

Activity 6.7.3: IPv4 Address Subnetting Part 1 (Answer Key)

Learning Objectives

Upon completion of this activity, you will be able to determine network information for a given IP address and network mask.

Background

This activity is designed to teach how to compute network IP address information from a given IP address.

Scenario

When given an IP address and network mask, you will be able to determine other information about the IP address such as:

- Network address
- Network broadcast address
- Total number of host bits
- Number of hosts

Task 1: For a given IP address, Determine Network Information.

Given:

Host IP Address	172.25.114.250
Network Mask	255.255.0.0 (/16)

Find:

Network Address	
Network Broadcast Address	
Total Number of Host Bits	
Number of Hosts	

Step 1: Translate Host IP address and network mask into binary notation.

Convert the host IP address and network mask to binary:

	172	25	114	250
IP Address	10101100	00011001	01110010	11111010
Network Mask	11111111	11111111	00000000	00000000
	255	255	0	0

Step 2: Determine the network address.

1. Draw a line under the mask.
2. Perform a bit-wise AND operation on the IP address and the subnet mask.

Note: 1 AND 1 results in a 1; 0 AND anything results in a 0.

3. Express the result in dotted decimal notation.
4. The result is the network address for this host IP address, which is **172.25.0.0**.

	172	25	114	250
IP Address	10101100	00011001	01110010	11111010
Subnet Mask	11111111	11111111	00000000	00000000
Network Address	10101100	00011001	00000000	00000000
	172	25	0	0

Step 3: Determine the broadcast address for the network address

The network mask separates the network portion of the address from the host portion. The network address has all 0s in the host portion of the address and the broadcast address has all 1s in the host portion of the address.

	172	25	0	0
Network Add.	10101100	00011001	00000000	00000000
Mask	11111111	11111111	00000000	00000000
Broadcast.	10101100	00011001	11111111	11111111
	172	25	255	255

By counting the number of host bits, we can determine the total number of usable hosts for this network.

Host bits: 16

Total number of hosts:

$$2^{16} = 65,536$$

65,536 – 2 = 65,534 (addresses that cannot use the *all 0s* address, network address, or the *all 1s* address, broadcast address.)

Add this information to the table:

Host IP Address	172.25.114.250
Network Mask	255.255.0.0 (/16)
Network Address	172.25.0.0
Network Broadcast Address	172.25.255.255
Total Number of Host Bits	16 bits or 2_{16} or 65,536 total hosts
Number of Hosts	$65,536 - 2 = 65,534$ usable hosts

Task 2: Challenge

For all problems:

Create a Subnetting Worksheet to show and record all work for each problem.

Problem 1

Host IP Address	172.30.1.33
Network Mask	255.255.0.0
Network Address	172.30.0.0
Network Broadcast Address	172.30.255.255
Total Number of Host Bits	16
Number of Hosts	65536 total hosts or 65534 usable hosts

Problem 2

Host IP Address	172.30.1.33
Network Mask	255.255.255.0
Network Address	172.30.1.0
Network Broadcast Address	172.30.1.255
Total Number of Host Bits	8
Number of Hosts	256 total hosts or 254 usable hosts

Problem 3

Host IP Address	192.168.10.234
Network Mask	255.255.255.0
Network Address	192.168.10.0
Network Broadcast Address	192.168.10.255
Total Number of Host Bits	8
Number of Hosts	256 total hosts or 254 usable hosts

Problem 4

Host IP Address	172.17.99.71
Network Mask	255.255.0.0
Network Address	172.17.0.0
Network Broadcast Address	172.17.255.255
Total Number of Host Bits	16
Number of Hosts	65536 total hosts or 65534 usable hosts

Problem 5

Host IP Address	192.168.3.219
Network Mask	255.255.0.0
Network Address	192.168.0.0
Network Broadcast Address	192.268.255.255
Total Number of Host Bits	16
Number of Hosts	65536 total hosts or 65534 usable hosts

Problem 6

Host IP Address	192.168.3.219
Network Mask	255.255.255.224
Network Address	192.168.3.192
Network Broadcast Address	192.168.3.223
Total Number of Host Bits	5
Number of Hosts	32 total hosts or 30 usable hosts

Task 3: Clean Up

Remove anything that was brought into the lab, and leave the room ready for the next class.