IP AND SUBNETTING EXERCISES

1. Write the subnet, broadcast address, and valid host range for the following:

a. 192.168.100.17, with 4 bits of subnetting

In order to obtain the subnet for this address, we know this is an IP Class C because the first three decimals are between 191 and 223. Then the mask of this will be 255.255.255.0.

For a class C, 24 bits are dedicated to the network so we need to perform the calculation with the last 8 binary digits.

For the subnet we take 4 extra bits and put a 1 at the end, the rest numbers will be zeroes.

192.168.100.0001|0000

Convert into decimal

192.168.100.16 → this is the subnet

To obtain the broadcast we need to do the same, but this time the last four digits will be ones.

192.168.100.0001|1111

Converting into decimals

192.168.100.31→ this is the broadcast

Thus, the range of hosts will discard the network and the broadcast 192.168.100.17 to 192.168.100.30 gives a total of 14 hosts.

b. 192.168.100.66, with 3 bits of subnetting

In order to obtain the subnet for this address, we know this is an IP Class C because the first three decimals are between 191 and 223. Then the mask of this will be 255.255.255.0.

For a class C, 24 bits are dedicated to the network so we need to perform the calculation with the last 8 binary digits.

For the subnet we take 3 extra bits and put a 1 at the end, the rest numbers will be zeroes.

192.168.100.010|00000

Convert into decimal

192.168.100.64 → this is the subnet

To obtain the broadcast we need to do the same, but this time the last five digits will be ones.

192.168.100.010|11111

Converting into decimals

192.168.100.95→ this is the broadcast

Thus, the range of hosts will discard the network and the broadcast 192.168.100.65 to 192.168.100.94 gives a total of 30 hosts. Or $\mathbf{2^5-2=30}$.

c. 172.16.10.5/20

In this case, we know the mask for this IP address because is represented by /20, which means 20 bits are dedicated to representing the network.

The mask in binary will be 11111111.11111111.**1111|**0000.00000000

We can know this is an IP Class B, because is between 128 to 191.

The binary representation of the two last octets 172.16.00000101|00000101

The process to obtain the subnet is similar like before but this time we will turn the last 12 digits into zeroes for the subnet and ones for the broadcast.

172.16.0000**0000|00000000** → 172.16.0.0 →subnet

172.16.0000**1111|11111111** → 172.16.15.255 → broadcast

The range between 172.16.0.1 to 172.16.15.255**(2^{12}-2=4094 hosts).**

d. 172.16.10.33/255.255.252.0

In this case, we know the mask for this IP address because is represented by /20, which means 20 bits are dedicated to representing the network.

The mask in binary will be 11111111.11111111.**111111**00.00000000

We can know this is an IP Class B, because is between 128 to 191.

The binary representation of the two last octets 172.16.00000101|00100001

The process to obtain the subnet is similar like before but this time we will turn the last 10 digits into zeroes for the subnet and ones for the broadcast.

172.16.000000**00|00000000** → 172.16.0.0 →subnet

172.16.000000**11|11111111** → 172.16.3.255 → broadcast

The range between 172.16.0.1 to 172.16.15.255**(2^{10}-2=1022 hosts).**

2. You have been asked to create a subnet that supports 126 hosts. What subnet mask is the most efficient one?

2^7 -2=128-2 =126 this means 7 bits for the host in the mask 11111111.11111111.11111111.1**0000000** and the most efficient subnet mask is 255.255.255.128 or /25

3. Given the following

a. Network address: 192.168.10.0

b. Subnet mask: 255.255.255.192

How many subnets are there? How many hosts? What are the valid subnets?

First of all, the binary representation will be 11111111.11111111.00001010.00000000

The binary mask 11111111.11111111.11111111.**11|**000000, then we dedicate 2 extra bits for the network.

Then we need to take the last 14 digits to calculate the subnet and broadcast.

192.168.10.**01|**000000 → 192.168.10.0 → subnetwork

192.168.10.**01**|111111 → 192.168.10.127 → broadcast

A total of 4 subnet (2^2) and 62 host(2^6-2)

To know all the subnetworks we need to use all the combinations.

1.00|000000=0

2. 01|000000=64

3. 10|000000=128

4. 11|000000=192

We could use the magic number which is 64 to calculate the rest of them.

In order to calculate de rest is the same as before:

1. 192.168.10.**00**000000 => **192.168.0.0/26** whose broadcast is **192.168.10.63** and the valid hosts from 192.168.10.1 to 192.168.10.62.
2. 192.168.10.**01**000000 => **192.168.0.64/26** whose broadcast is **192.168.10.127** and the valid hosts range from 192.168.10.65 to 192.168.10.126
3. 192.168.10.**10**000000 => **192.168.10.128/26** whose broadcast is **192.168.10.191** and valid host range from 192.168.10.129 to 192.168.10.190
4. 192.168.10.**11**000000 => **192.168.10.192/26** whose broadcast is **192.168.10.255** and valid host range from 192.168.10.193 to 192.168.10.254

4. What is the problem in this Network?

5. XYZ Company would like to subnet its network so that there are five separate subnets. They will need 25 computers in each subnet. Complete the following table: NOTE: If you create more than five subnets, list the extra ones too.

192.168.162.x

192.168.162.00000000

192.168.162.11111111

192.168.162.255

255.255.255.0

In order to find the best and most efficient option:

2^5-2=30

For this proposal, we need first calculate the mask, so if we want 25 hosts for each subnet, we have to use this 2^n-2= number of hosts then 2^n-2=30→2^5-2=30. So, we need the following mask:

2^5=32-2=30

We take 5 bits for the host so the mask will be:

11111111.11111111.11111111.111|00000

255.255.255.**111**|00000

255.255.255.**224**

To know all the subnetworks, we need to use all the combinations.

1. 192.168.162.00**0**|00000 = 192.168.162.**0**

Network address

000|00000 → 0

Host addresses

192.168.162.1-192168.162.30

Broadcast address

001|11111 → 31

2.

Network address

001|00000 → 32

Host addresses

192.168.162.33-192168.162.62

Broadcast address

001|11111 → 63

3.

Network address

010|00000 → 64

Host addresses

192.168.162.65-192168.162.94

Broadcast address

010|11111 → 95

4.

Network address

011|00000 → 96

Host addresses

192.168.162.97-192168.162.126

Broadcast address

011|11111 → 127

5.

Network address

100|00000 → 128

Host addresses

192.168.162.129-192168.162.158

Broadcast address

100|11111 → 159

6.

Network address

192.168.162.160

Host addresses

192.168.162.161-192168.162.190

Broadcast address

192.168.162.191

7.

Network address

192.168.162.192

Host addresses

192.168.162.193-192168.162.222

Broadcast address

192.168.162.223

8.

Network address

192.168.162.224

Host addresses

192.168.162.225-192168.162.254

Broadcast address

192.168.162.255