Homework 7 Solutions

Problem 1:

We convert the last byte to binary: 208 -> 1101 0001. The network prefix is 27b long, leaving 5b for the host address. We change the last five bits to ones, giving us 1101 1111. Thus, the broadcast address is 134.48.171.223.

Problem 2:

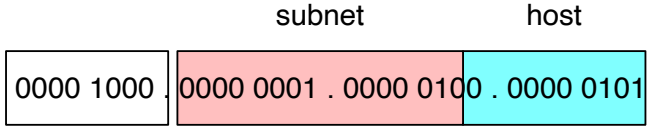
We expand the IP addresses.

10.190.210.0/28	**0000 1010 . 1011 1110 . 1101 0010 . 0000** 0000	A
10.190.210.32/25	**0000 1010 . 1011 1110 . 1101 0010 . 001**0 0000	B
10.190.208.0 /22	**0000 1010 . 1011 1110 . 1101 00**00 . 0000 0000	C
10.160.0.0/12	**0000 1010 . 1010** 0000 . 0000 0000 . 0000 0000	D
10.240.0.0/14	**0000 1010 . 1111 00**00 . 0000 0000 . 0000 0000	E
10.190.208.16/29	**0000 1010 . 1011 1110 . 1101 0000** . **0001 0**000	F

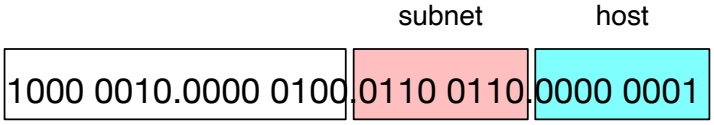
(a) IP address 10.190.208.22 is in binary 0000 1010.1011 1110.1101 0000.0001 0110 and matches C and F. Since F has the longer prefix, it is routed to F.
(b) IP address 10.242.210.42 is in binary 0000 1010.1111 0010. 1101 0010. 0010 1010 and only matches E and is therefore routed to E.
(c) IP address 10.190.209.100 is in binary 0000 1010 . 1011 1110 . 1101 0001 . 0110 0100 only matches C and is therefore routed to C.
(d) IP address 10.190.210.55 is in binary 0000 1010 . 1011 1110 . 1101 0010 . 0011 0111 matches B, C, and F and is therefore routed to B.
(e) IP address 10.190.208.13 is in binary 0000 1010 . 1011 1110 . 1101 0010 . 0000 1101 and matches A and C and is sent to A.

Problem 3:

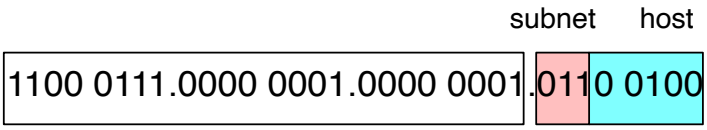
(a) 8.1.4.5 corresponds to 0000 1000.0000 0001.0000 0100.0000 0101 has as first byte 0000 1000 and is therefore a class A network. Mask 255.255.255.254.0 is 1111 1111.1111 1111.1111 1110.0000 0000 and corresponds to /23, giving us 15 subnet bits and 9 host bits. The number of subnets is therefore $2^{15} = 32\,768$ and the number of host addresses is $2^9 = 512$, leaving room for 510 hosts (plus network and broadcast address). The address is divided as



(b) 130.4.102.1 in binary is 1000 0010.0000 0100.0110 0110.0000 0001 and therefore a class B address. The network portion is 16 bits. The network mask corresponds to three bytes of ones and /24. This leaves 8 bits for the subnet address for a total of $2^8 = 256$ subnets. The number of host bits is also 8, leaving us with 256 host addresses and 254 host addresses.



(c) 199.1.1.100 in binary is 1100 0111.0000 0001.0000 0001.0110 0100. As the leading three digits are 110, this is a class C address. The subnet mask is 1111 1111.1111 1111.1111 1111. 1110 0000, where all but the last five bits are set to one. Therefore, this mask corresponds to /27. Thus, there are three subnet bits and five host address bits. The number of subnets is 8 and the number of host addresses is 32 for a total of 30 hosts.



Problem 4:

2800:a4:1600:d300:/56 in binary is
00011000 0000 0000:0000 0000 1010 0100:0001 0110 0000 0000:1101 0010.
The next three bits (according to the instructions) are used to define 2^3 subnets, each with a prefix of length 59. Thus we have for the next nibble: 0000, 0010, 0100, 0110, 1000, 1010, 1100, 1110 or 0, 2, 4, 6, 8, a, c, e. Thus, the eight network prefixes are:

- 2800:a4:1600:d320:/59
- 2800:a4:1600:d322:/59
- 2800:a4:1600:d324:/59
- 2800:a4:1600:d326:/59
- 2800:a4:1600:d328:/59
- 2800:a4:1600:d32a:/59
- 2800:a4:1600:d32c:/59
- 2800:a4:1600:d32e:/59