**Chapter 1  
Motherboards, Processors, and Memory**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **3.2 Given a scenario, install the appropriate RAM.**
  + **RAM types**
    - **Virtual RAM**
    - **Small outline dual inline memory module (SODIMM)**
    - **Double Data Rate 3 (DDR3)**
    - **Double Data Rate 4 (DDR4)**
    - **Double Data Rate 5 (DDR5)**
    - **Error correction code (ECC) RAM**
  + **Single-channel**
  + **Dual-channel**
  + **Triple-channel**
  + **Quad-channel**
* **3.4 Given a scenario, install and configure motherboards, central processing units (CPUs), and add-on cards.**
  + **Motherboard form factor**
    - **Advanced Technology eXtended (ATX)**
    - **Information Technology eXtended (ITX)**
  + **Motherboard connector types**
    - **Peripheral Component Interconnect (PCI)**
    - **PCI Express (PCIe)**
    - **Power connectors**
    - **SATA**
    - **eSATA**
    - **SAN**
    - **Headers**
    - **M.2**
  + **Motherboard compatibility**
    - **CPU sockets**
  + **Advanced Micro Devices, Inc. (AMD)**
  + **Intel**
    - **Server**
    - **Multisocket**
    - **Desktop**
    - **Mobile**
  + **Basic Input/Output System (BIOS)/Unified Extensible Firmware Interface (UEFI) settings**
    - **Boot options**
    - **USB permissions**
    - **Trusted Platform Module (TPM) security features**
    - **Fan considerations**
    - **Secure Boot**
    - **Boot password**
  + **Encryption**
    - **TPM**
    - **Hardware security module (HSM)**
  + **CPU architecture**
    - **x64/x86**
    - **Advanced RISC Machine (ARM)**
    - **Single-core**
    - **Multicore**
    - **Multithreading**
    - **Virtualization support**
  + **Cooling**
    - **Fans**
    - **Heat sink**
    - **Thermal paste/pads**
    - **Liquid**

**Chapter 2  
Expansion Cards, Storage Devices, and Power Supplies**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **3.3 Given a scenario, select and install storage devices.**
  + **Hard drives**
    - **Speeds**
      * **5,400rpm**
      * **7,200rpm**
      * **10,000rpm**
      * **15,000rpm**
  + **Form factor**
    - **2.5**
    - **3.5**
  + **SSDs**
    - **Communications interfaces**
      * **Non-volatile Memory Express** (**NVMe)**
      * **SATA**
      * **Peripheral Component Interconnect Express (PCIe)**
    - **Form factors**
      * **M.2**
      * **mSATA**
  + **Drive configurations**
    - **Redundant Array of Independent (or Inexpensive) Disks (RAID) 0, 1, 5, 10**
  + **Removable storage**
    - **Flash drives**
    - **Memory cards**
    - **Optical drives**
* **3.4 Given a scenario, install and configure motherboards, central processing units (CPUs), and add-on cards.**
  + **Expansion cards**
    - **Sound card**
    - **Video card**
    - **Capture card**
    - **NIC**
* **3.5 Given a scenario, install or replace the appropriate power supply.**
  + **Input 115V vs. 220V**
  + **Output 3.3V vs. 5.5V vs. 12V**
  + **20-pin to 24-pin motherboard adapter**
  + **Redundant power supply**
  + **Modular power supply**
  + **Wattage rating**

**Chapter 3  
Peripherals, Cables, and Connectors**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **3.1 Explain basic cable types and their connectors, features, and purposes.**
  + **Peripheral cables**
    - **USB 2.0**
    - **USB 3.0**
    - **Serial**
    - **Thunderbolt**
  + **Video cables**
    - **High-Definition Multimedia Interface** (**HDMI)**
    - **DisplayPort**
    - **Digital Visual Interface (DVI)**
    - **Video Graphics Array (VGA)**
  + **Hard drive cables**
    - **Serial Advanced Technology Attachment (SATA)**
    - **Small Computer System Interface (SCSI)**
    - **External SATA (eSATA)**
    - **Integrated Drive Electronics (IDE)**
  + **Adapters**
  + **Connector types**
    - **microUSB**
    - **miniUSB**
    - **USB-C**
    - **Molex**
    - **Lightning port**

**Chapter 4  
Printers and Multifunction Devices**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **3.6 Given a scenario, deploy and configure multifunction devices/printers and settings.**
  + **Properly unboxing a device – setup location considerations**
  + **Use appropriate drivers for a given OS**
    - **Printer Control Language (PCL) vs. PostScript**
  + **Device connectivity**
    - **USB**
    - **Ethernet**
    - **Wireless**
  + **Public/shared devices**
    - **Printer share**
    - **Print server**
  + **Configuration settings**
    - **Duplex**
    - **Orientation**
    - **Tray settings**
    - **Quality**
  + **Security**
    - **User authentication**
    - **Badging**
    - **Audit logs**
    - **Secured prints**
  + **Network scan services**
    - **Email**
    - **SMB**
    - **Cloud services**
  + **Automatic document feeder (ADF)/flatbed scanner**
* **3.7 Given a scenario, install and replace printer consumables.**
  + **Laser**
    - **Imaging drum, fuser assembly, transfer belt, transfer roller, pickup rollers, separation pads, duplexing assembly**
    - **Imaging process: processing, charging, exposing, developing, transferring, fusing, and cleaning**
    - **Maintenance: Replace toner, apply maintenance kit, calibrate, clean**
  + **Inkjet**
    - **Ink cartridge, print head, roller, feeder, duplexing assembly, carriage belt**
    - **Calibration**
    - **Maintenance: Clean heads, replace cartridges, calibrate, clear jams**
  + **Thermal**
    - **Feed assembly, heating element**
    - **Special thermal paper**
    - **Maintenance: Replace paper, clean heating element, remove debris**
    - **Heat sensitivity of paper**
  + **Impact**
    - **Print head, ribbon, tractor feed**
    - **Impact paper**
    - **Maintenance: Replace ribbon, replace print head, replace paper**
  + **3-D printer**
    - **Filament**
    - **Resin**
    - **Print bed**

**Chapter 5  
Networking Fundamentals**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **2.2 Compare and contrast common networking hardware.**
  + **Routers**
  + **Switches**
    - **Managed**
    - **Unmanaged**
  + **Access points**
  + **Patch panel**
  + **Firewall**
  + **Power over Ethernet (PoE)**
    - **Injectors**
    - **Switch**
    - **PoE standards**
  + **Hub**
  + **Cable modem**
  + **Digital subscriber line (DSL)**
  + **Optical networking terminal (ONT)**
  + **Network interface card (NIC)**
  + **Software-defined networking (SDN)**
* **2.7 Compare and contrast Internet connection types, network types, and their features.**
  + **Network types**
    - **Local area network (LAN)**
    - **Wide area network (WAN)**
    - **Personal area network (PAN)**
    - **Metropolitan area network (MAN)**
    - **Storage area network (SAN)**
    - **Wireless local area network (WLAN)**
* **3.1 Explain basic cable types and their connectors, features, and purposes.**
  + **Network cables**
    - **Copper**
      * **Cat 5**
      * **Cat 5e**
      * **Cat 6**
      * **Cat 6a**
      * **Coaxial**
      * **Plenum**
      * **Shielded twisted pair**
        + **Direct burial**
      * **Unshielded twisted pair**
    - **Plenum**
    - **Optical**
      * **Fiber**
    - **T568A/T568B**
  + **Connector types**
    - **RJ11**
    - **RJ45**
    - **F type**
    - **Straight tip (ST)**
    - **Subscriber connector (SC)**
    - **Lucent connector (LC)**
    - **Punchdown block**

**Chapter 6  
Introduction to TCP/IP**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **2.1 Compare and contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) ports, protocols, and their purposes.**
  + **Ports and protocols**
    - **20/21—File Transfer Protocol (FTP)**
    - **22—Secure Shell (SSH)**
    - **23—Telnet**
    - **25—Simple Mail Transfer Protocol (SMTP)**
    - **53—Domain Name System (DNS)**
    - **67/68—Dynamic Host Configuration Protocol (DHCP)**
    - **80—Hypertext Transfer Protocol (HTTP)**
    - **110—Post Office Protocol 3 (POP3)**
    - **137/139—Network Basic Input/Output System (NetBIOS)/NetBIOS over TCP/IP (NetBT)**
    - **143—Internet Mail Access Protocol (IMAP)**
    - **161/162—Simple Network Management Protocol (SNMP)**
    - **389—Lightweight Directory Access Protocol (LDAP)**
    - **443—Hypertext Transfer Protocol Secure (HTTPS)**
    - **445—Server Message Block (SMB)/Common Internet File System (CIFS)**
    - **3389—Remote Desktop Protocol (RDP)**
  + **TCP vs. UDP**
    - **Connectionless**
      * **DHCP**
      * **Trivial File Transfer Protocol (TFTP)**
    - **Connection-oriented**
      * **HTTPS**
      * **SSH**
* **2.5 Given a scenario, install and configure basic wired/wireless small office/home office (SOHO) networks.**
  + **Internet Protocol (IP) addressing**
    - **IPv4**
      * **Private addresses**
      * **Public addresses**
    - **IPv6**
    - **Automatic Private IP Addressing (APIPA)**
    - **Static**
    - **Dynamic**
    - **Gateway**
* **2.6 Compare and contrast common network configuration concepts.**
  + **DNS**
    - **Address**
      * **A**
      * **AAAA**
    - **Mail exchange (MX)**
    - **Text (TXT)**
      * **Spam management**
        + **DomainKeys Identified Mail (DKIM)**
        + **Sender Policy Framework (SPF)**
        + **Domain-based Message Authentication, Reporting, and Conformance (DMARC)**
  + **DHCP**
    - **Leases**
    - **Reservations**
    - **Scope**
  + **Virtual LAN (VLAN)**
  + **Virtual private network (VPN)**

**Chapter 7  
Wireless and SOHO Networks**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **2.3 Compare and contrast protocols for wireless networking.**
  + **Frequencies**
    - **2.4GHz**
    - **5GHz**
  + **Channels**
    - **Regulations**
    - **2.4GHz vs. 5GHz**
  + **Bluetooth**
  + **802.11**
    - **a**
    - **b**
    - **g**
    - **n**
    - **ac (WiFi 5)**
    - **ax (WiFi 6)**
  + **Long-range fixed wireless**
    - **Licensed**
    - **Unlicensed**
    - **Power**
    - **Regulatory requirements for wireless power**
  + **NFC**
  + **Radio-frequency identification (RFID)**
* **2.5 Given a scenario, install and configure basic wired/wireless small office/home office (SOHO) networks.**
  + **Internet Protocol (IP) addressing**
    - **IPv4**
      * **Private addresses**
      * **Public addresses**
    - **IPv6**
    - **Automatic Private IP Addressing (APIPA)**
    - **Static**
    - **Dynamic**
    - **Gateway**
* **2.7 Compare and contrast Internet connection types, network types, and their features.**
  + **Internet connection types**
    - **Satellite**
    - **Fiber**
    - **Cable**
    - **DSL**
    - **Cellular**
    - **Wireless Internet service provider (WISP)**

**Chapter 8  
Network Services, Virtualization, and Cloud Computing**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **2.4 Summarize services provided by networked hosts.**
  + **Server roles**
    - **DNS**
    - **DHCP**
    - **Fileshare**
    - **Print servers**
    - **Mail servers**
    - **Syslog**
    - **Web servers**
    - **Authentication, authorization, and accounting (AAA)**
  + **Internet appliances**
    - **Spam gateways**
    - **Unified threat management (UTM)**
    - **Load balancers**
    - **Proxy servers**
  + **Legacy/embedded systems**
    - **Supervisory control and data acquisition (SCADA)**
  + **Internet of Things (IoT) devices**
* **4.1 Summarize cloud-computing concepts.**
  + **Common cloud models**
    - **Private cloud**
    - **Public cloud**
    - **Hybrid cloud**
    - **Community cloud**
    - **Infrastructure as a service (IaaS)**
    - **Software as a service (SaaS)**
    - **Platform as a service (PaaS)**
  + **Cloud characteristics**
    - **Shared resources**
    - **Metered utilization**
    - **Rapid elasticity**
    - **High availability**
    - **File synchronization**
  + **Desktop virtualization**
    - **Virtual desktop infrastructure (VDI) on premises**
    - **VDI in the cloud**
* **4.2 Summarize aspects of client-side virtualization.**
  + **Purpose of virtual machines**
    - **Sandbox**
    - **Test development**
    - **Application virtualization**
      * **Legacy software/OS**
      * **Cross-platform virtualization**
  + **Resource requirements**
  + **Security requirements**

**Chapter 9  
Laptop and Mobile Device Hardware**

**THE FOLLOWING COMPTIA A+ EXAM 220-1101 OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **1.1 Given a scenario, install and configure laptop hardware and components.**
  + **Hardware/device replacement**
    - **Battery**
    - **Keyboard/keys**
    - **Random-access memory (RAM)**
    - **Hard disk drive (HDD)/solid-state drive (SSD) migration**
    - **HDD/SSD replacement**
    - **Wireless cards**
  + **Physical privacy and security components**
    - **Biometrics**
    - **Near-field scanner features**
* **1.2 Compare and contrast the display components of mobile devices.**
  + **Types**
    - **Liquid crystal display (LCD)**
      * **In-plane switching (IPS)**
      * **Twisted nematic (TN)**
      * **Vertical alignment (VA)**
    - **Organic light-emitting diode (OLED)**
  + **Mobile display components**
  + **WiFi antenna connector/placement**
  + **Camera/webcam**
  + **Microphone**
  + **Touch screen/digitizer**
  + **Inverter**
* **1.3 Given a scenario, set up and configure accessories and ports of mobile devices.**
  + **Connection methods**
    - **Universal serial bus (USB)/USB-C/microUSB/miniUSB**
    - **Lightning**
    - **Serial interfaces**
    - **Near-field communication (NFC)**
    - **Bluetooth**
    - **Hotspot**
  + **Accessories**
    - **Touch pens**
    - **Headsets**
    - **Speakers**
    - **Webcam**
  + **Docking station**
  + **Port replicator**
  + **Trackpad/drawing pad**

**Chapter 10  
Mobile Connectivity and Application Support**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **1.4 Given a scenario, configure basic mobile-device network connectivity and application support.**
  + **Wireless/cellular data network (enable/disable)**
    - **2G/3G/4G/5G**
    - **Hotspot**
    - **Global System for Mobile Communications (GSM) vs. code-division multiple access (CDMA)**
    - **Preferred Roaming List (PRL) updates**
  + **Bluetooth**
    - **Enable Bluetooth**
    - **Enable pairing**
    - **Find a device for pairing**
    - **Enter the appropriate PIN code**
    - **Test connectivity**
  + **Location services**
    - **Global Positioning System (GPS) services**
    - **Cellular location services**
  + **Mobile device management (MDM)/mobile application management (MAM)**
    - **Corporate email configuration**
    - **Two-factor authentication**
    - **Corporate applications**
  + **Mobile device synchronization**
    - **Recognizing data caps**
    - **Microsoft 365**
    - **ActiveSync**
    - **Calendar**
    - **Contacts**
    - **Commercial mail application**

**Chapter 11  
Troubleshooting Methodology and Resolving Core Hardware Problems**

**THE FOLLOWING COMPTIA A+ 220-1101 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **5.1 Given a scenario, apply the best practice methodology to resolve problems.**
  + **Always consider corporate policies, procedures, and impacts before implementing changes**
  + **1. Identify the problem**
    - **Gather information from the user, identify user changes, and, if applicable, perform backups before making changes**
    - **Inquire regarding environmental or infrastructure changes**
  + **2. Establish a theory of probable cause** (**question the obvious)**
    - **If necessary, conduct external or internal research based on symptoms**
  + **3. Test the theory to determine the cause**
    - **Once the theory is confirmed, determine the next steps to resolve the problem**
    - **If the theory is not confirmed, re-establish a new theory or escalate**
  + **4. Establish a plan of action to resolve the problem and implement the solution**
    - **Refer to the vendor's instructions for guidance**
  + **5. Verify full system functionality and, if applicable, implement preventive measures**
  + **6. Document the findings, actions, and outcomes**
* **5.2 Given a scenario, troubleshoot problems related to motherboards, RAM, CPU, and power.**
  + **Common symptoms**
    - **Power-on self-test (POST) beeps**
    - **Proprietary crash screens (blue screen of death [BSOD]/pinwheel)**
    - **Black screen**
    - **No power**
    - **Sluggish performance**
    - **Overheating**
    - **Burning smell**
    - **Intermittent shutdown**
    - **Application crashes**
    - **Grinding noise**
    - **Capacitor swelling**
    - **Inaccurate system date/time**

**Chapter 12  
Hardware and Network Troubleshooting**

**THE FOLLOWING COMPTIA A+ EXAM 220‐1101 OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **2.8 Given a scenario, use networking tools.**
  + **Crimper**
  + **Cable stripper**
  + **WiFi analyzer**
  + **Toner probe**
  + **Punchdown tool**
  + **Cable tester**
  + **Loopback plug**
  + **Network tap**
* **5.3 Given a scenario, troubleshoot and diagnose problems with storage drives and RAID arrays.**
  + **Common symptoms**
    - **Light‐emitting diode (LED) status indicators**
    - **Grinding noises**
    - **Clicking sounds**
    - **Bootable device not found**
    - **Data loss/corruption**
    - **RAID failure**
    - **Self‐monitoring, Analysis, and Reporting Technology (S.M.A.R.T.) failure**
    - **Extended read/write times**
    - **Input/output operations per second (IOPS)**
    - **Missing drives in OS**
* **5.4 Given a scenario, troubleshoot video, projector, and display issues.**
  + **Common symptoms**
    - **Incorrect data source**
    - **Physical cabling issues**
    - **Burned‐out bulb**
    - **Fuzzy image**
    - **Display burn‐in**
    - **Dead pixels**
    - **Flashing screen**
    - **Incorrect color display**
    - **Audio issues**
    - **Dim image**
    - **Intermittent projector shutdown**
* **5.5 Given a scenario, troubleshoot common issues with mobile devices.**
  + **Common symptoms**
    - **Poor battery health**
    - **Swollen battery**
    - **Broken screen**
    - **Improper charging**
    - **Poor/no connectivity**
    - **Liquid damage**
    - **Overheating**
    - **Digitizer issues**
    - **Physically damaged ports**
    - **Malware**
    - **Cursor drift/touch calibration**
* **5.6 Given a scenario, troubleshoot and resolve printer issues.**
  + **Common symptoms**
    - **Lines down the printed page**
    - **Garbled print**
    - **Toner not fusing to paper**
    - **Paper jams**
    - **Faded print**
    - **Incorrect paper size**
    - **Paper not feeding**
    - **Multipage misfeed**
    - **Multiple prints pending in queue**
    - **Speckling on printed pages**
    - **Double/echo images on print**
    - **Incorrect chroma display**
    - **Grinding noise**
    - **Finishing issues**
      * **Staple jams**
      * **Hole punch**
    - **Incorrect page orientation**
* **5.7 Given a scenario, troubleshoot problems with wired and wireless networks.**
  + **Common symptoms**
    - **Intermittent wireless connectivity**
    - **Slow network speeds**
    - **Limited connectivity**
    - **Jitter**
    - **Poor Voice over Internet Protocol (VoIP) quality**
    - **Port flapping**
    - **High latency**
    - **External interference**

**Chapter 13  
Operating System Basics**

**THE FOLLOWING CompTIA A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **1.1 Identify basic features of Microsoft Windows editions.**
  + **Windows 10 editions**
    - **Home**
    - **Pro**
    - **Pro for Workstations**
    - **Enterprise**
  + **Feature differences**
    - **Domain access vs. workgroup**
    - **Desktop styles/user interface**
    - **Availability of Remote Desktop Protocol (RDP)**
    - **Random access memory (RAM) support limitations**
    - **BitLocker**
    - **gpedit.msc**
  + **Upgrade paths**
    - **In‐place upgrade**
* **1.7 Given a scenario, apply application installation and configuration concepts.**
  + **System requirements for applications**
    - **32‐bit vs. 64‐bit dependent application requirements**
    - **Dedicated graphics card vs. integrated**
    - **Video random access memory (VRAM) requirements**
    - **RAM requirements**
    - **Central processing unit (CPU) requirements**
    - **External hardware tokens**
    - **Storage requirements**
  + **OS requirements for applications**
    - **Application to OS compatibility**
    - **32‐bit vs. 64‐bit OS**
  + **Distribution methods**
    - **Physical media vs. downloadable**
    - **ISO mountable**
  + **Other considerations for new applications**
    - **Impact to device**
    - **Impact to network**
    - **Impact to operation**
    - **Impact to business**
* **1.8 Explain common OS types and their purposes.**
  + **Workstation OSs**
    - **Windows**
    - **Linux**
    - **macOS**
    - **Chrome OS**
  + **Cell phone/tablet OSs**
    - **iPadOS**
    - **iOS**
    - **Android**
  + **Vendor life‐cycle limitations**
    - **End‐of‐life (EOL)**
    - **Update limitations**
    - **Compatibility concerns between OSs**

**Chapter 14  
Windows Configuration**

**THE FOLLOWING** COMPTIA **A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **1.3 Given a scenario, use features and tools of the Microsoft Windows 10 operating system (OS).**
  + **Task Manager**
    - **Services**
    - **Startup**
    - **Performance**
    - **Processes**
    - **Users**
  + **Microsoft Management Console (MMC) snap‐in**
    - **Event Viewer (eventvwr.msc)**
    - **Disk Management (diskmgmt.msc)**
    - **Task Scheduler (taskschd.msc)**
    - **Device Manager (devmgmt.msc)**
    - **Certificate Manager (certmgr.msc)**
    - **Local Users and Groups (lusrmgr.msc)**
    - **Performance Monitor (perfmon.msc)**
    - **Group Policy Editor (gpedit.msc)**
  + **Additional tools**
    - **System Information (msinfo32.exe)**
    - **Resource Monitor (resmon.exe)**
    - **System Configuration (msconfig.exe)**
    - **Disk Cleanup (cleanmgr.exe)**
    - **Disk Defragment (dfrgui.exe)**
    - **Registry Editor (regedit.exe)**
* **1.4 Given a scenario, use the appropriate Microsoft Windows 10 Control Panel utility.**
  + **Internet Options**
  + **Devices and Printers**
  + **Programs and Features**
  + **Network and Sharing Center**
  + **System**
  + **Windows Defender Firewall**
  + **Mail**
  + **Sound**
  + **User Accounts**
  + **Device Manager**
  + **Indexing Options**
  + **Administrative Tools**
  + **File Explorer Options**
    - **Show hidden files**
    - **Hide extensions**
    - **General options**
    - **View options**
  + **Power Options**
    - **Hibernate**
    - **Power plans**
    - **Sleep/suspend**
    - **Standby**
    - **Choose what closing the lid does**
    - **Turn on fast startup**
    - **Universal Serial Bus (USB) selective suspend**
  + **Ease of Access**
* **1.5 Given a scenario, use the appropriate Windows settings.**
  + **Time and Language**
  + **Update and Security**
  + **Personalization**
  + **Apps**
  + **Privacy**
  + **System**
  + **Devices**
  + **Network and Internet**
  + **Gaming**
  + **Accounts**
* **1.8 Explain common OS types and their purposes.**
  + **Various filesystem types**
    - **New Technology File System (NTFS)**
    - **File Allocation Table 32 (FAT32)**
    - **Third extended filesystem (ext3)**
    - **Fourth extended filesystem (ext4)**
    - **Apple File System (APFS)**
    - **Extensible File Allocation Table (exFAT)**
* **1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.**
  + **Partitioning**
    - **GUID [globally unique identifier] Partition Table (GPT)**
    - **Master boot record (MBR)**
  + **Drive format**

**Chapter 15  
Windows Administration**

**THE FOLLOWING COMPTIA A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **1.2 Given a scenario, use the appropriate Microsoft command‐line tool.**
  + **Navigation**
  + **cd**
  + **dir**
  + **md**
  + **rmdir**
  + **Drive navigation inputs**
    - **C:\ or D:\ or x:\**
  + **Command‐line tools**
    - **ipconfig**
    - **ping**
    - **hostname**
    - **netstat**
    - **nslookup**
    - **chkdsk**
    - **net user**
    - **net use**
    - **tracert**
    - **format**
    - **xcopy**
    - **copy**
    - **robocopy**
    - **gpupdate**
    - **gpresult**
    - **shutdown**
    - **sfc**
    - **[command name] /?**
    - **diskpart**
    - **pathping**
    - **winver**
* **1.6 Given a scenario, configure Microsoft Windows networking features on a client/desktop.**
  + **Workgroup vs. domain setup**
    - **Shared resources**
    - **Printers**
    - **File servers**
    - **Mapped drives**
  + **Local OS firewall settings**
    - **Application restrictions and exceptions**
    - **Configuration**
  + **Client network configuration**
    - **Internet Protocol (IP) addressing scheme**
    - **Domain Name System (DNS) settings**
    - **Subnet mask**
    - **Gateway**
    - **Static vs. dynamic**
  + **Establish network connections**
    - **Virtual private network (VPN)**
    - **Wireless**
    - **Wired**
    - **Wireless wide area network (WWAN)**
  + **Proxy settings**
  + **Public network vs. private network**
  + **File Explorer navigation—network paths**
  + **Metered connections and limitations**
* **1.9 Given a scenario, perform OS installations and upgrades in a diverse OS environment.**
  + **Boot methods**
    - **USB**
    - **Optical media**
    - **Network**
    - **Solid‐state/flash drives**
    - **Internet‐based**
    - **External/hot‐swappable drive**
    - **Internal hard drive (partition)**
  + **Types of installations**
    - **Upgrade**
    - **Recovery partition**
    - **Clean install**
    - **Image deployment**
    - **Repair installation**
    - **Remote network installation**
    - **Other considerations (Third‐party drivers)**
  + **Upgrade considerations**
    - **Backup files and user preferences**
    - **Application and driver support/backward compatibility**
    - **Hardware compatibility**
  + **Feature updates**
    - **Product life cycle**

**Chapter 16  
Working with macOS and Linux**

**THE FOLLOWING COMPTIA A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **1.10 Identify common features and tools of the macOS/desktop OS.**
  + **Installation and uninstallation of application**
    - **File types**
      * **.dmg**
      * **.pkg**
      * **.app**
    - **App Store**
    - **Uninstallation process**
  + **Apple ID and corporate restrictions**
  + **Best practices**
    - **Backups**
    - **Antivirus**
    - **Updates/patches**
  + **System Preferences**
    - **Displays**
    - **Networks**
    - **Printers**
    - **Scanners**
    - **Privacy**
    - **Accessibility**
    - **Time Machine**
  + **Features**
    - **Multiple desktops**
    - **Mission Control**
    - **Key Chain**
    - **Spotlight**
    - **iCloud**
    - **Gestures**
    - **Finder**
    - **Remote Disc**
    - **Dock**
  + **Disk Utility**
  + **FileVault**
  + **Terminal**
  + **Force Quit**
* **1.11 Identify common features and tools of the Linux client/desktop OS.**
  + **Common commands**
    - **ls**
    - **pwd**
    - **mv**
    - **cp**
    - **rm**
    - **chmod**
    - **chown**
    - **su/sudo**
    - **apt‐get**
    - **yum**
    - **ip**
    - **df**
    - **grep**
    - **ps**
    - **man**
    - **top**
    - **find**
    - **dig**
    - **cat**
    - **nano**
  + **Best practices**
    - **Backups**
    - **Antivirus**
    - **Updates/patches**
  + **Tools**
    - **Shell/terminal**
    - **Samba**

**Chapter 17  
Security Concepts**

**THE FOLLOWING COMPTIA A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **2.1 Summarize various security measures and their purposes.**
  + Physical security
    - Access control vestibule
    - Badge reader
    - Video surveillance
    - Alarm systems
    - Motion sensors
    - Door locks
    - Equipment locks
    - Guards
    - Bollards
    - Fences
  + Physical security for staff
    - Key fobs
    - Smart cards
    - Keys
    - Biometrics
      * Retina scanner
      * Fingerprint scanner
      * Palmprint scanner
    - Lighting
    - Magnetometers
  + Logical Security
    - Principle of least privilege
    - Access control lists (ACLs)
    - Multifactor authentication (MFA)
    - Email
    - Hard token
    - Soft token
    - Short message service (SMS)
    - Voice call
    - Authenticator application
  + Mobile device management (MDM)
  + Active Directory
    - Login script
    - Domain
    - Group Policy/updates
    - Organizational units
    - Home folder
    - Folder redirection
    - Security groups
* **2.3 Given a scenario, detect, remove, and prevent malware using the appropriate tools and methods.**
  + Malware
    - Trojan
    - Rootkit
    - Virus
    - Spyware
    - Ransomware
    - Keylogger
    - Boot sector virus
    - Cryptominers
  + Tools and methods
    - Recovery console
    - Antivirus
    - Anti‐malware
    - Software firewalls
    - Anti‐phishing training
    - User education regarding common threats
    - OS reinstallation
* **2.4 Explain common social‐engineering attacks, threats, and vulnerabilities.**
  + Social engineering
    - Phishing
    - Vishing
    - Shoulder surfing
    - Whaling
    - Tailgating
    - Impersonation
    - Dumpster diving
    - Evil twin
  + Threats
    - Distributed denial of service (DDoS)
    - Denial of service (DoS)
    - Zero‐day attack
    - Spoofing
    - On‐path attack
    - Brute‐force attack
    - Dictionary attack
    - Insider threat
    - Structured Query Language (SQL) injection
    - Cross‐site scripting (XSS)
  + Vulnerabilities
    - Non‐compliant systems
    - Unpatched systems
    - Unprotected systems (missing antivirus/missing firewall)
    - EOL OSs
    - Bring your own device (BYOD)
* **2.6 Given a scenario, configure a workstation to meet best practices for security.**
  + Data‐at‐rest encryption
  + Password best practices
    - Complexity requirements (Length, Character types)
    - Expiration requirements
    - Basic input/output system (BIOS)/Unified Extensible Firmware Interface (UEFI) passwords
  + End‐user best practices
    - Use screensaver locks
    - Log off when not in use
    - Secure/protect critical hardware (e.g., laptops)
    - Secure personally identifiable information (PII) and passwords
  + Account management
    - Restrict user permissions
    - Restrict login times
    - Disable guest account
    - Use failed attempts lockout
    - Use timeout/screen lock
  + Change default administrator's user account/password
  + Disable AutoRun
  + Disable AutoPlay
* **2.8 Given a scenario, use common data destruction and disposal methods.**
  + Physical destruction
    - Drilling
    - Shredding
    - Degaussing
    - Incinerating
  + Recycling or repurposing best practices
    - Erasing/wiping
    - Low‐level formatting
    - Standard formatting
  + Outsourcing concepts
    - Third‐party vendor
    - Certification of destruction/recycling

**Chapter 18  
Securing Operating Systems**

**THE FOLLOWING COMPTIA A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **2.2 Compare and contrast wireless security protocols and authentication methods.**
  + **Protocols and encryption**
    - **WiFi Protected Access 2 (WPA2)**
    - **WPA3**
    - **Temporal Key Integrity Protocol (TKIP)**
    - **Advanced Encryption Standard (AES)**
  + **Authentication**
    - **Remote Authentication Dial‐In User Service (RADIUS)**
    - **Terminal Access Controller Access‐Control System (TACACS+)**
    - **Kerberos**
    - **Multifactor**
* **2.5 Given a scenario, manage and configure basic security settings in the Microsoft Windows OS.**
  + **Defender Antivirus**
    - **Activate/deactivate**
    - **Updated definitions**
  + **Firewall**
    - **Activate/deactivate**
    - **Port security**
    - **Application security**
  + **Users and groups**
    - **Local vs. Microsoft account**
    - **Standard account**
    - **Administrator**
    - **Guest user**
    - **Power user**
  + **Login OS options**
    - **Username and password**
    - **Personal identification number (PIN)**
    - **Fingerprint**
    - **Facial recognition**
    - **Single sign‐on (SSO)**
  + **NTFS vs. share permissions**
    - **File and folder attributes**
    - **Inheritance**
  + **Run as administrator vs. standard user**
    - **User Account Control (UAC)**
  + **BitLocker**
  + **BitLocker To Go**
  + **Encrypting File System (EFS)**
* **2.7 Explain common methods for securing mobile and embedded devices.**
  + **Screen locks**
    - **Facial recognition**
    - **PIN codes**
    - **Fingerprint**
    - **Pattern**
    - **Swipe**
  + **Remote wipes**
  + **Locator applications**
  + **OS updates**
  + **Device encryption**
  + **Remote backup applications**
  + **Failed login attempts restrictions**
  + **Antivirus/Anti‐malware**
  + **Firewall**
  + **Policies and procedures**
    - **BYOD vs. corporate‐owned**
    - **Profile security requirements**
  + **Internet of Things (IoT)**
* **2.9 Given a scenario, configure appropriate security settings on small office/home office (SOHO) wireless and wired networks.**
  + **Home router settings**
    - **Change default passwords**
    - **IP filtering**
    - **Firmware updates**
    - **Content filtering**
    - **Physical placement/secure locations**
    - **Dynamic Host Configuration Protocol (DHCP) reservations**
    - **Static wide‐area network (WAN) IP**
    - **Universal Plug and Play (UPnP)**
    - **Screened subnet**
  + **Wireless specific**
    - **Changing the service set identifier (SSID)**
    - **Disabling SSID broadcast**
    - **Encryption settings**
    - **Disabling guest access**
    - **Changing channels**
  + **Firewall settings**
    - **Disabling unused ports**
    - **Port forwarding/mapping**
* **2.10 Given a scenario, install and configure browsers and relevant security settings.**
  + **Browser download/installation**
    - **Trusted sources**
      * **Hashing**
    - **Untrusted sources**
  + **Extensions and plug‐ins**
    - **Trusted sources**
    - **Untrusted sources**
  + **Password managers**
  + **Secure connections/sites – valid certificates**
  + **Settings**
    - **Pop‐up blocker**
    - **Clearing browsing data**
    - **Clearing cache**
    - **Private‐browsing mode**
    - **Sign‐in/browser data synchronization**
    - **Ad blockers**

**Chapter 19  
Troubleshooting Operating Systems and Security**

**THE FOLLOWING COMPTIA A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **3.1 Given a scenario, troubleshoot common Windows OS problems.**
  + Common symptoms
    - Blue screen of death (BSOD)
    - Sluggish performance
    - Boot problems
    - Frequent shutdowns
    - Services not starting
    - Applications crashing
    - Low memory warnings
    - USB controller resource warnings
    - System instability
    - No OS found
    - Slow profile load
    - Time drift
  + Common troubleshooting steps
    - Reboot
    - Restart services
    - Uninstall/reinstall/update applications
    - Add resources
    - Verify requirements
    - System file check
    - Repair Windows
    - Restore
    - Reimage
    - Roll back updates
    - Rebuild Windows profiles
* **3.2 Given a scenario, troubleshoot common personal computer (PC) security issues.**
  + Common symptoms
    - Unable to access the network
    - Desktop alerts
    - False alerts regarding antivirus protection
    - Altered system or personal files
      * Missing/renamed files
    - Unwanted notifications within the OS
    - OS update failures
  + Browser‐related symptoms
    - Random/frequent pop‐ups
    - Certificate warnings
    - Redirection
* **3.3 Given a scenario, use best practice procedures for malware removal.**
  1. **1.** Investigate and verify malware symptoms.
  2. **2.** Quarantine the infected systems.
  3. **3.** Disable System Restore in Windows.
  4. **4.** Remediate infected systems.
     1. **a.** Update anti‐malware software
     2. **b.** Scanning and removal techniques (e.g., safe mode, preinstallation environment)
  5. **5.** Schedule scans and run updates
  6. **6.** Enable System Restore and create a restore point in Windows
  7. **7.** Educate the end user

1. **3.4 Given a scenario, troubleshoot mobile OS and application issues.**
   1. Common symptoms
      1. Application fails to launch
      2. Application fails to close/crashes
      3. Application fails to update
      4. Slow to respond
      5. OS fails to update
      6. Battery life issues
      7. Randomly reboots
      8. Connectivity issues
         * Bluetooth
         * WiFi
         * Near‐field communication (NFC)
         * AirDrop
      9. Screen does not autorotate
2. **3.5 Given a scenario, troubleshoot common mobile OS and application security issues.**
   1. Security concerns
      1. Android package (APK) source
      2. Developer mode
      3. Root access/jailbreak
      4. Bootleg/malicious application
         * Application spoofing
   2. Common symptoms
      1. High network traffic
      2. Sluggish response time
      3. Data‐usage limit notification
      4. Limited Internet connectivity
      5. No Internet connectivity
      6. High number of ads
      7. Fake security warnings
      8. Unexpected application behavior
      9. Leaked personal files/data

**Chapter 20  
Scripting and Remote Access**

**THE FOLLOWING COMPTIA A+ 220‐1102 EXAM OBJECTIVES ARE COVERED IN THIS CHAPTER:**

* **4.8 Identify the basics of scripting.**
  + Script file types
    - .bat
    - .ps1
    - .vbs
    - .sh
    - .js
    - .py
  + Use cases for scripting
    - Basic automation
    - Restarting machines
    - Remapping network drives
    - Installation of applications
    - Automated backups
    - Gathering of information/data
    - Initiating updates
  + Other considerations when using scripts
    - Unintentionally introducing malware
    - Inadvertently changing system settings
    - Browser or system crashes due to mishandling of resources
* **4.9 Given a scenario, use remote access technologies.**
  + Methods/tools
    - RDP
    - VPN
    - Virtual network computer (VNC)
    - Secure Shell (SSH)
    - Remote monitoring and management (RMM)
    - Microsoft Remote Assistance (MSRA)
    - Third‐party tools
      * Screen‐sharing software
      * Video‐conferencing software
      * File transfer software
      * Desktop management software
  + Security considerations of each access method