complete the task. We will provide the most logical or practical solution in Appendix B at the back of the book. Note that these may cover topic areas not covered in the actual A+ performance-based questions. However, we feel that being able to think logically is a great way to learn.

The CompTIA A+ Exam Objectives

The A+ exams consist of the 220-901 exam and the 220-902 exam. Following are the detailed exam objectives for each test.

Exam objectives are subject to change at any time without prior notice and at CompTIA's sole discretion. Please visit the A+ Certification page of CompTIA's website (http://certification.comptia.org/getCertified/certifications/a.aspx) for the most current listing of exam objectives.

A+ Certification Exam Objectives: 220-901

The following table lists the domains measured by this examination and the extent to which they are represented on the exam:

Domain	Percentage of Exam
1.0 Hardware	34%
2.0 Networking	21%
3.0 Mobile Devices	17%
4.0 Hardware & Network Troubleshooting	28%

Objective	Chapter
1.0 Hardware	
1.1. Given a scenario, configure settings and use BIOS/UEFI tools on a PC	1
▪ Firmware upgrades—flash BIOS ▪ BIOS component information: RAM; hard drive;	1

optical drive; CPU ▪ BIOS configurations: Boot sequence; enabling and disabling devices; date/time; clock speeds; virtualization support; BIOS security (passwords, drive encryption: TPM, lo-jack, secure boot) ▪ Built-in diagnostics ▪ Monitoring: Temperature monitoring; fan speeds; intrusion detection/notification; voltage; clock; bus speed	
1.2.Explain the importance of motherboard components, their purpose, and properties	1
▪ Sizes: ATX; Micro-ATX; Mini-ITX; ITX ▪ Expansion slots: PCI; PCI-X; PCIe; miniPCI ▪ RAM slots ▪ CPU sockets ▪ Chipsets: North Bridge; South Bridge ▪ CMOS battery ▪ Power connections and types ▪ Fan connectors ▪ Front/Top panel connectors: USB; audio; power button; power light; drive activity lights; reset button ▪ Bus speeds	1
1.3.Compare and contrast RAM types and their features	1
▪ Types: DDR; DDR2; DDR3; SODIMM; DIMM; parity vs. non-parity; ECC vs. non-ECC; RAM configurations (single channel vs. dual channel vs. triple channel); single sided vs. double sided; buffered vs. unbuffered; RAM compatibility	1
1.4.Install and configure PC expansion cards	3

▪ Sound cards ▪ Video cards ▪ Network cards ▪ USB cards ▪ FireWire cards ▪ Thunderbolt cards ▪ Storage cards ▪ Modem cards ▪ Wireless/cellular cards ▪ TV tuner cards ▪ Video capture cards ▪ Riser cards	3
1.5.Install and configure storage devices and use appropriate media	2
▪ Optical drives: CD-ROM/CD-RW; DVD-ROM/DVD-RW/DVD-RW DL; Blu-Ray; BD-R; BD-RE ▪ Magnetic hard disk drives: 5400 rpm; 7200 rpm; 10,000 rpm ▪ Hot swappable drives ▪ Solid state/flash drives: CompactFlash; SD; Micro-SD; Mini-SD; xD; SSD; hybrid; eMMC ▪ RAID types: 0; 1; 5; 10 ▪ Tape drive ▪ Media capacity: CD; CD-RW; DVD-RW; DVD; Blu-Ray; tape; DVD DL	2
1.6.Install various types of CPUs and apply the appropriate cooling methods	1
	1

▪ Socket types Intel: 775, 1155, 1156, 1366, 1150, 2011 AMD: AM3, AM3+, FM1, FM2, FM2+ ▪ Characteristics: speeds; cores; cache size/type; hyperthreading; virtualization support; architecture (32-bit vs. 64-bit); integrated GPU; disable execute bit ▪ Cooling: heat sink; fans; thermal paste; liquid-based; ▪ fanless/passive	
1.7.Compare and contrast various PC connection interfaces, their characteristics and purpose	3
▪ Physical connections ▪ USB 1.1 vs. 2.0 vs. 3.0:Connector types: A, B, mini, micro ▪ FireWire 400 vs. FireWire 800 ▪ SATA1 vs. SATA2 vs. SATA3, eSATA ▪ Other connector types: VGA; HDMI; DVI; Audio (analog, digital (optical connector)); RJ-45; RJ-11; Thunderbolt ▪ Wireless connections: Bluetooth; RF; IR; NFC ▪ Characteristics: analog; digital; distance limitations; data transfer speeds; quality; DRM; frequencies	3
1.8.Install a power supply based on given specifications	2
▪ Connector types and their voltages: SATA; Molex; 4/8-pin 12v; PCIe 6/8-pin; 20-pin; 24-pin ▪ Specifications: wattage; dual rail; size; number of connectors; ATX; Micro-ATX; dual-voltage options	2
1.9.Given a scenario, select the appropriate components for a custom PC configuration, to meet customer specifications or needs	5
▪ Graphic/CAD/CAM design workstation: multicore	5

processor, high-end video, maximum RAM ▪ Audio/video editing workstation: specialized audio and video card, large fast hard drive, dual monitors ▪ Virtualization workstation: maximum RAM and CPU cores ▪ Gaming PC: multicore processor, high-end video/specialized GPU, high definition sound card, high-end cooling ▪ Home Theater PC: surround sound audio, HDMI output, HTPC compact form factor, TV tuner ▪ Standard thick client: desktop applications, meets recommended requirements for selected OS ▪ Thin client: basic applications, meets minimum requirements for selected OS; network connectivity ▪ Home server PC: media streaming, file sharing, print sharing, Gigabit NIC, RAID array	
1.10.Compare and contrast types of display devices and their features	4
▪ Types: LCD (TN vs. IPS; fluorescent vs. LED backlighting); Plasma; Projector; OLED ▪ Refresh/frame rates ▪ Resolution ▪ Native resolution ▪ Brightness/lumens ▪ Analog vs. digital ▪ Privacy/antiglare filters ▪ Multiple displays ▪ Aspect ratios: 16:9; 16:10; 4:3	4
1.11.Identify common PC connector types and associated	3

cables	
▪ Display connector types: DVI-D; DVI-I; DVI-A; DisplayPort; RCA; HD15 (i.e. DE15 or DB15); BNC; miniHDMI; miniDin-6	
▪ Display cable types: HDMI; DVI; VGA; component; composite; coaxial ▪ Device cables and connectors: SATA; eSATA; USB; Firewire (IEEE1394); PS/2; audio ▪ Adapters and convertors: DVI to HDMI; USB A to USB B; USB to Ethernet; DVI to VGA; Thunderbolt to DVI; PS/2 to USB; HDMI to VGA	3
1.12.Install and configure common peripheral devices	3
▪ Input devices: mouse; keyboard; scanner; barcode reader; biometric devices; game pads; joysticks; digitizer; motion sensor; touch pads; smart card readers; digital cameras; microphone; webcam; camcorder ▪ Output devices: printers; speakers; display devices ▪ Input & output devices: touch screen; KVM; smart TV; set-top box; MIDI-enabled devices	3
1.13.Install SOHO multifunction device / printers and configure appropriate settings	11
▪ Use appropriate drivers for a given operating system: Configuration settings (duplex; collate; orientation; quality) ▪ Device sharing: wired (USB; serial; Ethernet); Wireless (Bluetooth; 802.11(a, b, g, n, ac); Infrastructure vs. ad hoc); integrated print server (hardware); cloud printing/remote printing ▪ Public/shared devices: sharing local/networked device via operating system settings (TCP/Bonjour/AirPrint);	11

Data privacy (user authentication on the device; hard drive caching)	
1.14.Compare and contrast differences between the various print technologies and the associated imaging process	11
▪ Laser: imaging drum, fuser assembly, transfer belt, transfer roller, pickup rollers, separate pads, duplexing assembly. Imaging process: processing, charging, exposing, developing, transferring, fusing and cleaning. ▪ Inkjet: ink cartridge, print head, roller, feeder, duplexing assembly, carriage and belt; calibration. ▪ Thermal: Feed assembly, heating element; special thermal paper ▪ Impact: Print head, ribbon, tractor feed; impact paper ▪ Virtual: print to file; print to PDF; print to XPS; print to image	11
1.15 Given a scenario, perform appropriate printer maintenance	11
▪ Laser: replacing toner, applying maintenance kit, calibration, cleaning ▪ Thermal: replace paper, clean heating element, remove debris ▪ Impact: replace ribbon, replace print head, replace paper ▪ Inkjet: clean heads, replace cartridges, calibration, clear jams	11
2.0 Networking	
2.1.Identify the various types of network cables and connectors	6
▪ Fiber: Connectors: SC, ST, and LC ▪ Twisted Pair: Connectors: RJ-11, RJ-45; wiring	6

standards: T568A, T568B ▪ Coaxial: Connectors: BNC, F-connector	
2.2.Compare and contrast the characteristics of connectors and cabling	6
▪ Fiber: Types (single-mode vs. multi-mode); speed and transmission limitations ▪ Twisted pair: Types: STP, UTP, CAT3, CAT5, CAT5e, CAT6, CAT6e, CAT7, plenum, PVC; speed and transmission limitations; splitters and effects on signal quality ▪ Coaxial: Types: RG-6, RG-59; speed and transmission limitations; splitters and effects on signal quality	6
2.3.Explain the properties and characteristics of TCP/IP	7
▪ IPv4 vs. IPv6 ▪ Public vs. private vs. APIPA/link local ▪ Static vs. dynamic ▪ Client-side DNS settings ▪ Client-side DHCP ▪ Subnet mask vs. CIDR ▪ Gateway	7
2.4.Explain common TCP and UDP ports, protocols, and their purpose	7
▪ Ports: 21 – FTP; 22 – SSH; 23 – TELNET; 25 – SMTP; 53 – DNS; 80 – HTTP; 110 – POP3; 143 – IMAP; 443 – HTTPS; 3389 – RDP; 137–139, 445 – SMB; 548 or 427 – AFP ▪ Protocols: DHCP; DNS; LDAP; SNMP; SMB; CIFS; SSH; AFP ▪ TCP vs. UDP	7

2.5.Compare and contrast various WiFi networking standards and encryption types	8
▪ Standards: 802.11 a/b/g/n/ac; speeds; distances; and frequencies ▪ Encryption types: WEP; WPA; WPA2; TKIP; AES	8
2.6.Given a scenario, install and configure SOHO wireless/wired router and apply appropriate settings	8
▪ Channels ▪ Port forwarding, port triggering ▪ DHCP (on/off) ▪ DMZ ▪ NAT/DNAT ▪ Basic QoS ▪ Firmware ▪ UPnP	8
2.7.Compare and contrast Internet connection types, network types, and their features	8
▪ Internet connection types: cable; DSL; dial-up; fiber; satellite; ISDN; cellular (tethering; mobile hotspot); line of sight wireless Internet service ▪ Network types: LAN; WAN; PAN; MAN	8
2.8.Compare and contrast network architecture devices, their functions, and features	6
▪ Hub ▪ Switch ▪ Router ▪ Access point	6

▪ Bridge ▪ Modem ▪ Firewall ▪ Patch panel ▪ Repeaters/extenders ▪ Ethernet over power ▪ Power over Ethernet injector	
2.9.Given a scenario, use appropriate networking tools	12
▪ Crimper ▪ Cable stripper ▪ Multimeter ▪ Toner generator & probe ▪ Cable tester ▪ Loopback plug ▪ Punchdown tool ▪ WiFi analyzer	12
3.0 Mobile Devices	
3.1.Install and configure laptop hardware and components	9
▪ Expansion options: express card /34; express card /54;SODIMM; Flash; ports/adapters (Thunderbolt; DisplayPort; USB to RJ-45 dongle; USB to WiFi dongle; USB to Bluetooth; USB optical drive) ▪ Hardware/device replacement: keyboard; hard drive (SSD vs. hybrid vs. magnetic disk; 1.8in vs. 2.5in); memory; smart card reader; optical drive; wireless card; Mini-PCIe; screen; DC jack; battery; touchpad; plastics/frames; speaker; system board; CPU	9
3.2.Explain the functions of components within the display	9

of a laptop	
▪ Types: LCD (TTL vs. IPS; fluorescent vs. LED backlighting); OLED ▪ Wi-Fi antenna connector/placement ▪ Webcam ▪ Microphone ▪ Inverter ▪ Digitizer	9
3.3.Given a scenario, use appropriate laptop features	9
▪ Special function keys: dual displays; wireless (on/off); cellular (on/off); volume settings; screen brightness; Bluetooth (on/off); keyboard backlight; touch pad (on/off); screen orientation; media options (fast forward/rewind); GPS (on/off); airplane mode ▪ Docking station ▪ Physical laptop lock and cable lock ▪ Rotating/removable screens	9
3.4.Explain the characteristics of various types of other mobile devices	10
▪ Tablets ▪ Smart phones ▪ Wearable technology devices: smart watches; fitness monitors; glasses and headsets ▪ Phablets ▪ e-Readers ▪ Smart camera ▪ GPS	10
3.5.Compare and contrast accessories & ports of other	10

mobile devices	
▪ Connection types: NFC; proprietary vendor specific ports (communication/power); microUSB/miniUSB; Lightning; Bluetooth; IR; hotspot/tethering ▪ Accessories: headsets; speakers; game pads; docking stations; extra battery packs/battery chargers; protective covers/water proofing; credit card readers; memory/MicroSD	10
4.0 Hardware and Network Troubleshooting	
4.1.Given a scenario, troubleshoot common problems related to motherboards, RAM, CPU and power with appropriate tools	12
▪ Common symptoms: unexpected shutdowns; system lockups; POST code beeps; blank screen on bootup; BIOS time and settings resets; attempts to boot to incorrect device; continuous reboots; no power; overheating; loud noise; intermittent device failure; fans spin—no power to other devices; indicator lights; smoke; burning smell; proprietary crash screens (BSOD/pin wheel); distended capacitors ▪ Tools: multimeter; power supply tester; loopback plugs; POST card/ USB	12
4.2.Given a scenario, troubleshoot hard drives and RAID arrays with appropriate tools	12
▪ Common symptoms: read/write failure; slow performance; loud clicking noise; failure to boot; drive not recognized; OS not found; RAID not found; RAID stops working; proprietary crash screens (BSOD/pin wheel); S.M.A.R.T. errors ▪ Tools: screwdriver; external enclosures; CHKDSK; FORMAT; file recovery software; bootrec; diskpart; defragmentation tool	12

4.3.Given a scenario, troubleshoot common video, projector and display issues	12
▪ Common symptoms: VGA mode; no image on screen; overheat shutdown; dead pixels; artifacts; color patterns incorrect; dim image; flickering image; distorted image; distorted geometry; burn-in; oversized images and icons	12
4.4.Given a scenario, troubleshoot wired and wireless networks with appropriate tools	12
▪ Common symptoms: no connectivity; APIPA/link local address; limited connectivity; local connectivity; intermittent connectivity; IP conflict; slow transfer speeds; low RF signal; SSID not found ▪ tools: cable tester; loopback plug; punch down tools; tone generator and probe; wire strippers; crimper; wireless locator ▪ Command line tools: PING; IPCONFIG/IFCONFIG; TRACERT; NETSTAT; NBTSTAT; NET; NETDOM; NSLOOKUP	12
4.5.Given a scenario, troubleshoot, and repair common mobile device issues while adhering to the appropriate procedures	12
▪ Common symptoms: no display; dim display; flickering display; sticking keys; intermittent wireless; battery not charging; ghost cursor/pointer drift; no power; num lock indicator lights; no wireless connectivity; no Bluetooth connectivity; cannot display to external monitor; touchscreen non-responsive; apps not loading; slow performance; unable to decrypt email; extremely short battery life; overheating; frozen system; no sound from speakers; GPS not functioning; swollen battery ▪ Disassembling processes for proper re-assembly:	12

document and label cable and screw locations; organize parts; refer to manufacturer resources; use appropriate hand tools	
4.6.Given a scenario, troubleshoot printers with appropriate tools	12
▪ Common symptoms: streaks; faded prints; ghost images; toner not fused to the paper; creased paper; paper not feeding; paper jam; no connectivity; garbled characters on paper; vertical lines on page; backed up print queue; low memory errors; access denied; printer will not print; color prints in wrong print color; unable to install printer; error codes; printing blank pages; no image on printer display ▪ Tools: maintenance kit; toner vacuum; compressed air; printer spooler	12

A+ Certification Exam Objectives: 220-902

The following table lists the domains measured by this examination and the extent to which they are represented on the exam.

Domain	**Percentage of Exam**
1.0 Windows Operating Systems	29%
2.0 Other Operating Systems & Technologies	12%
3.0 Security	22%
4.0 Software Troubleshooting	24%
5.0 Operational Procedures	13%
Total	100%

Objective	**Chapter**
1.0 Windows Operating Systems	
1.1.Compare and contrast various features and requirements of Microsoft Operating Systems (Windows	15, 16, 17

Vista, Windows 7, Windows 8, Windows 8.1).	
▪ Features: 32-bit vs. 64-bit; Aero; gadgets; user account control; bit-locker; shadow copy; system restore; ready boost; sidebar; compatibility mode; virtual XP mode; easy transfer; administrative tools; defender; Windows firewall; security center; event viewer; file structure and paths; category view vs. classic view; Side by side apps; Metro UI; pinning; One Drive; Windows store; multimonitor task bars; charms; start screen; power shell; Live sign in; action center ▪ Upgrade paths—differences between in place upgrades; compatibility tools; Windows upgrade OS advisor	15, 16, 17
1.2.Given a scenario, install Windows PC operating systems using appropriate method	15, 16, 17
▪ Boot methods: USB; CD-ROM; DVD; PXE; solid state/flash drives; netboot; external/hot swappable drive; internal hard drive (partition) ▪ Type of installations: unattended installation; upgrade; clean install; repair installation; multiboot; remote network installation; image deployment; recovery partition; refresh/restore ▪ Partitioning: dynamic; basic; primary; extended; logical; GPT ▪ File system types/formatting: ExFAT; FAT32; NTFS; CDFS; NFS; ext3, ext4; quick format vs. full format ▪ Load alternate third party drivers when necessary ▪ Workgroup vs. Domain setup ▪ Time/date/region/language settings ▪ Driver installation, software and windows updates ▪ Factory recovery partition ▪ Properly formatted boot drive with the correct	15, 16, 17

partition/format	
1.3.Given a scenario, apply appropriate Microsoft command line tools	14
▪ TASKKILL; BOOTREC; SHUTDOWN; TASKLIST; MD; RD; CD; DEL; FORMAT; COPY; XCOPY; ROBOCOPY; DISKPART; SFC; CHKDSK; GPUPDATE; GPRESULT; DIR; EXIT; HELP; EXPAND; [command name] /?; commands available with standard privileges vs. administrative privileges	14
1.4.Given a scenario, use appropriate Microsoft operating system features and tools.	14
▪ Administrative: computer management; device manager; local users and groups; local security policy; performance monitor; services; system configuration; task scheduler; component services; data sources; print management; Windows memory diagnostics; Windows firewall; advanced security ▪ MSCONFIG: general; boot; services; startup; tools ▪ Task Manager: applications; processes; performance; networking; users ▪ Disk management: drive status; mounting; initializing; extending partitions; splitting partitions; shrink partitions; assigning/changing drive letters; adding drives; adding arrays; storage spaces ▪ Other: User State Migration tool (USMT); Windows Easy Transfer; Windows Upgrade Advisor ▪ System utilities: REGEDIT; COMMAND; SERVICES.MSC; MMC; MSTSC; NOTEPAD; EXPLORER; MSINFO32; DXDIAG; DEFRAG; System restore; Windows Update	14
1.5.Given a scenario, use Windows Control Panel utilities	14
▪ Internet options: Connections; Security; General;	14

Privacy; Programs; Advanced ▪ Display/Display Settings: Resolution; Color depth; refresh rate ▪ User accounts ▪ Folder options: View hidden files; Hide extensions; general options; view options ▪ System: Performance (virtual memory); Remote settings; System protection ▪ Windows firewall ▪ Power options: Hibernate; power plans; Sleep/suspend; Standby ▪ Programs and features ▪ HomeGroup ▪ Devices and Printers ▪ Sound ▪ Troubleshooting ▪ Network and Sharing Center ▪ Device Manager	
1.6.Given a scenario, install and configure Windows networking on a client/desktop.	15, 16, 17
▪ HomeGroup vs. Workgroup ▪ Domain setup ▪ Network shares/administrative shares/mapping drives ▪ Printer sharing vs. network printer mapping ▪ Establish networking connections: VPN; dialups; wireless; wired; WWAN (cellular) ▪ Proxy settings ▪ Remote desktop connection	15, 16, 17

▪ Remote assistance ▪ Home vs. Work vs. Public network settings ▪ Firewall settings: exceptions; configuration; enabling/disabling Windows firewall ▪ Configuring an alternative IP address in Windows: IP addressing; subnet mask; DNS; gateway ▪ Network card properties: half duplex/full duplex/auto; speed; Wake-on-LAN; QoS; BIOS (on-board NIC)	
1.7.Perform common preventive maintenance procedures using the appropriate Windows OS tools	14
▪ Best practices: scheduled backups; scheduled disk maintenance; Windows updates; patch management; driver/firmware updates; antivirus/antimalware updates ▪ Tools: Backup; System Restore; recovery image; disk maintenance utilities	14
2.0 Other Operating Systems and Technologies	
2.1.Identify common features and functionality of the Mac OS and Linux operating systems	18
▪ Best practices: Scheduled backups; scheduled disk maintenance; system updates/App store; patch management; driver/firmware updates; antivirus/antimalware updates ▪ Tools: Backup/Time Machine; Restore/snapshot; image recovery; disk maintenance utilities; shell/terminal; screen sharing; force quit ▪ Features: Multiple desktops/Mission Control; Key Chain; Spot Light; iCloud; gestures; Finder; Remote Disc; Dock; Boot Camp ▪ Basic Linux commands: ls; grep; cd; shutdown; pwd vs.	18

passwd; mv; cp; rm; chmod; chown; iwconfig/ifconfig; ps; q; su/sudo; apt-get; vi; dd	
2.2.Given a scenario, setup and use client-side virtualization	20
▪ Purpose of virtual machines ▪ Resource requirements ▪ Emulator requirements ▪ Security requirements ▪ Network requirements ▪ Hypervisor	20
2.3.Identify basic cloud concepts	20
▪ SaaS ▪ IaaS ▪ PaaS ▪ Public vs. Private vs. Hybrid vs. Community ▪ Rapid elasticity ▪ On-demand ▪ Resource pooling ▪ Measured service	20
2.4.Summarize the properties and purpose of services provided by networked hosts	20
▪ Server roles: Web server, file server; print server; DHCP server; DNS server; proxy server; mail server; authentication server ▪ Internet appliance: UTM; IDS; IPS ▪ Legacy / embedded systems	20
2.5.Identify basic features of mobile operating systems	21

▪ Android vs. iOS vs. Windows ▪ Open source vs. closed source/vendor specific ▪ App source (play store, app store and store) ▪ Screen orientation (accelerometer/gyroscope) ▪ Screen calibration ▪ GPS and geotracking ▪ WiFi calling ▪ Launcher/GUI ▪ Virtual assistant ▪ SDK/APK ▪ Emergency notification ▪ Mobile payment service	21
2.6.Install and configure basic mobile device network connectivity and email	21
▪ Wireless / cellular data network (enable/disable): hotspot; tethering; airplane mode ▪ Bluetooth: enable Bluetooth; enable pairing; find device for pairing; enter appropriate pin code; test connectivity ▪ Corporate and ISP email configuration: POP3; IMAP; port and SSL settings; Exchange, S/MIME ▪ Integrated commercial provider email configuration: Google/Inbox; Yahoo; Outlook.com; iCloud ▪ PRI updates/PRL updates/baseband updates ▪ Radio firmware ▪ IMEI vs. IMSI ▪ VPN	21
2.7.Summarize methods and data related to mobile device	21

synchronization	
▪ Types of data to synchronize: contacts; programs; email; pictures; music; videos; calendar; bookmarks; documents; location data; social media data; eBooks ▪ Synchronization methods: synchronize to the cloud; synchronize to the desktop ▪ Mutual authentication for multiple services ▪ Software requirements to install the application on the PC ▪ Connection types to enable synchronization	21
3.0 Security	
3.1.Identify common security threats and vulnerability	19
▪ Malware: spyware; viruses; worms; Trojans; rootkits; ransomware ▪ Phishing ▪ Spear phishing ▪ Spoofing ▪ Social engineering ▪ Shoulder surfing ▪ Zero day attack ▪ Zombie/botnet ▪ Brute forcing ▪ Dictionary attacks ▪ Non-compliant systems ▪ Violations of security best practices ▪ Tailgating ▪ Man-in-the-middle	19

3.2.Compare and contrast common prevention methods	19
▪ Physical security: lock doors; mantrap; cable locks; securing physical documents/passwords/shredding; biometrics; ID badges; key fobs; RFID badge; smart card; tokens; privacy filters; entry control roster ▪ Digital security: antivirus/antimalware; firewalls; user authentication/strong passwords; multifactor authentication; directory permissions; VPN; DLP; Disabling ports; Access control lists; smart card; email filtering; trusted/untrusted software sources ▪ User education/AUP ▪ Principle of least privilege	19
3.3.Compare and contrast differences of basic Windows OS security settings	19
▪ User and groups: administrator; power user; guest; standard user ▪ NTFS vs. share permissions: allow vs. deny; moving vs. copying folders and files; file attributes ▪ Shared files and folders: administrative shares vs. local shares; permission propagation; inheritance ▪ System files and folders ▪ User authentication: single sign-on ▪ Run as administrator vs. standard user ▪ Bitlocker ▪ Bitlocker-to-Go ▪ EFS	19
3.4.Given a scenario, deploy and enforce security best practices to secure a workstation	19
▪ Password best practices: Setting strong passwords;	19

Password expiration; Changing default user names/passwords; Screensaver required password; BIOS/UEFI passwords; Requiring passwords ▪ Account management: Restricting user permissions; Login time restrictions; Disabling guest account; Failed attempts lockout; Timeout/screen lock ▪ Disable autorun ▪ Data encryption ▪ Patch/update management	
3.5.Compare and contrast various methods for securing mobile devices	17
▪ Screen locks: fingerprint lock; face lock; swipe lock; passcode lock ▪ Remote wipes ▪ Locator applications ▪ Remote backup applications ▪ Failed login attempts restrictions ▪ Antivirus/antimalware ▪ Patching/OS updates ▪ Biometric authentication ▪ Full device encryption ▪ Multifactor authentication ▪ Authenticator applications ▪ Trusted sources vs. untrusted sources ▪ Firewalls ▪ Policies and procedures: BYOD vs. corporate owned; profile security requirements	17
3.6.Given a scenario, use appropriate data destruction and	17

disposal methods	
▪ Physical destruction: shredder; drill/hammer; electromagnetic (degaussing); incineration; certificate of destruction ▪ Recycling or repurposing best practices: Low level format vs. standard format; overwrite; drive wipe	17
3.7.Given a scenario; secure SOHO wired and wireless networks	17
▪ Wireless specific: Changing default SSID; Setting encryption; Disabling SSID broadcast; Antenna and access point placement; Radio power levels; WPS ▪ Change default usernames and passwords ▪ Enable MAC filtering	17
▪ Assign static IP addresses ▪ Firewall settings ▪ Port forwarding/mapping ▪ Disabling ports ▪ Content filtering/parental controls ▪ Update firmware ▪ Physical security	17
4.0 Software Troubleshooting	
4.1.Given a scenario, troubleshoot PC operating system problems with appropriate tools	22
▪ Common symptoms: Proprietary crash screens (BSOD/pin wheel); failure to boot; improper shutdown; spontaneous shutdown/restart; device fails to start/detected; missing dll message; services fails to start; compatibility error; slow system performance; boots to safe mode; file fails to open; missing	22

BOOTMGR; missing Boot Configuration Data; missing operating system; missing graphical interface; missing GRUB/LILO; kernel panic; graphical interface fails to load; multiple monitor misalignment/ orientation	
▪ Tools: BIOS/UEFI; SFC; logs; system recovery options; repair disks; pre-installation environments; MSCONFIG; DEFRAG; REGSRV32; REGEDIT; event viewer; safe mode; command prompt; uninstall/reinstall/repair	22
4.2.Given a scenario, troubleshoot common PC security issues with appropriate tools and best practices	22
▪ Common symptoms: pop-ups; browser redirection; security alerts; slow performance; internet connectivity issues; PC/OS lock up; application crash; OS update failures; rogue antivirus; spam; renamed system files; files disappearing; file permission changes; hijacked email (responses from users regarding email; automated replies from unknown sent mail); access denied; invalid certificate (trusted root CA) ▪ Tools: anti-virus software; anti-malware software; system recovery options; terminal; system restore/snapshot; pre-installation environments; event viewer; refresh/restore; MSCONFIG/safe boot ▪ Best practices for malware removal: Identify malware symptoms; Quarantine infected system; Disable system restore (in Windows); Remediate infected systems (Update antimalware software; Scan and removal techniques (safe mode; pre-installation environment)); Schedule scans and run updates; Enable system restore and create restore point (in Windows); Educate end user	22
4.3.Given a scenario, troubleshoot common mobile OS and application issues with appropriate tools	22

▪ Common symptoms: dim display; intermittent wireless; no wireless connectivity; no Bluetooth connectivity; cannot broadcast to external monitor; touchscreen non-responsive; apps not loading; slow performance; unable to decrypt email; extremely short battery life; overheating; frozen system; no sound from speakers; inaccurate touch screen response; system lockout ▪ Tools: hard reset; soft reset; close running applications; reset to factory default; adjust configurations/settings; uninstall/reinstall apps; force stop	22
4.4.Given a scenario, troubleshoot common mobile OS and application security issues with appropriate tools	22
▪ Common symptoms: signal drop/weak signal; power drain; slow data speeds; unintended WiFi connection; unintended Bluetooth pairing; leaked personal files/data; data transmission overlimit; unauthorized account access; unauthorized root access; unauthorized location tracking; unauthorized camera/microphone activation; high resource utilization ▪ Tools: antimalware; app scanner; factory reset/clean install; uninstall/reinstall apps; WiFi analyzer; force stop; cell tower analyzer; backup/restore (iTunes/iCloud/Apple Configurator; Google sync; One Drive)	22
5.0 Operational Procedures	
5.1.Given a scenario, use appropriate safety procedures	23
▪ Equipment grounding ▪ Proper component handling and storage: antistatic bags; ESD straps; ESD mats; Self-grounding ▪ Toxic waste handling: batteries; toner; CRT ▪ Personal safety: disconnect power before repairing PC; remove jewelry; lifting techniques; weight limitations;	23

electrical fire safety, cable management; safety goggles; air filter mask ▪ Compliance with local government regulations	
5.2.Given a scenario with potential environmental impacts, apply the appropriate controls	23
▪ MSDS documentation for handling and disposal ▪ Temperature, humidity level awareness and proper ventilation ▪ Power surges, brownouts, blackouts: battery backup; surge suppressor ▪ Protection from airborne particles: enclosures; air filters/mask ▪ Dust and debris: compressed air; vacuums ▪ Compliance to local government regulations	23
5.3.Summarize the process of addressing prohibited content/activity, and explain privacy, licensing, and policy concepts	23
▪ Incident response: First response (identify; report through proper channels; data/device preservation); Use of documentation/documentation changes; Chain of custody (tracking of evidence/documenting process) ▪ Licensing/DRM/EULA: open source vs. commercial license; personal license vs. enterprise licenses ▪ Personally Identifiable Information ▪ Follow corporate end-user policies and security best practices	23
5.4.Demonstrate proper communication techniques and professionalism	23
▪ Use proper language – avoid jargon, acronyms, slang	23

when applicable ▪ Maintain a positive attitude / Project confidence ▪ Actively listen (taking notes) and avoid interrupting the customer ▪ Be culturally sensitive: use appropriate professional titles, when applicable ▪ Be on time (if late contact the customer) ▪ Avoid distractions: personal calls; texting/social media sites; talking to co-workers while interacting with customers; personal interruptions ▪ Dealing with difficult customer or situation: do not argue with customers and/or be defensive; avoid dismissing customer problems; avoid being judgmental; clarify customer statements (ask open ended questions to narrow the scope of the problem, restate the issue or question to verify understanding); do not disclose experiences via social media ▪ Set and meet expectations/timeline and communicate status with the customer: offer different repair/replacement options if available; provide proper documentation on the services provided; follow up with customer/user at a later date to verify satisfaction ▪ Deal appropriately with customers confidential and private materials: located on a computer, desktop, printer, etc.	
5.5. Given a scenario, explain the troubleshooting theory.	23
▪ Always consider corporate policies, procedures and impacts before implementing changes. ▪ Identify the problem: Question the user and identify user changes to computer and perform backups before making changes ▪ Establish a theory of probable cause (question the	23

obvious): If necessary, conduct external or internal research based on symptoms ▪ Test the theory to determine cause: Once theory is confirmed determine next steps to resolve problem; If theory is not confirmed re-establish new theory or escalate ▪ Establish a plan of action to resolve the problem and implement the solution ▪ Verify full system functionality and if applicable implement preventive measures ▪ Document findings, actions and outcomes	

Exam objectives are subject to change at any time without prior notice at CompTIA's sole discretion. Please visit CompTIA's website (www.comptia.org) for the most current listing of exam objectives.

Assessment Test

1. Which of the following is *not* considered a system component that can be found inside a computer?
   A. CPU
   B. RAM
   C. PCIe graphics adapter
   D. Motherboard
2. Which of the following is a physical memory format installed directly in today's desktop computer systems?
   A. DIMM
   B. HDD
   C. SSD
   D. eMMC
3. Which of the following are components that can commonly be found on a motherboard? (Choose all that apply.)
   A. Slots
   B. Fan connectors
   C. Gyroscope
   D. Scanner
   E. HDD
4. What suffix indicates that the capacity of an optical disc is roughly twice that of its standard counterpart?
   A. DL
   B. R
   C. RW

D. RE

5. What is the name of the standard power connector that has been used with larger drives since the first IBM personal computers were introduced?

   A. AT system connector

   B. Berg

   C. Molex

   D. ATX system connector

6. Except in the case of RAID 0, which two things do all types of RAID offer?

   A. Faster read speeds

   B. Faster write speeds

   C. Redundancy

   D. Fault tolerance

   E. Ability to restore automatically from tape after a drive failure

7. You are installing a new graphics adapter in a Windows 7 system. Which of the following expansion slots is designed for high-speed, 3D graphics adapters?

   A. USB

   B. FireWire

   C. PCI

   D. PCIe

8. A user complains that changing from a VGA graphics card to one that supports the latest HDMI revision has resulted in not being able to play back certain content from the computer. Some content does play back, however. What could be the problem?

   A. Digital signal required

   B. Resolution too low

C. DRM

D. VGA cable not compatible

9. Which of the following are modular ports used in data communications? (Choose two.)

A. RG-6

B. RJ-45

C. RJ-11

D. Thunderbolt

E. RG-11

0. The _____is the measurement of the number of pixels an LCD monitor can display without the image appearing distorted.

A. Native resolution

B. Contrast ratio

C. Pixelation

D. Base frequency

11. Which of the following is *not* a common monitor technology?

A. LCD

B. Plasma

C. OLED

D. Super PMOLED

2. What can be used at the check-in desk of a doctor's office to prevent patients from viewing confidential information?

A. An antiglare filter

B. A privacy filter

C. An LED-backlit display

D. A thin client

13. Which of the following is a standard computer that can access resources locally as well as from servers but requires no specialized enhancements?

    A. Gaming PC

    B. Home server

    C. Thin client

    D. Thick client

14. Which of the following is a requirement for virtualization workstations?

    A. Enhanced video

    B. Enhanced audio

    C. Maximum RAM and CPU cores

    D. RAID array

15. Which of the following is *not* a requirement for a home server PC?

    A. TV tuner

    B. Print and file sharing services

    C. Gigabit NIC

    D. RAID array

16. Which network connectivity device stops broadcasts from being sent to computers on a different network segment?

    A. Hub

    B. Switch

    C. Router

    D. Firewall

17. Which layer of the OSI model has the important role of providing error checking?

    A. Session layer

    B. Presentation layer

C. Application layer

D. Transport layer

18. On which port does FTP run by default?

A. 21

B. 25

C. 63

D. 89

19. Which of the following protocols can be used by a client to access email on a server?

A. DNS

B. FTP

C. SMTP

D. IMAP

20. Which of the following is a company that provides direct access to the Internet for home and business computer users?

A. ASP

B. ISP

C. DNS

D. DNP

21. What is the data throughput provided by one ISDN bearer channel?

A. 16Kbps

B. 56Kbps

C. 64Kbps

D. 128Kbps

22. Which LCD component in a laptop is responsible for providing brightness?

A. Backlight

B. Inverter

C. Screen

D. Backdrop

23. Your laptop has 2GB of installed memory and uses shared video memory. If the video card is using 512MB, how much is left for the rest of the system?

A. 2GB

B. 1.5GB

C. 512MB

D. Cannot determine

24. Which of the following standards supports both PCIe and USB 3.0?

A. PC Card

B. PlugCard

C. ExpandCard

D. ExpressCard

25. When using a capacitive touchscreen on a mobile device, what is the most common tool used to input data?

A. Keyboard

B. Trackball

C. Stylus

D. Finger

26. Which technology used by e-Readers gives them longer battery life than tablets?

A. Lithium-polymer battery

B. Low-power backlight

C. Electrophoretic ink

D. Capacitive touchscreen

27. What is the name of the mode that allows two NFC-enabled devices to transmit data to each other?

A. Emulation mode

B. Peer-to-peer mode

C. Reader/writer mode

D. Ad hoc mode

28. What is the function of the laser in a laser printer?

A. It heats up the toner so that it adheres to the page.

B. It charges the paper so that it will attract toner.

C. It creates an image of the page on the drum.

D. It cleans the drum before a page is printed.

29. What is the component called that stores the material that ends up printed to the page in a laser printer?

A. Toner cartridge

B. Ink cartridge

C. Laser module

D. Laser cartridge

30. What service was created by Apple to allow iPhones and iPads to print without installing printer drivers?

A. TCP printing

B. Bonjour

C. AirPrint

D. iPrint

31. Your laser printer has recently starting printing vertical white lines on the documents that it prints. What is the most likely cause of the problem?

A. The print driver is faulty.

B. The fuser is not heating properly.

C. There is toner on the transfer corona wire.

D. There is a scratch on the EP drum.

32. You are working with a Windows 7 computer that is assigned IP configuration information from a central server. You wish to refresh the IP information on the system manually. Which of the following commands would you use?

A. `IPCONFIG /refresh`

B. `IPCONFIG /all`

C. `IPCONFIG /renew`

D. `WINIPCFG /all`

33. One laser printer in your office experiences frequent paper jams. What is the most likely cause of the problem?

A. Worn paper feed rollers.

B. Faulty stepper motor.

C. Faulty fuser assembly.

D. The EP drum isn't advancing properly.

34. One of your network users was recently caught browsing pornographic websites at work. Which of the following servers could be installed to prohibit this activity?

A. Web

B. Security

C. Proxy

D. DNS

35. Google Docs is an example of what type of cloud service?

A. SaaS

B. IaaS

C. PaaS

D. GaaS

36. Which type of software is required to run client-side virtualization on your home network?

A. Terminal emulation

B. Process replication

C. Hyperthreading

D. Hypervisor

37. Which of the following are popular mobile-device operating systems? (Choose all that apply.)

A. Android

B. Windows 7

C. Ubuntu

D. iOS

38. Which of the following protocols can be used in close range to transfer data between a mobile device and a computer system or to allow media to stream from the mobile device to an audio system?

A. SMTP

B. Bluetooth

C. NFC

D. Pegasus

39. What term refers to copying data between a mobile device and a computer system to mirror such things as contacts, programs, pictures, and music?

A. Calibration

B. Remote wipe

C. Pairing

D. Synchronization

40. Which of the following computer components can retain a lethal

electrical charge even after the device is unplugged? (Choose two.)

A. Monitor

B. Processor

C. Power supply

D. RAM

11. Roughly how much time spent communicating should be devoted to listening?

A. 23 percent

B. 40 percent

C. 50 percent

D. 80 percent

12. You have found prohibited content on a user's machine and need to follow proper procedures. What is the term used to describe the handling of evidence from discovery to delivery to the proper authorities?

A. First response

B. Chain of custody

C. Data preservation

D. Documentation flow changes

13. Which of the following is a security mechanism used by HTTPS to encrypt web traffic between a web client and server?

A. IPSec

B. SSL

C. L2TP

D. PPPoE

14. Which of the following are 4G technologies? (Choose all that apply.)

A. LTE

B. GSM

C. CDMA

D. WiMax

15. Which of the following standards is also known as CardBus?

A. PCMCIA 1.0

B. PCMCIA 2.0

C. PCMCIA 5.0

D. ExpressCard

16. When lifting heavy equipment, what is the proper technique?

A. Get the heaviest part closest to your body and lift with your legs.

B. Get the heaviest part closest to your body and lift with your back.

C. Get the lightest part closest to your body and lift with your legs.

D. Get the lightest part closest to your body and lift with your back.

17. Which of the following is a chip that is integrated into PATA drives, as opposed to being mounted on a daughter card?

A. Controller

B. CPU

C. Host adapter

D. IDE

18. After SATA was introduced, what was the retroactive term used for the original ATA specification?

A. EIDE

B. IDE

C. PATA

D. SCSI

19. Which of the following is a virtual machine manager—the software

that allows the virtual machines to exist?

A. Comptroller

B. Shell

C. Kernel

D. Hypervisor

50. Which of the following would *not* be considered a standard permission in Windows using NTFS?

A. Full Control

B. Modify

C. Allow

D. Write

51. Which feature is designed to keep Windows current by automatically downloading updates such as patches and security fixes and installing these fixes automatically?

A. Security Center

B. Action Center

C. Windows Update

D. Windows Anytime

52. With dynamic storage, which of the following partition types are possible?

A. Complex, bridged, or mirrored

B. Simple, spanned, or striped

C. Simple, complex, or interleaved

D. Spanned, interleaved, or striped

53. You have been told to use Task Manager to change the priority of a process to Below Normal. This equates to a base priority of what?

A. 2

B. 4

C. 6

D. 8

54. Encrypting File System (EFS) is available in which editions of Windows 7? (Choose all that apply.)

A. Professional

B. Home Premium

C. Enterprise

D. Ultimate

E. Business

55. Which of the following can provide electrical power over Ethernet cabling?

A. PoE

B. QoS

C. DoS

D. WoL

56. With which type of duplexing do communications travel in both directions but in only one direction at any given time?

A. Full

B. Half

C. Auto

D. Mechanical

57. Which applet in Windows Vista is the primary interface for configuring synchronization of offline files?

A. Synchronization Wizard

B. Action Center

C. Merge

D. Sync Center

58. Which Control Panel applet allows you to administer, as well as deploy, component services and configure behavior like security?

A. SFC

B. Data Sources

C. Component Services

D. DDR

59. In Windows, the Account Lockout Counter in an Account Lockout policy keeps track of the number of invalid attempts before lockout occurs. The default is 0 (meaning the feature is turned off), but it can be set from 1 to what?

A. 9999

B. 999

C. 99

D. 24

60. What Windows operating system tool can be used to block access from the network (be it internal or the Internet)?

A. Windows Firewall

B. Windows Defender

C. Advanced Security

D. Device Manager

61. Which of the following are programs that enter a system or network under the guise of another program? (Choose the best answer.)

A. Worms

B. Trojans

C. Rootkits

D. Spyware

62. Which of the following involves applying a strong magnetic field to

initialize the media before tossing it away?

A. Fraying
B. Fracking
C. Degaussing
D. Spreading

13. Which term is synonymous with *MAC filtering*?

A. Disabling Autorun
B. Shredding
C. Port disabling
D. Network Lock

14. Which of the following is a copy of your system configuration at a given point in time?

A. Restore point
B. MBR
C. Registry
D. `BOOT.INI`

15. Which of the following could be described as a small, deviously ingenious program that replicates itself to other computers, generally causing those computers to behave abnormally? (Choose the best answer.)

A. Rogue
B. Redirector
C. Virus
D. Pop-up

Answers to Assessment Test

1. C. System components are essential for the basic functionality of a computer system. Many of the landmarks found on the

motherboard can be considered system components, even expansion slots to a degree. What you plug into those slots, however, must be considered peripheral to the basic operation of the system. For more information, see Chapter 1.

2. A. Except for DIMMs, all options represent some form of secondary storage, all of which are covered in Chapter 2. For more information, see Chapter 1.
3. A, B. Motherboards commonly have RAM slots and expansion slots. Older motherboards even had CPU slots. Modern motherboards have connectors for powering cooling fans. Gyroscopes are most commonly found in mobile devices. Scanners are external devices. Although there might be one or more types of HDD interfaces built into the motherboard, the HDD itself is not. For more information, see Chapter 1.
4. A. DL stands for double or dual layer. With DVDs, the capacity almost doubles, but with Blu-ray discs, it actually does. For more information, see Chapter 2.
5. C. The standard peripheral power connector, or Molex connector, is commonly used on larger drives because it allows more current to flow to the drive than smaller peripheral connectors. For more information, see Chapter 2.
6. C, D. Except for RAID 0, all implementations of RAID offer a way to recover from the failure of at least one drive, which is an example of fault tolerance, through the implementation of some mechanism that stores redundant information for that purpose. Some RAID types offer faster read and/or write performance. RAID 1, for instance does not guarantee either. For more information, see Chapter 2.
7. D. Although technically PCI could be used for graphics adapters, PCIe supports high-speed, 3D graphic video cards. PCIe offers better performance than older graphics adapters. USB and FireWire can stream video, but they are not used for attachment of graphics adapters. For more information, see Chapter 3.
8. C. Digital rights management (DRM), using High-bandwidth

Content Protection (HDCP), is supported by adapters and monitors that support HDMI and later versions of DVI. If the content is protected, HDMI in the adapter will use HDCP to encrypt the stream across the cable, and the monitor will use HDCP to decrypt it for playback. From the information given, it cannot be assumed that the monitor changed when the adapter did. As a result, the monitor might have an older DVI-D port that uses a passive converter to receive the HDMI cable's signal but that does not support HDCP. The signal over the HDMI cable is always digital. As a result, a VGA cable, which only supports analog signals, cannot be used when a DVI-D or HDMI interface is involved. HDMI supports all resolutions supported by a VGA interface. For more information, see Chapter 3.

9. B, C. RJ-11 ports are used in analog telephony, and they allow modems attached to computer serial ports to transmit modulated digital information across the public switched telephone network (PSTN). RJ-45 ports are used by various network interface controller (NIC) cards for attachment to networks such as Ethernet. RG-6 and RG-11 are coaxial cable types, and Thunderbolt connectors are not modular. For more information, see Chapter 3.

0. A. The native resolution refers to how many pixels an LCD screen can display (across and down) without distortion. The native resolution is based on the placement of the actual transistors that create the image by twisting the liquid crystals. The contrast ratio is the measurement between the darkest color and the lightest color that an LCD screen can display. For more information, see Chapter 4.

11. D. Although there *is* a Super AMOLED display, employing active-matrix technology, there is no corresponding "super" passive-matrix version. The other technologies exist and are discussed in further detail in Chapter 4.

2. B. Privacy filters are used to limit the viewing angle for a monitor. With such filters, the screen image becomes indiscernible when viewed at just a few degrees from center. For more information, see Chapter 4.

13. D. A thick client is any computer system with a standard configuration. The gaming PC has enhancements over thick clients to their CPU, video, audio, and cooling. The home server PC must have specialized capabilities and services along with a faster NIC than the thick client and a RAID array. The thin client is a lesser device in comparison to the thick client, but that cost-saving feature is its enhancement. These less expensive computers can connect over the network to servers for their operating system images and applications. For more information, see Chapter 5.

14. C. Virtualization workstations require more RAM than standard systems and need to be equipped with as many multicore processors as possible. Video and audio are not resources that need to be enhanced for such workstations. Although a RAID array is a wise addition whenever servers with valuable information are involved, a virtualization workstation does not require one. For more information, see Chapter 5.

15. A. A TV tuner card is a requirement for a home theater PC but not for a home server. The other options are among those features that are required. For more information, see Chapter 5.

16. C. A router does not pass along broadcasts to computers on other segments. Hubs and switches send broadcasts along because they do not segment traffic at the logical network address level. See Chapter 6 for more information.

17. D. A key role of the Transport layer is to provide error checking. The Transport layer also provides functions such as reliable end-to-end communications, segmentation and reassembly of larger messages, and combining smaller messages into a single larger message. See Chapter 6 for more information.

18. A. FTP listens on port 21. See Chapter 7 for more information.

19. D. The IMAP and POP3 protocols can be used to retrieve email from mail servers. See Chapter 7 for more information.

20. B. An Internet service provider (ISP) provides direct access to the Internet. See Chapter 8 for more information.

21. C. An ISDN B (bearer) channel provides 64Kbps data throughput.

A home-based BRI ISDN provides two B channels. See Chapter 8 for more information.

22. A. The backlight provides light to the LCD screen. The inverter provides power to the backlight, and the screen displays the picture. See Chapter 9 for more information.

23. B. If the laptop is using shared video memory, then the system memory is shared with the video card. If the video card is using 512MB (half a gigabyte), then there is 1.5GB left for the system. See Chapter 9 for more information.

24. D. ExpressCard supports PCIe and USB 3.0. See Chapter 9 for more information.

25. D. Capacitive touchscreens react to slight changes in electrical charges. The human finger is used as an input device for capacitive touchscreens. For more information, see Chapter 10.

26. C. e-Readers use electrophoretic ink, also known as E Ink. E Ink uses less energy than other LCD displays, prolonging battery life. For more information, see Chapter 10.

27. B. Card emulation mode, reader/writer mode, and peer-to-peer mode are the three valid NFC communication modes. For two devices to transmit to each other, they will use peer-to-peer mode. For more information, see Chapter 10.

28. C. The laser creates an image on the photosensitive drum that is then transferred to the paper by the transfer corona. The fuser heats up the toner so that it adheres to the page. The transfer corona charges the page, and the eraser lamp cleans the drum before a page is printed. A rubber blade is also used to remove toner physically from the drum. See Chapter 11 for more information.

29. A. Laser printers use toner, which they melt to the page in the image of the text and graphics being printed. A toner cartridge holds the fine toner dust until it is used in the printing process. See Chapter 11 for more information.

30. C. AirPrint was created by Apple to let iPhones and iPads print

without installing a printer driver. See Chapter 11 for more information.

31. C. Toner on the transfer corona wire is most likely the cause of white streaks on printouts. A scratch or a groove in the EP drum causes vertical black lines. If the fuser was not heating properly, toner would not bond to the paper and you would have smearing. Faulty print drivers will cause garbage to print or there will be no printing at all. See Chapter 12 for more information.

32. C. The `IPCONFIG` utility can be used with Windows computers to see the networking configuration values at the command line. It is one of the most commonly used command-line utilities that can be used in troubleshooting and network configurations. To renew IP configuration information, the `IPCONFIG /renew` command is used to force the DHCP server to renew the IP information assigned to the system. See Chapter 12 for more information.

33. A. The most likely cause of those listed is a worn paper feed roller. Stepper motors control the back-and-forth motion of a print head in an inkjet printer. If the fuser assembly were faulty, the images would smear. See Chapter 12 for more information.

34. C. A proxy server can be configured to block access to websites containing potentially objectionable material. See Chapter 20 for more information.

35. A. Google Docs is software, so it is an example of Software as a Service (SaaS). See Chapter 20 for more information.

36. D. The hypervisor is the key piece of software needed for virtualization. See Chapter 20 for more information.

37. A, D. Google's Android and Apple's iOS are two of the most popular operating systems for mobile devices on the market. The other two are not. Although some mobile operating systems are based on Linux or UNIX, Ubuntu is a Linux distribution not used for mobile devices. For more information, see Chapter 21.

38. B. Bluetooth allows you to pair a mobile device to a computer or to a device such as an automotive sound system or headset. Data can be transferred between devices, and media can be streamed from

the mobile device. For more information, see Chapter 21.

9. D. Synchronizing a mobile device with a computer system allows you to mirror personal data between the devices, regardless of which one contains the most current data. Calibration refers to matching the device's and user's perceptions of where the user is touching the screen. Remote wipes allow you to remove personal data from a lost or stolen device. Pairing is what must be done in Bluetooth for two Bluetooth devices to connect and communicate. For more information, see Chapter 21.

0. A, C. Monitors and power supplies can retain significant electrical charges, even after they're unplugged. Don't open the back of a monitor or the power supply unless you are specifically trained to do so. See Chapter 23 for more information.

1. C. Roughly half the time spent communicating should be devoted to listening. See Chapter 23 for more information.

2. B. *Chain of custody* describes the procedure used to track handling and the location of evidence in the event of an incident such as discovering illegal or improper material on a user's computer. See Chapter 23 for more information.

3. B. HTTPS connections are secured using either Secure Sockets Layer (SSL) or Transport Layer Security (TLS).

4. A, D. WiMax and LTE are the two current 4G cellular technologies. GSM and CDMA are 3G technologies.

5. C. PCMCIA 5.0 is also known as CardBus.

6. A. When lifting heavy equipment, center the weight as close to your body as possible. Then, keep your back straight and lift with your legs.

7. A. A controller chip is responsible for encoding data to be stored on the disk platters as well as performing geometry translation for the BIOS. Translation is necessary because the true number of sectors per track of the hard disk drive system usually exceeds what is supported by the BIOS.

8. C. *IDE* (ATA-1) and *EIDE* (ATA-2 and later) were specific

nicknames for the ATA series of standards. Although *ATA* is technically accurate, it refers to legacy IDE standards as well as newer SATA standards. Instead of using the term *ATA* to be synonymous with *IDE* and *EIDE*, as had been done in the past, the term *PATA* was coined, referring to the parallel nature of IDE communications. The term *PATA* differentiates the IDE and EIDE form of ATA from Serial ATA. SCSI is a related, yet completely different type of technology.

49. D. The hypervisor is a virtual machine manager—the software that allows the virtual machines to exist.

50. C. Standard permissions are collections of special permissions, including Full Control, Modify, Read & Execute, Read, and Write.

51. C. Windows includes Windows Update, a feature designed to keep Windows current by automatically downloading updates such as patches and security fixes and installing these fixes automatically.

52. B. Windows supports both basic and dynamic storage. Basic can have a primary and an extended partition, while dynamic can be simple, spanned, or striped.

53. C. For applications that don't need to drop all of the way down to Low, this equates to a base priority of 6.

54. A, C, D. EFS is available in the Professional, Enterprise, and Ultimate editions of Windows 7, allowing for encryption/decryption on files stored in NTFS volumes.

55. A. Power over Ethernet (PoE) is a handy technology to supply both power and an Ethernet connection. The purpose of Power over Ethernet (PoE) is pretty much described in its name: Electrical power is transmitted over twisted-pair Ethernet cable (along with data).

56. B. With half duplex, communications travel in both directions but in only one direction at any given time.

57. D. The Sync Center in Windows Vista is the primary interface for configuring synchronization.

58. C. Component Services allows you to administer as well as deploy

component services and configure behavior like security.

59. B. It can be set from 1 to 999.

60. A. Windows Firewall (Start ➢ Control Panel ➢ Windows Firewall) is used to block access from the network (be it internal or the Internet).

61. B. Trojans are programs that enter a system or network under the guise of another program. While rootkits *may* do this, it is not their primary feature and thus not the best answer for this question.

62. C. Degaussing involves applying a strong magnetic field to initialize the media (this is also referred to as disk wiping). This process helps ensure that information doesn't fall into the wrong hands.

63. D. On a number of wireless devices, the term Network Lock is used in place of *MAC filtering*, and the two are synonymous.

64. A. A restore point is a copy of your system configuration at a given point in time. It's like a backup of your configuration but not necessarily your data.

65. C. A computer virus is a small, deviously ingenious program that replicates itself to other computers, generally causing those computers to behave abnormally. Generally speaking, a virus's main function is to reproduce.