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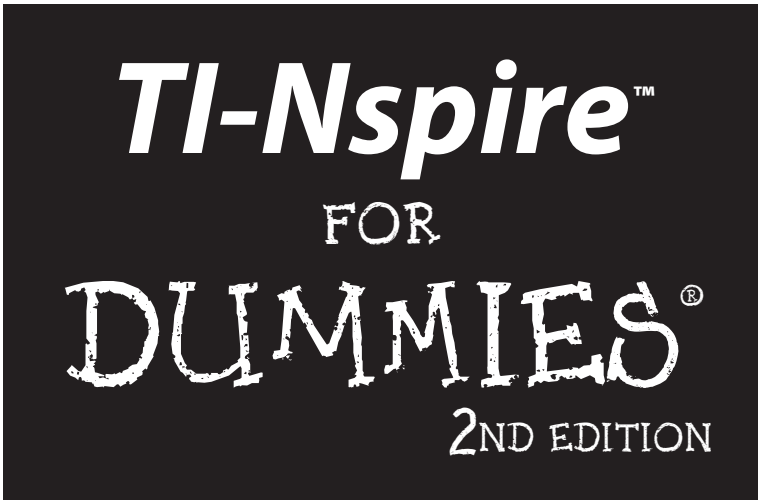

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Steve Ouellette, or Mr. O, is currently the Math Department chair at Westwood High School in Westwood, Massachusetts. Steve holds a bachelor's degree in electrical engineering from Worcester Polytechnic Institute and a Master of Arts in teaching degree from Boston University. Steve began his teaching career in 1993 after having worked as an electrical engineer at Otis Elevator Company for five years. His engineering expertise helped fuel Steve's passion for incorporating educational technology into his teaching. In addition to this book, Steve has also authored the *CliffsNotes Guide to TI-Navigator* and the *CliffsNotes Guide to TI-Nspire,* and he relishes the irony that he used to avoid writing assignments during his high school and college years. Steve has enjoyed working on a number of other TI-related projects, most notably as a regular activity writer for the *We All Use Math Everyday* program, a Texas Instruments and NCTM joint venture that provides classroom activities that relate mathematics to the TV series *NUMB3RS.* When he's not lobbying for a cameo role on *NUMB3RS,* Steve enjoys spending time with his family, camping, running with his weekend warrior buddies, and watching the local sports teams compete for championships. His passion for baseball is evident in the name chosen for his 90-pound labradoodle, Wally, named after the mascot for the Boston Red Sox.

Dedication

Jeff McCalla: This book is dedicated to my family: my wife, Shannon, and my three boys Matt, Josh, and Caleb.

Steve Ouellette: This book is dedicated to my family: my wife Christine and my three boys, Noah, Ben, and Danny.

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Introduction

TI-Nspire changes the way that teachers teach and students learn. This transformative device has just undergone a transformation of its own. The TI-Nspire CX features color on the handheld (which is definitely a game-changer). The Touchpad control of TI-Nspire is another innovation that helps students to interact with the mathematics. In addition, the operating system has undergone some major improvements in the last few years. These are some of the reasons we have updated this book.

Many of the improvements to TI-Nspire (both the OS and hardware) and TI-Nspire Computer Software are a direct result of feedback received from teachers and students. Texas Instruments is committed to providing the best tools for the teaching and learning of mathematics and science.

Do you know how to use TI-Nspire to do each of the following?

- Create and edit documents that contain multiple pages and problems
- Evaluate expressions in the Calculator application and work with fractional or decimal results
- Graph and manipulate a parabola
- Manipulate a geometric object and analyze its changing attributes on a coordinate plane in real time
- Generate a sequence in the Lists & Spreadsheet application
- Enter data in the Lists & Spreadsheet application and construct a summary plot in Data & Statistics that compares the data in a side-by-side bar chart
- Use TI-Nspire Computer Software to insert a color background image on a Graphs page
- Take pictures of your TI-Nspire Handheld screen and insert them in a word processing document
- Link TI-Nspire applications to represent information algebraically, numerically, graphically, and verbally

If not, then this book is for you. As you read through the pages, you will find straightforward and practical information that is sure to take you well beyond the beginning stages of using TI-Nspire.

About This Book

This book will not tell you everything you need to know about TI-Nspire. However, I do cover all the basics and give you the tools to start creating your own TI-Nspire documents. Additionally, you will see enough examples to gain an appreciation for the *potential* that TI-Nspire has to offer. It's my belief that your experience gained from reading this book (and playing along on your TI-Nspire device) will give you the confidence to forge out on your own.

I outline a lot of concrete steps and processes to perform a variety of tasks. I use specific math applications as the backdrop for these tasks for the purpose of demonstrating how TI-Nspire can be used as a wonderful teaching and learning tool. As you read this book, you will begin to appreciate that TI-Nspire is a very robust device — if you can think it, TI-Nspire can most likely represent it.

TI-Nspire Terminology

TI-Nspire learning technology comes with its own unique language. The meaning of most TI-Nspire-related words found in this book can be initially understood from their context. However, just to avoid any unnecessary confusion, here are three key terms that you should know right from the get-go:

- **Handheld:** I use this term when referring to the TI-Nspire product that you quite literally hold in your hand. You find three families of TI-Nspire Handhelds: TI-Nspire with Clickpad (the original), TI-Nspire with Touchpad (the next generation), and TI-Nspire CX (new color version), as well as CAS versions of each type (with the computer algebra system built-in). Notice that it is not called TI-Nspire Calculator, but TI-Nspire Handheld, because it is much more than just a calculator! Incidentally, the word "handheld" will be capitalized when prefaced by TI-Nspire, otherwise it will be lowercase.
- **Tool:** I routinely make reference to *tools* when talking about some of the features contained in the Graphs or Geometry application. When a tool is activated in either application, its associated icon is displayed in the upper-left corner of the screen. A tool remains active until you press either esc or tab, or when you begin using another tool. The Triangle tool is one such example. As the name implies, this tool allows you to draw a triangle.

- **TI-Nspire Computer Software:** Texas Instruments offers two types of software: TI-Nspire Student Software (which comes free with the purchase of a handheld) and TI-Nspire Teacher Software. Because these products are so similar, I often use the more generic term to describe both. Schools and our society are using computers more and more. With that in mind, one chapter on TI-Nspire Computer Software has been expanded to include three chapters in the update of this book.

Conventions Used in This Book

When I wrote this book, I had to train myself not to refer to the TI-Nspire unit as a *calculator.* This word is quite misleading, and it suggests that TI-Nspire has a limited amount of computing power. Rather, you will find that I refer to this product as a *device* or *handheld.*

As for pressing keys, I always refer to them by an icon represented by the physical key. For example, rather than saying "press the Enter key," I say "press enter." Sometimes, I refer to a sequence of keys to push, in which case I say "press ctrl to grab the object."

To access secondary functions, you must first press the ctrl key. I always tell you the exact keys to press to access such functions. For example, I say "press ctrl x^2 to access the square root template."

The Touchpad (similar to a touchpad on a laptop) is located at the top of the keypad with the key in the center. You also see small ◀ ▶ ▲ ▼ symbols located on the Touchpad. If I want you to move the cursor in a specific direction, say to the left, I tell you to "press the ◀ key repeatedly." If I simply want you to move the cursor to some other location, I say, "Use the Touchpad keys to move the cursor to a new location." If you want to move quickly, just swipe your finger across the Touchpad like you would on a laptop.

Foolish Assumptions

I assume that you are a beginning user who wants to discover the basics to get up and running with TI-Nspire. Why else would you choose to read a *For Dummies* book? Here are some other assumptions that I've made:

- You already own a handheld device or are planning on obtaining one soon.
- You are either an educator or a student. Being an educator myself, I found it tempting to write this book from a teacher's perspective. Although I do make some occasional references to teachers, you can expect that this book will work equally well for both teachers and students.

- As you see in Part IX, TI-Nspire Computer Software works nicely as a companion to the handheld device. I wrote these chapters under the assumption that you have some basic knowledge of how computers work. As you see in other sections of this book, a basic working knowledge of computers also comes in handy when working with your TI-Nspire Handheld (the *right-click* shortcut will become your best friend).

How This Book Is Organized

This book is organized around TI-Nspire's seven core applications. Because TI-Nspire applications often work together, it's hard to talk about them in isolation. However, I've done my best to write this book in such a way that you can jump in pretty much anywhere in the text without having to read the pages leading up to it. That being said, I recommend that you read this book sequentially to get the most out of it.

Part I: Getting to Know Your TI-Nspire Handheld

In this part, I cover all the basics. This is where I introduce you to the philosophy behind TI-Nspire, the initial setup procedure, the document model, and all the tips and tricks that allow you to create, edit, and navigate documents quickly and efficiently.

If you are the type who likes to jump around from section to section, go right ahead. However, check out this part of the book first. It gives you the underlying structure to everything TI-Nspire.

Part II: The Calculator Application

This part gets into the first of seven core TI-Nspire applications. Here, you find out how to access a range of tools and commands that allow you to work with a variety of mathematical expressions and equations. In this part, I also start getting into how the Calculator application can "talk" to other applications. Finally, I introduce you to the computer algebra system of the TI-Nspire CAS Handheld.

Part III: The Graphs Application

The Graphs application represents one of TI-Nspire's most powerful applications. You find out how this application is used to provide a wide variety of different graph types, including functions, inequalities, scatter plots, polar equations, parametric equations, differential equations, and sequences.

I hope you'll also recognize the advantages that the Graphs application has to offer, providing a visual representation that can be analyzed right in the graphing window.

Part IV: The Geometry Application

The Geometry application provides one of TI-Nspire's most dynamic environments. Here, you find out how to work in an analytical environment, a plane geometry environment, or a combined analytic/plane geometry environment.

If you have some experience working with dynamic geometry software, you'll appreciate the smooth transition to this application. I hope you'll also recognize the advantages that the Geometry application has to offer, especially with its capability to have multiple representations on one page.

Part V: The Lists & Spreadsheet Application

Your experience with computer-based spreadsheet applications really pays off here. If words such as *fill down, cell,* and *formula* sound familiar, you'll have little trouble figuring out how to navigate this application. I also get into combining the Lists & Spreadsheet application with the Graphs, Geometry, or Data & Statistics application to perform regressions and investigate scatter plots.

Part VI: The Data & Statistics and Vernier DataQuest Applications

If you are working with the Lists & Spreadsheet application or the Calculator application, this application is perfectly suited for one- and two-variable analysis. In this part, you discover how to create and analyze a host of different

statistical graphs, including dot plots, histograms, box plots, scatter plots, and summary plots. New color features allow incredible-looking comparative data representations. I also introduce Data Collection, a feature that works in conjunction with the Graphs, Geometry, Lists & Spreadsheet, and Data & Statistics applications.

The Vernier DataQuest application provides you with data collection tools that you have only dreamed of! Three views allow multiple representations of the data. Customize the data by selecting only the part of the data you would like to analyze. Using Lab Cradles, digital probes are now available. In addition, multiple probes are available using USB connections to a computer. If you are used to using EasyData on the TI-84, this application will blow you away!

Part VII: The Notes Application

The Notes application is the glue that holds together TI-Nspire's other applications. Simply put, this application makes the document model possible, eliminating the need to add paper to your activities as well as providing the continuity that makes your documents flow. You will find out how math expression boxes can become dynamic, linking interactively with the other applications.

Part VIII: TI-Nspire Computer Software

In this part, I talk about how TI-Nspire Computer Software makes a connection between your handheld device and your computer, allowing you to transfer files, take pictures of your handheld screen, back up your device, and upgrade the operating system.

TI-Nspire Computer Software allows you to quickly create and edit documents that are completely compatible with those that reside on your handheld device. In addition to providing the nuts and bolts of how to use this software, I give you several reasons why you might want to use it in the first place. I think you will agree that using the software to add a color image to the background of a Graphs page is bad to the bone!

Part IX: The Part of Tens

In Part IX, I give you a lot of good information — *quickly.* Here, I summarize ten great tips and shortcuts, periodically mentioned throughout the book, that are sure to save you lots of time. Finally, I resolve some common

mistakes that I see in the classroom, and I equip you with the tools and knowledge to avoid the same pitfalls, as well as provide a way for you to access the vast array of resources that are available on the Internet.

Icons Used in This Book

This book uses four icons that help to emphasize a variety of points.

The text that follows this icon gives suggestions or shortcuts that help enhance your documents. These helpful little nuggets often pertain to the current material or suggest ways to extend or enhance the use of TI-Nspire.

The text that follows this icon tells you something that is truly worth remembering. I often use this icon to repeat something mentioned earlier in the book or to highlight information that will eliminate potential mistakes down the road.

The text associated with this icon is intended to warn you about more catastrophic mistakes, especially those that are difficult to troubleshoot. I'm thinking about that insidious issue that has no associated warning message. Nothing is more frustrating than dealing with an issue for which there appears to be no solution. This icon eliminates some of those issues.

I use this icon sparingly in this book. It gives you additional technical information that is intended only to satisfy your intellectual curiosity.

Where to Go from Here

This book is not the end-all. In fact, I periodically point you in the direction of some additional resources that are available to you. These resources include those provided with your TI-Nspire device when you purchased it as well as the abundance of resources found on TI's Web site, `www.education.ti.com`.

Regarding how to read this book, I mention earlier that you can read it sequentially or jump around as you see fit. If you are trying to locate something specific, refer to the table of contents or look it up in the index at the back of the book.

Many people try to memorize steps to accomplish a task on the TI-Nspire. I have even had a participant in one of my sessions who didn't want to pick up the TI-Nspire. She would have been happy to just take notes on all of the

steps that we went through in the training. But is this the best way to learn new technologies? My suggestion to her (and you) is to experiment! Don't be afraid of making a mistake. Live dangerously. Grab different objects and observe the corresponding effects. If you don't like an effect, press ctrl esc to undo what you did. Fortunately, you don't have to take notes on the steps (they are already written down for you in this wonderful book). Don't be afraid to branch out and do additional explorations of your own.

Part I

Getting to Know Your TI-Nspire Handheld

The 5th Wave By Rich Tennant

"You can sure do a lot with a TI-Nspire, but I never thought dressing up in G.I. Joe clothes and calling it your little desk commander would be one of them."

In this part . . .

This part gives you all the tools necessary to start creating and editing TI-Nspire documents. I encourage you to start thinking of TI-Nspire as something more than a calculator — something closer to a computer. From installing the batteries to managing files to understanding the document model, this part is sure to get you comfortable with the nuts and bolts behind TI-Nspire. I show you how to use such time-saving shortcuts as right-click and Ctrl+S.

Chapter 1

Using TI-Nspire for the First Time

In This Chapter

- Understanding the philosophy behind TI-Nspire
- Using TI-Nspire to explore mathematical concepts
- Understanding the document model
- Relating TI-Nspire to things you do on a computer
- Comparing the TI-Nspire product line
- Taking TI-Nspire out of the box and getting started

If you are brand new to TI-Nspire, I encourage you to start with this chapter. In this chapter, you begin to gain an appreciation of how TI-Nspire can help you understand mathematical concepts in a new way. You also find out about the different TI-Nspire products available and see some of the first steps to get up and running with TI-Nspire technology.

The Philosophy behind TI-Nspire

The best way to understand the philosophy behind TI-Nspire is to read this book and start playing with the device. However, let me whet your appetite now with a few thoughts about how TI-Nspire works and describe some things you can do with TI-Nspire that really showcase its capabilities.

Multiple representations

It has been demonstrated that students learn mathematical concepts more quickly and in greater depth when concepts are presented in multiple ways — that is, in algebraic, graphical, geometric, numeric, and verbal ways. TI-Nspire technology is all about multiple representations. In fact, TI-Nspire can display up to four different representations on a single screen.

Furthermore, these representations are dynamically linked. As you see in the next section, changes to one representation automatically affect the other representations, in real time, right on the screen. This highly interactive approach allows students to "see" the math, which enhances their ability to make mathematical connections and solve problems.

Figure 1-1 shows a simple example in which three representations of a concept are displayed. In the first screen in Figure 1-1, I give the algebraic representation of a given word description. In the second screen in Figure 1-1, I give the geometric representation and the numeric representation. Notice that the second screen contains two different applications on the same screen. With TI-Nspire, you have the option of displaying up to four different applications on one screen.

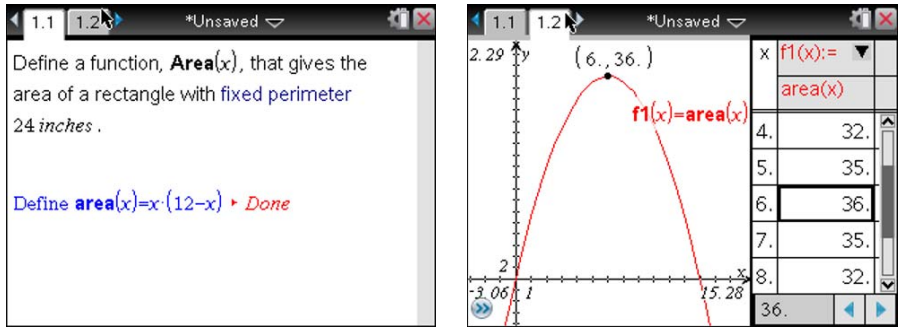

Figure 1-1: Multiple representations.

Linking representations

The idea of linking representations is another core feature that separates TI-Nspire from other calculators or handhelds.

Although it's nice to see multiple representations of a mathematical concept, it's really cool to have the option of manipulating one representation and watching the corresponding effect on another representation.

In the first screen in Figure 1-2, I change the size of a circle and watch the corresponding changes in *radius* and *area* measurements plotted on the coordinate plane in real time. The second screen in Figure 1-2 shows the radius and area data that automatically populates the Lists & Spreadsheet application as the circle is resized. This data represents the coordinates of each point that comprise the scatter plot.

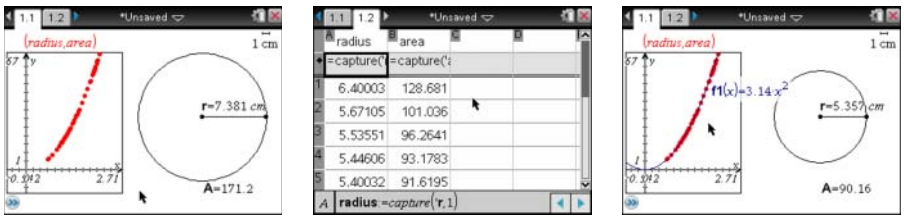

Figure 1-2: Linking representations.

Grab and move

The previous example helps to illustrate the grab-and-move philosophy inherent to TI-Nspire. You can also grab and move certain graphed functions and manipulate the axes themselves.

Imagine graphing $y = x^2$ in the previous example. TI-Nspire gives you the ability to grab the graph itself and change its shape. As you do this, the displayed equation on the screen updates automatically, again, in real time. Match the function to the scatter plot, and observe that the equation approximates $y = 3.14x^2$. Refer to the third screen in Figure 1-2.

The interactive feedback from this simple scenario allows students to explore and identify patterns and to make conjectures based on their observations. What a wonderful and interactive way to demonstrate the formula for the area of a circle!

The document model

In Chapter 2, you find out how TI-Nspire uses documents to engage students in interactive activities. A *document* is a TI-Nspire file that contains problems and pages. With TI-Nspire, you can create, edit, save, and review your documents using many of the same commands and file storage methods you use on a computer.

The document model provides students with three distinct advantages:

- Students can interact with the mathematics rather than just read about the mathematics in a static textbook.
- Students can pick up where they left off after leaving class.
- Students can work at home, either on their handhelds or on their computers.

As an educator, the document model provides you with these advantages:

- Teachers can prepare documents in advance and transmit them to students for use individually or in groups.
- Complicated constructions can be prepared in advance, thereby allowing students to focus on the math.
- Teachers can use multiple representations and the dynamic nature of TI-Nspire to really understand the underlying concepts behind the math.

The Computer Connection

If you are at all familiar with a PC, you should find the transition to TI-Nspire quite smooth. For starters, TI-Nspire documents consist of one or more pages, much like a document you might prepare using a word processor. As for working with your documents, you will find out about a variety of shortcuts that are virtually identical to those that you may already be using on your PC. For example, pressing the key sequence ctrl S saves your work, pressing tab moves you to the next field in a dialog box, pressing ctrl menu pulls up the context menu (the equivalent of a right-click menu on your computer), and so on. As for the right-click reference, get used to me talking about that feature. It's an incredible time-saver that you simply must take advantage of!

The more you remind yourself of this computer connection, the faster you will travel along the learning curve.

TI-Nspire versus TI-Nspire CAS

The TI-Nspire product line includes TI-Nspire and TI-Nspire CAS (both in the handheld and as a computer application). The TI-Nspire Handheld device performs numerical or *floating-point* calculations, much like those performed by the TI-83 and TI-84 product line. The TI-Nspire CAS Handheld has all the functionality of the TI-Nspire technology with two notable differences:

- TI-Nspire CAS technology has a built-in computer algebra system, which allows symbolic representation of numerical calculations — and the manipulation of algebraic expressions and processes (that is, you can expand binomials, find derivatives of algebraic expressions, and so on). For example, the solution to $x^2 = 12$ is given as

  $x = -2\sqrt{3}$

  and

  $x = 2\sqrt{3}$