

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

Number of bits borrowed 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									

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

$$\begin{array}{r} 128 \\ 64 \\ 32 \\ + 16 \\ \hline 240 \end{array}$$

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

Observe the total number of hosts.

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

Number of bits borrowed 10

Show your work for Problem 2 in the space below.

Number of Hosts -	65,536	2	65,536	4	32,768	8	16,384	16	8,192	32	4,096	64	2,048	128	64	32	16	8	4	2	1
Number of Subnets -	128	2	64	4	32	8	16	32	64	128	256	512	1,024	2,048	4,096	8,192	16,384	32,768	65,536		
Binary values -	128	64	32	16	8	4	2	1	.	128	64	512	1,024	2,048	4,096	8,192	16,384	32,768	65,536		
165.100.0.0	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																				
	16																				
Add the binary value numbers to the left of the line to create the custom subnet mask.	8																				
	4																				
	2																				
	+1																				
	255																				

Observe the total number of hosts.

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 _____

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.

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 2048

Total number of host addresses 32

Number of usable addresses 30

Number of bits borrowed 11

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	4096	8192	16384	32768	65536	
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	-																	

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 1024

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.

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	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 -	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Binary values -	128	64	32	16	8	4	2	1	.	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
	172	59	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	0	0		

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

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

$$\begin{array}{r} 128 \\ 64 \\ 32 \\ 16 \\ 8 \\ 4 \\ 2 \\ \hline 255 \end{array}$$

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

Number of bits borrowed 4

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	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 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							

128 64 32 +16 <hr style="border-top: 1px solid black;"/> Custom subnet mask	16 -2 <hr style="border-top: 1px solid black;"/> Usable subnets	16 -2 <hr style="border-top: 1px solid black;"/> Usable hosts
	14	14

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 broadcast address.

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

Number of bits borrowed 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.

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 8192

Number of usable addresses 8190

Number of bits borrowed 3

What is the 6th subnet range? 135.70.160.0 to 135.70.171.225

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.

(0)	135.70.0.0	to	135.70.31.255
(1)	135.70.32.0	to	135.70.63.255
(2)	135.70.64.0	to	135.70.95.255
(3)	135.70.96.0	to	135.70.127.255
(4)	135.70.128.0	to	135.70.159.255
(5)	135.70.160.0	to	135.70.191.255
(6)	135.70.192.0	to	135.70.223.255
(7)	135.70.224.0	to	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

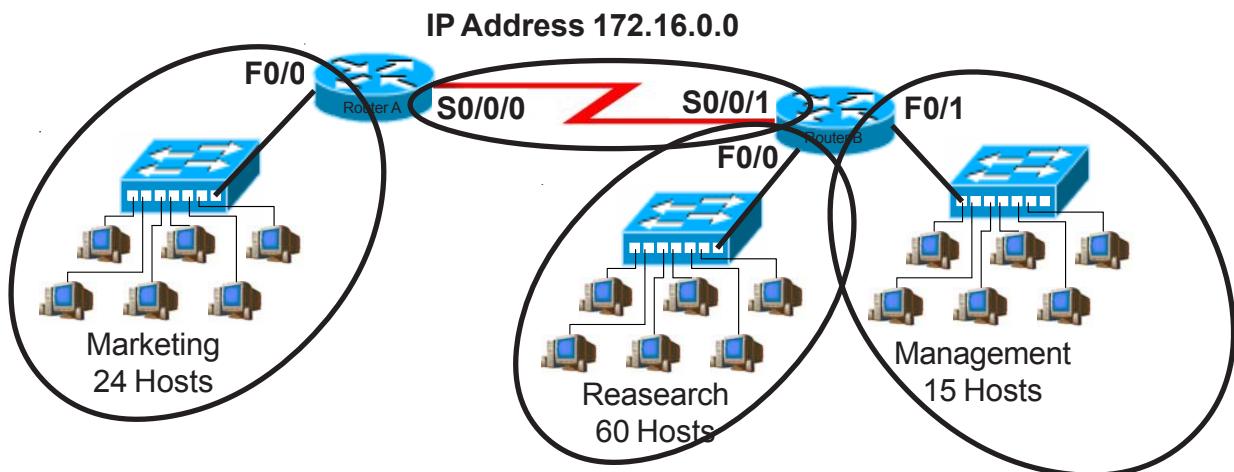
What are the assignable addresses for the 3rd subnet? 198.125.50.128 to 198.125.50.190

Show your work for Problem 12 in the space below.

- | | | | |
|-----|---------------------|----|---------------------|
| (0) | 198. 125 . 50 . 0 | 60 | 198. 125 . 50 . 63 |
| (1) | 198. 125 . 50 . 66 | 60 | 198. 125 . 50 . 127 |
| (2) | 198. 125 . 50 . 128 | 60 | 198. 125 . 50 . 191 |
| (3) | 198. 125 . 50 . 192 | 60 | 198. 125 . 50 . 255 |

Practical Subnetting 1

Based on the information in the graphic shown, design a network addressing scheme that will supply the minimum number of subnets, and allow enough extra subnets and hosts for 100% growth in both areas. Circle each subnet on the graphic and answer the questions below.



Address class B

Custom subnet mask 255.255.224.0

Minimum number of subnets needed 4

Extra subnets required for 100% growth
(Round up to the next whole number) + 4

Total number of subnets needed = 8

Number of host addresses in the largest subnet group 60

Number of addresses needed for 100% growth in the largest subnet
(Round up to the next whole number) + 60

Total number of address needed for the largest subnet = 120

Start with the first subnet and arrange your sub-networks from the largest group to the smallest.

IP address range for Research 172.16.0.0 to 172.31.255

IP address range for Marketing 172.16.32.0 to 172.63.255

IP address range for Management 172.16.64.0 to 172.95.255

IP address range for Router A to Router B serial connection 172.16.96.0 to 172.127.255

Show your work for Practical Subnetting 1 in the space below.

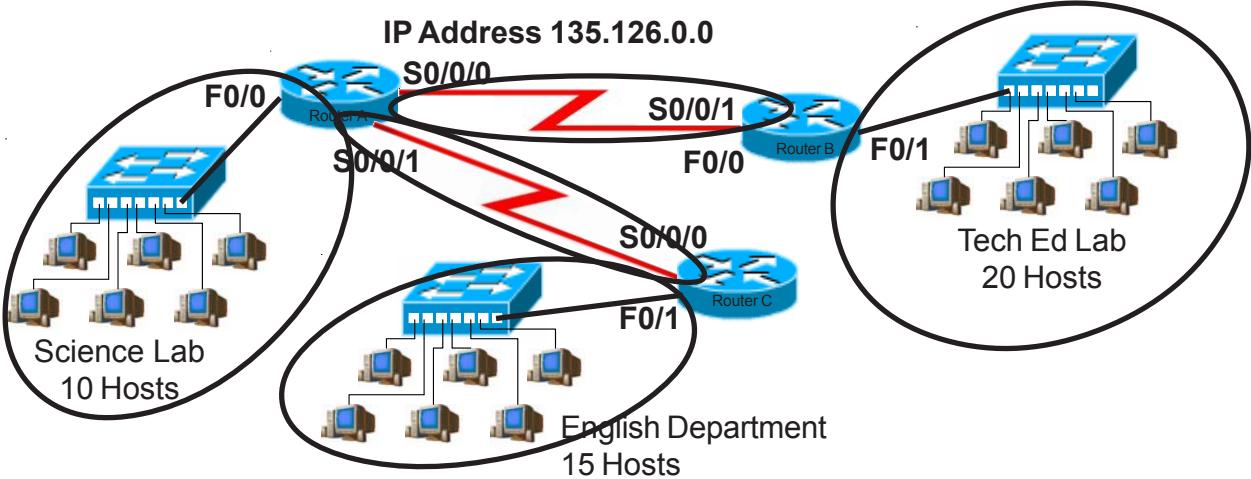
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Number of Hosts -</td><td style="padding: 5px;">65,536</td></tr> <tr> <td style="padding: 5px;">Number of Subnets -</td><td style="padding: 5px;">32,768</td></tr> <tr> <td style="padding: 5px;">Binary values -</td><td style="padding: 5px;">128 64 32 16 8 4 2</td></tr> <tr> <td style="padding: 5px;">172 . 16 . 0 0 0 0</td><td style="padding: 5px;">0 0 0 0 0 0 0</td></tr> </table>	Number of Hosts -	65,536	Number of Subnets -	32,768	Binary values -	128 64 32 16 8 4 2	172 . 16 . 0 0 0 0	0 0 0 0 0 0 0	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">512</td><td style="padding: 5px;">. 256 128 64 32 16 8 4 2</td></tr> <tr> <td style="padding: 5px;">1,024</td><td style="padding: 5px;">32,768</td></tr> <tr> <td style="padding: 5px;">2,048</td><td style="padding: 5px;">16,384</td></tr> <tr> <td style="padding: 5px;">4,096</td><td style="padding: 5px;">8,192</td></tr> <tr> <td style="padding: 5px;">8,192</td><td style="padding: 5px;">4,096</td></tr> <tr> <td style="padding: 5px;">16,384</td><td style="padding: 5px;">2,048</td></tr> <tr> <td style="padding: 5px;">32,768</td><td style="padding: 5px;">1,024</td></tr> <tr> <td style="padding: 5px;">65,536</td><td style="padding: 5px;">512</td></tr> </table>	512	. 256 128 64 32 16 8 4 2	1,024	32,768	2,048	16,384	4,096	8,192	8,192	4,096	16,384	2,048	32,768	1,024	65,536	512								
Number of Hosts -	65,536																																
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(0)	0																																
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(3)	1 1																																
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(5)	1 0 1																																
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172.16.0.0	to																																
172.16.32.0	to																																
172.16.64.0	to																																
172.16.96.0	to																																
172.16.128.0	to																																
172.16.160.0	to																																
172.16.192.0	to																																
172.16.224.0	to																																

$$\begin{array}{r} 4 \\ \times 1.0 \\ \hline 4 \end{array}$$

$$\begin{array}{r} 60 \\ \times 1.0 \\ \hline 60 \end{array}$$

Practical Subnetting 2

Based on the information in the graphic shown, design a network addressing scheme that will supply the minimum number of hosts per subnet, and allow enough extra subnets and hosts for 30% growth in all areas. Circle each subnet on the graphic and answer the questions below.



Address class B

Custom subnet mask 255.255.255.224

Minimum number of subnets needed 5

Extra subnets required for 30% growth
(Round up to the next whole number) + 2

Total number of subnets needed = 7

Number of host addresses in the largest subnet group 20

Number of addresses needed for 30% growth in the largest subnet
(Round up to the next whole number) + 6

Total number of address needed for the largest subnet = 26

Start with the first subnet and arrange your sub-networks from the largest group to the smallest.

IP address range for Tech Ed 135.126.0.0 to 135.126.0.31

IP address range for English 135.126.0.32 to 135.126.0.63

IP address range for Science 135.126.0.64 to 135.126.0.95

IP address range for Router A to Router B serial connection 135.126.0.96 to 135.126.0.127

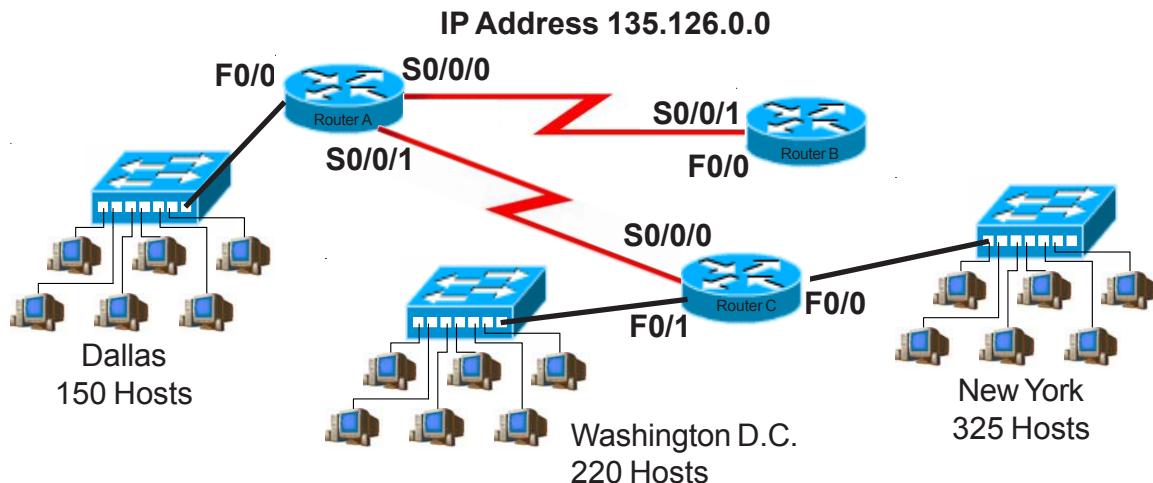
IP address range for Router A to Router B serial connection 135.126.0.128 to 135.126.0.159

Show your work for Problem 2 in the space below.

Number of Hosts -	512	. 256 128 64 32 16 8 4 2	65,536
Number of Subnets -	1,024	. 512 256 128 64 32 16 8 4	32,768
Binary values -	128 64 32 16 8 4 2 1 .	128 64 32 16 8 4 2 1	16,384
135. 126. 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 0 0 0 0 0 0
(0)	.	0 /35.126.0.0	t0 /35.126.0.31
(1)	.	1 /35.126.0.32	t0 /35.126.0.63
(2)	.	1 /0 /35.126.0.64	t0 /35.126.0.95
(3)	.	1 /1 /35.126.0.96	t0 /35.126.0.127
(4)	.	1 /0 /0 /35.126.0.128	t0 /35.126.0.159
(5)	.	1 /1 /0 /1 /35.126.0.160	t0 /35.126.0.191
(6)	.	1 /1 /1 /0 /35.126.0.192	t0 /35.126.0.223
(7)	.	1 /1 /1 /1 /35.126.0.224	t0 /35.126.0.255
(8)	.	1 /0 /0 /0 /35.126.1.0	t0 /35.126.1.31
(9)	.	1 /0 /0 /0 /35.126.1.32	t0 /35.126.1.63
(10)	.	1 /0 /0 /1 /35.126.1.64	t0 /35.126.1.95
(11)	.	1 /1 /1 /1 /35.126.1.96	t0 /35.126.1.27
(12)	.	1 /1 /1 /1 /35.126.1.128	t0 /35.126.1.159
(13)	.	1 /1 /1 /1 /35.126.1.160	t0 /35.126.1.191
(14)	.	1 /1 /1 /1 /35.126.1.192	t0 /35.126.1.223
(15)	.	1 /1 /1 /1 /35.126.1.224	t0 /35.126.1.255

Practical Subnetting 4

Based on the information in the graphic shown, design a network addressing scheme that will supply the minimum number of subnets, and allow enough extra subnets and hosts for 70% growth in all areas. Circle each subnet on the graphic and answer the questions below.



Address class B

Custom subnet mask 255.255.240.0

Minimum number of subnets needed 5

Extra subnets required for 70% growth
(Round up to the next whole number) + 4

Total number of subnets needed = 9

Number of host addresses in the largest subnet group 325

Number of addresses needed for 70% growth in the largest subnet
(Round up to the next whole number) + 228

Total number of address needed for the largest subnet = 553

Start with the first subnet and arrange your sub-networks from the largest group to the smallest.

IP address range for New York 135.126.0.0 to 135.126.15.255

IP address range for Washington D. C. 135.126.16.0 to 135.126.31.255

IP address range for Dallas 135.126.32.0 to 135.126.47.255

IP address range for Router A to Router B serial connection 135.126.48.0 to 135.126.63.255

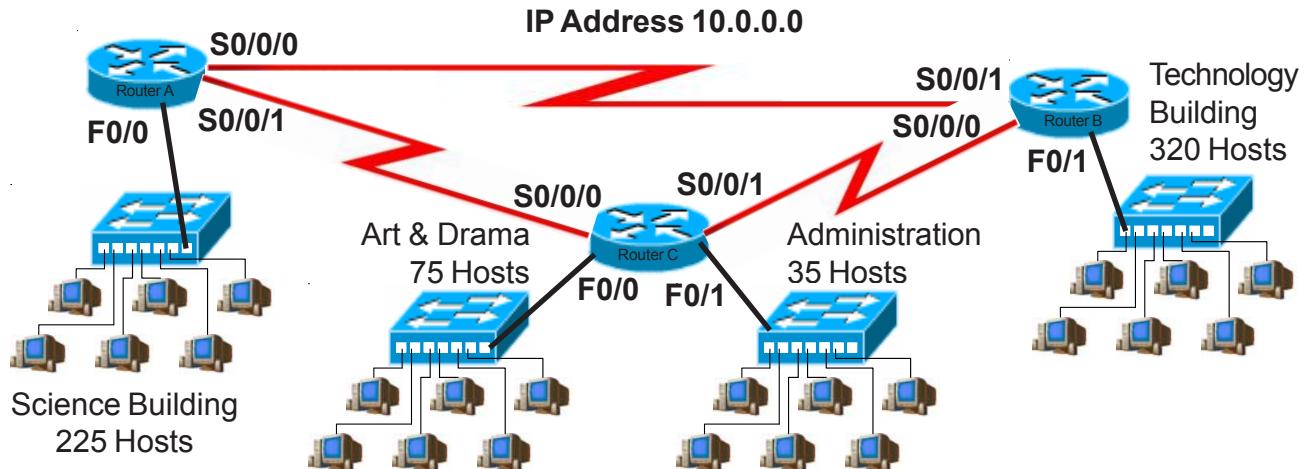
IP address range for Router A to Router C serial connection 135.126.64.0 to 135.126.79.255

Show your work for Problem 4 in the space below.

PG			
(0)	135.126. 0. 0	to	135.126. 15. 255
(1)	135.126. 16. 0	to	135.126. 31. 255
(2)	135.126. 32. 0	to	135.126. 47. 255
(3)	135.126. 48. 0	to	135.126. 63. 255
(4)	135.126. 64. 0	to	135.126. 79. 255
(5)	135.126. 80. 0	to	135.126. 95. 255
(6)	135.126. 96. 0	to	135.126. 111. 255
(7)	135.126. 112. 0	to	135.126. 127. 255
(8)	135.126. 128. 0	to	135.126. 143. 255
(9)	135.126. 144. 0	to	135.126. 159. 255
(10)	135.126. 160. 0	to	135.126. 171. 255
(11)	135.126. 172. 0	to	135.126. 174. 255
(12)	135.126. 172. 0	to	135.126. 208. 255
(13)	135.126. 209. 0	to	135.126. 223. 255
(14)	135.126. 224 ²²⁴ . 0	to	135.126. 239. 255
(15)	135.126. 240. 0	to	135.126. 255. 255

Practical Subnetting 6

Based on the information in the graphic shown, design a network addressing scheme that will supply the minimum number of subnets, and allow enough extra subnets and hosts for 20% growth in all areas. Circle each subnet on the graphic and answer the questions below.



Address class A

Custom subnet mask 255.250.0.0

Minimum number of subnets needed 7

Extra subnets required for 20% growth + 2
(Round up to the next whole number)

Total number of subnets needed = 9

Start with the first subnet and arrange your sub-networks from the largest group to the smallest.

IP address range for Technology 10.0.0.0 to 10.15.255.255

IP address range for Science 10.16.0.0 to 10.31.255.255

IP address range for Arts & Drama 10.32.0.0 to 10.47.255.255

IP Address range Administration 10.48.0.0 to 10.63.255.255

IP address range for Router A to Router B serial connection 10.64.0.0 to 10.79.255.255

IP address range for Router A to Router C serial connection 10.80.0.0 to 10.95.255.255

IP address range for Router B to Router C serial connection 10.96.0.0 to 10.111.255.255

Show your work for Problem 6 in the space below.

<u>PG</u>			
①)	10. 0.00	to	10.15 · 255 · 255
1)	10. 16 · 0.0	to	10.31 · 255 · 255
2)	10. 32 · 0.0	to	10.47 · 255 · 255
3)	10. 48 · 0.0	to	10.63 · 255 · 255
4)	10. 64 · 0.0	to	10.79 · 255 · 255
5)	10. 80 · 0.0	to	10.95 · 255 · 255
6)	10. 96 · 0.0	to	10.11 · 255 · 255
7)	10. 112 · 0.0	to	10.127 · 255 · 255
8)	10. 128 · 0.0	to	10.143 · 255 · 255
9)	10. 144 · 0.0	to	10.159 · 255 · 255
10)	10. 160 · 0.0	to	10.175 · 255 · 255
11)	10. 176 · 0.0	to	10.191 · 255 · 255
12)	10. 192 · 0.0	to	10.207 · 255 · 255
13)	10. 208 · 0.0	to	10.223 · 255 · 255
14)	10. 224 · 0.0	to	10.239 · 255 · 255
15)	10. 240 · 0.0	to	10.255 · 255 · 255