CHAPTER 2

Data Representation

Review Questions

1. Text, numbers, images, audio, and video.
2. All data types from outside the computer are transformed into a uniform representation when stored in the computer and then transformed back when leaving the computer
3. A bit pattern is a string of bits (0s or 1's) in a particular order.
4. ASCII uses 7 bits to represent a character and can represent up to 128 different symbols. Extended ASCII uses 8 bits to represent a character and can represent up to 256 different symbols. The first 128 symbols (00000000 to 01111111) are the same as the ASCII code while the remaining symbols tend to be a non-standard, manufacturer-specific code.
5. EBCDIC stands for 'Extended Binary-Coded Decimal Interchange Code'. IBM developed this code which is used only in its mainframes. It uses 8 bits to represent a character and can represent up to 256 different symbols.
6. A bit pattern of length n can represent 2^n different characters.
7. The bit pattern represents the color for each pixel (picture element) in a matrix of pixels that represents the image.
8. The advantage of the vector graphic method is that the image is clearer when it is rescaled.
9. Sampling - The magnitude of the signal is measured at regular intervals.

   Quantization - The sample is assigned a value from a set.

   Coding - The quantized values are changed to binary patterns.

   Storing - The binary patterns are stored.
10. Video data is made up of a series of images to be shown in sequence. It is usually stored in a compressed format.

Multiple-Choice Questions

11. d

12. d
13. c
14. c
15. d
16. b
17. d
18. a
19. c
20. d
21. d
22. b
23. d
24. c
25. a
26. b
27. a
28. d

Exercises

29. 32 different patterns can be represented by 5 bits.
30. If 0 is allowed: 100. If 0 is not allowed: 81.
31. If 0 is allowed, 1,757,600.; if 0 is not allowed, 1,423,656.
32. 3 bits may be used to represent each cycle.
33. 3 bits are needed to represent the grade with 1 pattern unused.
34. Using 10 bits would provide 1024 possible ID's. 124 patterns would be unused. If the company were to hire another 300 people, it would have to increase the number of bits unused in its ID numbers to 11 to provide 2048 possible ID patterns.
35. A four-bit pattern can represent up to 16 unique patterns. 6 patterns would be wasted.
36. 20,000 bits would be needed to represent the picture.
37. 8 bits would be needed to represent 256 different sound levels, so 64,000 bits would be required to represent 1 second of audio.
38.
   a. x8F0
   b. x20D
   c. x11
   d. xFF
39.
   a. 000100100000
   b. 0010101000110100

     c. 00000000

     d. 11111111

40.

     a. 04360

     b. 01015

     c. 021

     d. 0377

41.

     a. 001010

     b. 010111

     c. 100101

     d. 010000

42. Five hexadecimal digits are needed to convert a 19-bit pattern.

43. Seven octal digits are needed to convert a 19-bit pattern.

44. Twelve hexadecimal digits are needed to convert a 6-byte (48 bit) pattern.