Some Subnetting Practice Problem Solutions

practice problem

1. What is 23.183.62.51 in binary?

   Solution:

dec	bin
23	0001 0111
183	1011 0111
62	0011 1110
51	0011 0011

2. What class address is this?

   Solution: It begins with a 0, so it's an A.

3. If no subnetting has been done, on what network is it (in CIDR notation)?

   Solution: It's an A, so if no subnetting has been done, the first byte is used for the network part of the address. The network is:

   23.0.0.0/8

4. How many hosts can be put on a network of this class?

   Solution: 8 bits are used for the network part. This leaves 24 bits for the host part. With 24 bits, we can specify about 2^{24} hosts.

5. How many networks of this class are possible?

Solution: 8 bits are used for the network part, but the first bit must be a 0. There are 2^7 possibilities.

6. What is the natural netmask of a network of this class?

Solution: 8 bits are used for the network part. The netmask is the IP address with 8 1s and 24 0s. This is 255.0.0.0

7. Break this network into 8 subnets:
   (a) What is the address of each subnet (in CIDR notation)?

Solution: We have:

23	0	0	0
0001 0111	0000 0000	0000 0000	0000 000

To form the 8 subnets, we steal the first three bits of the host part (*i.e.*, the first 3 bits of the 2nd byte), and give it to the network part. The 8 possibilities for these three bits are:

000
001
010
011
100
101
110
111

These first three bits are in the 128s, 64s, and 32s column of the 2nd byte, so they represent the values:

000	0
001	32
010	64
011	64+32=96
100	128
101	128+32=160
110	128+64=192
111	128+64+32=224

The 8 subnets are therefore:

23.0.0.0/11
23.32.0.0/11
23.64.0.0/11
23.96.0.0/11
23.128.0.0/11
23.160.0.0/11
23.192.0.0/11
23.224.0.0/11

They're all /11s because we're now using 11 bits for the network part and not 8.

(b) How many hosts can be put on each subnet?

Solution: 11 bits are used for the network part. This leaves 21 bits for the host part, so there's roughly 2^{21} possible hosts.

(c) What is the netmask of each subnet?

Solution: We're using 11 bits for the network part. The netmask is the IP address that consists of 11 1s on the left hand side and 21 0s on the right hand side. This is:

255	224	0	0
1111 1111	1110 0000	0000 0000	0000 0000

another practice problem

8. What is 207.245.83.199 in binary?

Solution:

dec	**bin**
207	1100 1111
245	1111 0101
83	0101 0011
199	1100 0111

9. What class address is this?

Solution: It begins with a 110, so it's a C.

10. If no subnetting has been done, on what network is it (in CIDR notation)?

Solution: It's a C, so if no subnetting has been done, the first three bytes are used for the network part of the address. The network is:

207.245.83.0/24

11. How many hosts can be put on a network of this class?

Solution: 24 bits are used for the network part. This leaves 8 bits for the host part. With 8 bits, we can specify about 2^8 hosts.

12. How many networks of this class are possible?

Solution: 24 bits are used for the network part, but the first three bits must be 110. There are 2^{21} possibilities.

13. What is the natural netmask of a network of this class?

Solution: 24 bits are used for the network part. The netmask is the IP address with 24 1s and 8 0s. This is 255.255.255.0

14. Break this network into 4 subnets:
    (a) What is the address of each subnet (in CIDR notation)?

Solution: We have:

207	245	83	0
1100 1111	1111 0101	0101 0011	0000 0000
network part			host part

To form the 4 subnets, we steal the first two bits of the host part (*i.e.*, the first 2 bits of the 2nd byte), and give it to the network part. The 4 possibilities for these two bits are:

00
01
10
11

These first two bits are in the 128s and 64s column of the 2nd byte, so they represent the values:

00	0
01	64
10	128
11	128+64=192

The 8 subnets are therefore:
They're all /11s because we're now using 11 bits for the network part and not 8.

- How many hosts can be put on each subnet?

207.245.83.0/26
207.245.83.64/26
207.245.83.128/26
207.245.83.192/26

26 bits are used for the network part. This leaves 6 bits for the host part, so there's roughly $2^6 = 64$ possible hosts.

(b) What is the netmask of each subnet?

Solution: We're using 26 bits for the network part. The netmask is the IP address that consists of 26 1s on the left hand side and 6 0s on the right hand side. This is:

255	255	255	192
1111 1111	1111 1111	1111 1111	1100 0000

still another practice problem.

To show that we don't always start at the left-most bits of each byte. Consider the network 23.160.0.0/12.

15. How many hosts can be put on this network?

Solution: 12 bits are used for the network part. This leaves 20 bits for the host part, so approximately 2^{20} hosts.

16. What is the mask for this network?

Solution: It's the IP address with 12 1s on the left hand side and 20 0s on the right hand side, so:

255	240	0	0
1111 1111	1111 0000	0000 0000	0000 0000

17. Break the network into 8 subnets:
    (a) What is the address of each subnet (in CIDR notation)?

Solution: To break it into 8 subnets, we need to steal 3 bits from the host part and give it to the network part. These bits are in the 13th, 14th, and 15th position, *i.e.*, the 5th, 6th, and 7th bits of the 2nd byte.

The 8 possibilities for the three bits are:

000
001
010
011
100
101
110
111

These three bits are in the 8s, 4s, and 2s column, so they represent:

000	0
001	2
010	4
011	4+2=6
100	8
101	8+2=10
110	8+4=12
111	8+4+2=14

We started out with the address 23.160.0.0/12, so the full 2nd byte of each subnet will then be:

1010 **000**0	0
1010 **001**0	162
1010 **010**0	164
1010 **011**0	166
1010 **100**0	168
1010 **101**0	170
1010 **110**0	172
1010 **111**0	174

So the subnets are:

23.160.0.0/15
23.162.0.0/15
23.164.0.0/15
23.166.0.0/15
23.168.0.0/15
23.170.0.0/15
23.172.0.0/15
23.174.0.0/15

(b) How many hosts can be put on each subnet?

Solution: 15 bits are used for the network part, so 17 bits are used for the host part. This gives us approximately 2^{17} hosts per subnet.

(c) What is the netmask of each subnet?

Solution: The mask is the IP address with 15 1s on the left hand side and 17 0s on the right hand side, so:

1111 1111	1111 1110	0000 0000	0000 0000
255	254	0	0