



ACTIVIDAD 2

LLENADO DEL LIBRO

MATERIA: REDES II
DOCENTE: Ing. BRISA VILACAHUA

NOMBRE: MILLARES MANO ROIDER

Santa Cruz de la Sierra – Bolivia

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IP Address Classes

Class A	1 – 127	(Network 127 is reserved for loopback and internal testing)	
	Leading bit pattern	0	00000000.00000000.00000000.00000000 Network . Host . Host . Host
Class B	128 – 191	Leading bit pattern	10
			10000000.00000000.00000000.00000000 Network . Network . Host . Host
Class C	192 – 223	Leading bit pattern	110
			11000000.00000000.00000000.00000000 Network . Network . Network . Host
Class D	224 – 239	(Reserved for multicast)	
Class E	240 – 255	(Reserved for experimental, used for research)	

Private Address Space

Class A	10.0.0.0 to 10.255.255.255
Class B	172.16.0.0 to 172.31.255.255
Class C	192.168.0.0 to 192.168.255.255

Default Subnet Masks

Class A	255.0.0.0
Class B	255.255.0.0
Class C	255.255.255.0

Produced by: Robb Jones
jonesr@careertech.net
Frederick County Career & Technology Center
Cisco Networking Academy
Frederick County Public Schools
Frederick, Maryland, USA

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Workbooks included in the series:

IP Addressing and Subnetting Workbooks
ACLs - Access Lists Workbooks
VLSM Variable-Length Subnet Mask IWorkbooks

Instructors (and anyone else for that matter) please do not post the Instructors version on public websites. When you do this you are giving everyone else worldwide the answers. Yes, students look for answers this way. It also discourages others; myself included, from posting high quality materials.

Binary To Decimal Conversion

128	64	32	16	8	4	2	1	Answers	Scratch Area
1	0	0	1	0	0	1	0	146	128 16 32
0	1	1	1	0	1	1	1	119	2 16 4
1	1	1	1	1	1	1	1	255	2 1
1	1	0	0	0	1	0	1	197	119
1	1	1	1	0	1	1	0	246	
0	0	0	1	0	0	1	1	19	
1	0	0	0	0	0	0	1	129	
0	0	1	1	0	0	0	1	49	
0	1	1	1	1	0	0	0	120	
1	1	1	1	0	0	0	0	240	
0	0	1	1	1	0	1	1	59	
0	0	0	0	0	1	1	1	7	
								00011011	27
								10101010	170
								01101111	111
								11111000	248
								00100000	32
								01010101	85
								00111110	62
								00000011	3
								11101101	237
								11000000	192

128	64	32	16	8	4	2	1	Answers	Scratch Area
1	0	0	1	0	0	1	0	146	128 16 32
0	1	1	1	0	1	1	1	119	2 16 4
1	1	1	1	1	1	1	1	255	2 1
1	1	0	0	0	1	0	1	197	119
1	1	1	1	0	1	1	0	246	
0	0	0	1	0	0	1	1	19	
1	0	0	0	0	0	0	1	129	
0	0	1	1	0	0	0	1	49	
0	1	1	1	1	0	0	0	120	
1	1	1	1	0	0	0	0	240	
0	0	1	1	1	0	1	1	59	
0	0	0	0	0	1	1	1	7	
								00011011	27
								10101010	170
								01101111	111
								11111000	248
								00100000	32
								01010101	85
								00111110	62
								00000011	3
								11101101	237
								11000000	192

Decimal To Binary Conversion

Use all 8 bits for each problem

128 64 32 16 8 4 2 1 = 255 Scratch Area

/	/	/	0	/	/	/	0	238	238	34
0	0	1	0	0	0	1	0	34	-128	-32
0	1	1	1	1	0	1	1	123	110	2
0	0	1	1	0	0	1	0	50	-64	-2
1	1	1	1	1	1	1	1	255	46	0
1	1	0	0	1	0	0	0	200	-32	
0	0	0	0	1	0	1	0	10	14	
1	0	0	0	1	0	1	0	138	-8	
0	0	0	0	0	0	0	1	1	6	
0	0	0	0	1	1	0	1	13	-4	
1	1	1	1	1	0	1	0	250	2	
0	1	1	0	1	0	1	1	107	-2	
1	1	1	0	0	0	0	0	224	0	
0	1	1	1	0	0	1	0	114		
1	1	0	0	0	0	0	0	192		
1	0	1	0	1	1	0	0	172		
0	1	1	0	0	1	0	0	100		
0	1	1	1	0	1	1	1	119		
0	0	1	1	1	0	0	1	57		
0	1	1	0	0	0	1	0	98		
1	0	1	1	0	0	1	1	179		
0	0	0	0	0	0	1	0	2		

Address Class Identification

Address	Class
10.250.1.1	<u> A </u>
150.10.15.0	<u> B </u>
192.14.2.0	<u> C </u>
148.17.9.1	<u> B </u>
193.42.1.1	<u> C </u>
126.8.156.0	<u> A </u>
220.200.23.1	<u> C </u>
230.230.45.58	<u> D </u>
177.100.18.4	<u> B </u>
119.18.45.0	<u> A </u>
249.240.80.78	<u> E </u>
199.155.77.56	<u> C </u>
117.89.56.45	<u> A </u>
215.45.45.0	<u> C </u>
199.200.15.0	<u> C </u>
95.0.21.90	<u> A </u>
33.0.0.0	<u> A </u>
158.98.80.0	<u> B </u>
219.21.56.0	<u> C </u>

Network & Host Identification

Circle the network portion
of these addresses:

177.100.18.4

119.18.45.0

209.240.80.78

199.155.77.56

117.89.56.45

215.45.45.0

192.200.15.0

95.0.21.90

33.0.0.0

158.98.80.0

217.21.56.0

10.250.1.1

150.10.15.0

192.14.2.0

148.17.9.1

193.42.1.1

126.8.156.0

220.200.23.1

Circle the host portion of
these addresses:

10.15.123.50

171.2.199.31

198.125.87.177

223.250.200.222

17.45.222.45

126.201.54.231

191.41.35.112

155.25.169.227

192.15.155.2

123.102.45.254

148.17.9.155

100.25.1.1

195.0.21.98

25.250.135.46

171.102.77.77

55.250.5.5

218.155.230.14

10.250.1.1

Network Addresses

Using the IP address and subnet mask shown write out the network address:

188.10.18.2
255.255.0.0
188 . 10 . 0 . 0

10.10.48.80
255.255.255.0
10 . 10 . 48 . 0

192.149.24.191
255.255.255.0
192 . 149 . 24 . 0

150.203.23.19
255.255.0.0
150 . 203 . 0 . 0

10.10.10.10
255.0.0.0
10 . 0 . 0 . 0

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Wondershare PDFelement
255.255.255.0

223.69.230.250
255.255.0.0
223 . 69 . 0 . 0

200.120.135.15
255.255.255.0
200 . 120 . 135 . 0

27.125.200.151
255.0.0.0
27 . 0 . 0 . 0

199.20.150.35
255.255.255.0
199 . 20 . 150 . 0

191.55.165.135
255.255.255.0
191 . 55 . 165 . 0

28.212.250.254
255.255.0.0
28 . 212 . 0 . 0

Host Addresses

Using the IP address and subnet mask shown write out the host address:

188.10.18.2 255.255.0.0	<u>0 . 0 . 18 . 2</u>
10.10.48.80 255.255.255.0	<u>0 . 0 . 0 . 80</u>
222.49.49.11 255.255.255.0	<u>0 . 0 . 0 . 11</u>
128.23.230.19 255.255.0.0	<u>0 . 0 . 230 . 19</u>
10.10.10.10 255.0.0.0	<u>0 . 10 . 10 . 10</u>
200.113.123.11 255.255.255.0	<u>0 . 0 . 0 . 11</u>
223.169.23.20 255.255.0.0	<u>0 . 0 . 23 . 20</u>
203.20.35.215 255.255.255.0	<u>0 . 0 . 0 . 215</u>
117.15.2.51 255.0.0.0	<u>0 . 15 . 2 . 51</u>
199.120.15.135 255.255.255.0	<u>0 . 0 . 0 . 135</u>
191.55.165.135 255.255.255.0	<u>0 . 0 . 0 . 135</u>
48.21.25.54 255.255.0.0	<u>0 . 0 . 25 . 54</u>

Default Subnet Masks

Write the correct default subnet mask for each of the following addresses:

177.100.18.4	<u>255 . 255 . 0 . 0</u>
119.18.45.0	<u>255 . 0 . 0 . 0</u>
191.249.234.191	<u>255 . 255 . 0 . 0</u>
223.23.223.109	<u>255 . 255 . 255 . 0</u>
10.10.250.1	<u>255 . 0 . 0 . 0</u>
126.123.23.1	<u>255 . 0 . 0 . 0</u>
223.69.230.250	<u>255 . 255 . 255 . 0</u>
192.12.35.105	<u>255 . 255 . 255 . 0</u>
77.251.200.51	<u>255 . 0 . 0 . 0</u>
189.210.50.1	<u>255 . 255 . 0 . 0</u>
88.45.65.35	<u>255 . 0 . 0 . 0</u>
128.212.250.254	<u>255 . 255 . 0 . 0</u>
193.100.77.83	<u>255 . 255 . 255 . 0</u>
125.125.250.1	<u>255 . 0 . 0 . 0</u>
1.1.10.50	<u>255 . 0 . 0 . 0</u>
220.90.130.45	<u>255 . 255 . 255 . 0</u>
134.125.34.9	<u>255 . 255 . 0 . 0</u>
95.250.91.99	<u>255 . 0 . 0 . 0</u>

ANDING With Default subnet masks

Every IP address must be accompanied by a subnet mask. By now you should be able to look at an IP address and tell what class it is. Unfortunately your computer doesn't think that way. For your computer to determine the network and subnet portion of an IP address it must "AND" the IP address with the subnet mask.

Default Subnet Masks:

Class A	255.0.0.0
Class B	255.255.0.0
Class C	255.255.255.0

ANDING Equations:

1 AND 1 = 1
1 AND 0 = 0
0 AND 1 = 0
0 AND 0 = 0

Sample:

What you see...

IP Address: 192 . 100 . 10 . 33

What you can figure out in your head...

Address Class: C
 Network Portion: 192 . 100 . 10 . 33
 Host Portion: 192 . 100 . 10 . 33

In order for your computer to get the same information it must AND the IP address with the subnet mask in binary.

	Network	Host	
IP Address:	1 1 0 0 0 0 0 0 . 0 1 1 0 0 1 0 0 . 0 0 0 0 1 0 1 0 .	0 0 1 0 0 0 0 1	(192 . 100 . 10 . 33)
Default Subnet Mask:	1 1 1 1 1 1 1 1 . 0 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 .	0 0 0 0 0 0 0 0	(255 . 255 . 255 . 0)
AND:	1 1 0 0 0 0 0 0 . 0 1 1 0 0 1 0 0 . 0 0 0 0 1 0 1 0 .	0 0 0 0 0 0 0 0	(192 . 100 . 10 . 0)

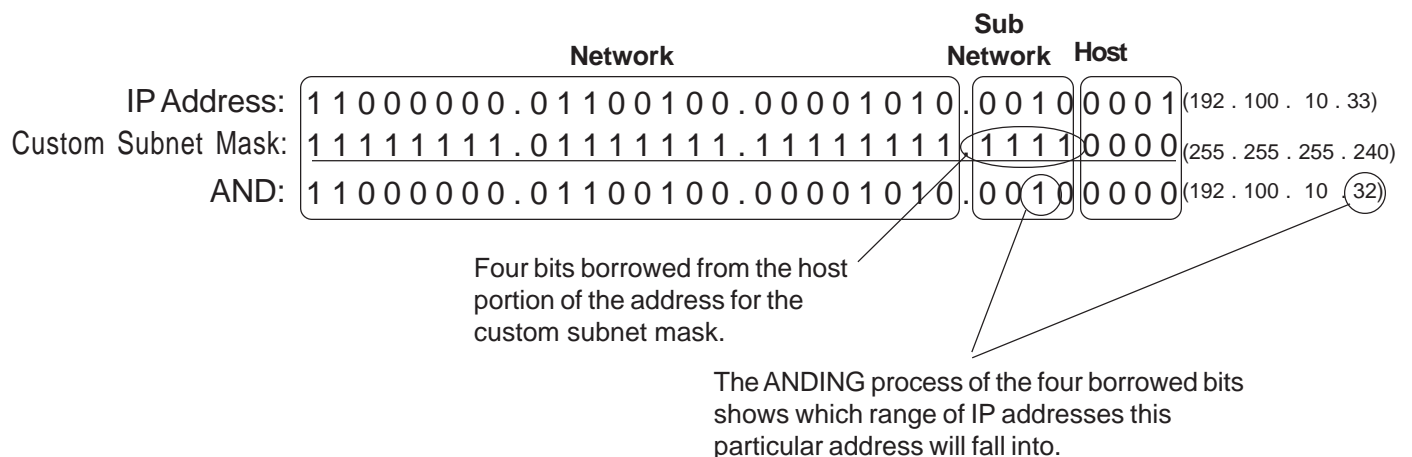
ANDING with the default subnet mask allows your computer to figure out the network portion of the address.

ANDING With Custom subnet masks

When you take a single network such as 192.100.10.0 and divide it into five smaller networks (192.100.10.16, 192.100.10.32, 192.100.10.48, 192.100.10.64, 192.100.10.80) the outside world still sees the network as 192.100.10.0, but the internal computers and routers see five smaller subnetworks. Each independent of the other. This can only be accomplished by using a custom subnet mask. A custom subnet mask borrows bits from the host portion of the address to create a subnetwork address between the network and host portions of an IP address. In this example each range has 14 usable addresses in it. The computer must still AND the IP address against the custom subnet mask to see what the network portion is and which subnetwork it belongs to.

IP Address: 192 . 100 . 10 . 0
Custom Subnet Mask: 255.255.255.240

Address Ranges: 192.10.10.0 to 192.100.10.15
192.100.10.16 to 192.100.10.31
192.100.10.32 to 192.100.10.47 (Range in the sample below)
192.100.10.48 to 192.100.10.63
192.100.10.64 to 192.100.10.79
192.100.10.80 to 192.100.10.95
192.100.10.96 to 192.100.10.111
192.100.10.112 to 192.100.10.127
192.100.10.128 to 192.100.10.143
192.100.10.144 to 192.100.10.159
192.100.10.160 to 192.100.10.175
192.100.10.176 to 192.100.10.191
192.100.10.192 to 192.100.10.207
192.100.10.208 to 192.100.10.223
192.100.10.224 to 192.100.10.239
192.100.10.240 to 192.100.10.255



In the next set of problems you will determine the necessary information to determine the correct subnet mask for a variety of IP addresses.

How to determine the number of subnets and the number of hosts per subnet

Two formulas can provide this basic information:

Number of subnets = 2_s (Second subnet formula: **Number of subnets = $2_s - 2$**)

Number of hosts per subnet = $2_h - 2$

Both formulas calculate the number of hosts or subnets based on the number of binary bits used. For example if you borrow three bits from the host portion of the address use the *number of subnets* formula to determine the total number of subnets gained by borrowing the three bits. This would be 2_3 or $2 \times 2 \times 2 = 8$ subnets

To determine the number of hosts per subnet you would take the number of binary bits used in the host portion and apply this to the *number of hosts per subnet* formula. If five bits are in the host portion of the address this would be 2_5 or $2 \times 2 \times 2 \times 2 \times 2 = 32$ hosts.

When dealing with the *number of hosts per subnet* you have to subtract two addresses from the range. The first address in every range is the subnet number. The last address in every range is the broadcast address. These two addresses cannot be assigned to any device in the network which is why you have to subtract two addresses to find the number of usable addresses in each range.

For example if two bits are borrowed for the network portion of the address you can easily determine the number of subnets and hosts per subnets using the two formulas.

195 . 223 . 50 . 0 0 | 0 0 0 0 0 0

The number of subnets created by borrowing 2 bits is 2^2 or $2 \times 2 = 4$ subnets.

The number of hosts created by leaving 6 bits is $2^6 - 2$ or $2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64 - 2 = 62$ usable hosts per subnet.

What about that second subnet formula:

Number of subnets = $2^s - 2$

In some instances the first and last subnet range of addresses are reserved. This is similar to the first and last host addresses in each range of addresses.

The first range of addresses is the **zero subnet**. The subnet number for the *zero subnet* is also the subnet number for the classful subnet address.

The last range of addresses is the **broadcast subnet**. The broadcast address for the last subnet in *the broadcast subnet* is the same as the classful broadcast address.

Class C Address unsubnetted:*195. 223 . 50 . 0**195.223.50.0 to 195.223.50.255*

Notice that the subnet and broadcast addresses match.

Class C Address subnetted (2 bits borrowed):*195. 223 . 50 . 0 0 | 0 0 0 0 0 0*

(Invalid range) (0) *195.223.50.0* to *195.223.50.63*
 (1) *195.223.50.64* to *195.223.50.127*
 (2) *195.223.50.128* to *195.223.50.191*
 (Invalid range) (3) *195.223.50.192* to *195.223.50.255*

The primary reason the the zero and broadcast subnets were not used had to do primarily with the broadcast addresses. If you send a broadcast to 195.223.255 are you sending it to all 255 addresses in the classful C address or just the 62 usable addresses in the broadcast range?

determine which formula to use, and whether or not you can use the first and last subnets. Use the chart below to help decide.

When to use which formula to determine the number of subnets	
Use the $2^S - 2$ formula and don't use the zero and broadcast ranges if...	Use the 2^S formula and use the zero and broadcast ranges if...
Classful routing is used	Classless routing or VLSM is used
RIP version 1 is used	RIP version 2, EIGRP, or OSPF is used
The no ip subnet zero command is configured on your router	The ip subnet zero command is configured on your router (default setting)
	No other clues are given

Bottom line for the CCNA exams; if a question does not give you any clues as to whether or not to allow these two subnets, assume you can use them.

This workbook has you use the number of subnets = 2^S formula.

Custom Subnet Masks

Problem 1

Number of needed subnets **14**

Number of needed usable hosts **14**

Network Address **192.10.10.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 240

Total number of subnets 16

Total number of host addresses 16

Number of usable addresses 14

4

Show your work for Problem 1 in the space below.

Number of Subnets	256 128 64 32				16 8 4 2				Number of Hosts
	2	4	8	16	32	64	128	256	
	128	64	32	16	8	4	2	1	Binary values
192 . 10 . 10 . 0	0	0	0	0	0	0	0	0	

Add the binary value numbers to the left of the line to create the custom subnet mask.

128
64
32
+16
240

16	Observe the total number of hosts.
-2	
14	Subtract 2 for the number of usable hosts.

Custom Subnet Masks

Problem 2

Number of needed subnets **1000**

Number of needed usable hosts **60**

Network Address **165.100.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 1,024

Total number of host addresses 64

Number of usable addresses 62

10

Show your work for **Problem 2** in the space below.

Number of Hosts -	65,536	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2
Number of Subnets -	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536
Binary values -	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
165 . 100 . 0 0 0 0 0 0 0 0 . 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

128	128
64	+64
32	192
16	
8	
4	
2	
+1	
<u>255</u>	

Add the binary value numbers to the left of the line to create the custom subnet mask.

64	Observe the total number of hosts.
-2	
<u>62</u>	Subtract 2 for the number of usable hosts.

Custom Subnet Masks

Problem 3

Network Address **148.75.0.0 /26**

/26 indicates the total number of bits used for the network and subnetwork portion of the address. All bits remaining belong to the host portion of the address.

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 1,024

Total number of host addresses 64

Number of usable addresses 62

Number of bits borrowed 10

Show your work for **Problem 3** in the space below.

Number of Hosts	65,536	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2
Number of Subnets	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536
Binary values	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
148 . 75 . 0 0 0 0 0 0 0 0 . 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

$ \begin{array}{r} 128 \\ 64 \\ \hline 32 \\ 16 \\ 8 \\ 4 \\ 2 \\ \hline 255 \end{array} $	$ \begin{array}{r} 128 \\ +64 \\ \hline 192 \end{array} $	$ \begin{array}{r} 1024 \\ -2 \\ \hline 1,022 \end{array} $
---	--	--

Add the binary value numbers to the left of the line to create the custom subnet mask.

Observe the total number of hosts.

Subtract 2 for the number of usable hosts.

Subtract 2 for the total number of subnets to get the usable number of subnets.

Custom Subnet Masks

Problem 4

Number of needed subnets **6**

Number of needed usable hosts **30**

Network Address **210.100.56.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 224

Total number of subnets 8

Total number of host addresses 32

Number of usable addresses 30

3

Show your work for Problem 4 in the space below.

	256	128	64	32	16	8	4	2	-	Number of Hosts
Number of Subnets	-	2	4	8	16	32	64	128	256	
	128	64	32	16	8	4	2	1	-	Binary values
210 . 100 . 56 . 0	0	0	0	0	0	0	0	0		

Dirección de Red: 210.100.56.0

Número de bits necesarios para subredes y hosts:

Número de bits necesarios para subredes: 3 (ya que $2^3 = 8$, lo cual es suficiente para 6 subredes)

Número de bits necesarios para hosts: 5 (ya que $2^5 = 32$, lo cual es suficiente para 30 hosts)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111111.11100000

Máscara de Subred en decimal: 255.255.255.224

Custom Subnet Masks

Problem 5

Number of needed subnets **6**

Number of needed usable hosts **30**

Network Address **195.85.8.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 224

Total number of subnets 8

Total number of host addresses 32

Number of usable addresses 30

3

Show your work for Problem 5 in the space below.

Number of Subnets	256	128	64	32	16	8	4	2	Number of Hosts	
	-	2	4	8	16	32	64	128	256	
		128	64	32	16	8	4	2	1	- Binary values
195 . 85 . 8 .	0	0	0	0	0	0	0	0	0	

Dirección de Red: 195.85.8.0

Número de bits necesarios para subredes y hosts:

Número de bits necesarios para subredes: 3 (ya que se necesitan 6 subredes, y $2^3 = 8$)

Número de bits necesarios para hosts: 5 (ya que se necesitan 30 hosts, y $2^5 = 32$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111111.11100000

Máscara de Subred en decimal: 255.255.255.224

Custom Subnet Masks

Problem 7

Number of needed subnets **2000**

Number of needed usable hosts **15**

Network Address **178.100.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 224

Total number of subnets 2,048

Total number of host addresses 32

Number of usable addresses 30

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Show your work for Problem 7 in the space below.

Number of Hosts	65,536	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2
Number of Subnets	2	4	8	16	32	64	128	256	512	1024	2048	4,096	8,192	16,384	32,768	65,536
Binary values	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
178 . 100 . 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Dirección de Red: 178.100.0.0

Número de bits necesarios para subredes y hosts:

Número de bits necesarios para subredes: 11 (ya que se necesitan 2000 subredes, y $2^{11} = 2048$)

Número de bits necesarios para hosts: 4 (ya que se necesitan 15 hosts, y $2^4 = 16$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111111.11100000

Máscara de Subred en decimal: 255.255.255.224

Custom Subnet Masks

Problem 8

Number of needed subnets **3**

Number of needed usable hosts **45**

Network Address **200.175.14.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 4

Total number of host addresses 64

Number of usable addresses 62

 2

Show your work for Problem 8 in the space below.

Dirección de Red: 200.175.14.0

Número de bits necesarios para subredes y hosts:

Número de bits necesarios para subredes: 2 (ya que se necesitan 3 subredes, y $2^2 = 4$)

Número de bits necesarios para hosts: 6 (ya que se necesitan 45 hosts, y $2^6 = 64$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111111.11000000

Máscara de Subred en decimal: 255.255.255.192

Custom Subnet Masks

Problem 9

Number of needed subnets **60**

Number of needed usable hosts **1,000**

Network Address **128.77.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 252 . 0

Total number of subnets 64

Total number of host addresses 1,024

Number of usable addresses 1,022

 6

Show your work for Problem 9 in the space below.

Dirección de Red: 128.77.0.0

Número de bits necesarios para subredes y hosts:

Número de bits necesarios para subredes: 6 (ya que se necesitan 60 subredes, y $2^6 = 64$)

Número de bits necesarios para hosts: 10 (ya que se necesitan 1,000 hosts, y $2^{10} = 1,024$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111100.00000000

Máscara de Subred en decimal: 255.255.252.0

Custom Subnet Masks

Problem 10

Number of needed usable hosts **60**

Network Address **198.100.10.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 4

Total number of host addresses 64

Number of usable addresses 62

Number of bits borrowed 2

Show your work for Problem 10 in the space below.

Número de subredes posibles: $2^2 = 4$ subredes.

Número de direcciones por subred: $2^6 - 2 = 62$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 6 bits (ya que se necesitan 64 hosts, y $2^6 = 64$, lo cual es suficiente para 62 hosts).

Custom Subnet Masks

Problem 11

Number of needed subnets **250**

Network Address **101.0.0.0**

Address class A

Default subnet mask 255 . 0 . 0 . 0

Custom subnet mask 255 . 255 . 0 . 0

Total number of subnets 256

Total number of host addresses 65,536

Number of usable addresses 65,534

Number of bits borrowed 8

Show your work for Problem 11 in the space below.

Dirección de Red: 101.0.0.0

Número de bits necesarios para subredes:

Número de bits necesarios para subredes: 8 (ya que se necesitan 250 subredes, y $2^8 = 256$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.00000000.00000000

Máscara de Subred en decimal: 255.255.0.0

Número de subredes posibles: $2^8 = 256$ subredes.

Número de direcciones por subred: $2^{16} - 2 = 65,534$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 16 bits (ya que se necesitan 65,536 hosts, y $2^{16} = 65,536$, lo cual es suficiente para 65,534 hosts).

Custom Subnet Masks

Problem 12

Number of needed subnets **5**

Network Address **218.35.50.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 224

Total number of subnets 8

Total number of host addresses 32

Number of usable addresses 30

Number of bits borrowed 3

Show your work for Problem 12 in the space below.

Número de bits necesarios para subredes:

Número de bits necesarios para subredes: 3 (ya que se necesitan 5 subredes, y $2^3 = 8$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111111.11100000

Máscara de Subred en decimal: 255.255.255.224

Custom Subnet Masks

Problem 13

Number of needed usable hosts **25**

Network Address **218.35.50.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 224

Total number of subnets 8

Total number of host addresses 32

Number of usable addresses 30

Number of bits borrowed 3

Show your work for Problem 13 in the space below.

Dirección de Red: 218.35.50.0

Número de bits necesarios para hosts:

Número de bits necesarios para hosts: 5 (ya que se necesitan 25 hosts, y $2^5 = 32$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111111.11100000

Máscara de Subred en decimal: 255.255.255.224

Custom Subnet Masks

Problem 14

Number of needed subnets **10**

Network Address **172.59.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 240 . 0

Total number of subnets 16

Total number of host addresses 4,096

Number of usable addresses 4,094

Number of bits borrowed 4

Show your work for Problem 14 in the space below.

Número de subredes posibles: $2^4 = 16$ subredes

Número de direcciones IP por subred: $2^{12} = 4096$ direcciones IP por subred (debido a que se necesitan 4094 hosts, se elige el siguiente valor más alto que sea una potencia de 2)

Número total de subredes: 16 subredes

Número de direcciones IP utilizables por subred: $4096 - 2$ (para dirección de red y dirección de broadcast) = 4094 direcciones utilizables por subred

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11110000.00000000

Máscara de Subred en decimal: 255.255.240.0

Custom Subnet Masks

Problem 15

Number of needed usable hosts **50**

Network Address **172.59.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 1,024

Total number of host addresses 64

Number of usable addresses 62

Number of bits borrowed 10

Show your work for Problem 15 in the space below.

Dirección de Red: 172.59.0.0

Número de bits necesarios para hosts:

Número de bits necesarios para hosts: 6 (ya que se necesitan 50 hosts, y $2^6 = 64$)

Máscara de Subred Personalizada:

Máscara de Subred en binario: 11111111.11111111.11111111.11000000

Máscara de Subred en decimal: 255.255.255.192

Custom Subnet Masks

Problem 16

Number of needed usable hosts **29**

Network Address **23.0.0.0**

Address class A

Default subnet mask 255 . 0 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 224

Total number of subnets 524,288

Total number of host addresses 32

Number of usable addresses 30

Number of bits borrowed 19

Show your work for Problem 16 in the space below.

Número de subredes posibles: $2^{19} = 524,288$ subredes.

Número de direcciones por subred: $2^5 - 2 = 30$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Longitud de cada subred en bits: $32 - 27 = 5$ bits para la parte de host.

Número de bits prestados: 5 bits prestados para las subredes.

Número de bits necesarios para hosts: 5 bits (ya que se necesitan 32 hosts, y $2^5 = 32$, lo cual es suficiente para 30 hosts).

Subnetting

Problem 1

Number of needed subnets **14**

Number of needed usable hosts **14**

Network Address **192.10.10.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 240

Total number of subnets 16

Total number of host addresses 16

Number of usable addresses 14

What is the 4th subnet range? 192.10.10.48 to 192.10.10.63

What is the subnet number for the 8th subnet? 192 . 10 . 10 . 112

What is the subnet broadcast address for the 13th subnet? 192 . 10 . 10 . 207

What are the assignable addresses for the 9th subnet? 192.10.10.129 to 192.10.10.142

Show your work for Problem 1 in the space below.

Number of Subnets					Number of Hosts				
256	128	64	32	16	8	4	2	-	
2	4	8	16	32	64	128	256		
128	64	32	16	8	4	2	1	-	Binary values
192	10	10	0	0	0	0	0		
(0)	0	0	0	0	192.10.10.0	to	192.10.10.15		
(1)	0	0	0	1	192.10.10.16	to	192.10.10.31		
(2)	0	0	1	0	192.10.10.32	to	192.10.10.47		
(3)	0	0	1	1	192.10.10.48	to	192.10.10.63		
(4)	0	1	0	0	192.10.10.64	to	192.10.10.79		
(5)	0	1	0	1	192.10.10.80	to	192.10.10.95		
(6)	0	1	1	0	192.10.10.96	to	192.10.10.111		
(7)	0	1	1	1	192.10.10.112	to	192.10.10.127		
(8)	1	0	0	0	192.10.10.128	to	192.10.10.143		
(9)	1	0	0	1	192.10.10.144	to	192.10.10.159		
(10)	1	0	1	0	192.10.10.160	to	192.10.10.175		
(11)	1	0	1	1	192.10.10.176	to	192.10.10.191		
(12)	1	1	0	0	192.10.10.192	to	192.10.10.207		
(13)	1	1	0	1	192.10.10.208	to	192.10.10.223		
(14)	1	1	1	0	192.10.10.224	to	192.10.10.239		
(15)	1	1	1	1	192.10.10.240	to	192.10.10.255		

$$\begin{array}{r}
 128 \\
 64 \\
 32 \\
 +16 \\
 \hline
 \text{Custom subnet mask } 240
 \end{array}$$

$$\begin{array}{r}
 16 \\
 -2 \\
 \hline
 \text{Usable subnets } 14
 \end{array}$$

$$\begin{array}{r}
 16 \\
 -2 \\
 \hline
 \text{Usable hosts } 14
 \end{array}$$

The binary value of the last bit borrowed is the range. In this problem the range is 16.

The first address in each subnet range is the subnet number.

The last address in each subnet range is the subnet broadcast address.

Subnetting

Problem 2

Number of needed subnets **1000**

Number of needed usable hosts **60**

Network Address **165.100.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 1,024

Total number of host addresses 64

Number of usable addresses 62

10

What is the 15th subnet range? 165.100.3.128 to 165.100.3.191

What is the subnet number for the 6th subnet? 165 . 100 . 1 . 64

What is the subnet broadcast address for the 6th subnet? 165 . 100 . 1 . 127

What are the assignable addresses for the 9th subnet? 165.100.2.1 to 165.100.0.62

Show your work for Problem 2 in the space below.

Number of Hosts	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536
Number of Subnets	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	16384	32768	65536
Binary values	128	64	32	16	8	4	2	1	1	1	1	1	1	1	1	1
165.100.0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Usable hosts	64	128	64	32	16	8	4	2	1	1	1	1	1	1	1	1
Custom subnet mask	128	64	32	16	8	4	2	1	1	1	1	1	1	1	1	1
	192	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255

The binary value of the last bit borrowed is the range. In this problem the range is 64.

The first address in each subnet range is the subnet number.

The last address in each subnet range is the subnet broadcast address.

(0)	165.100.0.0	to	165.100.0.63
(1)	165.100.0.64	to	165.100.0.127
(2)	165.100.0.128	to	165.100.0.191
(3)	165.100.0.192	to	165.100.0.255
(4)	165.100.1.0	to	165.100.1.63
(5)	165.100.1.64	to	165.100.1.127
(6)	165.100.1.128	to	165.100.1.191
(7)	165.100.1.192	to	165.100.1.255
(8)	165.100.2.0	to	165.100.2.63
(9)	165.100.2.64	to	165.100.2.127
(10)	165.100.2.128	to	165.100.2.191
(11)	165.100.2.192	to	165.100.2.255
(12)	165.100.3.0	to	165.100.3.63
(13)	165.100.3.64	to	165.100.3.127
(14)	165.100.3.128	to	165.100.3.191
(15)	165.100.3.192	to	165.100.3.255

Down to

(1022)	165.100.255.128	to	165.100.255.191
(1023)	165.100.255.192	to	165.100.255.255

Subnetting

Problem 3

Number of needed subnets **2**

Network Address **195.223.50.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 4

Total number of host addresses 64

Number of usable addresses 62

Number of bits borrowed 2

What is the 3rd
subnet range? 195.223.50.128 - 195.223.50.191

What is the subnet number
for the 2nd subnet? 195.223.50.64

What is the subnet
broadcast address for
the 1st subnet? 195.223.50.63

What are the assignable
addresses for the 3rd
subnet? 195.223.50.129 - 195.223.50.190

Show your work for Problem 3 in the space below.

	256	128	64	32	16	8	4	2	-	Number of Hosts
Number of Subnets	-	2	4	8	16	32	64	128	256	
	128	64	32	16	8	4	2	1	-	Binary values
195.223.50.0	0	0	0	0	0	0	0	0	0	

(0)	0	195.223.50.0	to	195.223.50.63
(1)	1	195.223.50.64	to	195.223.50.127
(2)	1 0	195.223.50.128	to	195.223.50.191
(3)	1 1	195.223.50.192	to	195.223.50.255

$$\begin{array}{r}
 128 \\
 +64 \\
 \hline
 192
 \end{array}
 \begin{array}{r}
 64 \\
 -2 \\
 \hline
 62
 \end{array}$$

Subnetting

Problem 4

Number of needed subnets **750**

Network Address **190.35.0.0**

Address class _____ B _____

Default subnet mask _____ 255 . 255 . 0 . 0 _____

Custom subnet mask _____ 255 . 255 . 255 . 192 _____

Total number of subnets _____ 1,024 _____

Total number of host addresses _____ 64 _____

Number of usable addresses _____ 62 _____

Number of bits borrowed _____ 10 _____

What is the 15th
subnet range? _____ 190.35.3.128 to 190.35.3.191 _____

What is the subnet number
for the 13th subnet?
_____ 190.35.3.0 _____

What is the subnet
broadcast address for
the 10th subnet?
_____ 190.35.2.127 _____

What are the assignable
addresses for the 6th
subnet?
_____ 190.35.1.65 to 190.35.1.126 _____

Show your work for Problem 4 in the space below.

Número de subredes posibles: $2^{10} = 1024$ subredes.

Número de direcciones por subred: $2^6 - 2 = 62$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 6 bits (ya que se necesitan 64 hosts, y $2^6 = 64$, lo cual es suficiente para 62 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast	Máscara de Subred
1	190.35.0.0	190.35.0.1	190.35.0.62	190.35.0.63	255.255.255.192
2	190.35.0.64	190.35.0.65	190.35.0.126	190.35.0.127	255.255.255.192
3	190.35.0.128	190.35.0.129	190.35.0.190	190.35.0.191	255.255.255.192
4	190.35.0.192	190.35.0.193	190.35.0.254	190.35.0.255	255.255.255.192
5	190.35.1.0	190.35.1.1	190.35.1.62	190.35.1.63	255.255.255.192



Subnetting

Problem 5

Number of needed usable hosts **6**

Network Address **126.0.0.0**

Address class A

Default subnet mask 255 . 0 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 248

Total number of subnets 2,097,152

Total number of host addresses 8

Number of usable addresses 6

Number of bits borrowed 21

What is the 2nd subnet range? 126.0.0.8 to 126.0.0.15

What is the subnet number for the 5th subnet? 126.0.0.32

What is the subnet broadcast address for the 7th subnet? 126.0.0.55

What are the assignable addresses for the 10th subnet? 126.0.0.73 to 126.0.0.78

Show your work for Problem 5 in the space below.

Número de subredes posibles: $2^{21} = 2,097,152$ subredes.

Número de direcciones por subred: $2^3 - 2 = 6$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast)..

Número de bits necesarios para hosts: 3 bits (ya que se necesitan 8 hosts, y $2^3 = 8$, lo cual es suficiente para 6 hosts).

red	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	126.0.0.0	126.0.0.1	126.0.0.6	126.0.0.7
2	126.0.0.8	126.0.0.9	126.0.0.14	126.0.0.15
3	126.0.0.16	126.0.0.17	126.0.0.22	126.0.0.23
4	126.0.0.24	126.0.0.25	126.0.0.30	126.0.0.31
5	126.0.0.32	126.0.0.33	126.0.0.38	126.0.0.39



Subnetting

Problem 6

Number of needed subnets **10**

Network Address **192.70.10.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 240

Total number of subnets 16

Total number of host addresses 16

Number of usable addresses 14

Number of bits borrowed 4

What is the 9th subnet range? 192.70.10.128 to 192.70.10.143

What is the subnet number for the 4th subnet? 192.70.10.48

What is the subnet broadcast address for the 12th subnet? 192.70.10.191

What are the assignable addresses for the 10th subnet? 192.70.10.145 to 192.70.10.158

Show your work for Problem 6 in the space below.

Número de subredes posibles: $2^4 = 16$ subredes.

Número de direcciones por subred: $2^4 - 2 = 14$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 4 bits (ya que se necesitan 16 hosts, y $2^4 = 16$, lo cual es suficiente para 14 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	192.70.10.0	192.70.10.1	192.70.10.14	192.70.10.15
2	192.70.10.16	192.70.10.17	192.70.10.30	192.70.10.31
3	192.70.10.32	192.70.10.33	192.70.10.46	192.70.10.47
4	192.70.10.48	192.70.10.49	192.70.10.62	192.70.10.63
5	192.70.10.64	192.70.10.65	192.70.10.78	192.70.10.79

Subnetting

Problem 7

Network Address **10.0.0.0 /16**

Address class A

Default subnet mask 255 . 0 . 0 . 0

Custom subnet mask 255 . 255 . 0 . 0

Total number of subnets 256

Total number of host addresses 65,536

Number of usable addresses 65,534

Number of bits borrowed 8

What is the 11th
subnet range? 10.10.0.0 to 10.10.255.255

What is the subnet number
for the 6th subnet? 10.5.0.0

What is the subnet
broadcast address for
the 2nd subnet? 10.1.255.255

What are the assignable
addresses for the 9th
subnet? 10.8.0.1 to 10.8.255.254

Show your work for Problem 7 in the space below.

Número de subredes posibles: $2^8 = 256$ subredes.

Número de direcciones por subred: $2^{16} - 2 = 65,534$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 16 bits (ya que se necesitan 65,536 hosts, y $2^{16} = 65,536$, lo cual es suficiente para 65,534 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	10.0.0.0	10.0.0.1	10.0.0.254	10.0.0.255
2	10.0.1.0	10.0.1.1	10.0.1.254	10.0.1.255
3	10.0.2.0	10.0.2.1	10.0.2.254	10.0.2.255
4	10.0.3.0	10.0.3.1	10.0.3.254	10.0.3.255
5	10.0.4.0	10.0.4.1	10.0.4.254	10.0.4.255



Subnetting

Problem 8

Number of needed subnets **5**
Network Address **172.50.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 224 . 0

Total number of subnets 8

Total number of host addresses 8,192

Number of usable addresses 8,190

Number of bits borrowed 3

What is the 4th
subnet range? 172.50.96.0 to 172.50.127.255

What is the subnet number
for the 5th subnet? 172.50.128.0

What is the subnet
broadcast address for
the 6th subnet? 172.50.191.255

What are the assignable
addresses for the 3rd
subnet? 172.50.64.1 to 172.50.95.254

Show your work for **Problem 8** in the space below.

Número de subredes posibles: $2^3 = 8$ subredes.

Número de direcciones por subred: $2^{13} - 2 = 8,190$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 13 bits (ya que se necesitan 8,192 hosts, y $2^{13} = 8,192$, lo cual es suficiente para 8,190 hosts).

subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast	Máscara de Subred
1	172.50.0.0	172.50.0.1	172.50.31.254	172.50.31.255	255.255.224.0
2	172.50.32.0	172.50.32.1	172.50.63.254	172.50.63.255	255.255.224.0
3	172.50.64.0	172.50.64.1	172.50.95.254	172.50.95.255	255.255.224.0
4	172.50.96.0	172.50.96.1	172.50.127.254	172.50.127.255	255.255.224.0
5	172.50.128.0	172.50.128.1	172.50.159.254	172.50.159.255	255.255.224.0
6	172.50.160.0	172.50.160.1	172.50.191.254	172.50.191.255	255.255.224.0
7	172.50.192.0	172.50.192.1	172.50.223.254	172.50.223.255	255.255.224.0
8	172.50.224.0	172.50.224.1	172.50.255.254	172.50.255.255	255.255.224.0



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Subnetting

Problem 9

Number of needed usable hosts **28**

Network Address **172.50.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 224

Total number of subnets 2,048

Total number of host addresses 32

Number of usable addresses 30

Number of bits borrowed 11

What is the 2nd
subnet range? 172.50.0.32 to 172.50.0.63

What is the subnet number
for the 10th subnet? 172.50.1.32

What is the subnet broadcast
address for
the 4th subnet? 172.50.0.127

What are the assignable
addresses for the 6th
subnet? 172.50.0.161 to 172.50.0.190

Show your work for Problem 9 in the space below.

Número de subredes posibles: $2^{11} = 2,048$ subredes.

Número de direcciones por subred: $2^5 - 2 = 30$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 5 bits (ya que se necesitan 32 hosts, y $2^5 = 32$, lo cual es suficiente para 30 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	172.50.0.0	172.50.0.1	172.50.0.30	172.50.0.31
2	172.50.0.32	172.50.0.33	172.50.0.62	172.50.0.63
3	172.50.0.64	172.50.0.65	172.50.0.94	172.50.0.95
4	172.50.0.96	172.50.0.97	172.50.0.126	172.50.0.127



Subnetting

Problem 10

Number of needed subnets **45**

Network Address **220.100.100.0**

Address class C

Default subnet mask 255 . 255 . 255 . 0

Custom subnet mask 255 . 255 . 255 . 252

Total number of subnets 64

Total number of host addresses 4

Number of usable addresses 2

Number of bits borrowed 6

What is the 5th
subnet range? 220.100.100.16 to 220.100.100.19

What is the subnet number
for the 4th subnet? 220.100.100.12

What is the subnet
broadcast address for
the 13th subnet? 220.100.100.51

What are the assignable
addresses for the 12th
subnet? 220.100.100.45 to 220.100.100.46

Show your work for Problem 10 in the space below.

Número de subredes posibles: $2^2 = 4$ subredes.

Número de direcciones por subred: $2^2 - 2 = 2$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 2 bits (ya que se necesitan 4 hosts, y $2^2 = 4$, lo cual es suficiente para 2 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	220.100.100.0	220.100.100.1	220.100.100.2	220.100.100.3
2	220.100.100.4	220.100.100.5	220.100.100.6	220.100.100.7
3	220.100.100.8	220.100.100.9	220.100.100.10	220.100.100.11
4	220.100.100.12	220.100.100.13	220.100.100.14	220.100.100.15



Subnetting

Problem 11

Number of needed usable hosts **8,000**

Network Address **135.70.0.0**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 224 . 0

Total number of subnets 8

Total number of host addresses 8,192

Number of usable addresses 8,190

Number of bits borrowed 3

What is the 6th
subnet range? 135.70.160.0 to 135.70.191.255

What is the subnet number
for the 7th subnet? 135.70.192.0

What is the subnet
broadcast address for
the 3rd subnet? 135.70.95.255

What are the assignable
addresses for the 5th
subnet? 135.70.128.1 to 135.70.159.254

Show your work for Problem 11 in the space below.

Número de subredes posibles: $2^3 = 8$ subredes.

Número de direcciones por subred: $2^{13} - 2 = 8190$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 13 bits (ya que se necesitan 8000 hosts, y $2^{13} = 8192$, lo cual es suficiente para 8000 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	135.70.0.0	135.70.0.1	135.70.31.254	135.70.31.255
2	135.70.32.0	135.70.32.1	135.70.63.254	135.70.63.255
3	135.70.64.0	135.70.64.1	135.70.95.254	135.70.95.255
4	135.70.96.0	135.70.96.1	135.70.127.254	135.70.127.255
5	135.70.128.0	135.70.128.1	135.70.159.254	135.70.159.255
6	135.70.160.0	135.70.160.1	135.70.191.254	135.70.191.255
7	135.70.192.0	135.70.192.1	135.70.223.254	135.70.223.255
8	135.70.224.0	135.70.224.1	135.70.255.254	135.70.255.255

Subnetting

Problem 12

Number of needed usable hosts **45**

Network Address **198.125.50.0**

Address class _____ C _____

Default subnet mask _____ 255 . 255 . 255 . 0 _____

Custom subnet mask _____ 255 . 255 . 255 . 192 _____

Total number of subnets _____ 4 _____

Total number of host addresses _____ 64 _____

Number of usable addresses _____ 62 _____

Number of bits borrowed _____ 2 _____

What is the 2nd
subnet range? 198.125.50.64 to 198.125.50.127

What is the subnet number
for the 2nd subnet? 198.125.50.64

What is the subnet
broadcast address for
the 4th subnet? 198.125.50.255

What are the assignable
addresses for the 3rd
subnet? 198.125.50.129 to 198.125.50.190

Show your work for Problem 12 in the space below.

Número de subredes posibles: $2^2 = 4$ subredes.

Número de direcciones por subred: $2^6 - 2 = 62$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits necesarios para hosts: 6 bits (ya que se necesitan 45 hosts, y $2^6 = 64$, lo cual es suficiente para 62 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	198.125.50.0	198.125.50.1	198.125.50.62	198.125.50.63
2	198.125.50.64	198.125.50.65	198.125.50.126	198.125.50.127
3	198.125.50.128	198.125.50.129	198.125.50.190	198.125.50.191
4	198.125.50.192	198.125.50.193	198.125.50.254	198.125.50.255



Subnetting

Problem 13

Network Address **165.200.0.0 /26**

Address class B

Default subnet mask 255 . 255 . 0 . 0

Custom subnet mask 255 . 255 . 255 . 192

Total number of subnets 1,024

Total number of host addresses 64

Number of usable addresses 62

Number of bits borrowed 10

What is the 10th subnet range? 165.200.2.64 to 165.200.2.127

What is the subnet number for the 11th subnet? 165.200.2.128

What is the subnet broadcast address for the 1023rd subnet? 165.200.255.191

What are the assignable addresses for the 1022nd subnet? 165.200.255.65 to 165.200.255.126

Show your work for Problem 13 in the space below.

Número de subredes posibles: $2^{10} = 1024$ subredes.

Número de direcciones por subred: $2^6 - 2 = 62$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast)..

Número de bits necesarios para hosts: 6 bits (ya que se necesitan 62 hosts, y $2^6 = 64$, lo cual es suficiente para 62 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	165.200.0.0	165.200.0.1	165.200.0.62	165.200.0.63
2	165.200.0.64	165.200.0.65	165.200.0.126	165.200.0.127
3	165.200.0.128	165.200.0.129	165.200.0.190	165.200.0.191
4	165.200.0.192	165.200.0.193	165.200.0.254	165.200.0.255
5	165.200.1.0	165.200.1.1	165.200.1.62	165.200.1.63
6	165.200.1.64	165.200.1.65	165.200.1.126	165.200.1.127
7	165.200.1.128	165.200.1.129	165.200.1.190	165.200.1.191
8	165.200.1.192	165.200.1.193	165.200.1.254	165.200.1.255
9	165.200.2.0	165.200.2.1	165.200.2.62	165.200.2.63
10	165.200.2.64	165.200.2.65	165.200.2.126	165.200.2.127
11	165.200.2.128	165.200.2.129	165.200.2.190	165.200.2.191
12	165.200.2.192	165.200.2.193	165.200.2.254	165.200.2.255
13	165.200.3.0	165.200.3.1	165.200.3.62	165.200.3.63
14	165.200.3.64	165.200.3.65	165.200.3.126	165.200.3.127
15	165.200.3.128	165.200.3.129	165.200.3.190	165.200.3.191

Subnetting

Problem 14

Number of needed usable hosts **16**

Network Address **200.10.10.0**

Address class _____ C _____

Default subnet mask _____ 255 . 255 . 255 . 0 _____

Custom subnet mask _____ 255 . 255 . 255 . 224 _____

Total number of subnets _____ 8 _____

Total number of host addresses _____ 32 _____

Number of usable addresses _____ 30 _____

Number of bits borrowed _____ 3 _____

What is the 7th
subnet range? _____ 200.10.10.192 to 200.10.10.223 _____

What is the subnet number
for the 5th subnet? _____ 200.10.10.128 _____

What is the subnet
broadcast address for
the 4th subnet? _____ 200.10.10.127 _____

What are the assignable
addresses for the 6th
subnet? _____ 200.10.10.161 to 200.10.10.190 _____

Show your work for Problem 14 in the space below.

Número de subredes posibles: $2^3 = 8$ subredes.

Número de direcciones por subred: $2^5 - 2 = 30$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

Número de bits prestados: 3 bits prestados para las subredes.

Número de bits necesarios para hosts: 5 bits (ya que se necesitan 30 hosts, y $2^5 = 32$, lo cual es suficiente para 30 hosts).

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast
1	200.10.10.0	200.10.10.1	200.10.10.30	200.10.10.31
2	200.10.10.32	200.10.10.33	200.10.10.62	200.10.10.63
3	200.10.10.64	200.10.10.65	200.10.10.94	200.10.10.95
4	200.10.10.96	200.10.10.97	200.10.10.126	200.10.10.127
5	200.10.10.128	200.10.10.129	200.10.10.158	200.10.10.159
6	200.10.10.160	200.10.10.161	200.10.10.190	200.10.10.191
7	200.10.10.192	200.10.10.193	200.10.10.222	200.10.10.223
8	200.10.10.224	200.10.10.225	200.10.10.254	200.10.10.255



Subnetting

Problem 15

Network Address **93.0.0.0** \19

Address class A

Default subnet mask 255 . 0 . 0 . 0

Custom subnet mask 255 . 255 . 224 . 0

Total number of subnets 2,048

Total number of host addresses 8,192

Number of usable addresses 8,190

Number of bits borrowed 11

What is the 15th subnet range? 93.1.192.0 to 93.1.223.255

What is the subnet number for the 9th subnet? 93.1.0.0

What is the subnet broadcast address for the 7th subnet? 93.0.223.255

What are the assignable addresses for the 12th subnet? 93.1.96.1 to 93.1.127.254

Dirección de Red: 93.0.0.0 /19

Rango de Direcciones:

Desde 93.1.192.0 hasta 93.1.223.255

Desde 93.1.0.0 hasta 93.0.223.255

Desde 93.1.96.1 hasta 93.1.127.254

Máscara de Subred en binario: 11111111.11111111.11100000.00000000

Máscara de Subred en decimal: 255.255.224.0

Número de subredes posibles: $2^{(32-19)} = 2^{13} = 8192$ subredes.

Número de direcciones por subred: $2^{(32-19)} - 2 = 8190$ direcciones por subred (2 direcciones restadas para la dirección de red y la dirección de broadcast).

salto 256-224=32

Subred	Dirección de Red	Primera IP Valida	Última IP Valida	Broadcast	Máscara de Subred
1	93.0.0.0	93.0.0.1	93.0.31.254	93.0.31.255	255.255.224.0
2	93.0.32.0	93.0.32.1	93.0.63.254	93.0.63.255	255.255.224.0
3	93.0.64.0	93.0.64.1	93.0.95.254	93.0.95.255	255.255.224.0
4	93.0.96.0	93.0.96.1	93.0.127.254	93.0.127.255	255.255.224.0
5	93.0.128.0	93.0.128.1	93.0.159.254	93.0.159.255	255.255.224.0
6	93.0.160.0	93.0.160.1	93.0.191.254	93.0.191.255	255.255.224.0
7	93.0.192.0	93.0.192.1	93.0.223.254	93.0.223.255	255.255.224.0
8	93.0.224.0	93.0.224.1	93.0.255.254	93.0.255.255	255.255.224.0
9	93.1.0.0	93.1.0.1	93.1.31.254	93.1.31.255	255.255.224.0
10	93.1.32.0	93.1.32.1	93.1.63.254	93.1.63.255	255.255.224.0
11	93.1.64.0	93.1.64.1	93.1.95.254	93.1.95.255	255.255.224.0
12	93.1.96.0	93.1.96.1	93.1.127.254	93.1.127.255	255.255.224.0
13	93.1.128.0	93.1.128.1	93.1.159.254	93.1.159.255	255.255.224.0
14	93.1.160.0	93.1.160.1	93.1.191.254	93.1.191.255	255.255.224.0