

CCNA Tutorial Series
SUBNETTING

This document contains the Course Map For The Interactive flash tutorial at:
<http://www.semsim.com/ccna/tutorial/subnetting/subnetting.html>

[HOME PAGE](#)

Course Objectives

By the end of the course, you should be able to:

- define subnet and subnet masks
- calculate network address
- define private addressing, and finally,
- subnet a network, given a scenario.

[Pre-test](#)

The pre-requisites for the course are:

- Knowledge of Network
- TCP/IP Protocol
- IP Address
- Internet addressing

Adequate knowledge of the above subjects is essential to benefit from the course. We suggest you take a pre-assessment test to see where you stand. If your score greater than or equal to 70%, you can go ahead. If not, brush up the pre-requisites before you commence the course.

Click Next to start the Pre-test. [NEXT](#)

Fill in the blank by clicking on the appropriate choice. Once you have finished, click on Submit.

1. _____ is used to identify the destination machine when transmitting data through the internet.
a. IP Address b. Protocol c. Subnet
2. A collection of terminals, computers, servers and components that allows easy flow of data and use of resources between one another _____.
a. Subnet b. Network c. Gateway

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

-
3. The binary value for 128 is _____.
- a. 10000000 b. 10101010 c. 11111111
4. MAC stands for _____.
- a. Memory Access Card b. Media Access Control c. Macintosh Apple computer
5. NIC stands for _____.
- a. Network Interface Card b. National Informatics Corporation c. Neutral Integrated Circuit
6. 10.1.0.1 is an example of _____.
1. Class A 2. Class B 3. Class C
7. _____ is a default subnet mask for Class A.
- a. 255.255.255.255 b. 10.0.0.0 c. 255.0.0.0
8. For an IP address - 120.6.12.200, the binary value for the network address is _____
- a. 00001111.00000000.00000000.00000000
b. 01111100.00000000.00000000.00000000
c. 11001100.00000000.00000000.00000000
9. _____ is the default mask for Class A network.
- a. 255.0.0.0 b. 255.255.255.0 c. 255.255.0.0 d. 255.255.255.255
10. The maximum decimal value for a byte is 255
- a. True b. False

SECTION I - INTRODUCTION TO SUBNET

Page 1 of 7

Scenario

- Imagine an organization that has 500 employees connected to a single network.
- Each employee is assigned a unique IP address.
- There is no security built in.
- All the employees use the network for both official and personal use.

Page 2 of 7

Scenario

The result

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

-
- ❑ Due to heavy transfer of data, the packets become slow resulting in collusion and retransmission.
 - ❑ As there is no security, critical data can be accessed by any employee.

This can be avoided by using SUBNET

Let's see how...

Page 3 of 7

What is subnet?

A portion of a network

- ❑ which may be a physically independent network or
- ❑ which shares a network address with other portions of a bigger network
- ❑ that uses bits from the host portion of the IP address and reserves them to define a subnet address. The more the subnets, the less the bits available for defining hosts.

Page 4 of 7

Why Subnet?

- ❑ To better control network traffic (all nodes on a segment on an Ethernet network view all the packets transmitted by all other nodes on that segment).
- ❑ To allow the flow of network traffic between hosts to be segregated, based on a network configuration.
- ❑ To regulate IP traffic.
- ❑ To improve network security and performance by organizing hosts into logical groups.

Page 5 of 7

How to subnet?

- ❑ Routers are used between different networks or subnets to control the flow of data or packets.
- ❑ A Router is nothing but a hardware network device that transmits data based on preset conditions of transmission and security.

Page 6 of 7

Check your understanding

1. Why do you need subnet?
 - a. To regulate IP Traffic and improve security

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- b. To preserve address space
- c. To create more IP address
- d. All the above

[Page 7 of 7](#)

[Check your understanding](#)

- 2. Subnets organize the hosts into logical groups.
 - a. True
 - b. False

[SECTION 2: SUBNET MASK](#)

[Page 1 of 9](#)

[Introduction](#)

There are three default subnet masks:

- ❑ Class A 255.0.0.0 - 11111111.00000000.00000000.00000000.
Represents: Network.Host.Host.Host
- ❑ Class B 255.255.0.0 - 11111111.11111111.00000000.00000000.
Represents: Network.Network.Host.Host
- ❑ Class C 255.255.255.0 - 11111111.11111111.11111111.00000000.
Represents: Network.Network.Network.Host

[Page 2 of 9](#)

[Introduction](#)

- ❑ Based on network configuration, subnet the network which divides the network into logical groups
- ❑ Apply a subnet mask to an IP address to identify the network and host parts of the address

[Page 3 of 9](#)

[Example](#)

- ❑ The network bits are represented by the 1s in the mask
- ❑ The host bits are represented by the 0s in the mask
- ❑ The result of a bit-wise logical 'AND' operation between the IP address and the subnet mask is a Network Address or Number or Subnet Address

[Page 4 of 9](#)

[Default Subnet Marks](#)

There are three default subnet masks

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

-
- ❑ Class A
 - 255.0.0.0 - 11111111.00000000.00000000.00000000
Represents: Network.Host.Host.Host
 - ❑ Class B
 - 255.255.0.0 - 11111111.11111111.00000000.00000000
Represents: Network.Network.Host.Host
 - ❑ Class C
 - 255.255.255.0 - 11111111.11111111.11111111.00000000
Represents: Network.Network.Network.Host

[Page 5 of 9](#)

[Example](#)

Using the IP address 140.130.240.200 and the default Class B subnet mask

We get:

- ❑ 10001100.10000010.11110000.11001000 140.130.240.200 Class B IP Address
- ❑ 11111111.11111111.00000000.00000000 255.255.000.000 Default Class B Subnet Mask
- ❑ 10001100.10000010.00000000.00000000 140.130.000.000 Network Address

[Page 6 of 9](#)

[Private Subnets](#)

- ❑ There are three IP network addresses reserved for private networks.
 - 10.0.0.0/8
 - 172.16.0.0/12 and
 - 192.168.0.0/16
- ❑ These can be used by anyone setting up internal IP networks
 - Labs, Homes, LANs behind a NAT or proxy server or router
- ❑ They are always safe to use because routers on the Internet will never forward packets coming from these addresses.

[Page 7 of 9](#)

[Check your understanding](#)

1. What is the network address for the IP address 12.10.200.100?

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- a. 12.10.0.0 b. 12.0.0.0 c. 12.10.200.0.

[Page 8 of 9](#)

[Check your understanding](#)

2. What is the default subnet mask for class b address?
 a. 255.0.0.0 b. 255.255.255.0 c. 255.255.0.0

[Page 9 of 9](#)

[Check your understanding](#)

3. Which of these is a private IP address?
 a. 10.0.0.0/8
 b. 172.16.0.0/12
 c: 192.168.0.0/16
 d: All of the above

SECTION 3: PROCESS

Customizing Subnets

[Page 1 of 15](#)

The TCP/IP packet uses 32 bits to contain the IP address.

- It is made up of a network and host address (Net ID and Host ID).
- The more bits used for network address, the fewer remain for hosts.
- Certain high-order bits identify class types and some numbers are reserved.

Class	Class Numbers	Maximum Networks	Maximum Hosts	bits in.....		First Octet	Most Significant Bits
				Net ID	Host ID		
A	1 - 127	127	16,777,214	7	24	1-127	0
B	128 - 191	16,383	65,534	14	16	128-191	10
C	192 - 223	2,097,151	254	21	8	192-223	110

Details of the Maximum network & host calculation of this table follow.

[Page 2 of 15](#)

Customizing Subnets

The TCP/IP packet uses 32 bits to contain the IP address

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

Classes	Total Number of Network per Class (Assignable only)	Network
Class A	01111111.00000000.00000000.00000000 = 2 to the 7th power = 126	Net.H.H.H
Class B	10111111.11111111.00000000.00000000 = 2 to the 14th power = 16,384	Net.Net.H.H
Class C	11011111.11111111.11111111.00000000 = 2 to the 21st power = 2,097,152	Net.Net.Net.H

[Page 3 of 15](#)

Customizing Subnets

Calculating Total Number of Hosts

Classes	Total Number of Host per Class (Assignable only)	Network
Class A	00000000.11111111.11111111.11111111 = 2 to the 24th power - 2 = 16,777,214	x.255.255.255
Class B	00000000.00000000.11111111.11111111 = 2 to the 16th power - 2 = 65,534	x.y.255.255
Class C	00000000.00000000.00000000.11111111 = 2 to the 8th power - 2 = 254	x.y.z.255

[Page 4 of 15](#)

Customizing Subnets

Understanding Powers Of 2

As seen in previous tables powers of 2 play a critical role for using IP subnets. The following are the powers of 2 that you should be aware of:

2 to the 1st power	=	2
2 to the 2nd power	=	4
2 to the 3rd power	=	8
2 to the 4th power	=	16
2 to the 5th power	=	32
2 to the 6th power	=	64
2 to the 7th power	=	128
2 to the 8th power	=	256

[Page 5 of 15](#)

Calculating number of subnets & hosts

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit **SemSim Learning Center** at:

<http://www.SemSim.com/>

The number of subnets can be calculated by:

- Using the formula $(2^n - 2)$ where n = number of masked bits in subnet field n is the number of 1's in the octet for that class that is available for subnetting.

Class A	Look at last 3 octet
Class B	Look at last 2 octet
Class C	Look at last octet

To calculate n :

The number of nodes/hosts can be calculated by:

- Using the formula $(2^y - 2)$ where y = number of off bits in host field
- y = Bits available for subnetting - n

Class A	24- n
Class B	16- n
Class C	8- n

To calculate y :

[Page 6 of 15](#)

[Calculating number of subnets & hosts](#)

Class A = Total 24 bits to use for subnetting

Bits (n)	Subnets ($2^n - 2$)	Subnets (Decimal)	Hosts Per ($2^{(24-n)} - 2$)	Hosts Per (Decimal)	Slash (Notation)	Masks (Decimal)	Sub (Slice)
1	$(2^1) - 2$	2-2=0	$(2^{23}) - 2$	8,388,606	/9	255.128.0.0	Subnet 0
2	$(2^2) - 2$	4-2=2	$(2^{22}) - 2$	4,194,302	/10	255.192.0.0	Sub 1/7
3	$(2^3) - 2$	8-2=6	$(2^{21}) - 2$	2,097,150	/11	255.224.0.0	Sub 2/7
4	$(2^4) - 2$	16-2=14	$(2^{20}) - 2$	1,048,574	/12	255.240.0.0	Sub 3/7
5	$(2^5) - 2$	32-2=30	$(2^{19}) - 2$	524,286	/13	255.248.0.0	Sub 4/7
6	$(2^6) - 2$	64-2=62	$(2^{18}) - 2$	262,142	/14	255.252.0.0	Sub 5/7
7*	$(2^7) - 2$	128-2=126	$(2^{17}) - 2$	131,070	/15	255.254.0.0	Sub 6/7
8*	$(2^8) - 2$	256-2=254	$(2^{16}) - 2$	65,534	/16	255.255.0.0	Sub 7/7

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit **SemSim Learning Center** at:

<http://www.SemSim.com/>

Page 7 of 15

Calculating number of subnets & hosts

Class B = Total 16 bits to use for subnetting

Bits	Subnets	Subnets	Hosts Per	Hosts Per	Slash	Masks	Sub
(n)	$(2^n - 2)$	(Decimal)	$(2^{(16-n)} - 2)$	(Decimal)	(Notation)	(Decimal)	(Slice)
1	$(2^1) - 2$	2-2=0	$(2^{15}) - 2$	32,766	/17	255.255.128.0	Subnet 0
2	$(2^2) - 2$	4-2=2	$(2^{14}) - 2$	16,382	/18	255.255.192.0	Sub 1/7
3	$(2^3) - 2$	8-2=6	$(2^{13}) - 2$	8,190	/19	255.255.224.0	Sub 2/7
4	$(2^4) - 2$	16-2=14	$(2^{12}) - 2$	4,094	/20	255.255.240.0	Sub 3/7
5	$(2^5) - 2$	32-2=30	$(2^{11}) - 2$	2,046	/21	255.255.248.0	Sub 4/7
6	$(2^6) - 2$	64-2=62	$(2^{10}) - 2$	1,022	/22	255.255.252.0	Sub 5/7
7*	$(2^7) - 2$	128-2=126	$(2^9) - 2$	510	/23	255.255.254.0	Sub 6/7
8*	$(2^8) - 2$	256-2=254	$(2^8) - 2$	254	/24	255.255.255.0	Sub 7/7

Page 8 of 15

Calculating number of subnets & hosts

Class C = Total 8 bits to use for subnetting

Bits	Subnets	Subnets	Hosts Per	Hosts Per	Slash	Masks	Sub
(n)	$(2^n - 2)$	(Decimal)	$(2^{(8-n)} - 2)$	(Decimal)	(Notation)	(Decimal)	(Slice)
1	$(2^1) - 2$	2-2=0	$(2^7) - 2$	0	/25	255.255.255.128	Subnet 0
2	$(2^2) - 2$	4-2=2	$(2^6) - 2$	62	/26	255.255.255.192	Sub 1/7
3	$(2^3) - 2$	8-2=6	$(2^5) - 2$	30	/27	255.255.255.224	Sub 2/7
4	$(2^4) - 2$	16-2=14	$(2^4) - 2$	14	/28	255.255.255.240	Sub 3/7
5	$(2^5) - 2$	32-2=30	$(2^3) - 2$	6	/29	255.255.255.248	Sub 4/7
6	$(2^6) - 2$	64-2=62	$(2^2) - 2$	2	/30	255.255.255.252	Sub 5/7

Page 9 of 15

Practical Tips

Broadcast address = the number before the next subnet. It consists of all host bits turned on.

256 - subnet mask = base number or first subnet (add this number to itself to find remaining subnets)

Valid hosts = Numbers between subnets excluding all 0's and all 1's

Page 10 of 15

Restrictions

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- ❑ Node addresses of all "0"s and all "1"s are reserved for specifying the local network (when a host does not know it's network address) and all hosts on the network (broadcast address), respectively.
- ❑ This also applies to subnets.
 - A subnet address cannot be all "0"s or all "1"s.
 - This also implies that a 1-bit subnet mask is not allowed.
- ❑ This restriction is required because older standards enforced this restriction.

Recent standards that allow use of these subnets have superseded these standards, but many "legacy" devices do not support the new standards. If you are operating in a controlled environment, such as a lab, you can safely use these restricted subnets.
Certification exam assumes subnet address cannot be all "0"s or all "1"s, hence the formula $2^n - 2$

[Page 11 of 15](#)

Example

If you have been assigned a Class C network number of 200.133.175.0, with the help of subnetting, you can divide the network into multiple groups within the organization and achieve the advantage of traffic isolation and security.

Let's break the network into 14 subnets of 14 nodes each, which limits us to 196 nodes.

To accomplish this, we need to use a subnet mask 4 bits long.

Recall the default Class C subnet mask
255.255.255.0 (11111111.11111111.11111111.00000000 binary)

Extending this by 4 bits yields a mask of
255.255.255.240 (11111111.11111111.11111111.11110000 binary)

[Page 12 of 15](#)

Example

This gives us 16 possible network numbers, 2 of which cannot be used:

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

Subnet bits	Network Number	Node Addresses	Broadcast Address
0000	200.133.175.0	Reserved	None
0001	200.133.175.16	.17 thru .30	200.133.175.31
0010	200.133.175.32	.33 thru .46	200.133.175.47
0011	200.133.175.48	.49 thru .62	200.133.175.63
0100	200.133.175.64	.65 thru .78	200.133.175.79
0101	200.133.175.80	.81 thru .94	200.133.175.95
0110	200.133.175.96	.97 thru .110	200.133.175.111
0111	200.133.175.112	.113 thru .126	200.133.175.127
1000	200.133.175.128	.129 thru .142	200.133.175.143
1001	200.133.175.144	.145 thru .158	200.133.175.159
1010	200.133.175.160	.161 thru .174	200.133.175.175
1011	200.133.175.176	.177 thru .190	200.133.175.191
1100	200.133.175.192	.193 thru .206	200.133.175.207
1101	200.133.175.208	.209 thru .222	200.133.175.223
1110	200.133.175.224	.225 thru .238	200.133.175.239
1111	200.133.175.240	Reserved	None

[Page 13 of 15](#)

[Check your understanding](#)

1. What is the maximum number of subnets that can be assigned to networks when using the address 131.107.0.0 with a subnet mask of 255.255.240.0?
- a. 16 b. 32 c. 30 d. 14

[Page 14 of 15](#)

[Check your understanding](#)

2. Using the address 192.64.10.0/28 how many subnets and hosts are available?
- a. 62 networks and 2 hosts
b. 6 networks and 30 hosts
c. 8 networks and 32 hosts
d. 16 networks and 16 hosts
e. 14 networks and 14 hosts

[Page 15 of 15](#)

[Check your understanding](#)

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

3. Given an IP address of 131.107.2.160 and a subnet mask of 255.255.255.192, to which subnet does the host belong?

- a. 131.107.2.32
- b. 131.107.2.64
- c. 131.107.2.96
- d. 131.107.2.128
- e. 131.107.2.192

SECTION 4: CIDR

Classless InterDomain Routing - CIDR

Page 1 of 10

Disadvantages of 'Classful' subnet

The classful address system of allocating IP addresses can be very wasteful:

- a. If somebody needs more than 254 hosts, were automatically given a class B address block, which consist of 65533 host addresses. Most of them are simply not used.
- b. Companies and organizations were allocated Class A address blocks of over 16 million host addresses.
- c. Only a tiny percentage of the allocated Class A and Class B address space has ever been actually assigned to a host computer on the Internet.

Page 2 of 10

A Better Alternative

- By eliminating the Class system, addresses can be conserved.
- Accurately allocating only the amount of address space that is actually needed to address can avoid space crisis for many years.

Page 3 of 10

Supernetting

- First proposed in the year 1992.
- The classful subnet masks were extended so that a network address and subnet mask could specify multiple Class C subnets with one address.
- If the IP networks are contiguous, you may be able to use a supernet.
- It is the reverse of subnetting.

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- ❑ Motivation is that although the Internet is running out of Class B addresses, there are still Class C addresses available. With supernetting it is possible to combine multiple Class C addresses into the equivalent of a Class B.

[Page 4 of 10](#)

Classless InterDomain Routing

- ❑ CIDR was invented to keep the Internet from running out of IP addresses.
- ❑ Under CIDR, the subnet mask notation is simplified, listing only 1s bits that start the mask.
- ❑ The use of a CIDR notated address is the same as for a Classful address. Classful addresses can easily be written in CIDR notation (Class A = /8, Class B = /16, and Class C = /24).

[Page 5 of 10](#)

Example

If I need about 1000 addresses, I could supernet 4 Class C networks together:

192.60.128.0	(11000000.00111100.10000000.00000000)	Class C subnet address
192.60.129.0	(11000000.00111100.10000001.00000000)	Class C subnet address
192.60.130.0	(11000000.00111100.10000010.00000000)	Class C subnet address
192.60.131.0	(11000000.00111100.10000011.00000000)	Class C subnet address
192.60.128.0	(11000000.00111100.10000000.00000000)	Supernetted Subnet address
255.255.252.0	(11111111.11111111.11111100.00000000)	Subnet Mask
192.60.131.255	(11000000.00111100.10000011.11111111)	Broadcast address

[Page 6 of 10](#)

Example

In this example,

- ❑ The subnet 192.60.128.0 includes all the addresses from 192.60.128.0 to 192.60.131.255.
- ❑ In the binary representation of the subnet mask, the Network portion of the address is 22 bits long, and the host portion is 10 bits long.

[Page 7 of 10](#)

Example

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

CIDR notation

- ❑ Instead of writing the address and subnet mask as 192.60.128.0 and 255.255.252.0 respectively, the network address can be written simply as 192.60.128.0/22
- ❑ such a number indicates starting address of the network, and number of 1s bits (22) in the network portion of the address.
- ❑ Look at the subnet mask in binary to see how this notation works.
11111111.11111111.11111100.00000000

Page 8 of 10

Conclusion

- ❑ Currently, it is almost impossible for an individual or company to be allocated their own IP address blocks.
- ❑ 10 years ago, there were less than 5000 network routes in the entire Internet.
- ❑ Today, there are over 100,000.
- ❑ Using CIDR, the biggest ISPs are allocated large chunks of address space (usually with a subnet mask of /19 or even smaller);
- ❑ The ISP's customers (often other, smaller ISPs) are then allocated networks from the bigger ISP's pool.
- ❑ Due to this, all the big ISP's customers (and their customers, and so on) are accessible via 1 network route on the Internet.

Page 9 of 10

Check your understanding

1. What is the total number of hosts in Class B address?
 - a. 65533
 - b. 17000
 - c. 65000

Page 10 of 10

Check your understanding

2. What is the total number of network id available in Class A?
 - a. 1600000
 - b. 126
 - c. 255

Answer : B.126

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

POST-ASSESSMENT

In this post-test, you will have the opportunity to check your understanding of the material covered in the various lessons of this course.

Once you start the test, you will not be able to access the lessons.

If you wish to review any of the lessons, before you take this test, please click on [HOME](#).

You will get your final score after answering all the questions in the test.

If you are ready to get started, click [NEXT](#) to begin.

1. What is the network address for a host with the IP address 123.200.8.68/28 ?

- a. 123.200.8.0
- b. 1231.200.8.32
- c. 123.200.8.64
- d. 123.200.8.65
- e. 123.200.8.31
- f. 123.200.8.1

2. If you take a dotted-decimal class A IP address such as 10.0.0.1 and convert the first octet to binary, which of the following is the correct bit pattern for the first octet?

- a. 0xxxxxxx
- b. 10xxxxxx
- c. 110xxxxx
- d. 1110xxxx
- e. 11110xxx

3. Which of the following hardware devices can be used to segment your network?

- a. Repeater
- b. Switch
- c. Router
- d. Media converter

4. Using a Class C address range 192.168.21.12, your network needs twenty-eight subnets. Which subnet mask should you use?

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- a. 255.255.0.28
- b. 255.255.255.0
- c. 255.255.255.28
- d. 255.255.255.248
- e. 255.255.255.252

5. You have been assigned a Class C network address. Your manager has asked you to create 30 subnets with at least 5 hosts per subnet for the different departments in your organization. What should the subnet mask be to create 30 subnets?

- a. 255.255.255.248
- b. 255.255.255.242
- c. 255.255.255.148
- d. 255.255.255.255

6. Your ISP has provided you the following Class B network range 131.107.0.0/24. Which of the following statements is true regarding this network? (Choose any two.)

- a. There are 254 usable hosts per subnet
- b. There is one usable network
- c. There are 255 usable hosts per subnet
- d. There are 254 usable subnets
- e. There are 30 usable subnets
- f. There are 62 usable hosts per subnet.

Answer: A or D

7. Using the following address and subnet mask 195.106.14.0/24, what is the total number of networks and the total number of host per network?

- a. 1 network with 254 hosts.
- b. 2 networks with 128 hosts.
- c. 4 networks with 64 hosts.
- d. 6 networks with 30 hosts.

8. IP addresses use hierarchical numbering. What portion of the address identifies the network number?

- a. Subnet Mask.
- b. Dots between octets.
- c. Class of first octet.
- d. Assignments of DHCP.
- e. Address Resolution Protocol.

9. Looking at this address 255.255.255.255, which one of the following is true?

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- a. IP, a flooded broadcast.
- b. IP, a directed broadcast.
- c. IPX, a flooded broadcast.

10. What does ISP stand for?

- a. Internet Service for Profit
- b. Internet Site Processing
- c. Internet Service Provider

11. How many USABLE HOST addresses are available on a class B, unsubnetted network?

- a. 2 raised to the 16 power
- b. 2 raised to the 14 power
- c. 2 raised to the 14 power minus 2
- d. 2 raised to the 16 power minus 2

12. How many unique Class B NETWORK addresses are there?

- a. 2 raised to the 16 power
- b. 2 raised to the 14 power
- c. 2 raised to the 14 power minus 2
- d. 2 raised to the 16 power minus 2

13. There are ___ bits in an IP address.

- a. 4
- b. 8
- c. 24
- d. 32

14. In a Class A address where 4 bits have been borrowed for subnetting, ____ bits are left for host addresses.

- a. 24
- b. 20
- c. 16
- d. 4

15. What is the high order bit pattern that all Class B addresses start with in their first octet?

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- a. 01_ _ _ _ _
- b. 10_ _ _ _ _
- c. 1_ _ _ _ _
- d. 0_ _ _ _ _

16. Which of the following assists devices on the same network in determining a packet's final destination?

- a. Host ID
- b. Host protocol
- c. vendor number
- d. source IP address

17. What is the broadcast address of the second usable subnet in Class C where 4 bits were borrowed?

- a. x.x.x.255
- b. x.x.x.47
- c. x.x.x.95
- d. x.x.x.63

18. Every eight bits in an IP address is referred to as ____ ?

- a. Class Address
- b. Octet
- c. Address group
- d. Decimal group

19. The source and destination address appear in an IP packet's ____

- a. Header
- b. Footer
- c. Field
- d. ADRS frame

20. Hosts that reside on a network with the same network ID can communicate directly with each other.

- a. True
- b. False

21. Given a Class A address that has been subnetted (8 bits borrowed), what is the subnet mask?

- a. 255.255.0.0
- b. 255.0.0.0

For interactive version of this tutorial & other free Cisco CCNA certification resources, visit SemSim Learning Center at:

<http://www.SemSim.com/>

- c. 255.240.0.0
- d. 0.0.255.255

22. Using a Class C address you need five subnets with a maximum of 17 hosts on each of these subnets. Which subnet mask would you use?

- a. 255.255.255.192
- b. 255.255.255.224
- c. 255.255.255.240