

Introduction to Networking

CT043-3-1 VE1

Tutorial Activity 11: Introduction to IP Addressing

Instructions: 10-15 minutes

Answer these questions:

Classful Addressing - A, B, C

Network & Host Identification

Highlight The <b>Network Portion</b> Of These Addresses:	Highlight The <b>Host Portion</b> Of These Addresses:
177.100.18.4	10.15.123.50
119.18.45.0	171.2.199.31
209.240.80.78	198.125.87.177
199.155.77.56	223.250.200.222
117.89.56.45	17.45.222.45
126.8.156.0	195.0.21.98

**Hint:**

In classful addressing, IP addresses are divided into five classes (A, B, C, D, and E), but only classes A, B, and C are used for network and host identification. Here's how you determine the network and host portions of the IP addresses based on their class:

**1. Class A:**

- Range: 0.0.0.0 to 127.255.255.255
- Network portion: First octet
- Host portion: Last three octets

**2. Class B:**

- Range: 128.0.0.0 to 191.255.255.255
- Network portion: First two octets
- Host portion: Last two octets

**3. Class C:**

- Range: 192.0.0.0 to 223.255.255.255
- Network portion: First three octets
- Host portion: Last octet

**Example Explanation:**

- For the IP address **177.100.18.4**, it falls into Class B (since 177 falls between 128 and 191).
  - Network portion: **177.100**
  - Host portion: **18.4**

### Default Subnet Masks

- Write the correct default subnet mask, network address and broadcast address for each of the following addresses:

IP Address	Subnet Mask	Network Address	Broadcast Address
177.100.18.4/16			
119.18.45.0/8			
191.249.234.191/16			
10.10.250.1/8			
192.12.35.105/24			
77.251.200.51/8			
189.210.50.1/18			
193.100.77.8/24			

### Answer:

IP Address	Subnet Mask	Network Address	Broadcast Address
177.100.18.4/ <b>16</b>	<b>255.255.0.0</b>	<b>177.100.0.0</b>	<b>177.100.255.255</b>
119.18.45.0/8	<b>255.0.0.0</b>	<b>119.0.0.0</b>	<b>119.255.255.255</b>
191.249.234.191/16	<b>255.255.0.0</b>	<b>191.249.0.0</b>	<b>191.249.255.255</b>
10.10.250.1/8	<b>255.0.0.0</b>	<b>10.0.0.0</b>	<b>10.255.255.255</b>
192.12.35.105/24	<b>255.255.255.0</b>	<b>192.12.35.0</b>	<b>192.12.35.255</b>
77.251.200.51/8	<b>255.0.0.0</b>	<b>77.0.0.0</b>	<b>77.255.255.255</b>
189.210.50.1/18	<b>255.255.192.0</b>	<b>189.210.0.0</b>	<b>189.210.63.255</b>
193.100.77.8//24	<b>255.255.255.0</b>	<b>193.100.77.0</b>	<b>193.100.77.255</b>

## Solution

**Question 1:** 177.100.18.4/16

<b>Powers</b>	$2^7$	$2^6$	$2^5$	$2^4$	$2^3$	$2^2$	$2^1$	$2^0$
<b>Number</b>	128	64	32	16	8	4	2	1

<b>IP Address</b>	177	100	18	14
<b>Subnet Mask (/16)</b>	255	255	0	0
<b>IP Address Binary</b>	1011 0001 (177-128-32-16-1)	0110 0100 (100-64-32-4)	0001 0010 (18-16-2)	0000 1110 (14-8-4-2)
<b>Subnet Mask (/16) Binary</b>	1111 1111	1111 1111	0000 0000	0000 0000
<b>Network Address (ANDing)</b>	1011 0001	0110 0100	0000 0000	0000 0000
<b>Network Address Decimal</b>	177	100	0	0
<b>Broadcast Address (1/16) Binary</b>	1011 0001	0110 0100	1111 1111	1111 1111
<b>Broadcast Address (1/16) Decimal</b>	177	100	255	255

**Question 2:** 119.18.45.0/8

IP Address	119	18	45	0
Subnet Mask (/8)	255	0	0	0
IP Address Binary	0111 0111	0001 0010	0010 1101	0000 0000
Subnet Mask (/8) Binary	1111 1111	0000 0000	0000 0000	0000 0000
Network Address (ANDing)	0111 0111	0000 0000	0000 0000	0000 0000
Network Address Decimal	119	0	0	0
Broadcast Address (1/8) Binary	0111 0111	1111 1111	1111 1111	1111 1111
Broadcast Address (1/8) Decimal	119	255	255	255

**Question 3:** 191.249.234.191/16

IP Address	191	249	234	191
Subnet Mask (/16)	255	255	0	0
IP Address Binary	1011 1111	1111 1001	1110 1010	1011 1111
Subnet Mask (/16) Binary	1111 1111	1111 1111	0000 0000	0000 0000
Network Address (ANDing)	1011 1111	1111 1001	0000 0000	0000 0000
Network Address Decimal	191	249	0	0
Broadcast Address (1/16) Binary	1011 1111	1111 1001	1111 1111	1111 1111
Broadcast Address (1/16) Decimal	191	249	255	255

**Question 4:** 10.10.250.1/8

IP Address	10	10	250	1
Subnet Mask (/8)	255	0	0	0
IP Address Binary	0000 1010	0000 1010	1111 1010	0000 0001
Subnet Mask (/8) Binary	1111 1111	0000 0000	0000 0000	0000 0000
Network Address (ANDing)	0000 1010	0000 0000	0000 0000	0000 0000
Network Address Decimal	10	0	0	0
Broadcast Address (1/8) Binary	0000 1010	1111 1111	1111 1111	1111 1111
Broadcast Address (1/8) Decimal	10	255	255	255

**Question 5:** 192.12.35.105/24

IP Address	192	12	35	105
Subnet Mask (/24)	255	255	255	0
IP Address Binary	1100 0000	0000 1100	0010 0011	0110 1001
Subnet Mask (/24) Binary	1111 1111	1111 1111	1111 1111	0000 0000
Network Address (ANDing)	1100 0000	0000 1100	0010 0011	0000 0000
Network Address Decimal	192	12	35	0
Broadcast Address (1/24) Binary	1100 0000	0000 1100	0010 0011	1111 1111
Broadcast Address (1/24) Decimal	192	12	35	255

**Question 6:** 77.251.200.51/8

IP Address	77	251	200	51
Subnet Mask (/8)	255	0	0	0
IP Address Binary	0100 1101	1111 1011	1100 1000	0011 0011
Subnet Mask (/8) Binary	1111 1111	0000 0000	0000 0000	0000 0000
Network Address (ANDing)	0100 1101	0000 0000	0000 0000	0000 0000
Network Address Decimal	77	0	0	0
Broadcast Address (1/8) Binary	0100 1101	1111 1111	1111 1111	1111 1111
Broadcast Address (1/8) Decimal	77	255	255	255

**Question 7:** 189.210.50.1/18

IP Address	189	210	50	1
Subnet Mask (/18)	255	255	192	0
IP Address Binary	1011 1101	1101 0010	0011 0010	0000 0001
Subnet Mask (/18) Binary	1111 1111	1111 1111	1100 0000	0000 0000
Network Address (ANDing)	1011 1101	1101 0010	0000 0000	0000 0000
Network Address Decimal	189	210	0	0
Broadcast Address (1/18) Binary	1011 1101	1101 0010	0011 1111	1111 1111
Broadcast Address (1/18) Decimal	189	210	63	255

**Question 8:** 193.100.77.8/24

IP Address	193	100	77	8
Subnet Mask (/24)	255	255	255	0
IP Address Binary	1100 0001	0110 0100	0100 1101	0000 1000
Subnet Mask (/24) Binary	1111 1111	1111 1111	1111 1111	0000 0000
Network Address (ANDing)	1100 0001	0110 0100	0100 1101	0000 0000
Network Address Decimal	193	100	77	0
Broadcast Address (1/24) Binary	1100 0001	0110 0100	0100 1101	1111 1111
Broadcast Address (1/24) Decimal	193	100	77	255



## IPv4 Addressing

### Question 1: What is an "octet"?

#### Answer:

An octet is a unit of digital information that consists of 8 bits. In networking and computing, the term "octet" is often used instead of "byte" because it clearly indicates that there are 8 bits, whereas the size of a byte can vary in different systems.

### Question 2: How many bits there are in 1 octet?

#### Answer:

1 octet = 8 bits

### Question 3: Name and state the function of these addresses?

- 127.0.0.1/8 –
- 169.254.0.1/16 -

#### Answer:

##### 127.0.0.1/8:

- **Function:** This is the **loopback address**. It is used to test network software without physically sending any packets over a network. It refers to the local computer or device you're using. The /8 indicates that the first 8 bits (or the first octet) represent the network portion of the IP address.

##### 169.254.0.1/16:

- **Function:** This address falls within the range of **APIPA (Automatic Private IP Addressing)**. When a device cannot obtain an IP address from a DHCP server, it automatically assigns itself an address in the range 169.254.0.0 to 169.254.255.255. The /16 indicates that the first 16 bits (or the first two octets) represent the network portion of the IP address.

### Question 4: What is a Classful addressing scheme?

#### Answer:

**Classful addressing** is a method of allocating IP addresses based on predefined classes (A, B, C, D, E) in the IPv4 system. Each class has a fixed range of IP addresses and a fixed number of bits for the network and host portions.

- **Class A:** 0.0.0.0 - 127.255.255.255 (large networks)
- **Class B:** 128.0.0.0 - 191.255.255.255 (medium-sized networks)
- **Class C:** 192.0.0.0 - 223.255.255.255 (small networks)
- **Class D:** 224.0.0.0 - 239.255.255.255 (multicast)
- **Class E:** 240.0.0.0 - 255.255.255.255 (reserved for future use)

**Question 5: Briefly explain why classful addressing wasted many IPv4 addresses?**

**Answer:**

Classful addressing led to waste because it allocated fixed block sizes for each class, regardless of the actual need. For example, a company might receive a Class B address block, which provides 65,536 IP addresses, even if they only needed a few hundred. The remaining addresses would be unused, leading to inefficiency and a rapid depletion of available IPv4 addresses.

**Question 6: What is a Classless addressing scheme?**

**Answer:**

**Classless addressing** (also known as **CIDR - Classless Inter-Domain Routing**) is a method that replaces the rigid class-based system by allowing a more flexible allocation of IP addresses. It uses a variable-length subnet mask (VLSM), which enables more efficient use of IP address space by allowing the division of an IP address space into subnets of varying sizes.

**Question 7: Give 2 examples of classless addressing.**

**Answer:**

**192.168.1.0/24:**

- A common subnet in private networks, where /24 indicates that the first 24 bits are the network portion, leaving 8 bits for host addresses.

**10.0.0.0/8:**

- A large subnet is often used in private networks, where /8 indicates that the first 8 bits are the network portion, leaving 24 bits for host addresses.