

IP Addressing and Subnetting Exercises Sample

Exercise1: Define IP address structure: Network ID and Host ID:

- IP address: 192.168.10.10/25
- IP address: 172.18.18.18/255.255.192.0

Exercise2: Find Network address and Broadcast address in IP address Below:

- IP address: 192.168.10.10/25
- IP address: 172.18.18.18/255.255.192.0

Exercise3: Design 3 Subnets (VLSM) from a Network: 192.168.20.0/24 with the Required Host Below:

- Required Host: 100
- Required Host: 50
- Required Host: 10

Exercise4: Design a Network for a Required Host 300.

Answer

Exercise1: Define IP address structure: Network ID and Host ID:

- IP address: 192.168.10.10/25

IP address in Binary: 11000000. 10101000. 00001010. 00001010

Subnet Mask in Binary: /24 = 11111111. 11111111. 11111111. 10000000

IP structure: **11000000.10101000.00001010.00001010**

Therefore: The Black Part is Network ID and the Red Part is Host ID.

- IP address: 172.18.18.18/255.255.192.0

IP address in Binary: 10101100. 00010010. 00010010. 00010010

Subnet Mask in Binary: 255.255.192.0 = 11111111. 11111111. 11000000. 00000000 = /18

IP structure: **10101100. 00010010. 00010010. 00010010**

Therefore: The Black Part is Network ID and the Red Part is Host ID.

Exercise2: Find Network address and Broadcast address in IP address below:

- IP address: 192.168.10.10/25

IP address in Binary: 11000000. 10101000. 00001010. 00001010

Subnet Mask in Binary: /24 = 11111111. 11111111. 11111111. 10000000

IP structure: **11000000.10101000.00001010.00001010**

Network address: Network ID + Set Host ID to 0

⇒ **Network address: 11000000.10101000.00001010.00000000 = 192.168.10.0/25**

Broadcast address: Network ID + Set Host ID to 1

⇒ **Broadcast address: 11000000.10101000.00001010.01111111 = 192.168.10.127/25**

Therefore: Network address: 192.168.10.0/25

Broadcast address: 192.168.10.127/25

- IP address: 172.18.18.18/255.255.192.0

IP address in Binary: 10101100. 00010010. 00010010. 00010010

Subnet Mask in Binary: 255.255.192.0 = 11111111. 11111111. 11000000. 00000000 = /18

IP structure: **10101100. 00010010. 00010010. 00010010**

Network address: Network ID + Set Host ID to 0

⇒ **Network address: 10101100. 00010010. 00000000. 00000000 = 172.18.0.0/18**

Broadcast address: Network ID + Set Host ID to 1

⇒ **Broadcast address: 10101100. 00010010. 00111111. 11111111 = 172.18.63.255/18**

Therefore: Network address: 172.18.0.0/18

Broadcast address: 172.18.63.255/18

Exercise3: Design 3 Subnets (VLSM) from a Network: 192.168.20.0/24 with the Required Host Below:

- Required Host: 100
- Required Host: 50
- Required Host: 10

Define Subnet1 for 100 hosts, Subnet2 for 50 hosts and Subnet3 for 20 hosts

+ Find Subnet1: Network address1/subnet mask1

Total IP address = $2^{32 - \text{subnet mask1}}$

100 = $2^{32 - \text{subnet mask1}}$

$128 = 2^7 = 2^{32 - \text{subnet mask1}} \Rightarrow \text{subnet mask1} = 32 - 7 = /25$

Therefore, Subnet1: 192.168.20.0/25

+ Find Broadcast address of Subnet1

IP structure of Subnet1: **11000000. 10101000. 00010100. 00000000**

The Black Part is Network ID and the Red Part is Host ID in Subnet1

Therefore, Broadcast address in Subnet1: **11000000. 10101000. 00010100. 01111111**

= **192.168.20.127/25**

+ Find Subnet2: Network address2/subnet mask2

Total IP address = $2^{32 - \text{subnet mask2}}$

50 = $2^{32 - \text{subnet mask2}}$

$64 = 2^6 = 2^{32 - \text{subnet mask2}} \Rightarrow \text{subnet mask2} = 32 - 6 = /26$

Therefore, Subnet2: **192.168.20.128/26**

+ Find Broadcast address of Subnet2

IP structure of Subnet2: **11000000. 10101000. 00010100. 10000000**

The Black Part is Network ID and the Red Part is Host ID in Subnet2

Therefore, Broadcast address in Subnet2: **11000000. 10101000. 00010100. 10111111**

= **192.168.20.191/26**

+ Find Subnet3: Network address3/subnet mask3

Total IP address = $2^{32 - \text{subnet mask3}}$

10 = $2^{32 - \text{subnet mask3}}$

$16 = 2^4 = 2^{32 - \text{subnet mask3}} \Rightarrow \text{subnet mask3} = 32 - 4 = /28$

Therefore, Subnet3: **192.168.20.192/28**

+ Find Broadcast address of Subnet3

IP structure of Subnet3: **11000000. 10101000. 00010100. 11000000**

The Black Part is Network ID and the Red Part is Host ID in Subnet3

Therefore, Broadcast address in Subnet3: **11000000. 10101000. 00010100. 11001111**

= **192.168.20.207/28**

Finally, Subnet1: **192.168.20.0/25**

Subnet2: **192.168.20.128/26**

Subnet3: **192.168.20.192/28**

Exercise4: Design a Network for a Requirement Host 300.

Network: Network address/subnet mask

+ Find subnet mask

Total IP address = $2^{32 - \text{subnet mask}3}$

$300 = 2^{32 - \text{subnet mask}3}$

$512 = 2^9 = 2^{32 - \text{subnet mask}3} \Rightarrow \text{subnet mask}3 = 32 - 9 = /23$

+ Select IP address in Class B: 172.16.0.0 – 172.31.255.255

IP selected: 172.16.17.17

+ Find Network address and Broadcast address

IP address: 172.16.17.17 with subnet mask: /23 = 11111111. 11111111. 11111110. 00000000

IP address in Binary: 10101100. 00010000. 00010001. 00010001

IP structure: **10101100. 00010000. 00010001. 00010001**

The Black Part is Network ID and the Red Part is Host ID

Network address: Network ID + Set Host ID to 0

⇒ **Network address: 10101100. 00010010. 00010000. 00000000 = 172.16.16.0/23**

Broadcast address: Network ID + Set Host ID to 1

⇒ **Broadcast address: 10101100. 00010010. 00010001. 11111111 = 172.16.17.255/23**

Finally,

+ Network: 172.16.16.0/23

+ Usable IP addresses: $2^{32 - 23} - 2 = 2^9 - 2 = 512 - 2 = 510$

+ Range of IP addresses: 172.16.16.0 → Network address

 172.16.16.1 → First host

172.16.17.254 → Last host

172.16.17.255 → Broadcast address