

SIMULATION EXAM 14 — QUESTIONS 1–100

1. A 16:9 display has a diagonal measurement of 65 inches. What is the approximate image height?
 - A. 22 inches
 - B. 32 inches
 - C. 49 inches
 - D. 57 inches

2. The 4H rule for Analytical Decision-Making content establishes the maximum viewing distance as:
 - A. Equal to the image height
 - B. Half the image height
 - C. Double the image width
 - D. Four times the image height

3. A 4K UHD resolution of 3840×2160 has approximately how many total pixels?
 - A. 8.3 million pixels
 - B. 2.1 million pixels
 - C. 33 million pixels
 - D. 500,000 pixels

4. The aspect ratio 16:9 represents:

- A. 16 cubic inches to 9 cubic inches volume
- B. 16 total pixels to 9 total pixels
- C. A ratio of 16 horizontal units to 9 vertical units of the display image
- D. 16 vertical units to 9 horizontal units of brightness

5. HDMI 2.1 supports a maximum bandwidth of approximately:

- A. 18 Gbps
- B. 48 Gbps
- C. 12 Gbps
- D. 6 Gbps

6. Chroma subsampling notation of 4:2:0 indicates:

- A. Luma (Y) is sampled at full resolution while chroma components (Cb, Cr) are sampled at one-quarter the horizontal and half the vertical resolution
- B. Full resolution sampling of all three components equally
- C. Luma is removed entirely from the signal
- D. Video signal is black and white only

7. The HDCP standard is primarily concerned with:

- A. Network connectivity between devices
- B. Audio signal level calibration
- C. Display color calibration

D. Content protection through device authentication between sources and sinks

8. Display refresh rate of 60 Hz means:

- A. The display produces 60 images per minute
- B. The display is only used for 60 hours maximum
- C. The display updates its image 60 times per second
- D. The display's lifetime is 60 years

9. A display's native resolution is:

- A. The resolution of the original content
- B. The physical pixel matrix of the display, which determines its optimal display resolution
- C. The resolution of the connected cable
- D. The display's aspect ratio

10. 1080p video resolution refers to:

- A. 1920×1080 pixel resolution with progressive scanning
- B. 1080×1920 interlaced
- C. Only 60 frames per second content
- D. Only cinema content

11. Display pixel density (pixels per inch or PPI) affects:

- A. The display's weight only
- B. The display's color accuracy only

- C. The speaker loudness only
- D. The perceived sharpness and minimum viewing distance for content

12. Progressive scanning (p) differs from interlaced (i) scanning in that:

- A. Progressive uses more colors
- B. Interlaced has higher resolution
- C. Progressive draws each frame as a complete image; interlaced alternates between odd and even lines
- D. They are identical methods

13. A pixel pitch of 1.5mm on an LED video wall means:

- A. The distance between adjacent pixel centers is 1.5mm
- B. Each pixel is 1.5mm thick
- C. The display is 1.5mm wide
- D. The display measures 1.5mm total

14. High Dynamic Range (HDR) video content differs from Standard Dynamic Range (SDR) primarily by:

- A. Using only black and white
- B. Supporting a wider luminance range (deeper blacks and brighter highlights) and expanded color gamut
- C. Reducing color depth
- D. Using consumer cables only

15. Color temperature measured in Kelvin relates to:

- A. The physical temperature of the display
- B. The room's ambient temperature
- C. The display's power consumption
- D. The color characteristic of light, with 6500K representing daylight reference

16. An OLED display technology differs from LCD in that:

- A. Each pixel emits its own light, enabling true blacks and higher contrast
- B. OLED uses consumer backlighting
- C. OLED cannot reproduce color
- D. OLED requires much higher wattage

17. Video latency in a display system includes:

- A. Only the cable signal propagation time
- B. Only the display's processing time
- C. Source processing, signal transmission, and display processing latencies combined
- D. Only the amplifier delay

18. HDMI EDID (Extended Display Identification Data) enables:

- A. Internet connectivity between devices
- B. The source to automatically configure its output based on the connected display's capabilities
- C. Audio processing only
- D. Network security only

19. The 6H rule for Basic Decision-Making content establishes maximum viewing distance as:

- A. Equal to image width
- B. Ten times the image height
- C. Three times the image width
- D. Six times the image height

20. 4K content at 60 Hz with 4:4:4 chroma and 8-bit color requires approximately:

- A. 12 Gbps of bandwidth
- B. 1 Gbps of bandwidth
- C. 100 Mbps of bandwidth
- D. 500 Mbps of bandwidth

21. Color gamut refers to:

- A. The total number of pixels
- B. The brightness of the display
- C. The range of colors a display or content can reproduce, often represented as a triangle in a chromaticity diagram
- D. The frame rate

22. The Rec. 709 color space is the standard for:

- A. HDR cinema content
- B. Only consumer audio
- C. CGI rendering only

D. Standard Dynamic Range HDTV content

23. A projector's ANSI lumens rating measures:

A. The projector's electrical power consumption

B. The light output using an ANSI-standardized measurement method averaging across 9 points on the screen

C. The number of pixels

D. The contrast ratio

24. Signal compression in video systems serves to:

A. Reduce the bandwidth required for transmission while preserving acceptable image quality

B. Increase the color saturation

C. Eliminate the need for a display

D. Add audio to video signals

25. DisplayPort 2.0/2.1 supports maximum bandwidths up to:

A. 80 Gbps

B. 1 Gbps

C. 2 Gbps

D. 12 Gbps

26. An LCD display's backlight source affects:

A. The display's IP address

- B. The display's network connectivity
- C. Black level performance, color uniformity, and energy efficiency
- D. The cable type required

27. Chroma subsampling 4:4:4 represents:

- A. Full sampling of luma and both chroma components with no subsampling
- B. Subsampling of luma only
- C. Complete signal elimination
- D. Black and white display

28. The minimum visual acuity limit for humans at a distance from a display is approximately:

- A. 10 arcminutes
- B. 1 degree
- C. 5 degrees
- D. 1 arcminute of visual angle (approximately 1/60 of a degree)

29. LED wall pixel pitch directly determines:

- A. The display's weight
- B. The minimum viewing distance for visually seamless image perception
- C. The number of connected cables
- D. The display's color temperature

30. A video wall made of 2×2 matrix of 1920×1080 panels displays:

- A. A 1920×1080 image at each panel's resolution
- B. A single 4K-equivalent image with 3840×2160 when properly configured
- C. No image at all
- D. Only text content

31. H.264/AVC and H.265/HEVC are examples of:

- A. Audio codecs
- B. Network protocols
- C. Display types
- D. Video compression codecs with H.265 offering improved efficiency over H.264

32. Latency in video conferencing affects:

- A. Only the display aesthetic
- B. Only the cable cost
- C. The perceived naturalness of interactive communication, with significant latency causing awkward conversation flow
- D. Only the audio quality

33. The bit depth of a video signal (e.g., 8-bit, 10-bit, 12-bit) refers to:

- A. The number of color values representable per channel, affecting color gradation smoothness and dynamic range
- B. The physical cable thickness
- C. The display's weight

D. The refresh rate

34. HDBaseT is primarily:

A. A display technology

B. A network-layer protocol using Category cable to transport video, audio, control, and Ethernet

C. An audio-only cable

D. A projector calibration tool

35. A projector's throw distance is:

A. The distance between projector and screen, determining image size based on throw ratio

B. The distance between projector and audience

C. The projector's weight in pounds

D. The projector's warranty duration

36. Color bit depth of 10-bit per channel provides approximately:

A. 256 shades per channel

B. 16 shades per channel

C. 1024 shades per channel

D. 1 million shades per channel

37. Active 3D stereoscopic display technology uses:

A. Polarized glasses with static displays

B. Shutter glasses synchronized with alternating left/right images on the display

- C. No glasses at all
- D. Only computer-generated imagery

38. An SDI (Serial Digital Interface) signal is typically used in:

- A. Consumer home theater systems
- B. Basic telephone networks
- C. Residential Wi-Fi
- D. Broadcast and professional video applications

39. The luminance unit "nit" (cd/m^2) measures:

- A. The number of pixels
- B. The light emitted from a display surface
- C. The display's thickness
- D. The display's price

40. Digital cinema DCI-P3 color space is:

- A. Smaller than Rec.709 color gamut
- B. Identical to sRGB
- C. Wider than Rec.709, approaching but not exceeding Rec.2020
- D. The smallest standard color space

41. Typical video surveillance cameras use:

- A. Progressive scanning with standard IP network protocols (RTSP, ONVIF)

- B. Only analog signals
- C. Only digital cinema interfaces
- D. HDMI connections exclusively

42. Video wall calibration accounts for:

- A. Only the room's lighting
- B. Only the display's aesthetic
- C. Only the manufacturer's warranty
- D. Tile-to-tile color and brightness uniformity matching

43. A 4K60 4:2:0 8-bit video signal has a bandwidth of approximately:

- A. 1 Gbps
- B. 6 Gbps
- C. 200 Mbps
- D. 50 Mbps

44. Gamma in a display context refers to:

- A. The display's weight
- B. The number of pixels
- C. The non-linear relationship between signal input and displayed luminance, calibrated to match human perception
- D. The brand of the display

45. Display contrast ratio represents:

- A. The luminance ratio between the display's maximum and minimum levels, with higher ratios generally better
- B. The color accuracy only
- C. The refresh rate only
- D. The resolution only

46. 4K displays typically require:

- A. Only HDMI 1.4 cables
- B. Only analog VGA connections
- C. Only consumer-grade cables
- D. HDMI 2.0 or higher for full 4K60 capability, with more demanding requirements for 4:4:4 and HDR

47. A video scaler's primary function is:

- A. To generate electrical power for displays
- B. To convert input resolutions and refresh rates to match the display's native capabilities
- C. To filter audio signals
- D. To control network traffic

48. Color accuracy in displays is measured using:

- A. Delta E (ΔE) values comparing measured to reference colors
- B. The display's manufacturing date
- C. The display's marketing awards

D. The display's purchase price

49. Ambient light fallout reduces perceived contrast by:

A. Increasing minimum black level that the display must overcome to show dark scene detail

B. Completely eliminating the image

C. Adding green tint to the display

D. Reducing refresh rate

50. A direct-view LED display advantage over a projector is:

A. Lower initial cost always

B. Consistent brightness across all viewing conditions and no ambient light sensitivity issues

C. Identical performance in all scenarios

D. Always used only for small rooms

51. HDMI handshake failures typically manifest as:

A. Complete audio loss only

B. Network connectivity issues

C. Increased ambient temperature

D. No signal, intermittent signal loss, or HDCP authentication errors

52. An 8K resolution display (7680×4320) provides:

A. Half the pixels of 4K

B. Four times the pixels of 4K

- C. The same pixels as 4K
- D. Fewer pixels than 1080p

53. SMPTE timecode in video production serves to:

- A. Provide frame-accurate time reference enabling synchronization of video, audio, and related signals
- B. Manage network traffic only
- C. Provide power to devices
- D. Replace HDMI cables

54. A projector throw ratio of 1.5 means:

- A. The projector weighs 1.5 times more than standard
- B. The projector lamp lasts 1.5 times longer
- C. The throw distance is 1.5 times the image width for the image to appear at that size
- D. The image is 1.5 times brighter than standard

55. A display with a 120 Hz refresh rate versus 60 Hz:

- A. Enables smoother motion rendering, particularly for fast-moving content and gaming
- B. Has a shorter lifespan
- C. Has reduced color accuracy
- D. Requires less bandwidth

56. A video codec's bit rate determines:

- A. Only the file name extension

- B. Only the container format
- C. Only the audio quality
- D. The data rate at which compressed video is encoded, balancing quality against bandwidth

57. The sRGB color space is:

- A. A broadcast video standard
- B. A standard for consumer digital imagery, web content, and most PC applications with a specific color primaries and gamma curve
- C. A cinema-specific color space
- D. The wide-gamut extension of Rec.2020

58. Refresh rate mismatches between source and display can cause:

- A. Connectivity issues only
- B. Sound synchronization problems only
- C. Motion artifacts, tearing, or display synchronization problems when content is displayed
- D. Network failures only

59. An LED tile's dead pixel ratio specification indicates:

- A. The maximum percentage of non-functional pixels within specifications of a normally functioning tile
- B. The display's life expectancy in years
- C. The display's warranty coverage duration
- D. The display's power consumption

60. Color space conversion (e.g., from Rec.709 to DCI-P3) involves:

- A. Physically moving the display
- B. Replacing the display entirely
- C. Changing the cable length
- D. Mathematical transformation of color values to map between different color primaries and luminance ranges

61. Interlaced video content displayed on a progressive-scan display:

- A. Appears unchanged without any processing
- B. Requires deinterlacing processing to produce smooth progressive frames
- C. Cannot be displayed under any condition
- D. Produces monochrome output

62. A projector's lens shift feature enables:

- A. Automatic image distortion
- B. Color correction
- C. Adjusting image position vertically and/or horizontally without geometric distortion, within lens design limits
- D. Replacing the lamp faster

63. The BT.2020 color space is:

- A. A wider color gamut standard for UHD content and next-generation broadcast, approaching but not reaching spectral locus
- B. The smallest consumer color space

- C. A broadcast audio standard
- D. Identical to Rec.709

64. Moire patterns on a displayed image may occur when:

- A. Content and display pixel grids interact at certain frequencies and positions
- B. The network is slow
- C. The audio is off
- D. The display is too dim

65. A video wall processor typically:

- A. Manages the input, output, scaling, and tiling of multiple sources across multiple displays
- B. Provides electricity to the displays
- C. Controls only the audio
- D. Is a network switch

66. Black level performance in displays relates to:

- A. The minimum amount of light the display emits when showing black content, affecting contrast and dark scene detail
- B. The purchase price only
- C. The aesthetic only
- D. Network connectivity only

67. The 480p (SD) resolution is:

- A. 1920×1080
- B. 3840×2160
- C. 7680×4320
- D. 720×480 or 720×576 depending on standard (NTSC vs PAL)

68. Dynamic Range of a display or content is the ratio between:

- A. The brightest and darkest values the display or content can represent
- B. The display and the source
- C. The audio and video portions
- D. The power and the brightness

69. HDR10 versus Dolby Vision differs primarily in:

- A. HDR10 is a dynamic metadata approach; Dolby Vision is static
- B. HDR10 uses static metadata; Dolby Vision supports dynamic scene-by-scene metadata and deeper color
- C. They are identical standards
- D. Only one has audio

70. A projector installation in a room with high ambient light requires:

- A. Consumer-grade equipment only
- B. Avoiding ambient light analysis
- C. Only short-throw projection
- D. Higher lumens output and potentially screen gain or dark room control to achieve acceptable contrast

71. The 1080i interlaced resolution produces:

- A. A 1920×1080 image through interlaced scanning of odd and even field lines
- B. A 1080×1920 rotated display
- C. A still image only
- D. A 4K image with compression

72. Digital Cinema Initiative (DCI) 4K resolution is:

- A. 3840×2160
- B. 8000×8000
- C. 4096×2160 (DCI 4K) rather than UHD's 3840×2160
- D. 1920×1080

73. A display's anti-reflective coating:

- A. Makes the display brighter
- B. Reduces glare from ambient light sources, improving visible contrast
- C. Reduces the display's refresh rate
- D. Reduces the display's power consumption

74. A projection screen's gain rating indicates:

- A. The screen's aesthetic appearance
- B. The screen's mounting type
- C. The screen's fabric color only
- D. The ratio of light reflected back at center axis relative to a reference white surface

75. A content protection violation on an HDCP-protected signal typically results in:

- A. A blank screen or a low-resolution image signaled to the display
- B. Complete system power loss
- C. Audio distortion only
- D. Increased power consumption

76. A displayed image at native resolution provides:

- A. Sharper results than displaying scaled content
- B. Identical results to scaled content
- C. Worse results than scaled content
- D. No difference at all

77. A 4K60 video signal with 4:4:4 chroma and 10-bit color produces bandwidth exceeding:

- A. Only what HDMI 1.4 can handle
- B. Only VGA signal capability
- C. HDMI 2.0 capability, requiring HDMI 2.1 or compression
- D. Only analog cable capability

78. Pixel pitch for video walls viewed at 3 meters (10 feet) typically uses:

- A. Approximately 20mm pixel pitch for optimal viewing
- B. Pixel pitch of approximately 2mm or less for seamless viewing at that distance
- C. Pixel pitch of 50mm always
- D. Larger pixel pitch to reduce cost

79. HDMI 2.0's maximum data rate supports:

- A. Only analog video
- B. Only 4K at 60 Hz without any configuration
- C. Only 1080p
- D. 4K60 at 4:4:4 8-bit or 4:2:0 at various higher configurations, up to 18 Gbps

80. A video signal's color depth of 12-bit per channel provides approximately:

- A. Over 68 billion colors when combining RGB channels
- B. Exactly 256 total colors
- C. Only monochrome output
- D. Black and white only

81. A broadcast video format using 1920×1080 at 59.94 frames per second:

- A. Has only standard-definition resolution
- B. Is analog only
- C. Represents 1080p59.94 content, a common HDTV format
- D. Does not exist in industry practice

82. A display calibration target for reference viewing typically aims for:

- A. 25 nits maximum brightness
- B. 100–300 nits brightness, 6500K color temperature, and gamma approximating 2.2 for Rec.709 content
- C. 10,000 nits minimum
- D. No specific targets

83. A video cable length that exceeds passive copper capability at a given bandwidth requires:

- A. Only louder audio
- B. Only a different signal color
- C. Only a consumer substitute
- D. Active cabling, fiber-optic extension, or distance-specific extender technology

84. An EDID handshake mismatch can cause:

- A. A source to output incorrect resolution, no signal, or reduced capabilities
- B. Complete system power failure
- C. Audio loss only
- D. Network disruption only

85. A video wall's bezel width affects:

- A. The display's weight only
- B. The room's temperature only
- C. The visual continuity of content spanning multiple displays at their boundaries
- D. The power consumption only

86. Chroma subsampling 4:2:2 represents:

- A. Full RGB capture
- B. Luma at full resolution with chroma sampled at half the horizontal resolution (still full vertical resolution)
- C. Black and white only

D. No compression at all

87. An HDR content signal typically requires:

A. Only analog connections

B. Only basic VGA

C. Only consumer cables

D. HDMI 2.0a or later with appropriate metadata support (HDR10, Dolby Vision, HLG, etc.)

88. Display calibration involves:

A. Measuring actual color, luminance, and white point of the display and adjusting to meet reference standards

B. Cleaning the screen only

C. Replacing the display

D. Removing all content from the display

89. An LCD display's viewing angle specifications affect:

A. Only the purchase price

B. Only the display thickness

C. The range over which colors and contrast remain acceptable as the viewer moves off-axis

D. The network speed only

90. The 2D vs 3D content display:

A. Are visually identical to the human eye

B. 3D provides stereoscopic depth perception requiring specific delivery methods (active/passive glasses, autostereoscopic displays)

C. 3D requires no special equipment

D. 2D requires more processing power

91. A DLP projector's imaging technology uses:

A. Three independent LCD panels

B. An OLED panel array

C. A plasma panel design

D. An array of micromirrors controlled individually to create the image

92. Color grading in video post-production:

A. Adjusts color appearance and tonal range to achieve a specific creative or technical intent, with monitoring on calibrated references

B. Is a network configuration only

C. Adjusts audio only

D. Has no creative impact on content

93. A video wall's real-time calibration requires:

A. Only hardware replacement

B. Only manufacturer warranty

C. Automatic tile-to-tile measurement and adjustment maintained across the wall over time

D. Only aesthetic cleaning

94. The ITU-R BT.601 standard defines:

- A. 4K UHD content
- B. The standard-definition digital video encoding (525/60 NTSC, 625/50 PAL), including color space and sampling structure
- C. 8K digital cinema
- D. Network video protocols

95. Laser projection versus lamp-based projection offers:

- A. Much higher acquisition cost with no benefit
- B. Inferior color performance
- C. Identical performance in all respects
- D. Longer light source life, faster warm-up, and consistent brightness over the source's life

96. A DisplayPort signal can be converted to HDMI using:

- A. Active or passive adapters depending on the signal version and features required
- B. Audio cables only
- C. Power cables only
- D. A single wireless transmitter only

97. Video latency totaling more than approximately 100 ms in a conferencing system is:

- A. The ideal target for best user experience
- B. Completely undetectable by users
- C. Generally problematic for natural conversation flow, with lower latency preferred

D. Required by all specifications

98. A screen's foot-lambert measurement indicates:

A. The screen's physical dimensions

B. The reflected luminance of the screen when illuminated by a projector, used to characterize image brightness

C. The screen's audio output

D. The screen's color only

99. A display calibrated for reference viewing:

A. Has predictable color reproduction matching industry standards for critical evaluation

B. Is limited to consumer applications only

C. Has reduced functionality

D. Cannot reproduce accurate color

100. Video compression artifacts visible as visible blocking or smearing are typically caused by:

A. Cable length alone

B. Audio problems

C. Display backlight failure

D. Insufficient bitrate for the content complexity, aggressive compression settings, or codec limitations

SIMULATION EXAM 14 — ANSWER

KEY AND FULL EXPLANATIONS

1. B — 32 inches. For a 16:9 display, image height \approx diagonal \times 0.49. So $65 \times 0.49 \approx 32$ inches. This quick calculation is foundational for determining viewing distance compliance with the 4H and 6H rules.
2. D — Four times the image height. The 4H rule for Analytical Decision-Making content specifies that the farthest viewer should be no more than $4 \times$ image height from the display. Beyond this distance, viewers cannot resolve the detail that ADM content requires. This standard drives display sizing against room depth.
3. A — 8.3 million pixels. $3840 \times 2160 = 8,294,400$ pixels, commonly rounded to 8.3 million. This pixel count is four times that of 1080p ($1920 \times 1080 \approx 2.1$ million) and drives bandwidth requirements for 4K content delivery.
4. C — A ratio of 16 horizontal units to 9 vertical units of the display image. Aspect ratio describes the proportion of width to height of the displayed image. The 16:9 ratio is the current standard for HDTV and most digital content. This ratio determines content compatibility and display shape.
5. B — 48 Gbps. HDMI 2.1 supports up to 48 Gbps through six 8-lane signaling, enabling 8K60, 4K120, and higher color depth configurations. This represents a significant increase over HDMI 2.0's 18 Gbps ceiling. Understanding bandwidth capabilities is essential for specifying cable and device compatibility.
6. A — Luma (Y) is sampled at full resolution while chroma components (Cb, Cr) are sampled at one-quarter the horizontal and half the vertical resolution. 4:2:0 is the most common consumer video chroma subsampling, reducing bandwidth by approximately 50% while remaining visually acceptable for most content. This is the trade-off that enables practical video distribution.
7. D — Content protection through device authentication between sources and sinks. HDCP (High-bandwidth Digital Content Protection) authenticates devices in the signal chain before allowing protected content to pass, preventing unauthorized copying of copyrighted material. Authentication failures produce blank screens or reduced-resolution output.
8. C — The display updates its image 60 times per second. Refresh rate in Hertz represents updates per second — 60 Hz means 60 complete image updates per second. Higher refresh rates reduce motion blur and enable smoother playback of fast-moving content.

9. B — The physical pixel matrix of the display, which determines its optimal display resolution. Native resolution is the display's physical pixel count — content at any other resolution requires scaling, which may introduce artifacts. Matching content resolution to native resolution produces optimal image quality.
10. A — 1920 × 1080 pixel resolution with progressive scanning. 1080p specifies both resolution (1920 × 1080) and scan type (progressive, vs. interlaced "i"). This is a foundational HDTV format that remains common in current content delivery.
11. D — The perceived sharpness and minimum viewing distance for content. PPI (pixels per inch) determines how closely viewers can approach the display before individual pixels become visible. Higher PPI enables closer viewing without pixel visibility. This is particularly important for close-view applications and video walls.
12. C — Progressive draws each frame as a complete image; interlaced alternates between odd and even lines. Progressive scan renders each frame completely, producing smoother motion; interlaced scan captures and displays alternate lines in fields, which can produce motion artifacts. This fundamental difference affects content compatibility and quality.
13. A — The distance between adjacent pixel centers is 1.5mm. Pixel pitch is a center-to-center measurement defining the physical spacing of pixels on an LED wall. This directly determines minimum viewing distance for visually seamless image perception.
14. B — Supporting a wider luminance range (deeper blacks and brighter highlights) and expanded color gamut. HDR content pushes both ends of the dynamic range — darker blacks and brighter highlights — while also expanding color gamut beyond Rec.709. These combined capabilities produce more lifelike images than SDR content.
15. D — The color characteristic of light, with 6500K representing daylight reference. Color temperature is a measure of the color characteristic of light expressed in Kelvin. 6500K is the standard daylight reference used in Rec.709 and most video calibration; lower values appear warmer, higher values appear cooler.
16. A — Each pixel emits its own light, enabling true blacks and higher contrast. OLED's self-emissive pixels can be completely off, producing true black unlike LCDs that always leak backlight. This enables substantially higher contrast ratios and better dark-scene performance than LCD technology.
17. C — Source processing, signal transmission, and display processing latencies combined. End-to-end video latency accumulates from multiple sources — source encoding, transmission latency, and display processing. Understanding these contributors enables targeted latency reduction where it matters most.
18. B — The source to automatically configure its output based on the connected display's capabilities. EDID provides a structured description of the display's capabilities (supported resolutions, refresh

rates, audio formats) that the source reads to configure its output. This enables automatic compatibility between varied source-display combinations.

19. D — Six times the image height. The 6H rule for Basic Decision-Making content allows viewing distance up to $6 \times$ image height, as BDM content doesn't require the fine detail resolution that ADM does. This standard appears in ANSI/AVIXA V202.01.
20. A — 12 Gbps of bandwidth. Uncompressed 4K60 at 4:4:4 8-bit requires approximately 12 Gbps of video bandwidth. This bandwidth is why 4K distribution often uses HDMI 2.0 (18 Gbps ceiling) or requires compression at lower bandwidth infrastructure.
21. C — The range of colors a display or content can reproduce, often represented as a triangle in a chromaticity diagram. Color gamut defines the boundaries of reproducible colors. Different standards (Rec.709, DCI-P3, Rec.2020) have progressively larger gamuts, enabling more lifelike color reproduction.
22. D — Standard Dynamic Range HDTV content. Rec. 709 (ITU-R BT.709) is the color space standard for HDTV — defining the primaries, white point, and transfer characteristics for standard-dynamic-range HD content. This is the current baseline for most broadcast and streaming content.
23. B — The light output using an ANSI-standardized measurement method averaging across 9 points on the screen. ANSI lumens uses a 9-point measurement across the screen, providing consistent comparison between projectors. Other rating methods (peak lumens, marketing lumens) can overstate actual performance.
24. A — Reduce the bandwidth required for transmission while preserving acceptable image quality. Video compression trades bandwidth reduction for some quality loss, enabling practical distribution of bandwidth-intensive content (4K, HDR). Modern codecs (H.265, AV1) achieve 50% bandwidth reduction over H.264 at equivalent quality.
25. C — 80 Gbps. DisplayPort 2.0/2.1 supports up to 80 Gbps through four-lane signaling, enabling 16K and ultra-high refresh rate configurations. This represents a major bandwidth increase over HDMI 2.1's 48 Gbps.
26. C — Black level performance, color uniformity, and energy efficiency. LCD backlight technology (CCFL, LED edge-lit, direct-lit LED, mini-LED, full-array local dimming) directly affects picture quality metrics. Backlight design is a major factor in distinguishing LCD display performance.
27. A — Full sampling of luma and both chroma components with no subsampling. 4:4:4 represents uncompressed color — every pixel has luminance and both chroma values sampled fully. This is the highest-quality chroma configuration, used where color fidelity matters most.
28. D — 1 arcminute of visual angle (approximately 1/60 of a degree). Normal human visual acuity can resolve approximately 1 arcminute of angular detail (the "20/20" standard). Beyond this distance, additional pixel density provides no perceivable benefit.

29. B — The minimum viewing distance for visually seamless image perception. Pixel pitch \times approximately 5.3 (multiplier varies by methodology) gives the minimum viewing distance in meters where individual pixels become visible. Tighter pitch enables closer viewing.
30. B — A single 4K-equivalent image with 3840 \times 2160 when properly configured. Four 1920 \times 1080 tiles arranged 2 \times 2 form a 3840 \times 2160 canvas — the UHD 4K resolution. This configuration requires video wall processing to distribute the image across the tiles.
31. D — Video compression codecs with H.265 offering improved efficiency over H.264. These are both ITU/MPEG video compression standards, with H.265 (HEVC) achieving approximately 50% better compression efficiency than H.264 at equivalent quality. Modern codec selection is driven by quality, bandwidth, and device compatibility.
32. C — The perceived naturalness of interactive communication, with significant latency causing awkward conversation flow. Video latency above approximately 150–200 ms noticeably impairs conversation flow, causing participants to talk over each other. Low-latency design is critical for interactive applications.
33. A — The number of color values representable per channel, affecting color gradation smoothness and dynamic range. Bit depth (8-bit = 256 values, 10-bit = 1024 values, 12-bit = 4096 values per channel) determines the granularity of color representation. Higher bit depth reduces banding in gradients and enables wider dynamic range.
34. B — A network-layer protocol using Category cable to transport video, audio, control, and Ethernet. HDBaseT uses twisted-pair cable to carry HDMI-equivalent video, plus audio, control, and Ethernet, up to 100 meters. This enables long-distance HDMI extension using standard cable infrastructure.
35. A — The distance between projector and screen, determining image size based on throw ratio. Throw distance combined with throw ratio determines the image size produced by a projector. Short-throw projectors have low throw ratios; long-throw projectors have high throw ratios.
36. C — 1024 shades per channel. 10-bit color provides $2^{10} = 1024$ shades per channel. Combined across RGB channels, this yields approximately 1 billion colors — significantly more than 8-bit color's 16.7 million colors.
37. B — Shutter glasses synchronized with alternating left/right images on the display. Active 3D uses battery-powered shutter glasses that alternate between eyes in sync with the display's alternating frames. This maintains full resolution per eye but requires active glasses and produces flicker sensations.
38. D — Broadcast and professional video applications. SDI (Serial Digital Interface) is a professional broadcast standard that uses coaxial cable to carry uncompressed digital video with tightly controlled timing and error handling. Consumer home theater, telephone, and Wi-Fi serve different purposes.

39. B — The light emitted from a display surface. Nit (cd/m^2 or candela per square meter) measures the luminance emitted from a surface. Typical displays range from 200–400 nits for office use, with HDR displays reaching 1000+ nits for HDR content.
40. C — Wider than Rec.709, approaching but not exceeding Rec.2020. DCI-P3 represents approximately 25% more gamut area than Rec.709, approaching the Rec.2020 specification. P3 is commonly used in cinema and HDR display applications.
41. A — Progressive scanning with standard IP network protocols (RTSP, ONVIF). Modern IP surveillance cameras use progressive scan video with network protocols (RTSP, ONVIF) for management and streaming. This contrasts with legacy analog CCTV systems.
42. D — Tile-to-tile color and brightness uniformity matching. Video wall calibration addresses the variation between tiles — color drift, brightness differences, gamma mismatches — to produce a seamless unified display. This is distinct from single-display calibration.
43. B — 6 Gbps. 4K60 at 4:2:0 8-bit requires approximately 6 Gbps — roughly half of 4:4:4 bandwidth due to the subsampling. This matches HDMI 2.0 capability with room for audio.
44. C — The non-linear relationship between signal input and displayed luminance, calibrated to match human perception. Gamma describes the power-law relationship between input signal and displayed luminance — typically 2.2 for Rec.709 content. This non-linearity matches human perception and efficiently uses bit depth.
45. A — The luminance ratio between the display's maximum and minimum levels, with higher ratios generally better. Contrast ratio (measured statically or dynamically) represents the brightest-to-darkest luminance range the display can produce. Higher contrast ratios enable better dark-scene detail and more impactful highlights.
46. D — HDMI 2.0 or higher for full 4K60 capability, with more demanding requirements for 4:4:4 and HDR. 4K at 60 Hz exceeds HDMI 1.4's bandwidth; HDMI 2.0 supports 4K60 4:2:0, with higher chroma and HDR requiring HDMI 2.0a or 2.1. Cable selection must match the signal requirements.
47. B — To convert input resolutions and refresh rates to match the display's native capabilities. Scalers adapt diverse input signals to the display's native resolution and refresh rate, enabling compatibility between content and display hardware. Quality scaling is important for preserving image integrity.
48. A — Delta E (ΔE) values comparing measured to reference colors. Delta E is a numerical measure of color difference between measured and reference values. Lower ΔE values indicate better accuracy — ΔE below 2 is generally considered imperceptible. This is the standard metric for calibration verification.

49. A — Increasing minimum black level that the display must overcome to show dark scene detail. Ambient light hitting the screen adds to the minimum light the display must exceed to show any dark scene detail — effectively raising the noise floor. This reduces perceived contrast and is why dark rooms produce better perceived image quality.
50. B — Consistent brightness across all viewing conditions and no ambient light sensitivity issues. Direct-view LED panels produce their own light at high brightness (often 1000+ nits), making them robust against ambient light that affects projection. This advantage is significant for bright environments.
51. D — No signal, intermittent signal loss, or HDCP authentication errors. HDMI handshake failures — electrical, EDID, or HDCP authentication issues — produce these specific symptoms. Understanding the symptom-cause relationship guides effective troubleshooting.
52. B — Four times the pixels of 4K. 8K (7680 × 4320) has 4× the pixel count of 4K (3840 × 2160). This drives the extreme bandwidth requirements of 8K content and the need for advanced codecs and infrastructure.
53. A — Provide frame-accurate time reference enabling synchronization of video, audio, and related signals. SMPTE timecode (HH:MM:SS:FF) enables frame-accurate synchronization across video, audio, and related signals. This is foundational for broadcast, post-production, and live event work.
54. C — The throw distance is 1.5 times the image width for the image to appear at that size. Throw ratio = throw distance / image width. A 1.5 throw ratio means throwing from 15 feet produces a 10-foot-wide image. This relationship enables projector placement calculations.
55. A — Enables smoother motion rendering, particularly for fast-moving content and gaming. 120 Hz refresh rate doubles the frame update frequency compared to 60 Hz, reducing motion blur and judder for content that benefits (sports, gaming, action content). This comes at increased bandwidth requirement.
56. D — The data rate at which compressed video is encoded, balancing quality against bandwidth. Bit rate directly determines the quality-bandwidth tradeoff in compressed video — higher bit rates produce better quality but require more bandwidth. Understanding this tradeoff drives encoding decisions.
57. B — A standard for consumer digital imagery, web content, and most PC applications with a specific color primaries and gamma curve. sRGB is the default color space for web content, Windows, and most consumer applications — providing a consistent color space across PCs, phones, and web browsers.
58. C — Motion artifacts, tearing, or display synchronization problems when content is displayed. Refresh rate mismatches produce visible artifacts as the display and source try to reconcile different timing. Solutions include matching refresh rates, frame rate conversion, or variable refresh rate (G-Sync, FreeSync).

59. A — The maximum percentage of non-functional pixels within specifications of a normally functioning tile. Dead pixel specifications set a threshold — typical LED tiles may have a very small percentage of dead pixels and still be within spec. This protects both manufacturers and customers from unreasonable expectations.
60. D — Mathematical transformation of color values to map between different color primaries and luminance ranges. Color space conversion uses 3×3 matrix math to remap color coordinates between different color primaries. This is essential when displaying content authored in one color space on a display calibrated for another.
61. B — Requires deinterlacing processing to produce smooth progressive frames. Interlaced content on progressive displays requires deinterlacing — combining fields to produce frames. Quality of deinterlacing (bob, weave, motion-adaptive) affects motion rendering and fine detail preservation.
62. C — Adjusting image position vertically and/or horizontally without geometric distortion, within lens design limits. Lens shift physically moves the projection lens relative to the imaging engine, repositioning the image without keystone distortion. This contrasts with digital keystone correction, which introduces scaling artifacts.
63. A — A wider color gamut standard for UHD content and next-generation broadcast, approaching but not reaching spectral locus. BT.2020 defines a very wide color gamut for UHD content — significantly larger than Rec.709 or DCI-P3. Current displays typically can't fully reproduce BT.2020, so content is often mastered in a subset.
64. A — Content and display pixel grids interact at certain frequencies and positions. Moire patterns occur when content patterns (like stripes or grids) align with the display pixel structure at certain frequencies, creating visible interference patterns. This is a geometric/optical phenomenon, not network, audio, or brightness related.
65. A — Manages the input, output, scaling, and tiling of multiple sources across multiple displays. Video wall processors handle the orchestration of sources across tiles — scaling, positioning, switching. This contrasts with simple video distribution where all tiles show the same content.
66. A — The minimum amount of light the display emits when showing black content, affecting contrast and dark scene detail. Black level is foundational to perceived image quality — low black levels enable dark scenes to show detail and enable higher contrast. This is a key differentiator between display technologies.
67. D — 720×480 or 720×576 depending on standard (NTSC vs PAL). Standard-definition 480p is 720×480 (NTSC) or 720×576 (PAL). The "480" in 480p refers to vertical lines. This is the resolution of legacy TV content.
68. A — The brightest and darkest values the display or content can represent. Dynamic range is the brightness ratio between maximum and minimum displayable/represented values. HDR content and displays have significantly wider dynamic range than SDR.

69. B — HDR10 uses static metadata; Dolby Vision supports dynamic scene-by-scene metadata and deeper color. HDR10 applies metadata once for the entire program; Dolby Vision applies metadata per-scene, enabling better tone mapping. Dolby Vision also supports 12-bit color vs. HDR10's 10-bit.
70. D — Higher lumens output and potentially screen gain or dark room control to achieve acceptable contrast. Bright rooms raise the floor of perceived black level, requiring higher projector output and screen gain to maintain acceptable contrast. This drives projector selection in real-world environments.
71. A — A 1920×1080 image through interlaced scanning of odd and even field lines. 1080i captures and delivers 1920×1080 resolution as alternating fields — odd lines then even lines. This is a common broadcast format, distinct from 1080p which captures frames completely.
72. C — 4096×2160 (DCI 4K) rather than UHD's 3840×2160 . Digital Cinema 4K is wider than consumer 4K at 4096×2160 vs. 3840×2160 . This cinema-specific resolution maintains the digital cinema aspect ratio.
73. B — Reduces glare from ambient light sources, improving visible contrast. Anti-reflective coatings reduce the ambient light reflected back to viewers, increasing perceived contrast by reducing "ambient light fallout" on the screen surface.
74. D — The ratio of light reflected back at center axis relative to a reference white surface. Screen gain indicates how much a screen concentrates reflected light at the viewing position versus a unity-gain reference white surface. High-gain screens trade off viewing angle for on-axis brightness.
75. A — A blank screen or a low-resolution image signaled to the display. HDCP protection violations result in the source downgrading or blocking the protected stream — either showing a blank screen or dropping to lower resolution for DRM-free content.
76. A — Sharper results than displaying scaled content. Native resolution display produces sharper images than any scaling, because scaling algorithms necessarily introduce some approximation. Scaling is acceptable but not preferred when quality matters most.
77. C — HDMI 2.0 capability, requiring HDMI 2.1 or compression. 4K60 4:4:4 10-bit exceeds HDMI 2.0's 18 Gbps bandwidth, requiring HDMI 2.1 (up to 48 Gbps) or compression (DSC). This scenario drives current HDMI 2.1 adoption.
78. B — Pixel pitch of approximately 2mm or less for seamless viewing at that distance. At 3-meter viewing distance, approximately 2mm pixel pitch produces visually seamless perception. This drives LED wall specification based on viewing distance.

79. D — 4K60 at 4:4:4 8-bit or 4:2:0 at various higher configurations, up to 18 Gbps. HDMI 2.0 supports 18 Gbps, enabling 4K60 4:4:4 8-bit or various 4:2:0 configurations with HDR. This was the major HDMI advancement that enabled mainstream 4K distribution.
80. A — Over 68 billion colors when combining RGB channels. 12-bit color = 4096 values per channel; $4096^3 \approx 68.7$ billion total color combinations. This exceeds the dynamic range of current displays and is used for mastering and high-end video production.
81. C — Represents 1080p59.94 content, a common HDTV format. 1080p59.94 is the U.S. HDTV format with 59.94 Hz frame rate (NTSC-derived). European content uses 50 Hz variants. This is distinct from 60 Hz native frame rates used in other applications.
82. B — 100–300 nits brightness, 6500K color temperature, and gamma approximating 2.2 for Rec.709 content. Reference viewing standards (SMPTE, ITU) specify these target values for consistent reproduction. Actual display calibration to these values enables matching content creation intent.
83. D — Active cabling, fiber-optic extension, or distance-specific extender technology. When passive copper can't support the required bandwidth at the required distance, active technologies (embedded amplification, conversion to fiber, or protocol-specific extenders like HDBaseT) are required.
84. A — A source to output incorrect resolution, no signal, or reduced capabilities. EDID mismatches or errors cause the source to negotiate incorrect signal parameters — wrong resolution, no output, or reduced features. This is a common source of installation-time issues.
85. C — The visual continuity of content spanning multiple displays at their boundaries. Tile bezel width creates visible dividing lines that can fragment images spanning multiple displays. Narrow-bezel displays improve continuity; tile-based video walls may have nearly invisible seams.
86. B — Luma at full resolution with chroma sampled at half the horizontal resolution (still full vertical resolution). 4:2:2 represents a middle ground between 4:4:4 and 4:2:0 — reducing bandwidth while preserving more chroma information than 4:2:0. Common in broadcast and some professional applications.
87. D — HDMI 2.0a or later with appropriate metadata support (HDR10, Dolby Vision, HLG, etc.). HDR content requires specific metadata signaling — HDMI 2.0a added HDR metadata support. Earlier HDMI versions can carry the video but not the HDR metadata that displays need to render correctly.
88. A — Measuring actual color, luminance, and white point of the display and adjusting to meet reference standards. Display calibration is an empirical process — measuring the actual output and applying correction to achieve target performance. This produces predictable, consistent color reproduction matching industry standards.

89. C — The range over which colors and contrast remain acceptable as the viewer moves off-axis. LCD viewing angle specifications indicate the angular range where image quality remains acceptable. Off-axis views typically show reduced contrast and color shifts, important for wide-seating configurations.
90. B — 3D provides stereoscopic depth perception requiring specific delivery methods (active/passive glasses, autostereoscopic displays). 3D content requires stereoscopic delivery — each eye sees a slightly different image, producing depth perception. This requires specific display technology and typically glasses.
91. D — An array of micromirrors controlled individually to create the image. DLP (Digital Light Processing) projectors use Digital Micromirror Devices (DMDs) — arrays of microscopic tilting mirrors that direct light to or away from the screen. This is distinct from LCD, OLED, or plasma technologies.
92. A — Adjusts color appearance and tonal range to achieve a specific creative or technical intent, with monitoring on calibrated references. Color grading shapes the visual character of content — brightness, contrast, color balance, saturation — to achieve specific creative or technical goals. Reference monitoring is essential for consistent results.
93. C — Automatic tile-to-tile measurement and adjustment maintained across the wall over time. Real-time calibration of video walls uses built-in sensors and feedback to continuously adjust tiles to maintain uniformity as they age and conditions vary. This is increasingly common in professional LED walls.
94. B — The standard-definition digital video encoding (525/60 NTSC, 625/50 PAL), including color space and sampling structure. ITU-R BT.601 is the foundational digital SD standard — defining the 525/60 and 625/50 formats plus the 4:2:2 chroma subsampling and YCbCr color space used in SD digital video.
95. D — Longer light source life, faster warm-up, and consistent brightness over the source's life. Laser projection offers practical advantages over lamp projection — tens of thousands of hours of life vs. thousands, no lamp replacement costs, instant-on, and consistent brightness rather than gradual dimming.
96. A — Active or passive adapters depending on the signal version and features required. DisplayPort-to-HDMI conversion can use passive adapters for basic compatibility (using dual-mode DisplayPort) or active adapters for full feature support and advanced signal handling. Matching adapter type to signal requirements is essential.
97. C — Generally problematic for natural conversation flow, with lower latency preferred. Video latency above approximately 100 ms produces perceptible delay that impairs conversation flow. Low latency is a key design target for interactive video systems, particularly conferencing.

98. B — The reflected luminance of the screen when illuminated by a projector, used to characterize image brightness. Foot-lamberts measure reflected luminance — combining projector output, screen gain, and projection distance. SMPTE recommends 16 foot-lamberts for cinema, though practical installations often target different values.
99. A — Has predictable color reproduction matching industry standards for critical evaluation. Reference-calibrated displays produce predictable, measurable color performance matching industry standards. This enables consistent content evaluation across different viewing environments and is essential for professional applications.
100. D — Insufficient bitrate for the content complexity, aggressive compression settings, or codec limitations. Visible compression artifacts occur when the encoder cannot represent the content adequately within the allocated bitrate. Complex content, aggressive encoding settings, or older codecs produce more visible artifacts. Solutions include higher bitrate, better codecs, or reduced content complexity.