

**Instructor's Guide**  
**for**  
**Networking Basics CCNA 1 Companion Guide**

By Wendell Odom and Tom Knott  
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Tom Knott has written this brief Instructor's Guide to answer some of your questions and offer a little guidance on the pedagogy and resources available to you and your students:

|                                                      |   |
|------------------------------------------------------|---|
| What's New About The Companion Guide? .....          | 1 |
| How Will The Companion Guide Help Me? .....          | 2 |
| How Will The Companion Guide Help My Students? ..... | 4 |
| Additional CCNA Exam Preparation Resources .....     | 5 |
| A Sample Lesson .....                                | 7 |

### **What's New About The Companion Guide?**

The new *Networking Basics CCNA 1 Companion Guide* has a different look and feel from the online curriculum. The authors bring a new and less formal perspective to the material, and make it more readable and relevant.

Wendell Odom, who may be familiar to you if you have used one of his CCNA Exam Certification Guides, is the principle author and brings a wealth of networking experience as a CCIE and as an instructor. His real-world examples and explanations are highly informative.

Tom Knott, a regional instructor, has taught all versions of the online curriculum since version 1.0. As the Cisco Networking Academy Program has evolved, he has been a contributing participant. He also worked for two years as a faculty intern for the Cisco Networking Academy Program. His mission in creating this book was to keep a focus on the audience and to give examples of what has worked in his classroom.

Together, the authors bring a blend of experience that makes this book unique. With this combination come some compelling reasons to use the *Networking Basics CCNA 1 Companion Guide*:

- As obvious as it may seem, **this book is portable**. Students without a computer at home can have access to the curriculum. Also, students in a classroom without the optimum 1:1 student to computer ratio may do alternative exercises or problems in the book and not have down time. Students traveling during school time can also use the book as a resource and stay caught up with their classmates.
- The *Networking Basics CCNA 1 Companion Guide* **matches the online curriculum module-for-module**. However, there is a major difference from earlier Companion Guides: **It is not a paper copy of the online curriculum**. While all the required topics are covered, new illustrations, examples and problems are used. Packet Tracer examples give a visual representation of concepts and increase comprehension.

To make it easier to use this book as a companion to the course, inside each chapter the major topic headings match the major sections of the online course modules. (Chapter 10 is an exception to this rule.) However, the *Companion Guide* presents many topics in a slightly different order under each major heading.

- The book **includes a CD with additional resources**. You will find version 3.2 of Packet Tracer, the network device simulation program on the CD along with interactive media activities from the course. The current online curriculum has sections that are identified in the PASS documents as optional. In the new Companion Guides these are now called “Additional Topics of Interest” and are set apart as PDFs on the CD instead of being included in the book.
- **Other online resources are also available**. There are two places for extra resources.
  1. **For Instructor Resources** go to [www.ciscopress.com/irc](http://www.ciscopress.com/irc) to follow the links to the Instructor Resources for this book on prenhall.com. (Or you can go directly to [www.prenhall.com](http://www.prenhall.com), click on Instructor Support, log on, and search for the *Networking Basics CCNA 1 Companion Guide*, ISBN: 1587131641.) Instructor resources available from this site include a testbank of questions and PowerPoint slides.
  2. **For access to the Student Resources**, use the *Companion Guide*’s ISBN to register online at the Cisco Press website. Included at the Cisco Press site are answers to the Appendix C Extra Practice problems and the Packet Tracer configuration files that are referred to throughout the book. By registering the book you will also be eligible for exclusive deals from Cisco Press.

To register this book, go to [www.ciscopress.com/bookstore/register.asp](http://www.ciscopress.com/bookstore/register.asp) and enter the book’s ISBN located on the back cover of the book. You’ll then be prompted to log in or join ciscopress.com to continue registration. After you register the book, a link to the supplemental content will be listed on your *My Registered Books* page.

This book will support and enhance what you are already doing in class. Use it to increase comprehension for you and your students. It goes beyond previous *Companion Guides* by providing alternate examples and explanations as compared with the online course.

## How Will The Companion Guide Help Me?

The book is a resource for instructors as much as it is a text for students. Don’t use it as a replacement for the online curriculum, but as a tool to supplement it. Here are some ways to use the book as an instructor:

- First, use the book as a resource to **increase your own understanding of networking**. Many Cisco Networking Academy Instructors teach several different courses and find it difficult to become comfortable with the course content. Reading this book and using the included additional resources will increase your understanding of the material. As an instructor, please find time to read the “Additional Topics of Interest” that are on the CD. You’ll learn the material to a depth that goes beyond the minimum, and will be better able to answer your students’ questions.
- The book is laid out with some **very useful items at the beginning of each chapter**. The “Chapter Objectives” cover the core concepts of the chapter and are useful in planning lessons. The “Key Terms” are listed in the order in which they are explained in the chapter. If there are “Additional Topics of Interest” for the chapters that are on the CD, they are also listed.

- Throughout the chapter there are “**How-To**” lists that are sets of steps used to accomplish a task. These lists are a quick summary of various procedures and often clarify complex tasks.
- **Notes, tips, cautions and warnings are in the margins of the pages.** Always read these as they point out interesting facts, time-saving steps and safety information.
- As mentioned earlier, look at the “**Additional Topics of Interest**” on the CD for each chapter. Although this material is optional and is not on the module exams, it is a great way for instructors to increase their knowledge and get a better background on certain technologies and concepts. Also, identify topics that, time permitting, can be used in class to help students deepen their understanding. Some topics you may want to include as part of your class discussions are fiber optic and wireless media, wireless security, TIA/EIA Category 6 UTP standards, routers with DSL and Cable modem connections, more depth on Ethernet collisions and errors, 10-Gigabit Ethernet and Ethernet encoding, and RARP and BOOTP.
- Use the book as a **resource for in-class work.** For example, many instructors assign a “warm-up” problem at the beginning of each class. The problem is from material covered in a previous meeting of the class and gives the instructor a quick way to check for student understanding before proceeding to a new topic. Also, some concepts require constant revisiting and reinforcement. Most instructors agree that students can never do too much subnetting! Even after CCNA 1, a subnetting problem every week is a common assignment by many instructors. Other areas you may want to revisit on a regular basis are the OSI and TCP/IP models, and Ethernet switching concepts.

See *A Sample Lesson* in this Instructor Guide for an example of how you might use the Companion Guide in a daily lesson.

- **Packet Tracer problems and examples are included throughout the chapters.** Students like using this visual (and sometimes noisy!) tool. Version 3.2 of Packet Tracer is included on the CD. Network designs from the simple to the complex can be done, and the resulting animations that show packet paths and collisions are very popular with students and instructors. The Packet Tracer program that is on the CD can be used by students to install on their home computers.

*Note:* The Packet Tracer application has a built-in Help function that serves well as an instruction manual. There is a “Contents” section that includes a lesson on “Getting Started.” There is also a “Tutorials” section that shows how to do common tasks. Use them to become familiar with Packet Tracer and have your students use them. While Packet Tracer does not have the full functionality of real equipment, it is an excellent simulation and visualization tool. The ability to create animations and then to watch packets as they move across a network is a very informative process for students.

- **Use the book as a resource for assignments on difficult topics.** Many instructors spend considerable time creating problems and worksheets for their students. With this book you can assign the book’s chapter opening questions (i.e., the objectives) as well as the end-of-chapter problems (noting that the answers are included in the appendix) and Packet Tracer Activities with associated configuration files. Also log on to the Instructor Resources at [prehall.com](http://prehall.com) for the testbank of questions.

- The book is a **good resource for homework assignments**. Assign a section for reading that will be covered in the next day's class discussion. When students come to class with a basic understanding of the topic, they are more likely to participate in the discussion and to learn additional information from your lectures.
- **Assign the key terms from each chapter as vocabulary words**. Part of the difficulty students have with new material is the lack of familiarity with the "lingo" of the topic. In many cases, it is similar to learning a new language. Students can use the new glossary to look up the terms, or can skim the chapter for definitions as the terms listed at the beginning of each chapter have the corresponding page number listed with each terms. Understanding the terms before coming to class will better prepare the students for classroom discussion.
- **The glossary contains over 700 terms**. It not only defines the key terms from the chapters, it includes other terms that are helpful in working toward the CCNA certification.
- **Each chapter has a summary** at the end. It is a good guide for creating an overview lecture or discussion before students take an online module exam, or it can be used to make sure all the important points of the chapter are covered as lessons are planned.

All of these activities and assignments are useful in preparing students for the module and semester exams, and instructors can also do them before taking the CCNA certification exam.

## How Will The Companion Guide Help My Students?

Our ultimate goal as instructors is to help students better grasp the information they need to be successful in our classes and eventually in a networking career. For this book to be truly useful, it has to assist in meeting that goal. Below are some ideas on how to help your students.

- **Use the book to reinforce and complement what you are already doing** as an instructor. You know your students best, and know what works with them. Use the resources in the book that are appropriate for your students.
- You will find that students' **understanding of networking topics will increase by reading a book that is in a different voice and uses different explanations** from the online material. The book is written in a more conversational tone that follows an accessible and consistent reading level. Students tend to skim through the online curriculum, so the book is written in a style that will hold their attention and seem more relevant to real-world networking situations.
- Be sure to call their attention to the **author's notes in the margin**. These little tidbits of information provide valuable insights into what sometimes are complex topics. Other times they give a bit more detail than the curriculum requires, but in doing so increase comprehension.
- **Evaluate students individually after they take an online module exam and then assign reading and problems from the book**. When they have gained a better understanding of the material, have them retake the module exam. Content mastery is the goal; students need to demonstrate solid knowledge before continuing with the next module.
- The book identifies the curriculum labs for each chapter. **Students must do the labs without exception**. The hands-on experience is invaluable in helping students understand the material.

Many students say that the labs make sense of the theory. The new supplemental *Labs and Study Guide* by Cisco Press contains the curriculum labs plus additional labs for even more practice.

- **Like every other subject, practice makes perfect** (or closer to it). Students need to work practice problems to prepare for the module exams. Questions at the end of each chapter should always be done before students take the online module exams. There are two types of problems at the end of most chapters: “Check Your Understanding” questions and “Challenge Questions and Activities.”
- The “**Check Your Understanding**” problems at the end of every chapter include an answer key. The answer key has explanations for why answers are correct. Just as important, it explains why other answers are incorrect.
- The “**Challenge Questions and Activities**” may be used to evaluate whether students have grasped the “big picture” concepts and related information from the current chapter to previous chapters. These questions and activities are similar in difficulty level to questions on the CCNA certification exam.
- The **practice math problems** in Appendix C are also appropriate for the evaluation of where students are in their understanding of manipulation of binary, hexadecimal and decimal numbers.
- Before they take an online module exam, have students **read the chapter summary** at the end of the chapter. If they see a term or concept that is unfamiliar or unclear, make sure they reread that section of the curriculum before taking the exam.
- Students can **use the book for CCNA exam preparation**, along with the online curriculum and other test preparation materials listed below.

This *Companion Guide* is a rich resource that is not a replacement for the online curriculum, but one that increases understanding and the comfort level students have with the curriculum.

## Additional CCNA Exam Preparation Resources

New *Companion Guides* for CCNA 2, CCNA 3 and CCNA 4 will also be published. They will be similar in concept to this book, bringing a fresh perspective to the curriculum. (Likewise there are new corresponding *Labs and Study Guide* books for each of the CCNA courses. For more information go to [www.ciscopress.com/irc](http://www.ciscopress.com/irc))

The *CCNA Certification Library* (ISBN: 1587200953) contains the *CCNA INTRO* and *CCNA ICND* (Interconnecting Cisco Networking Devices) books, along with *NetSim LE*. Also in the box set are two CD-ROMs with over 500 practice questions for the ICND, INTRO and CCNA exams. Simulation-based questions are included. There is a \$10.00 exam voucher with this set of two books and two CDs with self-study testing engines.

The *CCNA Flash Cards and Exam Practice Pack* (ISBN: 1587200791) book contains more than 1100 flash cards, practice questions, and quick reference sheets. In the time immediately before taking the CCNA exam, use the more than 550 flash cards that come in PC, handheld and print formats. The Test Engine contains more than 500 test questions, including simulations. The companion CD-ROM contains flash cards and test questions which can be downloaded to Palm OS and PocketPC handheld devices.

The **test engine** incorporated into the *Exam Certification Guides* and *CCNA Flash Cards and Exam Practice Pack* allows candidates to customize the test simulator to the exam path they choose, and select multiple-choice or simulation-based questions. Candidates can take sample INTRO exams, ICND exams, or unified exams, and may choose to take either practice exams or true-to-life timed exams.

The **CCNA Command Quick Reference** (ISBN: 1587131595) is designed especially for the Cisco Networking Academy Program. It summarizes all commands with keywords, command arguments, and associated prompts. *CCNA Command Quick Reference* is a short and concise reference to the commands needed for CCNA level and the CCNA exam.

Cisco Press is publishing a book called **31 Days Before Your CCNA Exam** (ISBN: 1587131749) that will work with the new Companion Guides and the online curriculum in context with the certification objectives. A day-by-day quick reference study guide, the book summarizes the key points from each module that pertain to each objective on the 640-801 CCNA exam. For a student who already understands the concepts and details through completion of the Cisco Networking Academy CCNA v3.1 curriculum, this book will help the reader sign up for the test and spend the next 31 days in preparation using the Academy curriculum and Companion Guides.

One last resource recommended for all students planning to take the CCNA certification exam is the **CCNA Exam Prep Center** that can be accessed at: <http://www.cisco.com/go/prepcenter/> It is necessary to obtain a login for cisco.com to gain access to this site, but even high school students can do so. After logging in, they have a wide variety of resources:

- INTRO and ICND exam practice questions
- CCNA exam practice questions
- CCNA videos that cover topics, such as ACLs, Routing Protocols, IP Addressing and VLANs
- labs and new simulations
- exam tips
- CCNA certification question of the week
- Live chat with customer service
- several Cisco learning games
- and much more!

All of these resources will work together in helping students (and instructors) obtain the CCNA certification.

## **Summary**

A good deal of work went into making the *Networking Basics CCNA 1 Companion Guide* more than just a copy of the online curriculum. The look-and-feel, the readability, the examples, the illustrations, the problems, all these things in combination make this an instructional tool you and your students will like.

## A Sample Lesson

Here is an example of how the material in the *Companion Guide* supplements the online curriculum and can be used in your classroom. This lesson covers part of everyone's favorite CCNA1 topic: subnetting.

**Goal:** Students will be able to identify an IP address' "resident subnet" using two different methods to solve the problem.

**Instructor's note:** One of the most difficult types of questions on the Module 10 exam (and the CCNA certification exam) involves identifying the resident subnet for a given IP address. According to the definition found in the book's glossary (p. 557), the *resident subnet* is "the subnet of which an IP address is a member." Make sure all key terms have been discussed prior to attempting the problem.

Knowing the terminology is critical to answering the questions, so knowing what a resident subnet is allows us to start solving this problem:

*What is the resident subnet of the IP address 192.168.1.200 with a subnet mask of 255.255.255.240?*

**Instructor's note:** Start by having students identify the class of this address, and the network number this address would be a part of if it was not subnetted.

### **Method One:**

Figure 10-14 on page 443 of the *Companion Guide* gives an example of how to solve a problem of this type using Boolean logic.

First, convert the IP address to binary:

11000000 . 10101000 . 00000001 . 11001000

Next, convert the subnet mask to binary:

11111111 . 11111111 . 11111111 . 11110000

Then, do a logical AND with the two lines (remember, ANDing is when only 1 AND 1 = 1, all other combinations = 0):

```
11000000 . 10101000 . 00000001 . 11001000
AND 11111111 . 11111111 . 11111111 . 11110000
= 11000000 . 10101000 . 00000001 . 11000000
```

Convert the result back to decimal, which will give the resident subnet for 192.168.1.200:

```
11000000 . 10101000 . 00000001 . 11000000
= 192.168.1.192
```

### **Method Two:**

As with many things in life, there's more than one way to accomplish a task. For those students who are challenged by binary math, the book provides an alternative method to approach the problem. There is a list of steps on page 444.

Step 1: Write down the Class A, B, or C network number in which the address resides.

Step 2: Using the process defined earlier in this chapter in the section "Finding Subnets and Broadcast Addresses Using Shortcuts," discover all subnet numbers of the Class A, B, or C network, using the stated subnet mask.

**Instructor's note:** The "process defined earlier" begins on page 439 and covers filling out a table that looks like this:

| Subnet Number | Lowest IP Address | Highest IP Address | Broadcast Address |
|---------------|-------------------|--------------------|-------------------|
| 192.168.1.0   | 192.168.1.1       | 192.168.1.14       | 192.168.1.15      |
| 192.168.1.16  | 192.168.1.17      | 192.168.1.30       | 192.168.1.31      |
| 192.168.1.32  | 192.168.1.33      | 192.168.1.46       | 192.168.1.47      |
| 192.168.1.48  | 192.168.1.49      | 192.168.1.62       | 192.168.1.63      |
| 192.168.1.64  | 192.168.1.65      | 192.168.1.78       | 192.168.1.79      |
| 192.168.1.80  | 192.168.1.81      | 192.168.1.94       | 192.168.1.95      |
| 192.168.1.96  | 192.168.1.97      | 192.168.1.110      | 192.168.1.111     |
| 192.168.1.112 | 192.168.1.113     | 192.168.1.126      | 192.168.1.127     |
| 192.168.1.128 | 192.168.1.129     | 192.168.1.142      | 192.168.1.143     |
| 192.168.1.144 | 192.168.1.145     | 192.168.1.158      | 192.168.1.159     |
| 192.168.1.160 | 192.168.1.161     | 192.168.1.174      | 192.168.1.175     |
| 192.168.1.176 | 192.168.1.177     | 192.168.1.190      | 192.168.1.191     |
| 192.168.1.192 | 192.168.1.193     | 192.168.1.206      | 192.168.1.207     |
| 192.168.1.208 | 192.168.1.209     | 192.168.1.222      | 192.168.1.223     |
| 192.168.1.224 | 192.168.1.225     | 192.168.1.238      | 192.168.1.239     |
| 192.168.1.240 | 192.168.1.241     | 192.168.1.254      | 192.168.1.255     |

Start by writing the network number in the first Subnetwork Number cell. Then write the unsubnetted network's broadcast address in the last Broadcast Address cell. It is then necessary to determine the increment that the Subnet Number will increase by for the next subnet.

Look at the subnet mask and determine how many former host bits are now used for subnetting (Compare to the default subnet mask for this class of address).

In this problem, the value of the default Class C subnet mask is 255.255.255.0. Since the last octet in this problem's subnet mask is 240, four host bits have been converted to subnet bits (128+64+32+16 = 240).

To determine the increment for each subnet, use this formula: Subnet Increment =  $2^{8-s}$ , where "S" is the number of subnet bits. The increment for this problem is  $2^{8-4}$ , or  $2^4$ , which is 16. Looking in the first column, and all other columns, the number in the last octet increases by 16 you go down each column.

Step 3: So how does all this help us find the answer to the original question? Look for the range of numbers the IP address 192.168.1.200 falls in. It's between 192.168.1.193 and 192.168.1.206, so look to the left column to find the resident subnet: 192.168.1.192.

*Note*: There is a quick way to find the increment that the subnet number will increase by in the first column. Look at the value of the right-most bit used for subnetting. In this problem, it's the "16" bit in the fourth octet. Subnet numbers will increment by a value of 16 in the fourth octet.