as it'll go? Like with the Return, for example. I just want the highest return I can get.

A: Goal Seek is really all about setting a single formula to a single value by modifying a single cell.

Q: That gets me to another question. What if I have more than one variable that I want to mess around with?

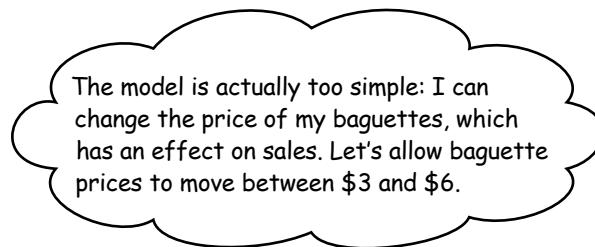
A: If that's your problem, it sounds like you need a more powerful tool.

Q: OK, you said that Goal Seek isn't the most powerful tool for optimization in Excel. What is?

A: You're about to find out!

Betty needs you to add complexity to the model

We're still trying to maximize our net income by looking at the best- and worst-case scenarios for new customers. But modelling these scenarios has become harder, because...



She needs you to do two things Goal Seek cannot do

Goals Seek sets the output on one formula to one value by changing one cell. But you need to be able to do more, since her problem needs you to...

Goal Seek can't handle either of these.

①

Change the values of more than one variable. Now you have both new customers *and* baguette prices to account for as you project net income.

②

One of the variables is subject to constraints. Baguette prices can't be any old number: they have to be somewhere between \$3 and \$6.

You need
a more
powerful
Goal Seek....

Solver can handle much more complex optimization problems

The gold standard for optimization inside Excel is the powerful add-on utility Solver. It comes as an optional installation in every copy of Excel for Windows.

In an **optimization problem**, you have a target cell you want to maximize, minimize, or set to a value by changing other cells that may be subject to constraints.



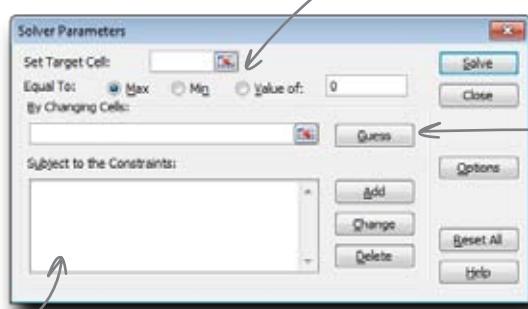
Don't see Solver in your menus?

Solver is there; it's not just installed yet.

Head over to Appendix ii to see how to get Solver up and running.

Here's the Solver window.

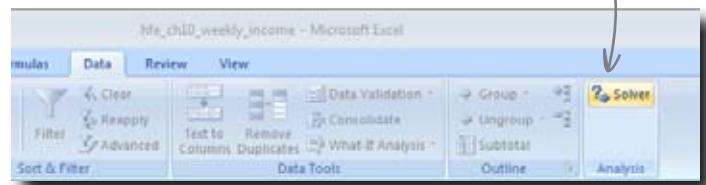
Your constraints affect the bounds of your variables.
Betty has constraints for her baguette price, for example.



Max and Min are options you don't have inside Goal Seek.

You want to change both the number of possible new customers and the price of the baguettes.

Click here for Solver.



We'd like to maximize our net income for television advertising.
Let's start setting up our optimization with Solver.

- ➊ Open Solver and set your target cell. This is the cell that contains the value you want to maximize.
- ➋ Set the cells you want to change. Solver will try a number of different values for these cells in order to maximize your target cell.



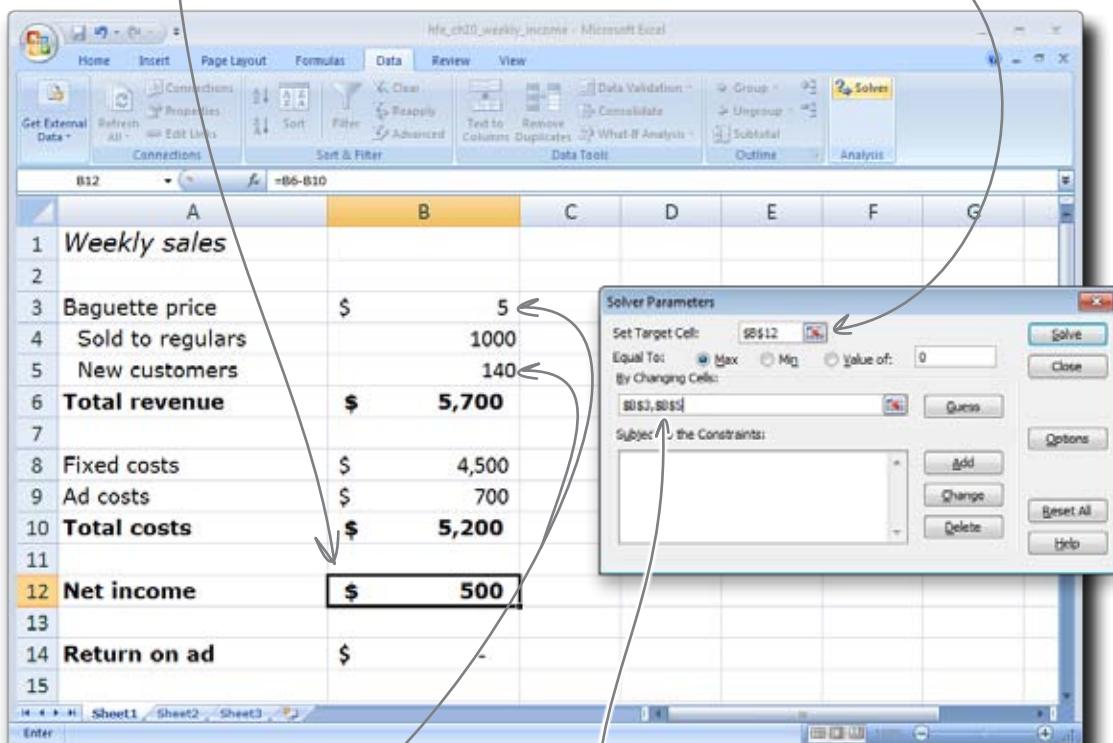
Exercise Solution

You just set up the first part of your Solver optimization. Did you enter the right parameters?

- ➊ Open Solver and set your target cell. This is the cell that contains the value you want to maximize.
- ➋ Set the cells you want to change. Solver will try a number of different values for these cells in order to maximize your target cell.

Your target cell is B12.

B12 is where you have your Net income formula.



The cells you want to change are B3 and B5.

Those cells are for Baguette price and New customers.

Let's set up the rest of the Solver optimization....



Finish your Solver optimization. How much net income can Betty hope to get if she uses television advertising?

1

Finally, set up your constraints. Betty told you that her baguette price can shift between \$3 and \$6, so that's one constraint. For the purposes of this scenario, set up this one as well: your maximum number of new customers equals 350.

If you don't set an upper bound for your New customers, Solver will take it up to infinity.

2

Click **Solve** to run Solver. What does Solver say to you? Write your answer below.

.....
.....
.....
.....

Write your answer here.



Exercise Solution

You just entered your constraints and ran Solver. What happened?

1

Finally, set up your constraints. Betty told you that her baguette price can shift between \$3 and \$6, so that's one constraint. For the purposes of this scenario, set up this one as well: your maximum number of new customers equals 350.

The screenshot shows three 'Add Constraint' dialog boxes and a Microsoft Excel spreadsheet. The first dialog box (top) has 'Cell Reference: \$B\$3' and 'Constraint: <= 6'. The second dialog box (middle) has 'Cell Reference: \$B\$3' and 'Constraint: >= 3'. The third dialog box (bottom) has 'Cell Reference: \$B\$5' and 'Constraint: =350'. Arrows point from these dialogs to handwritten notes: 'These constraints are for the baguettes.' (pointing to the top dialog), 'This one is for new customers.' (pointing to the bottom dialog), and 'Here's the result.' (pointing to the right). To the right is a screenshot of an Excel spreadsheet titled 'Int_2010_weekly_income'. The table contains the following data:

	A	B
1	Weekly sales	
2		
3	Baguette price	\$ 6
4	Sold to regulars	1000
5	New customers	350
6	Total revenue	\$ 8,100
7		
8	Fixed costs	\$ 4,500
9	Ad costs	\$ 700
10	Total costs	\$ 5,200
11		
12	Net income	\$ 2,900
13		
14	Return on ad	\$ 1,400
15		

2

Click **Solve** to run Solver. What does Solver say to you? Write your answer below.

Solver takes both of the cells we said could change and sets them to their maximum values. Baguettes are at their highest possible price, and the most possible new customers are expected. The resulting net income figure is high: \$2,900.

Both of these values are as high as they can go.



She's right. In the real world, you can't just raise your prices without anyone noticing. Your models somehow needs to recognize that other variables may be changed by a change in the price of baguettes.



How might a change in the price of baguettes affect other variables in the model?

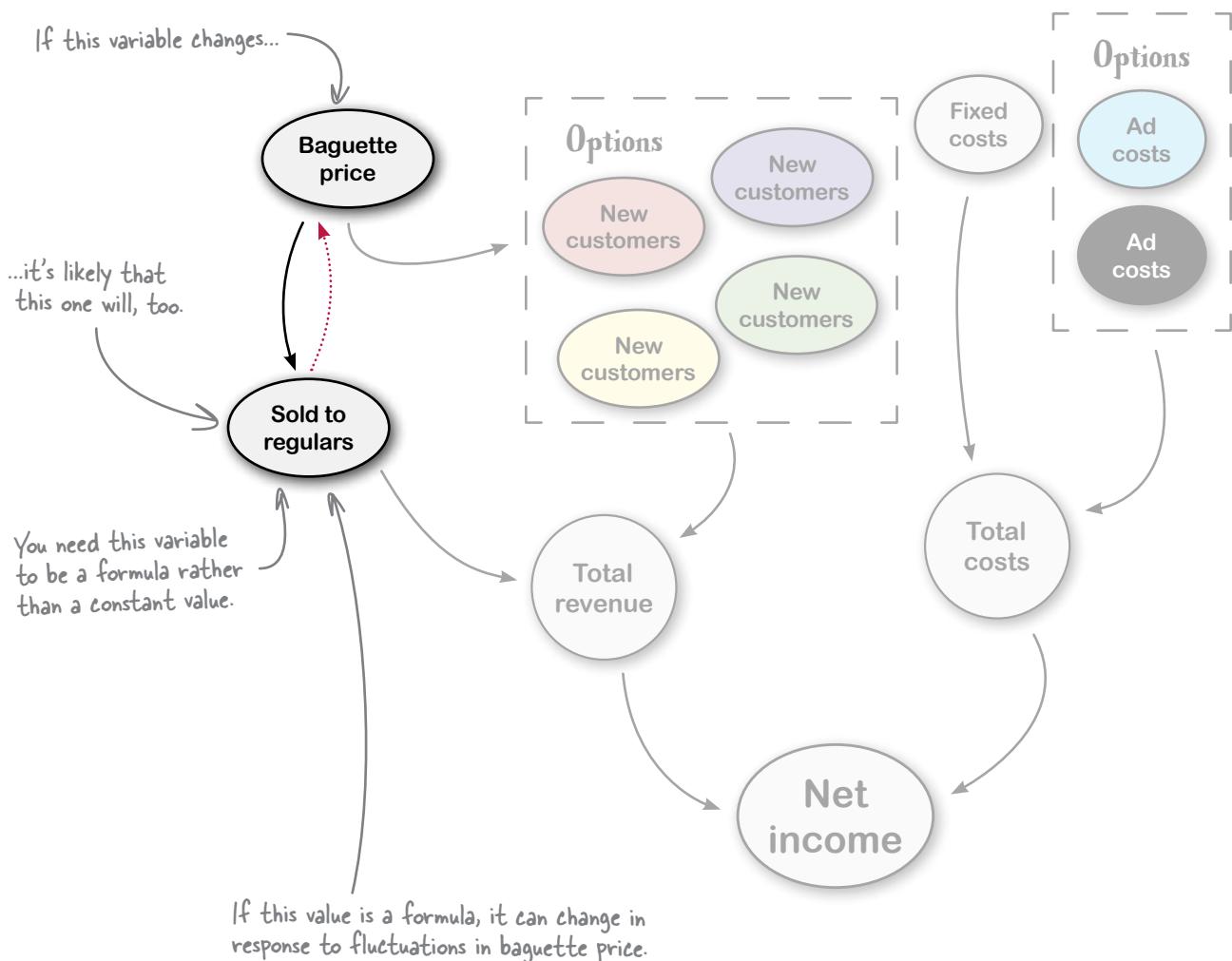
.....

.....

Do a sanity check on your Solver model

Solver will give you optimal answers, provided that your model is correct. But it doesn't know whether your model is based in reality.

You always need to check your formulas to make sure your model corresponds to reality correctly.



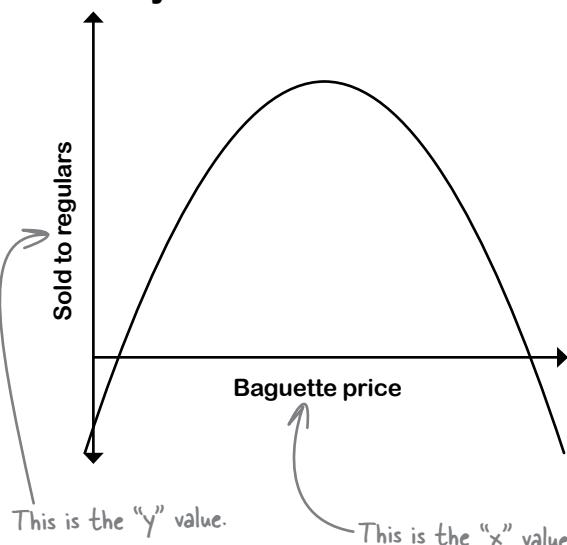


I commissioned an economist's report to find out the relationship between baguette price and demand.

This equation describes the relation between your variables.

$$y = -300x^2 + 2200x - 2500$$

Looks like Betty shelled out the big bucks and had an economist create an equation to describe the relationship between the cost of baguettes and the amount sold to regulars. This sort of thing just screams to be made into an Excel formula.



Exercise

Write the formula to incorporate this equation into your model.

This cell should have your new formula.

Your formula should represent "x" as the baguette price.

A	B
1 Weekly sales	
2	
3 Baguette price	\$
4 Sold to regulars	
5 New customers	
6 Total revenue	\$
	1000
	350
	8,100

Its output is the "y", the number sold to regulars.



Exercise Solution

You just entered a new formula to calculate the number of regulars who'll buy Betty's baguettes in light of the price of those baguettes. What formula did you use?

Here's your formula.

The "x" in the formula is replaced by a reference to cell B3.

$=-300*B3^2+2200*B3-2500$

There must be a big drop-off by the time she hits \$6, because the equation returns a negative customer count here.

Weekly sales		
1		
2		
3	Baguette price	\$ 6
4	Sold to regulars	\$ (100)
5	New customers	350
6	Total revenue	\$ 1,500
7		
8	Fixed costs	\$ 4,500
9	Ad costs	\$ 700
10	Total costs	\$ 5,200
11		
12	Net income	\$ (3,700)
13		
14	Return on ad	\$ 1,400
15		

This is not an encouraging net income figure, but maybe Solver will come up with a scenario that predicts better results.

If Excel switched to Currency formatting when you wrote the formula, switch this cell back to General formatting.



oo

Now you just have to re-run Solver and you'll have your projections! You'll probably get a different answer this time.



Go ahead and run Solver again.

Since you've set it up already, you won't have to make any sort of modifications to your target cells, constraints, or any other element of the optimization problem. The change you made is in the model itself, so Solver will just try to maximize your profits like it did previously, but this time with a slightly different model.

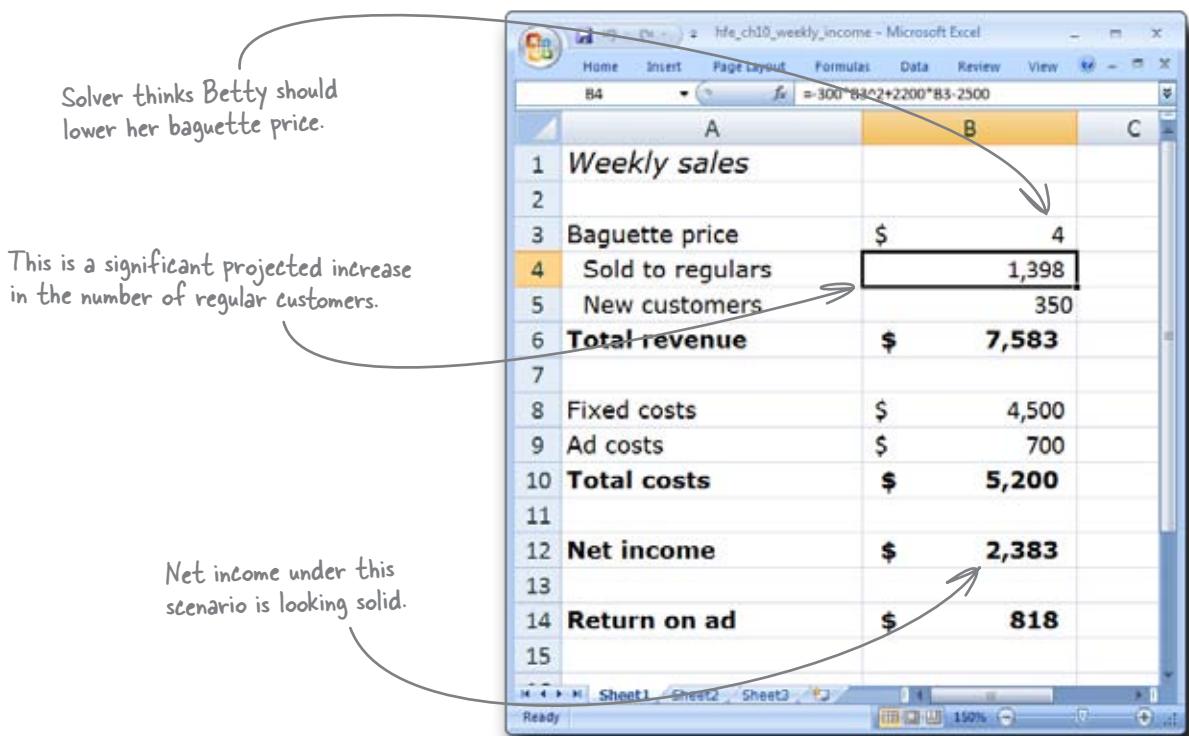
Solver calculated your projections

When you reran Solver, it used the same assumptions you gave it previously, but this time the formula outputs were all different because you added a formula to provide a better prediction of the number of regulars who would buy baguettes at whatever price Solver thinks is best. Here's what happened:

This is a Solver solution you want to keep.



You can name this set of outputs as a scenario if you like.



Solver thinks Betty should bring her price down to \$4, which will optimize her regular customer purchases, but not any further down, which could hurt her revenue. This configuration represents a final best-case scenario for TV advertisement.

Betty's best-case scenario came to pass...

...and she's a very, very happy client. The public reaction to her TV advertisements appears overwhelmingly positive.



11 text functions



Letters as data



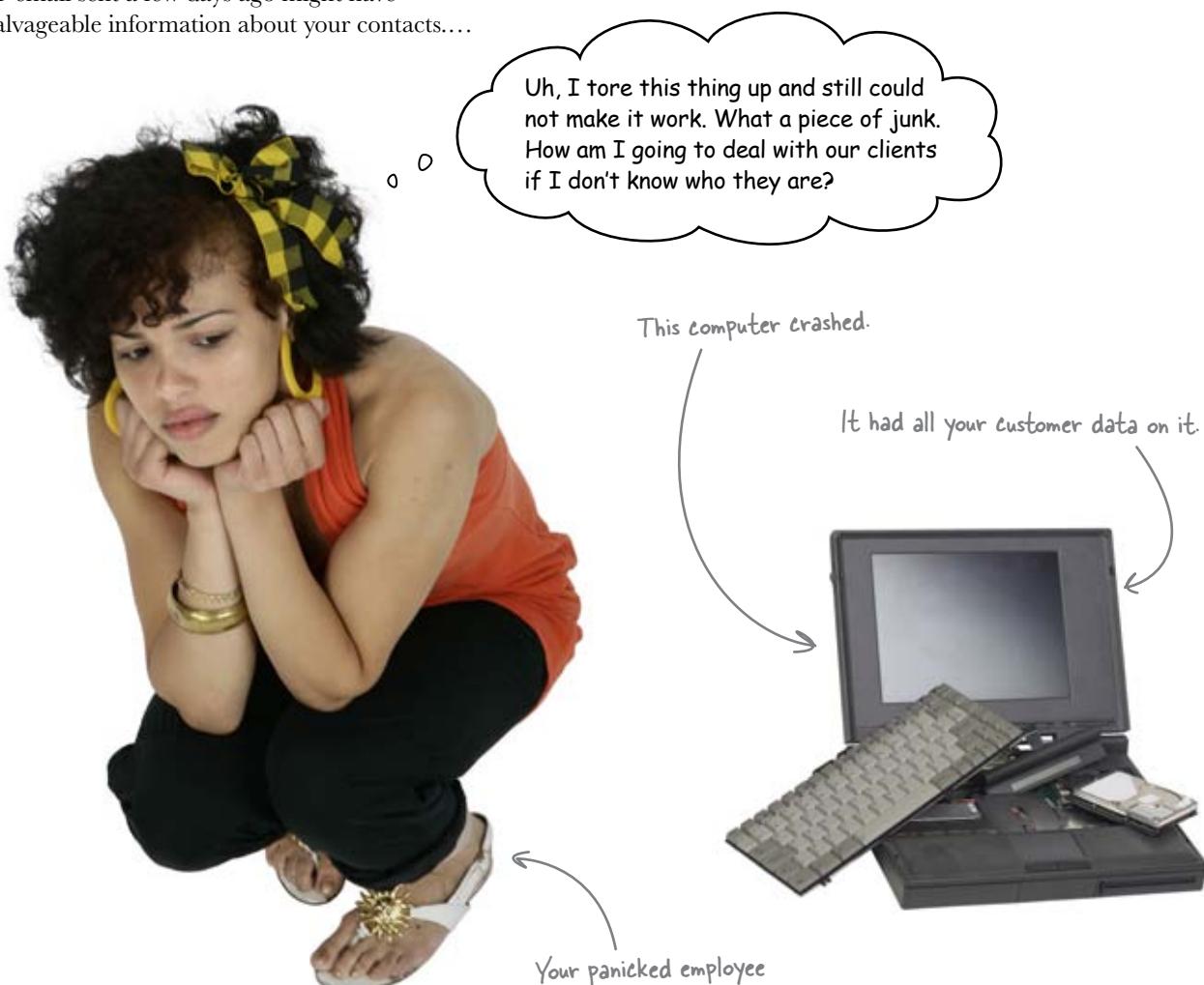
Excel loves your numbers, but it can also handle your text.

It contains a suite of functions designed to enable you to manipulate **text data**. There are many applications to these functions, but one that all data people must deal with is what to do with **messy** data. A lot of times, you'll receive data that isn't at all in the format you need it to be in—it might come out of a strange database, for example. Text functions shine at letting you pull elements out of messy data so that you can make analytic use of it, as you're about to find out....

Your database of analytic customers just crashed!

Lightning smashed into your office and wiped out all your hard drives, including your **customer database**. No problem. Just go get the backup disks, right?

Wrong. The guy in charge of backups forgot to do them (he sends his apologies). Fortunately, you have **something** you might be able to use. Word is, a garbled scrap of email sent a few days ago might have salvageable information about your contacts....



Here's the data

That email has your client list, all right, but the list isn't looking so hot. All the data is mashed together. One of your employees loaded it and saved it to an Excel file for you....

Load this!

[www.headfirstlabs.com/books/hfexcel/
hfe_ch11_messy_data.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch11_messy_data.xlsx)

A	B	C	D
1	ssssWALTON,GRANT,202*431*4040		
2	ssANDREWS,CIERRA,646*351*8529		
3	ssSTEELE,BRYNLEE,917*652*6716		
4	sssssDUNN,MADILYN,212*679*6373		
5	ssWELCH,LILAH,202*596*6969		
6	ssPARRISH,GABRIEL,703*538*8735		
7	ssssKEY,XAVIER,917*657*6528		
8	ssssBALL,YARITZA,212*519*4075		
9	ssNELSON,JAZLYN,718*913*7723		
10	ssFOSTER,MAKENZIE,347*714*3418		
11	ssSALINAS,PAMELA,718*376*6902		
12	ssMATHES,IRELAND,917*538*7421		
13	ssHYDE,SPENCER,202*517*3275		
14	ssMCKENZIE,JAYDA,646*893*1014		
15	ssMOORE,KARLY,202*216*6224		
16	ssDUFFY,MAXIMO,240*677*8638		
17	ssCLEVELAND,MIRANDA,646*492*5471		
18	ssCHASE,MELISSA,646*749*7422		
19	ssREES,DIEGO,301*634*9751		
20	ssssRIVERS,BRICE,212*716*8642		
21	ssssLAWSON,NOEL,646*351*4181		
22	ssssMUNOZ,ITZIEL,917*824*2362		
23	ssssSIMS,CINA,212*381*7598		
24	ssssWHITEHEAD,KEYLA,646*334*6513		
25	ssssWHITAKER,ALONDRA,646*611*4024		
26	ssssTHOMPSON,KAIDEN,917*889*3974		
27	ssSTOKES,PAYTON,301*363*4329		
28	ssBRADFORD,ALIZA,301*360*1746		
29	ssBURKE,BREANNA,202*740*4579		
30	ssssDURAN,WYATT,703*941*9848		
31	ssssHAMPTON,MYLES,646*942*2079		
32	ssBURGESS,LAUREN,301*868*1211		
33	ssssPETERS,SHERIYN,301*496*5674		
34	ssWARE,MOHAMMAD,301*833*8468		
35	ssRIVERS,ISABELA,917*481*1265		
36	ssSHARPE,CAMDEN,917*265*1355		
37	ssRODRIGUEZ,JAQUELINE,646*290*2046		
38	ssssHEWITT,FAITH,646*716*2288		
39	ssMALONE,HALLIE,240*312*8237		
40	ssVALENTINE,ROCCO,646*590*4581		
41			
42			
43			
44			
45			
46			
47			

Your messy data is all mashed together in the same column. How do you separate the good data from the garbage?



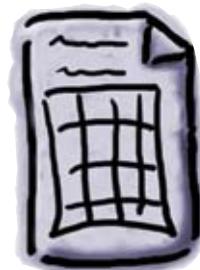
Look at the toolbar. What feature of Excel do you think would break this data into multiple columns?

Text to Columns uses a delimiter to split up your data

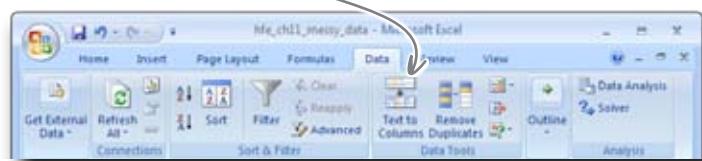
Text to Columns is a great feature that lets you split your data into columns using a **delimiter**, which is simply a text character that signifies the breaks between the different data points. If your delimiter is, say, a period, Text to Columns will put the data to the left of the period in one column, the data to the right in another, and then it'll delete the period.



Here everything is mashed into one column.

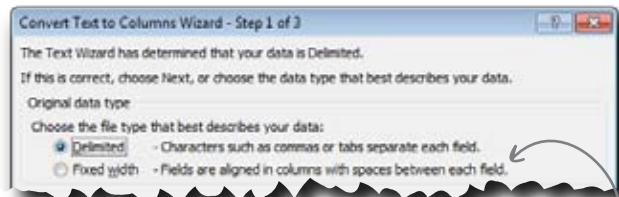
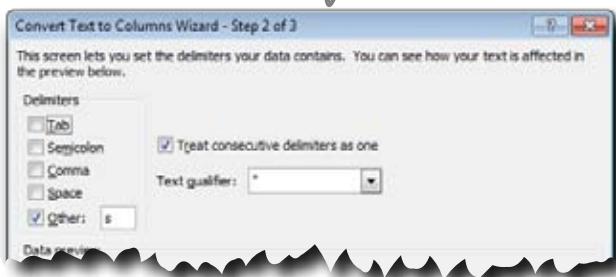


Text to Columns splits your data into columns.



If you have more than one type of delimiter, you might have to run Text to Columns more than once. In this case, you have a period acting as a delimiter, as well as a comma, and you could even treat those weird “s” characters as delimiters, which would make Excel throw them out.

Here you tell Excel what character(s) serve as delimiters.



If your data points are arranged in columns with the data separated by spaces, click "Fixed width."

Click Finish to skip step 3 of the Wizard, which is about number formatting.



Geek Bits

CSV is a really popular file format for data. The letters stand for **Comma Separated Value**. For these files, commas act as the delimiter. The format is so common that when you load a CSV file, Excel automatically splits the data into columns using the comma delimiter.



Exercise

Try using Text to Columns to fix this messy data. Make sure your cursor is inside your data first.

You'll probably have to **run it a second time** to get the period delimiter.

You'll have to run Text to Columns more than once to get rid of all your delimiters.

	A1	A	B	C	D
1	ssssWALTON,GRANT.202*431*4040				
2	ssANDREWS,CIERRA.646*351*8529				
3	ssSTEEL,BRYNLEE.917*652*6716				
4	sssssDUNIN,MADILYNN.212*679*6373				
5	sWELCH,LILAH.202*596*6969				
6	sPARRISH,GABRIEL.703*538*8735				
7	ssssKEY,XAVIER.917*657*6528				
8	sssssBALL,YARITZA.212*519*4075				
9	sNELSON,JAZLYN.718*913*7723				
10	sFOSTER,MAKENZIE.347*714*3418				
11	sssSALINAS,PAMELA.718*376*6902				
12	sMATHIS,IRELAND.917*538*7421				
13	sssHYDE,SPENCER.202*517*3275				
14	sMCKENZIE,JAYDA.646*893*1014				
15	ssMOORE,KARLY.202*216*6224				
16	ssDUFFY,MAXIMO.240*677*8638				
17	sCLEVELAND,MIRANDA.646*492*5471				
18	sCHASE,MELISSA.646*749*7422				
19	sREESE,DIEGO.301*634*9751				
20	sssRIVERS,BRICE.212*716*8642				
21	ssssLAWSON,NOEL.646*351*4181				
22	ssssMUNOZ,ITZEL.917*824*2362				
23	sssSIMS,GINA.212*381*7598				
24	ssssWHITEHEAD,KEYLA.646*334*6513				
25	ssssWHITAKER,ALONDRA.646*611*4024				
26	ssssTHOMPSON,KAIDEN.917*889*3974				
27	sSTOKES,PAYTON.301*363*4329				
28	ssBRADFORD,ALIZA.301*360*1746				
29	sssBURKE,BREANNA.202*740*4579				
30	ssssDURAN,WYATT.703*941*9848				
31	ssssHAMPTON,MYLES.646*942*2079				
32	sssBURGESS,LAUREN.301*868*1211				
33	ssssPETERS,SHERLYN.301*496*5674				
34	sssWARE,MOHAMMAD.301*833*8468				
35	ssRIVERS,ISABELA.917*881*1265				
36	ssssSHARPE,CAMDEN.917*265*1355				
37	sssRODRIGUEZ,JAQUELINE.646*290*2946				
38	ssssHEWITT,FAITH.646*716*2288				
39	ssMALONE,MALLIE.240*312*8237				
40	ssVALENTINE,ROCCO.646*590*4581				
41					

When you specify that "s" is a delimiter, Excel will put a column to the left of them, which you can delete.

You don't need to treat the asterisk as a delimiter, because the data on the right is a phone number.

Once we're done splitting the data up, we can fix the uppercase letters and the asterisks in the phone number.



Exercise Solution

You just used Text to Columns to break your data into multiple pieces. How'd it go?

Here are your last names.

Here are your first names.

This is the phone number.

This is a lot better
looking than the messy
data you received!

Text to Columns
did a good job.

	A	B	C	D	E	F
1	WALTON	GRANT	202*431*4040			
2	ANDREWS	CIERRA	646*351*8529			
3	STEELE	BRYNLEE	917*652*6718			
4	DUNN	MADILYNN	212*579*6373			
5	WELCH	LILAH	202*596*6969			
6	PARRISH	GABRIEL	703*538*8735			
7	KEY	XAVIER	917*657*6528			
8	BALL	YARITZA	212*519*4075			
9	NELSON	JAZLYN	718*913*7723			
10	FOSTER	MAKENZIE	347*714*3418			
11	SALINAS	PAMELA	718*376*6902			
12	MATHIS	IRELAND	917*538*7421			
13	HYDE	SPENCER	202*517*3275			
14	MCKENZIE	JAYDA	646*893*1014			
15	MOORE	KARLY	202*216*6224			
16	DUFFY	MAXIMO	240*677*8638			
17	CLEVELAND	MIRANDA	646*492*5471			
18	CHASE	MELISSA	646*749*7422			
19	REESE	DIEGO	301*634*9751			
20	RIVERS	BRICE	212*716*8642			
21	LAWSON	NOEL	646*351*4181			
22	MUNOZ	ITZEL	917*824*2362			
23	SIMS	GINA	212*381*7598			
24	WHITEHEAD	KEYLA	646*334*6513			
25	WHITAKER	ALONDRA	646*611*4024			
26	THOMPSON	KAIDEN	917*889*3974			
27	STOKES	PAYTON	301*363*4329			
28	BRADFORD	ALIZA	301*360*1746			
29	BURKE	BREANNA	202*740*4579			
30	DURAN	WYATT	703*941*9040			
31	HAMPTON	MYLES	646*942*2079			
32	BURGESS	LAUREN	301*668*1211			
33	PETERS	SHERLYN	301*496*5674			
34	WARE	MOHAMMAD	301*833*8468			
35	RIVERS	ISABELA	917*481*1265			
36	SHARPE	CAMDEN	917*265*1355			
37	RODRIGUEZ	JAQUELINE	646*290*2946			
38	HEWITT	FAITH	646*716*2288			
39	MALONE	HALLIE	240*312*8237			
40	VALENTINE	ROCCO	646*590*1581			
41						
42						



Uh, we need the "s" characters. They are actually data! They stand for "stars," and they're a ranking of the quality of our customers. We need them, so is there any chance you can bring them back?

Text to Columns doesn't work in all cases

For starters, you need a delimiter, or at least you need the data elements to be evenly spaced. Here you have neither: the "s" characters aren't evenly spaced, they aren't delimiters, and there's nothing that separates them from the next data element: the last name.

	A	B
1	ssssWALTON,GRANT.202*431*4040	
2	ssANDREWS,CIERRA.646*351*8529	
3	ssSTEELE,BRYNLEE.917*652*6716	
4	sssssDUNN,MADILYNN.212*679*6373	

There's no delimiter between these two data fields.

Better click **Undo** a couple times to start from scratch. You're going to need some more firepower for this problem. Weren't there formulas for dealing with text data?

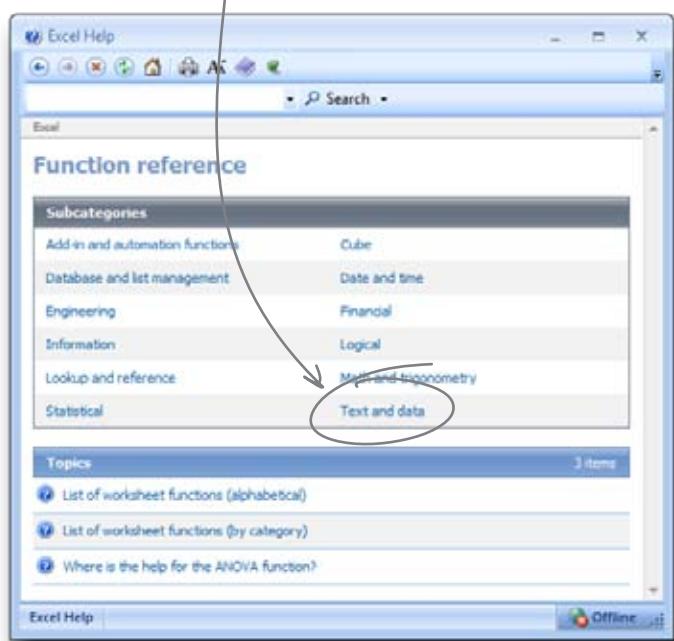
Do this!

Press Undo a few times to get the data back to its original messy state, and then look up text formulas in Help files.

Excel has a suite of functions for dealing with text

Earlier you used the function VALUE() to convert text data to numbers, but VALUE() is just the beginning of Excel's text functions. Excel has a whole suite of functions to deal with all sorts of situations in which you need to change or query text data.

Click here to get to the reference on text functions.



Here are all of Excel's text formulas.

Text and data	
Topics	20 items
② Text functions (reference)	
② ASC function	
② BAHTTEXT function	
② CHAR function	
② CLEAN function	
② CODE function	
② CONCATENATE function	
② DOLLAR function	
② EXACT function	
② FIND, FINDB functions	
② FIXED function	
② JIS function	
② LEFT, LEFTB functions	
② LEN, LENB functions	
② LOWER function	
② MID, MIDB functions	
② PHONETIC function	
② PROPER function	
② REPLACE, REPLACEB functions	
② REPT function	
② RIGHT, RIGHTB functions	
② SEARCH, SEARCHB functions	
② SUBSTITUTE function	
② T function	
② TEXT function	
② TRIM function	
② UPPER function	
② VALUE function	

There are a whole bunch!

You're going to use a few of these to clean up this database, and in the future when you have text problems that Text to Columns can't solve, you should check out the Help files for other function-based solutions.



Match each Excel text function to what it does. Which functions would you use to extract the “s” characters and the phone numbers from your messy data?

LEFT

Removes duplicate spaces and spaces on each end of text in a cell.

RIGHT

Grabs the leftmost text in a cell. You tell it how many characters you want.

FIND

Returns a value equal to two or more text cells mashed together.

TRIM

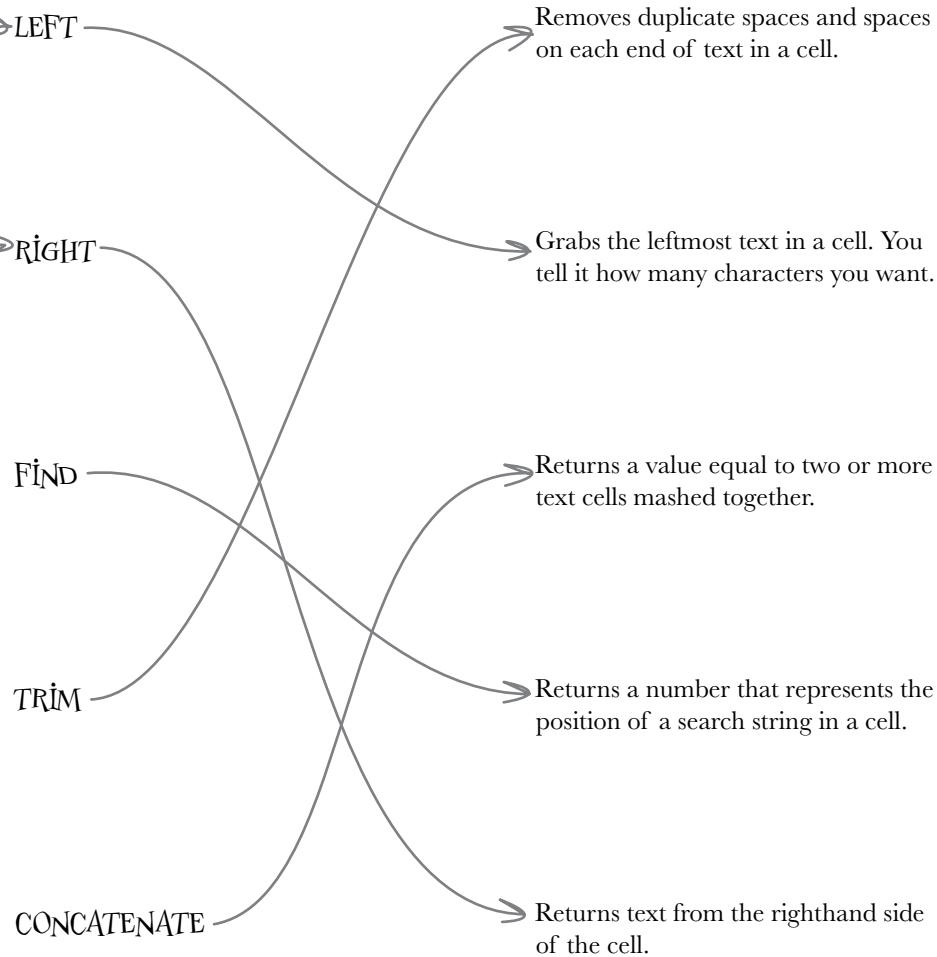
Returns a number that represents the position of a search string in a cell.

CONCATENATE

Returns text from the righthand side of the cell.

* WHO DOES WHAT? SOLUTION *

You were to match each Excel text function to what it does. Which functions would you use to extract the “s” characters and the phone numbers from your messy data?



We want to use LEFT() and RIGHT() to extract our “s” characters and phone numbers.

LEFT and RIGHT are basic text extraction functions

You need to extract characters on the left side of your cells (the “s” characters) and on the right side of your cells (the phone numbers). To do this, you can use the LEFT() and RIGHT() functions. Here’s the syntax.

=RIGHT(target cell, # of characters)

You’ll put a formula with this function in a new cell, and the formula will point to your original raw data and say how many characters to grab.

This has the text or cell reference where you want to extract characters.

This is a value or formula saying how many characters to grab.



Exercise

Let’s start with the phone numbers. Use RIGHT() to extract the phone numbers and display them in a different cell. Once you’ve done the first record, copy and paste the formula for each row.

For the first argument, point a reference to cell A1.

Put your first RIGHT() formula here.

For the second argument of your formula, type the number of text characters to extract.

Once you’ve done the first record, copy and paste the formula for the remaining records.

	A	B
1	ssssWALTON,GRANT.202*431*4040	
2	ssANDREWS,CIERRA.646*351*8529	
3	ssSTEELE,BRYNLEE.917*652*6716	
4	sssssDUNN,MADILYNN.212*679*6373	
5	sWELCH,LILAH.202*596*6969	
6	sPARRISH,GABRIEL.703*538*8735	
7	ssssKEY,XAVIER.917*657*6528	
8	sssssBALL,YARITZA.212*519*4075	
9	sNELSON,JAZLYN.718*913*7723	
10	sFOSTER,MAKENZIE.347*714*3418	
11	sssSALINAS,PAMELA.718*376*6902	
12	sMATHIS,IRELAND.917*538*7421	
13	ssHVAT,SHAYLER.202*517*3273	
14	smCKENZIE,JAYDA.646*893*1014	



Exercise Solution

You just used the text function `RIGHT()` to extract phone numbers from your raw data. Were you able to get what you needed out of the mess?

Here's the formula to use.

`=RIGHT(A1,12)`

A1 is just the first record of messy data.

	A	B
1	ssssWALTON,GRANT.202*431*4040	202*431*4040
2	ssANDREWS,CIERRA.646*351*8529	646*351*8529
3	ssSTEELE,BRYNLEE.917*652*6716	917*652*6716
4	sssssDUNN,MADILYN.212*679*6373	212*679*6373
5	sWELCH,LILAH.202*596*6969	202*596*6969
6	sPARRISH,GABRIEL.703*538*8735	703*538*8735
7	ssKEY,XAVIER.917*657*6528	917*657*6528

You want to extract 12 characters, because the phone number itself is 10 characters and there are two asterisks.

The raw data remains untouched, since your formula is returning cleaned-up data to a new location.

The formula copies and pastes smoothly for each record.

You have all your phone numbers!

	A	B
1	ssssWALTON,GRANT.202*431*4040	202*431*4040
2	ssANDREWS,CIERRA.646*351*8529	646*351*8529
3	ssSTEELE,BRYNLEE.917*652*6716	917*652*6716
4	sssssDUNN,MADILYN.212*679*6373	212*679*6373
5	sWELCH,LILAH.202*596*6969	202*596*6969
6	sPARRISH,GABRIEL.703*538*8735	703*538*8735
7	ssKEY,XAVIER.917*657*6528	917*657*6528
8	ssBALL,YARITZA.212*519*4075	212*519*4075
9	sNELSON,JAZLYN.718*913*7723	718*913*7723
10	sFOSTER,MAKENZIE.714*3418	347*714*3418
11	ssSALINAS,PAMELA.718*376*6902	718*376*6902
12	sMATHIS,IRELAND.917*538*7421	917*538*7421
13	ssHYDE,SPENCER.202*517*3275	202*517*3275
14	sMCENZIE,JAYDA.646*893*1014	646*893*1014
15	ssMOORE,KARLY.202*216*6224	202*216*6224
16	ssDUFFY,MAXIMO.240*577*6638	240*577*6638
17	sCLEVELAND,MARINA.646*492*5471	646*492*5471
18	ssCHAPMAN,ELISSA.646*749*7422	646*749*7422
19	sREESE,DIEGO.301*634*9751	301*634*9751
20	ssRIVERS,BRICE.212*716*8642	212*716*8642
21	ssssLAWSON,NOEL.646*351*4181	646*351*4181
22	ssMUNOZ,ITZEL.917*824*2362	917*824*2362
23	ssSIMS,GINA.212*716*7598	212*716*7598
24	ssWHITEHEAD,KEYLA.646*334*6513	646*334*6513
25	ssWHITAKER,ALONDRA.646*611*4024	646*611*4024
26	ssTHOMPSON,KAIDEN.917*889*3974	917*889*3974
27	sSTOKES,PATONY.301*363*4329	301*363*4329
28	ssBRADFORD,ALIZA.301*360*1746	301*360*1746
29	ssBURKE,BREANNA.202*740*4579	202*740*4579
30	ssssDURAN,WYATT.703*941*9848	703*941*9848
31	ssssHAMPTON,MYLES.646*942*2079	646*942*2079
32	ssBURGESS,LAUREN.301*868*1211	301*868*1211
33	ssssPETERS,SMERYLN.301*496*5674	301*496*5674
34	ssWARE,MOHAMMAD.301*833*8468	301*833*8468
35	ssRIVERS,ISABELA.917*481*1265	917*481*1265
36	ssSHARPE,CAMDEN.917*265*1355	917*265*1355
37	ssRODRIGUEZ,JAQUELINE.646*290*2946	646*290*2946
38	ssHEWITT,FAITH.646*716*2288	646*716*2288
39	ssMALONE,HALLIE.240*312*8237	240*312*8237
40	ssVALENTINE,ROCCO.646*590*4581	646*590*4581
41		
42		

Now you can extract the "s" characters....

You need to vary the values that go into the second argument

In the RIGHT () formula you used to extract phone numbers, you told Excel to extract 12 characters, which works for all the phone numbers. But the count of “s” characters varies among the cells—from one character to five.

Here are four “s” characters...

1	ssssWALTON,GRANT.202*431*4040
2	ssANDREWS,CIERRA.646*351*8529
3	ssSTEELE,BRYNLEE.917*652*6716
4	ssssDUNN,MADILYNN.212*679*6373
	WEI,CHI,LILAH.202*596*6969

...two here...

...and five here.

So when you create a LEFT () formula to extract the “s” characters, the value of your second argument somehow needs to vary among the cells.



Exercise

- 1 Create column headings, because you’re about to have a number of columns. Right-click on the 1 button to the left of the first row, and tell Excel to insert a row. Then type some column headings.
- 2 Sort your data by column A. This will mostly group together records that have a similar number of “s” characters.
- 3 In column C, type the number of “s” characters in each row. Since similar records will be grouped together, you should be able to copy and paste.
- 4 Finally, in column D, create the LEFT () formula that will return the “s” characters. Have your second argument refer to the number you just created in column C.

Be sure to add column headers in your new row.

Sort your data and type the number of “s” characters in this column.

Put your LEFT () formula here.

	A	B	C	D
1	ssssWALTON,GRANT.202*431*4040	202*431*4040		
2	ssANDREWS,CIERRA.646*351*8529	646*351*8529		
3	ssSTEELE,BRYNLEE.917*652*6716	917*652*6716		
4	ssssDUNN,MADILYNN.212*679*6373	212*679*6373		
5	WEI,CHI,LILAH.202*596*6969	202*596*6969		
6				
7				
8				
9				
10				



Exercise Solution

You just created a column full of numbers representing the "s" character count in each cell. Then you created a `LEFT()` formula using that number to extract the characters from your raw data. How did it go?

Here are your column headers.

This data is sorted by your Original column.

	A	B	C	D
1	Original	Phone	Star Count	Stars
2	sCHASE,MELISSA.646*749*7422	646*749*7422	1	
3	sCLEVELAND,MIRANDA.646*492*5471	646*492*5471	1	
4	sFOSTER,MAKENZIE.347*714*3418	347*714*3418	1	
5	sMATHIS,IRELAND.917*538*7421	917*538*7421	1	
6	sMCKENZIE,JAYDA.646*893*1014	646*893*1014	1	
7	sNELSON,JAZLYN.718*913*7723	718*913*7723	1	
8	sPARRISH,GABRIEL.703*538*8735	703*538*8735	1	
9	sREESE,DIEGO.301*634*9751	301*634*9751	1	
10	ssANDREWS,CIERRA.646*351*8529	646*351*8529	2	
11	ssBRADFORD,ALIZA.301*360*1746	301*360*1746	2	
12	ssDUFFY,MAXIMO.240*677*8638	240*677*8638	2	
13	ssMALONE,HALLIE.240*312*8237	240*312*8237	2	
14	ssMOORE,KARLY.202*216*6224	202*216*6224	2	

It's easy to copy and paste the Star Count values as you write them.

This column shows the number of stars in each row of your data.

Here's the formula you need.

=LEFT(A2 , C2)

The formula copies and pastes with no problem.

Now you have two data elements from your raw, messy data extracted!

	A	B	C	D
1	Original	Phone	Star Count	Stars
2	sCHASE,MELISSA.646*749*7422	646*749*7422	1	
3	sCLEVELAND,MIRANDA.646*492*5471	646*492*5471	1	
4	sFOSTER,MAKENZIE.347*714*3418	347*714*3418	1	
5	sMATHIS,IRELAND.917*538*7421	917*538*7421	1	
6	sMCKENZIE,JAYDA.646*893*1014	646*893*1014	1	
7	sNELSON,JAZLYN.718*913*7723	718*913*7723	1	
8	sPARRISH,GABRIEL.703*538*8735	703*538*8735	1	
9	sREESE,DIEGO.301*634*9751	301*634*9751	1	
10	ssANDREWS,CIERRA.646*351*8529	646*351*8529	2	
11	ssBRADFORD,ALIZA.301*360*1746	301*360*1746	2	
12	ssDUFFY,MAXIMO.240*677*8638	240*677*8638	2	
13	ssMALONE,HALLIE.240*312*8237	240*312*8237	2	
14	ssMOORE,KARLY.202*216*6224	202*216*6224	2	
15	ssRIVERS,ISABELA.917*481*1265	917*481*1265	3	
16	ssBURGESS,LAUREN.301*868*1211	301*868*1211	3	
17	ssBURKE,BREANNA.202*740*4579	202*740*4579	3	
18	ssHYDE,SPENCER.202*517*3275	202*517*3275	3	
19	ssRODRIGUEZ,JAQUELINE.646*290*2946	646*290*2946	3	
20	ssSALINAS,PAMELA.718*376*6902	718*376*6902	3	
21	ssSIMS,GINA.212*381*7598	212*381*7598	3	
22	ssKEY,XAVIER.917*657*6528	917*657*6528	4	
23	ssMUNOZ,ITZEL.917*824*2362	917*824*2362	4	
24	ssRIVERS,BRICE.212*716*8642	212*716*8642	4	
25	ssBALL,YARITZA.212*519*4075	212*519*4075	5	
26	ssDUNN,MADILYN.212*679*6373	212*679*6373	5	
27	ssDURAN,WYATT.703*941*9848	703*941*9848	5	
28	ssHAMPTON,MYLES.646*942*2079	646*942*2079	5	
29	ssSHARPE,CAMDEN.917*265*1355	917*265*1355	4	
30	ssHEWITT,FAITH.646*716*2288	646*716*2288	5	
31	ssLAWSON,NOEL.646*351*4181	646*351*4181	5	
32	ssPETERS,SHERLYN.301*496*5674	301*496*5674	5	
33	ssWHITEHEAD,KEYLA.646*334*6513	646*334*6513	5	
34	ssTHOMPSON,KAIDEN.917*889*3974	917*889*3974	4	
35	ssWALTON,GRANT.202*431*4040	202*431*4040	4	
36	ssWHITAKER,ALONDRA.646*611*4024	646*611*4024	4	
37	ssSTEELE,BRYNLEE.917*652*6716	917*652*6716	2	
38	ssWARE,MOHAMMAD.301*833*8468	301*833*8468	3	
39	ssSTOKES,PATTON.301*363*4329	301*363*4329	1	
40	ssVALENTINE,ROCCO.646*590*4581	646*590*4581	2	
41	ssWELCH,LILAH.202*596*6969	202*596*6969	1	
42				

Business is starting to suffer for lack of customer data

That data you're working on is really important, and without it your employees are starting to have problems.

Hate to bug you about this, but I need our customer data! Right now, I can't get in touch with anyone, which is seriously hurting business!



Better punch through those first and last names really quickly!

You know, because you already extracted values on both ends of your raw data, it'd be nice if you could use that information to get the name out. It'd be nice if you could use the data you've extracted to trim the ends off of your raw data.

If you had a formula that told you the length of things...

Let's use the stars and phone fields to whittle down the original. That way, breaking apart the last name and first name will be easier.

This will be easy to break apart.

sCHASE , MELISSA . 646*749*7422

sCHASE , MELISSA

CHASE , MELISSA

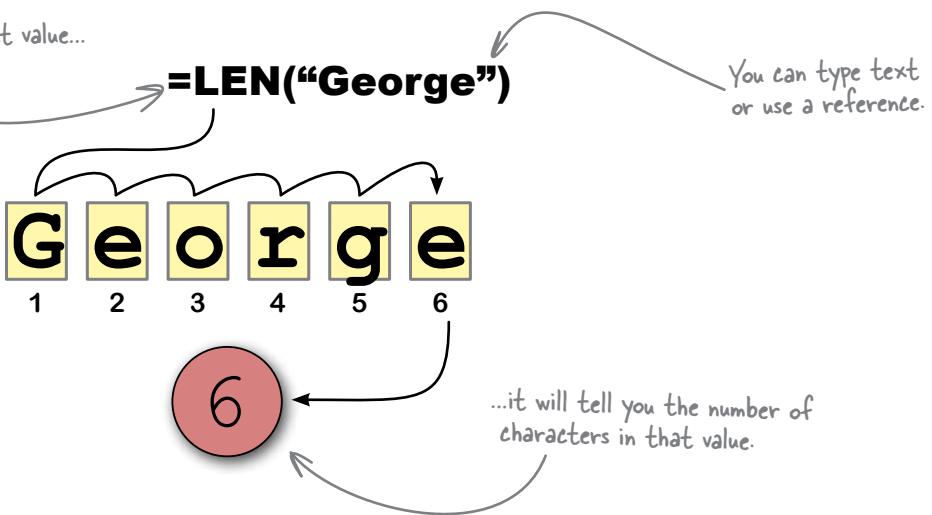
...you could use
a LEFT()
formula here...

...and a RIGHT()
formula here.



The `LEN()` function returns the number of characters in its argument, and it can help you extract the names from your raw data.

If you give `LEN()` a text value...



- Create two columns for transitional messy data. In the first column, you'll peel the phone number out of the original data. In the second column, you'll peel the stars out of the original data.

Create these two columns.

Car Count	Stars	Messy 1	Messy 2
1	s		
1	s		
1	s		
1	s		

You're going to use these columns to clean up your name data.

- 2 Write a function that takes the leftmost characters out of the original data.

How many characters? An amount equal to the **length of the original data** minus the **length of the phone number**. The second argument of your LEFT() formula should contain another formula that makes this calculation.

LEN(A2) is the length of the original data.

LEN(B2) is the length of the phone number.

Put the formula for question 2 here...

...and put the formula for question 3 here.

	A	B	C	D	E	F
1	Original				Messy 1	Messy 2
2	sCHASE,MELISSA.646*749*7422	646*749*7422	1	s		
3	sCLEVELAND,MIRANDA.646*492*5471	646*492*5471	1	s		
4	sFOSTER,MAKENZIE.347*714*3418	347*714*3418	1	s		
5	sMATHIS,IRELAND.917*538*7421	917*538*7421	1	s		
6	sMCKENZIE,JAYDA.646*893*1014	646*893*1014	1	s		
7	sNELSON,JAZLYN.718*913*7723	718*913*7723	1	s		
8	sPARRISH,GABRIEL.703*538*8735	703*538*8735	1	s		
9	sREESE,DIEGO.301*634*9751	301*634*9751	1	s		

- 3 Now write a function that takes the rightmost characters out of your new value. How many? An amount equal to the length of your new value minus the length of your star value.



Exercise Solution

You just wrote formulas to extract the names from your raw data. How did it go?

Here is your first formula.

=LEFT(A2,LEN(A2)-LEN(B2))

This is the number of characters in the cell minus the length of the phone number.

A screenshot of Microsoft Excel showing a table of data. The columns are labeled A through E. Column A contains the original data, column B contains phone numbers, column C contains star counts, column D contains stars, and column E contains the result of the formula =LEFT(A2,LEN(A2)-LEN(B2)). The formula is also visible in the formula bar above the table. The data in column E consists of names followed by a period, such as "sCHASE,MELISSA.". A callout arrow points from the text "Here is your first formula." to the formula in the formula bar.

	A	B	C	D	E	Mess
1	Original					
2	sCHASE,MELISSA 646*749*7422	646*749*7422	1	s	sCHASE,MELISSA.	
3	sCLEVELAND,MIRANDA,646*492*5471	646*492*5471	1	s		
4	sFOSTER,MAKENZIE,347*714*3418	347*714*3418	1	s		
5	sMATHIS,IRELAND,917*538*7421	917*538*7421	1	s		
6	sMCKENZIE,JAYDA,646*893*1014	646*893*1014	1	s		
7	sNELSON,JAZLYN,718*913*7723	718*913*7723	1	s		
8	sPARRISH,GABRIEL,703*538*8735	703*538*8735	1	s		
9	sREESE,DIEGO,301*634*9751	301*634*9751	1	s		
10	ssANDREWS,CIERRA,646*351*8529	646*351*8529	2	ss		
11	ssBRADFORD,ALIZA,301*360*1746	301*360*1746	2	ss		

Here is your raw data with the phone number element removed.

Here is your second formula.

=RIGHT(E2,LEN(E2)-LEN(D2))

A screenshot of Microsoft Excel showing a table of data. The columns are labeled B through F. Columns B, C, and D contain raw data. Column E contains the result of the formula =LEFT(A2,LEN(A2)-LEN(B2)), which is names followed by a period. Column F contains the result of the formula =RIGHT(E2,LEN(E2)-LEN(D2)), which is the customer name itself. A callout arrow points from the text "Here is your second formula." to the formula in the formula bar.

B	C	D	E	F	G
749*7422	Star Count	1	s		
492*5471		1	s		
714*3418		1	s		
538*7421		1	s		
893*1014		1	s		
913*7723		1	s		
538*8735		1	s		
634*9751		1	s		
351*8529		2	ss		
360*1746		2	ss		

This value is equal to the number of characters in cell E2 minus the length of the "s" character element.

Now you have an almost-clean value consisting of the customer name!

This spreadsheet is starting to get large!

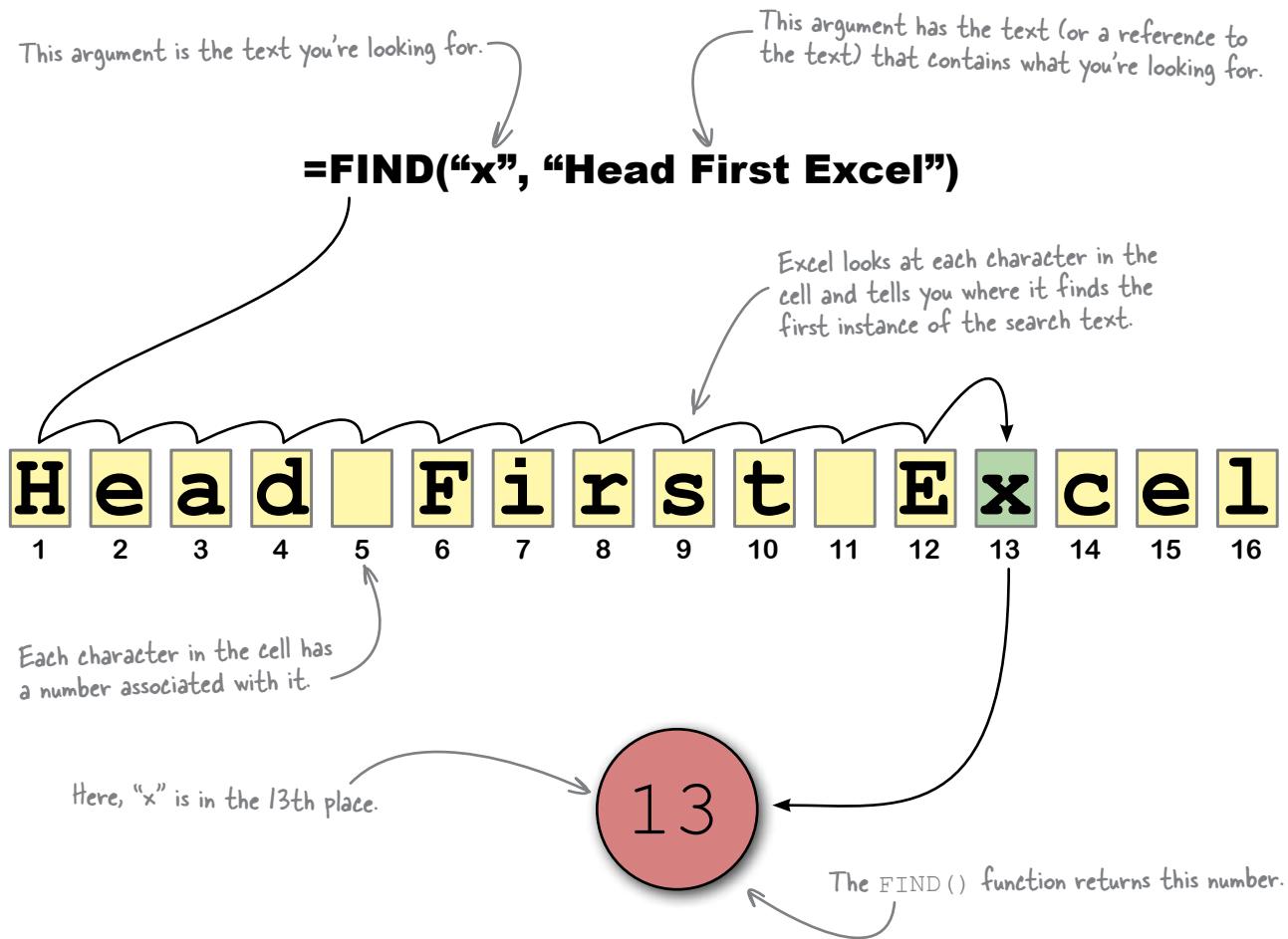
The spreadsheet is getting complex, but we're making lots of progress. Go ahead and copy/paste the two formulas you just created for the remaining rows in your spreadsheet.

Here's your clean data so far.

	A	B	C	D	E	F
	Name	Phone	Star Count	Stars	Memory 1	Memory 2
1	Original					
2	McNamee, Mervin 644-7487-2422	644-7487-2422	1	*	MCNAMEE, MERVIN	MCNAMEE, MERVIN
3	Tollefson, Miriam 644-7487-2547	644-7487-2547	1	*	TOLEFSO, MIRIAM	CLEVELAND, MIRIAM
4	Deeter, Maureen 347-7147-2418	347-7147-2418	1	*	DEETER, MAUREEN	FOSTER, MAUREEN
5	Mather, Ireland 917-5307-7421	917-5307-7421	1	*	MATHER, IRELAND	MATHER, IRELAND
6	McNamee, Myra 644-893-1914	644-893-1914	1	*	MCNAMEE, MYRA	MCKENZIE, JAYDA
7	Nelson, Matlyn 718-5137-7723	718-5137-7723	1	*	NELSON, MATLYN	NELSON, MATLYN
8	Sparish, Gabriel 703-387-8730	703-387-8730	1	*	SPARISH, GABRIEL	PARKER, GABRIEL
9	Reese, Cindi 361-534-9751	361-534-9751	1	*	REESE, CINDI	REESE, CINDI
10	Andrews, Anna 646-355-6529	646-355-6529	2	**	ANDREW, ANNA	ANDREW, CINDI
11	Bradford, Aliza 361-360-1746	361-360-1746	2	**	BRADFORD, ALIZA	BRADFORD, ALIZA
12	Duffy, Maximo 340-777-8638	340-777-8638	2	**	DUFFY, MAXIMO	DUFFY, MAXIMO
13	Shmalone, Paul 492-312-8237	492-312-8237	2	**	SHMALONE, PAUL	MALONE, HALLIE
14	Winters, Vicki 203-555-1265	203-555-1265	2	**	WINTERS, VICKI	WINTERS, VICKI
15	McNamee, Sirella 917-487-1265	917-487-1265	2	**	MCNAMEE, SIRELLA	WINTERS, SIRELLA
16	Reed, Lauren 901-888-1211	901-888-1211	3	***	REED, LAUREN	BUERGER, LAUREN
17	Bratton, Breanna 202-240-4079	202-240-4079	3	***	BRATTION, BREANNA	BURNT, BREANNA
18	Smythe, Spencer 204-717-3275	204-717-3275	3	***	SMYTHE, SPENCER	HYDE, SPENCER
19	Rodriguez, Jacqueline 640-290-2946	640-290-2946	3	***	RODRIGUEZ, JACQUELINE	RODRIGUEZ, JACQUELINE
20	Estman, Pamela 718-376-0902	718-376-0902	3	***	ESTMAN, PAMELA	SALINAS, PAMELA
21	Reeves, Xavier 212-381-7539	212-381-7539	3	***	REEVES, XAVIER	STHS, XINA
22	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
23	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
24	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
25	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
26	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
27	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
28	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
29	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
30	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
31	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
32	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
33	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
34	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
35	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
36	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
37	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
38	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
39	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
40	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
41	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
42	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
43	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
44	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
45	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
46	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
47	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
48	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
49	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
50	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
51	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
52	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
53	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
54	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
55	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
56	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
57	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
58	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
59	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
60	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
61	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
62	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
63	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
64	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
65	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
66	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
67	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
68	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
69	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
70	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
71	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
72	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
73	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
74	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
75	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
76	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
77	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
78	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
79	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
80	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
81	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
82	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
83	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
84	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
85	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
86	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
87	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
88	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
89	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
90	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
91	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
92	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
93	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
94	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
95	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
96	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
97	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
98	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
99	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
100	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
101	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
102	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
103	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
104	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
105	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
106	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
107	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
108	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
109	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
110	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
111	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
112	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
113	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
114	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
115	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
116	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
117	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
118	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
119	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
120	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
121	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
122	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
123	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
124	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
125	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
126	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
127	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
128	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
129	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
130	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
131	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
132	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
133	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
134	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
135	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
136	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER
137	Reeves, Xavier 913-657-6528	913-657-6528	4	****	REEVES, XAVIER	REEVES, XAVIER

FIND returns a number specifying the position of text

`FIND()` is a function that returns a number that states where a search string can be found within a piece of text. Say you were looking for the position of the text “x” in the expression “Head First Excel”.



Why would you need a function like this? Well, for starters, you could use it in conjunction with a `LEFT()` or `RIGHT()` formula to extract a number of characters that varies from formula to formula.

Let's use `FIND()` to extract our Last Name field....



Exercise

Use FIND() inside your LEFT() formula to specify the position of the comma, telling LEFT() how many characters to grab to return your **Last Name** value.

- ➊ Combine LEFT() and FIND() into a formula that extracts last names from column F.
- ➋ Copy and paste for each line of messy data.

FIND() should look for the comma in cell F2.

Put your formula in a new Last Name column.

	F	G	H
1	Messy 2		
2	CHASE,MELISSA.		
3	CLEVELAND,MIRANDA.		
4	FOSTER,MAKENZIE.		
5	MATHIS,IRELAND.		
6	MCKENZIE,JAYDA.		
7	NELSON,JAZLYN.		
8	PARRISH,GABRIEL.		
9	REESE,DIEGO.		
10	ANDREWS,CIERRA.		
11	BRADFORD,ALIZA.		
	DUFFY,MAXIMO		

Make your FIND() expression
the second argument of
your LEFT() formula.

You might need to add or subtract a
character, so that you don't actually
include the comma in your Last Name field.



Exercise Solution

You just combined two formulas to get your Last Name field. What happened?

This formula searches for the comma,
and it returns the last name...

	F	G
1	Messy 2	Last Name
2	CHASE,MELISSA.	CHASE,
3	CLEVELAND,MIRANDA.	
4	FOSTER,MAKENZIE.	
5	MATHIS,IRELAND.	
6	MCKENZIE,JAYDA.	

=LEFT(F2,FIND(“,”,F2))

...but it also includes the comma
in the result, so you need a formula
that will exclude the comma.

	F	G
1	Messy 2	Last Name
2	CHASE,MELISSA.	CHASE
3	CLEVELAND,MIRANDA.	
4	FOSTER,MAKENZIE.	
5	MATHIS,IRELAND.	
6	MCKENZIE,JAYDA.	

All you have to do is subtract 1
from the value of your FIND()
formula, and your comma is excluded.

=LEFT(F2,FIND(“,”,F2)-1)

That LEFT/FIND formula is cool and
everything, but wouldn't it be easier in this
case just to use Text to Columns? We have
a simple delimiter here, why not use it?

Now your Last Name has been extracted!



there are no Dumb Questions

Q: Wouldn't Text to Columns be an easier way to deal with this problem?

A: Text to Columns is definitely quick and easy. You could use it in this case.

Q: So why didn't we?

A: Whether and when you use Text to Columns versus formulas is really a personal preference, and there is nothing wrong with using it here. But there is one big, fat reason to use formulas primarily.

Q: Because it's the harder way, so it's easier to show off?

A: Not at all! You'd always want to use formulas in situations where you think you might want to go back and trace exactly how your clean data was derived from your messy data.

Q: Why would you care? As long as the clean data works correctly, aren't you in good shape?

A: If you have messy data that has a single, simple pattern to it, you probably wouldn't have to go back and see how you derived your clean data. If every data point is separated by a delimiter, and you run a Text to Columns, you probably won't have problems with your cleaned data not squaring with your original data.

Q: But if the original data is complicated, it's a different story.

A: Exactly. The customer data you salvaged from the email has several patterns to the messiness: the first two fields (stars and names) aren't separated by a delimiter, the last name and the first name are separated by a comma, the first name and the phone number are separated by a period, and don't forget the asterisks inside the phone number.

Q: The data is really messy.

A: And because it's so messy, you've had to do a bunch of things to fix it. In creating the big, formula-filled spreadsheet you used to clean the data, you've also set up an audit that you can review if your clean data doesn't match your messy data perfectly later on.

Q: But there are still a lot of cases where I need to use Text to Columns, right?

A: Totally. Cleaning messy data—which all of us have to do at one point or another—is about finding the boundary conditions between your individual data points. And those boundaries are usually delimiters of some sort. If it's not a comma or a period, it might be spaces. So most of the field of cleaning messy data involves identifying those boundary conditions and making the software split the data using them.

Q: Which is what Text to Columns does.

A: Right. And if you run it over and over, Text to Columns can usually make some pretty complicated breaks. Just remember that you sacrifice the ability to go back and tweak the formulas you used to get different results. Once you run Text to Columns on data, it deletes the original data and leaves you with new columns.

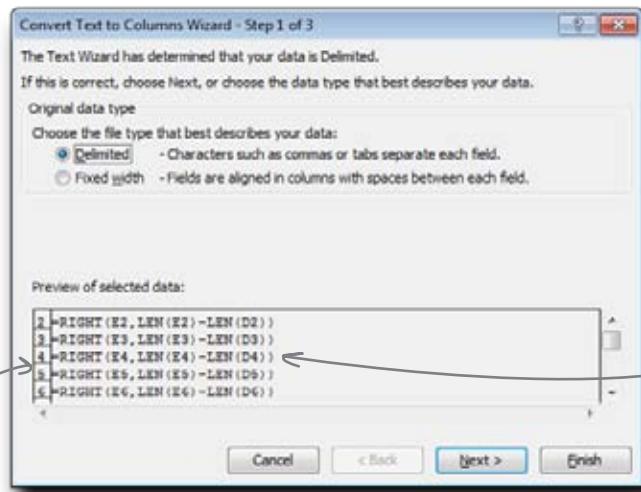
Q: I think that on the first name, which is the last data field we have, we're safe to go with Text to Columns. By now, all the formulaic work we've done to break up the original mess has made what's left pretty simple.

A: Then go right ahead and use Text to Columns!

Can you run Text to Columns on column Messy 2? What happens when you try?

Text to Columns sees your formulas, not their results

There's a little snag when it comes to running this operation on the data you created in the Messy 2 column:



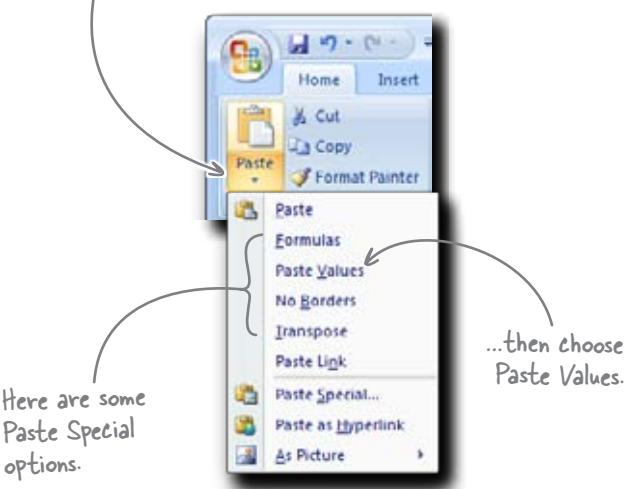
Text to Columns does what it says it does: take **text** and break it into columns. But here Excel wants to treat your *formulas* as text. This won't work: you need to take the formulas and render them as **values**.

Paste Special lets you paste with options

Paste Special is a fantastically helpful operation in Excel that lets you copy something and then—rather than paste an exact copy of the original—paste a modification of the original.

You can use Paste Special to paste the values that the formulas you've copied return, rather than the formulas themselves. And that is just what you need to do with your Messy 2 column data.

Copy your formulas and click on this drop box...





Exercise

In order to run Text to Columns on your Messy 2 column, you need to Paste Special > Values its contents to a new column first. Do this and then run Text to Columns to break your first and last names apart while getting rid of the comma and period.

Copy this data.

Put your cursor here
and choose Paste
Special > Values.

Then run Text to Columns
on your new data.

	F	G	H	I	J
1	Messy 2				
2	CHASE,MELISSA.	CHASE			
3	CLEVELAND,MIRANDA.	CLEVELAND			
4	FOSTER,MAKENZIE.	FOSTER			
5	MATHIS,IRELAND.	MATHIS			
6	MCKENZIE,JAYDA.	MCKENZIE			
7	NELSON,JAZLYN.	NELSON			
8	PARRISH,GABRIEL.	PARRISH			
9	REESE,DIEGO.	REESE			
10	ANDREWS,CIERA.	ANDREWS			
11	BRADFORD,ALIZA.	BRADFORD			
12	DUFFY,MAXIMO.	DUFFY			
13	MALONE,HALLIE.	MALONE			
14	MOORE,KARLY.	MOORE			
15	RIVERS,ISABELA.	RIVERS			
16	BURGESS,LAUREN.	BURGESS			
17	BURKE,BREANNA.	BURKE			
18	HYDE,SPENCER.	HYDE			
19	RODRIGUEZ,JAQUELINE.	RODRIGUEZ			
20	SALINAS,PAMELA.	SALINAS			
21	SIMS,GINA.	SIMS			
22	KEY,XAVIER.	KEY			
23	MUÑOZ,ITZEL.	MUÑOZ			
24	RIVERS,BRICE.	RIVERS			
25	BALL,YARITZA.	BALL			
26	DUNN,MADILYNN.	DUNN			
27	DURAN,WYATT.	DURAN			
28	HAMPTON,MYLES.	HAMPTON			
29	SHARPE,CAMDEN.	SHARPE			
30	HEWITT,FAITH.	HEWITT			
31	LAWSON,NOEL.	LAWSON			
32	PETERS,SHERLYN.	PETERS			

Be sure to label your new columns.



Exercise Solution

You just ran Paste Special > Values to make your data ready for the Text to Columns operation. What happened?

Paste your data here.

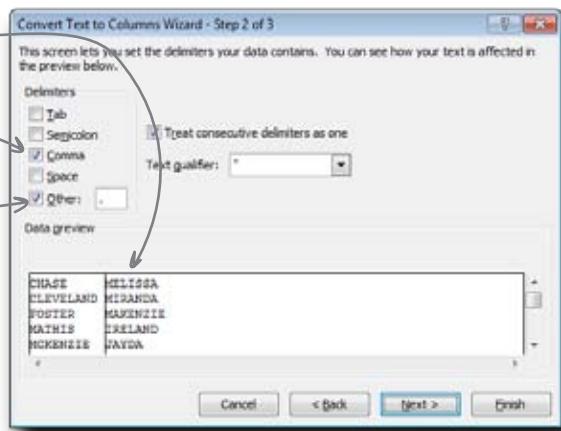
Text to Columns has no problem reading your data this time around.

Tell the dialog box to use the commas and the periods.

Now you finally have your names extracted!

Here are your new column headings.

	F	G	H
1	Messy 2	Last Name	CHASE, MELISSA.
2	CHASE, MELISSA.	CHASE	CHASE, MELISSA.
3	CLEVELAND, MIRANDA.	CLEVELAND	CLEVELAND, MIRANDA.
4	FOSTER, MAKENZIE.	FOSTER	FOSTER, MAKENZIE.
5	MATHIS, IRELAND.	MATHIS	MATHIS, IRELAND.
6	MCKENZIE, JAYDA.	MCKENZIE	MCKENZIE, JAYDA.
7	NELSON, JAZLYN.	NELSON	NELSON, JAZLYN.
8	PARRISH, GABRIEL.	PARRISH	PARRISH, GABRIEL.



	F	G	H	I
1	Messy 2	Last Name	CHASE	First Name
2	CHASE, MELISSA.	CHASE		MELISSA
3	CLEVELAND, MIRANDA.	CLEVELAND		MIRANDA
4	FOSTER, MAKENZIE.	FOSTER		MAKENZIE
5	MATHIS, IRELAND.	MATHIS		IRELAND
6	MCKENZIE, JAYDA.	MCKENZIE		JAYDA
7	NELSON, JAZLYN.	NELSON		JAZLYN
8	PARRISH, GABRIEL.	PARRISH		GABRIEL

Looks like time's running out...

Wow...she's starting
to get worked up!

From: Employee
To: Head First
Subject: That database...

Dear Head First,

You know, could I get that data? I know fixing it up is a pain, but I'm starting to get angry phone calls from customers who are wondering whether we've forgotten them. It's getting really rough.

There's still time to patch things up with everyone, but not much. Can I get that data?

—Your Employee

Better take care of this.



You've successfully extracted all your data from the original mess, but in order for your employee to use your work, you'll need a perfectly clean version.

1

Fix the case of your names. Use the PROPER() function to make your names look like This rather than THIS. Look up the function in Help if you need to learn how to use it.

2

Change the asterisks in the phone number to dashes. Use the SUBSTITUTE() function, looking it up in Help if you need to.

3

Copy everything to a new sheet with Paste Special > Values.

These steps will
perfect your work.

4

Delete the columns you no longer need from your new sheet.



Exercise Solution

You just went through the final steps to fix your data so that your employee can use it. How did it go?

1

- Fix the case of your names.** Use the PROPER() function to make your names look like This rather than THIS. Look up the function in help if you need to learn how to use it.

This formula is pretty simple—it just takes one argument.

=PROPER(H2)

You can copy and paste this formula for all the name values.

	H	I	J	K
1	Last Name	First Name	Last Name	First Name
2	CHASE	MELISSA	Chase	Melissa
3	CLEVELAND	MIRANDA	Cleveland	Miranda
4	FOSTER	MAKENZIE	Foster	Makenzie
5	MATHIS	IRELAND	Mathis	Ireland
6	MCKENZIE	JAYDA	Mckenzie	Jayda
7	NELSON	JAZLYN	Nelson	Jazlyn
8	PARRISH	GABRIEL	Parrish	Gabriel

2

- Change the asterisks in the phone number to dashes.** Use the SUBSTITUTE() function, looking it up in Help if you need to.

The second and third arguments are what you want to replace and what you want to replace it with.

=SUBSTITUTE(B2,"*","-")

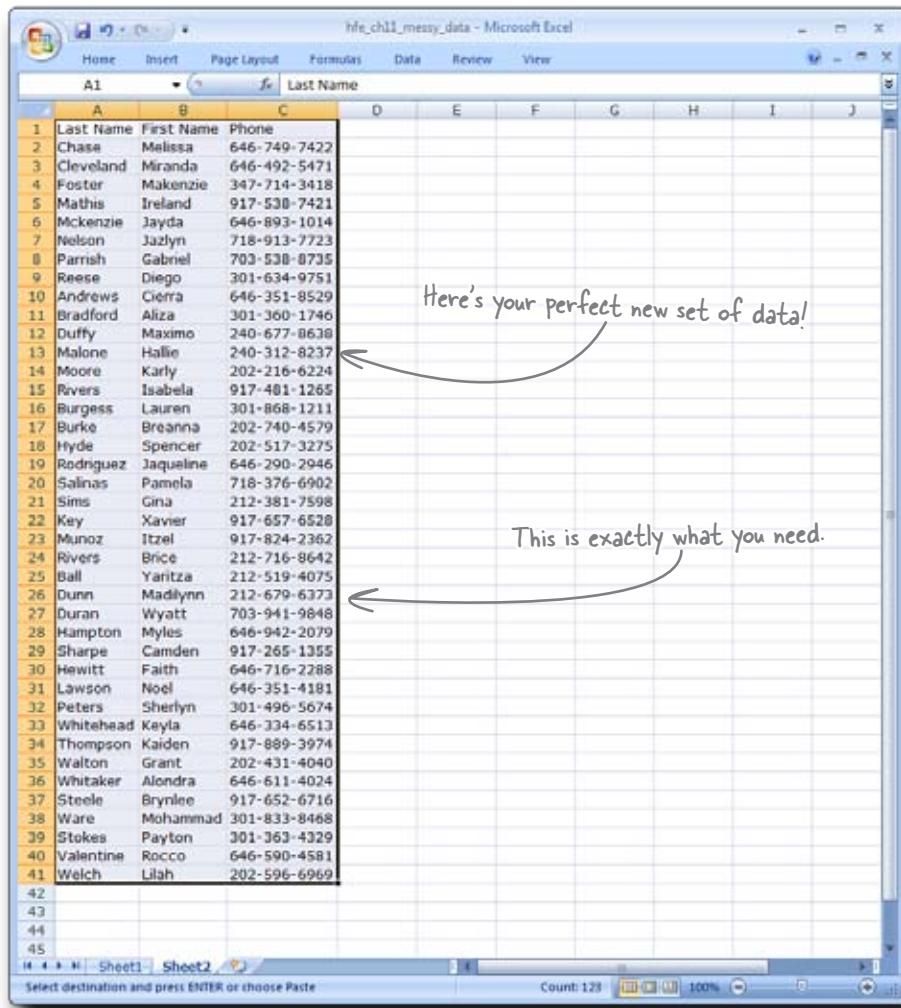
Here's SUBSTITUTE() in action.

	H	I	J	K	L
1	Last Name	First Name	Last Name	First Name	Phone
2	CHASE	MELISSA	Chase	Melissa	646-749-7422
3	CLEVELAND	MIRANDA	Cleveland	Miranda	646-492-5471
4	FOSTER	MAKENZIE	Foster	Makenzie	347-714-3418
5	MATHIS	IRELAND	Mathis	Ireland	917-538-7421
6	MCKENZIE	JAYDA	Mckenzie	Jayda	646-893-1014
7	NELSON	JAZLYN	Nelson	Jazlyn	718-913-7723
8	PARRISH	GABRIEL	Parrish	Gabriel	702-529-8725

- 3** Copy everything to a new sheet with Paste Special > Values.

These tasks are pretty straightforward.

- 4** Delete the columns you no longer need from your new sheet.



Here's your perfect new set of data!

	A	B	C	D	E	F	G	H	I	J
1	Last Name	First Name	Phone							
2	Chase	Melissa	646-749-7422							
3	Cleveland	Miranda	646-492-5471							
4	Foster	Makenzie	347-714-3418							
5	Mathis	Ireland	917-530-7421							
6	Mckenzie	Jayda	646-893-1014							
7	Nelson	Jazlyn	718-913-7723							
8	Parrish	Gabriel	703-530-8735							
9	Reese	Diego	301-634-9751							
10	Andrews	Cierra	646-351-8529							
11	Bradford	Aliza	301-360-1746							
12	Duffy	Maximo	240-677-8638							
13	Malone	Halle	240-312-8237							
14	Moore	Karly	202-216-6224							
15	Rivers	Isabela	917-401-1265							
16	Burgess	Lauren	301-868-1211							
17	Burke	Breanna	202-740-4579							
18	Hyde	Spencer	202-517-3275							
19	Rodnguez	Jacqueline	646-290-2946							
20	Salinas	Pamela	718-376-6902							
21	Sims	Gina	212-381-7598							
22	Key	Xavier	917-657-6528							
23	Munoz	Itzel	917-824-2362							
24	Rivers	Brice	212-716-8642							
25	Ball	Yanitra	212-519-4075							
26	Dunn	Madilynn	212-679-6373							
27	Duran	Wyatt	703-941-9848							
28	Hampton	Myles	646-942-2079							
29	Sharpe	Camden	917-265-1355							
30	Hewitt	Faith	646-716-2288							
31	Lawson	Noel	646-351-4181							
32	Peters	Sherlyn	301-496-5674							
33	Whitehead	Keyla	646-334-6513							
34	Thompson	Kaiden	917-889-3974							
35	Walton	Grant	202-431-4040							
36	Whitaker	Alondra	646-611-4024							
37	Steele	Brynlee	917-652-6716							
38	Ware	Mohammad	301-833-8468							
39	Stokes	Payton	301-363-4329							
40	Valentine	Rocco	646-590-4581							
41	Welch	Lilah	202-596-6969							
42										
43										
44										
45										

Sheet1 Sheet2

Select destination and press ENTER or choose Paste

Count: 129 100%

Your data crisis is solved!

This chapter started off with a real mess: you received a pile of jumbled-up data, which was all you had left of your customer database. But with the help of Excel's powerful text formulas, you fixed that messy data right up.



The spreadsheet started as a mess...

...and now it shows your progress as you cleaned it up!



Hardcore grouping



Pivot tables are among Excel's most powerful features.

But what are they? And why should we care? For Excel newbies, pivot tables can also be among Excel's most *intimidating* features. But their purpose is quite simple: **to group data quickly** so that you can analyze it. And as you're about to see, grouping and summarizing data using pivot tables is **much faster** than creating the same groupings using formulas alone. By the time you finish this chapter, you'll be slicing and dicing your data in Excel faster than you'd ever thought possible.

new analysis needed

Head First Automotive Weekly needs an analysis for their annual car review issue

Head First Automotive Weekly has signed you on to help them create some **table visualizations** out of their annual car test data.

The magazine's readers are serious data junkies; they just love looking at stats on all the cars available. On the one hand, it's great that you have such passionate readers, but on the other hand, it's kind of a drag that you have to slice and dice the car data in so many ways in order to satisfy them.

Load this!
[www.headfirstlabs.com/books/hfexcel/
hfe_ch12_pivot_tables.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch12_pivot_tables.xlsx)

This is going to be a big project, so you'd better brew up a pot of Starbuzz coffee. I need you to summarize, slice, and dice the car data in every way you can. Especially the cars' mileage. Why don't you start there?

Here's the ratings data.

The HFAW editor

A	B	C	D	E	F	G	H	I	J	
1	Make	Model	Number	Type	LowPrice	HighPrice	Predicted reliability	Owner satisfaction	Accident avoidance	MPG
2	Chevrn	4 Coupe	13860	25120	71	1	2	4	22	
3	Taya	2 Truck	18700	30830	81	5	4	3	32	
4	Vmacchna	1 SUV	25460	41830	77	2	3	3	24	
5	Luxo	4 SUV	32990	37870	81	2	3	1	29	
6	FurDay	2 SUV	9000	18340	58	2	3	4	29	
7	Prodigy	2 SUV	14050	15860	59	5	5	1	34	
8	Brilliant	1 Sedan	11640	18490	27	4	1	4	40	
9	FurDay	6 SUV	31380	47150	88	5	4	5	20	
10	Fore	6 SUV	19440	39320	73	3	2	1	20	
11	Taya	5 SUV	15150	21920	64	4	4	1	37	
12	Luxo	5 Truck	20850	58990	76	3	5	1	26	
13	Buck	1 SUV	25020	35590	69	2	5	2	20	
14	Prodigyn	1 Sedan	16830	18970	68	5	4	5	24	
15	Hyacinth	5 Sedan	19530	28500	78	4	5	3	21	
16	Vmacchna	2 SUV	22690	25530	78	3	1	3	26	
17	Hinda	10 Sedan	13700	29900	74	1	4	5	33	
18	Taya	1 SUV	27720	38080	78	1	1	3	23	
19	Neso	4 Sedan	20190	36410	79	1	1	3	21	
20	Hinda	5 Truck	14070	29230	76	3	5	4	27	
21	Hinda	4 SUV	15395	27210	76	2	4	5	27	
22	Taya	3 Truck	18480	39160	82	3	2	3	24	
23	LoE	1 Truck	25130	25700	61	1	3	2	19	
24	Jupiter	1 Coupe	21840	28850	66	2	5	2	26	
25	Duck	3 Sedan	23570	45520	55	4	2	1	16	
26	FurDay	1 Truck	3400	17360	59	4	1	4	30	
27	FurDay	7 SUV	20226	32300	66	4	4	2	21	
28	Taya	7 Sedan	20200	29740	74	2	5	5	43	
29	Hyacinth	3 SUV	19440	29070	75	2	5	5	25	
30	LoE	4 SUV	17330	24710	76	5	1	5	27	



Sharpen your pencil

The editor has just given you a pretty broad request. Using the fields in your data, come up with four ways you might group and summarize the MPG (miles per gallon) information. One is provided for you.

1

The average MPGs grouped by Make and Type.

Here's an example.

2

.....

3

.....

4

.....

5

.....

Describe some of the steps you'd have to undertake to implement these summaries using formulas. How long do you think it would take to do all this?

Put your answers in the blanks.

.....
.....
.....
.....



You just brainstormed a bunch of ways to summarize the data on the basis of MPG. What did you find?

- 1 The average MPG grouped by Make and Type.
- 2 The minimum MPG for each Make.
- 3 The maximum MPG for each type of car.
- 4 The average MPG grouped by reliability and Make.
- 5 The average MPG of SUVs under \$40,000.

Describe some of the steps you'd have to undertake to implement these summaries using formulas. How long do you think it would take to do all this?

This would take quite a while. For each one of these, I'd have to write formulas to group the data in one or more ways, and I'd have to write formulas like AVERAGE or MAX that would actually calculate the summaries.

You've been asked to do a lot of repetitive operations

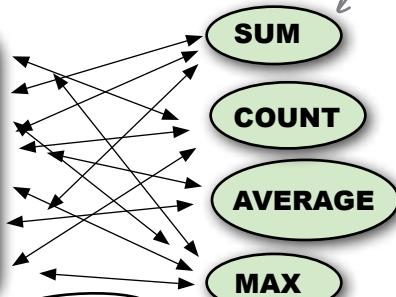
There is **complexity** in these data summaries that you've envisioned. You can slice the data in a million different ways, and it could take forever.

But there's **simplicity** as well. These summaries basically have you doing the same sort of operation over and over again: applying formulas to various groups and sub-groups of data.

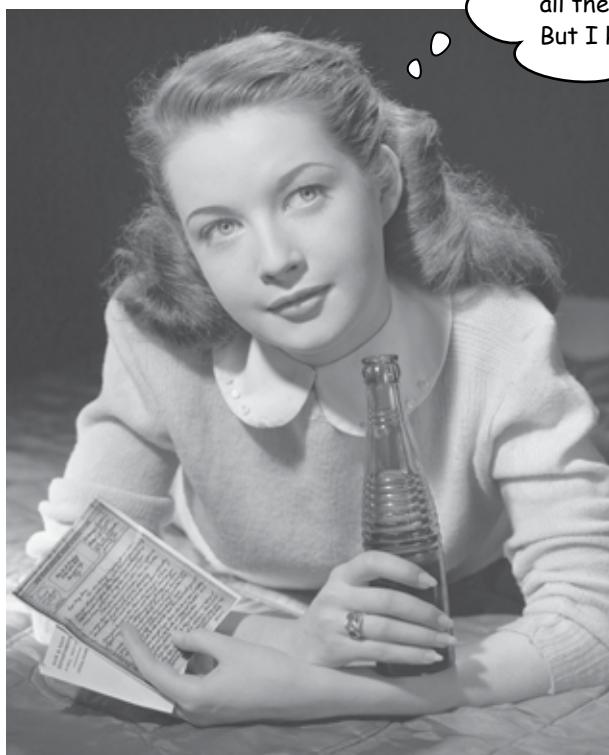
There are a bunch of different combinations to your groupings...

Make	Model Number
MPG	Owner satisfaction
Accident avoidance	
Predicted reliability	
LowPrice	HighPrice
Rating	Type

...but it's the same basic set of functions that you're applying over and over.



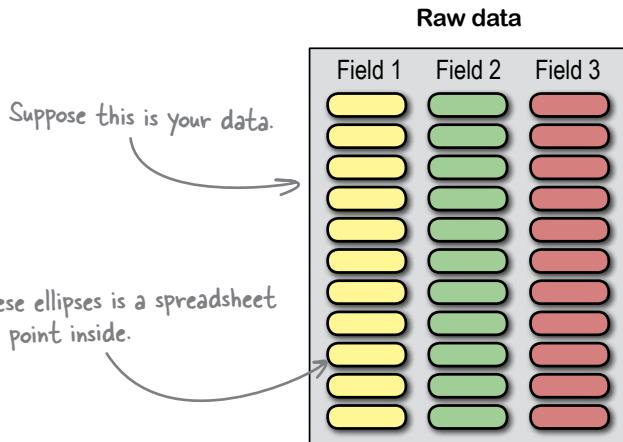
Wouldn't it be dreamy if I could do all these operations more quickly?
But I know it's just a fantasy....



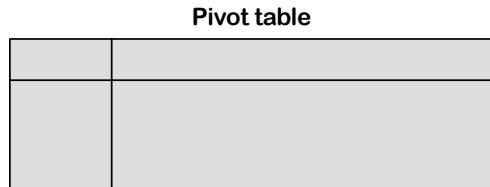
Pivot tables are an incredibly powerful tool for summarizing data

How do you group data in a bunch of different ways and summarize the groupings with formulas? The best approach is to use Excel's pivot tables. Pivot tables are an extraordinarily powerful feature of Excel that let you quickly and visually run these operations. Here's the basic idea behind how to make them.

What you want to do is take your data and put the different fields together into a new summary table.

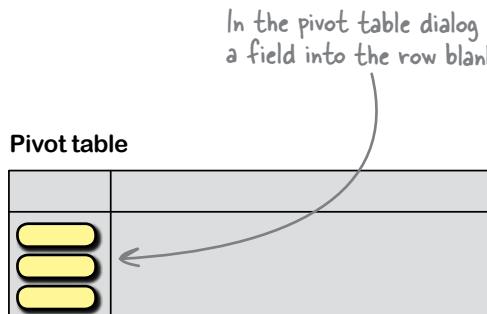
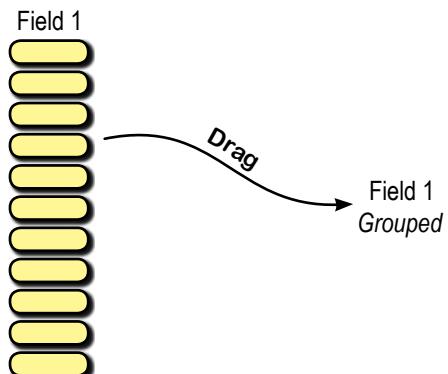


Here's your pivot table.



You want your data fields grouped into each of the boxes in the table.

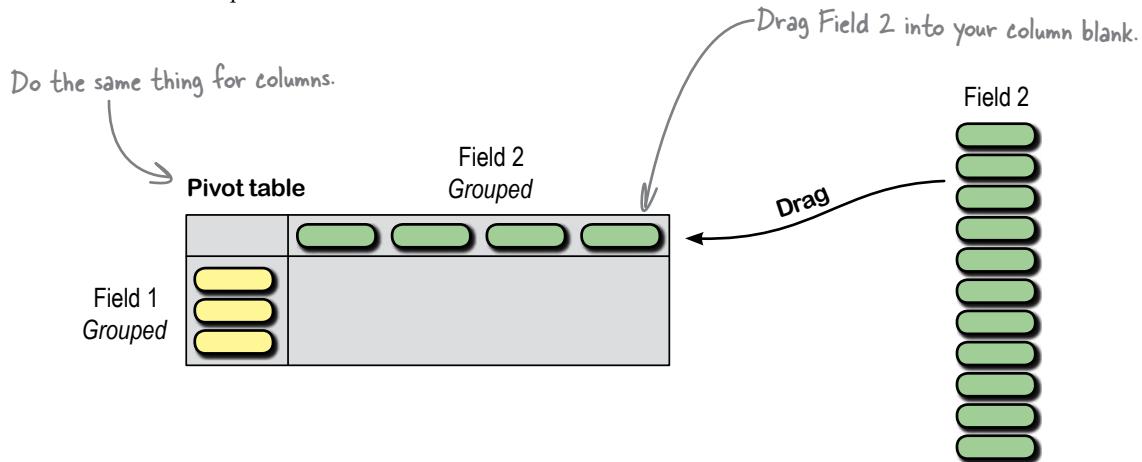
Drag one of your fields to the row blank. This will show unique values from that field as row elements. That is the sort of grouping that takes place in pivot tables.



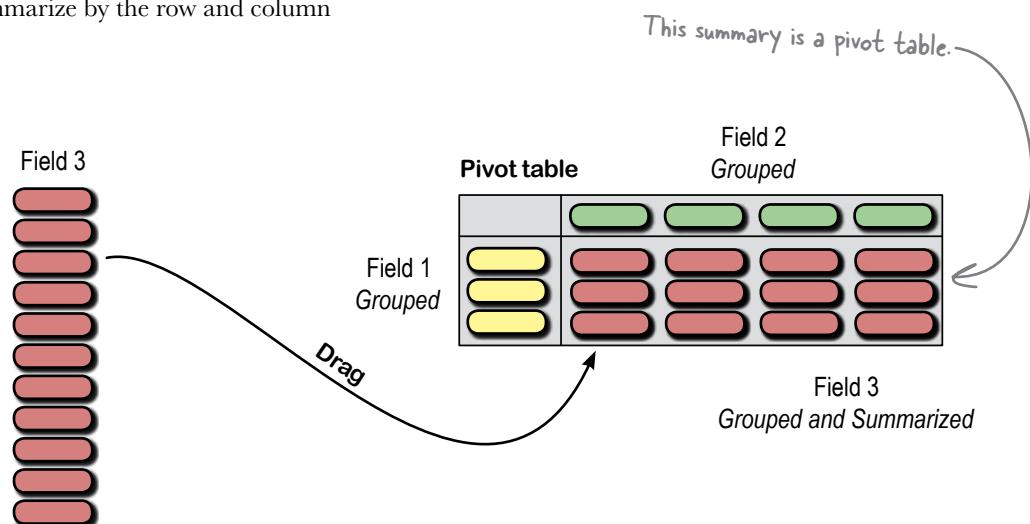
In the pivot table dialog box, drag a field into the row blank.

- Now there are only the unique values from Field 1 in this column.

Next, you do the same thing for the element you want to represent in your column. Drag the field name into the column blanks on the pivot table.

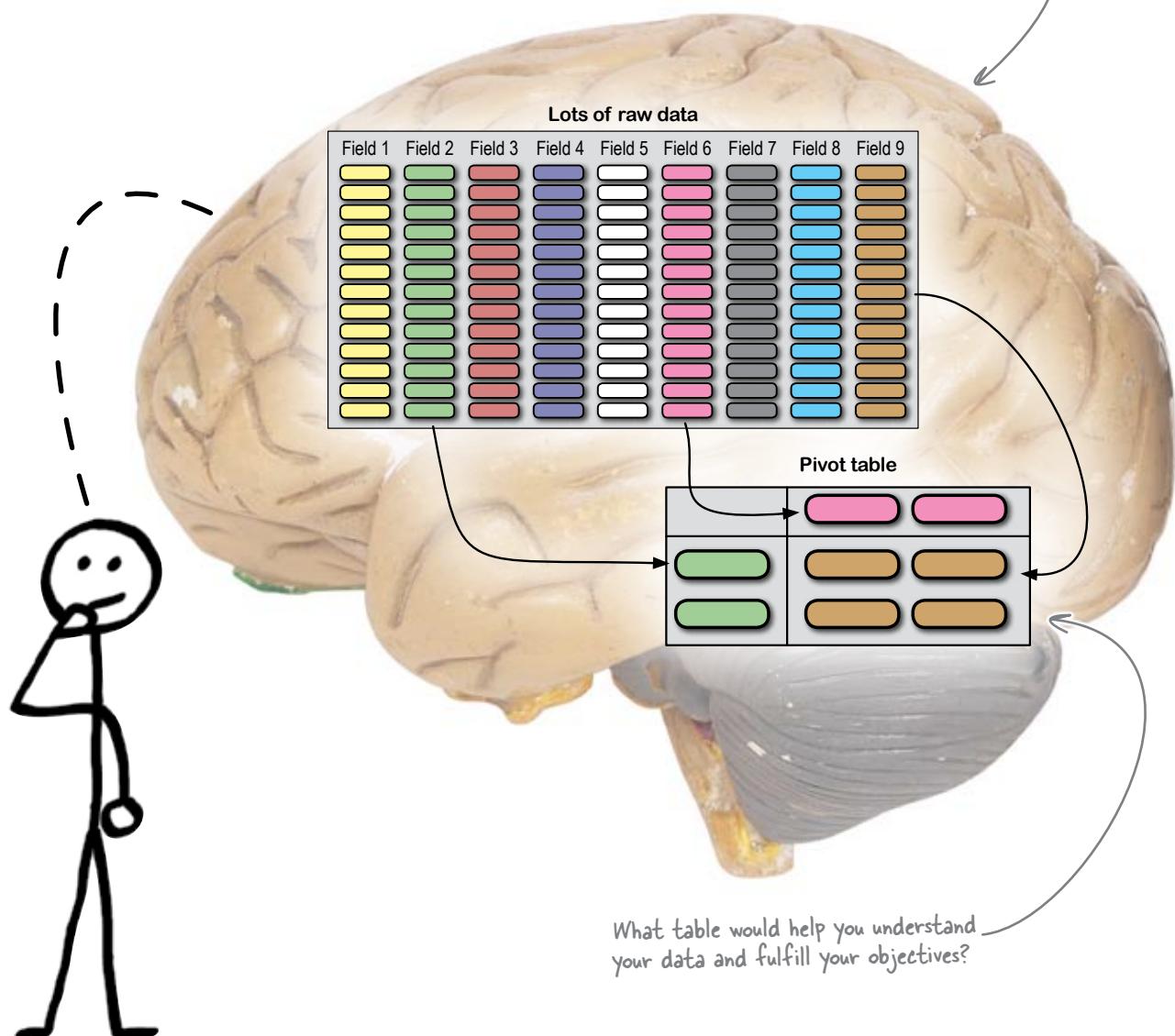


Finally, pick the quantitative field that you'd like to see summarized and pick the function you want to use. Generally (but not always), your rows and columns will be categories, and your data blank will be the numerical thing you want to group and summarize by the row and column categories.



Pivot table construction is all about previsualizing where your fields should go

Pivot tables are their own little universe inside Excel, and people get intimidated at first by all the options. The thing you need to remember is this: stay focused on your analytical objectives, and try to create tables that help you understand your data better.





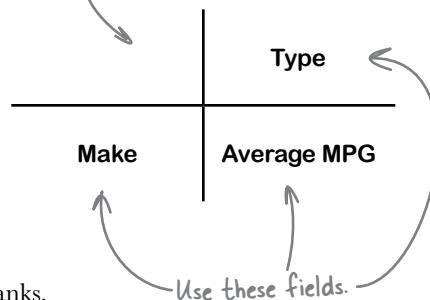
Exercise

Try out creating your first pivot table from the summary you envisioned in the first exercise of this chapter.



Let's make a pivot table out of this idea.

Your table should look like this:



Go through these steps to create your pivot table.

- 1 Select a cell in your data, and click Insert > Pivot Table.
 - 2 Drag fields from the Field List to the column, row, and data blanks.
 - 3 Click the “Sum of MPG” drop box, and change the Value Field Settings so that you’re taking the **Average**. Also, tweak the Number Format so that you don’t end up with a bunch of decimal zeros.

Here's your data.

		Mr_Car_Mkt_Jul08 - Microsoft Excel										
		Name	Insert	Page Layout	Formulas	Data	Review	View				
	AT				Make							
	Main	Model	Number	Type	LowPrice	HighPrice	Rating	Reliability	Predicted	Owner Satisfaction	Accident Variance	MPG
2	Chum	4 Coupe	13866	25120	71	1	2	4	22			
3	Tara	2 Truck	18700	30650	81	5	4	3	32			
4	Vaccinina	1 SUV	75990	43810	77	2	3	3	24			
5	Lux	4 SUV	32995	37070	81	2	3	1	29			
6	Furby	2 SUV	9000	18340	50	2	3	4	29			
7	Froddy	2 SUV	14550	15860	59	5	5	1	34			
8	Brilliant	1 Sedan	11045	16999	27	4	1	4	40			
9	Holiday	6 SUV	313860	42150	88	5	4	5	20			
10	Fore	6 SUV	19490	30220	72	3	2	1	20			
11	Tara	5 SUV	15150	21920	64	4	4	1	32			
12	Lux	5 Truck	30895	54990	76	2	5	1	26			
13	Duck	1 SUV	25202	35599	69	4	5	2	20			
14	Froddy	1 Sedan	19830	18970	68	5	4	5	24			
15	Hyacinth	6 Sedan	19520	28160	78	6	5	3	21			
16	Vineccine	2 SUV	22590	25530	78	3	1	3	26			
17	Hinda	10 Sedan	12700	20900	74	1	4	6	33			
18	Taya	1 SUV	27270	36000	78	1	1	3	23			
19	Nissa	4 Sedan	78190	36410	79	1	1	3	21			
20	Hinda	5 Truck	14370	29220	76	2	5	4	27			
21	Hinda	4 SUV	15390	27210	76	2	4	5	27			
22	Taya	3 Truck	18480	30160	82	3	2	3	24			
23	Loz	1 Truck	25120	26700	61	1	3	2	19			
24	Jupiter	1 Coupe	21840	26850	66	2	5	2	26			
25	Duck	3 Sedan	23570	40520	55	4	2	1	16			
26	Furby	1 Truck	9400	17360	59	4	1	4	30			
27	Holiday	7 SUV	20720	32100	86	4	4	2	21			
28	Taya	7 Sedan	20200	26740	74	3	5	2	43			
29	Hyacinth	3 SUV	19440	29070	75	2	5	5	25			
30	Loz	4 SUV	17330	24710	76	5	1	5	27			

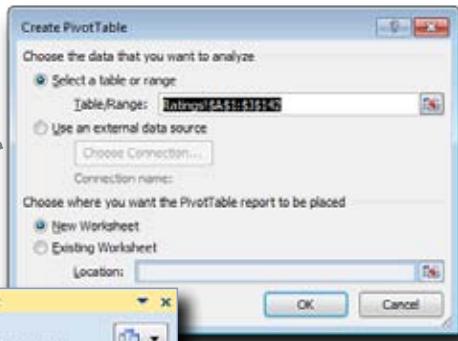


Exercise Solution

You just created your first pivot table, summarizing average MPG by Make and Type. How did it go?

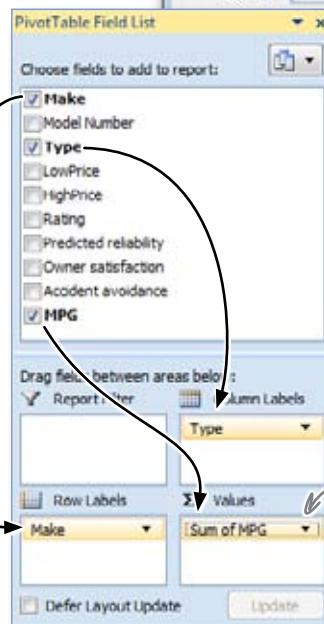
- 1 Select a cell in your data, and click Insert > Pivot Table.

Here's the window you use to make sure you have the correct data selected.



- 2 Drag fields from the Field List to the column, row, and data blanks.

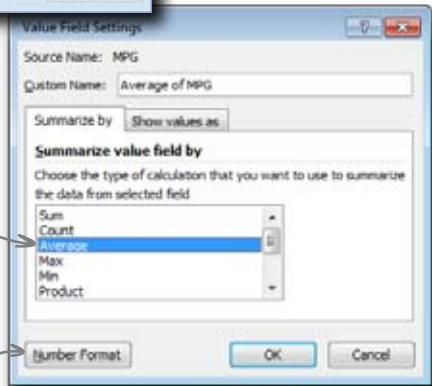
Drag the field names to the boxes where you want them to be.



We need a different formula here, because the sum of MPG values doesn't make any sense.

- 3 Click the "Sum of MPG" drop box, and change the Value Field Settings so that you're taking the **Average**. Also, tweak the Number Format so that you don't end up with a bunch of decimal zeros.

Tell Excel to take the Average of your MPG field.



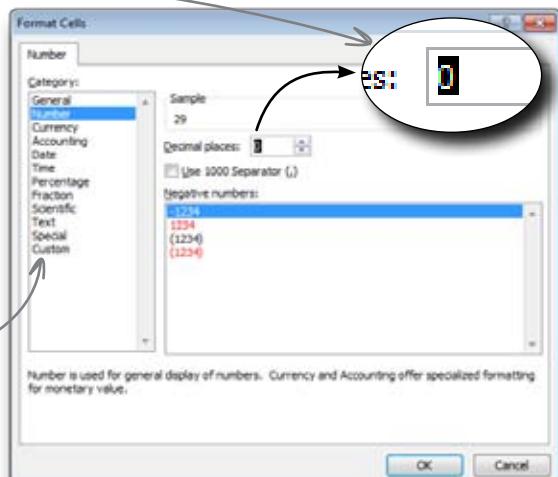
Click this button to change the number format.

You want to reduce the decimal places.

No need for currency formatting or anything like that.

Here's your final pivot table.

This table summarizes average MPG by Type and Make.

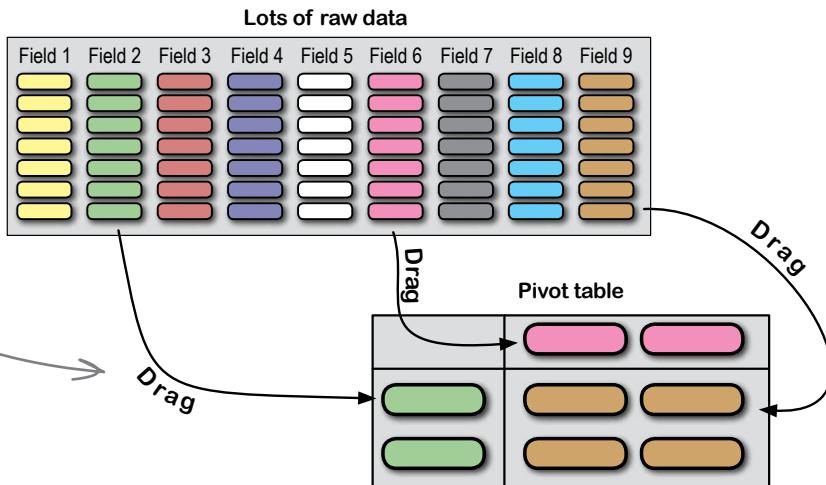


	Average of MPG	Column Labels	Sedan	SUV	Truck	Grand Total
Row Labels	Coupe					
Brilliant		40				40
Buck			20	17		19
Chevri		23	22	22		23
CMW		27	23	24		24
Duck		17	17	20		18
Eterniti		18	18	21		19
Fore		22	21	21	29	24
Funday		20	24	29		25
Gaudi		17	24	18		20
Hinda		27	32	29	27	29
Hyacinth		20	21	33		23
Jimena		18	20	18		19
Jupiter		26		18		22
Loe		33	26	19		26
Luxo		23	26	22		24
Maxi		33		28		31
Maza		17	26	25		24
Mitzuko			27			27
Motzu			22	23		23
Nisso		27	25	26	27	26
Precision			25	17	21	21
Prodigy			27	34		29
Puma			19			19
Skaag		24		23		24
Slash				17	22	19
Stalinn			20	20		20

The pivot table summarized your data way faster than formulas would have

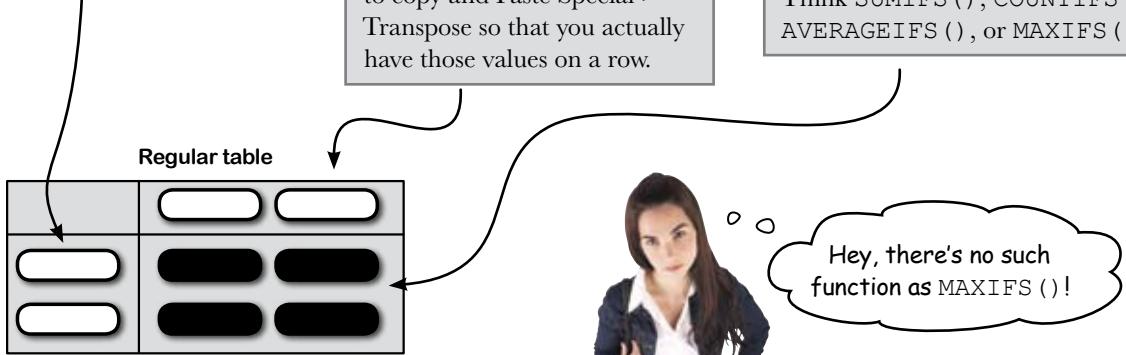
The steps to create a pivot table are pretty simple. Just select your data and drag your fields where you want them to be.

The steps to create this table using formulas are more **complicated**.



Using formulas to create something like a pivot table

- 1 Create unique lists of your row headings. You can copy and paste the column headings and remove duplicates.
- 2 Next, do the same thing for your column headings. But this time after you're done removing duplicates, you need to copy and Paste Special > Transpose so that you actually have those values on a row.
- 3 Finally, you're ready for your data. You'll need to create a long formula to make sure that your results are grouped correctly. Think SUMIFS(), COUNTIFS(), AVERAGEIFS(), or MAXIFS().



That's true. In order to create the functionality of a MAXIFS() formula you'd need to write a long **array formula**, and those are beyond the scope of this book. Aren't pivot tables just easier?

there are no Dumb Questions

Q: Where does the word “pivot” come into play? Have we been pivoting the data somehow?

A: You “pivot” the data when you look at it from different angles. One of the things that pivot tables enable you to do is switch around your data summaries really quickly, so if you wanted to “pivot” your rows and columns literally you’d be able to do it easily.

Q: But what if I just wanted to make groups and summarize them, but not actually pivot the data?

A: Don’t get too hung up on the word “pivot.” If you think of pivot tables as efficient ways to group and summarize, you’ve grasped what they’re all about.

Q: How would I use pivot tables in a workflow for data analysis?

A: They are great for doing exploratory data analysis, where you are looking at data from a bunch of different angles in order to prepare your ideas for the use of more advanced data analysis techniques.

Q: So if there was something in the data I wanted to optimize with Solver, for example, I might knock around inside the data with pivot tables in order to develop my ideas about what I wanted to optimize?

A: That’s exactly it. And the reason that pivot tables are good for dealing with data in this way is because they are so fast. As long as it would take to create the formulas you’d need to create one summary table, you can create a whole mess of pivot tables.

Q: Speaking of formulas, what if I want the speed and flexibility of pivot tables but just want a little scrap of summary data rather than a full-blown table? Got anything for me?

A: There are a bunch of ways to do this. First, even though you want a piece or two of data, you can still create a pivot table for it. Just be judicious in your use of grouping and filtering, and you can get the answers you need quickly.

Q: I was thinking more along the lines of a pivot formula.

A: Check out the GETPIVOTDATA () function. You’ll need to create a pivot table, but once you have it you can call it from another worksheet using that function.

Q: What else?

A: You can also replicate a lot of the functionality of pivot tables using structured references. The more advanced structured reference syntax enables you to group data in ways you can’t using conventional references. Yet another reason to deepen your skills as a formula master.

Q: Nice. Another question: so I liked the fact that I can use different functions to calculate the “Data” portion of the pivot table. But what if I want to do something really fancy—say, use a function that compares my data field to some other data field?

A: Not a problem. Under your field’s settings, click “Show values as...” for some options to compare the data to other fields.

Q: Impressive. Here’s another question: say I wanted to use pivot tables that aren’t actually in my document. Like, say they’re inside a corporate database.

A: Again, this is no problem. Excel uses a technology called OLAP (Online Analytical Processing) that enables it to plug into (potentially huge) databases. This usage of pivot tables is beyond the scope of this book, but using pivot tables to access and evaluate external data is one of the powerful uses of Excel.

Q: Hmm.

A: You know, you’re throwing a lot of questions at pivot tables and seem to be having a hard time stumping the feature.

Q: Yeah, pivot tables sound pretty powerful.

A: It’s a good idea to use them every time you can, and to stay on the lookout for opportunities to use them. Chances are, if it’s possible at all to do a task with pivot tables, doing that task with pivot tables is faster than the alternatives.

Q: Got it. OK, so here’s a question. How does this filtering thing work? With all the power of pivot tables, what does filtering get me?

A: Let’s take a look....

happy client

Your editor is impressed!



You need to filter.

Pivot tables have yet another dimension: filtering. Filters allow you to take the elements you've assigned to your Values box and calculate only the ones that meet your criteria. In this case, you want to look at average MPG only for cars with a reliability of 5. Let's take filters for a spin....



Exercise

Go back to your pivot table and tell it to show the summary only for highest reliability cars. What box do you use?

Use the filter option in your pivot table.

The screenshot shows a Microsoft Excel window with a PivotTable named "hfe_ch12_pivot_tables". The PivotTable Field List pane is open, showing a list of fields: Make, Model Number, Type, LowPrice, HighPrice, Rating, Predicted reliability, Owner satisfaction, Accident avoidance, and MPG. The "Predicted reliability" field is checked. The Report Filter pane shows "Type" and "Make" fields. The Values pane shows "Average of MPG". The main table area displays data for various car models across different vehicle types (Coupe, Sedan, SUV, Truck) and years (1985-1990). A large arrow points from the text "Use the filter option in your pivot table." towards the PivotTable Field List pane.

Drag your Predicted reliability field to filters and access the drop box in cell B2 to specify that you want the value to equal 5.



Exercise Solution

You just created your first filtered pivot table. What did you find?

Here's your filter with the reliability field added.

Here's your filtered data.

Report Filter

Predicted reliability ▾

Make sure it's set to "5".

This is what your data looked like before you added the filter.

Be sure to specify that you want a reliability of 5.

Nice work!

A	B	C	D	E	F
1 Predicted reliability	5				
2					
3 Average of MPG	Column Labels				
4 Row Labels	Coupe	Sedan	SUV	Truck	Grand Total
5 Buck				17	17
6 Chevri		27	26		27
7 CMW		27		24	26
8 Eterniti				21	21
9 FunDay			20	20	23
10 Hinda		22	23	29	23
11 Hyacinth				16	16
12 Jimena	18				18
13 Jupiter				18	18
14 Loe				27	27
15 Luxo			23	20	21
16 Mazda				30	30
17 Mitzuki				27	27
18 Nisso				25	25
19 Prodigy		21	34		29
20 Slosch				22	22
21 Stallion			18		18
22 Subori			23	24	23
23 Taya				33	33
24 Trala		17			17
25 Washington		19	20		20
26 Grand Total		22	24	24	23
27					

Average of MPG	Column Labels	Row Labels	Coupe	Sedan
Brilliant				
Buck				23
Chevri				27
CMW				27
Duck				17
Eterniti				18
Fore				22
FunDay				22
Gaudi				17
Hinda				27
Hyacinth				27
Jimena				18
Jupiter				26
Loe				



Pivot Tables Exposed

This week's interview:
Are they really all that?

Pivot Table: I must say that I'm delighted to be here. It's always such a joy to spread the word about me and what I do. People need to recognize that there is nothing inside of Excel that matches my *raw analytic power*.

Head First: Well, we're happy you're here and you're welcome any time. But I have to ask, is it true that there is *nothing* in Excel that matches your *analytic power*? Actually, let me rephrase the question. Isn't the analytic power something the analyst brings to the game, not something you do?

Pivot Table: OK, touché. The user needs to be a good analyst in order to use me to come up with good analytic results. But I'm a big deal.

Head First: Just to play devil's advocate here, are you? It seems that all you can do is group data on two dimensions and run a calculation.

Pivot Table: Two dimensions? You should think bigger than that. Try dragging more than one field to my column, row, data, and filter blanks. You can insert as many levels of dimensionality into your pivot table analysis as you like.

Head First: Yep, that's pretty powerful.

Pivot Table: Told you so.

Head First: But wouldn't that clutter up the spreadsheet big time to have four or five or ten dimensions of summary?

Pivot Table: I would point you to your previous observation. It takes a good analyst to do good pivot table-based analysis. Yes, dragging a whole mess of fields into a pivot table makes the resulting table full of fields, but if a user has the analytic chops for it, then creating such a table may be exactly what is in order.

Head First: But there must be something to be said for keeping things simple.

Pivot Table: There is indeed. Even the most brilliant analyst is going to have to present results to someone who isn't a brilliant analyst, so keeping things simple for an audience's sake is a good idea.

Head First: Well, suppose that brilliant analyst wanted to make a chart rather than a table. They'd need make to a chart off the pivot table—they can't make a pivot *chart*.

Pivot Table: *Au contraire, mon frère.* I can make pivot charts. The feature is called Pivot Charts, and it's right under the Pivot Table button under the Insert tab. Charts are no problem.

Head First: What if we want to do some more subtle formatting of our pivot table? Can we just format the pivot table directly as if it were a regular spreadsheet?

Pivot Table: You can, but a lot of people will copy and Paste Special > Values the result of a pivot table to another sheet and then format the pasted results. The downside of that approach is that you lose your formulas. But the upside of the approach is that your formatting doesn't mess up if you want to change your pivot table to look at another set of summaries.

Head First: Last question. This is possibly a weird one. You've been dropping some interesting terminology: *touché* and *au contraire*, for example. Are you French?

Pivot Table: Let's just say my versatility in processing different types of data has enabled me to cultivate a certain cosmopolitanism. But no, I'm not French. I'm a feature in a computer program, silly.

You're ready to finish the magazine's data tables



Now that's fancy work. I can see that this is going to shape up really well. Here are the tables I'd like to see us have in the magazine for our special car review issue. Do these summaries, and we're ready to print!

The pivot tables you need to create

Average owner satisfaction and reliability by make.

Rating by make and model number.

The most expensive price for each make.

Time to wrap this analysis up and execute the pivot tables your client needs.



LONG Exercise

Create the data summaries that your client needs using Excel's pivot tables.

1

Implement the tables that the editor describes on the facing page. You might have to get a little creative....

Here's your blank pivot table.



2

In order to create a presentation, copy and Paste Special > Values each to a new sheet. Format the results as you see fit.



LONG Exercise SOLUTION

With your new knowledge of pivot tables, you created the tables the *Head First Automotive Weekly* needed for its review issue. How'd it go?

- 1 Implement the tables that the editor describes on the facing page. You might have to get a little creative....
- 2 In order to create a presentation, copy and Paste Special > Values each to a new sheet. Format the results as you see fit.

Here's your first pivot table.

Average owner satisfaction and reliability by make.

You can actually put both satisfaction and reliability in the Values box.

Drag fields between areas below:

Report Filter

Row Labels	Column Labels
Make	Σ Values
	Σ Values
	Average of Owner satisfaction
	Average of Predicted reliability

Defer Layout Update Update

"Values" automatically shows up here when you fill the Values box.

Book2 - Microsoft Excel

	Values	Values
1	Row Labels	Average of Owner satisfaction
2	Brilliant	1
3	Buck	5
4	Chevri	2
5	CMW	4
6	Duck	4
7	Eterniti	3
8	Fore	3
9	FunDay	3
10	Gaudi	3
11	Hinda	3
12	Hyacinth	4
13	Jimena	3
14	Jupiter	5
15	Loo	2
16	Luxo	4
17	Maxi	2
18	Maza	4
19	Mitzuki	1
20	Motzu	2
21	Nisso	2
22	Precision	3
23	Prodigy	4
24	Puma	5
25	Skaag	3
26	Slash	3
27	Stallion	4
28	Subori	3
29	Taya	3
30	Trala	2
31	Vmacchina	3
32	Washington	3
33		4

Satisfaction Reliability

Set your number formatting to round off the extra zeros.



Rating by make and model number.

It's fine to use the SUM formula here, since this configuration only displays one value for each row/column combination.

Drag fields between areas below:

Report Filter

Column Labels
Model Number

Row Labels

Make

Σ Values

Sum of Rating

Defer Layout Update

Update



The most expensive price for each make.

In this case, you need to select the max formula in the Values box.

Drag fields between areas below:

Report Filter

Column Labels

Row Labels

Make

Σ Values

Max of HighPrice

Defer Layout Update

Row Labels	Max of HighPrice
Brilliant	\$ 13,490
Buck	\$ 44,630
Chevri	\$ 34,490
CMW	\$ 65,910
Duck	\$ 45,100
Etemits	\$ 59,100
Fone	\$ 54,070
Funday	\$ 42,150
Gaudi	\$ 85,720
Hinda	\$ 34,090
Hyacinth	\$ 31,500
Jimena	\$ 220,540
Jupiter	\$ 23,850
Love	\$ 25,700
Luxe	\$ 112,690
Mae	\$ 35,330
Mazza	\$ 33,410
Mitzu&i	\$ 21,820
Motru	\$ 44,280
Niso	\$ 42,290
Precision	\$ 55,040
Prodigy	\$ 18,970
Puma	\$ 83,180
Skaag	\$ 54,910
Slash	\$ 45,750
Stalon	\$ 41,290
Subon	\$ 30,470
Taya	\$ 30,080
Trala	\$ 72,340
Vmacarena	\$ 43,830
Washington	\$ 55,590
Wolca	\$ 52,170
Grand Total	\$ 229,540

Your pivot tables are a big hit!

Head First Automotive Weekly released a particularly illuminating annual car review this year, all thanks to your well-crafted pivot tables. Reader response has been overwhelmingly positive.

Man, that issue of HFAW was the best. It helped me figure out which car I wanted to buy. This baby doesn't have the best reliability, but man, the stats were right about satisfaction!



One of your (very happy) readers

13 booleans



TRUE and FALSE



The values in this spreadsheet are too good to be TRUE....



There's a deceptively simple data type available in Excel.

They're called **Boolean values**, and they're just plain ol' TRUE and FALSE. You might think that they are too basic and elementary to be useful in serious data analysis, but nothing could be further from the truth. In this chapter, you'll plug Boolean values into **logical formulas** to do a variety of tasks, from cleaning up data to making whole new data points.

Are fishermen behaving on Lake Dataville?

Lake Dataville has so many enthusiastic fishermen that the Dataville government has had to impose limits on fishermen to make sure they don't take all the fish!

Most fishermen love the rules, because they guarantee the supply of fish. But there's always a handful of bad apples, and the government needs your help sifting through the catch records to find them.

Here's one of the Dataville fishing boats



I need your help finding the violators!



You need to help fill in these blanks.

A screenshot of Microsoft Excel showing a spreadsheet titled 'hfe_ch13_boolean - Microsoft Excel'. The data is organized into three tabs: 'Catch Targets', 'Catch Data', and 'Naming Scheme'. The 'Catch Targets' tab contains the following data:

Individual catch limits (in fish)			
		Trout	Bass
Boat size	Large	600	435
	Small	325	280
Count of violators			
Boat size	Large	Trout	Bass
	Small		
10			

Load this!
[www.headfirstlabs.com/books/hfexcel/
hfe_ch13_boolean.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch13_boolean.xlsx)

This guy regulates fishing in Dataville.

There are three sheets in this spreadsheet: Catch Targets, Catch Data, and the Naming Scheme.

Large trout boats are allowed to catch 600 fish.

You have data on catch amounts for each boat

There's a complex system for each boat ID. Each ID tells you whether the boat is small or large and what kind of fish it catches. That determines the catch regulations for each boat.

The problem in dealing with this data is that you don't have cells to tell you the type and size of each boat. That information is all mashed up inside the ID cells.

This sheet describes the codes.

	A	B	C	D	E
1	Boat naming scheme				
2					
3	Trout boats -T				
4		SLM			
5					
6	Bass boats (nothing)				
7		BSS			
8					
9	Large boats (nothing)				
10		L			
11					
12	Small boats S				
13					
14					
15					

If a boat ID has "L" in it, it's "Large."

If a boat has neither "L" nor "S," it's "Large."

"S" in an ID means "Small."

If that information isn't broken out of the ID cell, you'll never be able to cross-reference each boat with the catch limits.

You need a formula that can tag each boat as small and large, and as bass and trout. It'd be nice to have a field for each boat that says "Large" or "Small," and one that says "Bass" or "Trout."

Here is the number of fish caught by each boat.

The IDs are written in code.

	A	B	C
1	Boat ID	Catch	
2	L388SLM	587	
3	L46SLM	591	
4	L369SLM	576	
5	S285SLM	316	
6	S279	255	
7	381-T	580	
8	S30SLM	315	
9	S136	271	
10	S330	271	
11	S348BSS	267	
12	L349SLM	593	
13	S286BSS	260	
14	S275PC	273	
15	362-T	568	
16	S232SLM	316	
17	S51	258	
18	334SLM	586	
19	S37	262	
20	S3SLM	319	
21	S257BSS	268	
22	S265	268	
23	S322SLM	312	
24	S361PC	259	
25	S237SLM	308	
26	S79	257	
27	S387-T	315	
28	S246-T	315	
29	S115PC	268	
30	262-T	575	
31	178	423	
32	S122-T	311	
33	S11BSS	272	
34	S319	264	
35	S65	263	
36	L62-T	569	
37	S6-T	316	
38	S167	265	
39	228PC	409	

Boolean expressions return a result of TRUE or FALSE

A Boolean expression is a formula or argument to a formula that returns a value of TRUE or FALSE. It's often used to compare two values.

Some examples of Boolean expressions	
1 = 1	TRUE
3.334 > 5	FALSE
"Head" = LEFT("Head First", 4)	TRUE
EXACT("Hi", "HI")	FALSE
SUM(2, 3) = 1+4	TRUE

Here's a text formula that looks at text substrings...can you think of any use for it?

One is equal to one.

3.334 is not greater than 5!

This formula compares two text strings.

IF gives results based on a Boolean condition

If you stick a Boolean expression inside an IF formula, you can have your formula return any value you want instead of returning TRUE or FALSE.

Your Boolean goes into the first argument.

The results you want go into the second and third arguments.

=IF(boolean expression, value if true, value if false)

This formula won't apply to all the boats, but it's getting close to what you need.

You can put text, numbers, or even another formula in these arguments.

This expression evaluates to TRUE.

=IF(LEFT(A2,1)="L", "Large", "Small")

It looks at the first character of A2...

...then it returns "Large" if that character is "L" and "Small" if it's not.

"Large"

	Boat ID	Catch
1	L388SLM	
2	L388SLM	
3	L46SLM	
4	L369SLM	
5		



Booleans Exposed

This week's interview:
Is what we've heard about
Booleans TRUE or FALSE?

Head First: I have to say, as simple as the TRUE and FALSE data values are, you're definitely looking promising as a tool to help with data analysis in Excel.

Boolean: You bet! And you've only seen the beginning of what I can do. I'm going to rock your brains out.

Head First: OK, relax and let's talk through your features slowly.

Boolean: Fire away.

Head First: Are there other formulas besides IF that accept Boolean expressions?

Boolean: Are you kidding? I'm all over the place. The most obvious place to find me is in the category of logical functions, and IF is one of those. But there is also AND, OR, NOT, and a bunch of others.

Head First: I assume that those three functions are similar to IF in how they work?

Boolean: Yep. I bet you can guess what they do. But even if you can't, don't worry, because you'll need them soon enough. I've been looking at that fishing boat problem of yours, and you're going to need to throw a lot more Booleans at it to get what you want.

Head First: We'll get to that in a moment. So you show up in logical functions...what else?

Boolean: I'm in logical functions, but I'm in all sorts of functions throughout Excel. A lot of the time, the third or fourth argument of a function that's totally unrelated to the logical functions will take a Boolean expression.

Head First: Why is that?

Boolean: The heavy-duty functions in Excel often have a lot of subtle permutations to how they can run. So it's a good idea to put in a Boolean or two so that you tell Excel the specifics of what you want.

Don't worry, if you spend enough time in the Help files, you'll notice me all over the place.

Head First: So what about the equals sign and the greater-than sign?

Boolean: Sure. You can also use less than (<), greater than or equal to (>=), and less than or equal to (<=).

Head First: What if I wanted to see whether something wasn't equal to something, like whether 1 is not equal to 3?

Boolean: You'd type this formula: =1<>3. That Boolean expression asks whether 1 is *unequal* to 3, and since it is, the expression returns TRUE.

Head First: Cool. So you can use Booleans in a bunch of ways to compare values. And you can use IF to return values different from TRUE and FALSE.

Boolean: Oh, you're just getting started with IF. It's one of the most powerful functions in Excel.

Head First: Yeah, I wanted to ask. What if I wanted to compare three values rather than two using an IF formula?

Boolean: Now you're talking. This is the sort of question that makes you an Excel power user. This sort of thing makes your friends stare in awe at the breadth of your mastery over spreadsheets....

Head First: Could you just answer the question?

Boolean: To compare three things, you nest IF formulas inside each other. Like this:

```
=IF(exp1,value2,IF(exp2,value3,value4))
```

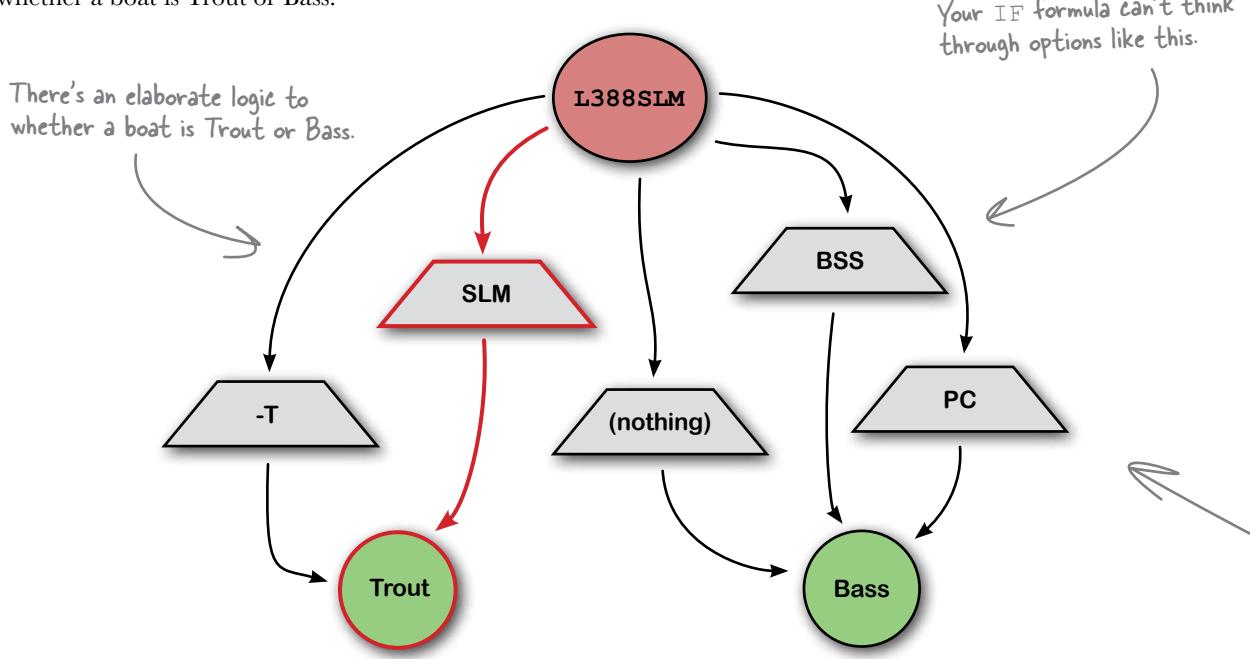
If you want to compare x, y, and z, you compare x and y in exp1 and then y and z in exp2.

Head First: Heavy!

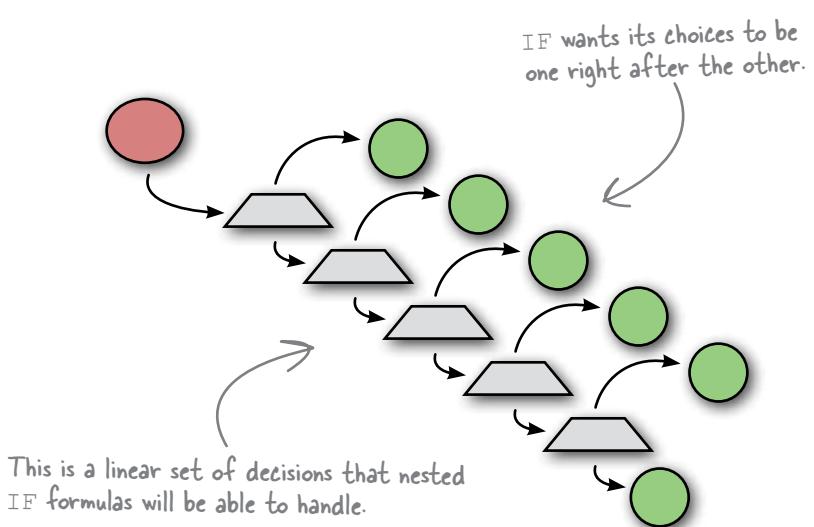
Boolean: Why don't you try it?

Your IF formulas need to accommodate the complete naming scheme

The boats are coded by fish type using a complex logic. The presence of one of five special codes is what determines whether a boat is Trout or Bass.



The problem is that `IF` doesn't evaluate five options in order to return one or two answers. It just looks at one Boolean expression at a time. So you need to take the complex logic of boat ID assignments and convert it into a series of **linear** decisions. That way, you'll be able to write the `IF` formula that gives you the right answer.



Pool Puzzle



Your **job** is to take text strings from the pool and place them into the blank lines in the logic structure. You may **not** use the same text string more than once. Your **goal** is to make a logical structure that you'll be able to represent in nested IF formulas.

Fill in this logical structure.



IF it has _____ the type of fish is _____,

otherwise, if it has _____ the type of fish is _____,

otherwise, if it has _____ the type of fish is _____,

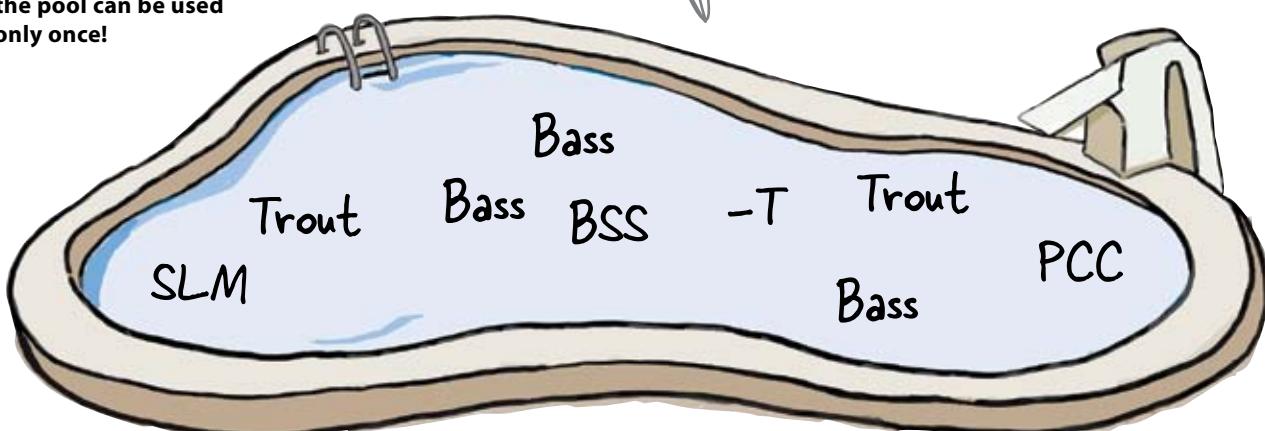
otherwise, if it has _____ the type of fish is _____,

otherwise, the type of fish is _____.

Use the diagram on the facing page.

Note: Each thing from the pool can be used only once!

Nope, "(nothing)" is not in here...you don't need it!



Pool Puzzle Answers



You just created a logical diagram to describe the **linear** way in which you want your nested IF formulas to decide the value to assign to each boat. How did it go?

Excel will be able to make sense of this.

Here's how the logic works.

A15	B	C	D
1	Boat naming scheme		
2			
3	Trout boats -T		
4	SLM		
5			
6	Bass boats (nothing)		
7	BSS		
8	PC		
9			
10	Large boats (nothing)		
11	L		
12			
13	Small boats S		
14			
15			

IF it has -T the type of fish is Trout,

otherwise, if it has SLM the type of fish is Trout,

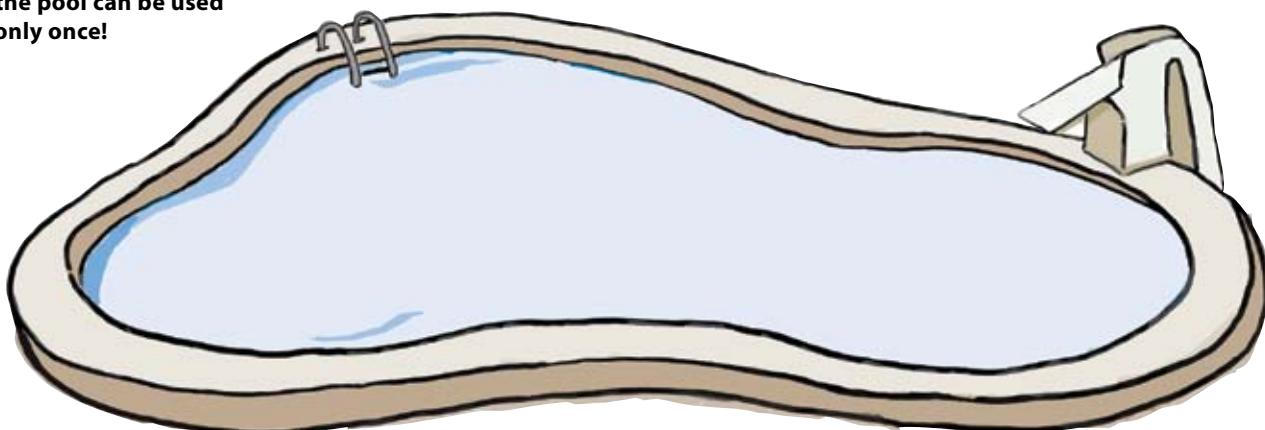
otherwise, if it has BSS the type of fish is Bass,

otherwise, if it has PC the type of fish is Bass,

otherwise, the type of fish is Bass.

Now let's write the formula....

Note: Each thing from the pool can be used only once!



Nested IF Magnets

Use the logic diagram you created to complete your nested IF formula.

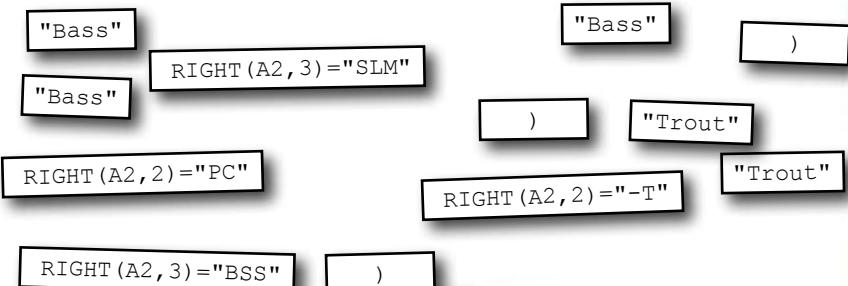
Then implement that formula in your spreadsheet.

Here's the IF formula.

Match the Boolean expressions with the logic you created.

Where should the extra parentheses go?

```
=IF ( _____ , _____ ,  
    IF ( _____ , _____ ,  
        IF ( _____ , _____ ,  
            _____ ) ) )
```



nest your IF formulas

Nested IF Magnets

Were you able to create the formula that tags each boat as either Trout or Bass?

```
=IF ( [RIGHT (A2, 2) ="-T"], "Trout",  
    IF ( [RIGHT (A2, 3) ="SLM"], "Trout",  
        IF ( [RIGHT (A2, 3) ="BSS"], "Bass",  
            IF ( [RIGHT (A2, 2) ="PC"], "Bass",  
                "Bass" ) ) ) ) )
```

Just like what you did in the last exercise!

The nested elements end, so you put the parentheses at the end of the formula.



Now that you've created the formula to tag each boat as being Trout or Bass, it's time to write another formula that tags each boat as being either Large or Small.

Boat naming scheme	
3	Trout boats -T
4	SLM
6	Bass boats (nothing)
7	BSS
8	PC
10	Large boats (nothing)
11	L
13	Small boats S

Here's the naming scheme—a little simpler for size than it is for type.

Create a Boat size field as well.
Here's your Boat type field.

A	B	C	D
1	Boat ID	Catch	Boat type
2	L3885LM	591	Trout
3	L465LM	576	Trout
4	L3695LM	316	Trout
5	S285SLM	255	Bass
6	S279	580	Trout
7	381-T	315	Trout
8	S30SLM	271	Bass
9	S136	271	Bass
10	S330	267	Bass
11	S348BSS	593	Trout
12	L3495LM	260	Bass
13	S286BSS	273	Bass
14	S275PC	568	Trout
15	362-T	316	Trout
16	S232SLM	258	Bass
17	S51	586	Trout
18	334SLM	262	Bass
19	S37	319	Trout
20	S3SLM	268	Bass
21	S257BSS	312	Trout
22	S265		
23	S322SLM		

Here's the formula you used to assign Bass or Trout.

```
=IF(RIGHT(A2, 2)="-T", "Trout",
IF(RIGHT(A2, 3)="SLM", "Trout",
IF(RIGHT(A2, 3)="BSS", "Bass",
IF(RIGHT(A2, 2)="PC", "Bass",
"Bass"))))
```



Exercise Solution

You just created a formula to assign a size amount to each boat. What does it look like?

If you had nested IF formulas in this exercise like you did in the last one, your formula might look like this.

```
=IF(LEFT(A2, 1)="S", "Small",
    IF(LEFT(A2, 1)="L", "Large",
        "Large"))
```

	A	B	C	D	E
1	Boat ID	Catch	Boat type	Boat size	
2	L388SLM	587	Trout	Large	
3	L465LM	591	Trout	Large	
4	L369SLM	576	Trout	Large	
5	S285SLM	316	Trout	Small	
6	S279	255	Bass	Small	
7	381-T	580	Trout	Large	
8	S30SLM	315	Trout	Small	
9	S136	271	Bass	Small	
10	S330	271	Bass	Small	
11	S348BSS	267	Bass	Small	
12	L349SLM	593	Trout	Large	
13	S286BSS	260	Bass	Small	
14	S275PC	273	Bass	Small	
15	362-T	568	Trout	Large	
16	S232SLM	316	Trout	Small	
17	S51	258	Bass	Small	
18	334SLM	586	Trout	Large	
19	S37	262	Bass	Small	
20	S3SLM	319	Trout	Small	
21	S257BSS	268	Bass	Small	
22	S265	268	Bass	Small	

Here it is in action.

Since all small boats are marked "S", you know that all boats not marked "S" are large.

But you also could have written a simpler formula that looks like this.

```
=IF(LEFT(A2, 1)="S", "Small", "Large")
```

Summarize how many boats fall into each category

Good work! Now are you going to use that data to help us fill out our spreadsheet? We first need to count boats that fall into each category: Large Trout, Small Trout, Large Bass, and Small Bass.

He's asking you to fill up these cells on your spreadsheet.

Individual catch limits (in fish)			
	Trout	Bass	
Boat size	Large	600	435
	Small	325	280
Count of violators			
	Trout	Bass	
Boat size	Large		
	Small		
			A10



You won't be able to use IF for this problem. IF just returns one or two values depending on your calculation. You'll need a formula that **counts** based on a Boolean expression. Or rather, a formula that will count based on **two** expressions, because each boat is part of two **categories**, size and type....

consider the pivot table



A pivot table would work.

You could, but it'd be easier to use a formula. Their doc is already laid out and formatted, so you can just fill in the blanks. If you created a pivot table, you'd have to Paste Special > Values the results into the regulator's table anyway. If you create a formula in those cells, you'll be able to check your values, too.

The screenshot shows a Microsoft Excel interface with a table and a ribbon menu. The table has columns for 'FISH' (with rows 'Trout' and 'Bass'), 'Gill size' (with rows 'Large' and 'Small'), and 'CATCH' (with a single row). The cell at the intersection of 'Trout' and 'Large' is highlighted with a yellow border. Hand-drawn arrows point from the text 'You're just trying to fill these four cells.' to the highlighted cell and the adjacent cell below it. The ribbon menu includes tabs for 'Home', 'Catch Data', 'Naming Scheme', and 'Catch Targets'. The status bar at the bottom shows '344 Chapter 13'.

FISH	Gill size	CATCH
Trout	Large	
Bass	Small	



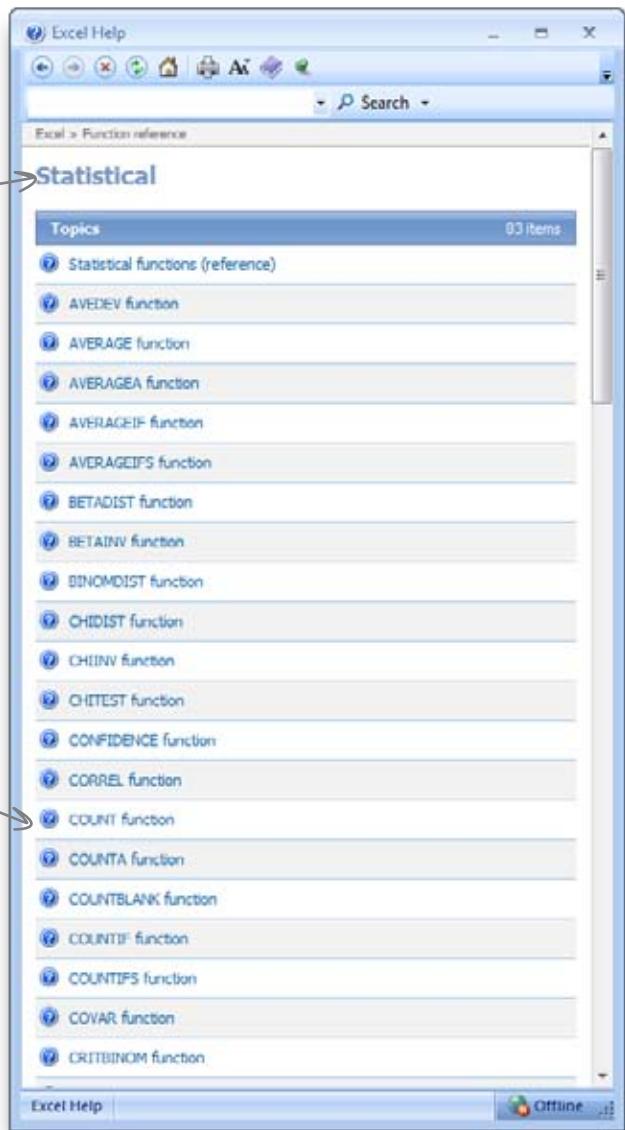
The COUNT functions are under the category of Statistical functions.

You need a formula that counts based on two conditions: size and type.

You've used COUNT, which counts based on one condition.

Your goal is to count boats that have, for example, both Large and Trout among their values.

In the Help files, find the COUNT formula that will count records based on a boat's type and size.





Did you find the function that counts based on multiple conditions?

This is the one you want.

COUNTIFS function

This article describes the formula syntax and usage of the COUNTIF function in Microsoft Office Excel.

Description

Applies criteria to cells across multiple ranges and counts the number of times all criteria are met.

Syntax

```
COUNTIFS(criteria_range1, criterial, [criteria_range2, criterial2], ...)
```

"Multiple ranges"...
that sounds
about right.

COUNTIFS is like COUNTIF, only way more powerful

COUNTIFS is a formula new to Excel 2007 that can count elements based on one or more criteria. Say you want to count the number of boats that have "Large" and "Trout" in their rows. COUNTIFS is the function you want.

It also can count based on single criteria, so it has all the functionality of COUNTIF and more. A lot of Excel users have stopped using COUNTIF altogether because COUNTIFS is so powerful.

COUNTIFS will handle the entire list for each boat.

Here are four Large Trout boats.

A	B	C	D	E
Boat ID	Catch	Boat type	Boat size	
L388SLM	587	Trout	Large	
L465LM	591	Trout	Large	
L369SLM	576	Trout	Large	
S285SLM	316	Trout	Small	
S279	255	Bass	Small	
381-T	580	Trout	Large	
S305LM	315	Trout	Small	
S136	271	Bass	Small	
S330	271	Bass	Small	



COUNTIFS is a straightforward formula, but implementing it here could get tricky. Your challenge is to create one formula that you can copy to the other three blanks in your Count of boats table. You'll need to use absolute references.

Your criteria values will be these cells.

Use references inside your COUNTIFS formula to point to these criteria values.

Individual catch limits (in fish)					
		Trout	Bass		
1	Boat size	Large	600	435	
2		Small	325	280	
Count of violators					
6	Boat size	Large	Trout	Bass	
7		Small			
8					
9					
10					
11					

Your criteria range will be on this sheet over here.

You'll need to use absolute references to hold row, column, and both row and column, depending on the reference.



Exercise Solution

You just implemented a COUNTIFS formula to count the number of boats in each category. What were your results?

This range refers to the Boat types values.

It's an absolute reference on row and column, because you don't want either to shift.

=COUNTIFS('Catch Data'!\$C\$2:\$C\$393, 'Catch Targets'!C\$7,
'Catch Data'!\$D\$2:\$D\$393, 'Catch Targets'!\$B8)

This refers to the Boat size field.

Here's "Large."

This reference is to "Trout" because you want to count the instances of the word "Trout."

Hold the row reference here...
...and the column reference here.

The formula copies and pastes smoothly for the other three blanks.

A screenshot of Microsoft Excel showing a spreadsheet titled "hfe_ch13_boolean - Microsoft Excel". The formula bar shows the formula =COUNTIFS('Catch Data'!\$C\$2:\$C\$393, 'Catch Targets'!C\$7, 'Catch Data'!\$D\$2:\$D\$393, 'Catch Targets'!\$B8) entered into cell C8. The spreadsheet contains two sections: "Individual catch limits (in fish)" and "Count of violators". The "Individual catch limits" section has columns for Boat size (Large/Small), Fish Type (Trout/Bass), and Catch Count (e.g., 600, 435, 325, 280). The "Count of violators" section has columns for Boat size (Large/Small), Fish Type (Trout/Bass), and Violation Count (e.g., 40, 32, 113, 207). The cell C8, which contains the formula, is highlighted with a black border. A curved arrow points from the formula in the formula bar down to the value 40 in the cell C8 of the "Count of violators" section.

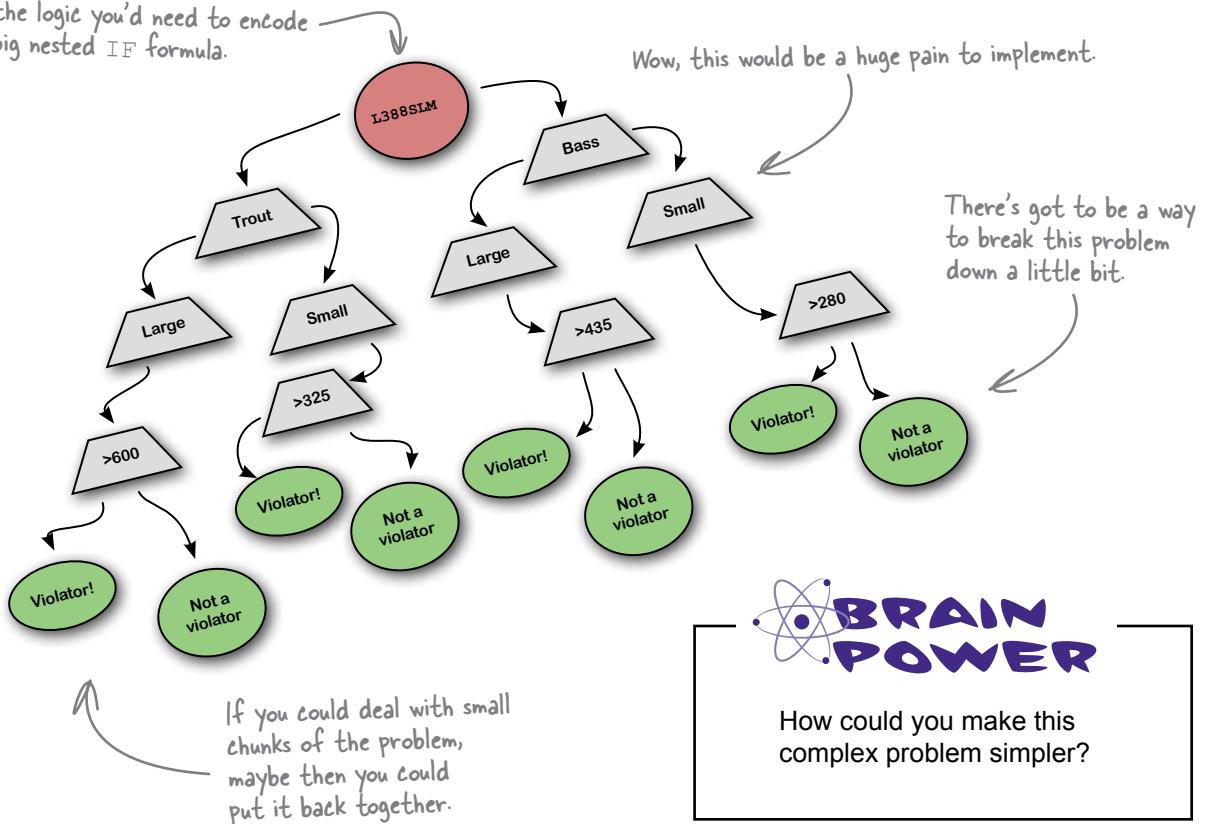
If your absolute references are correct, this is what you'll see.



This could be tricky.

You **could** do it with about 50 nested IF formulas for each row. But imagine what that would entail! There must be an easier solution.

Here's the logic you'd need to encode into a big nested IF formula.



BRAIN POWER

How could you make this complex problem simpler?

When working with complex conditions, break your formula apart into columns

You'd have an easier time if you just created a field for each item that said whether it was in violation of any of the four categories. Take boat L388SLM in row 2. You could create a formula that returned true if the boat is "Trout Large" and over its catch limit of 600.

And if you could copy that formula so that it evaluated every other combination (Trout Small, catch > 325, and so forth), then if L388SLM were in violation, at least one of the new cells would be true.

You want a formula here that returns TRUE if L388SLM is "Trout Large" and in violation.

It'd be nice if you could copy and paste the same formula for all these other cells.

	A	B	C	D	E	F	G	H	I
1	Boat ID	Catch	Boat type	Boat size	Trout Large	Trout Small	Bass Large	Bass Small	Violator
2	L388SLM	587	Trout	Large					
3	L46SLM	591	Trout	Large					
4	L369SLM	576	Trout	Large					
5	S285SLM	316	Trout	Small					
6	S279	255	Bass	Small					
7	381-T	580	Trout	Large					
8	S30SLM	315	Trout	Small					
9	S136	271	Bass	Small					
10	S330	271	Bass	Small					
11	S348BSS	267	Bass	Small					
12	L349SLM	593	Trout	Large					
13	END	360	Bass	Small					

You know that L388SLM isn't a Bass Large, but as long as your formula returns TRUE only for the category Trout Large if it's in violation, you can ignore the FALSE values in the other columns. Then you can write a formula in column I that returns TRUE if one of the cells in columns E through H are TRUE.

Yes, it's a roundabout solution. But give it a shot. Excel ninjas are always thinking about how to solve complex problems in multiple simple steps.

That way, one of the values in columns E through H will be TRUE if the boat is in violation.



Create a formula that returns TRUE if a boat matches one of the labels in E1 : H1 and is in excess of the corresponding catch limit.

- 1 You're going to use the AND function in this case, which takes a series of Boolean expressions and returns TRUE only if all those expressions individually evaluate to TRUE. Take a look at AND in the help screens if you need more information.
- 2 Write an AND formula for each of these columns. The first one is partially done for you below, but you'll have to add dollar signs to create absolute references. Plus, the maximum catch amount is going to change for each of the four cells.

Add these column headings.

	A	B	C	D	E	F	G	H	Viol
1	Boat ID	Catch	Boat type	Boat size	Trout Large	Trout Small	Bass Large	Bass Small	Viol
2	L388SLM	587	Trout	Large	FALSE				
3	L46SLM	591	Trout	Large					
4	L369SLM	576	Trout	Large					
5	S285SLM	316	Trout	Small					

Here's your first formula.

=AND (E1=C2&" "&D2, B2>'Catch Targets'!C3)

The ampersand here combines two text strings together, like the CONCATENATE function.

This expression evaluates to "Trout Large."

Be sure to change the references to make them absolute, where necessary.

Copy and paste your formula for all the cells in these columns.



Exercise Solution

You just created formulas to evaluate whether each boat is in violation of any of the categories. What did you find?

```
=AND (E$1=$C2&" "&$D2 , $B2>'Catch Targets' !$C$3)
```

Here's where the absolute reference dollar signs go for the formula in E2.

For the other three columns, you just need to change the reference to the catch limit.

```
=AND (F$1=$C2&" "&$D2 , $B2>'Catch Targets' !$C$4)
```

```
=AND (G$1=$C2&" "&$D2 , $B2>'Catch Targets' !$D$3)
```

```
=AND (H$1=$C2&" "&$D2 , $B2>'Catch Targets' !$D$4)
```

	A	B	C	D	E	F	G	H	I
1	Boat ID	Catch	Boat type	Boat size	Trout Large	Trout Small	Bass Large	Bass Small	Violator
2	L388SLM	587	Trout	Large	FALSE	FALSE	FALSE	FALSE	
3	L46SLM	591	Trout	Large	FALSE	FALSE	FALSE	FALSE	
4	L369SLM	576	Trout	Large	FALSE	FALSE	FALSE	FALSE	
5	S285SLM	316	Trout	Small	FALSE	FALSE	FALSE	FALSE	
6	S279	255	Bass	Small	FALSE	FALSE	FALSE	FALSE	
7	381-T	580	Trout	Large	FALSE	FALSE	FALSE	FALSE	
8	S30SLM	315	Trout	Small	FALSE	FALSE	FALSE	FALSE	
9	S136	271	Bass	Small	FALSE	FALSE	FALSE	FALSE	
10	S330	271	Bass	Small	FALSE	FALSE	FALSE	FALSE	
11	S348BSS	267	Bass	Small	FALSE	FALSE	FALSE	FALSE	

There are lots of FALSE values, but we're looking for needles in a haystack here, since there aren't a whole lot of violators.

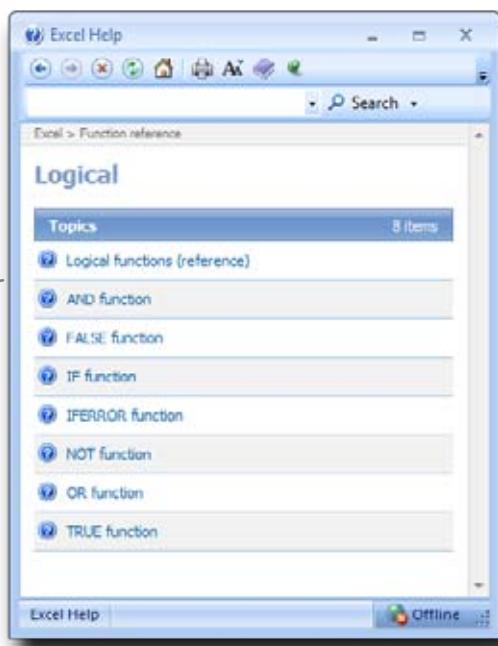
This formula shows that it's FALSE that 381-T is both "Bass Small" boat and in violation of the Bass Small catch limit.

Now you have a grid of Boolean values. Combine the values for each boat using a single formula that says whether the boat is a violator.



Now you're ready to wrap up this assignment. Create the formula that will combine the Boolean values in columns E through H for each boat. That will tell you once and for all whether the boat is a violator. Then filter the list to show violators only.

- Using the Help files, look up the logical function that takes a range of Booleans and returns TRUE if one or more of them is correct.



- Implement the function you've chosen for each boat. For example, for boat L388SLM, make the formula look at the Boolean values in cells E2 : H2 and return TRUE if one of them is TRUE.
- Filter the violators. Make your filter display only rows where the value in column I is TRUE.



Exercise Solution

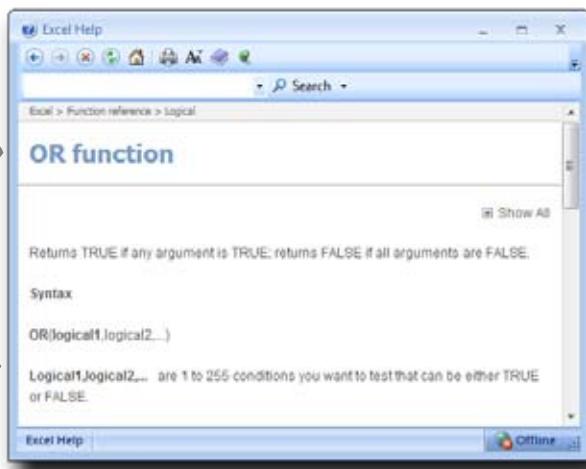
You just created formulas that return TRUE if the boat is a violator. Are there a lot of boats who are violators?

1

- Using the Help files, look up the logical function that takes a range of Booleans and returns TRUE if one or more of them is correct.

The OR function is what you want to use.

If you want to get real fancy, you can nest AND, OR, and IF functions all inside each other.



2

- Implement the function you've chosen for each boat. For example, for boat L388SLM, make the formula look at the Boolean values in cells E2 : H2 and return TRUE if one of them is TRUE.

You can write the formula in one of two ways.

=OR(E2,F2,G2,H2)

=OR(E2:H2)

This formula returns TRUE if one of its arguments is TRUE.

	B	C	D	E	F	G	H	I
1	Catch	Boat type	Boat size	Trout Large	Trout Small	Bass Large	Bass Small	Violator
2	587	Trout	Large	FALSE	FALSE	FALSE	FALSE	FALSE
3	591	Trout	Large	FALSE	FALSE	FALSE	FALSE	FALSE
4	579	Trout	Large	FALSE	FALSE	FALSE	FALSE	FALSE
5	318	Trout	Small	FALSE	FALSE	FALSE	FALSE	FALSE
6	255	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
7	580	Trout	Large	FALSE	FALSE	FALSE	FALSE	FALSE
8	315	Trout	Small	FALSE	FALSE	FALSE	FALSE	FALSE
9	271	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
10	271	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
11	267	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
12	593	Trout	Large	FALSE	FALSE	FALSE	FALSE	FALSE
13	260	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
14	279	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
15	568	Trout	Large	FALSE	FALSE	FALSE	FALSE	FALSE
16	310	Trout	Small	FALSE	FALSE	FALSE	FALSE	FALSE
17	258	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
18	586	Trout	Large	FALSE	FALSE	FALSE	FALSE	FALSE
19	262	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
20	319	Trout	Small	FALSE	FALSE	FALSE	FALSE	FALSE
21	268	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
22	268	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE
23	312	Trout	Small	FALSE	FALSE	FALSE	FALSE	FALSE
24	259	Bass	Small	FALSE	FALSE	FALSE	FALSE	FALSE

- 3 Filter the violators. Make your filter display only rows where the value in column I is TRUE.

Here's the filtered list.

	A	B	C	D	E	F	G	H	I
1	Boat ID	Catch	Boat type	Boat size	Trout Large	Trout Small	Bass Large	Bass Small	Violator
112	L184B55	436	Bass	Large	FALSE	FALSE	TRUE	FALSE	TRUE
157	S190SLM	326	Trout	Small	FALSE	TRUE	FALSE	FALSE	TRUE
277	S165-T	327	Trout	Small	FALSE	TRUE	FALSE	FALSE	TRUE
324	341-T	602	Trout	Large	TRUE	FALSE	FALSE	FALSE	TRUE
357	L18PC	443	Bass	Large	FALSE	FALSE	TRUE	FALSE	TRUE
362	S225SLM	326	Trout	Small	FALSE	TRUE	FALSE	FALSE	TRUE
391	L150	437	Bass	Large	FALSE	FALSE	TRUE	FALSE	TRUE
394									
395									

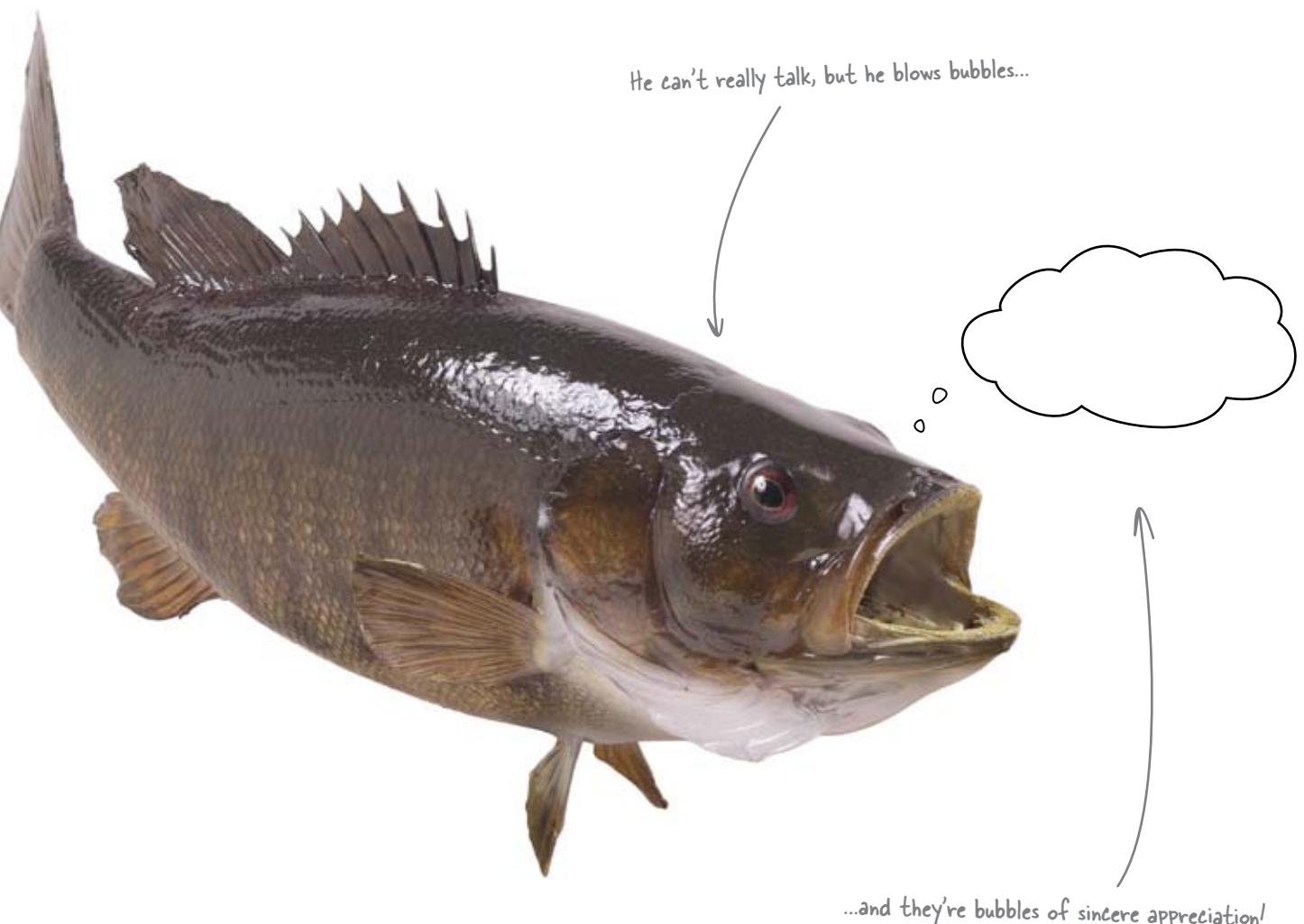
There aren't many violators, but these folks are definitely catching too much!

That's it! That's precisely the information I'm after. The fishes of Dataville (not to mention the environment that depends on them) will thank you....



Justice for fishies!

Using your analysis, violators were brought to justice. They paid a fine and promised not to take more than their share again. As a result, the ecology of Lake Dataville is in tip-top shape, with stable populations of very happy fish.



14 segmentation



Slice and dice



Get creative with your tools.

You've developed a formidable knowledge of Excel in the past 13 chapters, and by now you know (or know how to find) most of the tools that fit your data problems. But what if your problems **don't fit those tools**? What if you don't even have the data you need all in one place, or your data is divided into categories that don't fit your analytical objectives? In this final chapter, you'll use **lookup functions** along with some of the tools you already know to slice new **segments** out of your data and get really creative with Excel's tools.

You are with a watchdog that needs to tally budget money

Geopolitical Grunts is a swashbuckling group of policy geeks who advise businesses and governments on the most important macro trends of the day. They need your help doing some hardcore pivot table work.

The data set describes the spending of the U.S. federal government at the county level for the past couple years.



Here's the graph they want

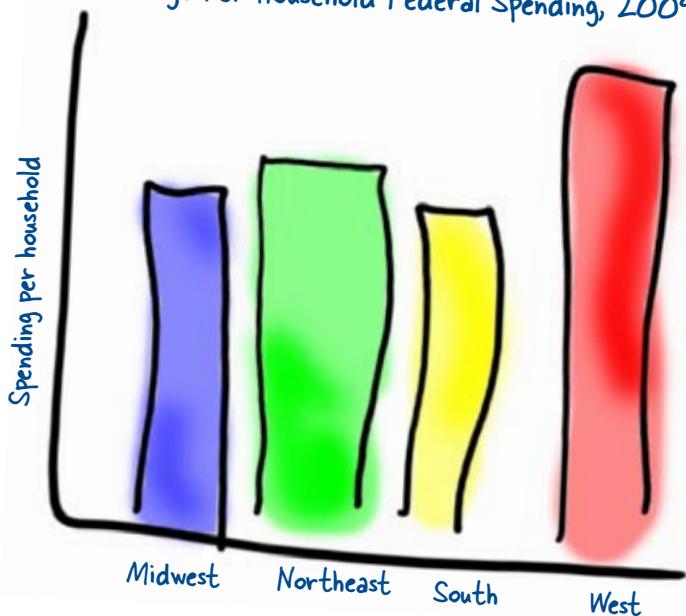
This doesn't seem like it'd be a problem.

From: G.G.
To: Head First
Subject: Data project

Dear Head First,

Guess what? I drew for you exactly what I'm looking for. If you can draw the graph below, you're done. It describes how much each agency spends per household on average.

Average Per Household Federal Spending, 2009



No data? That's a problem.

Problem is, we don't have the data for this graphic. We don't have the per household spending, and we don't have our geography broken into these regional divisions.

We have something altogether different. Our data is big, and it's ugly. Be prepared to look at a bunch of zeros.

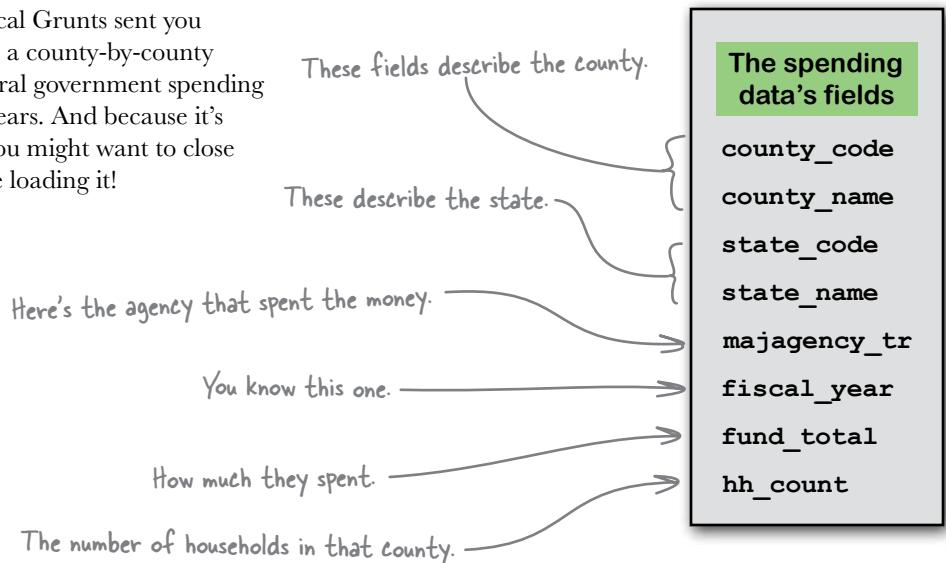
Anyhow, if you can somehow make that data into the data to create this chart, that would be great. Can't you Excel gurus make the impossible happen?

—G.G.

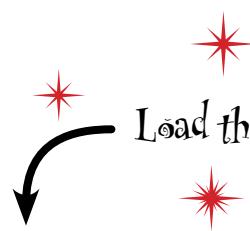
Wow, he wants the "impossible"....

Here's the federal spending data, broken out by county

The folks at Geopolitical Grunts sent you this database, which is a county-by-county summary of U.S. federal government spending over the past couple years. And because it's almost 50,000 lines, you might want to close other programs before loading it!



There's a lot of data in here.



[www.headfirstlabs.com/books/hfexcel/
hfe_ch14_usaspread.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch14_usaspread.xlsx)

Line	country_code	country_name	state_code	state_name	malapportionment	Year	Budget	Unit
1	US	America East Borough	2	All other agencies	2007	\$ 594,126	796	
2	US	America East Borough	2	All	2007	\$ 3,791,848	796	
3	US	America East Borough	2	Environmental Protection Agency	2007	\$ 6,000,000	796	
4	US	America East Borough	2	Department of Commerce	2007	\$ 3,731,808	796	
5	US	America East Borough	2	Department of Education	2007	\$ 3,731,808	796	
6	US	America East Borough	2	All other agencies	2008	\$ 2,000,000	796	
7	US	America East Borough	2	Department of Education	2008	\$ 2,000,000	796	
8	US	America East Borough	2	Environmental Protection Agency	2008	\$ 1,720,002	796	
9	US	America East Borough	2	Environmental Protection Agency	2008	\$ 690,000	796	
10	US	America East Borough	2	Department of Justice	2008	\$ 161,570	796	
11	US	America East Borough	2	Department of Health and Human Services	2009	\$ 84,512	796	
12	US	America East Borough	2	Department of Health and Human Services	2009	\$ 2,864,134	796	
13	US	America East Borough	2	Department of Education	2009	\$ 2,794,490	796	
14	US	America West Census Area	2	Department of Education	2007	\$ 9,831,836	2341	
15	US	America West Census Area	2	Department of Homeland Security	2007	\$ 200,000	2341	
16	US	America West Census Area	2	Department of Justice	2007	\$ 64,690	2341	
17	US	America West Census Area	2	Environmental Protection Agency	2007	\$ 1,160,000	2341	
18	US	America West Census Area	2	Department of Education	2008	\$ 1,080,354	2341	
19	US	America West Census Area	2	Department of Justice	2008	\$ 556,000	2341	
20	US	America West Census Area	2	Department of Commerce	2008	\$ 977,336	2341	
21	US	America West Census Area	2	Environmental Protection Agency	2008	\$ 270,690	2341	
22	US	America West Census Area	2	Department of Education	2008	\$ 1,799,226	2341	
23	US	America West Census Area	2	Department of Energy	2008	\$ 1,000,000	2341	
24	US	America West Census Area	2	Department of Housing and Urban Development	2008	\$ 524,037	2341	
25	US	America West Census Area	2	All other agencies	2008	\$ 315,690	2341	
26	US	America West Census Area	2	Department of Health and Human Services	2008	\$ 2,841,380	2341	
27	US	America West Census Area	2	Department of Education	2008	\$ 6,296,626	2341	
28	US	America West Census Area	2	Department of Energy	2009	\$ 6,000,000	2341	
29	US	America West Census Area	2	Department of Justice	2009	\$ 1,047,390	2341	
30	US	America West Census Area	2	Department of Commerce	2009	\$ 752,908	2341	
31	US	America West Census Area	2	Department of Housing and Urban Development	2009	\$ 1,427,336	2341	
32	US	America West Census Area	2	All other agencies	2009	\$ 24,000	2341	
33	US	America West Census Area	2	Environmental Protection Agency	2009	\$ 676,996	2341	
34	US	Anchorage Municipality	2	Department of Commerce	2007	\$ 30,000	132016	
35	US	Anchorage Municipality	2	Department of Energy	2007	\$ 30,000	132016	
36	US	Anchorage Municipality	2	Department of Homeland Security	2007	\$ 24,499,900	132016	
37	US	Anchorage Municipality	2	All other agencies	2007	\$ 2,646,334	132016	
38	US	Anchorage Municipality	2	Small Business Administration	2007	\$ 2,700,000	132016	
39	US	Anchorage Municipality	2	Department of Justice	2007	\$ 11,467,942	132016	
40	US	Anchorage Municipality	2	Environmental Protection Agency	2007	\$ 20,000	132016	
41	US	Anchorage Municipality	2	Department of Transportation	2007	\$ 222,471,956	132016	
42	US	Anchorage Municipality	2	Social Security Administration	2007	\$ 773,438	132016	
43	US	Anchorage Municipality	2	Department of Labor	2007	\$ 15,999,976	132016	
44	US	Anchorage Municipality	2	Department of Agriculture	2007	\$ 25,149,000	132016	
45	US	Anchorage Municipality	2	All other agencies	2008	\$ 2,646,000	132016	
46	US	Anchorage Municipality	2	Department of Housing and Urban Development	2008	\$ 341,000	132016	
47	US	Anchorage Municipality	2	Department of Transportation	2008	\$ 134,142,610	132016	

- Almost 50,000 lines...sheesh!



Sharpen your pencil

Look at the chart he wants. Can you create it from the data you have? Why or why not?

Here's your data.

county_code	county_name	state_code	state_name	majagency_tr	fiscal_year	fund_total	hh_count
13	Aleutians East Borough	2	AK	All other agencies	2007	\$ 504,110	760
13	Aleutians East Borough	2	AK	Environmental Protection Agency	2007	\$ 2,791,048	760

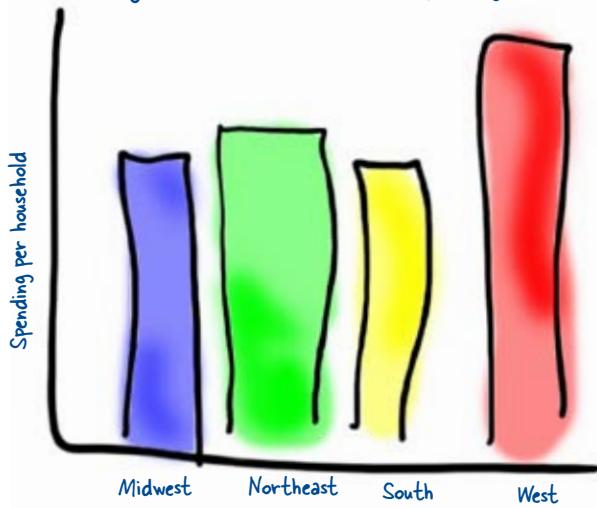
This means that the EPA spent \$2.8 million in Aleutians East Borough in 2007.

Look at both axes of this chart and say whether you can create those axes from the database you have.

There are 760 households in this county.

Here's the chart they want.

Average Per Household Federal Spending, 2009



Write your answer here.

can you make the chart?

Sharpen your pencil Solution

You just compared the data to the chart you've been asked to generate. How well do the two match up?

county_code	county_name	state_code	state_name	magency_tr	fiscal_year	fund_total	hh_count
13	Aleutians East Borough	2	AK	All other agencies	2007	\$ 504,110	760
13	Aleutians East Borough	2	AK	Environmental Protection Agency	2007	\$ 2,791,848	760

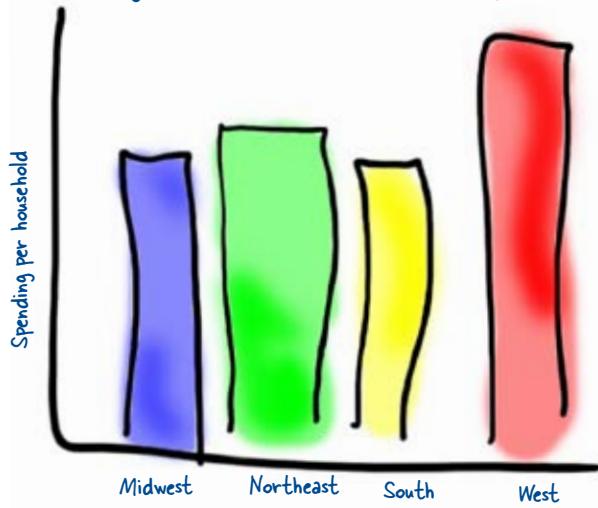
The data says county/state, but the chart they want says region.

You can probably calculate per household spending from these data points.

There are going to be some problems making this work. First, the data is divided into states and counties, not regions. Alaska is "West," but that fact is not in the data set itself. Spending per household isn't in the data either, but we could probably create that figure with a simple calculation.

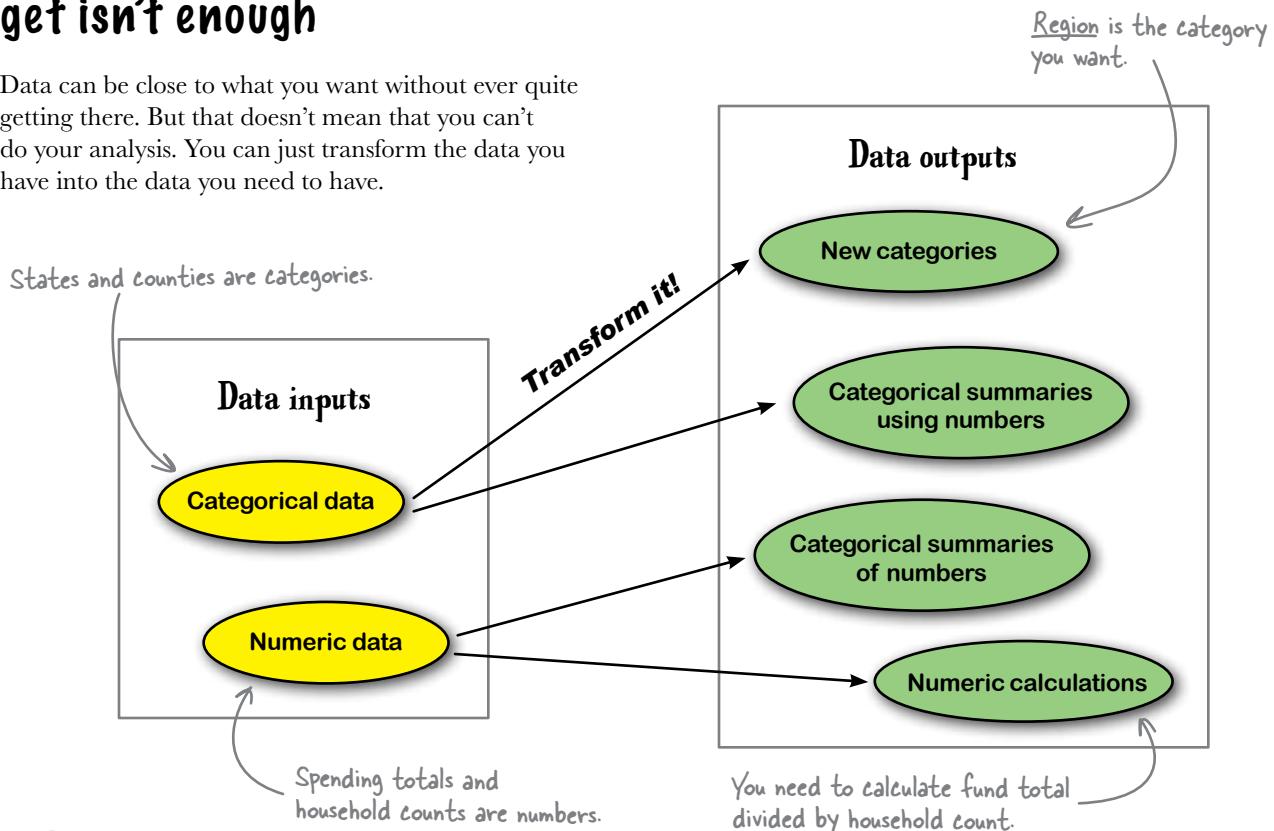
There is a lot going on here.

Average Per Household Federal Spending, 2009



Sometimes the data you get isn't enough

Data can be close to what you want without ever quite getting there. But that doesn't mean that you can't do your analysis. You can just transform the data you have into the data you need to have.



Go ahead and create the field you need: the spending per household for each agency in each county.

- 1 Convert your data to a table and name the table "SpendingData."
- 2 Create a column on the end called Per_Household and populate it with a function that divides the fund_total field by the hh_count field.

Put your Per_Household column here.

	fiscal_year	fund_total	hh_count
1	2007	\$ 594,118	796
2	2007	\$ 2,791,849	796
3	2007	\$ 6,080,060	796
4	2007	\$ 2,321,889	796
5	2008	\$ 646,719	796
6	2008	\$ 3,894,549	796
7	2008	\$ 1,134,193	796
8	2009	\$ 910,060	796
9	2009	\$ 161,679	796
10	2009	\$ 64,932	796
11	2009	\$ 2,003,874	796
12	2009	\$ 761,500	796
13	2007	\$ 6,811,426	2341
14	2007	\$ 200,060	2341
15	2007	\$ 948,969	2341
16	2007	\$ 1,180,060	2341
17	2008	\$ 3,894,549	2341
18	2008	\$ 510,060	2341
19	2008	\$ 977,318	2341
20	2008	\$ 270,060	2341
21	2008	\$ 1,739,219	2341
22	2008	\$ 1,300,060	2341
23	2008	\$ 1,000,060	2341
24	2008	\$ 524,052	2341
25	2008	\$ 521,405	2341
26	2009	\$ 2,941,369	2341



Exercise Solution

You just created one of the fields you need for your chart: spending per household.
How did it go?

- Convert your data to a table and name the table "SpendingData."



If the colored bars annoy you, clean up the formatting of the table.

fiscal_year	fund_total	hh_count
2007	\$ 504,110	760
2007	\$ 2,791,848	760
2007	\$ 6,000,000	760
2007	\$ 2,321,888	760
2008	\$ 568,710	760
2008	\$ 2,596,040	760
2008	\$ 1,320,002	760
2009	\$ 690,000	760
2009	\$ 161,678	760
2009	\$ 64,532	760
2009	\$ 2,963,874	760

- Create a column on the end called Per_Household and populate it with a function that divides the fund_total field by the hh_count field.

Add your column here.

=SpendingData[[#This Row],[fund_total]] /
SpendingData[[#This Row],[hh_count]]

fiscal_year	fund_total	hh_count	Per_Household
2007	\$ 504,110	760	\$ 663.4025316
2007	\$ 2,791,848	760	\$ 3,673.804211
2007	\$ 6,000,000	760	\$ 7,895.47619
2007	\$ 2,321,888	760	\$ 3,055.842165
2008	\$ 568,710	760	\$ 746.3620316
2008	\$ 2,596,040	760	\$ 3,415.842165
2008	\$ 1,320,002	760	\$ 1,730.842165
2009	\$ 690,000	760	\$ 897.8042165

This calculates per household spending.

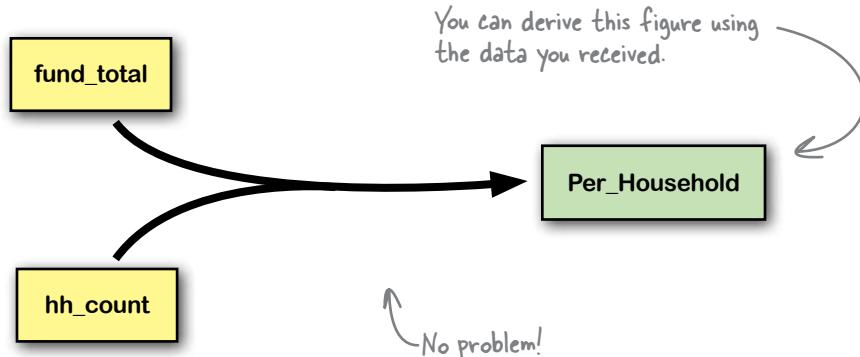
To get this, press "=", then click on fund_total, then press "/", then click hh_count.

Don't forget to format the data as currency.

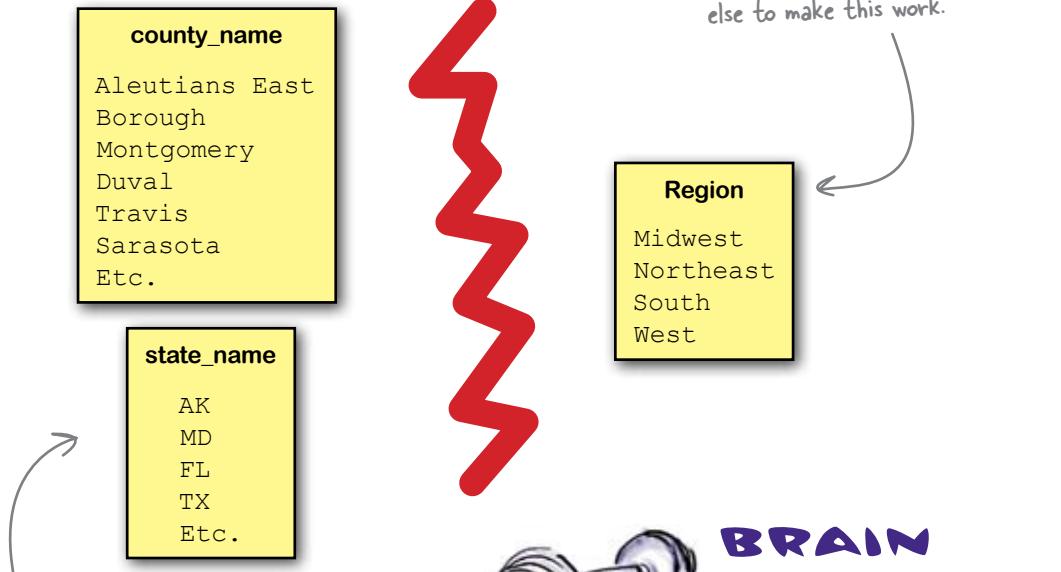
I	Per_Household
760	\$ 663
760	\$ 3,673
760	\$ 7,895
760	\$ 3,055

Your problems with region are bigger

Calculating the Per_Household figure was straightforward, because you had all the data you needed right there on the spreadsheet.



But you're in a different situation with Region, since there's nothing implicit in the data that you can use to calculate Region. You need to **incorporate more data** in order to determine the region for each row.



There's no formula you can use to get "West" from "Aleutians East Borough" or "AK."



What kind of data do you need?
What would you do with it?

a *lookup table*

Here's a lookup key

You can poke around in search engines for a few minutes and find data like this: a key that shows how state names fit with regions.

Load this!

[www.headfirstlabs.com/books/hfexcel/
hfe_ch14_state_region.xlsx](http://www.headfirstlabs.com/books/hfexcel/hfe_ch14_state_region.xlsx)

The screenshot shows a Microsoft Excel spreadsheet titled "hfe_ch14_state_region.xlsx". The table has columns labeled "State" and "Region". The data includes:

	A	B	C	D
1	State	Region		
2	Alabama	South		
3	Alaska	West		
4	Arizona	West		
5	Arkansas	South		
6	California	West		
7	Colorado	West		
8	Connecticut	Northeast		
9	Delaware	South		
10	District of Columbia	South		
11	Florida	South		
12	Georgia	South		
13	Hawaii	West		
14	Idaho	West		
15	Illinois	Midwest		
16	Indiana	Midwest		
17	Iowa	Midwest		
18	Kansas	Midwest		
19	Kentucky	South		
20	Louisiana	South		
21	Maine	Northeast		
22	Maryland	South		
23	Massachusetts	Northeast		
24	Michigan	Midwest		
25	Minnesota	Midwest		
26	Mississippi	South		
27	Missouri	Midwest		
28	Montana	West		

This key shows how State and Region match each other.

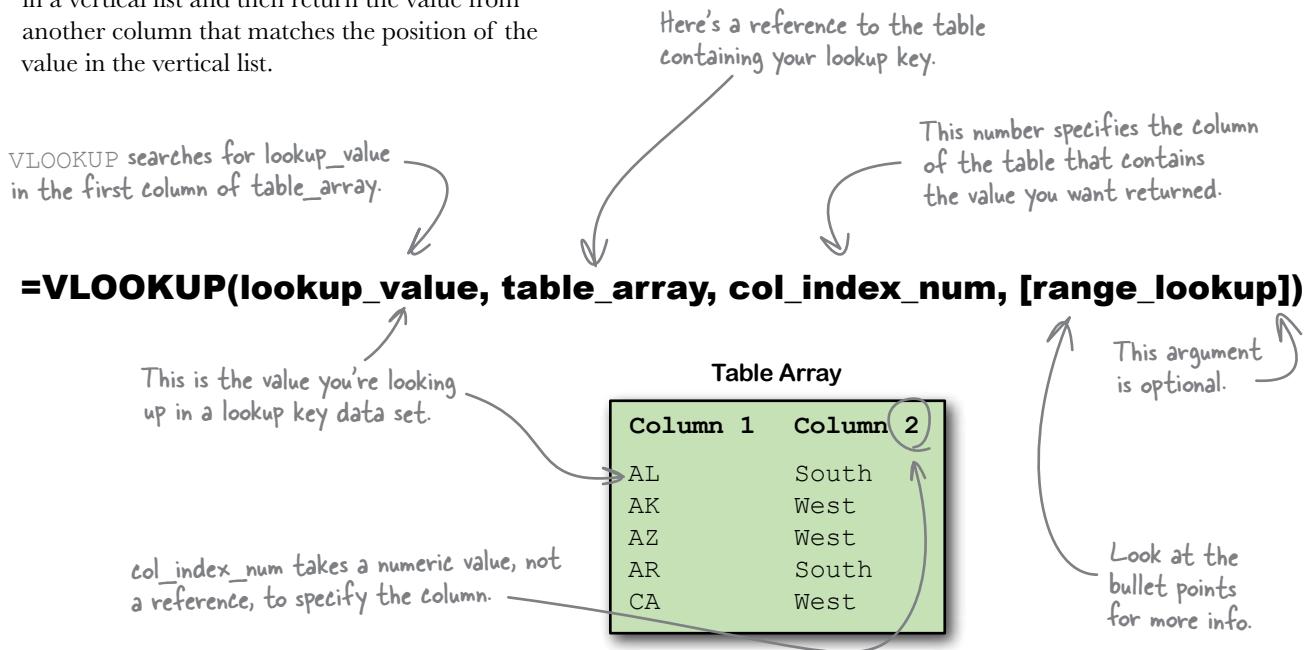


Using this data, you can bring Region data into your spending spreadsheet, which will enable you to create that chart they want.

If your spreadsheet doesn't have the data you need, maybe you can use another data source to bring that data in.

VLOOKUP will cross-reference the two data sources

A particularly useful function in Excel is VLOOKUP. The V stands for *vertical*, and what the function does is look up a reference value in a vertical list and then return the value from another column that matches the position of the value in the vertical list.



BULLET POINTS

- VLOOKUP searches for the `lookup_value` in the first column of the `table_array`.
- `col_index_num` asks for a number to point to the column containing the data you want returned, not a reference.
- `[range_lookup]` takes a Boolean argument.
- If you set the `[range_lookup]` to FALSE, VLOOKUP returns an error if there isn't an exact match, and your `table_array` doesn't have to be sorted.
- If you set `[range_lookup]` to TRUE, VLOOKUP returns a value near your `lookup_value` if there isn't an exact match, but your `table_array` has to be in order.

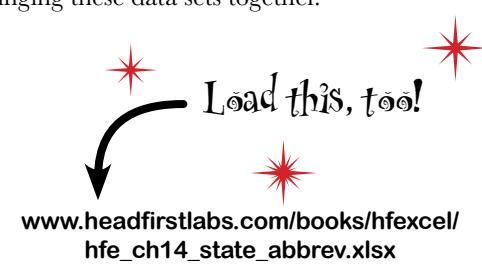
`state_name` will be your `lookup_value`.

C	D	E
code	state_name	maj
2	AK	All o
2	AK	Env
2	AK	Dep
2	AK	Dep
2	AK	All o
2	AK	Dep
2	AK	Env
2	AK	Env
2	AK	Dep

**It's a big function.
Let's give it a shot....**

Stop! The data doesn't match! In the new file, state names are spelled out, and in the original data, state names are abbreviated.

Oh, bother. So it looks like you're going to have to cross-reference the region to the state abbreviation, then use that abbreviation to cross-reference the region to your original data. Fortunately, VLOOKUP will make quick work of bringing these data sets together.



Copy the state_region data into your state_abbrev spreadsheet like this....

Now you'll have both data sets on the same sheet.

A screenshot of Microsoft Excel showing the "state_abbrev" spreadsheet. It has columns "State_Abbrev", "State_Name", and "Region". The "Region" column contains data such as South, West, Northeast, and South. Arrows point from the text "Let's put the region data into this column." to the "Region" column header and the first few cells of the "Region" column.

	A	B	C	D	E	F
1	State_Abbrev	State_Name	Region	State	Region	
2	AL	Alabama		Alabama	South	
3	AK	Alaska		Alaska	West	
4	AZ	Arizona		Arizona	West	
5	AR	Arkansas		Arkansas	South	
6	CA	California		California	West	
7	CO	Colorado		Colorado	West	
8	CT	Connecticut		Connecticut	Northeast	
9	DE	Delaware		Delaware	South	
10	DC	District of Columbia		District of Cc	South	
11	FL	Florida		Florida	South	
12	GA	Georgia		Georgia	South	
13	HI	Hawaii		Hawaii	West	

This spreadsheet matches state names with their abbreviations.

Let's put the region data into this column.

Pool Puzzle

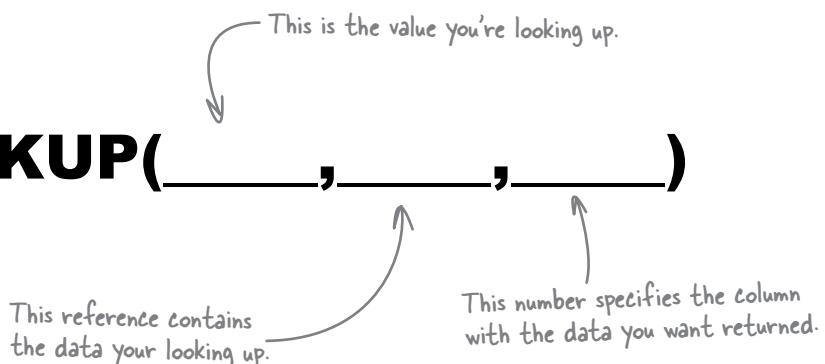


Your **job** is to take formula elements from the pool and place them into the blank lines in the formula. You may **not** use the same formula element more than once, and you won't need to use all of them.

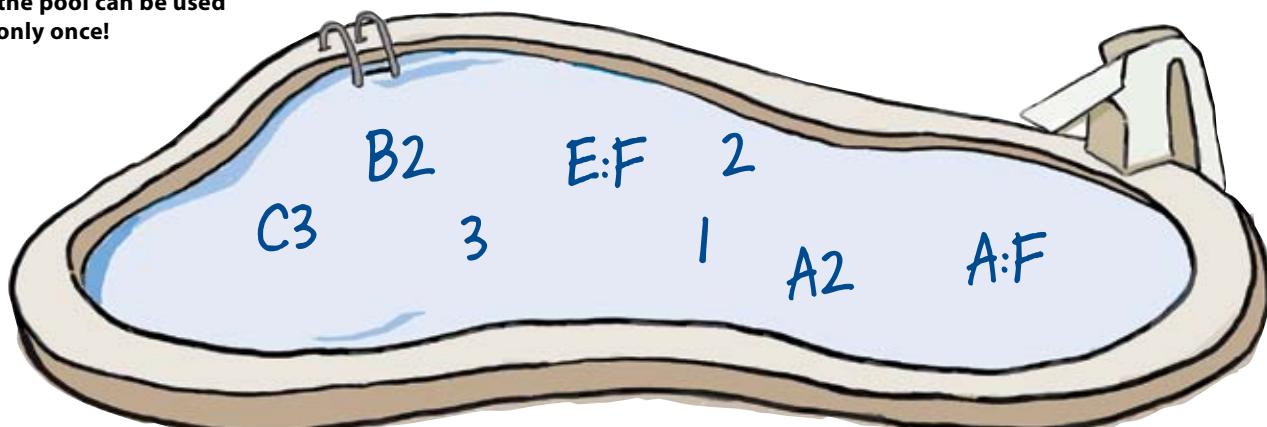
Your **goal** is to make a VLOOKUP formula that puts Region and State_Abbrev into the same table.

Write the formula that would go here.

=VLOOKUP(_____,_____,_____)



Note: Each thing from the pool can be used only once!



Pool Puzzle Answers



You just wrote your first VLOOKUP formula to create a table that relates your Region field to your State_Abbrev field.

Here's where you're looking....

=VLOOKUP(B2, E:F, 2)

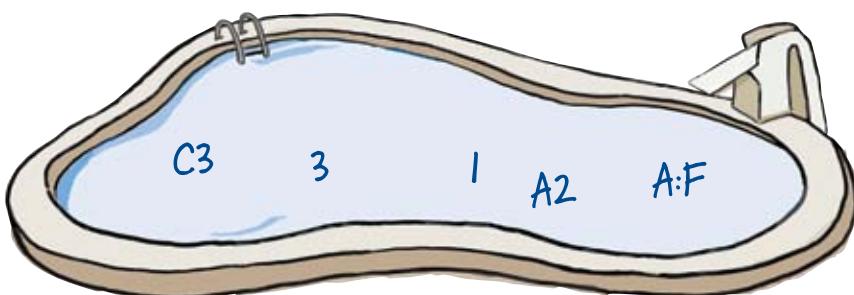
In the first row, the value you're looking up is "Alabama".

A	B	
1	State_Abbrev	State_Name
2	AL	Alabama
3	AK	Alaska
4	AZ	Arizona
		Arkansas

You want VLOOKUP to return the corresponding value in the second column.

E	F
State	Region
Alabama	South
Alaska	West
Arizona	West
Arkansas	South
California	West
Colorado	West
Connecticut	Northeast
Delaware	South
District of Cc	South
Florida	South
Georgia	South
Hawaii	West

We don't have to use the [range_lookup] argument, since we know the state data is complete and in order.



If you haven't already, type this formula into your cell C2 and copy/paste it for each row. You'll use it in the next exercise.



Long Exercise

You're just a step away from having all the data you need to create the chart the Geopolitical Grunts want. Create the VLOOKUP formula that will bring region data into your spending spreadsheet and then create the pivot chart your client wants.

- Copy the lookup key sheet you've been working on in `hfe_ch14_state_abbrev.xlsx` into your original workbook. Right-click on Sheet1 and tell Excel to move the sheet into your `hfe_ch14_usaspending.xlsx` workbook.

*Put the formula to look up
your Region value here.*

- Add a Region column to your original data and then write the VLOOKUP formula that will look up the region field based on the state abbreviation in that row.

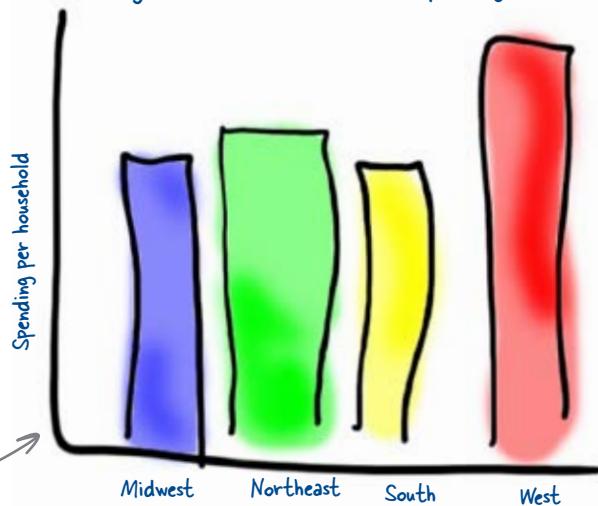
NOTE: You will need to have the fourth argument of VLOOKUP be FALSE.

	H	I	J	K
1	hh_count	Per_Household	Region	
2	760	\$ 663		
3	760	\$ 3,673		
4	760	\$ 7,895		
5	760	\$ 3,055		
6	760	\$ 748		
7	760	\$ 3,416		
8	760	\$ 1,737		
9	760	\$ 908		

Here is the sheet you import from hfe_ch14_state_abbrev.xlsx.

- Create the pivot chart that the Geopolitical Grunts want. Just click "Pivot Chart" rather than "Pivot Table" and let Excel create the chart. You **will** have to change the title and formatting to get the chart right.

Average Per Household Federal Spending, 2009



Here is the chart they want.



LONG Exercise SOLUTION

You just added another column to your data set and then created a pivot chart.
How does it look?

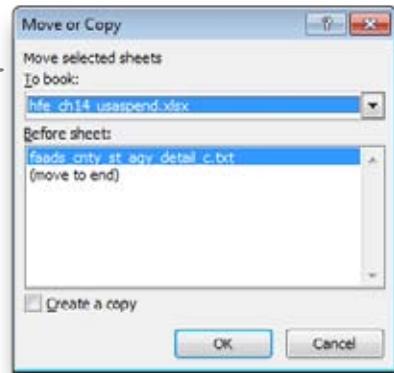
1

- Copy the lookup key sheet you've been working on in `hfe_ch14_state_abbrev.xlsx` into your original workbook. Right-click on Sheet1 and tell Excel to move the sheet into your `hfe_ch14_usaspending.xlsx` workbook.

Here's what the "Move or Copy" dialog box looks like.



You get to it from right-clicking on the sheet's tab at the bottom of the screen.



2

- Add a Region column to your original data and then write the VLOOKUP formula that will look up the region field based on the state abbreviation in that row.

The second and third arguments point to the lookup table you created.

`=VLOOKUP(SpendingData[[#This Row],[state_name]],Sheet1!A:C,3,FALSE)`

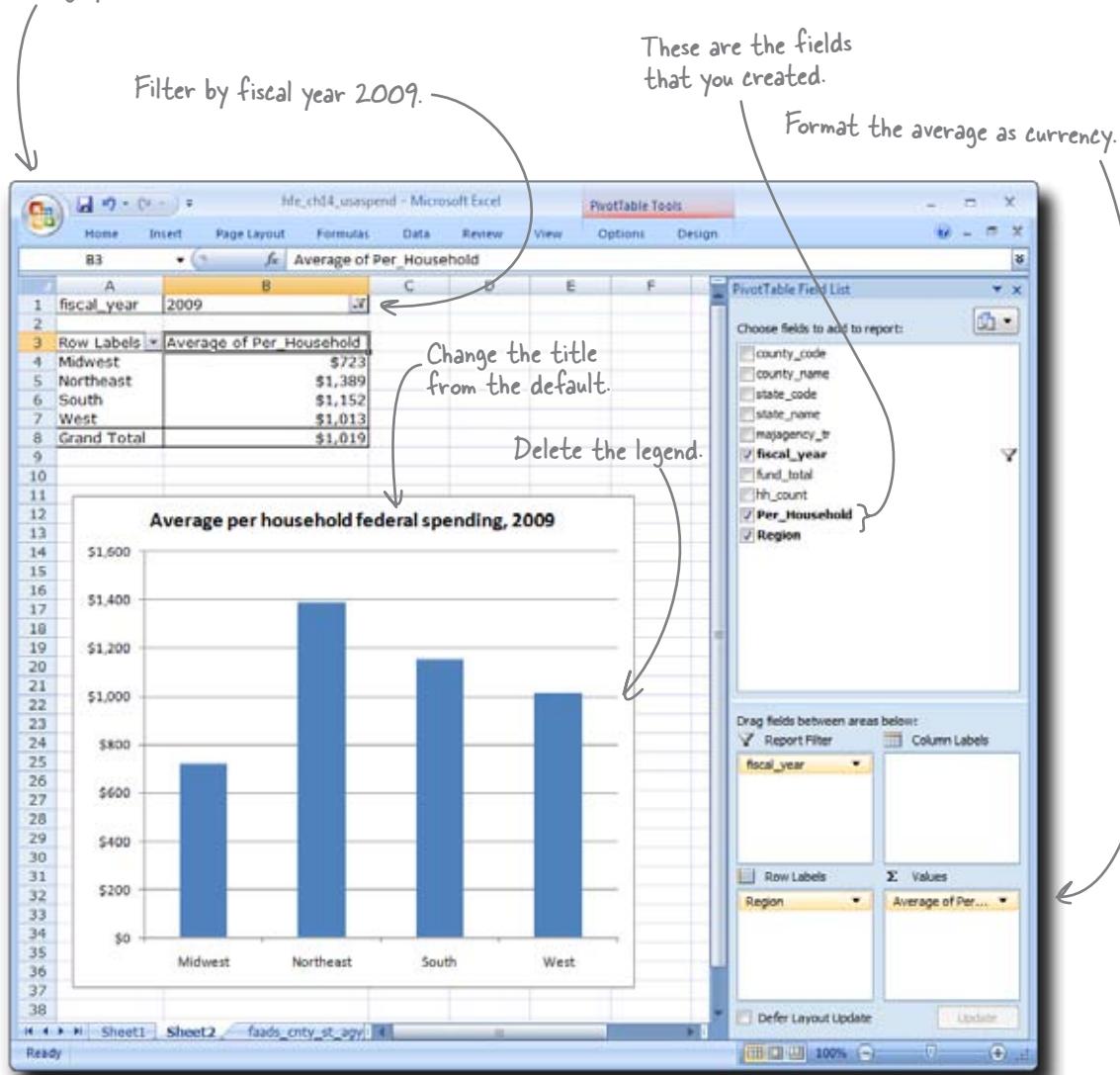
Here's your formula.

Take a look at the help screens for more information on this argument.

	D	E	F	G	H	I	J
1	state_name	majagency_tr	fiscal_year	fund_total	hh_count	Per_Household	Region
2	AK	All other agencies	2007	\$ 504,110	760	\$ 663	West
3	AK	Environmental Protection Agency	2007	\$ 2,791,848	760	\$ 3,673	West
4	AK	Department of Commerce	2007	\$ 6,000,000	760	\$ 7,895	West
5	AK	Department of Education	2007	\$ 2,321,888	760	\$ 3,055	West
6	AK	All other agencies	2008	\$ 568,710	760	\$ 748	West
7	AK	Department of Education	2008	\$ 2,596,040	760	\$ 3,416	West
8	AK	Environmental Protection Agency	2008	\$ 1,320,002	760	\$ 1,737	West
9	AK	Environmental Protection Agency	2009	\$ 690,000	760	\$ 908	West
10	AK	Department of Justice	2009	\$ 161,678	760	\$ 213	West
11	AK	Department of Health and Human Services	2009	\$ 64,512	760	\$ 85	West

- 3 Create the pivot chart that the Geopolitical Grunts want. Just click “Pivot Chart” rather than “Pivot Table” and let Excel create the table. You **will** have to change the title and formatting to get the chart right.

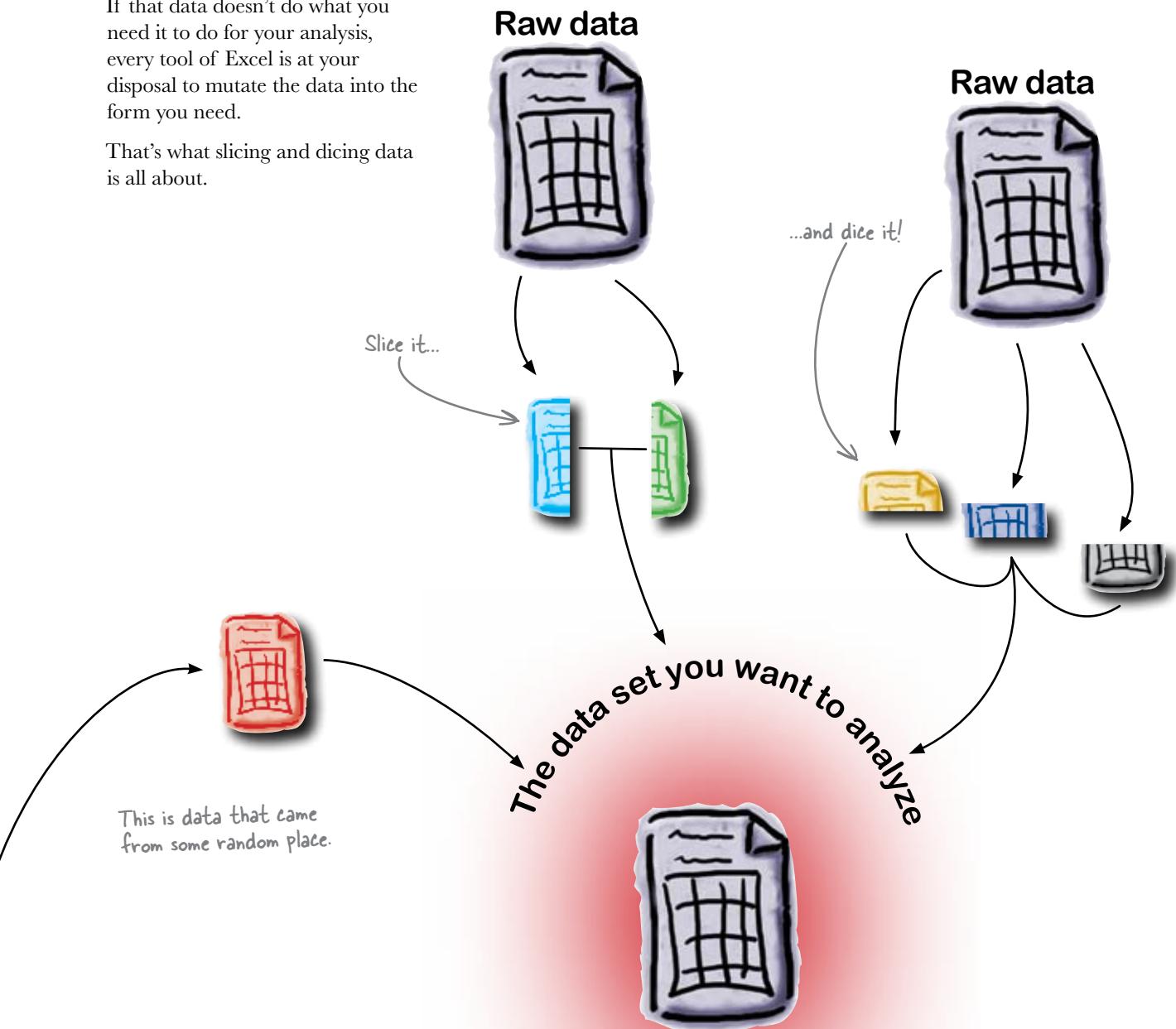
Lots of things you need to do to clean this up....



Create segments to feed the right data into your analysis

The data you receive to analyze inside Excel is just a starting point. If that data doesn't do what you need it to do for your analysis, every tool of Excel is at your disposal to mutate the data into the form you need.

That's what slicing and dicing data is all about.



there are no Dumb Questions

Q: Will I always use VLOOKUP to do this sort of thing?

A: By no means! VLOOKUP is powerful, but there are other lookup functions as well. There's HLOOKUP, which does horizontal lookups, as well as INDEX and MATCH, which are popular but slightly harder to understand.

Q: So there's a lot of versatility in Excel's functions when it comes to looking things up.

A: Absolutely. But you never know what formulas you'll be able to use to slice and dice data into the form you need. Remember, earlier in the chapter you used simple division to create a new field, which you graphed using a pivot chart.

Q: Now that I have lookup formulas and division, what else can I use to segment data points?

A: Boolean functions are big here. Say you wanted to tag all the records in your database that were Department of Defense programs in Maryland. It'd be easy to use a simple AND function to create a Boolean value.

Q: And I could take that Boolean value and use it with a formula like COUNTIFS to compare it with other values in my data set.

A: Or better yet, you could plug the Boolean value somewhere into a pivot table. Boolean functions are fantastic for segmentation, and they play really well with pivot tables.

Q: You know, this is kind of funny advice you're giving me. What you're basically saying is that there are a lot of different functions and techniques that can all do the same basic thing.

A: Right! Go on....

Q: And at the same time you're not giving me any quick and easy rules for how to use those functions and techniques for segmentation. Your advice is basically, "Look at the problem, and pluck an Excel feature out of thin air to solve it. Use whichever Excel feature is best."

A: That's a fair observation. But you've learned enough about the features of Excel that all the stuff you don't know consists of either super-advanced topics or subtle variations on the themes you've already picked up. At this point, your goal should be to play with the functions and think creatively about how to make them work for your specific problems.

Q: The student has become the master.

A: That might be overstating it a bit, but you're well on your way. Just as a book on Microsoft Word won't show you how to write the Great American Novel, a book on Excel can't teach you to create a brilliant spreadsheet.

Q: What can teach me how to do wild stuff in Excel?

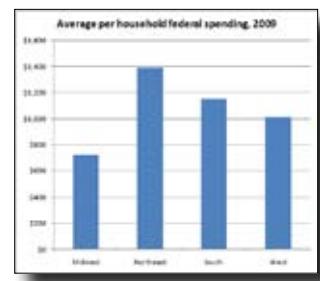
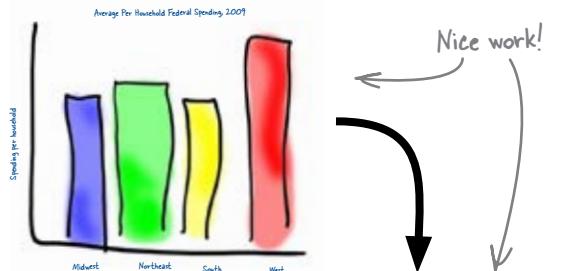
A: You can certainly always be on the lookout for people's novel solutions to problems, but the best way to get good with Excel once you have a strong base of knowledge is just to learn as many functions as you can and experiment with making them work together. You'll inevitably surprise yourself with the creative ways you can use Excel.

Q: It probably wouldn't hurt to be good at math, either.

A: Definitely. A solid book on general data analysis or analysis for your area of expertise would show you some of the theoretical points that will make your spreadsheets smarter. But that's a whole different deal. In the meantime, let's see what your friend at Geopolitical Grunts has to say about your pivot chart.

Geopolitical Grunts would like a little more nuance

Oh, wow, that visualization is fantastic. You know, you've got me thinking. What would be really nice would be to break out the department-level projects from everything else. Could you filter the data so that it only includes transactions where the word "Department" is in the majagency_tr field?



Ah, clients.... What are you going to do? You flash a little skill, and once they know what you're capable of doing, they'll never leave you alone!



And while you're at it, could you show me all the dates rather than just 2009? Like grouping a bunch of bars together that show regional averages by year?



Your client would like a little more detail in his chart. Looks like you're going to have to create a new segment....

- 1 Adding dates to your pivot chart is the easy part. Drag the date field out of the Filter box and into the box that will make the pivot show many bars representing region *and* year, not just region.
 - 2 Your raw data rows need a tag to denote whether each transaction is from a department-level organization or not. Create a Boolean data field that contains TRUE if the word “Department” is in the **majagency_tr** field. If you need help, take a look at the hint below.
 - 3 Head back over to your pivot table. Since you’ve added data to your data table, you’ll need to press the button in the Ribbon to refresh your pivot table. Then add your new field as a filter, showing only data points where it’s TRUE that the transaction is from a department-level organization.

`FIND()` returns an error if the requested text substring is not found. `ISERROR()` returns TRUE if its argument is an error, NOT() returns TRUE if its argument is FALSE. Put these formulas together to create a big nested formula that returns TRUE if “Department” is in the substring you’re looking at.

Hint...



Exercise Solution

You just created a new segment to describe transactions originating from department-level organizations. How did it go?

- Adding dates to your pivot chart is the easy part. Drag the date field out of the Filter box and into the box that will make the pivot show many bars representing region *and* year, not just region.

Drag fields between areas below:

Report Filter	Legend Fields (S...)
fiscal_year	
Axis Fields (Category)	
Region	Σ Values
fiscal_year	Average of Per...
<input type="checkbox"/> Defer Layout Update	
Update	

- Your raw data rows need a tag to denote whether each transaction is from a department-level organization or not. Create a Boolean data field that contains TRUE if the word “Department” is in the **majagency_tr** field.

Add the year to the axis.

Imagine a cell doesn't have “Department” in it...

This formula will return an error...

=NOT(ISERROR(FIND("Department", SpendingData[[#This Row], [majagency_tr]])))

...this will return TRUE...

...and this will flip it to FALSE, since the cell doesn't contain “Department”.

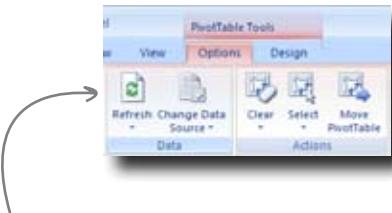
Here's your formula.

hfe_ch14_usaspending - Microsoft Excel

	E	F	G	H	I	J	K
	majagency_tr	fiscal_year	fund_total	hh_count	Per_Household	Region	Department
1	All other agencies	2007	\$ 504,110	760	\$ 663	West	FALSE
2	Environmental Protection Agency	2007	\$ 2,791,848	760	\$ 3,673	West	FALSE
3	Department of Commerce	2007	\$ 6,000,000	760	\$ 7,095	West	TRUE
4	Department of Education	2007	\$ 2,321,888	760	\$ 3,055	West	TRUE
5	All other agencies	2008	\$ 568,710	760	\$ 748	West	FALSE
6	Department of Education	2008	\$ 2,596,040	760	\$ 3,416	West	TRUE
7	Environmental Protection Agency	2008	\$ 1,320,002	760	\$ 1,737	West	FALSE

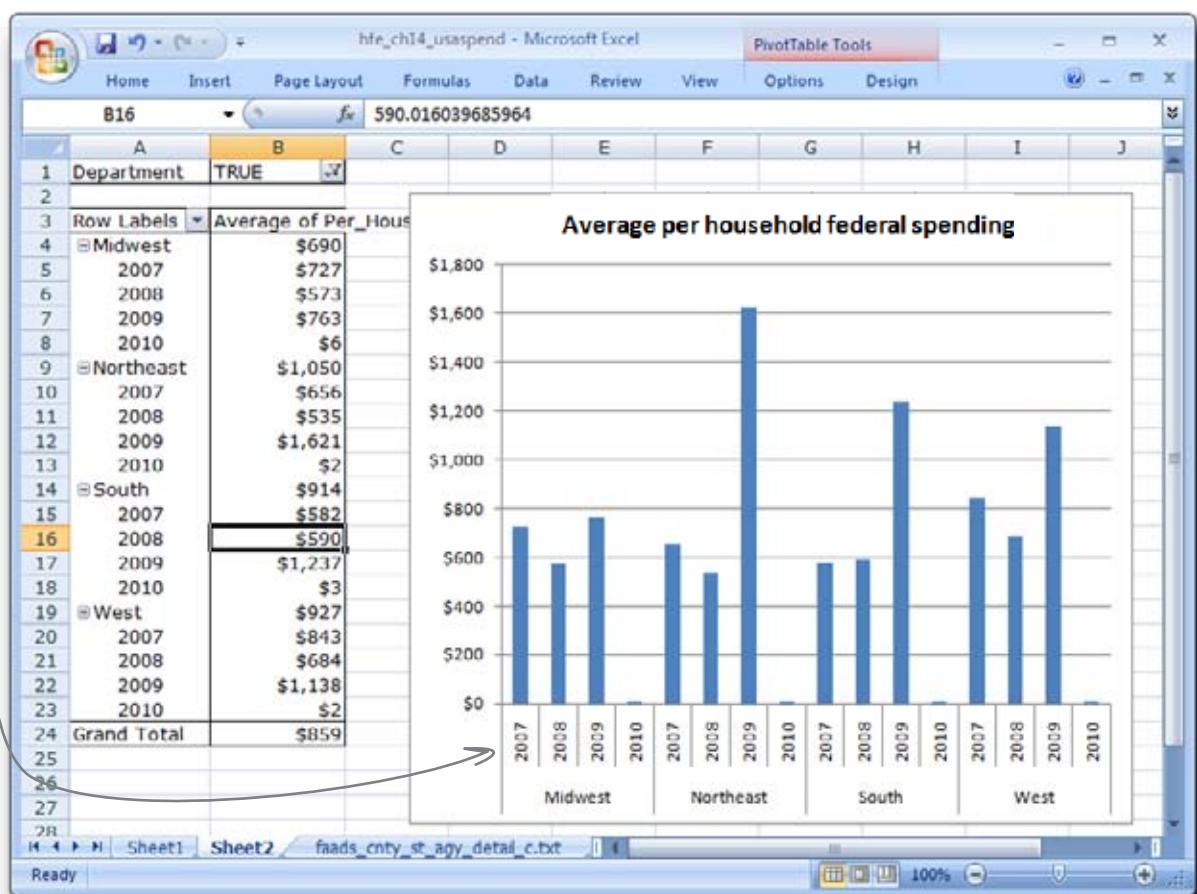
3

Head back over to your pivot table. Since you've added data to your data table, you'll need to press the button in the Ribbon to refresh your pivot table. Then add your new field as a filter, showing only data points where it's TRUE that the transaction is from a department-level organization.



Click the refresh button to enable you to include your new field.

Here's your new chart!



show me the money

You've enabled Geopolitical Grunts to follow the money trail...

Which is a good thing, because there's a whole lot of it. So much of it, that it's hard to keep track of it all. There's so much of it that you could get buried in it.



Leaving town...



It's been great having you here in Dataville!

We're sad to see you leave, but there's nothing like taking what you've learned and putting it to use. You're just beginning your Excel journey, and we've put you in the driver's seat. We're dying to hear how things go, so **drop us a line** at the Head First Labs website, www.headfirstlabs.com, and let us know how data analysis is paying off for **YOU!**

appendix i: leftovers



* **The Top Ten Things (we didn't cover)**



You've come a long way.

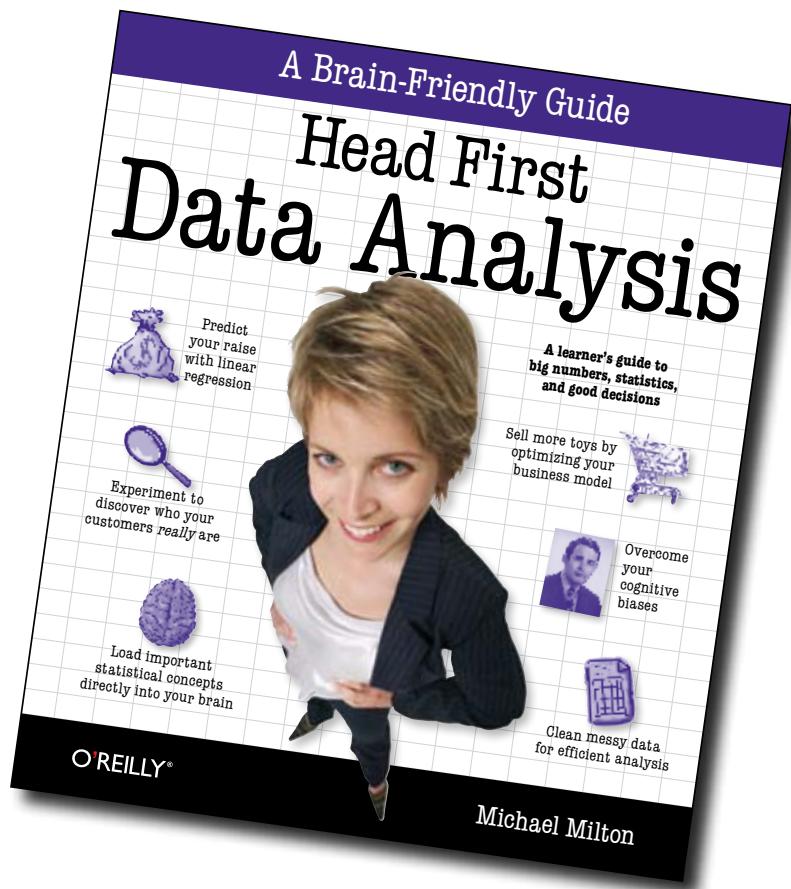
But Excel is a complicated program, and there's so much left to learn. In this appendix, we'll go over 10 items that there wasn't enough room to cover in this book, but should be high on your list of topics to learn about next.

#1: Data analysis

It's one thing to be able to rock and roll inside Excel, but it's another thing altogether to be a good data analyst. **Data analysis** is a broad (and hot) field that encompasses knowledge not only of Excel and other software but of higher level topics like statistics and psychology.

Crack data analysts are omnivorous and voracious thinkers when it comes to data, and if you're interested in boning up on data analysis, might we suggest...

This book is more about analytic principles than software.



#2: The format painter

The **format painter** is one of those tools inside Excel that you'll use all the time. The format painter provides a super-quick way to copy formatting attributes from one cell to another. Just select the cell that has the formatting you want to copy to another cell, click the Format Painter button, and then click on the cell or range where you want to apply that formatting.

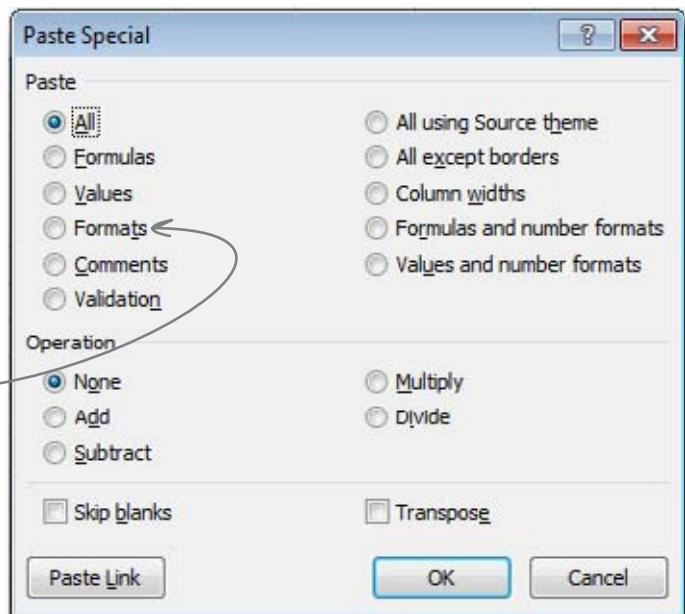


Try out this feature.

If you want to apply the formatting you've loaded into the format painter to a number of places in your spreadsheet (rather than just one), double-click the button when the cell whose formatting you want to copy is highlighted.

You can also achieve the same results using Paste Special > Formatting.

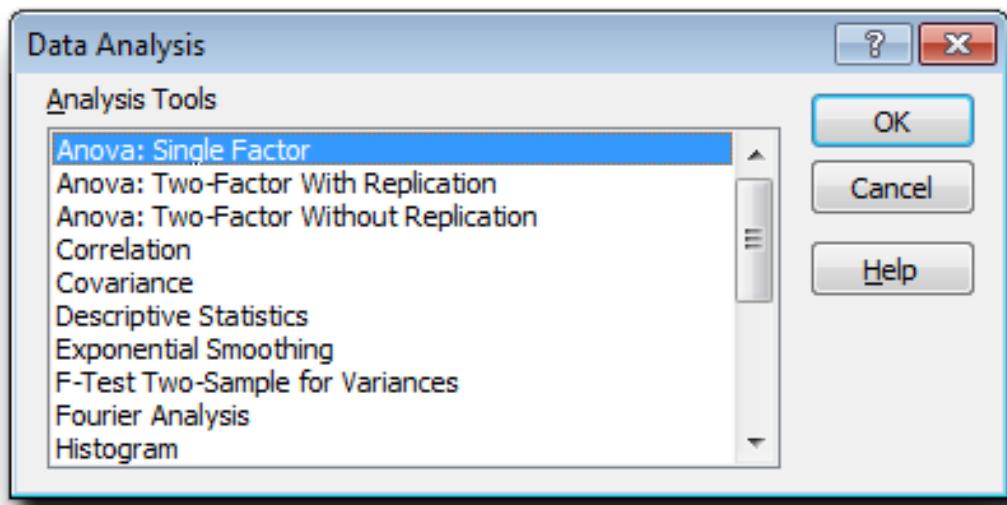
You can paste formats using Paste Special, too.



#3: The Data Analysis ToolPak

The Data Analysis ToolPak is a set of analysis tools that comes standard with Excel but isn't activated by default. If you need to use Excel for serious statistical operations like hypothesis testing, you'll want to take a look at this feature. Check out the Help files for information on how to activate it.

The Data Analysis ToolPak has a bunch of cool statistical functions.



#4: Array formulas

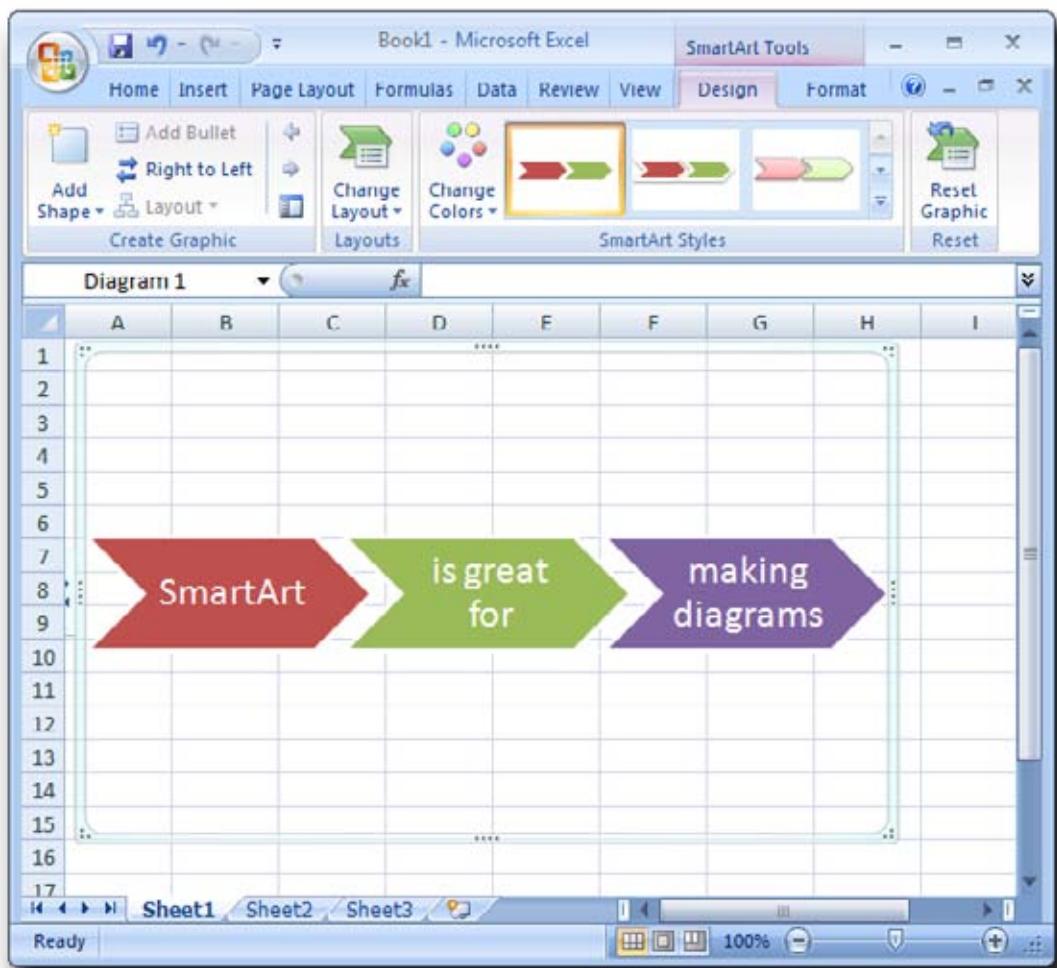
Ever needed a formula to return more than one result? Does that question blow your mind? **Array formulas** are a conceptually difficult but programmatically powerful feature of Excel that push functions to the limits of their performance.

They're worth looking into if you're interested in taking your mastery of functions into a whole different dimension...literally!

#5: Shapes and SmartArt

Excel 2007 introduced a bunch of visual formatting tools, and this book has only scratched the surface of those tools. If you enjoy thinking visually, try poking around the Shapes and SmartArt features. They are a treasure trove for quick and easy yet elegant formatting options for flow charts and other visualizations.

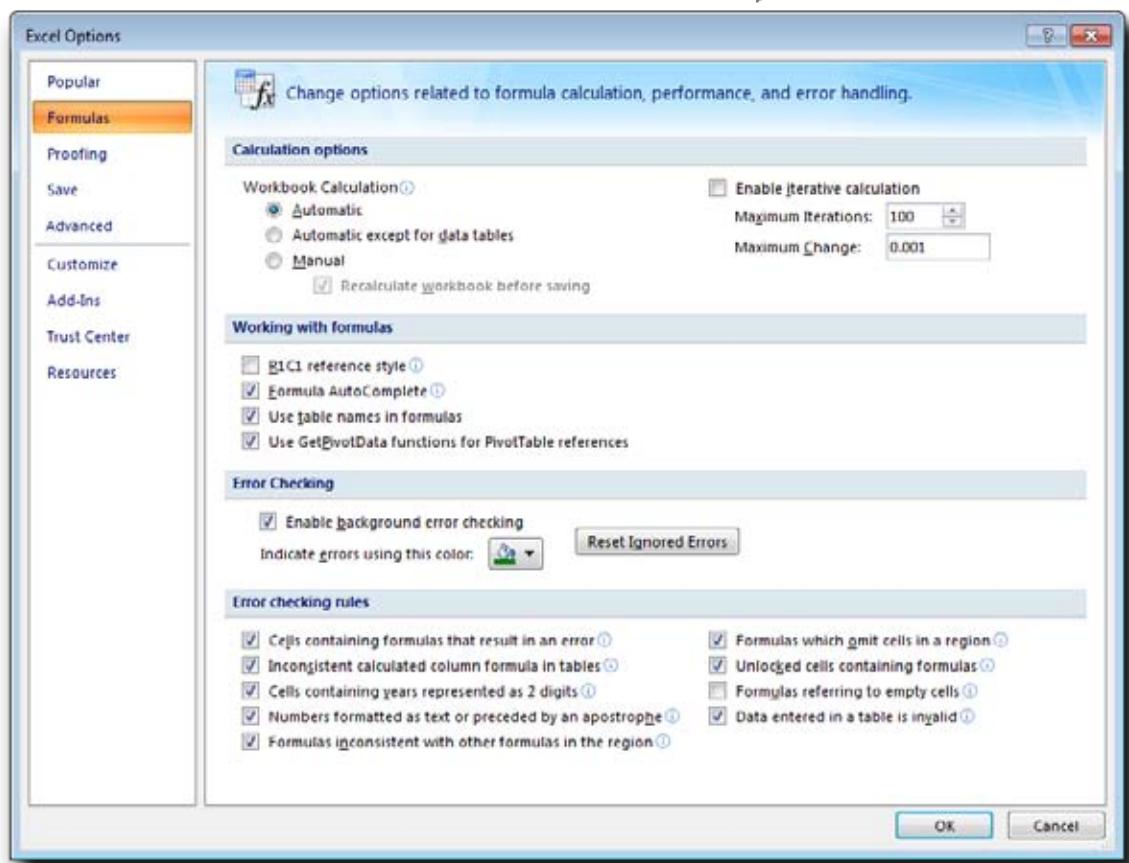
You can draw all sorts of interesting diagrams inside Excel using Shapes and SmartArt.



#6: Controlling recalculation and performance tuning

If your spreadsheet gets large and full of formulas, especially array formulas, you might experience slowdowns as all your formulas recalculate when you update data. If you suspect you're experiencing something like this, head over to the Options menu and play around with the settings that control Excel's recalculation and other performance behaviors.

Check out this window for performance tuning options.

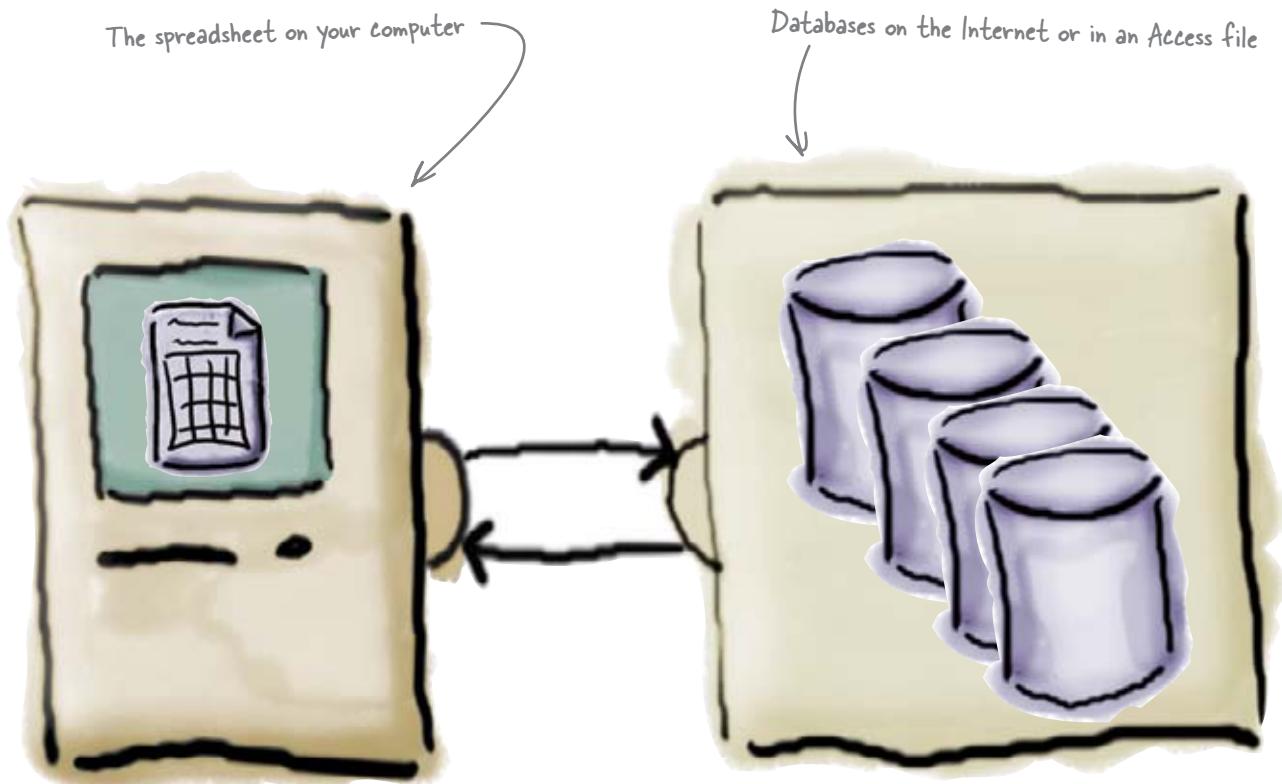


#7: Connecting to the Web

All of us spend time surfing the Web, so why not make Excel and the Web work together? Excel has a number of facilities for bringing web data into your worksheets and exporting your spreadsheets for use on the Web.

#8: Working with external data sources

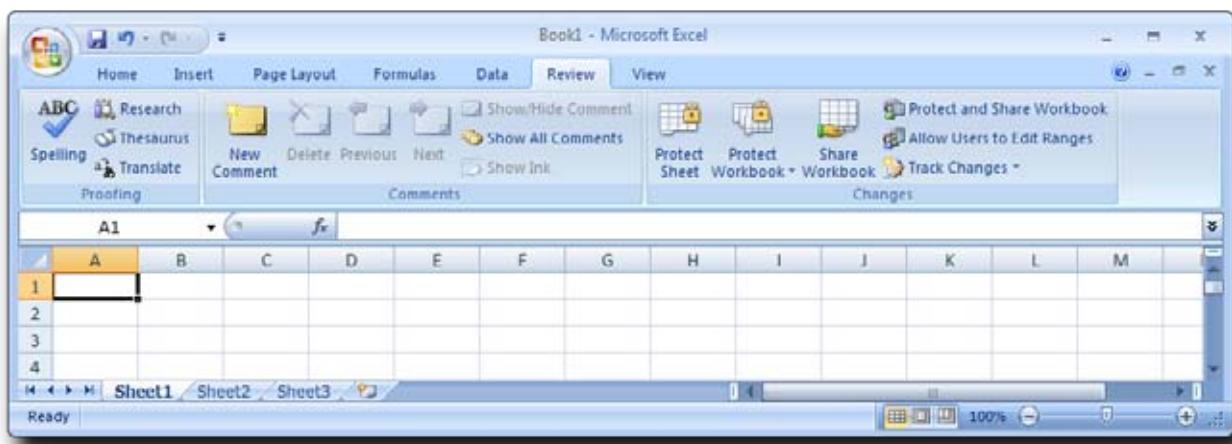
You can pull data into Excel from relational databases like Microsoft Access and from a variety of other external sources besides the Internet. Interfacing databases with Excel pivot tables using OLAP (Online Analytical Processing) technology is a particularly powerful and cool way to analyze data.



#9: Collaboration

Excel's collaboration features like Track Changes make working with other people on the same spreadsheet a lot easier. To look at some of the collaboration features, head over to the Review tab.

Look into collaboration options here.



#10: Visual Basic for Applications

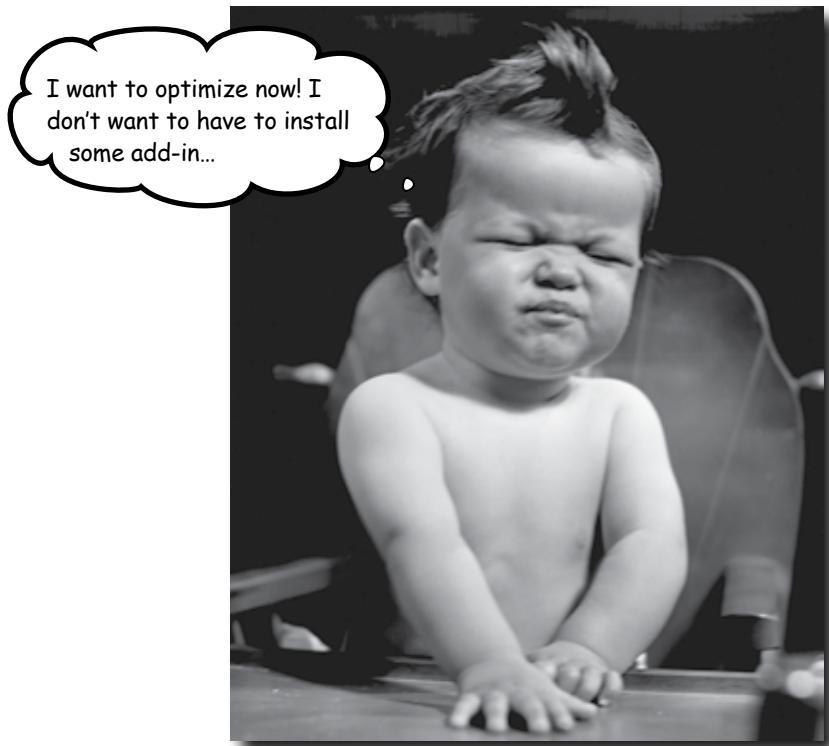
Have you learned most of Excel's features, even the super-technical stuff like array formulas, and find yourself demanding more? Visual Basic for Applications (VBA) is a full-blown programming language that you can use inside Excel to create your own functions and much, much more.



appendix ii: install excel's solver



The Solver



Some of the best features of Excel aren't installed by default.

That's right, in order to run the optimization from Chapter 10, you need to activate the **Solver**, an add-in that is included in Excel by default but not activated without your initiative.

here are the steps

Install Solver in Excel

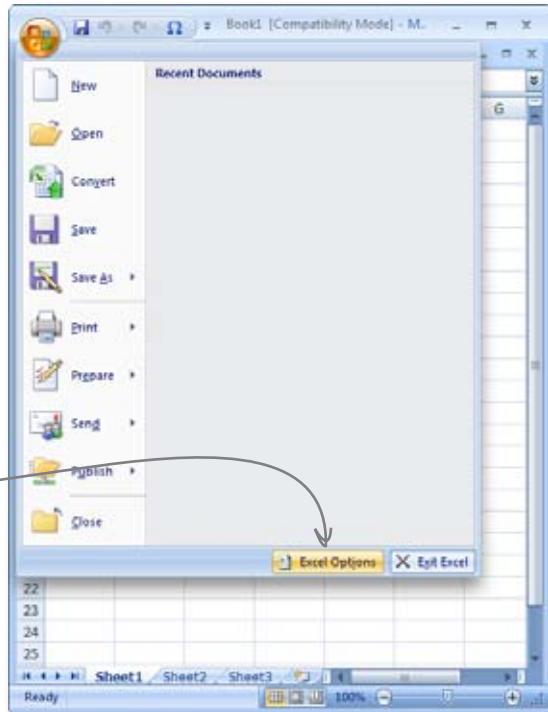
Installing the Solver in Excel is no problem if you follow these simple steps.

This is the Microsoft Office button.

- 1 Click the Microsoft Office button and select **Excel Options**.

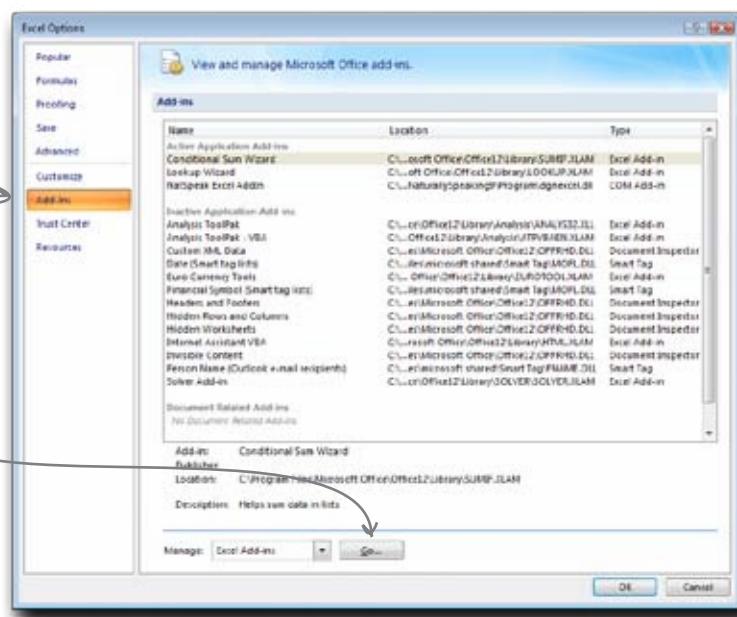
Here's Excel Options.

- 2 Select the Add-Ins tab and click **Go...** next to "Manage Excel Add-Ins."



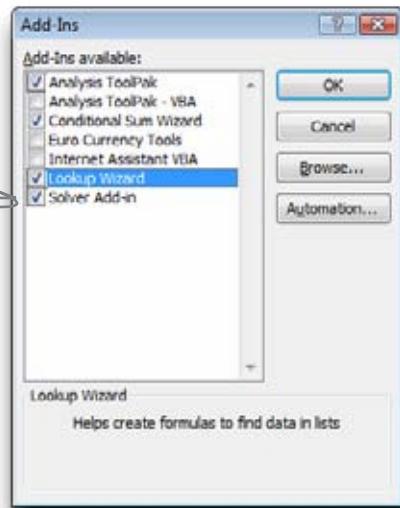
The Add-Ins tab

Click this button.



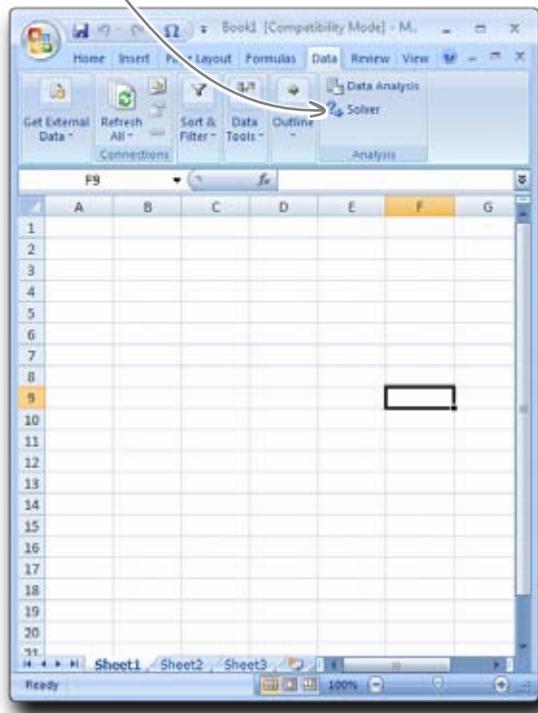
- 3** Make sure that the Solver Add-in box is checked, and then press **OK**.

Make sure that this box is checked.



- 4** Take a look at the Data tab to make sure that the Solver button is there for you to use.

Make sure that Solver can be seen under the Data tab.



That's it!

With those steps complete, you're ready to start running optimizations!

Index

Symbols

- & (ampersand), in formulas, 351
- * (asterisk), multiplication operator, 8
- [] (brackets), in structured references, 82
- : (colon), in cell references, 15
- \$ (dollar sign), in cell references, 73–75
- = (equals sign)
 - in logical expressions, 335
 - preceding formulas, 5
- ! (exclamation point), in cell references, 68, 70
- / (forward slash), division operator, 8
- > (greater than sign), 335
- >= (greater than or equal sign), 335
- < (less than sign), 335
- <= (less than or equal sign), 335
- (minus sign), subtraction operator, 8
- <> (not equal to sign), 335
- () parentheses
 - enclosing function arguments, 15
 - enclosing numbers, 24
 - to group values in formulas, 14, 62
- + (plus sign), addition operator, 5

A

- absolute references, 73–75
- addition, 5
 - (*see also* COUNTIF function; COUNTIFS function; SUM function)
- advertising example, 252–277
 - advertising costs, adding to data, 253–254
 - breakeven points for multiple scenarios, 261–264

- new customers, adding to data, 253–254
- optimization model, checking, 272–276
- optimizing based on multiple, constrained cells, 267–270
- projections for TV and magazine ads, 255–260
- alignment of cell contents, 36
- alignment principle of design, 53–56
- ampersand (&), in formulas, 351
- AND function, 351–353
- appreciation calculation, 217
- arguments for functions, 15
- array formulas, 386
- asterisk (*), multiplication operator, 8
- auditing formulas, 208–211
- Automotive Weekly example, 310–330
 - average satisfaction and reliability by make, 328–329
 - filtering average MPG by reliability, 322–324
 - most expensive price for each make, 329
 - rating by make and model, 329
 - summarizing average MPG by make and type, 313–319
- AVERAGE function, 119–121, 172

B

- balance sheet example, 50–57
- bar charts, 238, 239–240
- bold text, 42
- Boolean data type, 131, 334–335
 - (*see also* logical expressions)
- borders around cells, 36, 42
- brackets ([]), in structured references, 82
- bubble charts, 238

C

calculations (*see* formulas; functions)
cell ranges
 named, automatically generating, 82–87
 named, specifying manually, 76–78
 selecting with mouse, 67–68
 specifying in formulas, 15–16, 70
Cell Styles, 45–49
cells, 5
 formatting for (*see* formatting)
 green triangles in, 121–122
 references to (*see* references)
characters (*see* text)
charts
 appropriateness of, 229–230, 235–236, 238
 bar charts, 238, 239–240
 changing type of, 239
 creating, 231
 data for, selecting, 232
 design and layout, 232–235, 247–248
 limitations of, 235
 line charts, 238, 241–248
 list of, 238
 pie charts, 230–234, 236
 from pivot tables, 325, 371–373, 377–379
 transforming data for, 243–246
collaboration, 390
colon (:), in cell references, 15
color
 of cell background, 36, 42
 of cell contents, 36
columns
 referencing all cells in, 70
 sorting data by a specific column, 92–95
 sorting data by multiple columns, grouped, 96–98
 splitting text data into, 282–285, 301–304
computer manufacturing example, 60–88
 discounted prices, incorporating, 71–78
 gross profit margin, 61–62
 least expensive parts, 63–68
 projected profitability, 69–70
 projected profitability for all computer models, 84–87

CONCATENATE function, 288
convention center example (*see* parking spaces example)
copying and pasting
 cell formatting, 385
 formulas, 20–21
 with modifications, 302–304, 385
 references not shifted during, 73–75, 83
 references shifted during, 20–21, 73
COUNTIF function, 190–192
COUNTIFS function, 346–348
cross-referencing data sources, 367–373, 375
CUMIPMT function, 216
currency symbols, 33–38
customer database example, 280–288
 counting “s” characters, 291–292
 extracting names, 294–304
 extracting phone numbers, 289–290
 formatting data, 305–307
 splitting text data into columns, 282–285

D

data analysis, 113, 321, 384
Data Analysis ToolPak, 386
data for exercises, downloading, xxxiii
data types, 122
 Boolean data type, 131, 334–335
 changing, 128, 131
 converting text to values, 128–130, 172
 converting values to text, 128
 determining data type of cell, functions for, 128
 errors as, 135
 numbers stored as text, 121–122
 (*see also* dates and times; numbers; text)
database example (*see* customer database example)
databases, using with pivot tables, 321, 389
DATE function, 182–184
DATEDIF function, 156–160, 172
dates and times
 converting serial numbers to, 182–184
 converting to serial numbers, 148–151, 172

differences between, 156–160, 172
 formatting, 150–152, 165–166
 functions for, finding, 181–182
 mathematical operations on, 148–152, 156–160, 164
 sorting, 143–144
 stored as numbers, 145–147, 162, 165–166
(see also parking spaces example; training program example)

DATEVALUE function, 148–151, 172

delimiter, 282

design and layout

- alignment principle, 53–56
- Cell Styles for, 45–49
- for charts, 232–235, 247–248
- keep it simple principle, 40–44
- proximity principle, 53–56
- Themes for, 47–49

(see also formatting)

diagrams, 387

#DIV/0! error, 120–121, 135

division, 7–8

dollar sign (\$), in cell references, 73–75

downloading data for exercises, xxxiii

drug study example, 118–140

- attempting calculations on text data, 119–122
- converting text to numbers, 126–130
- errors in spreadsheet, analyzing, 133–139

E

equals sign (=)

- in logical expressions, 335
- preceding formulas, 5

errors

- analyzing, 120–121, 133–139
- data type for, 135
- #DIV/0! error, 120–121, 135
- functions for, 136
- #N/A! error, 136
- #NAME! error, 134, 138–139
- #REF! error, 134, 137–138
- #VALUE! error, 134, 138–139

ERROR.TYPE function, 136

examples

- advertising, 252–277
- Automotive Weekly, 310–330
- balance sheet, 50–57
- computer manufacturing, 60–88
- customer database, 280–308
- data for, downloading, xxxiii
- drug study, 118–140
- fishermen, 332–356
- fundraising, 90–115
- government spending, 358–380
- house purchase, 198–225
- income statement, 30–57
- investment report, 228–249
- parking spaces, 170–195
- restaurant expenses, 2–27
- training program, 142–167

Excel

- versions of, covered in this book, xxxii

- website resources, xxxiii

(see also spreadsheets)

exclamation point (!), in cell references, 68, 70

exercise data, downloading, xxxiii

F

filtering data

- applying multiple filters, 109–111
- applying one filter, 107–108, 113–114, 193–194
- in pivot tables, 322–324
- uses of, 113

FIND function, 288, 298–300

fishermen example, 332–356

- counting boats in each category, 343–348

- counting boats over their limits, 350–355

- determining type of boat from boat ID codes, 333–342

font, changing, 36

format painter, 385

formatting

- alignment of cell contents, 36

- bold text, 42

- borders around cells, 36, 42

- Cell Styles, 45–49

formatting (*continued*)

- color of cell background, 36, 42
- color of cell contents, 36
- copying from one cell to another, 385
- currency, 33–38
- dates and times, 150–152, 165–166
- decimal places, 36
- excessive, avoiding, 40
- font, 36
- formulas interpreting, 36
- italic text, 42
- menu buttons for, 36
- percentages, 36, 61
- Shapes for, 387
- SmartArt for, 387
- (*see also* design and layout)

formula bar, 5–6

formulas, 5–8

- accuracy of, checking, 13–14
- auditing, 208–211
- combining results of, 24–26
- complex, breaking into columns, 350–355
- concatenating references in, 351
- copying and pasting, 20–21
- definition of, 5
- entering in cells, 5–6, 19–20
- errors produced by (*see* errors)
- formatting interpreted by, 36
- formatting not allowed in, 34–35
- functions in (*see* functions)
- grouping parts of, with parentheses, 14, 62
- mathematical operations in, 7–8
- modeling (*see* models)
- performance of recalculations, 388
- references to cell ranges in, 15–16, 67–68
- references to cells in, 11–14, 19–20, 73–75
- references to named cell ranges in, 76–78, 82–87
- references to worksheets in, 66–70

forward slash (/), division operator, 8

functions, 15–16

- arguments for, 15
- categories of, 186–189
- for data type testing and conversions, 128–130, 172
- for date and time operations, 181–182
- for errors, 136
- finding, 173–177, 181–182, 186–191, 193

for logical expressions, 335

- for pivot tables, 317–319
- for statistical calculations, 189–191
- for text operations, 286–288
- (*see also* specific functions)

fundraising example, 90–115

- filtering data, 107–111, 113–114
 - sorting data by largest contributors, 91–94
 - sorting data by largest contributors and location, 96–98
 - zooming data, 103–105
- future value calculation, 212
- FV function, 212

G

GETPIVOTDATA function, 321

Goal Seek, 262–265

government spending example, 358–380

- determining region from state, 365–373
- filtering by department-level projects, 376–379
- grouping by years, 378
- pivot chart for household by region, 372–373
- spending per household by agency and county, 363–364

graphs (*see* charts)

greater than or equal sign (\geq), 335

greater than sign ($>$), 335

green triangles in cells, 121–122

grouping and summarizing data (*see* pivot tables)

grouping parts of formulas (*see* parentheses ())

grouping sort results, 96–98

H

headings, Cell Styles for, 46

help, on functions, 173–177

hiding data (*see* filtering data)

HLOOKUP function, 375

Home tab in Ribbon, 36

house purchase example, 198–225
 assumptions, analyzing, 218–224
 determining money able to borrow, 199–201
 incorporating net present value, 202–204
 mortgage model, 207, 213–217
 rent model, 206, 210–211

I

IF function, 334–342
 IFERROR function, 136
 income statement example, 30–57
 balance sheet, 51–56
 design and layout, 40–56
 formatting, 33–38
 income statement calculations, 31–32
 interest payments calculation, 216
 interest rate calculation, 212
 investment report example, 228–249
 chart for portfolio allocation, 228–231, 239–240
 design and layout for chart, 232–234
 time chart comparing stocks, 241–248
 ISBLANK function, 128
 ISERR function, 136
 ISNONTEXT function, 128
 ISREF function, 128
 ISTEXT function, 128, 172
 italic text, 42

K

keep it simple principle of design, 40–44

L

Lake Dataville example (*see* fishermen example)
 layout (*see* design and layout; formatting)
 LEFT function, 288, 289–292, 299–300
 LEN function, 294–296

less than or equal sign (\leq), 335
 less than sign ($<$), 335
 line charts, 238, 241–248
 loans
 appreciation calculation, 217
 assumptions of, analyzing, 218–224
 future value calculation, 212
 interest payments calculation, 216
 interest rate calculation, 212
 net present value calculation, 202–206
 number of periods calculation, 212
 opportunity cost calculation, 217
 payment calculation, 211–213
 present value calculation, 200–201
 logical expressions
 counting elements based on, 190–192, 346–348
 functions for, 335
 operators for, 335
 testing if a cell contains an error, 136
 testing if all expressions are TRUE, 351–353
 testing if at least one expression is TRUE, 354–355
 testing if TRUE or FALSE, 334–342
 looking up values in a table, 367–373, 375
 lowest value, finding, 64–70, 172

M

magazine example (*see* Automotive Weekly example)
 Massachusetts Marathon example (*see* training program example)
 mathematical operations
 on dates and times, 148–152, 156–160, 164
 specifying in formulas, 7–8
 totals (*see* SUM function)
 MAX function, 64
 menu row at top of screen (Ribbon), 36
 MIN function, 64–70, 172
 minus sign ($-$), subtraction operator, 8
 models, 206–207
 assumptions of, analyzing, 218–224, 265
 different scenarios for, 258–260
 optimizations for, 262–265, 267–270, 272–276

money values, currency symbols for, 33–38
mortgages (*see* loans)
mouse, selecting cell ranges using, 67–68
multiplication, 7–8

N

#N/A! error, 136
#NAME! error, 134, 138–139
named ranges
 automatically generating, 82–87
 specifying manually, 76–78
negative numbers, 24
nesting IF functions, 336–342
net present value calculation, 202–206
not equal to sign (<>), 335
NPER function, 212
NPV function, 202–206
numbers
 converting dates to serial numbers, 148–151, 172
 converting serial numbers to dates, 182–184
 currency symbols for, 33–38
 dates and times stored as, 145–147, 165–166
 dates stored as, 162
 negative, 24
 stored as text, converting to numbers, 128–130, 172
 stored as text, green triangle indicating, 121–122

O

OLAP (Online Analytical Processing), 389
Online Analytical Processing (OLAP), 389
operators
 logical operators, 335
 mathematical operators, 7–8
opportunity cost calculation, 217
optimization problems, solving, 267–270, 272–276
OR function, 354–355

P

parentheses ()
 enclosing function arguments, 15
 enclosing numbers, 24
 to group values in formulas, 14, 62
parking spaces example, 170–195
 counting tickets sold on weekend dates, 185–189
 determining weekend dates, 178–184
 filtering dates with tickets over criteria, 194
Paste Special, 302–304, 385
payment calculation for loans, 211–213
percentages, 36, 61
performance of recalculations, 388
pie charts, 230–234, 236
pivot tables
 charts from, 325, 371–373, 377–379
 creating, 314–319
 filtering data in, 322–324
 getting data from, 321
 uses of, 313–314, 321, 325
 using databases with, 321
 using with Solver, 321
plus sign (+), addition operator, 5
PMT function, 211–213
political campaign example (*see* fundraising example)
present value calculation, 200–201
profitability example (*see* computer manufacturing example)
PROPER function, 305–307
proximity principle of design, 53–56
PV function, 200–201

R

ranges (*see* cell ranges)
RATE function, 212
#REF! error, 134, 137–138

references

- absolute references, 73–75
 - to all cells in a column, 70
 - to cell ranges, 15–16, 67–68
 - to cells, 11–14, 19–20, 73–75
 - concatenating, 351
 - to named cell ranges, 76–78, 82–87
 - relative references, 73
 - shifted during copying and pasting, 20–21
 - structured references, 82–87
 - testing if cell contains, 128
 - to worksheets, 66–70
- relative references, 73
- renting versus buying example (*see* house purchase example)
- resources, xxxiii
- restaurant expenses example, 2–27
- separating expenses individually, 18–25
 - splitting total between each person, 7–8, 12, 16
 - totaling money spent, 3–6, 11–16
- Ribbon (menu row at top of screen), 36
- RIGHT function, 288, 289–292
- running example (*see* training program example)

S

- scaling spreadsheets, 55
- scatter (XY) charts, 238
- scenarios, 258–260, 276
- segmentation of data
 - creating new fields based on existing fields, 363–365, 377–379
 - lookup tables for, 366–373, 375
- Shapes, 387
- size of spreadsheet, changing, 55
- slash (/), division operator, 8
- SmartArt, 387
- Solver, 267–270, 272–276
 - installing, 392–393
 - saving results as scenario, 276
 - using with pivot tables, 321

sorting data

- checking for accuracy of, 95, 99
- customizing criteria for, 99
- dates and times, 143–144
- by multiple columns, grouped, 96–98
- by one column, 92–95
- tables used to improve accuracy of, 99
- uses of, 113
- warnings during, 98

spreadsheets

- errors in (*see* errors)
 - files for (*see* workbooks)
 - formatting in (*see* formatting)
 - formulas in (*see* formulas)
 - functions in (*see* functions)
 - scaling, 55
 - worksheets in (*see* worksheets)
 - zooming, 103–106, 113
- square brackets ([]), in structured references, 82
- statistical calculations
- averages, 119–121, 172
 - counting elements based on logical expression, 190–192, 346–348
 - functions for, 189–191
 - maximum values, 64
 - minimum values, 64–70, 172
 - standard deviation, 138–139, 172
- (*see also* drug study example; parking spaces example)

STDEV function, 138–139, 172

- stock charts, 238
- strings (*see* text)
- structured references, 82–87
- styles for cells, 45–49
- SUBSTITUTE function, 305–307
- subtraction, 7–8, 19–20
- SUM function, 15–16, 172
- summarizing and grouping data (*see* pivot tables)
- surface charts, 238

T

tables

- creating for structured references, 82
- grouping and summarizing data in (*see* pivot tables)
- improving sorting accuracy with, 99
- looking up values in, 367–373, 375

text

- capitalizing words in, 305–307
- concatenating, 288
- copying and pasting with modifications, 302–304, 385
- determining length of a string, 294–296
- finding location of specific characters in, 288, 298–300
- functions for, list of, 286–288
- getting left substring, 288, 289–292, 299–300
- getting right substring, 288, 289–292
- numbers stored as, converting to numbers, 128–130, 172
- numbers stored as, green triangle indicating, 121–122
- removing extraneous spaces in, 288
- replacing characters in, 305–307
- splitting into columns, 282–285, 301–304
- (*see also* customer database example)

TEXT function, 128

Text to Columns, 282–285, 301–304

Themes, 47–49

time information (*see* dates and times)

Track Changes, 390

training program example, 142–167

- finding 10K races after training completed, 143–153
- finding marathons after training completed, 154–160
- time calculations, 162–166

triangles in cells, 121–122

TRIM function, 288

TYPE function, 128

U

Undo feature, 34

V

#VALUE! error, 134, 138–139

VALUE function

- converting dates to serial numbers, 146
- converting text to numbers, 128–130, 172

values (*see* numbers)

VBA (Visual Basic for Applications), 390

VLOOKUP function, 367–373, 375

W

website resources, xxxiii

what if analysis

- finding optimal outcome based on multiple variables, 267–270, 272–276
- finding optimal outcome based on one variable, 262–265
- multiple scenarios (*see* scenarios)

workbooks, 63

(*see also* spreadsheets)

worksheets

- referencing in formulas, 66–70
- selecting with tabs, 63
- (*see also* spreadsheets)

X

.xls file extension, xxxiii

.xlsx file extension, xxxiii

XY (scatter) charts, 238

Z

zooming data, 103–106, 113