

STRANDS AND STANDARDS

COMPUTER SYSTEMS 1



Course Description

Students will learn necessary competencies for an entry-level IT professional including installing, building, upgrading, repairing, configuring, troubleshooting, optimizing, diagnosing, and performing preventive maintenance of basic personal computer hardware.

Relationship to the CompTIA Certification

To receive CompTIA A+ certification a candidate must pass two exams. The first exam is the CompTIA A+ Certification Exam: Core 1 (220-1001) as of 09/2020. The Strands & Standards for Computer Systems 1 match to this certification. The candidate must also pass the CompTIA A+ Certification Exam: Core 2 (220-1002) as of 09/2020. This is the second exam required for CompTIA A+ certification candidates to complete their certification. The Strands & Standards for Computer Systems 2 match to this certification.

Intended Grade Level	10-12
Units of Credit	0.5
Core Code	35.01.00.00.040
Concurrent Enrollment Core Code	35.01.00.13.040
Suggested Prerequisite	Intro to Info Technology or Teacher Approval
Skill Certification Test Number	884 CompTIA IT Fundamentals (FCO-U61), CompTIA A+ Core 1 (220-1001), CompTIA A+ Core 2 (220-1002), TestOut PC Pro
Skill Certification Cut Score	884 - 75% CompTIA IT Fundamentals (FCO-U61), CompTIA A+ Core 1 (220-1001), CompTIA A+ Core 2 (220-1002), TestOut PC Pro (no cut score)
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1 or	Cybersecurity
Endorsement 2 or	Information Technology System

CompTIA A+ Certification Exam: Core 1 Objectives

The table below lists the domains measured by the CompTIA A+ Core 1 examination and the extent to which they are represented. The CompTIA A+ Core 1 exam is based on these objectives.

Domain A+ (220-1001)	Percentage of Exam
1.0 Mobile Devices	14%
2.0 Networking	20%
3.0 Hardware	27%
4.0 Virtualization and Cloud Computing	12%
5.0 Hardware and Network Troubleshooting	27%
Total	100%

These Strand & Standards align with the CompTIA A+ Certification Exam: Core 1.
These Strands & Standards also align with the TestOut PC Pro (Chapters 1 – 7).

STRAND 1

Mobile Devices

Standard 1

Recognize laptop hardware and components.

- Hardware:
 - Keyboard
 - Hard drive
 - SSD vs. Hybrid vs. Magnetic disk
 - 1.8in vs. 2.5in
 - RAM (Random Access Memory)
 - Smart card reader
 - Optical drive
 - Wireless card/Bluetooth module
 - Cellular card
 - Video card
 - PCI/PCIe
 - Screen
 - DC Jack
 - Battery
 - Touchpad
 - Plastics/frame
 - Speaker
 - System Board
 - CPU
 - Webcam
 - Microphone
 - WiFi antenna connector
 - Inverter
- Features and types:
 - Special function keys
 - Docking station
 - Port replicator
 - Rotating/removeable screens
 - Tablets
 - Smartphones
 - Wearable technology devices
 - GPS
 - E-readers
 - Wired and wireless

Standard 2

Cloud storage connection and configuration.

- Synchronization methods:
 - Synchronize to the cloud
 - Synchronize to the desktop
 - Synchronize to the automobile
- Types of data to synchronize:
 - Contacts
 - Applications
 - Email
 - Pictures
 - Music
 - Etc.

STRAND 2**Networking****Standard 1**

Define protocols and their purposes.

- Ports and protocols:
 - 21 – FTP
 - 22 – SSH
 - 23 – Telnet
 - 25 – SMTP
 - 53 – DNS
 - 80 – HTTP
 - 110 – POP3
 - 143 – IMAP
 - 3389 – RDP
 - 538 – AFP
 - 67/68 – DHCP
 - 389 – LDAP
- TCP vs. UDP

Standard 2

Compare and contrast common networking hardware devices.

- Routers
- Switches
 - Managed
 - Unmanaged
- Access points
- Cloud-based network controller
- Firewall
- Network interface card
- Repeater
- Hub
- Cable/DSL modem
- Bridge
- Patch Panel
- Power over Ethernet (PoE)
 - Injectors
 - Switch
- Ethernet over Power

Standard 3

Understand basic wired/wireless SOHO networks and installation standards.

- Router/switch functionality
- Access point settings
- IP addressing
- NIC Configuration
 - Wired
 - Wireless
- End-user device configuration
- IoT device configuration
 - Thermostat
 - Light switches
 - Security cameras
 - Door locks
 - Voice-enabled, smart speaker/digital assistant
- Cable/DSL modem configuration
- Firewall settings
 - DMZ
 - Port forwarding
 - NAT
 - UPnP
 - Whitelist/blacklist
 - MAC filtering
- QoS
- Wireless settings
 - Encryption
 - Channels
 - Qos

- Uplink Configuration
 - Cable/DSL
 - Satellite
 - Fiber Optic

Standard 4

Compare and contrast wireless networking protocols.

- 802.11a
- 802.11b
- 802.11g
- 802.11n
- 802.11ac
- 802.11ax
- Frequencies
 - 2.4 GHz (channels 1 – 11)
 - 5 GHz
 - 6 GHz
- Bluetooth
- NFC
- RFID
- Z-Wave
- 4G
- 5G
- LTE

Standard 5

Identify common networks, their purpose, and benefits.

- Server roles
 - Web server
 - File server
 - Print server
 - DHCP server
 - DNS server
 - Proxy server
 - Mail server
 - Authentication server
 - syslog
- Internet appliance
 - UTM
 - IDS
 - IPS
 - End-point management server
- Network types
 - LAN
 - WAN
 - PAN
 - MAN
 - WMN

Standard 6

Explain common network configuration concepts.

- IP addressing
 - Static
 - Dynamic
 - APIPA
 - Link local
- DNS
- DHCP
 - Reservations
- IPv4 vs. IPv6
- Subnet mask
- Gateway
- VPN
- VLAN
- NAT

Standard 7

Compare and contrast Internet connection types.

- Internet connection types
 - Cable
 - DSL
 - Dial-up
 - Fiber
 - Satellite
- ISDN
- Cellular
 - Tethering
 - Mobile hotspot
- Line-of-sight wireless internet service

Standard 8

Understand appropriate use of networking tools.

- Crimper
- Cable stripper
- Multimeter
- Tone generator and probe
- Fiber optic cable tester
- Loopback plug
- Punchdown tool
- WiFi analyzer
- Ethernet cable tester

STRAND 3

Hardware

Standard 1

Explain basic cable types, features, and their purposes.

- Network cables
 - Ethernet
 - Cat 5
 - Cat 5e
 - Cat 6
 - Cat 6a
 - Plenum vs. Riser cable
 - Shielded twisted pair
 - Unshielded twisted pair
 - 568A/B
 - Fiber
 - Coaxial
 - Speed and transmission limitations
- Video cables
 - VGA
 - HDMI
 - Mini-HDMI
 - DisplayPort
 - DVI (DVI-D/DVI-I)
- Multipurpose cables
 - Lightning
 - Thunderbolt
 - USB-A
 - USB-B
 - USB-C
 - USB 2.0
 - USB 3.0
- Peripheral cables
 - Serial
- Hard drive cables
 - SATA
 - SAS
- Adapters
 - DVI to HDMI
 - USB to Ethernet
 - DVI to VGA

Standard 2

Identify common connector types.

- RJ-11
- RJ-45
- RS-232
- RG-59
- RG-6

- USB
- Mini-USB
- USB-C
- Lightning
- eSATA
- Molex

Standard 3

Compare, contrast, and install RAM types.

- RAM Types
 - SODIMM
 - DDR2
 - DDR3
 - DDR4
- Single channel
- Dual channel
- Triple channel
- Error correcting
- Parity vs. non-parity

Standard 4

Understand how to install and configure storage devices.

- Identify optical drives
- Solid-state drives
 - M2 drives
 - NVME
 - SATA 2.5
- Magnetic hard drives
 - 5,400rpm
 - 7,200rpm
 - 10,000rpm
 - 15,000rpm
 - Sizes:
 - 2.5
 - 3.5
- Hybrid drives
- Flash
 - SD card
 - Micro-SD card
 - Mini-SD card
 - xD
- Configurations
 - RAID 0, 1, 5, 10
 - Hardware vs. software raids (benefits)
 - Hot-swappable

Standard 5

Install and configure motherboards, CPU's, and expansion cards.

- Motherboard form factor
 - ATX
 - mATX
 - ITX
 - mITX
- Motherboard connectors types
 - PCI
 - PCIe
 - Riser card
 - Socket types
 - SATA
 - SAS
 - Front panel connector
 - Internal USB connector
- BIOS/UEFI settings
 - Boot options
 - Firmware updates
 - Security settings
 - Interface configurations
 - Security
 - Passwords
 - Drive encryption
 - TPM
 - Secure boot
- CMOS battery
- CPU features
 - Single-core
 - Multicore
 - Virtualization
 - Hyperthreading
 - Speeds (Hertz)
 - Overclocking
 - Integrated GPU
- Compatibility
 - AMD
 - Intel
- Cooling mechanism
 - Fans
 - Heat sink
 - Liquid
 - Thermal paste
- Expansion cards
 - Video cards
 - Onboard
 - Expansion cards
 - Sound cards

- Network interface card
- USB expansion card
- eSATA card

Standard 6

Understand the use of various peripherals.

- Printer
- ADF/flatbed scanner
- Barcode scanner/QR scanner
- Monitors
- VR/AR headset
- Optical drive types
- Mouse
- Keyboard
- Touchpad
- Signature pad
- Game controllers
- Camera/webcam
- Microphone
- Speakers
- Headset
- Projector
 - Lumens/brightness
- External storage drives
- KVM
- Magnetic reader/chip reader
- NFC/tap pay device
- Smart card reader

Standard 7

Understand power supply installation types and features.

- Input 115V vs. 220V
- Output 5V v. 12V
- 24-pin motherboard adapter
- Wattage rating
- Number of devices/types of devices to be powered

Standard 8

Understand the appropriate components needed for a custom PC configuration.

- Graphic/CAD/CAM design workstation
 - SSD
 - 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
 - SSD
 - High-end video/specialized GPU
 - High-definition sound card
 - High-end cooling
- Network attached storage device
 - Media streaming
 - File sharing
 - Gigabit NIC
 - RAID array (0, 1, 5, 1+0)
 - Hard drive
 - JBOD
- Standard thick client
 - Desktop applications
 - Meets recommended requirements for selection OS
- Thin client
 - Basic applications
 - Meets minimum requirements for selected OS
 - Network connectivity

Standard 9

Understand printer types and installation.

- 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, ax)
 - 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/Google Print
 - Data privacy
 - User authentication on the device
 - Hard drive caching
- Print technologies
 - 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
 - Maintenance Replace toner, apply maintenance kit, calibrate, clean
 - Inkjet
 - Ink cartridge, print head, roller, feeder, duplexing assembly, carriage, and belt
 - Calibrate
 - Maintenance: Clean heads, replace cartridges, calibrate, clear jams
 - Thermal
 - Feed assembly, heating element
 - Special thermal paper
 - Maintenance: Replace paper, clean heating element, remove debris

- Impact
 - Print head, ribbon, tractor feed
 - Impact paper
 - Maintenance: Replace ribbon, replace print head, replace paper
- Virtual
 - Print to file
 - Print to PDF
 - Print to XPS
 - Print image
- 3D printers
 - Plastic filament

STRAND 4

Hardware and Network Troubleshooting

Standard 1

Use the best practice methodology to resolve problems.

- Always consider corporate policies, procedures, and impacts before implementing changes.
 1. Identify the problem
 - Question the user and identify user changes to computer and perform backups before making changes
 - Inquire regarding environmental or infrastructure changes
 - Review system and application logs
 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 cause
 - Once the theory is confirmed, determine the next steps to resolve problem
 - If theory is not confirmed re-establish new theory or escalate
 4. Establish a plan of action to resolve the problem and implement the solution
 5. Verify full system functionality and, if applicable, implement preventive measures
 6. Document findings, actions, and outcomes

Standard 2

Understand the trouble shooting process relating to motherboards, RAM, CPU's, and power.

- Common symptoms
 - Unexpected shutdowns
 - System lockups
 - POST code beeps
 - Blank screen on bootup
 - CMOS
 - time and setting resets
 - Attempts to boot to incorrect device
 - Continuous reboots
 - No power
 - Overheating
 - Loud noise
 - Intermittent device failures
 - Fans pain- no power to other devices
 - Indicator lights
 - Smoke
 - Burning smell
 - Proprietary crash screens (BSOD/pin wheel)
 - Distended capacitors
 - Log entries and error messages

Standard 3

Troubleshooting storages devices.

- 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

Standard 4

Troubleshooting multimedia components.

- Common systems
 - VGA mode
 - No image on screen
 - Overheat shutdown
 - Dead pixels
 - Artifacts
 - Incorrect color patterns
 - Dim image
 - Flickering image
 - Distorted image
 - Distorted geometry
 - Burn-in
 - Oversized images and icons

Standard 5

Troubleshoot common network problems.

- Common symptoms
 - Limited connectivity
 - Unavailable resources
 - Internet
 - Local resources
 - Shares
 - Printers
 - Email
 - No connectivity
 - APIPA/link local address
 - Intermittent connectivity
 - IP conflict
 - Slow transfer speeds
 - Low RF signal
 - SSID not found

STRAND 5

Operational Procedures

Standard 1

Understand proper communication techniques and professionalism.

- Use proper language and avoid jargon, acronyms, and slang, when applicable
- Maintain a positive attitude/ project confidence
- Actively listen (taking notes) and avoid interrupting the customer
- Be respectful of different cultures
 - Use appropriate professional titles, when applicable
- Be on time (if late, contact the customer)
- Avoid distractions
 - Personal calls
 - Texting/social media sites
 - Talking to coworkers while interacting with customers
 - Personal interruptions
- Dealing with difficult customers or situations
 - 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 outlets
- Set and meet expectations/timeline and communicate status with the customer
 - Offer different repair/ replacement options, if applicable
 - 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.

Performance Skills

- Remote support from an external location.
- Assisting with software and hardware, including troubleshooting.
- Ask client/customer various questions about the installed computer systems, run diagnostic, handle software security.
- Highlight customer service and listening skills to understand a customer's problem so that student can help them, even when they are frustrated.
- Problem-solving skills are paramount so that you can figure out exactly what is causing the tricky hardware and software issues.

Workplace Skills

The following workplace skills should be discussed, taught, and re-enforced in the course:

- Communication
- Problem Solving
- Teamwork
- Critical Thinking
- Dependability
- Accountability
- Legal requirements/expectations

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
Computer Systems 1	884	3	6	14	7	2						32	27