4. How many ones are there in 891 if it is a number in each of the following bases?
   a. base 10
   b. base 8
   c. base 12
   d. base 13
   e. base 16
5. Express 891 as a polynomial in each of the bases in Exercise 4.
6. Convert the following numbers from the base shown to base 10.
   a. 111 (base 2)
   b. 777 (base 8)
   c. FEC (base 16)
   d. 777 (base 16)
   e. 111 (base 8)
7. Explain how base 2 and base 8 are related.
8. Explain how base 8 and base 16 are related.
9. Expand the table on page 40 to include the decimal numbers from 11 through 16.
10. Expand the table in Exercise 9 to include hexadecimal numbers.
11. Convert the following octal numbers to binary.
    a. 766
    b. 101
    c. 202
    d. 142
    e. 889
12. Convert the following binary numbers to octal.
    a. 111110110
    b. 1000001
    c. 010000010
    d. 1100010
    e. 111000111
13. Convert the following binary numbers to hexadecimal.
    a. 111110110
    b. 1000001
    c. 010000010
    d. 1100010
    e. 111000111
14. Convert the following octal numbers to hexadecimal.
    a. 777
    b. 605
    c. 443
    d. 521
    e. 1
15. Convert the following decimal numbers to octal.
    a. 901
    b. 321
    c. 1492
    d. 1066
    e. 2001

16. Convert the following decimal numbers to binary.
    a. 45
    b. 69
    c. 1066
    d. 99
    e. 1
17. Convert the following decimal numbers to hexadecimal.
    a. 1066
    b. 1939
    c. 1
    d. 998
    e. 43
18. If you were going to represent numbers in base 18, what symbols might you use to represent the decimal numbers 10 through 17 other than letters?
19. Convert the following decimal numbers to base 18 using the symbols you suggested in Exercise 18.
    a. 1066
    b. 99099
    c. 1
20. Perform the following binary additions.
    a. 1110011 + 11001
    b. 1111111 + 11111
    c. 1010101 + 10101
21. Perform the following octal additions.
    a. 770 + 665
    b. 101 + 707
    c. 202 + 667
22. Perform the following hexadecimal additions.
    a. 19AB6 + 43
    b. AE9 + F
    c. 1066 + ABCD
23. Perform the following binary subtractions.
    a. 1100111 − 111
    b. 1010110 − 101
    c. 1111111 − 111
24. Perform the following octal subtractions.
    a. 1066 − 776
    b. 1234 − 765
    c. 7766 − 5544

25. Perform the following hexadecimal subtractions.
    a. ABC ″ 111
    b. 9988 ″ AB
    c. A9F8 ″ 1492
26. Why are binary numbers important in computing?
27. A byte contains how many bits?
28. How many bytes are there in one word of a 64-bit machine?
29. Why do microprocessors such as pagers have only 8-bit words?
30. Why is important to study how to manipulate fixed-sized numbers?

Thought Questions

1. Exercise 3 asked you to classify π as one of the options. π does not belong in any of the categories named; π (and *e)* are transcendental numbers. Look up transcendental numbers in the dictionary or in an old math book and give the definition in your own words.
2. Complex numbers are another category of numbers that are not discussed in this chapter. Look up complex numbers in a dictionary or an old math book and give the definition in your own words.
3. Many everyday occurrences can be represented as a binary bit. For example, a door is open or not open, the stove is on or off, the dog is asleep or awake. Could relationships be represented as a binary value? Discuss the question giving examples.
4. The digital divide puts those that have access to technology on one side and those that do not on the other. Do you feel that it is the right of everyone to have access to technology?
5. It will cost a great deal of money to erase the digital divide. Who do you think should be responsible for paying the cost?
6. Having access to technology is not enough; people must be taught to use the technology they have. How would you define computer literacy for each of the following groups of people?
    - high school students in an industrialized country
    - kindergarten teachers in an industrialized country
    - college graduates in an industrialized country
    - students in sub-Saharan Africa
    - college graduates in sub-Saharan Africa
    - government officials in the Andes