PRACTICE EXAM 9: CTS-I SIMULATION

QUESTIONS 1–125

Domain A — Conducting Pre-Installation Activities

1. A project's wiring schedule includes 18 Cat6A cable runs each averaging 75 feet in length. An installer planning the cable order including 4-foot rack service loops, 5-foot device service loops, and 15% contingency should order approximately:

A. 1,350 feet

B. 1,739 feet

C. 1,500 feet

D. 1,900 feet

2. A pre-installation walkthrough identifies that the proposed cable pathway runs parallel to high-voltage lighting feeders for approximately 40 feet. The NEC-required separation distance to prevent electromagnetic coupling is typically:

A. 2 inches minimum

B. 6 inches minimum

C. 12 inches minimum

D. At least 12 inches or per NEC/specification requirements

3. The cross-sectional area of a 0.24-inch-diameter cable is approximately:

A. 0.0452 square inches

B. 0.0281 square inches

C. 0.0904 square inches

D. 0.0724 square inches

4. A 1.25-inch EMT conduit with 1.496 square inches internal cross-sectional area is planned for 12 cables each with 0.042 square inch cross-sectional area. The total cable area is:

A. 0.442 square inches

B. 0.496 square inches

C. 0.504 square inches

D. 0.556 square inches

5. Continuing from the previous question, the fill percentage is approximately:

A. 29.5%

B. 31.2%

C. 28.4%

D. 33.7%

6. A pre-installation review identifies that the specified display weighs 145 pounds, requiring mounting to a wall rated for 200 pounds of load. The safety factor applied is:

A. 1.0:1

B. Approximately 1.4:1, below the 4:1 industry standard

C. 2.0:1

D. Approximately 2.8:1

7. The 4:1 safety factor for non-overhead mounting of a 145-pound display requires minimum mount/wall capacity of:

A. 580 pounds

B. 290 pounds

C. 435 pounds

D. 725 pounds

8. A pre-installation review identifies that cable pulls will pass through ceiling spaces that operate as plenum. What cable rating is required?

A. CMG (general purpose)

B. CMR (riser)

C. CMP (plenum)

D. CL2 (Class 2)

9. An OSHA 10-hour construction safety card is primarily required for:

A. Only personnel handling electrical work

B. Only personnel operating aerial lifts

C. Only personnel working above 30 feet

D. General worker access on commercial construction jobsites

10. A pre-installation walkthrough identifies that the AV installation is scheduled after drywall completion. The primary coordination concern is:

A. Cable pathways must be completed before drywall closes

B. Drywall completion enables AV installation

C. Drywall finishing requires AV installer assistance

D. Drywall and AV are entirely independent activities

11. A wiring schedule lists 220 cable runs averaging 65 feet. The installer's hardware list specifies one label per termination at both ends. Total labels required is:

A. 220 labels

B. 330 labels

C. 440 labels

D. 660 labels

12. A pre-installation site survey identifies that a ceiling-mounted projector will be installed 16 feet above the finished floor, with access for maintenance requiring ladder work. The appropriate planning consideration is:

A. Projector specifications can be ignored during mounting

B. Fall protection and appropriate access equipment must be planned

C. Maintenance access is not a pre-installation concern

D. Wireless remote control eliminates the need for physical access

13. A project's bill of materials includes fiber optic cable specified for 10 Gbps Ethernet to 300 meters. The appropriate cable category is:

A. Single-mode fiber

B. Multi-mode OM1 fiber

C. Multi-mode OM2 fiber

D. Multi-mode OM3 fiber

14. A 2-inch EMT conduit with 3.36 square inches internal cross-sectional area has what maximum cable area permitted at 40% fill?

A. 1.344 square inches

B. 1.008 square inches

C. 0.672 square inches

D. 1.68 square inches

15. A pre-installation review identifies that the AV control system requires network access to route commands between the touch panel and controlled equipment. The appropriate network planning includes:

A. Client IT coordination for VLAN and addressing

B. Installing a separate dedicated AV network

C. Sharing the general office network without configuration

D. Using wireless networking for all AV traffic

16. A cable run in a conduit with 3 bends of 90 degrees each has cumulative bend angle of:

A. 180 degrees

B. 270 degrees

C. 360 degrees

D. 405 degrees

17. The NEC limit on cumulative bend angle between pull points is:

A. 180 degrees

B. 270 degrees

C. 450 degrees

D. 360 degrees

18. A pre-installation site survey identifies that an essential test instrument is not available in the installer's inventory. The appropriate action is:

A. Procure the required instrument with adequate lead time before installation

B. Proceed without the instrument and document gaps

C. Borrow similar equipment from another project

D. Request the client provide the instrument

19. A pre-installation review of project documentation identifies that an XLR microphone cable must carry phantom power to a condenser microphone at 75 feet distance. The appropriate cable type is:

A. Unbalanced cable to reduce material cost

B. Balanced cable with two signal conductors and shield

C. Speaker-level cable with thick conductors

D. Coaxial cable with center conductor

20. A pre-installation labor calculation uses 150 base hours and applies productivity factors. For occupied-building work with 20% adjustment and evening shifts with 25% additional adjustment, the total estimated hours are approximately:

A. 170 hours

B. 195 hours

C. 225 hours

D. 240 hours

21. A drawing scale of 1/8" = 1'-0" shows a room 64 feet wide. The drawing dimension is:

A. 8 inches

B. 6 inches

C. 10 inches

D. 12 inches

22. A pre-installation site survey documents an equipment room with inadequate ventilation for planned equipment heat loads. The appropriate response is:

A. Accept the condition since equipment tolerance varies

B. Install portable fans near the rack location

C. Specify smaller equipment to reduce heat

D. Coordinate with mechanical engineering to address ventilation before installation

23. A pre-installation review identifies that the proposed equipment rack door must open a full 90 degrees but available clearance in front of the rack is only 30 inches with the door fully opened. The concern is:

A. The limited clearance is adequate for installation and service

B. The clearance is insufficient for typical rack door operation

C. The rack must be rotated 90 degrees from drawings

D. Rack doors can be removed permanently to solve the issue

24. A pre-installation take-off calculation for the number of cable ties should include:

A. The base quantity required plus a reasonable reserve (typically 10-15%)

B. Only the exactly calculated base quantity

C. Twice the calculated quantity as reserve

D. No reserve since excess is wasteful

25. A site survey identifies that the AV equipment room shares air supply with offices containing printers. The primary concern is:

A. Office noise will be transmitted through the AV room

B. Printer emissions will not affect AV equipment

C. Paper dust from printers may contaminate AV equipment intakes

D. Shared air is not a concern for AV installations

26. A pre-installation review of project documentation finds that the rack elevation specifies a 42U rack with 35U of equipment and 7U of blanking panels. The effective equipment capacity used is:

A. 35 rack units

B. 42 rack units

C. 38 rack units

D. 40 rack units

27. An installer's pre-installation meeting with the client typically addresses:

A. Only technical specifications of installed equipment

B. Only installation schedule and access

C. Schedule, access, scope, safety, communication, and key personnel

D. Only warranty and maintenance agreements

28. A pre-installation review finds that the cable pathway designated on drawings has a 30-foot horizontal run with 8-foot vertical rise. Planning the pull, the total cable pathway length is approximately:

A. 30 feet

B. 38 feet

C. 44 feet

D. 32 feet

Domain B — Conducting Site Rough-In/First-Fix

29. An installer pulling cable through a 120-foot conduit run with three 90-degree bends encounters progressive tension increase approaching the cable's maximum specification. The appropriate response is:

A. Stop the pull and investigate the cause before proceeding

B. Apply additional pulling lubricant at the feed end

C. Continue at reduced speed to complete the run

D. Switch to mechanical pulling assistance for smooth tension

30. A 75-pound display mounted on a stud wall with studs on 16-inch centers should use which mounting approach?

A. High-capacity drywall toggle anchors between studs

B. Adhesive mounting directly to drywall

C. Lag bolts threaded into studs with appropriate spacer hardware

D. Plastic expansion anchors in the drywall

31. A 5/16-inch A307 threaded rod has a tensile failure capacity of approximately 4,000 pounds. Its working load with a 5:1 overhead safety factor is:

A. 2,000 pounds

B. 1,600 pounds

C. 1,000 pounds

D. 800 pounds

32. OSHA construction fall protection requires fall protection at:

A. 4 feet or greater

B. 6 feet or greater

C. 8 feet or greater

D. 10 feet or greater

33. The 4-to-1 rule for extension ladder positioning means:

A. The base extends 1 foot from the structure for every 4 feet of working height

B. The ladder must be 4 times stronger than the load

C. The ladder rungs must be at 4-inch intervals

D. The ladder must be 4 feet longer than the working height

34. A worker on a scissor lift platform with full-perimeter guardrails:

A. Must always wear personal fall arrest

B. Must have a spotter on the ground at all times

C. Must wear personal fall arrest only above 20 feet

D. Is provided sufficient passive fall protection by the guardrails

35. A worker on a boom lift platform must wear:

A. Personal fall arrest attached to the ground

B. No fall protection beyond platform guardrails

C. Personal fall arrest attached to a designated anchor on the platform

D. Safety nets suspended below the work area

36. Concrete masonry walls require which fastener type?

A. Wood lag bolts threaded into the masonry

B. Concrete-rated wedge anchors or sleeve anchors

C. Standard plastic expansion anchors

D. Sheet metal screws

37. A cable pulled through a conduit must not be bent tighter than:

A. 2 times the cable diameter

B. 6 times the cable diameter

C. 8 times the cable diameter

D. 4 times the cable diameter

38. An installer encountering asbestos-containing material during deinstallation work should:

A. Stop work and contact qualified asbestos abatement personnel

B. Continue using an N95 dust mask

C. Cut cable ends and leave the suspect portion in place

D. Document and continue with normal procedures

39. Structural blocking for wall-mounted AV equipment should be installed by:

A. The AV installer during equipment mounting

B. The drywall contractor during wall finishing

C. The general contractor or framing trade during construction

D. The electrical contractor during rough-in

40. OSHA requires fall arrest anchor points to have minimum rated capacity of:

A. 2,500 pounds per worker

B. 5,000 pounds per worker

C. 3,500 pounds per worker

D. 1,000 pounds per worker

41. The jam ratio in cable pulling refers to:

A. The ratio of conduit internal diameter to cable outside diameter

B. The ratio of pulling tension to maximum tension

C. The ratio of cable count to conduit fill

D. The ratio of conduit length to pull distance

42. OSHA's silica standard requires which controls during concrete cutting?

A. Standard N95 dust masks regardless of exposure

B. Performing all cutting outside the building

C. Carbide-tipped blade replacement every 100 cuts

D. Water suppression, local exhaust ventilation, or respiratory protection

Domain C — Installing Audiovisual Systems

43. The standardized vertical unit of measure for equipment racks is:

A. 1.5 inches per rack unit

B. 2.0 inches per rack unit

C. 1.75 inches per rack unit

D. 1.625 inches per rack unit

44. A 15U rack-mount device occupies how many inches of vertical mounting height?

A. 26.25 inches

B. 22.5 inches

C. 30 inches

D. 18.75 inches

45. The standard rack mounting width is:

A. 17 inches

B. 19 inches

C. 18 inches

D. 21 inches

46. The 80% rule applied to a 20-ampere circuit limits continuous loads to:

A. 14 amperes

B. 18 amperes

C. 20 amperes

D. 16 amperes

47. A power amplifier dissipates 400 watts continuously. This represents approximately how many BTU/hour?

A. 1,000 BTU/hour

B. 1,200 BTU/hour

C. 1,365 BTU/hour

D. 1,500 BTU/hour

48. The XLR pin assignments per AES convention are:

A. Pin 1 ground, Pin 2 hot, Pin 3 cold

B. Pin 1 hot, Pin 2 ground, Pin 3 cold

C. Pin 1 cold, Pin 2 ground, Pin 3 hot

D. Pin 1 hot, Pin 2 cold, Pin 3 ground

49. Phantom power for condenser microphones is standardized at:

A. 12 volts DC

B. 24 volts DC

C. 36 volts DC

D. 48 volts DC

50. A balanced audio cable uses:

A. One conductor plus shield

B. Two conductors plus shield

C. Three conductors plus shield

D. Four conductors plus shield

51. A 3 dB increase in audio signal power represents:

A. A 30% power increase

B. A tenfold power increase

C. A halving of power

D. A doubling of power

52. The decibel formula for power ratios uses:

A. $20 \times \log(P1/P2)$

B. $10 \times \log(P1/P2)$

C. $5 \times \log(P1/P2)$

D. $2 \times \log(P1/P2)$

53. The transformer at each loudspeaker on a 70V distributed audio system:

A. Steps down the high-voltage line to the loudspeaker's voltage

B. Provides phantom power to the loudspeakers

C. Converts AC to DC for solid-state drivers

D. Boosts signal level for long runs

54. A 70V amplifier rated at 200 watts should drive total tap loads of approximately:

A. 200 watts

B. 240 watts

C. 160 watts

D. 300 watts

55. Cat6A cable supports maximum frequency of:

A. 100 MHz

B. 250 MHz

C. 350 MHz

D. 500 MHz

56. The maximum permissible untwist at Cat6A termination is:

A. 0.25 inches

B. 0.5 inches

C. 0.75 inches

D. 1.0 inches

57. 75-ohm coaxial cable is typically used for:

A. Video signal transport including SDI and CATV

B. Communications RF including two-way radio

C. Speaker-level audio

D. RS-232 serial control

58. The maximum HDBaseT 4K60 copper distance is approximately:

A. 50 meters

B. 75 meters

C. 100 meters (328 feet)

D. 200 meters

59. EDID information exchange occurs through:

A. A separate management network

B. The DDC channel embedded within the HDMI or DisplayPort cable

C. Manual configuration

D. RS-232 serial connection

60. HDCP 2.2 encryption is required for:

A. Audio content over Dante networks

B. 1080p content from any source

C. Standard-definition video

D. 4K UHD content from compatible sources

61. OM3 multimode fiber supports 10 Gbps Ethernet to:

A. 300 meters

B. 200 meters

C. 100 meters

D. 400 meters

62. APC fiber connectors are color-coded:

A. Blue

B. Beige

C. Green

D. Yellow

63. Dante audio networking typical latency is:

A. 50 to 100 milliseconds

B. 0.25 to 1 millisecond

C. 5 to 10 milliseconds

D. 10 to 20 milliseconds

64. SDVoE requires minimum network infrastructure of:

A. 1 Gbps Ethernet

B. 100 Mbps Ethernet

C. Wireless 802.11ac

D. 10 Gbps Ethernet

65. IEEE 802.3at provides power at the powered device of:

A. 25.5 watts

B. 51 watts

C. 12.95 watts

D. 71 watts

66. A /24 subnet provides:

A. 256 usable hosts

B. 128 usable hosts

C. 254 usable hosts

D. 126 usable hosts

67. RFC 1918 defines private IPv4 ranges including:

A. Only 192.168.0.0/16

B. Only 10.0.0.0/8

C. Only 172.16.0.0/12

D. 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16

68. RS-232 typical baud rates range between:

A. 1200 and 4800 bps

B. 9600 and 115200 bps

C. 250000 and 500000 bps

D. 4800 and 9600 bps

69. RS-232 configuration requires matching:

A. Baud rate, data bits, parity, stop bits

B. IP address, subnet mask, gateway

C. MAC address and VLAN

D. Frequency, modulation, encryption

70. IR control is generally:

A. Bidirectional with status feedback

B. Effective at 500 feet

C. Unidirectional with no status feedback

D. Compatible with all equipment

71. A control processor sending IP commands with no response should first:

A. Reboot the processor

B. Verify network connectivity using ping

C. Replace the network cable

D. Update the device firmware

72. An 8-ohm loudspeaker with cable resistance limited to 5% of impedance has maximum cable resistance of:

A. 0.40 ohms

B. 0.20 ohms

C. 0.10 ohms

D. 0.50 ohms

73. Three 8-ohm loudspeakers in parallel present combined impedance of:

A. 8 ohms

B. 4 ohms

C. 24 ohms

D. 2.67 ohms

74. Digital signals degrading over distance typically exhibit:

A. Gradual quality degradation

B. Increasing color saturation

C. Full quality until catastrophic failure at the digital cliff

D. Audible noise that grows

75. A waveform monitor displays:

A. Video chrominance on a polar plot

B. Video signal amplitude over time

C. Audio levels

D. Network bandwidth

76. A vectorscope displays:

A. Video signal amplitude over time

B. Audio frequency response

C. Video chrominance on a polar plot

D. Network packet loss

77. A projector with throw ratio 2.0:1 positioned 24 feet from the screen produces what image width?

A. 12 feet

B. 16 feet

C. 24 feet

D. 48 feet

78. The target white point for video calibration is:

A. 5500K

B. 7500K

C. 9300K

D. 6500K

79. The target gamma for standard video content is:

A. 1.8

B. 2.2

C. 2.4

D. 2.0

80. AVIXA DISCAS basic decision-making content maximum viewing distance is:

A. 8 times image height

B. 4 times image height

C. 12 times image height

D. 6 times image height

81. A measurement microphone should have:

A. Cardioid polar pattern

B. Hypercardioid polar pattern

C. Flat response with omnidirectional polar pattern

D. Ribbon transducer

82. AES67 primarily provides:

A. Audio encryption

B. Power delivery

C. Frequency analysis

D. Open interoperability between manufacturers' networked audio systems

83. A polarity tester confirms:

A. Amplifier output voltage

B. All loudspeakers move in the same direction on the same signal

C. Audio signal level

D. Cable shielding bonding

84. Cable certification for Cat6A tests:

A. Insertion loss, return loss, NEXT, ANEXT, propagation delay, and other parametric measurements

B. Length and continuity only

C. Voltage drop only

D. Visual inspection only

85. 1080p60 at 8-bit color requires approximately:

A. 3.0 Gbps

B. 6.0 Gbps

C. 4.5 Gbps

D. 9.0 Gbps

86. 4K60 with 10-bit color and HDR requires approximately:

A. 12 Gbps

B. 18 Gbps

C. 36 Gbps

D. 24 Gbps

87. A 70V system with 12 loudspeakers at 10-watt taps and 6 loudspeakers at 5-watt taps has total tap load of:

A. 120 watts

B. 150 watts

C. 180 watts

D. 200 watts

88. Acoustic echo cancellation removes:

A. The sound of room loudspeakers reproducing far-end audio

B. Background ambient noise

C. Microphone distortion

D. Room reverb

Domain D — Perform Systems Close-Out

89. ANSI/AVIXA 10:2013 structures verification items into three levels representing:

A. Critical, Important, Optional

B. Primary, Secondary, Tertiary

C. Level 1, Level 2, Level 3

D. Essential, specialized, and unique items

90. A non-functional control system touchpanel is classified as:

A. A cosmetic deficiency

B. A pre-existing condition

C. A substantive deficiency affecting system function

D. A user training issue

91. Substantial completion is the milestone at which:

A. The system is ready for its intended use and warranty typically begins

B. All punch list items are complete

C. The installer's contract begins

D. Final retention is fully released

92. A 12-month warranty effective date typically ties to:

A. Contract signing

B. Equipment delivery

C. First day of installation

D. Substantial completion when the client takes beneficial use

93. As-built documentation records:

A. Original design intent

B. The installed system's actual configuration for future reference

C. Contract scope

D. Change order history

94. A typical end-user training session is characterized by:

A. Extended technical sessions

B. Lecture-style presentation

C. Brief focused sessions on essential operations with hands-on practice

D. Self-paced video training

95. A quick reference guide should include:

A. Essential functions with screenshots and simple instructions

B. Detailed technical specifications

C. Complete signal flow diagrams

D. Manufacturer service information

96. A service agreement typically provides:

A. Complete upgrades at no additional cost

B. Free equipment replacement

C. Manufacturer warranty extension

D. Defined response times, scheduled preventive maintenance, and priority service

97. A typical preventive maintenance schedule recommends:

A. Monthly visits

B. Annual visits with more frequent visits for high-use environments

C. Visits only when problems occur

D. Quarterly visits universally

98. Signed sign-off documentation creates:

A. A formal written record of client acceptance

B. Authorization for warranty registration

C. Documentation for tax purposes

D. Trigger for next construction phase

99. A substantial completion walk-through involves:

A. Only the lead installer

B. Only the design engineer

C. The installer, client representative, and sometimes the general contractor

D. Only the client's facility staff

100. A certificate of substantial completion documents:

A. Original equipment costs

B. Serial numbers

C. Expected service life

D. That the system is ready for use even though minor work may remain

101. A client representative signing project completion documents typically holds:

A. Limited informal authority

B. Installation-date verification authority only

C. Authority to modify contract terms

D. Formal signing authority for the client organization

102. Project closeout deliverables typically include:

A. Only equipment manuals

B. As-built drawings, equipment manuals, warranty documentation, and verification reports

C. Only as-built drawings

D. Only warranty cards

Domain E — Conducting Ongoing Project Responsibilities

103. Daily progress reports primarily:

A. Calculate weekly invoices

B. Document equipment serial numbers

C. Document activities, labor, materials, and issues for the project record

D. Track individual installer productivity

104. A Request for Information (RFI) is used to:

A. Obtain clarification from the design team on field-discovered issues

B. Document materials consumed

C. Request labor resources

D. Submit invoices

105. Substituting equivalent accessories during installation is typically:

A. A major adaptation requiring change order

B. A code violation requiring inspector notification

C. A breach of contract

D. A minor adaptation within installer authority requiring documentation

106. Trade coordination is managed through:

A. The client's facilities director

B. The general contractor's superintendent and coordination meetings

C. Direct communication between trades

D. The architect

107. A change order is required when:

A. Work scope expands beyond original contract specifications

B. Materials are consumed faster than estimated

C. Work occurs during evening hours

D. Equipment fails during installation

108. "Clean as you go" practice means:

A. Weekly cleanup sweeps

B. Specialized cleaning contractors handle everything

C. Debris managed continuously throughout the day

D. Cleanup deferred to close-out phase

109. Construction debris is typically disposed of through:

A. The AV firm's own dumpster

B. The general contractor's construction waste management system

C. Client's regular building trash

D. Personal disposal by individual installers

110. A delay caused by another trade should be reported through:

A. Direct confrontation with the other trade

B. Social media platforms

C. Formal grievance to the building owner

D. The project manager who can coordinate response

111. OSHA silica controls during concrete cutting include:

A. Water suppression, local exhaust ventilation, or respiratory protection

B. Standard N95 dust masks

C. Outdoor work only

D. Carbide blade replacement

112. BIM coordination drawings primarily support:

A. Marketing presentations

B. Building permits

C. Conflict identification between MEP, fire protection, and technology systems

D. Insurance documentation

113. Discovering an unexpected condition affecting the original design requires:

A. Modifying the installation without notification

B. Reporting through appropriate channels for engineering review

C. Waiting for the design team's next visit

D. Documenting only for as-built drawings

114. A delay should be reported to the project manager:

A. As soon as identified, even if impact is uncertain

B. Only after a milestone is missed

C. At the next coordination meeting only

D. Only after cause is definitively determined

115. A scope change identified during installation should:

A. Be implemented immediately

B. Be ignored if small

C. Be assigned without documentation

D. Be routed through the project manager for change order processing

116. Work beyond original contract scope without change order approval typically results in:

A. Premium reimbursement rates

B. Automatic invoice addition

C. Labor and materials consumed without compensation

D. Default client acceptance at original rates

117. Documentation of field engineering decisions supports:

A. Sales discussions

B. Both as-built records and traceability of decisions under installer authority

C. Direct manufacturer communication

D. Crew performance reviews

118. The installer's firestopping responsibility is to:

A. Either perform firestopping correctly or coordinate with the firestop contractor

B. Defer to the general contractor

C. Apply silicone caulk as temporary measure

D. Use the same material regardless of wall rating

119. Discovering asbestos-containing material requires:

A. Continuing with respiratory protection

B. Notifying only the client

C. Capping cable ends

D. Stopping work immediately and contacting qualified asbestos abatement personnel

120. Root-cause analysis after service incident:

A. Determines crew responsibility

B. Documents for legal proceedings

C. Understands why the failure occurred so it does not recur

D. Calculates warranty coverage

121. A typical AV installation service life is approximately:

A. 7 to 10 years

B. 2 to 3 years

C. 15 to 20 years

D. 25 to 30 years

122. End-of-life indicators include:

A. Increased user satisfaction

B. Increasing service frequency, declining reliability, parts unavailability

C. Decreased preventive maintenance

D. Reduced electricity consumption

123. Decommissioned equipment with configuration data should be:

A. Returned to manufacturer

B. Donated without modification

C. Stored in client's facility

D. Factory-reset or data-wiped before leaving the client's site

124. RoHS primarily addresses:

A. Workplace safety

B. Building code requirements

C. Restricted materials in electronic equipment requiring responsible handling

D. Manufacturer warranty terms

125. The installer-installation relationship typically extends:

A. Through the entire service life via maintenance and service

B. Only through client handover

C. Through manufacturer warranty only

D. Until next management election

PRACTICE EXAM 9: ANSWER KEY WITH FULL ANSWER EXPLANATIONS

Questions 1–125

Domain A — Conducting Pre-Installation Activities

1. B — 1,739 feet. Base cable per run equals 75 + 4 + 5 = 84 feet, totaling 18 × 84 = 1,512 feet; adding 15% contingency (approximately 227 feet) yields approximately 1,739 feet. Accurate take-off calculations include service loops and contingency to prevent shortages during installation.

2. D — At least 12 inches or per NEC/specification requirements. NEC Article 800 and similar code provisions mandate physical separation between low-voltage communications cable and line-voltage conductors to prevent electromagnetic coupling and safety hazards. Specific separation distances may be defined by NEC, local codes, or project specifications with 12 inches being typical.

3. A — 0.0452 square inches. The cross-sectional area formula $\pi \times (d/2)^2$ applied with d = 0.24 inches yields $\pi \times (0.12)^2 = \pi \times 0.0144 \approx 0.0452$ square inches. Accurate cable cross-sectional calculations are fundamental to NEC conduit fill compliance.

4. C — 0.504 square inches. Total cable area equals 12 × 0.042 = 0.504 square inches. This calculation is compared against the conduit's maximum allowable area at 40% fill to verify NEC compliance.

5. D — 33.7%. Dividing 0.504 square inches by 1.496 square inches equals approximately 33.7%. This falls within the 40% NEC limit for three or more cables, confirming the cable count is code-compliant.

6. B — Approximately 1.4:1, below the 4:1 industry standard. The 200-pound mount rating divided by the 145-pound load equals 1.38:1, substantially below the 4:1 safety factor standard. This combination is inadequate for professional mounting and requires a higher-rated mount or stronger wall structure.

7. A — 580 pounds. The 4:1 safety factor multiplied by the 145-pound load equals 580 pounds minimum required support capacity. Non-overhead loads require minimum 4:1 safety factor to account for dynamic loading, fatigue, and installation imperfections.

8. C — CMP (plenum). NEC classification CMP (Communications Multipurpose Plenum) designates cable rated for installation in air-handling spaces. This classification meets the flame spread and smoke generation requirements for plenum environments.

9. D — General worker access on commercial construction jobsites. The OSHA 10-hour card certifies standardized 10-hour construction safety training and is commonly required for general worker access on commercial construction sites. It is not limited to specific work types but applies to general jobsite access.

10. A — Cable pathways must be completed before drywall closes. Cable rough-in in wall cavities and ceiling spaces must be completed before drywall closes the pathways, as drywall installation permanently seals these access points. This coordination sequence is essential for AV work in new construction.

11. C — 440 labels. 220 cable runs multiplied by 2 ends per cable equals 440 labels required. Accurate take-off calculations for consumables prevent shortages that would disrupt installation progress.

12. B — Fall protection and appropriate access equipment must be planned. Maintenance access at elevated positions requires planning for fall protection and suitable access equipment (ladders, scissor lifts, scaffolding) to safely service the equipment. This planning extends beyond installation to cover the equipment's service life.

13. D — Multi-mode OM3 fiber. OM3 multimode fiber supports 10 Gbps Ethernet transmission to 300 meters, matching the specification requirement. Lower-category fiber (OM1, OM2) does not reliably support this distance at 10 Gbps, and single-mode is typically used for longer distances.

14. A — 1.344 square inches. The 40% fill limit multiplied by the 3.36 square inch internal area equals 1.344 square inches available for cables. This calculation determines the maximum cable area permitted under NEC rules for three or more cables.

15. C — Client IT coordination for VLAN and addressing. AV control systems typically operate on the client's network infrastructure, requiring IT coordination for VLAN assignments, IP addressing, and any security considerations. This coordination ensures AV traffic integrates properly without conflicting with existing network architecture.

16. B — 270 degrees. Three 90-degree bends total $3 \times 90 = 270$ degrees. This falls below the NEC 360-degree limit between pull points, remaining compliant and allowing continued pulling without an intermediate pull box.

17. D — 360 degrees. NEC Chapter 9 limits cumulative bend angle between pull points to 360 degrees, equivalent to four 90-degree bends. Exceeding this limit requires intermediate pull boxes to prevent cable damage from excessive pulling tension.

18. A — Procure the required instrument with adequate lead time before installation. Professional installation firms procure missing test equipment with lead time to ensure availability for

verification and commissioning. Proceeding without test equipment or improvising compromises professional practice and installation quality.

19. B — Balanced cable with two signal conductors and shield. Balanced audio cable supports the balanced signal architecture required by professional microphones and the phantom power delivery required by condenser microphones. The two signal conductors carry balanced audio and phantom power, while the shield provides noise rejection.

20. C — 225 hours. Base 150 hours × 1.20 (occupied) equals 180 hours, then × 1.25 (evening shifts) equals approximately 225 hours. Productivity factors are applied multiplicatively to compound effects.

21. A — 8 inches. At 1/8" = 1'-0" scale, 64 feet × 1/8 inch per foot = 8 inches. Scale conversion allows dimensions on paper to be calculated from actual building dimensions, or vice versa.

22. D — Coordinate with mechanical engineering to address ventilation before installation. Inadequate ventilation is an engineering issue requiring mechanical engineering resolution before equipment installation. Portable fans, reduced equipment, or accepted conditions compromise professional practice.

23. B — The clearance is insufficient for typical rack door operation. Professional installation requires adequate clearance for rack door operation and service access, typically 24-30 inches minimum. The 30-inch available clearance with an open door creates constricted space that may impede service work.

24. A — The base quantity required plus a reasonable reserve (typically 10-15%). Professional take-off includes reasonable reserve (typically 10-15%) to prevent shortages during installation due to unexpected consumption, miscounted cables, or minor field changes. Exact-count purchases risk shortages without reserve.

25. C — Paper dust from printers may contaminate AV equipment intakes. Paper dust from printer/copier operation can enter AV equipment cooling intakes, accumulating on internal components and affecting thermal performance. Coordination with HVAC design addresses this through appropriate filtration or air separation.

26. A — 35 rack units. The 42U rack minus 7U of blanking panels leaves 35U available for equipment. The 35U of actual equipment matches this available space exactly, fitting the rack completely.

27. C — Schedule, access, scope, safety, communication, and key personnel. A comprehensive pre-installation meeting covers all aspects of the upcoming work so both parties are aligned on expectations and responsibilities. Partial coverage missing key topics leaves gaps that produce problems during installation.

28. B — 38 feet. Horizontal 30 feet plus vertical 8 feet equals 38 feet of physical pathway length. Additional length for routing, bends, service loops, and contingency would typically be added beyond the pathway length for final cable ordering.

Domain B — Conducting Site Rough-In/First-Fix

29. A — Stop the pull and investigate the cause before proceeding. Tension approaching manufacturer maximum indicates the cable is near its damage threshold. Continuing the pull risks invisible internal damage; professional practice stops to identify and address the cause.

30. C — Lag bolts threaded into studs with appropriate spacer hardware. Lag bolts engaging wood studs provide the highest-confidence attachment for substantial loads, and spacer hardware addresses the gap between the mount and the stud when the wall surface is offset. This approach distributes the 75-pound display load across multiple studs.

31. D — 800 pounds. The 4,000-pound failure capacity divided by a 5:1 overhead safety factor equals 800 pounds working load. Overhead loads require higher safety factors than non-overhead loads because of the greater consequences of failure into occupied spaces below.

32. B — 6 feet or greater. OSHA construction fall protection standards (29 CFR 1926 Subpart M) require fall protection at heights of 6 feet or greater. This is stricter than the 4-foot general industry standard, and AV installers working in construction environments must comply with this specific requirement.

33. A — The base extends 1 foot from the structure for every 4 feet of working height. The 4-to-1 rule sets the ladder angle for safe climbing and stability. A 16-foot working height requires the ladder base positioned 4 feet from the supporting surface.

34. D — Is provided sufficient passive fall protection by the guardrails. Scissor lifts equipped with full-perimeter guardrails permit operators to remain within the platform without personal fall arrest. Boom lifts, which can experience whipping motion, do require personal fall arrest in addition to guardrails.

35. C — Personal fall arrest attached to a designated anchor on the platform. Boom lifts can experience whipping motion that ejects workers from the platform, and OSHA requires personal fall arrest attached to designated anchor points on the platform. Anchoring to ground systems is not permitted.

36. B — Concrete-rated wedge anchors or sleeve anchors. Concrete masonry walls require anchors specifically designed for concrete materials with installation per anchor specifications. Wood screws, plastic expansion anchors, and lag bolts cannot effectively engage masonry for substantial AV mounting.

37. D — 4 times the cable diameter. Manufacturer specifications typically require minimum 4× cable diameter bend radius during installation and 8× diameter in the final installed position. Respecting bend radius prevents internal geometry deformation that degrades high-frequency performance.

38. A — Stop work and contact qualified asbestos abatement personnel. Asbestos must be handled only by qualified abatement personnel because exposure causes diseases emerging decades after exposure. Informal handling and standard PPE are not sufficient for asbestos.

39. C — The general contractor or framing trade during construction. Structural blocking is a construction activity that must be installed during framing, before walls are closed with drywall. Coordinating with the general contractor ensures blocking is in place when AV mounting begins.

40. B — 5,000 pounds per worker. OSHA 29 CFR 1926.502 requires fall arrest anchor points to have minimum rated capacity of 5,000 pounds per worker, providing the safety margin needed to arrest a falling worker. Engineered systems with documented lower capacity may be used but must be specifically designed.

41. A — The ratio of conduit internal diameter to cable outside diameter. The jam ratio describes the geometric relationship that determines whether cables wedge in conduit during pulling. Specific ratio ranges (2.8 to 3.2) cause three cables to jam together, dramatically increasing pulling tension.

42. D — Water suppression, local exhaust ventilation, or respiratory protection. OSHA's silica standard (29 CFR 1926.1153) requires specific dust controls during silica-generating activities including water suppression, local exhaust ventilation with HEPA filtration, or respiratory protection appropriate to the exposure level.

Domain C — Installing Audiovisual Systems

43. C — 1.75 inches per rack unit. The standardized rack unit (RU) measure is 1.75 inches of vertical mounting height. This standard allows equipment from any manufacturer to mount into any compatible rack.

44. A — 26.25 inches. A 15U device occupies 15 × 1.75 inches, which equals 26.25 inches of vertical mounting height. Multiplying RU count by 1.75 gives the precise vertical space requirement.

45. B — 19 inches. The 19-inch width measured between front mounting flanges is the global standard for professional AV, broadcast, data, and telecommunications equipment racks.

46. D — 16 amperes. The 80% rule limits continuous loads to 80% of circuit rating, so 20 × 0.80 = 16 amperes. This rule prevents breaker tripping and equipment damage from sustained near-rated current draw.

47. C — 1,365 BTU/hour. Converting watts to BTU/hour uses the factor 3.412, so 400 × 3.412 equals approximately 1,365 BTU/hour. This calculation is essential for HVAC sizing in equipment rooms.

48. A — Pin 1 ground, Pin 2 hot, Pin 3 cold. The AES convention for XLR pin assignments is universally adopted in professional audio. This standardization ensures XLR cables function consistently across professional audio equipment.

49. D — 48 volts DC. Phantom power for condenser microphones is standardized at 48 volts DC, delivered through balanced audio cables in a configuration that does not affect the audio signal.

50. B — Two conductors plus shield. Balanced audio uses two signal conductors (hot and cold) carrying the signal as a voltage difference, plus a shield/ground conductor. This enables common-mode rejection that distinguishes balanced from unbalanced audio.

51. D — A doubling of power. A 3 dB increase represents a power ratio of 2:1. This reference value is one of the key decibel facts for audio calculations.

52. B — 10 × log(P1/P2). The decibel formula for power ratios uses the multiplier 10, while the voltage formula uses 20. Understanding which formula applies prevents calculation errors.

53. A — Steps down the high-voltage line to the loudspeaker's voltage. The transformer at each loudspeaker on a 70V distributed audio system steps down the 70-volt line to the lower voltage the loudspeaker driver requires.

54. C — 160 watts. Professional practice sizes amplifiers at approximately 125% of total tap load, meaning a 200-watt amplifier should drive no more than approximately 160 watts of total tap load (200 ÷ 1.25 = 160). This headroom ensures reliable operation.

55. D — 500 MHz. Cat6A cable supports a maximum frequency of 500 MHz, supporting 10GBase-T and 4K60 HDBaseT applications.

56. B — 0.5 inches. Cat6A cable specifications permit only half an inch of untwist at termination to preserve high-frequency performance and crosstalk rejection.

57. A — Video signal transport including SDI and CATV. 75-ohm coaxial cable is the standard for video applications; 50-ohm is used for RF communications.

58. C — 100 meters (328 feet). HDBaseT supports 4K60 over Cat6A to 100 meters, matching general Ethernet limits.

59. B — The DDC channel embedded within the HDMI or DisplayPort cable. EDID exchange uses the DDC channel on dedicated pins within the cable, enabling automatic negotiation without separate connections.

60. D — 4K UHD content from compatible sources. HDCP 2.2 is required for 4K content because the original HDCP 1.x was not designed for 4K bandwidth. Every device in the signal path must support the required HDCP version.

61. A — 300 meters. OM3 multimode fiber supports 10 Gbps Ethernet to 300 meters, substantially exceeding copper Ethernet's 100-meter limit.

62. C — Green. APC (Angled Physical Contact) fiber connectors are color-coded green to distinguish them from blue PC and beige UPC connectors, preventing accidental mating of incompatible types.

63. B — 0.25 to 1 millisecond. Dante audio networking operates with extremely low latency at standard settings, essential for professional audio applications.

64. D — 10 Gbps Ethernet. SDVoE distributes uncompressed 4K60 video over 10 Gbps Ethernet, providing required bandwidth plus protocol overhead.

65. A — 25.5 watts. IEEE 802.3at (PoE+) provides 25.5 watts at the powered device, with 30 watts at the source; the difference accounts for cable losses.

66. C — 254 usable hosts. A /24 subnet provides 256 addresses minus 2 reserved (network and broadcast), leaving 254 usable host addresses.

67. D — 10.0.0.0/8, 172.16.0.0/12, and 192.168.0.0/16. RFC 1918 defines three private IPv4 ranges reserved for internal networks.

68. B — 9600 and 115200 bps. RS-232 serial communication operates at typical baud rates between 9600 and 115200 bps, with 9600 being the most common default.

69. A — Baud rate, data bits, parity, stop bits. RS-232 communication requires matching configuration of these four serial parameters between controller and device.

70. C — Unidirectional with no status feedback. IR control transmits commands from controller to device but receives no feedback, making it limited compared to bidirectional protocols.

71. B — Verify network connectivity using ping. Ping testing is the most efficient first diagnostic step for network connectivity issues, eliminating the most common cause before pursuing more complex diagnostics.

72. A — 0.40 ohms. The 5% of 8 ohms equals 0.40 ohms maximum cable resistance. Maintaining this limit preserves power transfer efficiency.

73. D — 2.67 ohms. Three 8-ohm loudspeakers in parallel equal $8 \div 3 = 2.67$ ohms. Parallel impedance is always lower than any individual element.

74. C — Full quality until catastrophic failure at the digital cliff. Digital signals maintain full quality until bits become indistinguishable, then fail completely rather than degrading gradually like analog.

75. B — Video signal amplitude over time. A waveform monitor displays video signal voltage as a waveform on a time-axis display, useful for verifying signal levels and sync timing.

76. C — Video chrominance on a polar plot. A vectorscope displays video chrominance as a polar plot showing color hue (angle) and saturation (radius from center).

77. A — 12 feet. Throw ratio formula: image width = distance ÷ throw ratio = 24 ÷ 2.0 = 12 feet. This calculation determines projector positioning for image sizes.

78. D — 6500K. The D65 white point references 6500 Kelvin and is the standard for video content calibration, producing accurate white without warm or cool tints.

79. B — 2.2. Standard video content is encoded for gamma 2.2, matching human visual perception and content creation standards.

80. A — 8 times image height. AVIXA DISCAS recommends 8× image height for basic decision-making content (text readable from back of room). Analytical content requires shorter 4× distances.

81. C — Flat response with omnidirectional polar pattern. Measurement microphones are designed for analytical accuracy rather than performance coloration, with flat response capturing the room's actual sound.

82. D — Open interoperability between manufacturers' networked audio systems. AES67 is an open AES standard enabling audio exchange between different manufacturers' systems. Modern Dante implementations include AES67 compatibility.

83. B — All loudspeakers move in the same direction on the same signal. A polarity tester verifies correct loudspeaker polarity across the system. Polarity errors cause destructive interference and low-frequency loss.

84. A — Insertion loss, return loss, NEXT, ANEXT, propagation delay, and other parametric measurements. Cat6A certification tests multiple parameters demonstrating high-frequency performance meets specification; simple continuity tests are insufficient.

85. C — 4.5 Gbps. 1080p60 at 8-bit color requires approximately 4.5 Gbps. Cable infrastructure must support this bandwidth for signal integrity.

86. D — 24 Gbps. 4K60 with 10-bit color and HDR requires approximately 24 Gbps, exceeding Premium High Speed HDMI's 18 Gbps capacity. Ultra High Speed HDMI or equivalent is required.

87. B — 150 watts. 12 loudspeakers × 10 W = 120 W, plus 6 × 5 W = 30 W, totaling 150 watts. Tap load calculations determine amplifier demand.

88. A — The sound of room loudspeakers reproducing far-end audio. AEC removes far-end audio from microphone signals so far-end participants don't hear their own echo. Essential for hands-free conferencing.

Domain D — Perform Systems Close-Out

89. D — Essential, specialized, and unique items. ANSI/AVIXA 10:2013 uses A-Level (essential), B-Level (specialized), and C-Level (unique) verification items to structure the verification process appropriately.

90. C — A substantive deficiency affecting system function. A non-functional touchpanel prevents operation of the AV system, making it substantive rather than cosmetic. Substantive deficiencies receive priority for resolution.

91. A — The system is ready for its intended use and warranty typically begins. Substantial completion is the milestone where the system is usable for intended purpose, triggering warranty, beneficial use, and final payment provisions.

92. D — Substantial completion when the client takes beneficial use. Warranties typically begin at substantial completion because that is when the system enters service and wear accumulates.

93. B — The installed system's actual configuration for future reference. As-built documentation captures the system as it actually exists, supporting future service, modifications, and expansions.

94. C — Brief focused sessions on essential operations with hands-on practice. End-user training is most effective when concise, focused on essential tasks, and includes hands-on practice for better retention.

95. A — Essential functions with screenshots and simple instructions. Quick reference guides provide brief, accessible instruction on essential functions that users reference repeatedly after training concludes.

96. D — Defined response times, scheduled preventive maintenance, and priority service. Service agreements combine response time commitments, scheduled maintenance, remote support, and priority over ad-hoc requests.

97. B — Annual visits with more frequent visits for high-use environments. Professional preventive maintenance schedules recommend annual visits as baseline, with more frequent visits for demanding applications.

98. A — A formal written record of client acceptance. Signed sign-off documents create contractual record of client acceptance, protecting both parties from later disputes.

99. C — The installer, client representative, and sometimes the general contractor. Substantial completion walk-through is a formal event involving these parties to verify the installation and document remaining items.

100. D — That the system is ready for use even though minor work may remain. The certificate documents reach of the substantial completion milestone with remaining punch list items scheduled for resolution.

101. D — Formal signing authority for the client organization. Project completion documents must be signed by authorized representatives with formal signing authority, making acknowledgment binding.

102. B — As-built drawings, equipment manuals, warranty documentation, and verification reports. Comprehensive closeout includes documentation of configuration, operations, warranty, and verification—all supporting the installation's service life.

Domain E — Conducting Ongoing Project Responsibilities

103. C — Document activities, labor, materials, and issues for the project record. Daily progress reports create the ongoing project record supporting schedule tracking, change management, billing, and historical reference.

104. A — Obtain clarification from the design team on field-discovered issues. RFIs are formal questions to the design team documenting both question and response, becoming part of the project record.

105. D — A minor adaptation within installer authority requiring documentation. Substituting equivalent accessories is minor adaptation within installer authority, though even minor changes should be documented in daily reports and as-builts.

106. B — The general contractor's superintendent and coordination meetings. The GC's superintendent coordinates across all trades and is the primary contact for trade coordination; meetings provide structured forums for interaction.

107. A — Work scope expands beyond original contract specifications. Change orders are required when scope expands beyond original contract, documenting the addition, impact, and client approval.

108. C — Debris managed continuously throughout the day. Clean-as-you-go integrates debris management into installation work, preventing end-of-day accumulation that requires time-consuming cleanup.

109. B — The general contractor's construction waste management system. Construction debris typically goes through the GC's waste management infrastructure with appropriate disposal routes.

110. D — The project manager who can coordinate response. Trade issues should be routed through the project manager who has authority and relationship with the GC to coordinate resolution.

111. A — Water suppression, local exhaust ventilation, or respiratory protection. OSHA silica standard requires these specific controls; standard N95 masks are insufficient for silica exposure.

112. C — Conflict identification between MEP, fire protection, and technology systems. BIM coordination drawings show how building systems fit together without conflicts, with coordination continuing in the field as issues emerge.

113. B — Reporting through appropriate channels for engineering review. Field-discovered design conditions must be reported for engineering review rather than silently absorbed into installation.

114. A — As soon as identified, even if impact is uncertain. Early delay reporting permits project manager response; late reporting produces surprise schedule slips.

115. D — Be routed through the project manager for change order processing. Scope changes must flow through formal change order processes with project manager coordination and client approval.

116. C — Labor and materials consumed without compensation. Unauthorized scope expansion consumes resources without recovery because the work was not part of the original contract.

117. B — Both as-built records and traceability of decisions under installer authority. Field engineering documentation supports as-built records and professional decisions traceability.

118. A — Either perform firestopping correctly or coordinate with the firestop contractor. Firestopping is life-safety work requiring proper materials and methods; the installer must perform correctly or coordinate with qualified contractors.

119. D — Stop work immediately and contact qualified asbestos abatement personnel. Asbestos exposure causes diseases emerging decades later; only qualified abatement personnel should disturb suspect materials.

120. C — Understand why the failure occurred so it does not recur. Root-cause analysis seeks the fundamental cause so addressing it prevents recurrence, unlike symptom-focused repairs that produce repeat failures.

121. A — 7 to 10 years. Professional AV installations typically have service life of 7-10 years before substantial refresh, with components having varying lives within this range.

122. B — Increasing service frequency, declining reliability, parts unavailability. End-of-life indicators signal approaching service life end, supporting proactive refresh planning.

123. D — Factory-reset or data-wiped before leaving the client's site. Decommissioned equipment with configuration data must be reset to protect sensitive information from exposure.

124. C — Restricted materials in electronic equipment requiring responsible handling. RoHS restricts hazardous materials in electronic equipment and requires responsible end-of-life handling.

125. A — Through the entire service life via maintenance and service. The installer-installation relationship extends through the system's full service life, sustaining through recurring revenue and client loyalty.