UNIT 1.Review IPv4 Subnetting

1. Fill out the following table. The first line is an example.

IP Address	Mask	Network ID	Broadcasting address	Subnet Mask split it into 4 subnets	Host address range for subnet nº 3
129.102.197.23	255.255.0.0	129.102.0.0	129.102.255.255	255.255.192.0	129.102.128.1- 129.102.191.254
131.107.2.1	255.255.0.0	131.107.0.0	131.107.255.255	255.255.192.0	131.107.128.1 – 131.107.191.254
199.32.123.54	255.255.255.0	199.32.123.0	199.32.123.255	255.255.255.192	199.32.123.129 – 199.32.123.190
32.12.54.23	255.0.0.0	32.0.0.0	32.255.255.255	255.192.0.0	32.128.0.1 – 32.191.255.254
1.1.1.1	255.0.0.0	1.0.0.0	1.255.255.255	255.192.0.0	1.128.0.1 – 1.191.255.254
221.22.64.7	255.255.255.0	221.22.64.0	221.22.64.255	255.255.255.192	221.22.64.129 – 221.22.64.190
93.44.127.235	255.0.0.0	93.0.0.0	93.255. 255. 255	255.192.0.0	93.128.0.1 – 93.191.255.254
23.46.92.184	255.0.0.0	23.0.0.0	23. 255. 255. 255	255.192.0.0	23.128.0.1 – 23.191.255.254
152.79.234.12	255.255.0.0	152.79.0.0	152.79. 255. 255	255.255.192.0	152.79.128.1 – 152.79.191.254
192.168.2.200	255.255.255.0	192.168.2.0	192.168.2. 255	255.255.255.192	192.168.2.129 – 192.168.2.190
168.192.3.26	255.255.0.0	168.192.0.0	168.192. 255. 255	255.255.192.0	168.192.128.1 – 168.192.191.254
200.100.50.25	255.255.255.0	200.100.50.0	200.100.50. 255	255.255.255.192	200.100.50.129 – 200.100.50.190
172.71.243.2	255.255.0.0	172.71.0.0	172.71. 255. 255	255.255.192.0	172.71.128.1 – 172.71.191.254
163.37.212.32	255.255.0.0	163.37.0.0	163.37. 255. 255	255.255.192.0	163.37.128.1 - 163.37.191.254
76.35.61.23	255.0.0.0	76.0.0.0	76. 255. 255. 255	255.192.0.0	76.128.0.1 – 76.191.255.254

2. For a given IP address 140.220.15.245 and mask 255.255.255.240, answer the following questions:

- What is the subnet IP address?

  255.255.255.240 ↔ /28 We take the first 28 bits and turn into 0 the remaining 4 bits, host id bits.
       140.220.15.**1111**0101 → 140.220.15.**1111**0000 → **140.220.15.240 /28**

- What is the broadcast IP address?
   The all 1s host number identifies the broadcast address

       140.220.15.**1111****1111** → **140.220.15.255 /28**

- What is a valid range for a hosts IP addresses?

   140.220.15.241 - 140.220.15.254

3. Given the following network mask 255.255.240.0. How many hosts are allowed on the subnet?

255.255.240.0 →   255.255.**1111**0000.00000000 /20 → 12 bits for host ID → 2^{12} -2=4094

4. Fill out the table with the appropriate values

IP ADDRESS	MASK	NETWORK ID	BROADCASTING ADDRESS
190.33.109.133	255.255.255.128	190.33.109.128	190.33.109.255
192.168.20.25	255.255.255.240	192.168.20.16	192.168.20.31
192.168.20.25	255.255.255.224	192.168.20.0	192.168.20.31
192.168.20.25	255.255.255.192	192.168.20.0	192.168.20.63
140.190.20.10	255.255.192.0	140.190.0.0	140.190.63.255
140.190.130.10	255.255.192.0	140.190.128.0	140.190.191.255
140.190.220.10	255.255.192.0	140.190.192.0	140.190.255.255

5. Given the following network address 150.10.0.0/16. Try to split it into almost 3 subnets.
   • What is the subnet mask address?

   In order to subnet a network address, the subnet mask has to be extended, using some of the bits from the host ID portion of the address to create a subnetwork. Subnets can be created only in blocks of powers of two. You can have 2 subnets (using only 1 bit, 2^1), four (using 2 bits, 2^2), eight (using 3, bits2^3), sixteen (using 4 bits, 2^4), and so on.

   2^x >=3   → 2^2 >= 4 → So, in this case we choose four subnets, which will also give us one free subnet for future use

   In resume we extend 2 bits the subnet mask, instead to be /16 it will be /18. To put it in another way

   11111111.11111111.00000000.00000000 ↔ /16 ↔ 255.255.0.0
   11111111.11111111.**11**000000.00000000 ↔ /18 ↔ 255.255.192.0
   • How many hosts are allowed on the subnets?
   After using 2 bits to create subnets, with the remaining six host ID bits we'll have 2^{14} -2= 16382 available hots on each subnet
   • What is the network ID and the broadcast address for each subnet.

   The all 0s host number identifies the base network or the subnet while the all 1s host number identifies the broadcast address of the network or subnetwork

Subnet ID	Broadcast address
150.10.**00**000000.00000000 → 150.10.0.0 /18	150.10.**00**111111.11111111 → 150.10.63.255 /18
150.10.**01**000000.00000000 → 150.10.64.0 /18	150.10.**01**111111.11111111 → 150.10.127.255 /18
150.10.**10**000000.00000000 → 150.10.128.0 /18	150.10.**10**111111.11111111 → 150.10.191.255 /18
150.10.**11**000000.00000000 → 150.10.192.0 /18	150.10.**11**111111.11111111 → 150.10.255.255 /18

6. Given the following IP address and network mask 150.27.35.255/22. Which is the correct answer?:

a) It's the broadcast address
b) It's the network id
c) It's the first host address on the network
d) It's the last host address on the network

7. The following network mask /20 is equal to...
a) 255.255.240.0
b) 255.240.0.0
c) 255.252.240.0
d) 255.255.252.0

8. Find out which of the following IP addresses belong to the same network. (Caution: There may be more than one correct answer).
   a) 172.166.78.3/22 and 172.166.92.5 /22
   b) 88.99.32.54 /15 and 88.98.72.32 /15
   c) 64.32.28.1 /25 and 64.32.28.72 /25
   d) 35.98.54.33/30 and 35.98.54.22/30

9.   Given the following IP address and mask: 199.77.44.28/26. What is the broadcast address?
   a) 199.77.44.127/26
   b) 199.77.44.31/26
   c) 199.77.44.63/26
   d) 199.77.44.255/26

10. Given the following network 199.77.44.24/29. Which of these shows the first host address and the last host address on the network.
   a) 199.77.44.25 /29 and 199.77.44.29 /29
   b) 199.77.44.26 /29 and 199.77.44.30/29
   c) 199.77.44.25 /29 and 199.77.44.30 /29
   d) 199.77.44.25 /29 and 199.77.44.31 /29