Solutions of Network activities I

1. Activity 1

   - 8 subnetworks are needed so, to know how many bits are needed to steal:
     $2^2 = 4 < 8$
     $2^3 = 8 = 8 \Rightarrow 3bits$ will be stolen to the hosts bits and they will be added to the mask.
   - 2500 hosts are needed to address so it is important to keep in mind how many bits will be needed for the hosts part of the mask ("0" bits):
     $2^{11} = 2048 < 2500$
     $2^{12} = 4096 > 2500 \Rightarrow 12bits$ will be needed for hosts.

   So, B class IP can be chosen because:

   - By default, mask has 16 bits, that is to say: 255.255.0.0
     - 3 bits will be stolen for the new mask in order to split in 8 subnets: 255.255.111 00000.0 so the new mask will be 19 bits.
     - there are 5+8 bits for hosts $\Rightarrow$ 13 bits $>$ 12 bits required.

     The mask will be: 255.255.224.0

2. Activity 2

   The mask is 255.255.224.0 $\Rightarrow$ 1111 1111. 1111 1111. 1110 0000 . 0000 0000

   (a) 172.16.66.24 $\Rightarrow$ 172.16. 0100 0010. 24
   Mask $\Rightarrow$ 255.255.224.0

IP	172	.16	.0	1	0	0	0	0	1	0	.24
$Mask$	255	.255	.1	1	1	0	0	0	0	0	.0
$ID\ Network$	172	.16	.0	1	0	0	0	0	0	0	.0
$ID\ Network$	172	.16	.							64	.0

   (b) 172.16.65.33 $\Rightarrow$ 172.16. 0100 0001. 33
   Mask $\Rightarrow$ 255.255.224.0

IP	172	.16	.0	1	0	0	0	0	0	1	.33
$Mask$	255	.255	.1	1	1	0	0	0	0	0	.0
$ID\ Network$	172	.16	.0	1	0	0	0	0	0	0	.0
$ID\ Network$	172	.16	.							64	.0

   (c) 172.16.64.42 $\Rightarrow$ 172.16. 0100 0000. 42
   Mask $\Rightarrow$ 255.255.224.0

IP	172	.16	.0	1	0	0	0	0	0	0	.42
$Mask$	255	.255	.1	1	1	0	0	0	0	0	.0
$ID\ Network$	172	.16	.0	1	0	0	0	0	0	0	.0
$ID\ Network$	172	.16	.							64	.0

(d) 172.16.63.51 ⇒ 172.16. 00111111. 51

Mask ⇒ 255.255.224.0

IP	172	.16	.0	0	1	1	1	1	1	1	.51
$Mask$	255	.255	.1	1	1	0	0	0	0	0	.0
$ID\ Network$	172	.16	.0	0	1	0	0	0	0	0	.0
$ID\ Network$	172	.16	.							32	.0

As it could be seen, the three first Ip belong to the same network (172.16.64.0), but the last one belongs to other different network, specifically to 172.16.32.0

3. Activity 3

   Mask ⇒ 255.255.255.192 ⇒ 255.255.255.11000000

IP	192	.168	.85	.1	0	0	0	0	0	0	1
$Mask$	255	.255	.255	.1	1	0	0	0	0	0	0
$ID\ Network$	192	.168	.85	.1	0	0	0	0	0	0	0
$ID\ Network$	192	.168	.85	.							128

   The network address is 192.168.85.128
   The IP broadcast is 192.168.85.10 111 111 ⇒ 192.168.85.191

4. Activity 4 . What is the network id and the suitable network mask for a company which has 39 hosts?

   It would be recommendable to calculate how many bits will be needed to address 39 hosts:

   $2^5 = 32$
   $2^6 = 64$ hosts

   A suitable mask would be 255.255.255.11000000 ⇒ 255.255.255.192

   An Id network could be an C class IP => 192.168.0.0

5. Activity 5

   That Ip is a B class IP so the mask is 255.255.0.0

   To split in 4 subnets, there will be necessary to stole 2 bits so the new mask will be: 255.255.192.0

Number of networks	Subnetwork ID	First host IP	Last host IP
0	150.40.00 000000.0	150.40.0.1	150.40.63.254
1	150.40.01 000000.0	150.40.64.1	150.40.127.254
2	150.40.10 000000.0	150.40.128.1	150.40.191.254
3	150.40.11 000000.0	150.40.192.1	150.40.255.254

6. Activity 6

   It would be recommendable to calculate how many bits will be needed to address 60 hosts:

   $2^5 = 32$
   $2^6 = 64$ hosts
   So, it could be stolen 2 bits in order to make subnets. It would be possible to do:

   $2^2 = 4$ subnets.

Number of networks	Subnetwork ID
0	192.168.50.00 000000 ⇒ 192.168.50.0
1	192.168.50.01 000000 ⇒ 192.168.50.64
2	192.168.50.10 000000 ⇒ 192.168.50.128
3	192.168.50.11 000000 ⇒ 192.168.50.192

7. Activity 7

   (a) Network 1

   IP 192.168.1.194 / 27 Mask ⇒ 255.255.255.224 ⇒ 255.255.255.11100000

IP	192	.168	.1	.1	1	0	0	0	0	1	0
$Mask$	255	.255	.255	.1	1	1	0	0	0	0	0
$ID\ Network$	192	.168	.1	.1	1	0	0	0	0	0	0
$ID\ Network$	192	.168	.1	.							192

   IP broadcast ⇒ 192.168.1.223

   Network 2

   IP 192.168.1.66 / 26 Mask ⇒ 255.255.255.224 ⇒ 255.255.255.11000000

IP	192	.168	.1	.0	1	0	0	0	0	1	0
$Mask$	255	.255	.255	.1	1	0	0	0	0	0	0
$ID\ Network$	192	.168	.1	.0	1	0	0	0	0	0	0
$ID\ Network$	192	.168	.1	.							64

   IP broadcast ⇒ 192.168.1.127

   Network 3

   IP 10.2.129.1 / 17 Mask ⇒ 255.255.128.0 ⇒ 255.255.10000000.00000000

IP	10	.2	.1	0	0	0	0	0	0	1	.1
$Mask$	255	.255	.1	0	0	0	0	0	0	0	.0
$ID\ Network$	10	.2	.1	0	0	0	0	0	0	0	.0
$ID\ Network$	10	.2	.							128	.0

IP broadcast ⇒ 10.2.255.255

Network 4

IP 192.168.1.1 / 23 Mask ⇒ 255.255.255.224 ⇒ 255.255.11111110.0

IP	192	.168	.0	0	0	0	0	0	0	1	.1
$Mask$	255	.255	.1	1	1	1	1	1	1	0	.0
$ID\ Network$	192	.168	.0	0	0	0	0	0	0	0	.0
$ID\ Network$	192	.168	.							0	.0

IP broadcast ⇒ 192.168.1.255

Network 5

IP 193.27.0.226 / 30 Mask ⇒ 255.255.255.252 ⇒ 255.255.255.11111100

IP	193	.27	.0	.1	1	1	0	0	0	1	0
$Mask$	255	.255	.255	.1	1	1	1	1	1	0	0
$ID\ Network$	193	.27	.0	.1	1	1	0	0	0	0	0
$ID\ Network$	193	.27	.0	.							224

IP broadcast ⇒ 193.27.0.227

(b) Network 1

- 1.1 192.168.1.193
- 1.2 192.168.1.195
- 1.3 192.168.1.196

Network 2

- 2.1 192.168.1.65
- 2.2 192.168.1.67
- 2.3 192.168.1.68
- 2.4 192.168.1.69

Network 3

- 3.1 10.2.128.2
- 3.2 10.2.128.3
- 3.3 10.2.128.4
- 3.4 10.2.129.2

Network 4

- 4.1 192.168.0.2
- 4.2 192.168.0.3
- 4.3 192.168.0.4
- 4.4 192.168.0.5

Network 5

- 5.1 193.27.0.225

(c) ROUTER 1

TARGET	INTERFACE
192.168.1.192	192.168.1.194
192.168.1.64	192.168.1.66
10.2.128.0	10.2.129.1
0.0.0.0	192.168.1.66

ROUTER 2

TARGET	INTERFACE
10.2.128.0	10.2.129.2
192.168.0.0	192.168.0.5
0.0.0.0	10.2.129.2

ROUTER 3

TARGET	INTERFACE
192.168.1.192	192.168.1.69
192.168.1.64	192.168.1.69
192.168.0.0	192.168.1.1
10.2.128.0	192.168.1.69
193.27.0.224	193.27.0.226
0.0.0.0	193.27.0.226

8. Activity 8

(a) How many hosts can we have?

i. A class network, there are 24 bits for hosts:
$2^{24} = 16777216; 16777216 - 2 = 16777214$ hosts

ii. B class network, there are 16 bits for hosts:
$2^{16} = 65536; 65536 - 2 = 65534$ hosts

iii. C class network, there are 8 bits for hosts:
$2^8 = 256; 256 - 2 = 254$ hosts

(b) ID mask 255.255.255.128
$2^7 = 128; 128 - 2 = 126$

(c) ID mask 255.255.255.192
$2^6 = 64; 64 - 2 = 62$