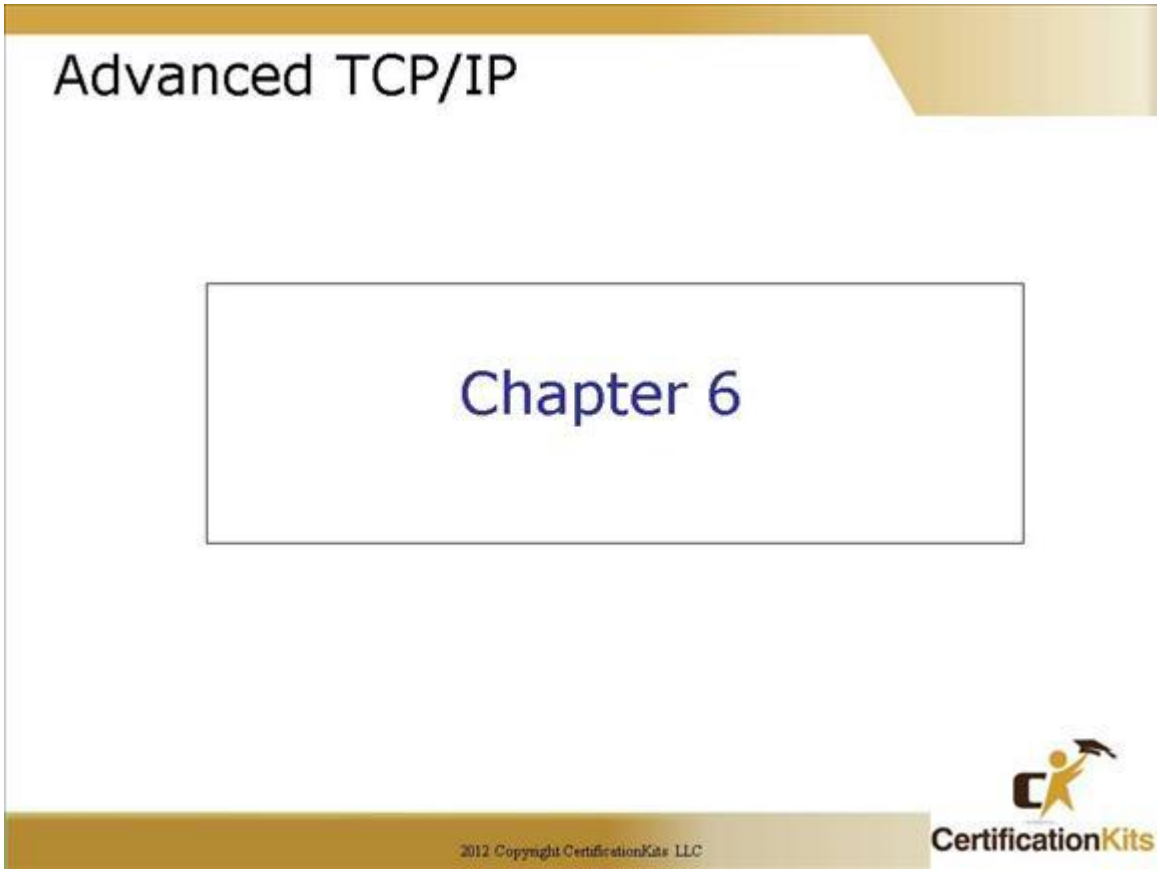
Cisco CCNA Advanced TCP/IP



This chapter will cover the following:

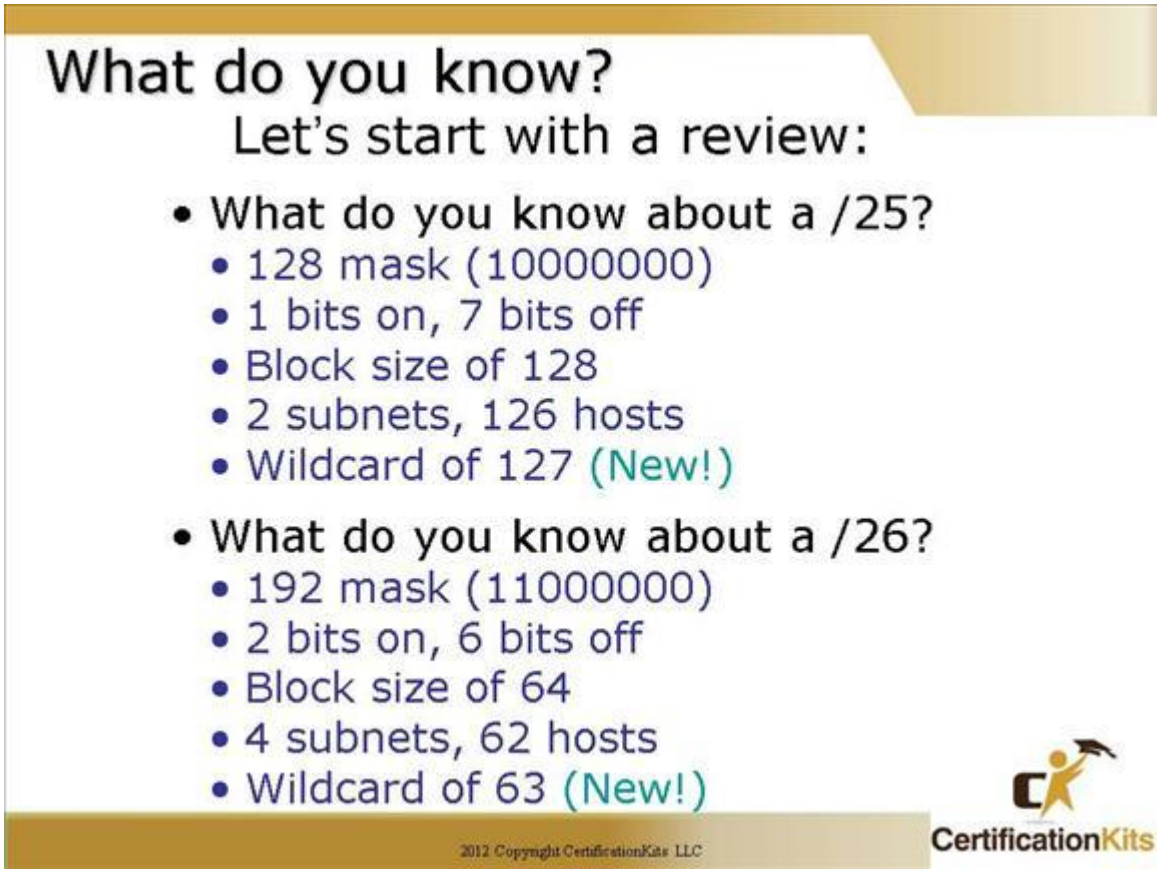
Class C subnetting review

Class B subnetting

VLSM design and implementation

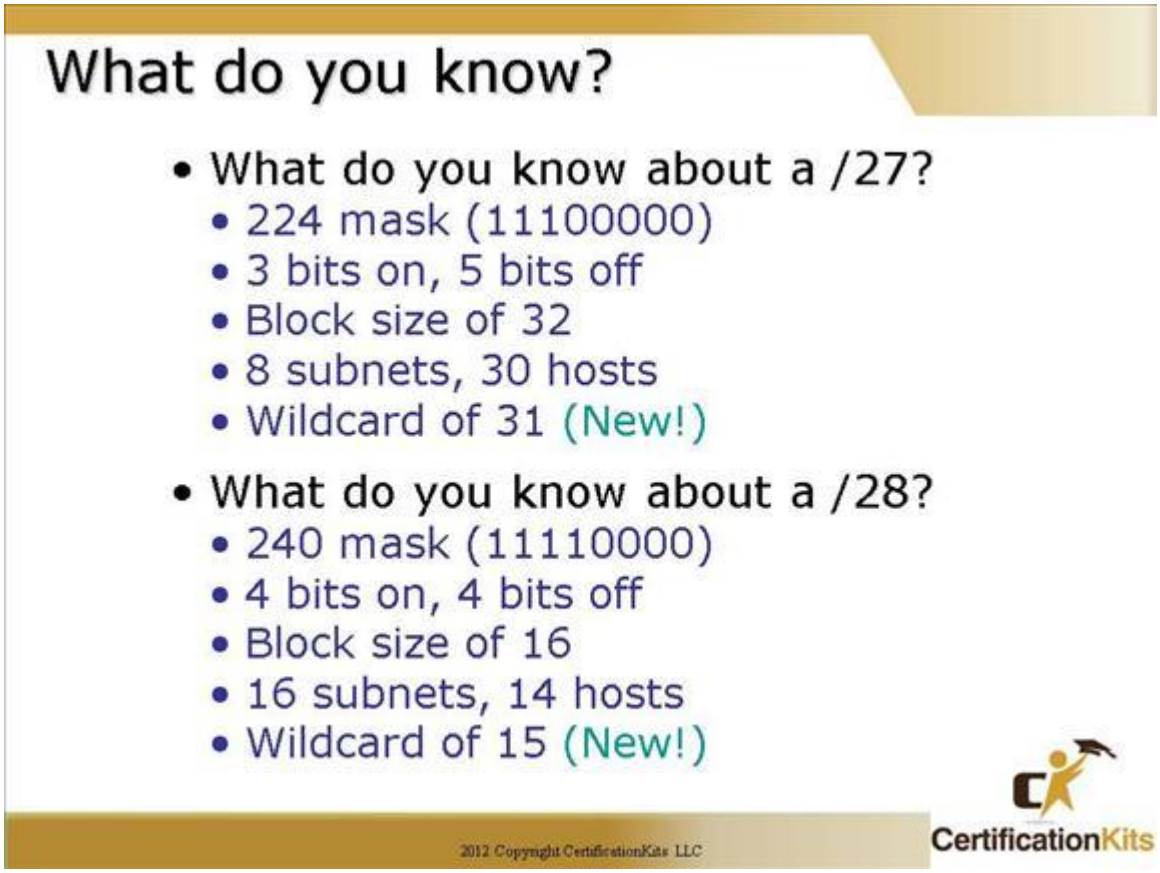
Summarization

Cisco CCNA What Do you Know?

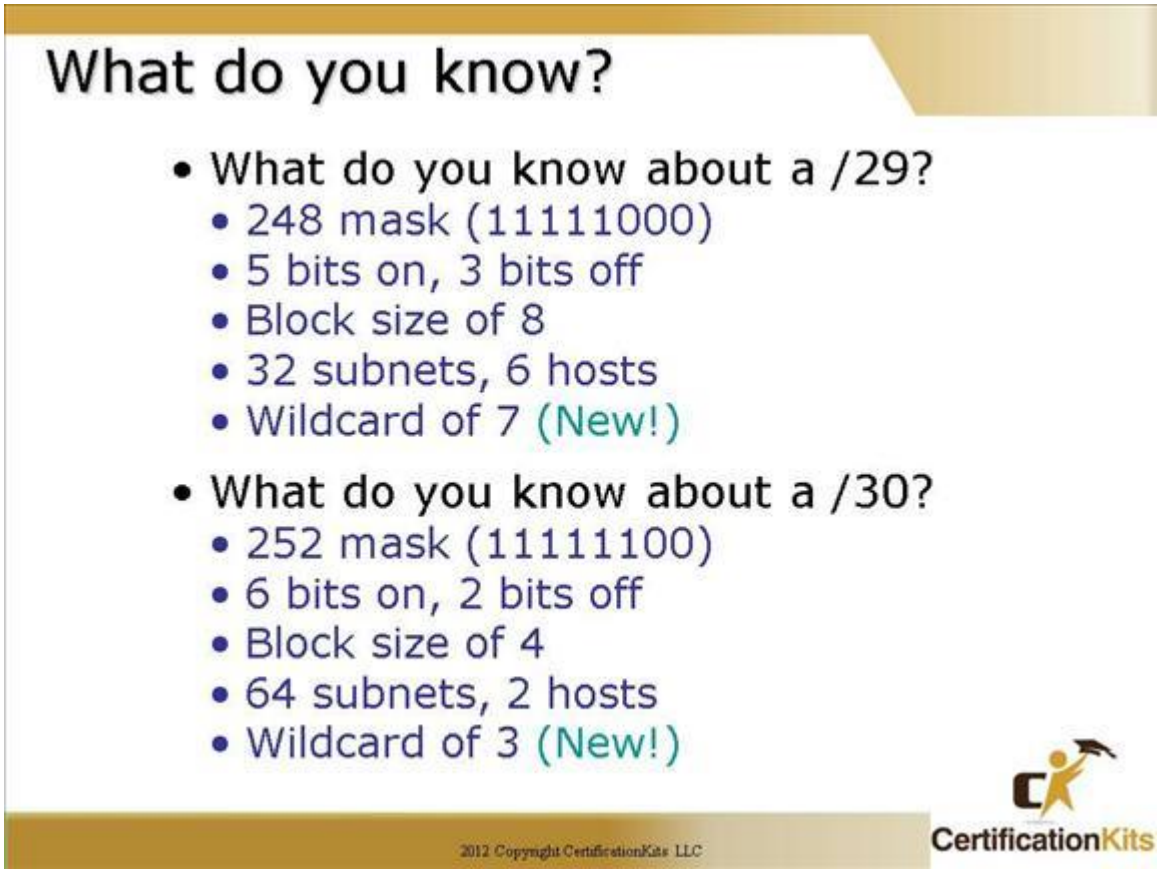


These next few slides are for review purposes, plus notice we now mention the wildcard!

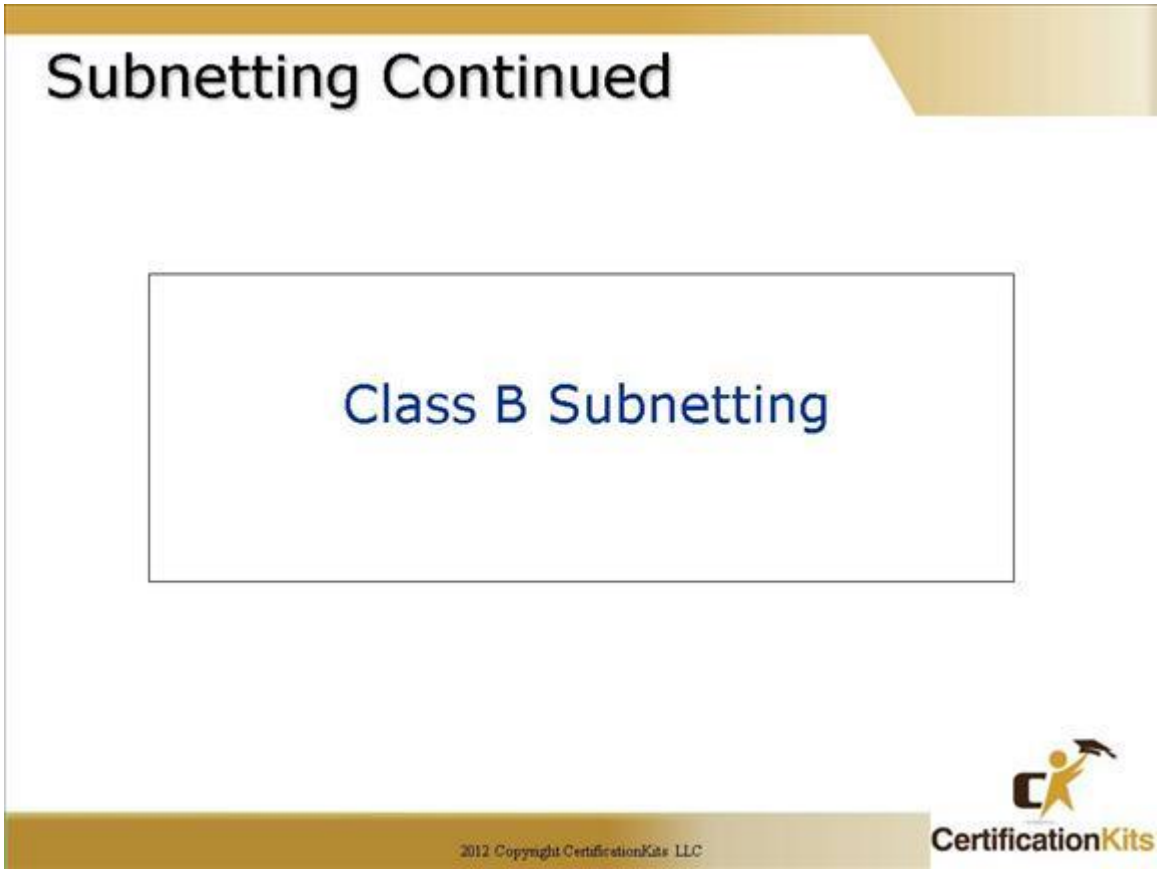
Cisco CCNA What do You know?



Cisco CCNA What do you know?

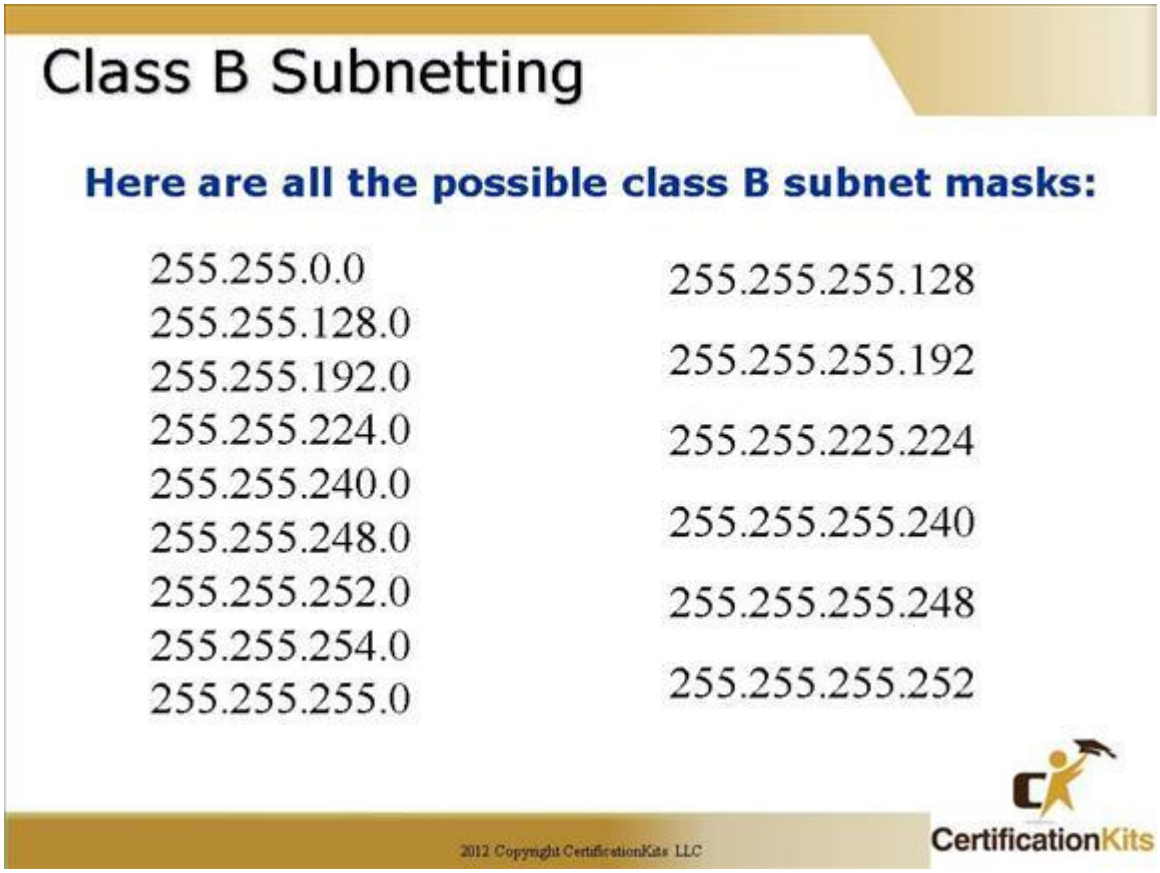


Cisco CCNA Subnetting Continued



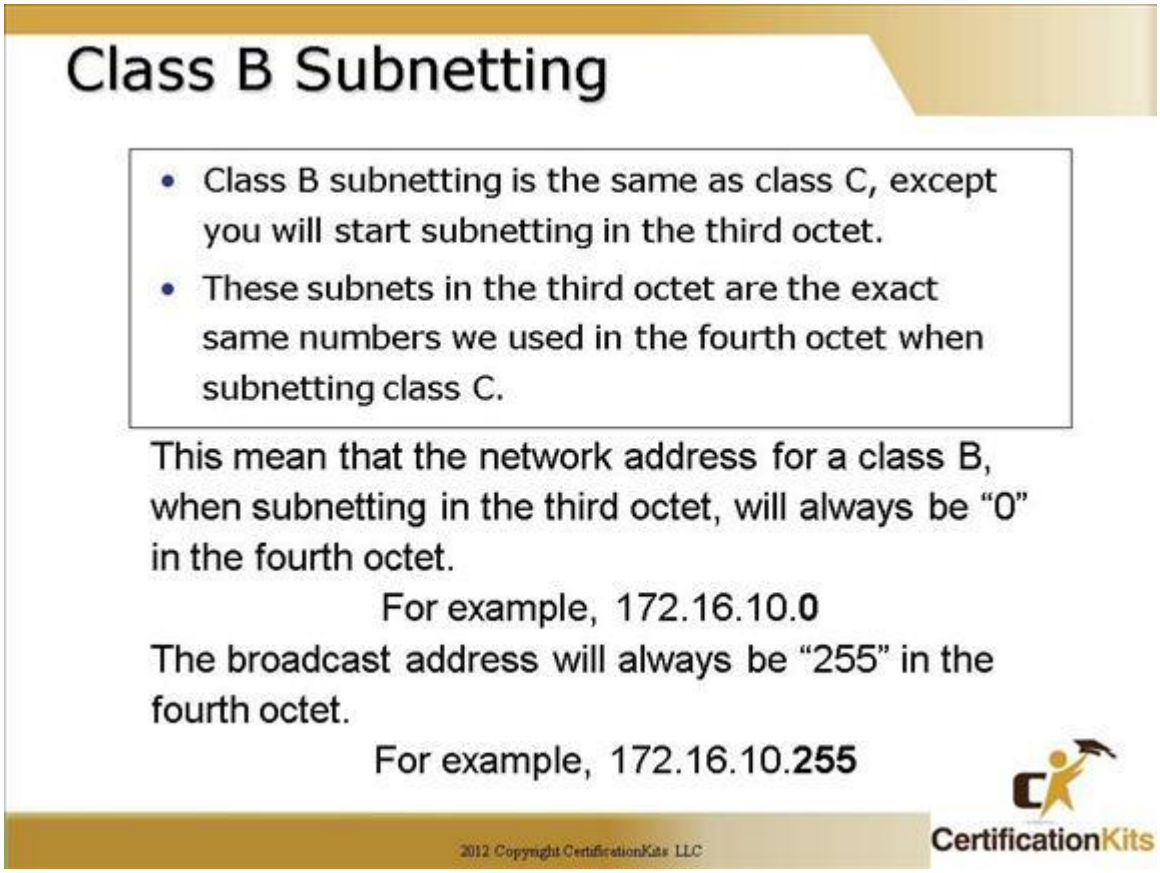
We have already covered Class C subnetting. This section will cover Class B subnetting. The concept is identical other than the subnetting occurs starting in the third octet rather than the fourth octet as it did when subnetting Class C networks.

Cisco CCNA Class B Subnetting



Before we dive into this, let's look at all the possible Class B subnet masks first. Notice that we have a lot more possible subnets than we do with a Class C network address. That is because we can subnet in either the third or fourth octet with a Class B address rather than just the fourth octet with Class C addresses.

Cisco CCNA Class B Subnetting



Let's look at all the possible Class B subnet masks first. Notice that we have a lot more possible subnets than we do with a Class C network address:

255.255.128.0 (/17) 255.255.255.0 (/24)

255.255.192.0 (/18) 255.255.255.128 (/25)

255.255.224.0 (/19) 255.255.255.192 (/26)

255.255.240.0 (/20) 255.255.255.224 (/27)

255.255.248.0 (/21) 255.255.255.240 (/28)

255.255.252.0 (/22) 255.255.255.248 (/29)

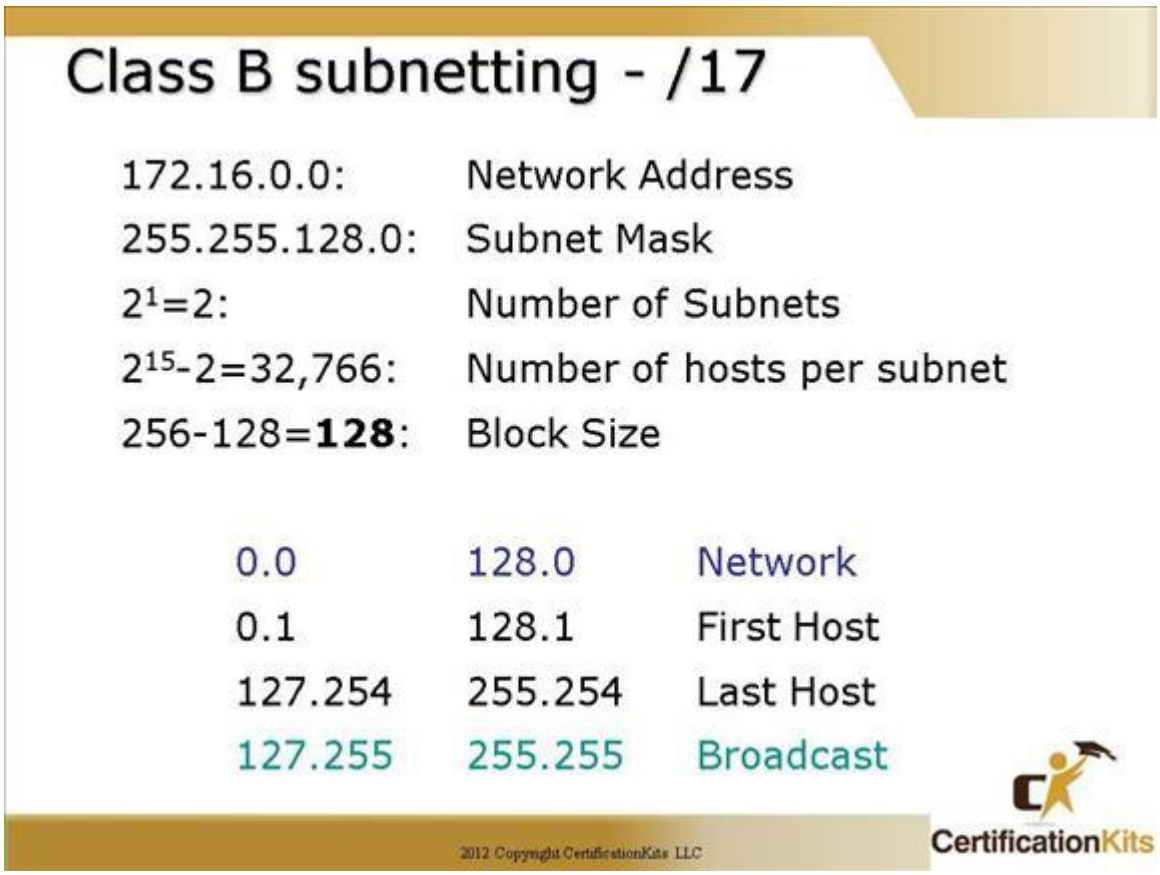
255.255.254.0 (/23) 255.255.255.252 (/30)

We know the Class B network address has 16 bits available for host addressing. This means we can use up to 14 bits for subnetting because we have to leave at least two bits for host addressing.

The process of subnetting a Class B network is pretty much the same as it is for a Class C, except that you just have more host bits.

Use the same subnet numbers you used with Class C, but add a zero to the network portion and a 255 to the broadcast section in the fourth octet.

Cisco CCNA Class B subnetting -/ 17



172.16.0.0 = Network address

255.255.128.0 = Subnet mask

How many subnets?

Since 128 is one bit on (**1**0000000), the answer would be $2^1 = 2$.

How many hosts per subnet? We have 15 host bits off, 7 in the third octet and 8 in the fourth octet. So the equation would be $2^{15} – 2 = 32{,}766$ hosts.

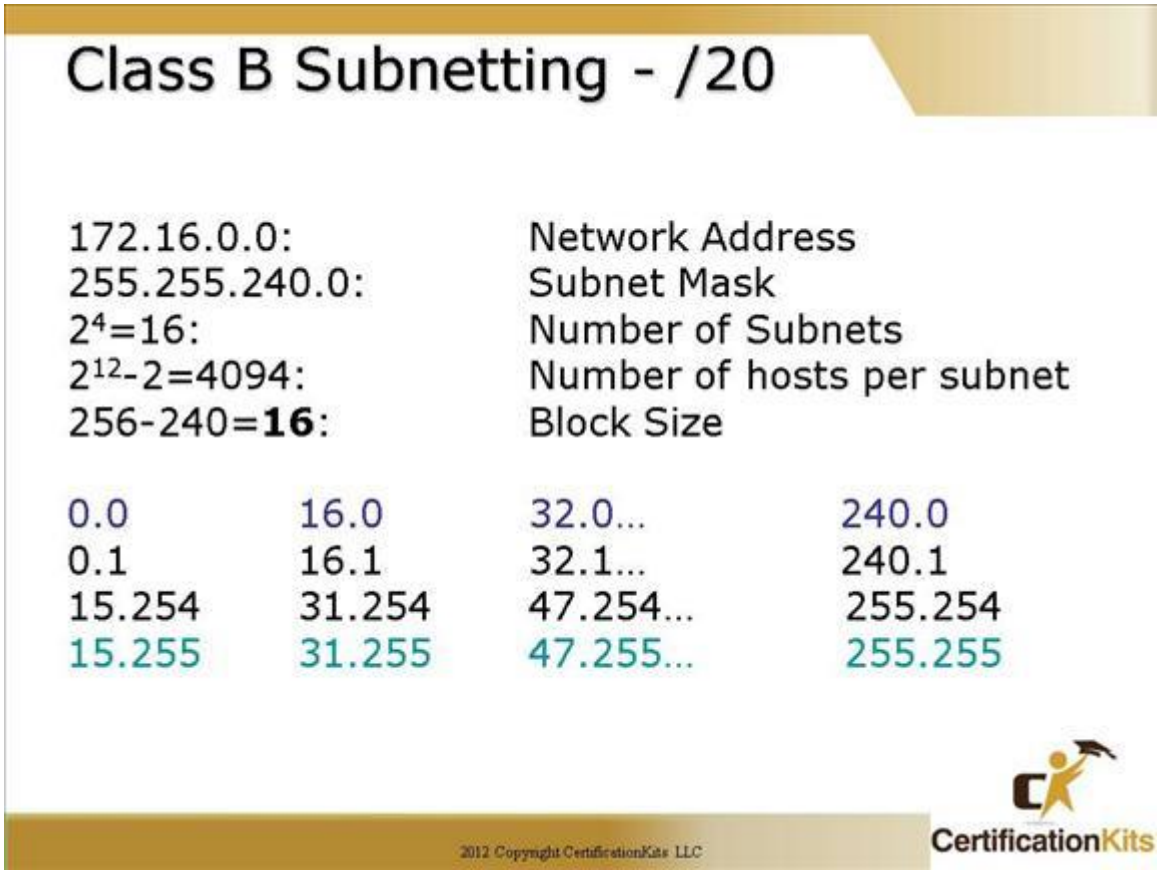
What are the valid subnets? 256 – 128 = 128, which gives us our block size. Start with 0 and keep adding the block size to get our valid subnets.

Our valid subnets are, then, 0 and 128.

What's the broadcast address for each subnet? The number right before the next subnet is all host bits turned on and equals the broadcast address.

What are the valid hosts? These are the numbers between the subnets and the broadcast address. The easiest way to find the hosts is to write out the subnet address and the broadcast address. This way the valid hosts are obvious.

Cisco CCNA Class B Subnetting -/20



172.16.0.0 = Network address

255.255.240.0 = Subnet address

Subnets? $2^4 = 16$.

Hosts? $2^{12} - 2 = 4094$.

Valid subnets? 256 – 240 = 0, 16, 32, 48, etc., up to 224. Notice these are the same numbers as a Class C 240 mask.

Broadcast address for each subnet?

Valid hosts?

172.16.0.0 = Network address

255.255.240.0 = Subnet mask

How many subnets?

Since 240 is four bits on (**1111**0000), the answer would be $2^4 = 16$.

How many hosts per subnet? We have 12 host bits off, 4 in the third octet and 8 in the fourth octet. So the equation would be $2^{12} – 2 = 4094$ hosts.

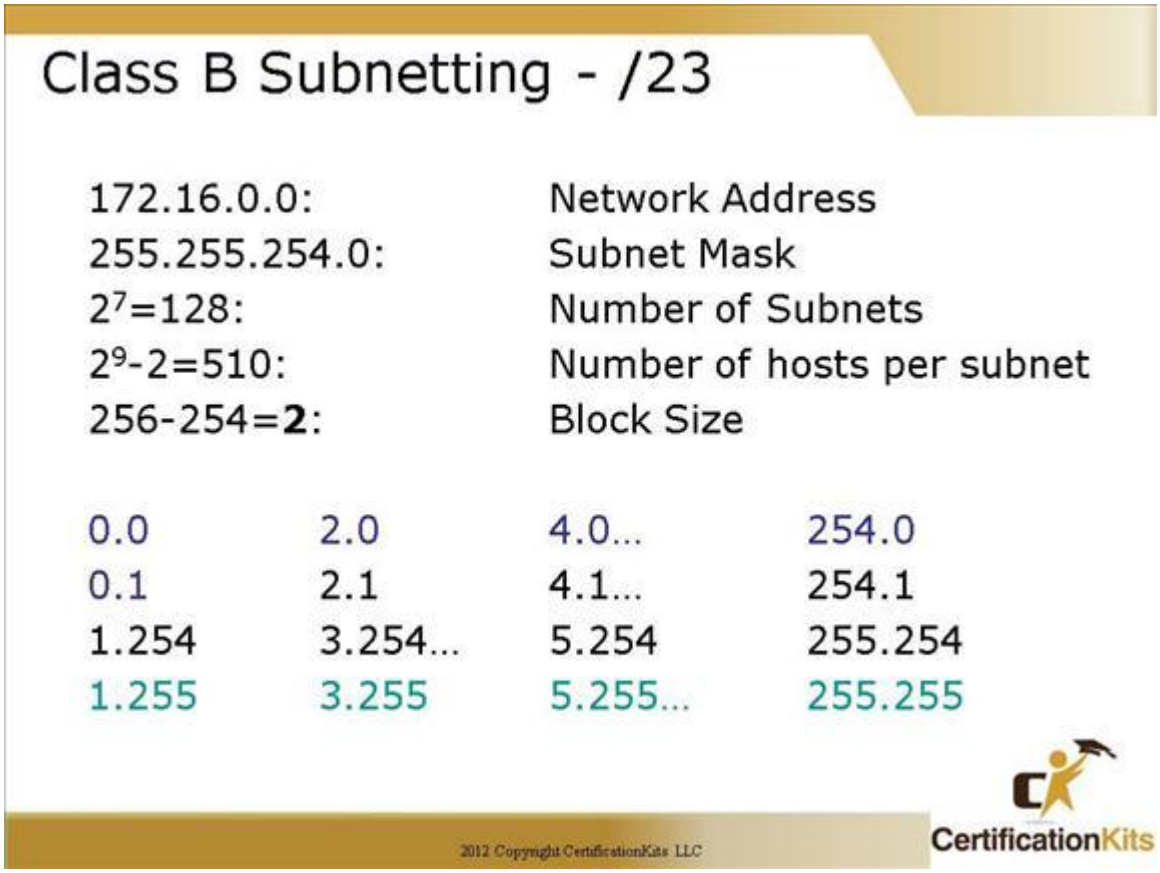
What are the valid subnets? 256 – 240 = 16, which gives us our block size. Start with 0 and keep adding the block size to get our valid subnets.

Our valid subnets are, then, 0, 16, 32, 48, 64, 80, 96, 112, 128, 144, 160, 176, 192, 208, 224 and 240.

What's the broadcast address for each subnet? The number right before the next subnet is all host bits turned on and equals the broadcast address.

What are the valid hosts? These are the numbers between the subnets and the broadcast address. The easiest way to find the hosts is to write out the subnet address and the broadcast address. This way the valid hosts are obvious.

Cisco CCNA Class B Subnetting -/23



172.16.0.0 = Network address

255.255.254.0 = Subnet mask

How many subnets?

Since 254 is seven bits on (**11111110**), the answer would be $2^7 = 128$.

How many hosts per subnet? We have 9 host bits off, 1 in the third octet and 8 in the fourth octet. So the equation would be $2^9 – 2 = 510$ hosts.

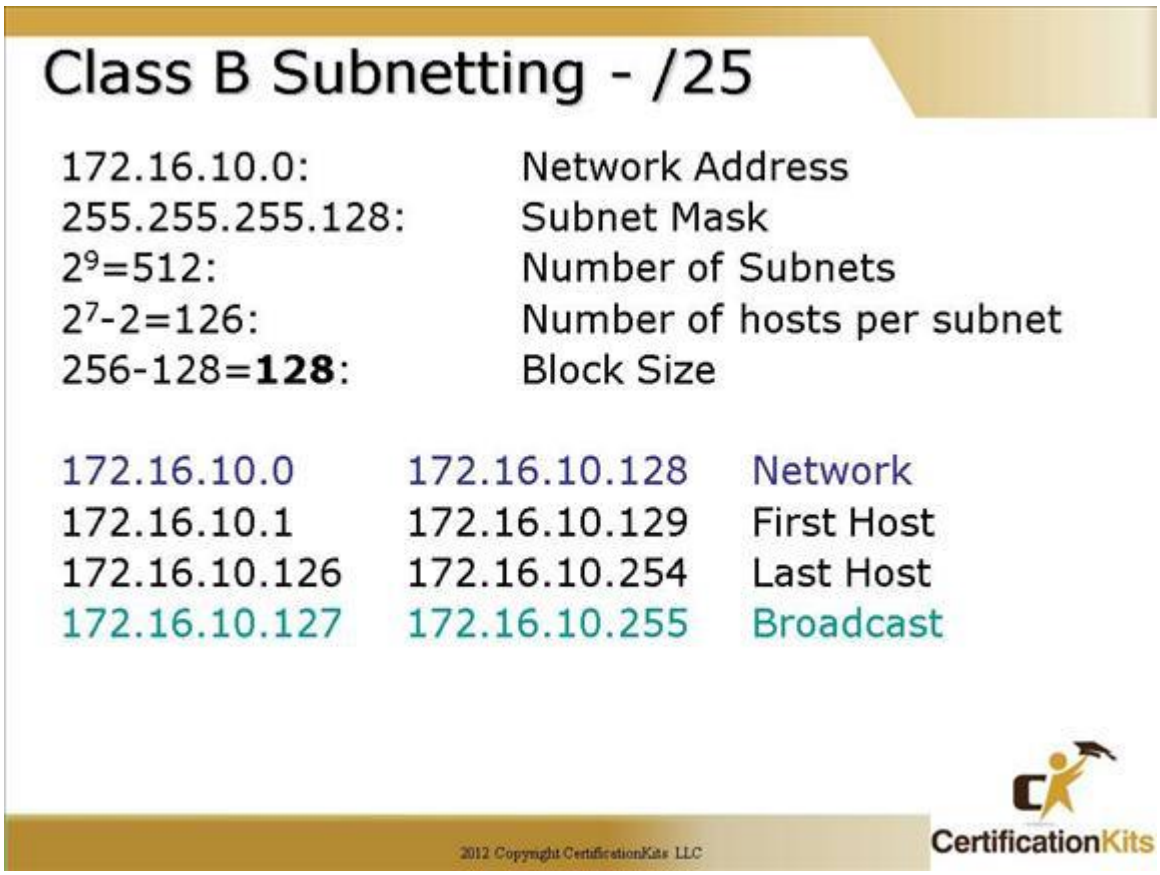
What are the valid subnets? 256 – 254 = 2, which gives us our block size. Start with 0 and keep adding the block size to get our valid subnets.

Our valid subnets are, then, 0, 2, 4, 6, 8, 10 etc. up to 254.

What's the broadcast address for each subnet? The number right before the next subnet is all host bits turned on and equals the broadcast address.

What are the valid hosts? These are the numbers between the subnets and the broadcast address. The easiest way to find the hosts is to write out the subnet address and the broadcast address. This way the valid hosts are obvious.

Cisco CCNA Class B Subnetting -/25



172.16.0.0 = Network address

255.255.255.128 = Subnet mask

How many subnets?

Since 128 is 9 bits on, 8 in the third octet and one in the fourth octet, the answer would be 2^9 = 512.

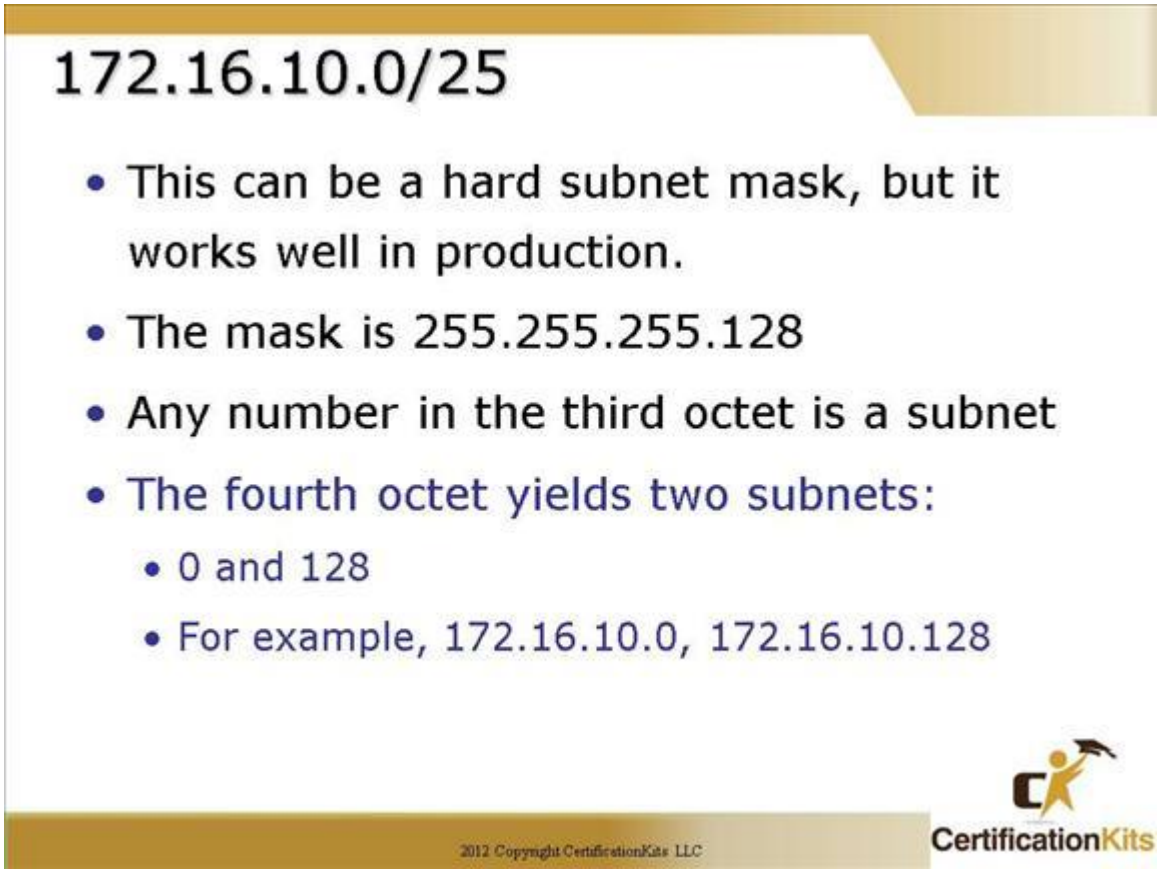
How many hosts per subnet? We have 7 host bits off, all in the fourth octet. So the equation would be $2^7 – 2 = 126$ hosts.

What are the valid subnets?

What's the broadcast address for each subnet? The number right before the next subnet is all host bits turned on and equals the broadcast address.

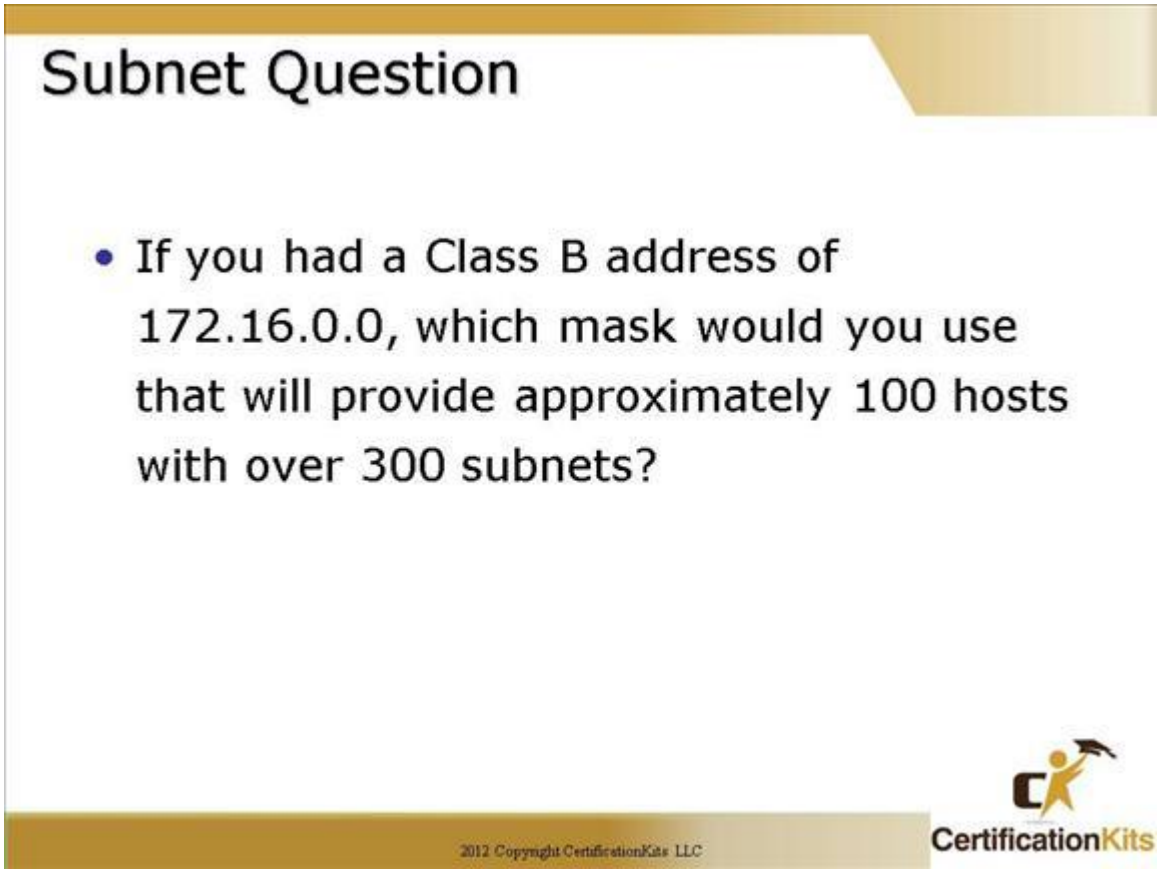
What are the valid hosts? These are the numbers between the subnets and the broadcast address. The easiest way to find the hosts is to write out the subnet address and the broadcast address. This way the valid hosts are obvious.

Cisco CCNA 172.16.10.0/25



This is actually a really good subnet to use in production because it creates over 500 subnets with 126 hosts for each subnet—a nice mixture. So, don't skip over it!

Cisco CCNA Subnet Question



255.255.255.0=256 subnet, 254 hosts

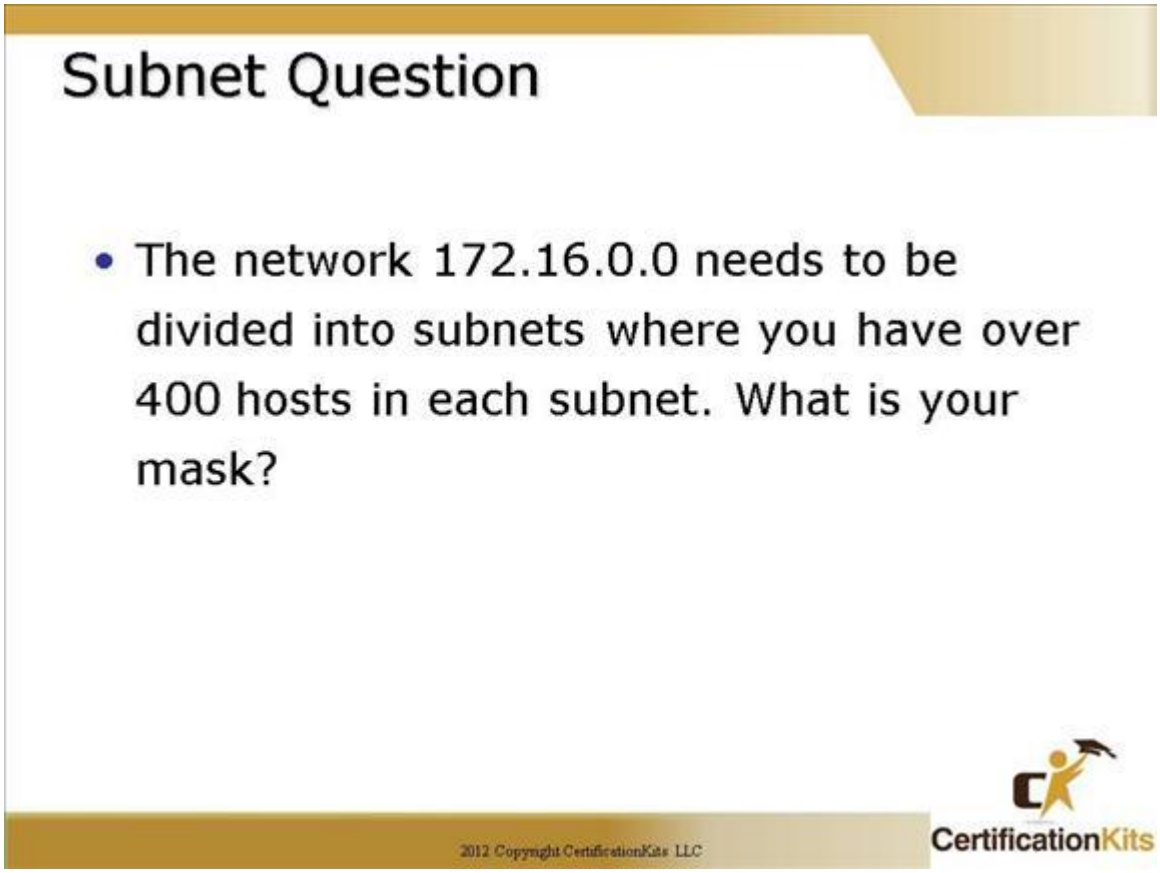
255.255.255.128 =512 subnets, 126 hosts (correct answer)

255.255.255.192=1024 subnets, 62 hosts

Start at 255.255.255.0, which provides 256 subnets, each with 254 hosts.

Then move right if you need more subnets, or left if you need more hosts. In this example, we move right with the subnet bits because we need more subnets.

Cisco CCNA Subnet Question



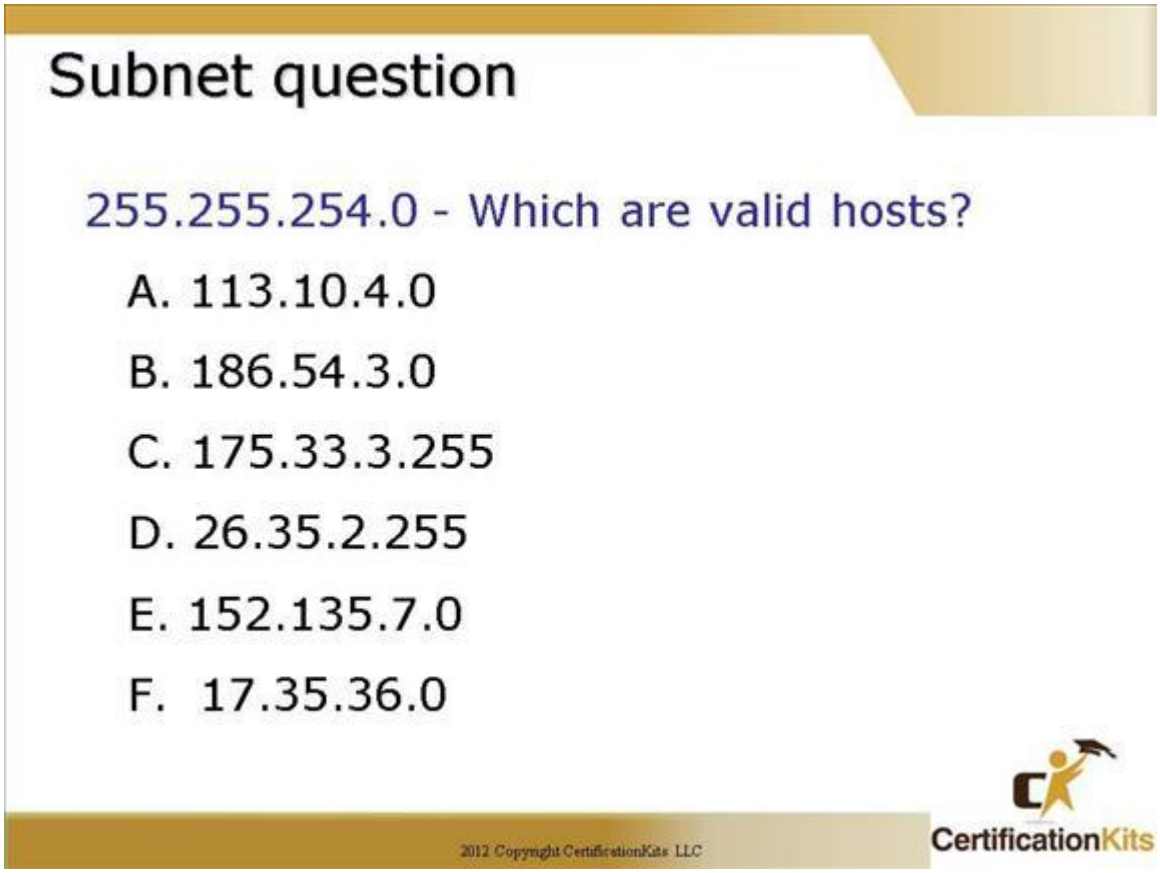
172.16.0.0 with over 400 hosts per subnet.

Start at 255.255.255.0, which provides 256 subnets, each with 254 hosts.

Then move right if you need more subnets, or left if you need more hosts. In this example, we move left with the subnet bits because we need more hosts.

255.255.254.0 = 128 subnets, each with 510 hosts (correct answer)

Cisco CCNA Subnet Question



The block size in the third octet is 2. The subnets in the third octet are 0, 2, 4, 6, 8, 10, 12, etc.

A. 113.10.4.0 is a subnet

B. 186.54.3.0 is a valid host

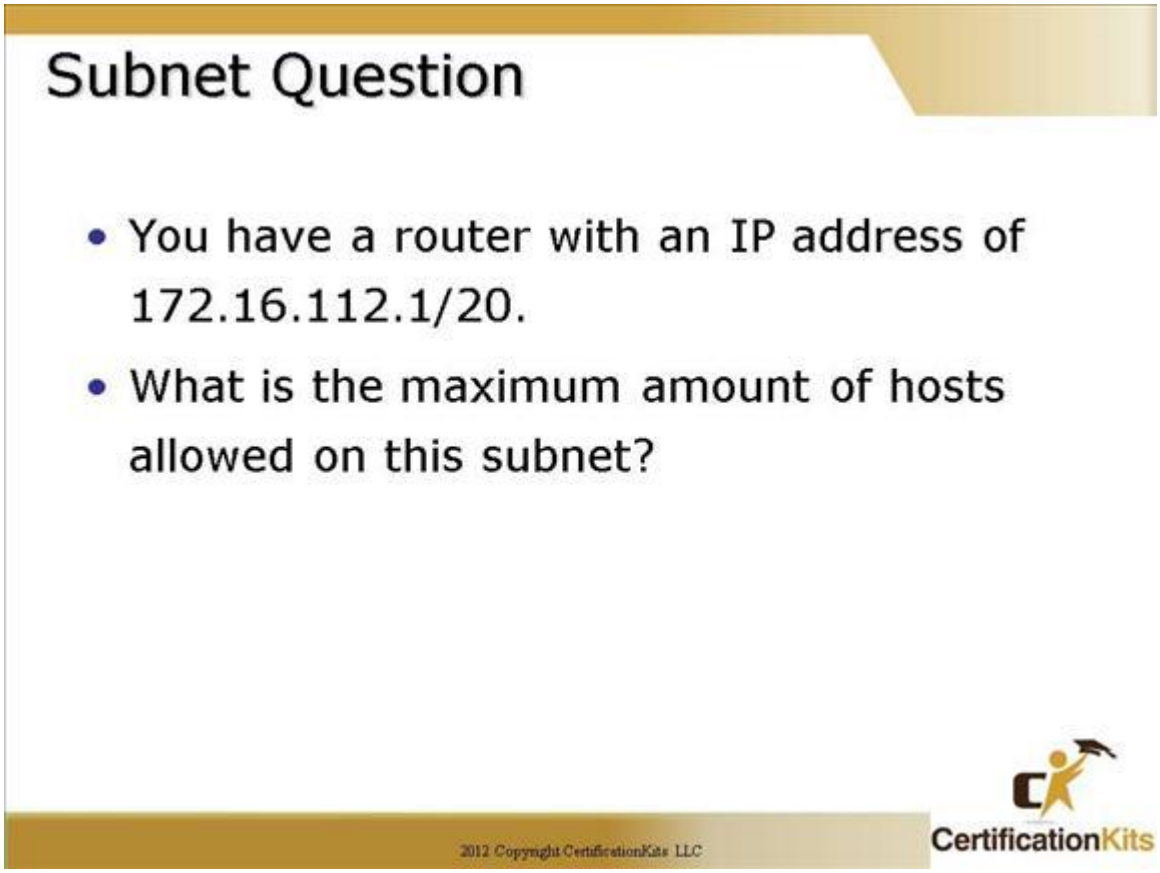
C. 175.33.3.255 is a broadcast address

D. 26.35.2.255 is a valid host

E. 152.135.7.0 is a valid host

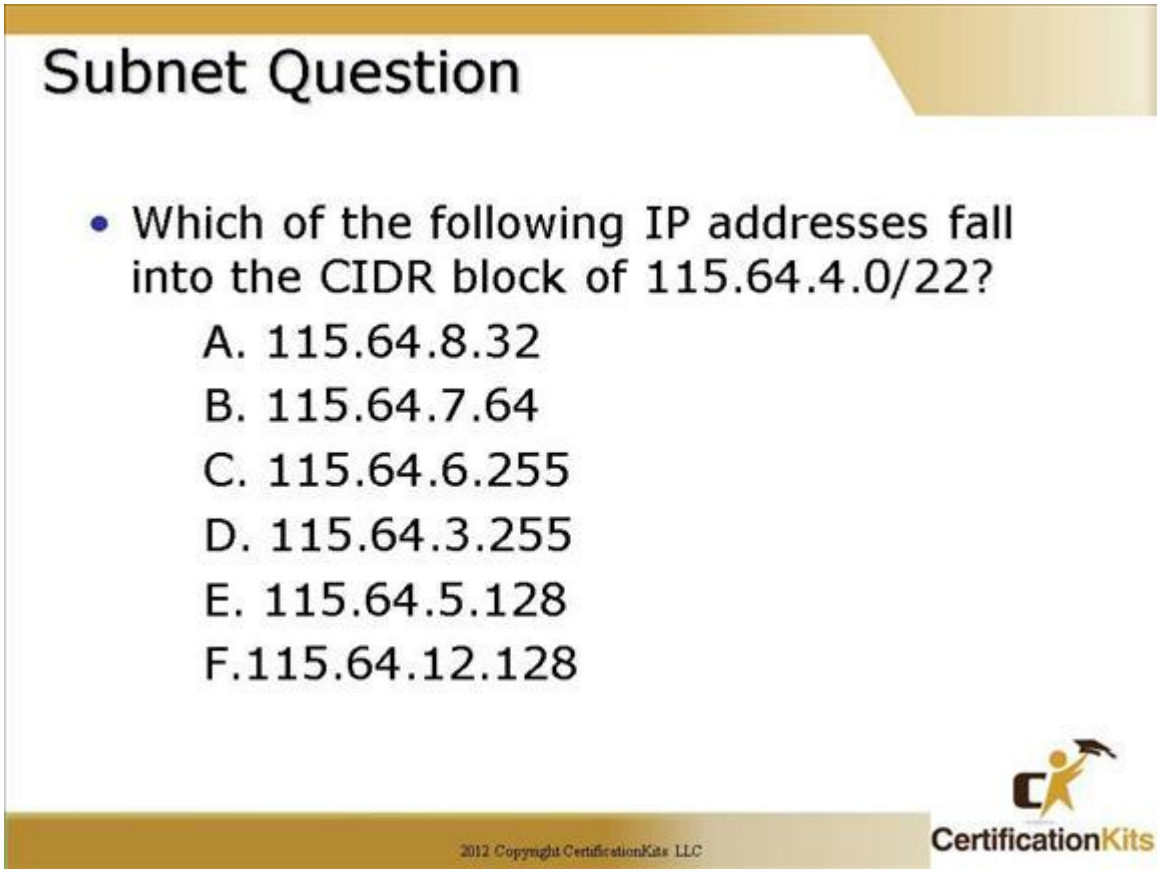
F. 17.35.36.0 is a subnet

Cisco CCNA Subnet Question



A /20 means the mask is 255.255.240.0. This is 12 host bits. 2^{12}-2 = 4094, which is the maximum number of hosts allowed on the subnet.

Cisco CCNA Subnet Question



A /22 means the mask is 255.255.252.0. The subnet is 115.64.4.0, the broadcast address is 115.64.7.255

B. 115.64.7.64

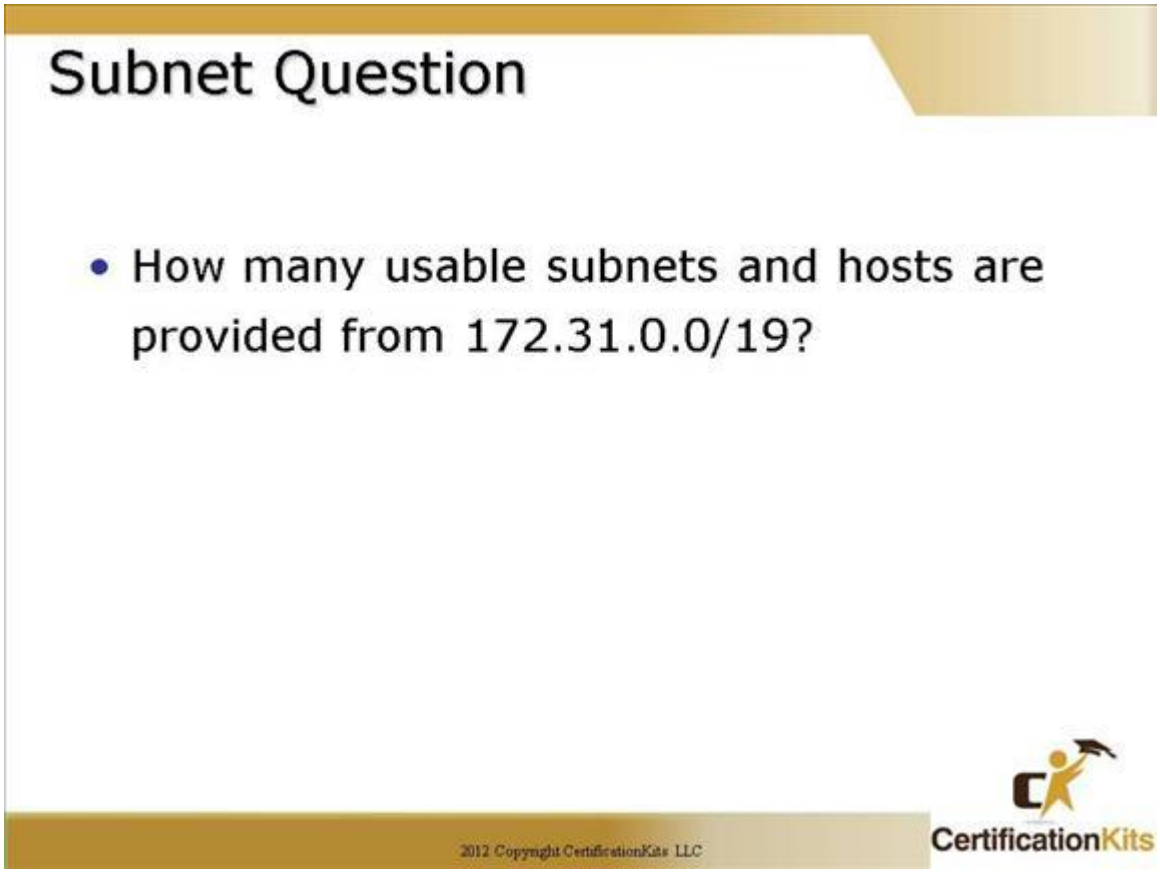
C. 115.64.6.255

and

E. 115.64.5.128

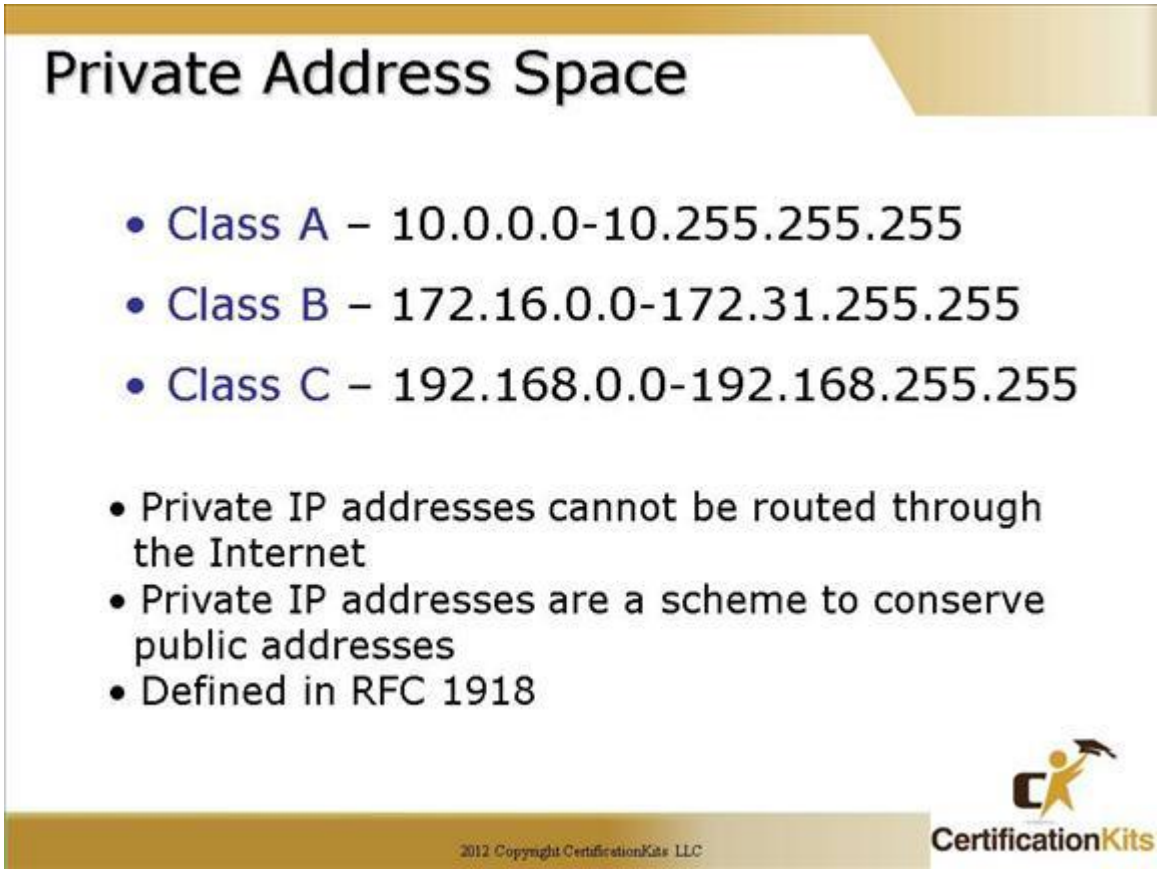
are valid host addresses within this subnet.

Cisco CCNA Subnet Question



A /19 means the mask is 255.255.224, which is 3 subnet bits and 13 host bits. This provides eight usable subnets, each with 8190 hosts.

Cisco CCNA Private Address Space



The people who sat around and created the IP addressing scheme also created what we call private IP addresses which are defined in RFC 1918.

These addresses can be used on a private network, but they're not routable through the Internet. This is designed for the purpose of creating a measure of well-needed security, but it also conveniently saves valuable IP address space.

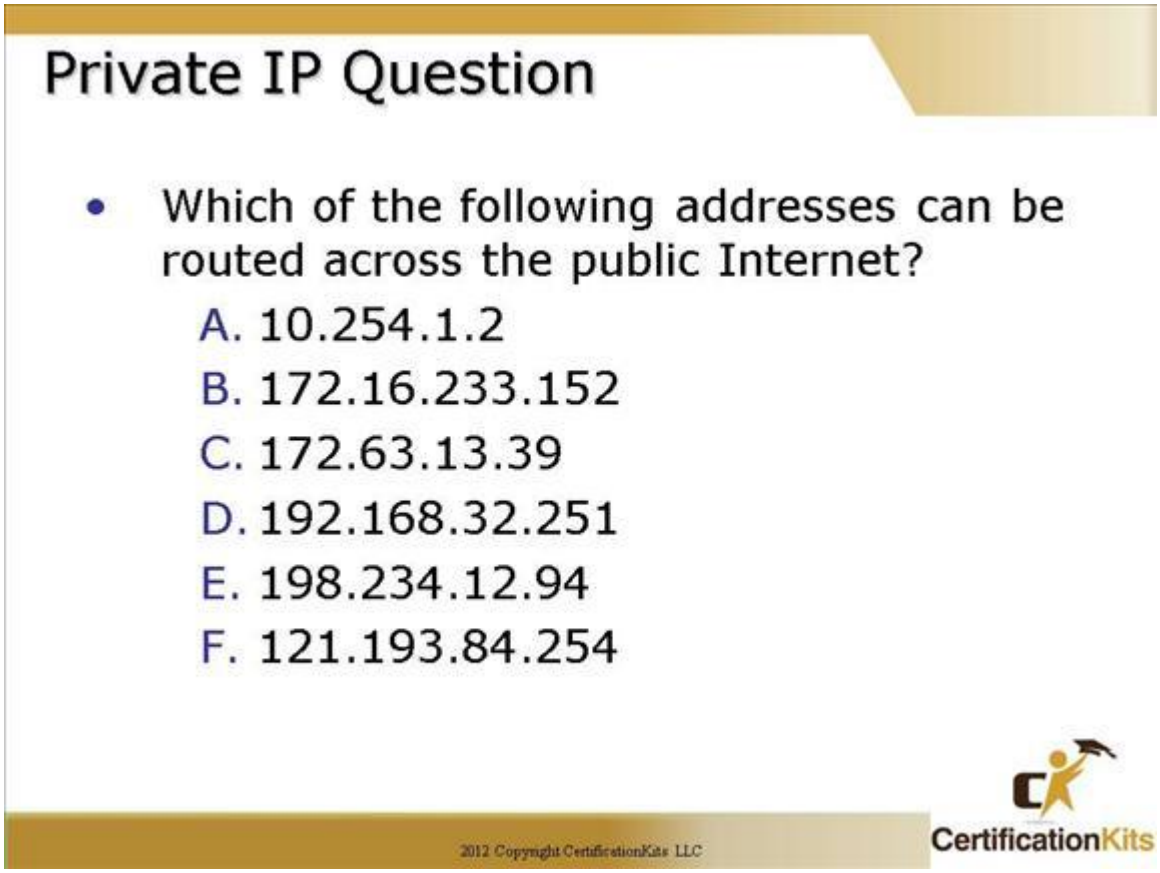
Again, now shown in binary:

Class A: 00001010

Class B: 10101100.00010000 through 10101100.00011111

Class C: 11000000.10101000

Cisco CCNA Private IP Question



The following addresses can be routed across the public Internet:

C. 172.63.13.39

E. 198.234.12.94

F. 121.193.84.254

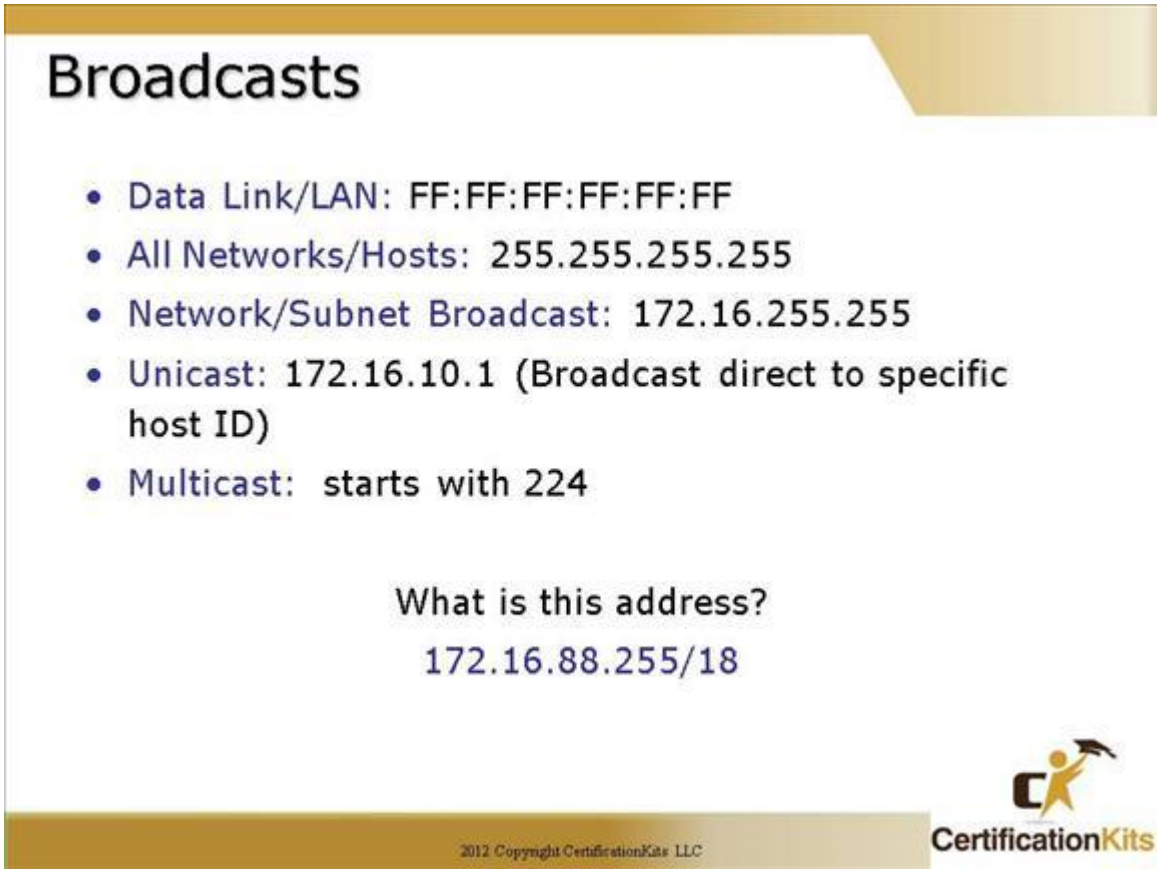
The following addresses fall under RFC 1918 and are not routed across the public Internet:

A. 10.254.1.2

B. 172.16.233.152

D. 192.162.32.251

Cisco CCNA Broadcasts



It is important to understand the different terms and uses of broadcast addresses.

There are four different types:

üLayer 2 broadcasts: broadcast that is sent to all nodes on a LAN – MAC address of FF:FF:FF:FF:FF:FF

üBroadcasts (layer 3): broadcast that is sent to all nodes on the network

üUnicast: broadcast sent to a single destination host

üMulticast: broadcast that is sent from a single source and transmitted to many devices (devices that subscribed to the multicast address) on different networks

The address 172.16.88.255/18 can also be written as 172.16.88.255 255.255.192.0 is a host address. Don't be fooled by the 255 in the last octet. The address would be a broadcast address with a 24 bit mask but not with an 18 bit mask. Valid host range with a 18 bit mask is:

172.16.64.1 – 172.16.127.254