

COMPLETE A+ GUIDE TO IT HARDWARE AND SOFTWARE

CompTIA® A+ Exams 220-1101 & 220-1102

CHERYL A. SCHMIDT CHRISTOPHER A. LEE



Complete A+ Guide to IT Hardware and Software

A CompTIA® A+ Core 1 (220-1101) & CompTIA A+ Core 2 (220-1102) Textbook

NINTH EDITION

CHERYL A. SCHMIDT CHRISTOPHER A. LEE

FLORIDA STATE COLLEGE AT JACKSONVILLE

PEARSON IT CERTIFICATION

Complete A+ Guide to IT Hardware and Software: CompTIA A+ Exams 220-1101 & 220-1102

Table of Contents

Cover

Title Page

Copyright Page

Contents at a Glance

Contents

Introduction

Features of this Book

Chapter 1: Introduction to the World of IT

Who Needs This Book?

Technician Qualities

Breaking into IT with the CompTIA A+ Certification

Basic Skills for This Course

Types of Computers

Basic Computer Hardware

Mice and Keyboards

Common Peripherals

1s and 0s

Safety Notes

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 1.1: Identifying Tower Computer Parts

Exercise 1.2: Identifying Computer Parts

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills



Chapter 2: Connectivity

Introduction to Connectivity

External Connectivity

Mouse and Keyboard Ports

Video Ports

Audio Ports

eSATA Ports

Modem and Serial Ports

Network Ports

Network Cabling

Integrated Motherboard Ports

Getting to Know Ports

Wireless Connectivity for Input Devices

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 2.1: Identifying Computer Ports

Exercise 2.2: Identifying More Computer Ports

Exercise 2.3: Identifying Display Ports

Exercise 2.4: Identifying USB Ports

Exercise 2.5: Identifying Cables

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 3: On the Motherboard

Introduction to the Motherboard

Processor Overview

Processor Basics

Speeding Up Processor Operations Overview

Clocking

Cache

Threading Technology



Connecting to the Processor

Multicore Processors

Graphics Processing Unit (GPU)

Introduction to Virtualization

Intel Processors

AMD Processors

CPU Sockets

Processor Cooling

Installing a Processor

Upgrading Processors

Overclocking Processors

Installing CPU Thermal Solutions

Troubleshooting Processor Issues

Expansion Slots

PCI (Peripheral Component Interconnect)

AGP (Accelerated Graphics Port)

PCIe (Peripheral Component Interconnect Express)

Motherboard Security Options

Types of Motherboards

Upgrading and Replacing Motherboards

Motherboard Troubleshooting

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 3.1: Identifying ATX Motherboard Parts

Exercise 3.2: Motherboard Analysis

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 4: Introduction to Configuration

Configuration Overview

BIOS Overview



The Setup Program

Flash BIOS

BIOS/UEFI Configuration Settings

CMOS Memory

Motherboard Battery

Firmware Updates: Flashing/Clearing the BIOS/UEFI

Other Configuration Parameters

Hardware Configuration Overview

Installing a USB Device

Installing an eSATA Card

Installing a Network Interface Card

Troubleshooting Configurations

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 4.1: System Expansion Exercise 4.2: BIOS/UEFI Options

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 5: Disassembly and Power

Disassembly Overview

Electrostatic Discharge (ESD)

Electromagnetic Interference (EMI)

Tools

Disassembly

Reassembly

Preventive Maintenance

Basic Electronics Overview

Power Supply Overview

Replacing or Upgrading a Power Supply

Power Protection



Symptoms of Power Supply Problems

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 5.1: Identifying Power Supply Connectors

Exercise 5.2: Recognizing Computer Replacement Parts

Exercise 5.3: Describing Computer Parts

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 6: Memory

Memory Overview

Memory Physical Packaging

Planning a Memory Installation

Installing Memory Overview

Virtual RAM

Monitoring Memory Usage in Windows

Older Applications in Windows

Troubleshooting Memory Problems

Removable Storage

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 6.1: Configuring Memory on Paper

Exercise 6.2: Configuring Memory on Paper

Exercise 6.3: Configuring Memory on Paper

Exercise 6.4: Configuring Memory on Paper

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 7: Storage Devices



Storage Devices Overview

Hard Drive Overview

Solid-State Drive (SSD) Overview

Mechanical Drive Interfaces Overview

M.2 and NVMe

PATA, SATA, and SAS Connectivity

Storage Device Configuration Overview

System BIOS/UEFI Configuration for Storage Devices

Hard Drive Preparation Overview

Windows Disk Management

Fault Tolerance

Windows Storage Spaces

Disk Caching/Virtual Memory

Troubleshooting Storage Devices Overview

Data Loss and Corruption

Troubleshooting New Storage Device Installation

Troubleshooting Previously Installed Storage Devices

RAID Issues

SSD Issues

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 7.1: Planning Storage Device Installation and Configuration

Exercise 7.2: Configuring a SATA Hard Drive on Paper

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 8: Video and Multimedia Devices

Multimedia Devices Overview

Video Overview

Video Cards

Projectors



Introduction to Audio

Installing Sound Cards

Sound Cards Using Windows

Speakers

Troubleshooting Sound Problems

Optical Drive Overview

Optical Drive Installation

Troubleshooting Optical Drive Issues

Scanners

Other Multimedia Devices

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 8.1: Video and Multimedia Device Research

Exercise 8.2: Which One Will You Buy?

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 9: Printers and Multifunction Devices

Printer/Multifunction Device Overview

Categories of Printers

Impact Printers

Inkjet Printers

Laser Printers

Thermal Printers

3-D Printers

Paper

Virtual Printing

Refilling Cartridges, Re-inking Ribbons, and Recycling Cartridges

Upgrading Printers

Printer Maintenance

Printer Installation Overview



Installing Multifunction Devices

USB Printer Installation

Printers in the Windows Environment

Printer Sharing

Cloud Printing/Scanning

General Printer Troubleshooting

USB-Attached Printer Troubleshooting

Windows Printer Troubleshooting

Impact Printer Troubleshooting

Inkjet Printer Troubleshooting

Laser Printer Troubleshooting

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 9.1: Research a Local Printer

Exercise 9.2: Printer Driver Research

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 10: Mobile Devices

Mobile Device Overview

Using Mobile Devices

Cell Phones

Mobile Apps

Mobile Device Wired Connectivity

Mobile Device Wireless Connectivity

Mobile Device Email Configuration

Mobile Device Synchronization and Backup

Other Mobile Software Tools

Laptops Overview

Laptop Hardware

Laptop Power



Laptop Repairs Overview

Laptop Display

Mobile Device Security

Mobile Device Travel and Storage

Mobile Device Troubleshooting Overview

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 10.1: Identifying Laptop Parts

Exercise 10.2: Identifying Common Laptop Keys

Exercise 10.3: Identifying Cell Phone Parts

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 11: Computer Design and Troubleshooting Review

Design Overview

Computer System Design

Motherboard and Associated Component Design

Power Supply and Case Design

Storage Subsystem Design

Audio Subsystem Design

Display Subsystem Design

Troubleshooting Overview

Step 1. Identify the Problem

Step 2. Establish a Theory of Probable Cause (Question the Obvious)

Step 3. Test the Theory to Determine the Cause

Step 4. Establish a Plan of Action to Resolve the Problem and Implement the Solution

Step 5. Verify Full System Functionality and, If Applicable, Implement Preventive Measures

Step 6. Document the Findings, Actions, and Outcomes

Sample Troubleshooting Flowcharts

Chapter Summary



Key Terms

Review Questions

Exercises

Exercise 11.1 Recommending Computer System Design

Exercise 11.2 Understanding Design Components

Exercise 11.3 Understanding Subsystem Design Components

Exercise 11.4 Determining the Troubleshooting Theory Step

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 12: Internet Connectivity, Virtualization, and Cloud Technologies

Internet Connectivity Overview

Dial-up Connectivity

Cable Modems

xDSL Modems

VolP

Fiber Networks

Satellite Modems

Mobile Connectivity Overview

Web Browsers

Basic Web Browser Issues

Introduction to Virtualization

Desktop Virtualization Basics

Cloud Computing

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 12.1: Exploring Internet Connectivity Options

Exercise 12.2: Exploring the Internet Options Window

Activities

Internet Discovery

Soft Skills



Critical Thinking Skills

Chapter 13: Networking

Networking Overview

Network Media Overview

Ethernet over Power

Protecting Your Network and Cable Investment

The OSI Model

The TCP/IP Model

Network Addressing

More IPv4 Addressing

Wireless Networks Overview

Wireless Network Standards

Wireless Network Components

Wireless Network Design

Antenna Basics

Wireless and Wired Client Device Configuration Overview

Configuring an End Device: IP Addressing

Adding a Computer to a Windows Domain

Wireless NICSpecific Settings

Advanced NIC Properties

NIC Configuration When Using Virtualization

Thin or Thick Client Installation Overview

Wireless AP/Router Configuration

WWAN Cellular Configuration

IoT and Smart Devices

Network Troubleshooting

Troubleshooting Cable and DSL Modems

Networking Multifunction Devices

Network Servers

Embedded, SCADA, and Legacy Systems

Software-Defined Networking

Network Terminology

The TCP/IP Model in Action



More Windows Network Settings

Introduction to Shared Folders

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 13.1: Understanding Wireless AP Paper Configuration

Exercise 13.2: Understanding T568B Color Sequence

Exercise 13.3: Recognizing Network Devices

Exercise 13.4: Identifying Basic Wireless Network Parts

Exercise 13.5: Creating a Wireless Network

Exercise 13.6: Practicing with Network Numbers and Broadcast Addresses

Exercise 13.7: Practicing with CIDR Notation

Exercise 13.8: Determining the Default Gateway

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 14: Introduction to Operating Systems

Operating Systems Overview

User Interaction with Operating Systems

Overview of Popular Operating Systems

32-Bit vs. 64-Bit Operating Systems

Windows 10 and Windows 11 Versions

Workstation Operating Systems

Operating Systems for Mobile Devices

End-of-Life (EOL) Concerns

Update Limitations

Compatibility Concerns

Corporate Operating System Needs

Basic Windows Usage Overview

Windows 10 and Windows 11 Desktop Components

Shortcuts and Tiles

Recycle Bin



Interactions Within a Window

Managing Windows Files and Folders

Searches and Indexing

Attributes, Compression, and Encryption

Introduction to Windows Control Panel Utilities

Determining the Windows Version

Windows Registry

Editing the Windows Registry

Backing Up Data

WinRE

Recovering the Windows OS

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 14.1

Exercise 14.2

Exercise 14.3

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 15: Introduction to Scripting

Scripting Overview

Command Prompt Overview

Command Prompt Basics

Moving Around from a Command Prompt

Critical Thinking Skills

The md and rd Commands

Two Useful Commands: del and type

Copying Files

The attrib Command

Why Learn Commands?

PowerShell



Other Commands You Should Look Over

Command Format

Introduction to Scripting

Script File Types

Use Cases for Scripting

Mitigating Consequences of Scripting

Environment Variables

Script Syntax

Introduction to Script Programming

Variables

Data Types

Examples of Using Variables

Comments Within Scripts

Basic Script Constructs

Decisions: The Selection Structure

Compound Conditions and Logical Operators

Loops: The Repetition Structure

A Brief Look at VBScript and PowerShell

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 15.1: Identifying command-line commands

Exercise 15.2: Scripting Concepts

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 16: Advanced Windows

Advanced Windows Overview

Preinstallation of Windows

Installation/Upgrade of Windows

Corporate Windows Deployment

Verifying the Installation



Troubleshooting a Windows Installation

Reloading Windows

Windows Updates

Backing Up the Windows Registry and Data

Configuring Windows Overview

Configuring Windows

Adding Devices

Installing/Removing Software

Computer Management Console

System Tools

User Account Management

Managing Storage

Managing Services and Applications

Data Sources (ODBC)

Print Management Console

Overview of the Windows Boot Process

System Restore

Windows Recovery Environment (WinRE)

Startup Settings Menu

System Configuration Utility

Task Manager

Speeding Up the Windows Boot Process

Troubleshooting the Windows Boot Process

Black Screen/Video Issues

Troubleshooting a Service That Does Not Start

Slow Boot

Troubleshooting Windows Network Settings

Windows Reboots/System Instability

Shutdown Problems

Summary of Troubleshooting Steps

Power Options

Monitoring System Performance

Supporting Windows Computers Remotely



Preventive Maintenance for Your Operating System

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 16.1: Windows Tools

Exercise 16.2: Task Manager Tabs

Exercise 16.3: System Configuration Tabs

Activities

Internet Discovery

Soft Skills

Chapter 17: macOS and Linux Operating Systems

Introduction to macOS

Navigating the User Interface

Basic System Usage, Updates, and Backups

Management and Troubleshooting Tools

Utilities

Introduction to Linux

Navigating the GNOME User Interface

Basic System Usage, Updates, and Backups

Command-Line Interface

macOS and Linux Best Practices

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 17.1

Exercise 17.2

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 18: Computer and Network Security

Security Overview



Security Policy

Physical Security

Logical Security

Considering the End User

Licensing

Security Threats and Vulnerabilities

Protecting Access to Local and Network Resources

Permissions

Folder Options

Protecting the Operating System and Data

Internet Security

Remote Access to Network Devices

Internet Appliances

Wireless Network Security Overview

Security Incident Response

A Final Word About Security

Chapter Summary

Key Terms

Review Questions

Exercises

Exercise 18.1: Examining the Security Incident Response

Exercise 18.2: Wireless Security

Exercise 18.3: Data Security

Activities

Internet Discovery

Soft Skills

Critical Thinking Skills

Chapter 19: Operational Procedures

Operational Procedures Overview

Proper Power Handling and Adverse Power Conditions

IT Documentation

Change Management

Chapter Summary

Key Terms



Review Questions Exercises Exercise 19.1: Determining a Power Solution Exercise 19.2: Determining the Type of Documentation Needed **Activities** Internet Discovery Soft Skills Critical Thinking Skills Appendix A: Subnetting Basics Exercise Exercise A.1: Subnet Practice Exercise Appendix B: Certification Exam Objectives (Online) Glossary Α В С D Ε F G Н J K L Μ Ν 0 Ρ Q R S Т U



٧

W

Χ

Ζ

Index