

## Lab - Calculate IPv4 Subnets (Instructor Version)

**Instructor Note:** Red font color or gray highlights indicate text that appears in the instructor copy only.

### Objectives

Part 1: Determine IPv4 Address Subnetting

Part 2: Calculate IPv4 Address Subnetting

### Background / Scenario

The ability to work with IPv4 subnets and determine network and host information based on a given IP address and subnet mask is critical to understanding how IPv4 networks operate. The first part is designed to reinforce how to compute network IP address information from a given IP address and subnet mask. When given an IP address and subnet mask, you will be able to determine other information about the subnet.

**Instructor Note:** This activity can be done in class or assigned as homework. If the assignment is done in class, you may wish to have students work alone or in teams of 2 students each. It is suggested that the first problem is done together in class to give students guidance as to how to proceed for the rest of the assignment.

The public IP addresses used in this lab are owned by Cisco.

### Required Resources

- 1 PC (Windows with Internet access)
- Optional: IPv4 address calculator

### Instructions

Fill out the tables below with appropriate answers given the IPv4 address, original subnet mask, and new subnet mask.

#### Problem 1:

Given:	
Host IP Address:	192.168.200.139
Original Subnet Mask	255.255.255.0
New Subnet Mask:	255.255.255.224

Find:	
Number of Subnet Bits	$27-24=3$ bits
Number of Subnets Created	$2^3=8$
Number of Host Bits per Subnet	$32-27=5$ bits
Number of Hosts per Subnet	$2^5-2=30$

Find:	
Network Address of this Subnet	192.168.200.128
IPv4 Address of First Host on this Subnet	192.168.200.129
IPv4 Address of Last Host on this Subnet	192.168.200.158
IPv4 Broadcast Address on this Subnet	192.168.200.159

**Problem 2:**

Given:	
Host IP Address:	10.101.99.228
Original Subnet Mask	255.0.0.0
New Subnet Mask:	255.255.128.0

Find:	
Number of Subnet Bits	$17-8=9$
Number of Subnets Created	$2^9=512$
Number of Host Bits per Subnet	$32-17=15$
Number of Hosts per Subnet	$2^{15}-2=32,766$
Network Address of this Subnet	10.101.0.0
IPv4 Address of First Host on this Subnet	10.101.0.1
IPv4 Address of Last Host on this Subnet	10.101.127.254
IPv4 Broadcast Address on this Subnet	10.101.127.255

**Problem 3:**

Given:	
Host IP Address:	172.22.32.12
Original Subnet Mask	255.255.0.0
New Subnet Mask:	255.255.224.0

Find:	
Number of Subnet Bits	$19-16=3$
Number of Subnets Created	$2^3=8$
Number of Host Bits per Subnet	$32-19=13$

Find:	
Number of Hosts per Subnet	$2^{13}-2=8190$
Network Address of this Subnet	172.22.32.0
IPv4 Address of First Host on this Subnet	172.22.32.1
IPv4 Address of Last Host on this Subnet	172.22.63.254
IPv4 Broadcast Address on this Subnet	172.22.63.255

**Problem 4:**

Given:	
Host IP Address:	192.168.1.245
Original Subnet Mask	255.255.255.0
New Subnet Mask:	255.255.255.252

Find:	
Number of Subnet Bits	$30-24=6$
Number of Subnets Created	$2^6=64$
Number of Host Bits per Subnet	$32-30=2$
Number of Hosts per Subnet	$2^2-2=2$
Network Address of this Subnet	192.168.1.244
IPv4 Address of First Host on this Subnet	192.168.1.245
IPv4 Address of Last Host on this Subnet	192.168.1.246
IPv4 Broadcast Address on this Subnet	192.168.1.247

**Problem 5:**

Given:	
Host IP Address:	128.107.0.55
Original Subnet Mask	255.255.0.0
New Subnet Mask:	255.255.255.0

Find:	
Number of Subnet Bits	$24-16=8$
Number of Subnets Created	$2^8=256$

Find:	
Number of Host Bits per Subnet	$32-24=8$
Number of Hosts per Subnet	$2^8-2=254$
Network Address of this Subnet	128.107.0.0
IPv4 Address of First Host on this Subnet	128.107.0.1
IPv4 Address of Last Host on this Subnet	128.107.0.254
IPv4 Broadcast Address on this Subnet	128.107.0.255

#### Problem 6:

Given:	
Host IP Address:	192.135.250.180
Original Subnet Mask	255.255.255.0
New Subnet Mask:	255.255.255.248

Find:	
Number of Subnet Bits	$29-24=5$
Number of Subnets Created	$2^5=32$
Number of Host Bits per Subnet	$32-29=3$
Number of Hosts per Subnet	$2^3-2=6$
Network Address of this Subnet	192.135.250.176
IPv4 Address of First Host on this Subnet	192.135.250.177
IPv4 Address of Last Host on this Subnet	192.135.250.182
IPv4 Broadcast Address on this Subnet	192.135.250.183

#### Reflection Question

Why is the subnet mask so important when analyzing an IPv4 address?

The subnet mask is crucial in analyzing an IPv4 address because it defines the division between the network and host portions of the address. It allows devices to determine which part of an IP address identifies the network and which part identifies a specific host within that network, enabling proper routing and communication in a networked environment.