

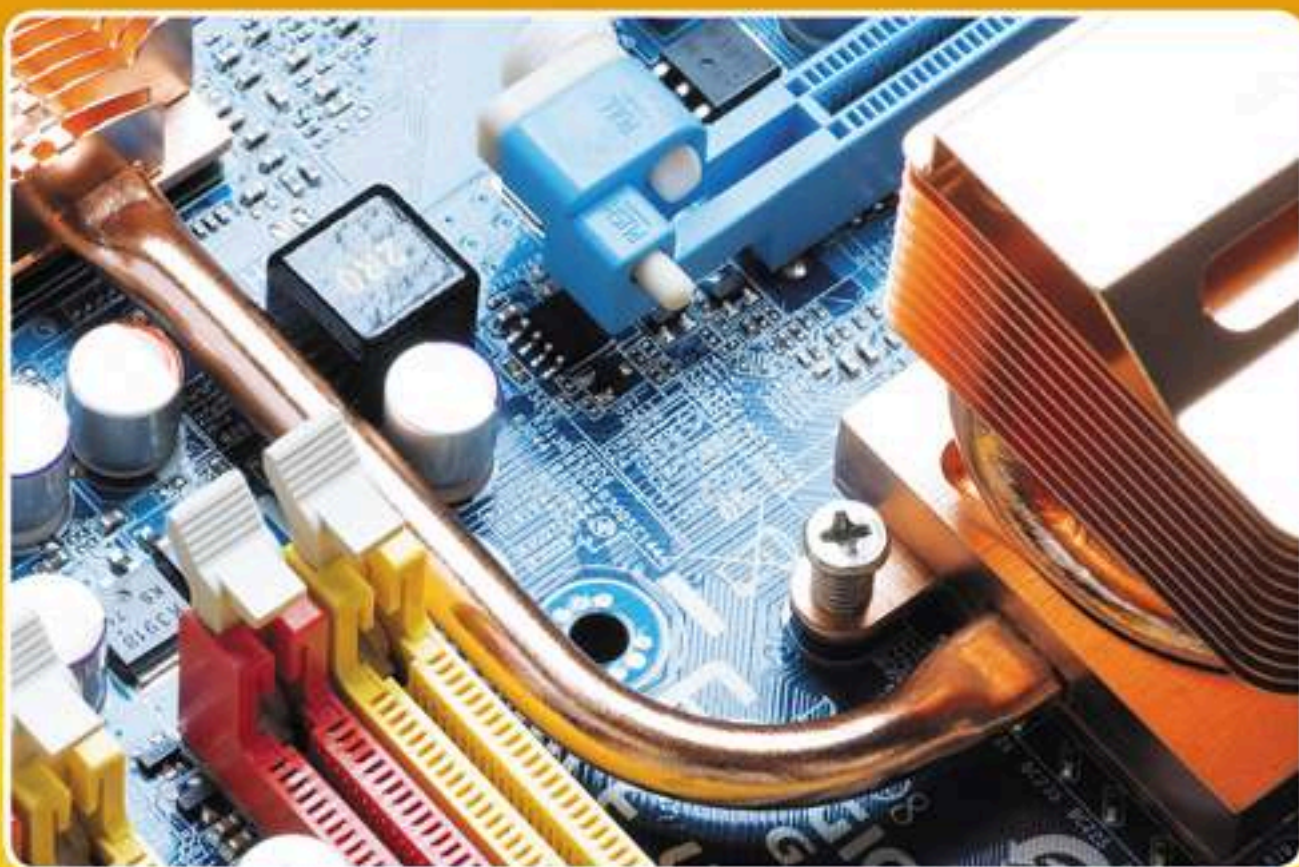
CompTIA

A+

Guide to Hardware

Managing, Maintaining, and Troubleshooting

6th Edition



000 A+™

CompTIA Certified



Jean Andrews

CompTIA A+ 220-801 Exam

	Objectives	Chapters
Domain 1.0	PC Hardware	
1.1	Configure and apply BIOS settings.	3
1.2	Differentiate between motherboard components, their purposes, and properties.	2, 3, 4
1.3	Compare and contrast RAM types and features.	4
1.4	Install and configure expansion cards.	3, 5, 6, 10
1.5	Install and configure storage devices and use appropriate media.	5, 6
1.6	Differentiate among various CPU types and features and select the appropriate cooling method.	2, 3, 4
1.7	Compare and contrast various connection interfaces and explain their purpose.	1, 5, 6
1.8	Install an appropriate power supply based on a given scenario.	1, 2
1.9	Evaluate and select appropriate components for a custom configuration, to meet customer specifications or needs.	7
1.10	Given a scenario, evaluate types and features of display devices.	6
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2.4	Explain common TCP and UDP ports, protocols, and their purpose.	9
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2.6	Install, configure, and deploy a SOHO wireless/wired router using appropriate settings.	9
2.7	Compare and contrast Internet connection types and features.	10
2.8	Identify various types of networks.	10
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4.3	Given a scenario, perform printer maintenance.	12
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5.2	Explain environmental impacts and the purpose of environmental controls.	1, 8
5.3	Given a scenario, demonstrate proper communication and professionalism.	7
5.4	Explain the fundamentals of dealing with prohibited content/activity.	7

CompTIA A+ 220-802 Exam

	Objectives	Chapters
Domain 1.0	Operating Systems	
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1.2	Given a scenario, install, and configure the operating system using the most appropriate method.	See <i>A+ Guide to Software</i>
1.3	Given a scenario, use appropriate command line tools.	See <i>A+ Guide to Software</i>
1.4	Given a scenario, use appropriate operating system features and tools.	12 and see <i>A+ Guide to Software</i>
1.5	Given a scenario, use Control Panel utilities.	6, 9, 11, 12 and see <i>A+ Guide to Software</i>
1.6	Setup and configure Windows networking on a client/desktop.	9, 10 and see <i>A+ Guide to Software</i>
1.7	Perform preventive maintenance procedures using appropriate tools.	See <i>A+ Guide to Software</i>
1.8	Explain the differences among basic OS security settings.	See <i>A+ Guide to Software</i>
1.9	Explain the basics of client-side virtualization.	See <i>A+ Guide to Software</i>
Domain 2.0	Security	
2.1	Apply and use common prevention methods.	See <i>A+ Guide to Software</i>
2.2	Compare and contrast common security threats.	See <i>A+ Guide to Software</i>
2.3	Implement security best practices to secure a workstation.	See <i>A+ Guide to Software</i>
2.4	Given a scenario, use the appropriate data destruction/disposal method.	See <i>A+ Guide to Software</i>
2.5	Given a scenario, secure a SOHO wireless network.	9
2.6	Given a scenario, secure a SOHO wired network.	9
Domain 3.0	Mobile Devices	
3.1	Explain the basic features of mobile operating systems.	See <i>A+ Guide to Software</i>
3.2	Establish basic network connectivity and configure email.	See <i>A+ Guide to Software</i>
3.3	Compare and contrast methods for securing mobile devices.	See <i>A+ Guide to Software</i>
3.4	Compare and contrast hardware differences in regards to tablets and laptops.	See <i>A+ Guide to Software</i>
3.5	Execute and configure mobile device synchronization.	See <i>A+ Guide to Software</i>
Domain 4.0	Troubleshooting	
4.1	Given a scenario, explain the troubleshooting theory.	See <i>A+ Guide to Software</i>
4.2	Given a scenario, troubleshoot common problems related to motherboards, RAM, CPU and power with appropriate tools.	1, 8
4.3	Given a scenario, troubleshoot hard drives and RAID arrays with appropriate tools.	8 and see <i>A+ Guide to Software</i>
4.4	Given a scenario, troubleshoot common video and display issues.	8
4.5	Given a scenario, troubleshoot wired and wireless networks with appropriate tools.	10 and see <i>A+ Guide to Software</i>
4.6	Given a scenario, troubleshoot operating system problems with appropriate tools.	See <i>A+ Guide to Software</i>
4.7	Given a scenario, troubleshoot common security issues with appropriate tools and best practices.	See <i>A+ Guide to Software</i>
4.8	Given a scenario, troubleshoot, and repair common laptop issues while adhering to the appropriate procedures.	11
4.9	Given a scenario, troubleshoot printers with appropriate tools.	12



A+ Guide to Hardware: Managing, Maintaining, and Troubleshooting

SIXTH EDITION

Jean Andrews, Ph.D.



Australia • Canada • Mexico • Singapore • Spain • United Kingdom • United States

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CompTIA A+ 220-801 Exam, 2012 Edition Examination Objectives Mapped to Chapters

A+ *Guide to Hardware* and A+ *Guide to Software* when used together fully meet all of the CompTIA A+ exams objectives. If the A+ exam objective is covered in the corresponding textbook, it is referenced in the Page Numbers column.

DOMAIN 1.0 PC HARDWARE

1.1 Configure and apply BIOS settings.

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▲ Install firmware upgrades – flash BIOS	3	106–126
▲ BIOS component information	3	106–126
• RAM	3	106–126
• Hard drive	3	106–126
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• CPU	3	106–126
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• Temperature monitoring	3	106–126
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1.2 Differentiate between motherboard components, their purposes, and properties.

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1.3 Compare and contrast RAM types and features.

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▲ Video cards	6	260–282
▲ Network cards	10	476–482
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• AMD: 940, AM2, AM2+, AM3, AM3+, FM1, F	3	84–89

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1.7 Compare and contrast various connection interfaces and explain their purpose.

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■ Connector types: A, B, mini, micro	6	238–293
• Firewire 400 vs. Firewire 800 speed and distance characteristics	6	238–293
• SATA1 vs. SATA2 vs. SATA3, eSATA, IDE speeds	5	190–204
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• Dual monitors	7	329–339
▲ Virtualization workstation	7	329–339
• Maximum RAM and CPU cores	7	329–339
▲ Gaming PC	7	329–339
• Powerful processor	7	329–339
• High-end video/specialized GPU	7	329–339
• Better sound card	7	329–339
• High-end cooling	7	329–339
▲ Home Theater PC	7	329–339
• Surround sound audio	7	329–339
• HDMI output	7	329–339
• HTPC compact form factor	7	329–339
• TV tuner	7	329–339
▲ Standard thick client	7	329–339
• Desktop applications	7	329–339
• Meets recommended requirements for running Windows	7	329–339
▲ Thin client	7	329–339
• Basic applications	7	329–339
• Meets minimum requirements for running Windows	7	329–339
▲ Home Server PC	7	329–339
• Media streaming	7	329–339
• File sharing	7	329–339
• Print sharing	7	329–339
• Gigabit NIC	7	329–339
• RAID array	7	329–339

1.10 Given a scenario, evaluate types and features of display devices.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Types	6	238–293
• CRT	6	238–293
• LCD	6	238–293
• LED	6	238–293
• Plasma	6	238–293
• Projector	6	238–293
• OLED	6	238–293

▲ Refresh rates	6	238–293
▲ Resolution	6	238–293
▲ Native resolution	6	238–293
▲ Brightness/lumens	6	238–293
▲ Analog vs. digital	6	238–293
▲ Privacy/antiglare filters	6	238–293
▲ Multiple displays	6	238–293

1.11 Identify connector types and associated cables.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Display connector types	6	268–282
• DVI-D	6	268–282
• DVI-I	6	268–282
• DVI-A	6	268–282
• Displayport	1	2–5
• RCA	6	268–282
• DB-15	1	2–5
• BNC	10	476–490
• miniHDMI	6	268–282
• RJ-45	10	476–506
• miniDin-6	6	268–282
▲ Display cable types	6	268–282
• HDMI	6	268–282
• DVI	6	268–282
• VGA	6	268–282
• Component	6	268–282
• Composite	6	268–282
• S-video	6	268–282
• RGB	6	268–282
• Coaxial	10	476–490
• Ethernet	10	476–490
▲ Device connectors and pin arrangements	5	190–204
• SATA	5	190–204
• eSATA	6	238–293
• PATA	5	190–204
■ IDE	5	190–204
■ EIDE	5	190–204
• Floppy	5	228–232
• USB	6	238–293
• IEEE1394	1	2–5
• SCSI	5	190–204
• PS/2	1	2–5
• Parallel	1	2–5
• Serial	1	2–5
• Audio	1	2–5
• RJ-45	10	476–506
▲ Device cable types		
• SATA	5	190–204
• eSATA	6	238–293
• IDE	5	190–204

• EIDE	5	190–204
• Floppy	5	228–232
• USB	6	238–293
• IEEE1394	6	238–293
• SCSI	5	190–204
■ 68pin vs. 50pin vs. 25pin	5	190–204
• Parallel	12	596–602
• Serial	6	238–293
• Ethernet	10	476–506
• Phone	10	476–490

1.12 Install and configure various peripheral devices.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Input devices	6	238–282
• Mouse	6	238–282
• Keyboard	6	238–282
• Touch screen	6	238–282
• Scanner	6	238–282
• Barcode reader	6	238–282
• KVM	6	238–282
• Microphone	6	238–282
• Biometric devices	6	238–282
• Game pads	6	238–282
• Joysticks	6	238–282
• Digitizer	6	238–282
▲ Multimedia devices	6	238–282
• Digital cameras	6	238–282
• Microphone	6	238–282
• Webcam	6	238–282
• Camcorder	6	238–282
• MIDI enabled devices	6	238–282
▲ Output devices	6	238–282
• Printers	12	591–608
• Speakers	6	238–282
• Display devices	6	238–282

DOMAIN 2.0 NETWORKING

2.1 Identify types of network cables and connectors.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Fiber	10	476–506
• Connectors: SC, ST and LC	10	476–506
▲ Twisted Pair	10	476–506
• Connectors: RJ-11, RJ-45	10	476–506
• Wiring standards: T568A, T568B	10	476–506
▲ Coaxial	10	476–506
• Connectors: BNC, F-connector	10	476–506

2.2 Categorize characteristics of connectors and cabling.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Fiber	10	476–490
• Types (single-mode vs. multi-mode)	10	476–490
• Speed and transmission limitations	10	476–490
▲ Twisted pair	10	476–490
• Types: STP, UTP, CAT3, CAT5, CAT5e, CAT6, plenum, PVC	10	476–490
• Speed and transmission limitations	10	476–490
▲ Coaxial	10	476–490
• Types: RG-6, RG-59	10	476–490
• Speed and transmission limitations	10	476–490

2.3 Explain properties and characteristics of TCP/IP.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ IP class	9	402–415
• Class A	9	402–415
• Class B	9	402–415
• Class C	9	402–415
▲ IPv4 vs. IPv6	9	402–415
▲ Public vs. private vs. APIPA	9	402–415
▲ Static vs. dynamic	9	402–415
▲ Client-side DNS	9	402–415
▲ DHCP	9	402–415
▲ Subnet mask	9	402–415
▲ Gateway	9	402–415

2.4 Explain common TCP and UDP ports, protocols, and their purpose.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Ports	9	415–423
• 21 – FTP	9	415–423
• 23 – TELNET	9	415–423
• 25 – SMTP	9	415–423
• 53 – DNS	9	415–423
• 80 – HTTP	9	415–423
• 110 – POP3	9	415–423
• 143 – IMAP	9	415–423
• 443 – HTTPS	9	415–423
• 3389 – RDP	9	415–423
▲ Protocols	9	415–423
• DHCP	9	415–423
• DNS	9	415–423
• LDAP	9	415–423
• SNMP	9	415–423
• SMB	9	415–423
• SSH	9	415–423
• SFTP	9	415–423
▲ TCP vs. UDP	9	415–423

2.5 Compare and contrast wireless networking standards and encryption types.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Standards	9	452–456
• 802.11 a/b/g/n	9	452–456
• Speeds, distances, and frequencies	9	452–456
▲ Encryption types	9	452–456
• WEP, WPA, WPA2, TKIP, AES	9	452–456

2.6 Install, configure, and deploy a SOHO wireless/wired router using appropriate settings.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ MAC filtering	9	441–456
▲ Channels (1 – 11)	9	441–456
▲ Port forwarding, port triggering	9	441–456
▲ SSID broadcast (on/off)	9	441–456
▲ Wireless encryption	9	441–456
▲ Firewall	9	441–456
▲ DHCP (on/off)	9	441–456
▲ DMZ	9	441–456
▲ NAT	9	441–456
▲ WPS	9	441–456
▲ Basic QoS	9	441–456

2.7 Compare and contrast Internet connection types and features.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Cable	10	464–476
▲ DSL	10	464–476
▲ Dial-up	10	464–476
▲ Fiber	10	464–476
▲ Satellite	10	464–476
▲ ISDN	10	464–476
▲ Cellular (mobile hotspot)	10	464–476
▲ Line of sight wireless internet service	10	464–476
▲ WiMAX	10	464–476

2.8 Identify various types of networks.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ LAN	10	464–476
▲ WAN	10	464–476
▲ PAN	10	464–476
▲ MAN	10	464–476
▲ Topologies	10	464–476
• Mesh	10	464–476
• Ring	10	464–476
• Bus	10	464–476
• Star	10	464–476
• Hybrid	10	464–476

2.9 Compare and contrast network devices their functions and features.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Hub	10	476–490
▲ Switch	10	476–490
▲ Router	10	476–490
▲ Access point	10	476–490
▲ Bridge	10	476–490
▲ Modem	10	476–490
▲ NAS	10	476–490
▲ Firewall	10	476–490
▲ VoIP phones	10	476–490
▲ Internet appliance	10	476–490

2.10 Given a scenario, use appropriate networking tools.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Crimper	10	491–506
▲ Multimeter	10	491–506
▲ Toner probe	10	491–506
▲ Cable tester	10	491–506
▲ Loopback plug	10	491–506
▲ Punchdown tool	10	491–506

DOMAIN 3.0 LAPTOPS

3.1 Install and configure laptop hardware and components.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Expansion options	11	523–571
• Express card /34	11	523–571
• Express card /54	11	523–571
• PCMCIA	11	523–571
• SODIMM	11	523–571
• Flash	11	523–571
▲ Hardware/device replacement	11	523–571
• Keyboard	11	523–571
• Hard Drive (2.5 vs. 3.5)	11	523–571
• Memory	11	523–571
• Optical drive	11	523–571
• Wireless card	11	523–571
• Mini-PCIe	11	523–571
• screen	11	523–571
• DC jack	11	523–571
• Battery	11	523–571
• Touchpad	11	523–571
• Plastics	11	523–571
• Speaker	11	523–571
• System board	11	523–571
• CPU	11	523–571

3.2 Compare and contrast the components within the display of a laptop.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Types	11	564–567
• LCD	11	564–567
• LED	11	564–567
• OLED	11	564–567
• Plasma	11	564–567
▲ Wi-Fi antenna connector/placement	11	564–567
▲ Inverter and its function	11	564–567
▲ Backlight	11	564–567

3.3 Compare and contrast laptop features.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Special function keys	11	514–538
• Dual displays	11	514–538
• Wireless (on/off)	11	514–538
• Volume settings	11	514–538
• Screen brightness	11	514–538
• Bluetooth (on/off)	11	514–538
• Keyboard backlight	11	514–538
▲ Docking station vs. port replicator	11	514–538
▲ Physical laptop lock and cable lock	11	514–538

DOMAIN 4.0 PRINTERS

4.1 Explain the differences between the various printer types and summarize the associated imaging process.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Laser	12	582–591
• Imaging drum, fuser assembly, transfer belt, transfer roller, pickup rollers, separate pads, duplexing assembly	12	582–591
• Imaging process: processing, charging, exposing, developing, transferring, fusing and cleaning	12	582–591
▲ Inkjet	12	582–591
• Ink cartridge, print head, roller, feeder, duplexing assembly, carriage and belt	12	582–591
• Calibration	12	582–591
▲ Thermal	12	582–591
• Feed assembly, heating element	12	582–591
• Special thermal paper	12	582–591
▲ Impact	12	582–591
• Print head, ribbon, tractor feed	12	582–591
• Impact paper	12	582–591

4.2 Given a scenario, install, and configure printers.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Use appropriate printer drivers for a given operating system	12	591–608
▲ Print device sharing	12	591–608
• Wired	12	591–608
■ USB	12	591–608
■ Parallel	12	591–608
■ Serial	12	591–608
■ Ethernet	12	591–608
• Wireless	12	591–608
■ Bluetooth	12	591–608
■ 802.11x	12	591–608
■ Infrared (IR)	12	591–608
• Printer hardware print server	12	591–608
▲ Printer sharing	12	591–608
• Sharing local/networked printer via Operating System settings	12	591–608

4.3 Given a scenario, perform printer maintenance.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Laser	12	608–619
• Replacing toner, applying maintenance kit, calibration, cleaning	12	608–619
▲ Thermal	12	608–619
• Replace paper, clean heating element, remove debris	12	608–619
▲ Impact	12	608–619
• Replace ribbon, replace print head, replace paper	12	608–619

DOMAIN 5.0 OPERATIONAL PROCEDURES**5.1 Given a scenario, use appropriate safety procedures.**

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ ESD straps	1	24–33, 39–40
▲ ESD mats	1	24–33, 39–40
▲ Self-grounding	1	24–33, 39–40
▲ Equipment grounding	1	24–33, 39–40
▲ Personal safety	1	24–33, 39–40
• Disconnect power before repairing PC	2	46–67
• Remove jewelry	2	46–67
• Lifting techniques	1	24–33, 39–40
• Weight limitations	1	24–33, 39–40
• Electrical fire safety	1	24–33, 39–40
• CRT safety – proper disposal	1	24–33, 39–40
• Cable management	1	24–33, 39–40
▲ Compliance with local government regulations	8	388–395

5.2 Explain environmental impacts and the purpose of environmental controls.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ MSDS documentation for handling and disposal	1	24–33, 39–40
▲ Temperature, humidity level awareness and proper ventilation	8	388–395

▲ Power surges, brownouts, blackouts	8	388–395
• Battery backup	8	388–395
• Surge suppressor	1	24–33, 39–40
▲ Protection from airborne particles	8	388–395
• Enclosures	8	388–395
• Air filters	8	388–395
▲ Dust and debris	8	388–395
• Compressed air	8	388–395
• Vacuums	8	388–395
▲ Component handling and protection	1	24–33, 39–40
• Antistatic bags	1	24–33, 39–40
▲ Compliance to local government regulations	8	388–395

5.3 Given a scenario, demonstrate proper communication and professionalism.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ Use proper language – avoid jargon, acronyms, slang when applicable	7	302–328
▲ Maintain a positive attitude	7	302–328
▲ Listen and do not interrupt the customer	7	302–328
▲ Be culturally sensitive	7	302–328
▲ Be on time (if late contact the customer)	7	302–328
▲ Avoid distractions	7	302–328
• Personal calls	7	302–328
• Talking to co-workers while interacting with customers	7	302–328
• Personal interruptions	7	302–328
▲ Dealing with difficult customer or situation	7	302–328
• Avoid arguing with customers and/or being defensive	7	302–328
• Do not minimize customer’s problems	7	302–328
• Avoid being judgmental	7	302–328
• Clarify customer statements (ask open ended questions to narrow the scope of the problem, restate the issue or question to verify understanding)	7	302–328
▲ Set and meet expectations/timeline and communicate status with the customer	7	302–328
• Offer different repair/replacement options if applicable	7	302–328
• Provide proper documentation on the services provided	7	302–328
• Follow up with customer/user at a later date to verify satisfaction	7	302–328
▲ Deal appropriately with customers confidential materials	7	302–328
• Located on a computer, desktop, printer, etc.	7	302–328

5.4 Explain the fundamentals of dealing with prohibited content/activity.

OBJECTIVES	CHAPTER	PAGE NUMBERS
▲ First response	7	328–329
• Identify	7	328–329
• Report through proper channels	7	328–329
• Data/device preservation	7	328–329
▲ Use of documentation/documentation changes	7	328–329
▲ Chain of custody	7	328–329
• Tracking of evidence/documenting process	7	328–329

CompTIA A+ 220-802 Exam, 2012 Edition Examination Objectives Mapped to Chapters

A+ *Guide to Hardware* and A+ *Guide to Software* when used together fully meet all of the CompTIA A+ exams objectives. If the A+ exam objective is covered in the corresponding textbook, it is referenced in the Page Numbers column.

DOMAIN 1.0 OPERATING SYSTEMS

1.1 Compare and contrast the features and requirements of various Microsoft Operating Systems.

OBJECTIVES	CHAPTER	PAGE NUMBERS
<ul style="list-style-type: none"> ▲ Windows XP Home, Windows XP Professional, <i>Windows XP Media Center</i>, <i>Windows XP 64-bit Professional</i> 		See A+ <i>Guide to Software</i>
<ul style="list-style-type: none"> ▲ Windows Vista Home Basic, Windows Vista Home Premium, Windows Vista Business, Windows Vista Ultimate, Windows Vista Enterprise 		See A+ <i>Guide to Software</i>
<ul style="list-style-type: none"> ▲ Windows 7 Starter, Windows 7 Home Premium, Windows 7 Professional, Windows 7 Ultimate, Windows 7 Enterprise 		See A+ <i>Guide to Software</i>
<ul style="list-style-type: none"> ▲ Features: <ul style="list-style-type: none"> • 32-bit vs. 64-bit • Aero, gadgets, user account control, bit-locker, shadow copy, system restore, ready boost, sidebar, compatibility mode, XP mode, easy transfer, administrative tools, defender, Windows firewall, security center, event viewer, file structure and paths, category view vs. classic view 		See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i>
<ul style="list-style-type: none"> ▲ Upgrade paths – differences between in place upgrades, compatibility tools, Windows upgrade OS advisor 		See A+ <i>Guide to Software</i>

1.2 Given a scenario, install and configure the operating system using the most appropriate method.

OBJECTIVES	CHAPTER	PAGE NUMBERS
<ul style="list-style-type: none"> ▲ Boot methods <ul style="list-style-type: none"> • USB • CD-ROM • DVD • PXE 		See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i>
<ul style="list-style-type: none"> ▲ Type of installations <ul style="list-style-type: none"> • Creating image • Unattended installation • Upgrade • Clean install • Repair installation • Multiboot • Remote network installation • Image deployment 		See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i> See A+ <i>Guide to Software</i>

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