New Perspectives on Computer Concepts 2018 Comprehensive 20th edition Parsons Solutions Manual

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NP2018 Module 1 Solutions

Pre-Check

(Answers from top left to bottom right)

1a. 110

1b. 00110110

2. sampling

3. lossless

4. JPG, RAW, TIF, GIF, PNG, BMP

5. phoneme

6. violet

7. vector

8. MPEG, VP8, DivX, H.264, Theora, WMV

9. rendering

QuickChecks (listed by page number)

19. D

20. C

21a. C

21b. B

22. 01001000, 01101001, 00100001

23a. B

23b. C

25. A

26a. C

26b. A

27. B

30. B

31. 44.1

32. A

33. C

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34. A

35. D

36. A

39. B

42. A

44a. C

44b. B

46. A

48. D

50. A

52a. D

52b. B

54. B

55. C

56. A

58. C

61. A

62. B

64.D

66a. A

66b. B

QuickQuizzes

Section A

1. Bit
2. ASCII
3. delimiter
4. terabyte
5. lossy

Section B

1. Sampling
2. lossy

3. extraction
4. MIDI
5. concatenative

Section C

1. CCD
2. dependent
3. 24
4. stereogram
5. PNG

Section D

1. True
2. rasterization, rendering
3. SVG
4. wireframe
5. tracing

Section E

1. capture
2. codec
3. progressive
4. container
5. transcoding

Issue Try Its

1. (From http://www.copyright.gov/fls/fl102.html):
    a. The purpose and character of the use, including whether such use is of commercial nature or is for nonprofit educational purposes.
    b. The nature of the copyrighted work.
    c. The amount and substantiality of the portion used in relation to the copyrighted work as a whole.
    d. The effect of the use upon the potential market for, or value of, the copyrighted work.
2. (From http://www.ncte.org/cccc/committees/ip/2006developments/remix): The Second Circuit found that with respect to the first factor, purpose and character of the use, the use of the Grateful Dead images was transformative since the images were used in a

timeline and for historical purposes rather than for the posters' original purposes of concert promotion. On the second factor regarding the nature of the copyrighted work, the court acknowledged this factor weighed against fair use because the posters were creative. Yet, the court limited the weight of this factor because the biographical book did not exploit the creative aspects of the posters. On the third factor, amount and substantiality of portion used, the court said that even though entire images were used, their reduced size was consistent with Dorling Kindersley's transformative use. And finally, on the fourth factor, the court stated that Dorling's use didn't harm the potential market because no actual market harm was sustained, and, in this case, the court wouldn't find market harm based on "hypothetical loss" of revenue.

3. Student should give an example of transformative use from Youtube and a list of the original works that were used. The student should also state their opinion on what makes the work transformative. Answers will vary.

4.
    a. Yes
    b. No
    c. No
    d. No

5.
    a. No
    b. No

Information Tools Try Its

1. Students' responses will vary but should include mention of 5 misleading photos and an explanation why they chose those photos.
2. Student responses will vary but should include something like the following:
    a. Remove tree stems
    b. Clean up imperfections in the background
    c. Remove the lens glare
    d. Remove tree in upper left
    e. Cropped the image
3. Student should provide a screenshot of the results from TinEye of an image that they uploaded.

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4. Students should provide answers to the following: a. date photo was taken. b. Date the photo was modified. c. The camera brand and model that was used to take the photo. D. Who the photographer was. E. Where the photo was taken.
5. Students should provide information about whether the analysis done by fotoforensics.com of a modified screenshot caught the student's modification.
6. Students should mention that the conclusion was that the shadow "...is consistent with the 3-D geometry of the scene and position of the sun." and that the film was in fact, real.

Interactive Summary

Section A

1. digital
2. Bit
3. Byte
4. information
5. pulses of current
6. magnetic
7. Numeric
8. binary
9. Character
10. ASCII
11. kilobyte
12. mega
13. gibi
14. Lossless
15. Lossy
16. .zip
17. decompressed

Section B

1. digital
2. samples

3. KHz
4. ACC
5. live
6. synthesized
7. messages
8. synthesis
9. recognition

Section C

1. pixels
2. binary
3. RGB
4. hexadecimal
5. base
6. depth
7. dependent
8. pixelated
9. Lossy
10. lossless
11. histogram
12. cloning
13. compositing
14. stitching
15. anaglyph

Section D

1. shapes
2. pixelated
3. drawing
4. rasterization
5. SVG
6. wireframe
7. rendering

8. Ray

Section E

1. analog
2. Webcams
3. progressive
4. 16:9
5. interframe
6. codec
7. ratio
8. container
9. stereoscopic

Interactive Situation Questions

1. OCR
2. MP3
3. MIDI
4. synthesis
5. scanner
6. JPG
7. compress
8. vector
9. codec
10. resolution

Labs

1. Student should activate voice commands on their device.

2. Students should respond if their device responds to the following:

   What time is it?

   Can you launch the camera app and take a photo using voice commands?

   Can the student use a voice command to get to the desktop, start screen, and home screen?

   Can the student dictate an e-mail message or text message using only voice commands?

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3. Student should activate the screen reader on their device.

4. The student should respond by describing their experience while closing their eyes while browsing or some other simple activity.

5. Students should respond with information about their experience when locating Web resources that help improve navigating while having their eyes shut.

Computer Concepts

Module One: Digital Content

A Guide to This Instructor's Manual:

We have designed this Instructor's Manual to supplement and enhance your teaching experience through classroom activities.

This document is organized chronologically, using the same heading in **blue** that you see in the textbook. Under each heading you will find (in order): Lecture Notes that summarize the section, Figures and Boxes found in the section (if any), Teacher Tips, and Classroom Activities. Pay special attention to teaching tips and activities geared toward quizzing your students, enhancing their critical thinking skills, and encouraging experimentation within the software.

In addition to this Instructor's Manual, our Instructor's Resources includes PowerPoint Presentations, Test Banks, and other supplements to aid in your teaching experience.

Module Contents

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Section A: Digital Basics 2
Section B: Digital Sound 6
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Section D: Vector Graphics 14
Section E: Digital Video 17
Glossary of Key Terms 20

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Objectives:

- Compress files containing various types of data, including text, photos, music, and videos.
- Record audio files.
- Select an audio sampling rate and file format for high-quality sound in files that won't use up all your storage space.
- Convert audio files from one format to another.
- Use voice commands to control your digital devices.
- Select the best file format for digital images, such as photos and scans, taking into account which formats reduce image quality with lossy compression.
- Convert a paper document into a digital file that can be edited using word processing software.
- Work with RGB colors in decimal, hexadecimal, or binary notation.
- Use resolution to gauge the maximum size for an image.
- Use "photoshopping" techniques to enhance, colorize, clone, inpaint, clip, and merge photo images.
- Capture 360-degree images on your smartphone.
- Draw vector images for logos and infographics.
- Convert vector images into bitmaps.
- Render a 3D image from a wireframe.
- Use video editing software to combine video footage with a soundtrack.
- Select output settings for a video, including aspect ratio, resolution, bit rate, compression level, and file format.
- Transcode a video from one file format to another.
- View vector and bitmap images in a VR headset.

SECTION A: DIGITAL BASICS

Section A: OBJECTIVES

Students will have mastered the material in Section A when they can answer the following questions:

- List three technologies that digital devices use to physically store or transmit 1s and 0s.
- Write the numbers 1 through 10 in binary.
- Decipher ASCII text.
- Demonstrate how to use the terms *bit*, *byte*, *megabyte*, *megabit*, and *gigabyte* in the context of data storage and digital devices.
- Distinguish between data that would be represented by binary numbers and data that would be represented by ASCII or Unicode.
- Explain how OCR relates to ASCII and Unicode.
- Describe the difference between lossy and lossless compression.
- Demonstrate how to compress a file.

SECTION A OPENER QUESTION:

Data refers to the symbols that represent people, events, things, and ideas. (Answer a)

a. True

b. False

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The Digital Revolution

LECTURE NOTES

- Is there a difference between data and information?
- What is data representation?
- What's the difference between analog and digital?
- How does digital data work?
- How is digital data stored?

FIGURE

- Figure 1-1

CLASSROOM ACTIVITIES

- Quick Check:

Which of the devices on the left illustrate analog data representation?

a. The speedometer and YouTube
b. The television and the vinyl record
c. All but the speedometer
d. All but YouTube and the clock

Digital devices work with bits in all of the following ways except:

a. voltage variations
b. light and dark spots
c. analog values
d. orientation of magnetized particles

Representing Numbers

LECTURE NOTE

- How do digital devices represent numbers?

FIGURE

- Figure 1-2

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TEACHER TIP
If you need to brush up on binary numbers refer to Figure 1-2.

- Quick Check:
  Which one of the following is considered numeric data?
  a. Passport number 47756902231
  b. Telephone number 906-222-3450
  c. The $28,995.00 cost of a car
  d. The address 22 E. Main Street

  Figure 1-2 shows the binary equivalent for numbers 0 through 11 and 1000. What is the binary equivalent for the number 12?
  a. 10111
  b. 1100
  c. 10000
  d. 1111

Representing Text

LECTURE NOTES

- How do digital devices represent text?
- Why are there ASCII codes for numbers?
- Where is digital text used?
- What is plain text?
- How does formatting get added to documents?
- What happens when I scan a document?

FIGURES

- Figure 1-3, Figure 1-4, Figure 1-5

TEACHER TIP
Take a look at the ASCII codes in Figure 1-3. Notice there is a code for the space character in addition to codes for symbols, numerals, uppercase letters, and lowercase letters.
Figure 1-4 illustrates an ASCII text file and the actual binary code that is stored for it.
Figure 1-5 gives you a behind-the-scenes look at the Roller Coasters document with all the embedded formatting codes revealed.

CLASSROOM ACTIVITIES

- Lab Activity
  Scan a one-page document using a scanner or a multifunction printer. The default format for the scan is probably a JPEG or PNG graphic. Try using your scanner's OCR feature or a free online OCR service to convert the scan into a document that can be edited using word processing software.

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- Quick Check:

Write out Hi! in Extended ASCII code. (Hint: Use an uppercase *H*, but a lowercase *i*.)

a. H _____
b. i _____
c. ! _____

If your address is 10 B Street, what are the first three bytes in ASCII?

a. 00110001 00110000 01000010
b. 00110001 00110000 00100000
c. 00110001 00110111 00100000

What is the seventh byte in the Roller Coasters file?

a. Uppercase C (01000011)
b. Lowercase c (01100011)
c. Space (00100000)
d. Carriage return (00001101)

Which one of the following would most likely require OCR?

a. A two-page bibliography of award-winning books from 1945 that you would like to annotate
b. An excerpt from a magazine article that you want to include in a term paper
c. A football poster containing the home game schedule
d. A page from a handwritten diary that you want to include in a historical biography

Bits and Bytes

LECTURE NOTES

- What is the difference between bits and bytes?
- What do the prefixes kilo-, mega-, giga-, and tera- mean?
- Why such odd numbers?
- When do I use bits and when do I use bytes?

FIGURES

- Figure 1-6, Figure 1-7

TEACHER TIP

Figure 1-7 provides examples for file sizes and storage capacities.

CLASSROOM ACTIVITIES

Group Discussion: What's a *kibibyte*? Some computer scientists have proposed alternative terminology to dispel the ambiguity in terms such as *kilo* that can mean 1,000 or 1,024. They suggest the following prefixes: Kibi = 1,024; Mebi = 1,048,576; and Gibi = 1,073,741,824.

Quick Check:

My iPhone has 8 _____ of storage space; I uploaded a high-resolution 8-_____ graphic; and I am going to download a small 8 _____ file.

a. GB, MB, Mbps
b. MB, GB, KB

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c. GB, MB, KB
d. Mbps, MB, GB

Compression

LECTURE NOTES

- What is the difference between lossless and lossy compression?
- How do I compress data?
- How do I return files to their uncompressed state?

FIGURES

- Figure 1-8, Figure 1-9

CLASSROOM ACTIVITIES

Lab Activity: Experiment with compressing files to see how much they shrink. Try compressing a document, and then try a graphic.

Quick Check:

Which one of the following requires lossless compression?

a. A very large document that you intend to send as an email attachment
b. A photo of your class reunion that you intend to post on your Facebook page
c. An iTunes track saved to your iPod that you want to back up on your computer

Compression utilities can be used to accomplish all of the following except:

a. bundle two or more files into a single small file
b. enlarge a file to increase its resolution
c. zip a single file to decrease its size
d. extract a file to its original size and content

Quick Quiz:

1. A(n) _____ is a 0 or 1 used in the digital representation of data.
2. Most computers use Unicode, UTF-8, or Extended _____ code to represent character data. (Hint: Use the acronym.)
3. Formatting codes can be added to documents using a(n) _____, such as slashes // and angle brackets< >.
4. In the computer world, TB is the abbreviation for _____.
5. The data files containing photos, videos, and music are typically compressed using _____ compression that throws away some of the original data.

SECTION B: DIGITAL SOUND

Section B: OBJECTIVES

Students will have mastered the material in Section B when they can answer the following questions:

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- Describe the process of digital sampling.
- Select the appropriate sampling rate for a digital audio recording.
- Identify digital audio files by their file name extensions.
- Convert digital audio files from one format to another.
- Understand why most audio files are compressed and how this affects sound quality.
- Decide when to download, live stream, or stream music on demand.
- Explain the difference between digital audio and MIDI.
- Explain how Siri and similar services work.

SECTION B OPENER QUESTION:

_____ is music, speech, and other sounds represented in binary format for use in digital devices. (Answer d)

a. MIDI
b. Speech recognition
c. Speech synthesis
d. Digital audio

Digital Audio Basics

LECTURE NOTES

- How do I record sound?
- How is sound digitized?
- Does sampling rate affect sound quality?
- How much space is required to store an audio file?
- Is there any way to compress audio files?

FIGURES

- Figure 1-10, Figure 1-11

TEACHER TIP

Figure 1-10 shows how a sound wave is digitally sampled.
Figure 1-11 illustrates how sampling rate affects sound quality and file size.

CLASSROOM ACTIVITIES

- Quick Check:

  What is the purpose of sampling?

  a. To measure the height of each sound wave
  b. To take multiple height measurements of a wave and convert them into binary
  c. To determine the type of instrument that makes each sound
  d. To record a sound at the highest fidelity

  In this calculation, the sampling rate is _____.

  a. 32 bits
  b. 44.1 kHz
  c. 1.4 Mbps
  d. None of the above

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Audio compression is usually _____.

a. Lossy
b. Lossless
c. Raw

Lab Activity

- Try recording a short narration. Does your digital device have a built-in microphone and recording software?

Digital Audio File Formats

LECTURE NOTES

- Which audio formats are most popular?
- What are the best sources for digital music?
- What type of software is required to work with digital audio files?

FIGURES

- Figure 1-12, Figure 1-13, Figure 1-14

TEACHER TIP
The table in Figure 1-12 provides an overview of the most popular digital audio formats, which include **AAC**, **MP3**, **Ogg Vorbis**, **WAV**, **FLAC**, and **WMA**.

CLASSROOM ACTIVITIES

- Lab Activities:
  1. Make a short audio recording using your favorite digital device. What are the default file format and sampling rate? If you record at a higher sampling rate, can you tell the difference in sound quality?
  2. Find the names of two live streaming music services and the names of two on-demand streaming services.

- Quick Check:
  1. You've selected a music track on your smartphone, but there is a pause before it begins. This pause is associated with _____.
     a. downloading audio tracks
     b. live streaming audio
     c. on-demand streaming
  2. The term *ripping* applies to:
     a. converting CD tracks to formats such as MP3 and AAC
     b. downloading MP3 files illegally from the Internet
     c. compressing AAC files with digital audio extraction

MIDI

LECTURE NOTES

- What is MIDI music?

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- What is the data representation for a MIDI message?
- What are the advantages and disadvantages of MIDI?
- Who uses MIDI?

FIGURE
- Figure 1-15

CLASSROOM ACTIVITIES
- Quick Check:
  Which of the following files is likely to contain synthesized music?
  a. Bongos.mp3
  b. Screech.wav
  c. Waltz.ogg
  d. Sugar.mid

DIGITIZED SPEECH

LECTURE NOTES
- What's the difference between speech synthesis and speech recognition?
- How does speech synthesis work?
- How does speech recognition work?
- How does Siri work?

FIGURES
- Figure 1-16, Figure 1-17

CLASSROOM ACTIVITIES

Lab Activities:
- If you have a laptop with Windows 10, it includes a comprehensive speech recognition system called Cortana. Try it out. You can speak commands to launch apps, navigate menus, and dictate text for email messages and documents.
- Are you wondering what a Speak & Spell is? Go to YouTube and search for "Speak & Spell" to see a demonstration.

Quick Check:
Which of the following files requires digital-to-analog conversion?
a. Speech synthesis
b. Speech recognition
c. Entering a Google Voice command
d. Voice dialing

CLASSROOM ACTIVITIES
- Quick Quiz:
  1. _____ rate refers to the number of times per second that a sound is measured during the recording process.

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2. Audio formats such as MP3, Ogg Vorbis, and AAC have good sound quality even though they use _____ compression.
3. The process of ripping tracks from an audio CD to a digital format such as MP3 is called digital audio _____.
4. _____ files store a series of instructions that specify which notes to play, their duration, and their volume.
5. The audio components for Siri and similar services are obtained by recording real voices and then applying _____ speech synthesis.

SECTION C: BITMAP GRAPHICS

Section C: OBJECTIVES

Students will have mastered the material in Section C when they can answer the following questions:

- Describe the differences between bitmap and vector graphics file formats.
- Explain how pixel color is represented in decimal, hexadecimal, and binary.
- Calculate the size of a bitmap file given its resolution.
- Decide which graphics format to use for school, work, or personal projects.
- List six popular bitmap file formats.
- Describe how cameras and scanners produce digital images.
- Explain how 3D images are created.
- Describe the RG B and CMYK color models.
- Explain what a color histogram represents and how to use one.
- Provide examples of image stitching.
- Describe two types of stereoscopic imaging.

SECTION C OPENER QUESTION:

A bitmap graphic is composed of a grid of tiny rectangular cells. (Answer b)

a. True
b. False

Bitmap Basics

LECTURE NOTES

- What is a bitmap graphic?
- Where would I encounter bitmap graphics?
- How do I create bitmap images?
- How do I convert a printed image into a bitmap?
- How does a digital camera capture bitmap images?
- What are the most common bitmap file formats?

FIGURES

- Figure 1-18, Figure 1-19, Figure 1-20, Figure 1-21

TEACHER TIP

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Figure 1-18 illustrates these basic characteristics of a bitmap graphic.
Figure 1-21 summarizes popular bitmap formats and their uses.

CLASSROOM ACTIVITIES

- Group Discussion: The term *3D* is used today to refer to a variety of commercial products that should be called stereoscopic. For example, those so-called 3D glasses with blue and red lenses are technically stereoscopic, not 3D. As you continue in this module, pay attention to the difference between 3D and stereoscopic.
- Lab Activity: Check the features of the photo app on your smartphone. Which of the following does it provide?
  Retouch
  Crop
  Special effects
  Exposure adjustment

- Quick Check:
  Bitmap graphics are based on:
  a. codecs
  b. pixels
  c. rasters
  d. vectors

Bitmap Data Representation

LECTURE NOTES

- How does each pixel get a color number?
- How are colors specified?
- How much data is required for each pixel color?
- How does resolution relate to image quality?
- Can I shrink and enlarge bitmaps?
- Can I change a bitmap's resolution?
- So how much resolution does a bitmap need to be printed as a poster?

FIGURES

- Figure 1-22, Figure 1-23, Figure 1-24

CLASSROOM ACTIVITIES

Assign a Project:
Open an image with Photoshop or similar graphics software. Check its size and its ppi. At 300 ppi, how large can the image be printed before its quality begins to deteriorate?

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Group Discussion: The *CMYK* color model defines four color values: cyan, magenta, yellow, and black. It is a subtractive system, whereas RGB is an additive system. In CMYK, white is 00000000; but in RGB, 11111111 is white. CMYK is typically used for projects that require color printing.

Quick Check:

1. To represent the color violet in Figure 1-22, the decimal value for green is 130. What are the equivalent hexadecimal and binary values for green?
    a. 82 and 10000010
    b. 255 and 11111111
    c. EE and 11101110

Image Compression

LECTURE NOTES

- What is image compression?
- Which formats apply lossless compression?
- How does lossless compression shrink a file without throwing away data?
- Which formats apply lossless compression?
- What happens during lossy compression?
- Can I compress images using general compression tools?

FIGURES

- Figure 1-25, Figure 1-26, Figure 1-27

TEACHER TIP
Figure 1-27 illustrates a section of a noncompressed image and a section of that same image after JPEG compression has been applied. Can you see any difference?

CLASSROOM ACTIVITIES

Assign a Project: Open a JPEG image. Use the Save As command or Duplicate command to make a copy of the image with a name different from the original. As you save the copy, apply as much compression as possible. Close both files and then reopen them. Is there a visible difference in quality?

- Quick Check:
    1. Run-length encoding is a type of _____.
        - bitmap digitization
        - RLE graphics format
        - lossless compression
        - pixelation

Modifying Bitmap Images

LECTURE NOTE

- What characteristics of a bitmap can I modify?

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FIGURES

- Figure 1-28, Figure 1-29, Figure 1-30, Figure 1-31, Figure 1-32

CLASSROOM ACTIVITIES

Assign an Activity:

- Histograms can perform miracles! Open a photo using software such as Photoshop, Apple Photos, or Photo Gallery. Locate the histogram control and experiment to see what you can reveal in the shadows.
- You can see digital compositing in action by going to YouTube and searching for *Content-Aware Fill*. If you have access to Photoshop, open a few of your own photos and see what kind of crazy composite you can create.

- Quick Check:

  When modifying a JPEG image, which of the following is true?

  a. It is stored in a compressed format.
  b. It cannot be modified until you unzip it.
  c. You can no longer edit individual pixels in the image.

Panoramic and 360 Images

LECTURE NOTES

- What is image stitching?
- What kinds of images does stitching produce?
- Are special software and equipment required to capture photos for stitched images?

FIGURE

- Figure 1-33

CLASSROOM ACTIVITIES

Quick Check:

Image stitching knits photos into panoramic, cylindrical, and spherical images, but what technique is used to insert parts of one image into another image?

a. Cloning
b. Inpainting
c. Compression
d. Compositing

Stereoscopy

LECTURE NOTES

- What is stereoscopic imaging?
- What's the modern version of stereoscopic imaging?
- What about those red and blue stereo glasses?

FIGURES

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- Figure 1-34, Figure 1-35, Figure 1-36

CLASSROOM ACTIVITIES

Quick Check:

Name two techniques for creating stereoscopic images.

a. Anaglyphs and stereograms
b. Compositing and overlays
c. Blue and red
d. Steganography and depthing

Quick Quiz:

1. A digital camera captures images on the photosites of a(n) _____. (Hint: Use the acronym.)
2. A characteristic of bitmap graphics is that they are resolution _____, so that reducing the resolution also reduces the image quality.
3. Graphics stored in True Color format require _____ bits for each pixel.
4. Two images from a stereo pair displayed side by side are called a(n) _____.
5. The most popular True Color formats for Web graphics include _____ and JPEG. (Hint: Use the acronym.)

SECTION D: VECTOR GRAPHICS

Section D: OBJECTIVES

Students will have mastered the material in Section D when they can answer the following questions:

- Identify vector graphics used on Web sites and social media.
- Based on the characteristics of vector graphics, determine when they are more suitable for a project than bitmaps.
- Draw simple vector shapes and outlines using drawing software.
- Convert a vector drawing into a bitmap.
- Explain the process of rendering a 3D wireframe into an image.
- Identify the key difference between rendering 3D graphics for computer games and creating special effects for movies.
- Explain how vector graphics relate to augmented reality.
- Describe the type of graphics commonly used for virtual reality.

SECTION D OPENER QUESTION:

A vector graphic consists of a set of instructions for creating a picture. (Answer a)

a. True
b. False

Vector Graphics Basics

LECTURE NOTES

- What is a vector graphic?

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- How do vector graphics compare with bitmap images?
- Where are vector graphics used?
- How can I identify vector graphics?

FIGURES

- Figure 1-37, Figure 1-38, Figure 1-39, Figure 1-40

TEACHER TIP
Figure 1-39 illustrates the difference between vector and bitmap graphics when you try to edit out parts of the Stonehenge image.

CLASSROOM ACTIVITIES

Quick Check:

Vector commands in the example at left are written using _____.

a. Flash
b. Basic
c. #00BF00
d. XML scripts

Which format tends to require the least storage space?

a. Bitmap
b. Vector
c. Compressed bitmap
d. MIDI

Vector Tools

LECTURE NOTES

- What tools do I need to create vector graphics?
- Is it possible to convert a vector graphic into a bitmap?

FIGURES

- Figure 1-41, Figure 1-42

TEACHER TIP
Figure 1-41 illustrates how to use drawing tools to create a vector graphic.

CLASSROOM ACTIVITIES

- Assign an Activity: You can find drawing tools such as ImageBot and Janvas online, or use Adobe Illustrator if it is installed on your computer. Try drawing the sky, sun, clouds, and grass from the Stonehenge image in Figure 1-41. Save your work to use for another TRY IT! later in the module.
- Quick Check:

  Which of the following input devices is used to create vector images?

  a. Camera
  b. Scanner
  c. Digitizing tablet

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d. Gradients

3D Graphics

LECTURE NOTES

- How do vector graphics relate to 3D graphics?
- Can 3D images go stereo?
- What about augmented reality?

FIGURES

- Figure 1-43, Figure 1-44, Figure 1-45, Figure 1-46

TEACHER TIP
Figure 1-44 shows the image from the previous figure rendered with an additional light source and ray tracing.

CLASSROOM ACTIVITIES

Assign an Activity: Turning a vector into a bitmap is as simple as taking a screenshot. Open your Stonehenge vector and then take a screenshot (PrtSc on a PC; Command-Shift-3 on a Mac). Next, try to move the sun on the screenshot. That simple task now requires digital compositing tools!
Software for creating 3D graphics includes Autodesk AutoCAD, open source Blender, and Trimble SketchUp. This software provides tools for drawing a wireframe and rotating it to any angle. It provides rendering and ray tracing tools, along with an assortment of surface textures that can be applied to individual objects.

Quick Check:

Rasterization and rendering both produce a _____.

a. bitmap
b. vector
c. 3D graphic
d. wireframe

Vectors and Virtual Reality

LECTURE NOTES

- How are vector animations created?
- What are the pros and cons of pre-rendering?
- How do vector animations handle interaction?
- How does real-time rendering relate to virtual reality?
- What's a game engine?

FIGURES

- Figure 1-47, Figure 1-48

TEACHER TIP
Figure 1-44 shows the image from the previous figure rendered with an additional light source and ray tracing.

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CLASSROOM ACTIVITIES

Assign an Activity: Can you find at least three popular games that were created using the Unity game engine?

Quick Check:

How many keyframes are needed to create the bouncing ball animation shown in Figure 1-47?

a. 1
b. 2
c. 3
d. 4

CLASSROOM ACTIVITIES

Quick Quiz:

1. Vector graphics require more storage space than bitmaps, but vectors can be enlarged without becoming pixelated. (True or false?)
2. A process called _____ converts vector graphics into bitmap images.
3. Based on XML, _____ is a popular format for vector graphics on the Web.
4. A 3D image is based on an assemblage of vectors called a(n) _____.
5. The technique of adding light and shadows to a 3D image is called ray _____.

SECTION E: DIGITAL VIDEO

Section E: OBJECTIVES

Students will have mastered the material in Section E when they can answer the following questions:

- Recognize digital video files by their file name extensions.
- List the video formats that are commonly used on the following: YouTube, iPhone, Android phone, television, Web browsers.
- List devices and other sources that are commonly used to capture video footage.
- List factors that affect the size and quality of digital videos.
- Explain the contents of a video container.
- Differentiate between interlaced and progressive scan.
- State the most commonly used aspect ratios on the following: iPhone screen, iPad screen, YouTube, and Windows laptop computer screen.
- Explain the purpose of a codec.
- List the variety of videos that originate as bitmap graphics.

SECTION E OPENER QUESTION:

Digital video uses bits to store color and brightness data for each video frame. (Answer a)

a. True
b. False

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Digital Video Basics

LECTURE NOTES

- What is digital video?
- Where does digital video footage originate?
- What are the access options?
- What are the key properties of digital video?
- What should I know about frame rate?
- How does resolution affect video quality?
- How is resolution expressed?
- What about aspect ratio?
- How does resolution relate to aspect ratio?
- How does color depth affect video quality
- Are digital devices powerful enough to handle all those bits?

FIGURES

- Figure 1-49, Figure 1-50, Figure 1-51, Figure 1-52, Figure 1-53

TEACHER TIP
Figure 1-49 explains several options for accessing digital videos.
Figure 1-53 illustrates horizontal by the vertical resolution of the popular devices.

CLASSROOM ACTIVITIES

- Quick Check:
  1. A digital video is essentially:
     a. a series of bitmap images
     b. a sequence of vector graphic frames
     c. an on-demand pixel stream
     d. an analog capture device

  2. Suppose your computer screen has a resolution of 1920 × 1080, but you want to play a video with a resolution of 640 × 480. What happens?
     a. The video won't play.
     b. The video plays in a 640 × 480 window.
     c. The video is upconverted to 640 × 480 resolution.

  3. How big is the file that holds a two-hour noncompressed video?
     a. 8 MB
     b. 1 GB
     c. 8 GB
     d. 1 TB

Video Compression

LECTURE NOTES

- How does video compression work?

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- Where does the compression come from?

FIGURE
- Figure 1-54

CLASSROOM ACTIVITIES
- Assign an Activity: Open a video that you've captured with a smartphone, camera, or other source. Can you use compression and other techniques to whittle the video to a file that is less than 1 MB?

Quick Check:

Which compression ratio produces the best quality video?

a. 2:1
b. 5:1
c. 10:1
d. 35:1

Video File Formats

LECTURE NOTES
- What are popular video container formats?
- Can I change videos from one format to another?
- What tools are provided by video editing software?

FIGURES
- Figure 1-55, Figure 1-56, Figure 1-57

TEACHER TIP
Figure 1-56 describes some popular video container formats: **AVI**, **MOV**, **MPEG**, **WebM**, **ASF**, **VOB**, and **Ogg Theora**.

CLASSROOM ACTIVITIES
- Assign an Activity: Apply the skills you picked up from this module to combine video footage, music clips, narrations, and a still photo into a video that is about ten seconds in length. How can you share it with your classmates?
- Quick Check:
  1. When someone mentions that he or she has H.264 video, that person is referring to the:
     a. file format
     b. codec used to compress the video
     c. video container format
     d. video compression ratio

Digital Video Variations

LECTURE NOTES
- What is a 360-degree video?
- How about 3D movies?

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- Can movies be created with stereograms?
- Are stereoscopic movies virtual reality?

FIGURES

- Figure 1-58, Figure 1-59, Figure 1-60

CLASSROOM ACTIVITIES

Assign an Activity: You can view examples of 360-degree videos on Facebook and YouTube. When watching on a flat screen, try dragging the mouse or swiping to scroll the video around the fixed pivot point. You can also watch these videos with a VR headset, and as you rotate in place, the scene will shift.

Open Google Street View and enter your address. Now that you understand graphics technology, how would you classify the type of graphics used for this app?

- Quick Quiz:
    1. The process of converting analog video signals into digital format is referred to as video _____.
    2. A(n) _____ is the software that compresses a video stream when a video is stored and decompresses the file when the video is played.
    3. The "p" in 1080p stands for _____ scan.
    4. MP4 is an example of a video _____ format.
    5. Digital videos can be converted from one file format to another through a process called _____.

WHAT DO YOU THINK?

1. What would you change about the Fair Use Doctrine to make it more fair? _____

2. In your opinion, do sites like the iTunes Store provide consumers with enough flexibility for copying files and creating playlists?

a. Yes
b. No
c. Not sure

3. Have you heard of situations in which someone appeared to follow fair use guidelines but was still charged with copyright infringement?

a. Yes
b. No
c. Not sure

Glossary of Key Terms

- 3D graphics 56
- AAC 32
- Alpha blending 48
- anaglyph 50
- analog data 19
- analog-to-digital converter 30

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