IP Calculation

1. An IP is given to us, for example: 125.254.36.24 with subnet /12
2. Then we have to know which is the mask in decimal:
   255.240.0.0
3. With this mask, we know the hops between network are of $2^4 = 16$. This is know by the following rule.
   Each octet has 8 values in the mask, in the example is:
   11111111 . 11110000 . 00000000 . 00000000
   Because in the second octet the first 4 binaries are 1's, then we know that the mask is: 128 + 64 + 32 + 16 = 240
   Now, the hops are given by 2^n, where n is the number of zeros inside the second octet, in this case is $2^4 = 16$, so the networks change every 16 hops.
   This mean that the network will be:
   125.0.0.0, 125.16.0.0, 125.32.0.0, 125.48.0.0, 125.64.0.0, 125.80.0.0, 125.96.0.0, 125.112.0.0, 125,128.0.0, 125.144.0.0, 125.160.0.0, 125.176.0.0, 125.192.0.0, 125.208.0.0, 125.224.0.0, 125.240.0.0, 126.0.0.0, ...
   Now, to know in which network our IP goes, we take the number of the second octet and divide it by 16, in this case 254/16 = 15.8, we floor the answer (15) and then multiply the answer per 16 to get the network: 15*16=240. If you see, 254 is inside the 240 network, so the network of our IP is:
   125.240.0.0
4. Now, the class it belong is seen with the first octet, in this case is Class A (1-126)
5. Now we discover the broadcast address, this is done by taking the next network after the one of our IP (in this case is 126.0.0.0) and we rest the last bit, so our broadcast address is (126.0.0.0 - 0.0.0.1) 125.255.255.255
6. Now, to have the first and last usable IP Address is to add one to the network address (first usable IP) and the last usable IP is to rest one to the broadcast address, so
   First IP Address: 125.240.0.1
   Last IP Address: 125.255.255.254

Now, lets take another example:
222.125.201.32 / 17
Mask in decimal: 255.255.128.0 (11111111 . 11111111 . 10000000 . 00000000)
Hops: $2^7 = 128$
Class C (192 – 222)
Networks: 222.125.0.0, 222.125.128.0, 222.126.0.0 or 201/128 =
1.5 -> 128*1 = 128
The network is 222.125.128.0

Broadcast Address: 222.126.0.0 – 0.0.0.1 = 222.125.255.255
1 usable IP Address: 222.125.128.0 + 0.0.0.1 = 22.125.128.1
Last usable IP Address: 222.125.255.255 – 0.0.0.1 = 222.125.255.254