Exercises

1. What is the address space in each of the following systems?

- **a.** a system with 8-bit addresses
- **b.** a system with 16-bit addresses
- **c.** a system with 64-bit addresses

2. An address space has a total of 1,024 addresses. How many bits are needed to represent an address?

3. An address space uses three symbols: 0, 1, and 2 to represent addresses. If each address is made of 10 symbols, how many addresses are available in this system?

4. Change the following IP addresses from dotted-decimal notation to binary notation:

- **a.** 114.34.2.8
- **b.** 129.14.6.8
- **c.** 208.34.54.12
- **d.** 238.34.2.1

5. Change the following IP addresses from dotted-decimal notation to hexadecimal notation:

- **a.** 114.34.2.8
- **b.** 129.14.6.8
- **c.** 208.34.54.12
- **d.** 238.34.2.1

6. Change the following IP addresses from hexadecimal notation to binary notation:

- **a.** 0x1347FEAB
- **b.** 0xAB234102
- **c.** 0x0123A2BE
- **d.** 0x00001111

7. How many hexadecimal digits are needed to define the netid in each of the following classes?

- **a.** Class A
- **b.** Class B
- **c.** Class C

8. Change the following IP addresses from binary notation to dotted-decimal notation:

- **a.** `01111111 11110000 01100111 01111101`
- **b.** `10101111 11000000 11111000 00011101`
- **c.** `11011111 10110000 00011111 01011101`
- **d.** `11101111 11110111 11000111 00011101`

9. Find the class of the following IP addresses:

- **a.** 208.34.54.12
- **b.** 238.34.2.1

c. 242.34.2.8

d. 129.14.6.8

10. Find the class of the following IP addresses:

a. `11110111 11110011 10000111 11011101`

b. `10101111 11000000 11110000 00011101`

c. `11011111 10110000 00011111 01011101`

d. `11101111 11110111 11000111 00011101`

11. Find the netid and the hostid of the following IP addresses:

a. 114.34.2.8

b. 132.56.8.6

c. 208.34.54.12

d. 251.34.98.5

12. Find the number of addresses in the range if the first address is 14.7.24.0 and the last address is 14.14.34.255.

13. If the first address in a range is 122.12.7.0 and there are 2048 addresses in the range, what is the last address?

14. Find the result of each operation:

a. NOT (22.14.70.34)

b. NOT (145.36.12.20)

c. NOT (200.7.2.0)

d. NOT (11.20.255.255)

15. Find the result of each operation:

a. (22.14.70.34) AND (255.255.0.0)

b. (12.11.60.12) AND (255.0.0.0)

c. (14.110.160.12) AND (255.200.140.0)

d. (28.14.40.100) AND (255.128.100.0)

16. Find the result of each operation:

a. (22.14.70.34) OR (255.255.0.0)

b. (12.11.60.12) OR (255.0.0.0)

c. (14.110.160.12) OR (255.200.140.0)

d. (28.14.40.100) OR (255.128.100.0)

17. In a class A subnet, we know the IP address of one of the hosts and the subnet mask as given below:

IP Address: 25.34.12.56 Subnet mask: 255.255.0.0

What is the first address (subnet address)? What is the last address?

18. In a class B subnet, we know the IP address of one of the hosts and the subnet mask as given below:

IP Address: 131.134.112.66 Subnet mask: 255.255.224.0

What is the first address (subnet address)? What is the last address?

19. In a class C subnet, we know the IP address of one of the hosts and the subnet mask as given below:

IP Address: 202.44.82.16 Subnet mask: 255.255.255.192

What is the first address (subnet address)? What is the last address?

20. Find the subnet mask in each case:

a. 1024 subnets in class A

b. 256 subnets in class B

c. 32 subnets in class C

d. 4 subnets in class C

21. In a block of addresses, we know the IP address of one host is 25.34.12.56/16. What is the first address (network address) and the last address (limited broadcast address) in this block?

22. In a block of addresses, we know the IP address of one host is 182.44.82.16/26.

What is the first address (network address) and the last address (limited broadcast address) in this block?

23. In fixed-length subnetting, find the number of 1s that must be added to the mask if the number of desired subnets is _____.

a. 2

b. 62

c. 122

d. 250

24. An organization is granted the block 16.0.0.0/8. The administrator wants to create 500 fixed-length subnets.

a. Find the subnet mask.

b. Find the number of addresses in each subnet.

c. Find the first and the last address in the first subnet.

d. Find the first and the last address in the last subnet (subnet 500).

25. An organization is granted the block 130.56.0.0/16. The administrator wants to create 1024 subnets.

a. Find the subnet mask.

b. Find the number of addresses in each subnet.

c. Find the first and the last address in the first subnet.

d. Find the first and the last address in the last subnet (subnet 1024).

26. An organization is granted the block 211.17.180.0/24. The administrator wants to create 32 subnets.

a. Find the subnet mask.

b. Find the number of addresses in each subnet.

c. Find the first and the last address in the first subnet.

d. Find the first and the last address in the last subnet (subnet 32).

27. Write the following mask in slash notation (/*n*):

a. 255.255.255.0

b. 255.0.0.0

c. 255.255.224.0

d. 255.255.240.0

28. Find the range of addresses in the following blocks:

a. 123.56.77.32/29

b. 200.17.21.128/27

c. 17.34.16.0/23

d. 180.34.64.64/30

29. In classless addressing, we know the first and the last address in the block. Can we find the prefix length? If the answer is yes, show the process and give an example.

30. In classless addressing, we know the first address and the number of addresses in the block. Can we find the prefix length? If the answer is yes, show the process and give an example.

31. In classless addressing, can two blocks have the same prefix length? Explain.

32. In classless addressing, we know the first address and one of the addresses in the block (not necessarily the last address). Can we find the prefix length? Explain.

33. An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows:

a. The first group has 200 medium-size businesses; each needs approximately 128 addresses.

b. The second group has 400 small businesses; each needs approximately 16 addresses.

c. The third group has 2000 households; each needs 4 addresses. Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.

34. An ISP is granted a block of addresses starting with 120.60.4.0/20. The ISP wants to distribute these blocks to 100 organizations with each organization receiving 8 addresses only. Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.

35. An ISP has a block of 1024 addresses. It needs to divide the addresses to 1024 customers. Does it need subnetting? Explain your answer.