



CompTIA PenTest+ Certification Exam Objectives

EXAM NUMBER: PTO-001



About the Exam

The CompTIA PenTest+ exam will certify the successful candidate has the knowledge and skills required to:

- **Plan and scope an assessment**
- **Understand legal and compliance requirements**
- **Perform vulnerability scanning and penetration testing using appropriate tools and techniques**
- **Analyze the results**

In addition, the candidate will be able to:

- **Produce a written report containing proposed remediation techniques**
- **Effectively communicate results to management**
- **Provide practical recommendations**

EXAM DEVELOPMENT

CompTIA exams result from subject-matter expert workshops and industry-wide survey results regarding the skills and knowledge required of a professional.

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PLEASE NOTE

The lists of examples provided in bulleted format are not exhaustive lists. Other examples of technologies, processes, or tasks pertaining to each objective may also be included on the exam although not listed or covered in this objectives document. CompTIA is constantly reviewing the content of our exams and updating test questions to be sure our exams are current and the security of the questions is protected. When necessary, we will publish updated exams based on existing exam objectives. Please know that all related exam preparation materials will still be valid.

TEST DETAILS

Required exam	PT0-001
Number of questions	Maximum of 80
Type of questions	Multiple choice and performance-based
Length of test	165 minutes
Recommended experience	3 to 4 years of hands-on experience performing penetration tests, vulnerability assessments, and vulnerability management
Passing score	750 (on a scale of 100-900)

EXAM OBJECTIVES (DOMAINS)

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

DOMAIN	PERCENTAGE OF EXAMINATION
1.0 Planning and Scoping	15%
2.0 Information Gathering and Vulnerability Identification	22%
3.0 Attacks and Exploits	30%
4.0 Penetration Testing Tools	17%
5.0 Reporting and Communication	16%
Total	100%



1.0 Planning and Scoping

1.1 Explain the importance of planning for an engagement.

- **Understanding the target audience**
- **Rules of engagement**
- **Communication escalation path**
- **Resources and requirements**
 - Confidentiality of findings
 - Known vs. unknown
- **Budget**
- **Impact analysis and remediation timelines**
- **Disclaimers**
 - Point-in-time assessment
 - Comprehensiveness
- **Technical constraints**
- **Support resources**
 - WSDL/WADL
 - SOAP project file
 - SDK documentation
 - Swagger document
 - XSD
 - Sample application requests
 - Architectural diagrams

1.2 Explain key legal concepts.

- **Contracts**
 - SOW
 - MSA
 - NDA
- **Environmental differences**
 - Export restrictions
 - Local and national government restrictions
 - Corporate policies
- **Written authorization**
 - Obtain signature from proper signing authority
 - Third-party provider authorization when necessary

1.3 Explain the importance of scoping an engagement properly.

- **Types of assessment**
 - Goals-based/objectives-based
 - Compliance-based
 - Red team
- **Special scoping considerations**
 - Premerger
 - Supply chain
- **Target selection**
 - Targets
 - Internal
 - On-site vs. off-site
 - External
 - First-party vs. third-party hosted
 - Physical
 - Users
 - SSIDs
 - Applications
 - Considerations
 - White-listed vs. black-listed
 - Security exceptions
 - IPS/WAF whitelist
 - NAC
 - Certificate pinning
 - Company's policies
- **Strategy**
 - Black box vs. white box vs. gray box
- **Risk acceptance**
- **Tolerance to impact**
- **Scheduling**
- **Scope creep**
- **Threat actors**
 - Adversary tier
 - APT
 - Script kiddies
 - Hactivist
 - Insider threat
 - Capabilities
 - Intent
 - Threat models



1.4 Explain the key aspects of compliance-based assessments.

- **Compliance-based assessments, limitations and caveats**
 - Rules to complete assessment
 - Password policies
 - Data isolation
 - Key management
- Limitations
 - Limited network access
 - Limited storage access
- **Clearly defined objectives based on regulations**



2.0 Information Gathering and Vulnerability Identification

2.1 Given a scenario, conduct information gathering using appropriate techniques.

- **Scanning**
- **Enumeration**
 - Hosts
 - Networks
 - Domains
 - Users
 - Groups
 - Network shares
 - Web pages
 - Applications
 - Services
 - Tokens
- Social networking sites
- **Packet crafting**
- **Packet inspection**
- **Fingerprinting**
- **Cryptography**
 - Certificate inspection
- **Eavesdropping**
 - RF communication monitoring
 - Sniffing
 - Wired
 - Wireless
- **Decompilation**
- **Debugging**
- **Open Source Intelligence Gathering**
 - Sources of research
 - CERT
 - NIST
 - JPCERT
 - CAPEC
 - Full disclosure
 - CVE
 - CWE

2.2 Given a scenario, perform a vulnerability scan.

- **Credentialed vs. non-credentialed**
- **Types of scans**
 - Discovery scan
 - Full scan
 - Stealth scan
 - Compliance scan
- **Container security**
- **Application scan**
 - Dynamic vs. static analysis
- **Considerations of vulnerability scanning**
 - Time to run scans
 - Protocols used
- Network topology
- Bandwidth limitations
- Query throttling
- Fragile systems/non-traditional assets

2.3 Given a scenario, analyze vulnerability scan results.

- **Asset categorization**
- **Adjudication**
 - False positives
- **Prioritization of vulnerabilities**
- **Common themes**
 - Vulnerabilities
 - Observations
 - Lack of best practices



2.4 Explain the process of leveraging information to prepare for exploitation.

- Map vulnerabilities to potential exploits
 - Prioritize activities in preparation for penetration test
 - Describe common techniques to complete attack
 - Cross-compiling code
 - Exploit modification
 - Exploit chaining
 - Proof-of-concept development (exploit development)
 - Social engineering
 - Credential brute forcing
 - Dictionary attacks
 - Rainbow tables
 - Deception
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2.5 Explain weaknesses related to specialized systems.

- ICS
- SCADA
- Mobile
- IoT
- Embedded
- Point-of-sale system
- Biometrics
- Application containers
- RTOS



3.0 Attacks and Exploits

3.1 Compare and contrast social engineering attacks.

- **Phishing**
 - Spear phishing
 - SMS phishing
 - Voice phishing
 - Whaling
- **Elicitation**
 - Business email compromise
- **Interrogation**
- **Impersonation**
- **Shoulder surfing**
- **USB key drop**
- **Motivation techniques**
 - Authority
 - Scarcity
 - Social proof
 - Urgency
 - Likeness
 - Fear

3.2 Given a scenario, exploit network-based vulnerabilities.

- **Name resolution exploits**
 - NETBIOS name service
 - LLMNR
- **SMB exploits**
- **SNMP exploits**
- **SMTP exploits**
- **FTP exploits**
- **DNS cache poisoning**
- **Pass the hash**
- **Man-in-the-middle**
 - ARP spoofing
 - Replay
 - Relay
 - SSL stripping
 - Downgrade
- **DoS/stress test**
- **NAC bypass**
- **VLAN hopping**

3.3 Given a scenario, exploit wireless and RF-based vulnerabilities.

- **Evil twin**
 - Karma attack
 - Downgrade attack
- **Deauthentication attacks**
- **Fragmentation attacks**
- **Credential harvesting**
- **WPS implementation weakness**
- **Bluejacking**
- **Bluesnarfing**
- **RFID cloning**
- **Jamming**
- **Repeating**



3.4 Given a scenario, exploit application-based vulnerabilities.

- **Injections**
 - SQL
 - HTML
 - Command
 - Code
 - **Authentication**
 - Credential brute forcing
 - Session hijacking
 - Redirect
 - Default credentials
 - Weak credentials
 - Kerberos exploits
 - **Authorization**
 - Parameter pollution
 - Insecure direct object reference
 - **Cross-site scripting (XSS)**
 - Stored/persistent
 - Reflected
 - DOM
 - **Cross-site request forgery (CSRF/XSRF)**
 - **Clickjacking**
 - **Security misconfiguration**
 - Directory traversal
 - Cookie manipulation
 - **File inclusion**
 - Local
 - Remote
 - **Unsecure code practices**
 - Comments in source code
 - Lack of error handling
 - Overly verbose error handling
 - Hard-coded credentials
 - Race conditions
 - Unauthorized use of functions/unprotected APIs
 - Hidden elements
 - Sensitive information in the DOM
 - Lack of code signing
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3.5 Given a scenario, exploit local host vulnerabilities.

- **OS vulnerabilities**
 - Windows
 - Mac OS
 - Linux
 - Android
 - iOS
- **Unsecure service and protocol configurations**
- **Privilege escalation**
 - Linux-specific
 - SUID/SGID programs
 - Unsecure SUDO
 - Ret2libc
 - Sticky bits
 - Windows-specific
- Cpassword
- Clear text credentials in LDAP
- Kerberoasting
- Credentials in LSASS
- Unattended installation
- SAM database
- DLL hijacking
- Exploitable services
 - Unquoted service paths
 - Writable services
- Unsecure file/folder permissions
- Keylogger
- Scheduled tasks
- Kernel exploits
- **Default account settings**
- **Sandbox escape**
 - Shell upgrade
 - VM
 - Container
- **Physical device security**
 - Cold boot attack
 - JTAG debug
 - Serial console



3.6 Summarize physical security attacks related to facilities.

- Piggybacking/tailgating
 - Fence jumping
 - Dumpster diving
 - Lock picking
 - Lock bypass
 - Egress sensor
 - Badge cloning
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3.7 Given a scenario, perform post-exploitation techniques.

- **Lateral movement**
 - RPC/DCOM
 - PsExec
 - WMI
 - Scheduled tasks
 - PS remoting/WinRM
 - SMB
 - RDP
 - Apple Remote Desktop
 - VNC
 - X-server forwarding
 - Telnet
 - SSH
 - RSH/Rlogin
- **Persistence**
 - Scheduled jobs
 - Scheduled tasks
 - Daemons
 - Back doors
 - Trojan
 - New user creation
- **Covering your tracks**



4.0 Penetration Testing Tools

4.1 Given a scenario, use Nmap to conduct information gathering exercises.

- SYN scan (-sS) vs. full connect scan (-sT)
- Port selection (-p)
- Service identification (-sV)
- OS fingerprinting (-O)
- Disabling ping (-Pn)
- Target input file (-iL)
- Timing (-T)
- Output parameters
 - oA
 - oN
 - oG
 - oX

4.2 Compare and contrast various use cases of tools.

(**The intent of this objective is NOT to test specific vendor feature sets.)

- **Use cases**
 - Reconnaissance
 - Enumeration
 - Vulnerability scanning
 - Credential attacks
 - Offline password cracking
 - Brute-forcing services
 - Persistence
 - Configuration compliance
 - Evasion
 - Decompilation
 - Forensics
 - Debugging
 - Software assurance
 - Fuzzing
 - SAST
 - DAST
- **Tools**
 - Scanners
 - Nikto
 - OpenVAS
 - SQLmap
 - Nessus
 - Credential testing tools
 - Hashcat
 - Medusa
 - Hydra
 - Cewl
 - John the Ripper
 - Cain and Abel
 - Mimikatz
 - Patator
 - Dirbuster
 - W3AF
 - Debuggers
 - OLLYDBG
 - Immunity debugger
 - GDB
 - WinDBG
 - IDA
 - Software assurance
 - Findbugs/findsecebugs
 - Peach
 - AFL
 - SonarQube
 - YASCA
 - OSINT
 - Whois
 - Nslookup
 - Foca
 - Theharvester
 - Shodan
 - Maltego
 - Recon-NG
 - Censys
 - Wireless
 - Aircrack-NG
 - Kismet
 - WiFite
 - Web proxies
 - OWASP ZAP
 - Burp Suite
 - Social engineering tools
 - SET
 - BeEF
 - Remote access tools
 - SSH
 - NCAT
 - NETCAT
 - Proxychains
 - Networking tools
 - Wireshark
 - Hping
 - Mobile tools
 - Drozer
 - APKX
 - APK studio
 - MISC
 - Searchsploit
 - Powersploit
 - Responder
 - Impacket
 - Empire
 - Metasploit framework



4.3 Given a scenario, analyze tool output or data related to a penetration test.

- Password cracking
 - Pass the hash
 - Setting up a bind shell
 - Getting a reverse shell
 - Proxying a connection
 - Uploading a web shell
 - Injections
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4.4 Given a scenario, analyze a basic script (limited to Bash, Python, Ruby, and PowerShell).

- Logic
 - Looping
 - Flow control
- I/O
 - File vs. terminal vs. network
- Substitutions
- Variables
- Common operations
 - String operations
 - Comparisons
- Error handling
- Arrays
- Encoding/decoding



5.0 Reporting and Communication

5.1 Given a scenario, use report writing and handling best practices.

- **Normalization of data**
- **Written report of findings and remediation**
 - Executive summary
 - Methodology
 - Findings and remediation
- Metrics and measures
 - Risk rating
 - Conclusion
- **Risk appetite**
- **Storage time for report**
- **Secure handling and disposition of reports**

5.2 Explain post-report delivery activities.

- **Post-engagement cleanup**
 - Removing shells
 - Removing tester-created credentials
 - Removing tools
- **Client acceptance**
- **Lessons learned**
- **Follow-up actions/retest**
- **Attestation of findings**

5.3 Given a scenario, recommend mitigation strategies for discovered vulnerabilities.

- **Solutions**
 - People
 - Process
 - Technology
- **Findings**
 - Shared local administrator credentials
 - Weak password complexity
 - Plain text passwords
 - No multifactor authentication
 - SQL injection
 - Unnecessary open services
- **Remediation**
 - Randomize credentials/LAPS
 - Minimum password requirements/password filters
 - Encrypt the passwords
 - Implement multifactor authentication
 - Sanitize user input/parameterize queries
 - System hardening

5.4 Explain the importance of communication during the penetration testing process.

- **Communication path**
- **Communication triggers**
 - Critical findings
 - Stages
- Indicators of prior compromise
- **Reasons for communication**
 - Situational awareness
 - De-escalation
- De-confliction
- **Goal reprioritization**

CompTIA PenTest+ Acronyms

The following is a list of acronyms that appear on the CompTIA PenTest+ exam. Candidates are encouraged to review the complete list and attain a working knowledge of all listed acronyms as part of a comprehensive exam preparation program.

ACRONYM	SPELLED OUT	ACRONYM	SPELLED OUT
ACL	Access Control List	I/O	Input/Output
ADFS	Active Directory Federation Services	ICMP	Internet Control Message Protocol
AP	Access Point	ICS	Industrial Control Systems
API	Application Programming Interface	IDOR	Indirect Object Reference
APNS	Apple Push Notification Service	IoT	Internet of Things
APT	Advanced Persistent Threat	IPS	Intrusion Prevention System
ASLR	Address Space Layout Randomization	IV	Initialization Vector
BPA	Business Partnership Agreement	JPCERT	Japan Computer Emergency Response Team
CA	Certificate Authority	JTAG	Joint Test Action Group
CAPEC	Common Attack Patterns Enumeration Classification	LAPS	Local Administrator Password Solution
CERT	Computer Emergency Response Team	LFI	Local File Inclusion
CGI	Common Gateway Interface	LLMNR	Link-Local Multicast Name Resolution
CIFS	Common Internet File System	LSASS	Local Security Authority Subsystem Service
CIRT	Computer Incident Response Team	MDM	Mobile Device Management
CORS	Cross-Origin Request Scripting	MFA	Multifactor Authentication
COTS	Commercial Off-The-Shelf	MITM	Man-in-the-Middle
CRL	Certificate Revocation List	MSA	Master Service Agreement
CSRF	Cross-Site Request Forgery	NAC	Network Access Control
CVE	Common Vulnerabilities Exposures	NBNS	Net Bios Name Service
CVSS	Common Vulnerability Scoring System	NDA	Non-Disclosure Agreement
CWE	Common Weakness Enumeration	NFC	Near-Field Communication
DAST	Dynamic Application Security Testing	NIST	National Institute of Standards and Technology
DCOM	Distributed Component Object Model	NOP	No Operation
DFD	Data Flow Diagram	NSE	Network Service Engine
DLL	Dynamic Link Library	OS	Operating System
DNS	Domain Name Service	OSINT	Open Source Intelligence
DOM	Document Object Model	OWASP	Open Web Application Security Project
DoS	Denial of Service	PII	Personally Identifiable Information
DTP	Dynamic Trunking Protocol	POS	Point of Sale
ECDSA	Elliptic Curve Digital Signature Algorithm	PS	PowerShell
EULA	End User License Agreement	RCE	Remote Code Execution
FTP	File Transfer Protocol	RDP	Remote Desktop Protocol
GPO	Group Policy Object	RFI	Remote File Inclusion
GPP	Generic Packetized Protocol	RFID	Radio Frequent ID
GRE	Generic Routing Encapsulation	RFP	Request for Proposal
HSTS	HTTP Strict Transport Security	ROE	Rules of Engagement
HTML	HyperText Markup Language	RPC	Remote Procedure Call
		RSH	Remote Shell

ACRONYM	SPELLED OUT
RTOS	Real Time Operating System
SAM	Security Account Manager
SAN	Subject Alternative Name
SAST	Static Application Security Testing
SCADA	Supervisory Control and Data Acquisition
SCEP	Simple Certificate Enrollment Protocol
SCP	Secure Copy
SDK	Software Development Kit
SGID	Set Group ID
SID	Secure Identifier
SIEM	Security Incident Event Manager
SLA	Service Level Agreement
SMB	Server Message Block
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOAP	Simple Object Access Protocol
SOC	Security Operation Center
SOW	Statement of Work
SPN	Service Principle Name
SQL	Structured Query Language
SSH	Secure Shell
SSL	Secure Sockets Layer
STP	Spanning Tree Protocol
SUID	Set User ID
TCP	Transmission Control Protocol
TLS	Transport Layer Security
TOTP	Time-Based One-Time Password
TPM	Trusted Platform Module
TTP	Tactics, Techniques and Procedures
UDP	User Datagram Protocol
VLAN	Virtual Local Area Network
VM	Virtual Machine
VNC	Virtual Network Connection
VPN	Virtual Private Network
WADL	Web Application Description Language
WAF	Web Application Firewall
WAR	Web Application Archive
WEP	Wired Equivalency Protocol
WinRM	Windows Remote Management
WMI	Windows Management Instrumentation
WPAD	Web Proxy Auto-Discovery
WPS	WiFi Protected Setup
WSDL	Web Services Description Language
XSD	XML Schema Document
XSS	Cross-Site Scripting
XST	Cross-Site Tracing
XXE	External Entity

CompTIA PenTest+ Proposed Hardware and Software List

CompTIA has included this sample list of hardware and software to assist candidates as they prepare for the CompTIA PenTest+ exam. This list may also be helpful for training companies that wish to create a lab component for their training offering. The bulleted lists below each topic are sample lists and not exhaustive.

EQUIPMENT

- Laptops
- Wireless access points
- Servers
- Switches
- Cabling
- Monitors
- Firewalls
- HID/door access controls
- Wireless adapters capable of packet injection
- Directional antenna
- Mobile device

SPARE HARDWARE

- Cables
- Keyboards
- Mouse
- Power supplies
- Dongles/adapters

TOOLS

- Lock pick kit
- Badge cloner
- Fingerprint lifter

SOFTWARE

- OS licensing
- Open source OS
- Penetration testing frameworks
- Virtual machine software
- Scanning tools
- Credential testing tools
- Debuggers
- Software assurance tools
- Wireless testing tools
- Web proxying tools
- Social engineering tools
- Remote access tools
- Network tools
- Mobility testing tools