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.

	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
192 . 10 . 10 .	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
−2
14

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	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	
165 . 100 .	0	0	0	0	0	0	0	0	.	0	0	0	0	0	0	0	0	

128 + 64 + 32 + 16 + 8 + 4 + 2 + 1 = 255

128 + 64 = 192

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

64 − 2 = 62

Observe the total number of hosts.

Subtract 2 for the number of usable hosts.

Custom Subnet Masks

Problem 3

/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.

Network Address **148.75.0.0 /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

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	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
148 . 75 .	0	0	0	0	0	0	0	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
8
4
2
+1
255

128
+64
192

64 Observe the total number of hosts.
−2 Subtract 2 for the number of usable hosts.
62

1024
−2
1,022

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

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

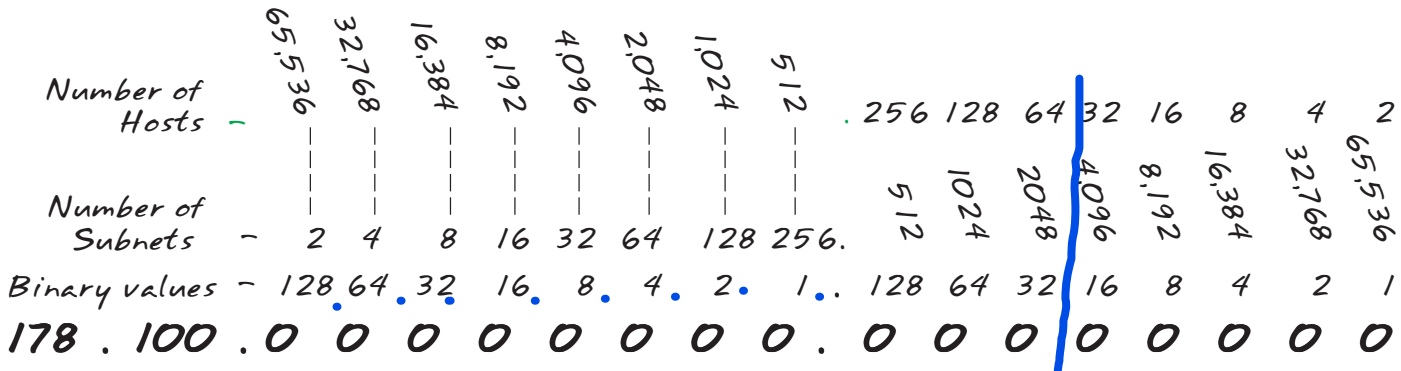
Total number of subnets 2048

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.



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.

172.59.11111111.11000000

1024

255

$2^6 = 62$ usable hosts / Sub

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 <u>Problem 1</u> 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	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

Custom subnet mask:
128
64
32
+16
240

Usable subnets:
16
−2
14

Usable hosts:
16
−2
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 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

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.

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
165 . 100 .	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**. 0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Usable hosts: 64 − 2 = 62

Custom subnet mask: 128 + 64 = 192

Broadcast: 128 + 64 − 1 = 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)									.		0	165.100.0.0	to	165.100.0.63
(1)											1	165.100.0.64	to	165.100.0.127
(2)										1	0	165.100.0.128	to	165.100.0.191
(3)										1	1	165.100.0.192	to	165.100.0.255
(4)								1	.	0	0	165.100.1.0	to	165.100.1.63
(5)								1	.	0	1	165.100.1.64	to	165.100.1.127
(6)								1	.	1	0	165.100.1.128	to	165.100.1.191
(7)								1	.	1	1	165.100.1.192	to	165.100.1.255
(8)							1	0	.	0	0	165.100.2.0	to	165.100.0.63
(9)							1	0	.	0	1	165.100.2.64	to	165.100.0.127
(10)							1	0	.	1	0	165.100.2.128	to	165.100.0.191
(11)							1	0	.	1	1	165.100.2.192	to	165.100.0.255
(12)							1	1	.	0	0	165.100.3.0	to	165.100.3.63
(13)							1	1	.	0	1	165.100.3.64	to	165.100.3.127
(14)							1	1	.	1	0	165.100.3.128	to	165.100.3.191
(15)							1	1	.	1	1	165.100.3.192	to	165.100.3.255

Down to

(1022)	1	1	1	1	1	1	1	1	.	1	0	165.100.255.128	to	165.100.255.191
(1023)	1	1	1	1	1	1	1	1	.	1	1	165.100.255.192	to	165.100.255.255

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 255.255.255.248

Total number of subnets B192

Total number of host addresses 7

Number of usable addresses 5

Number of bits borrowed 13

What is the 6th subnet range? 135.70.0.32 to 135.70.0.34

What is the subnet number for the 7th subnet? 175.70.0.40

What is the subnet broadcast address for the 3rd subnet? 175.70.0.15

What are the assignable addresses for the 5th subnet? 175.70.0.25

to

135.70.0.30

Show your work for Problem 11 in the space below.

1) 135.70 . 0 . 0 -> ... 7

2) 135.70 . 0 . 8 -> ... 15 ✱

3) 135.70 . 0 . 16 -> ... 23

4) 24 -> ... 31 ✱

5) 32 -> ... 39 ✱

6) 40 -> ... 47 ✱

7) 48 -> ... 57

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

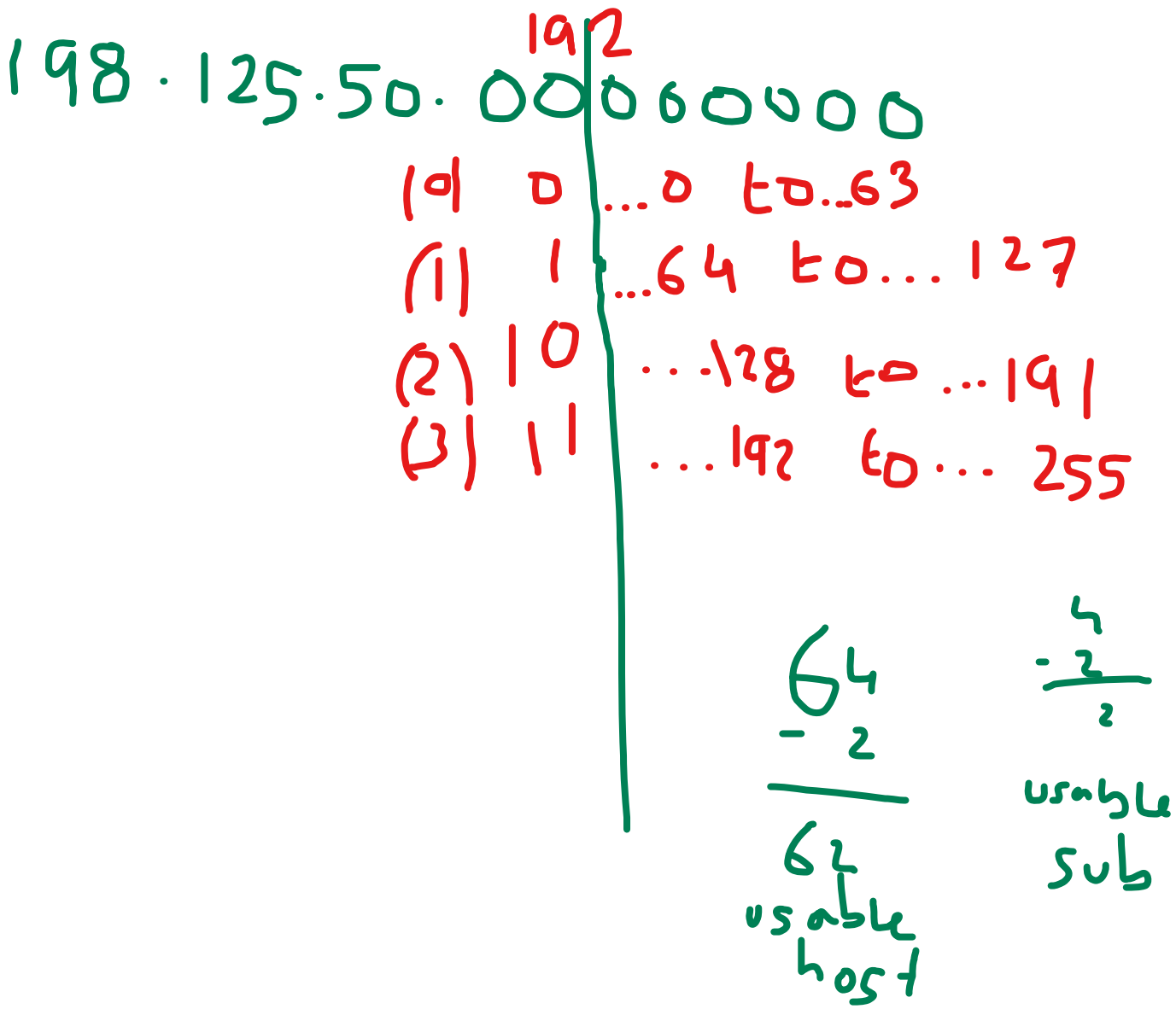
What is the 2nd subnet range? 198.125.50.64 to 198.125.50.127

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

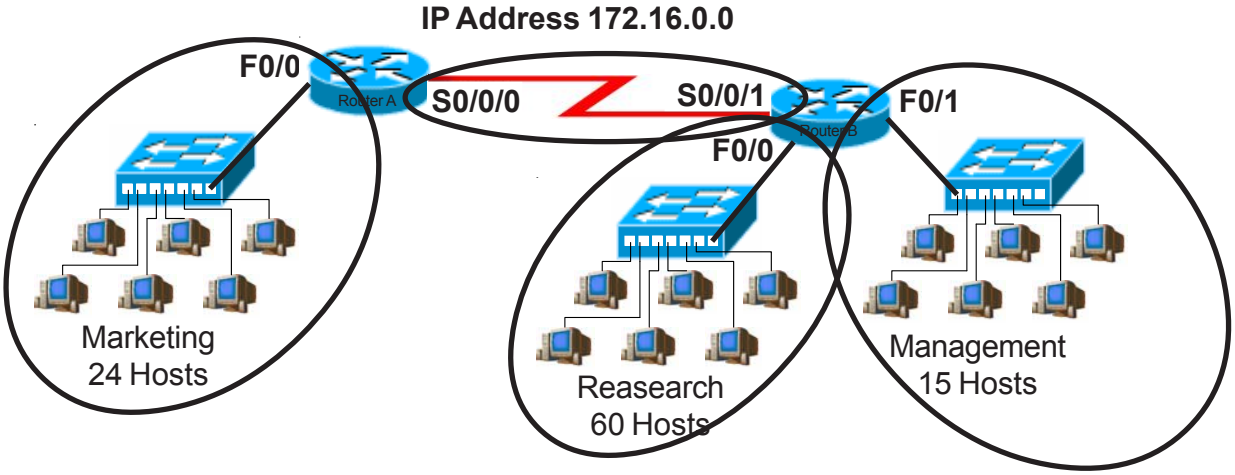
What are the assignable addresses for the 3rd subnet? 198.125.50.129 to 198.125.50.190

Show your work for <u>Problem 12</u> in the space below.



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.

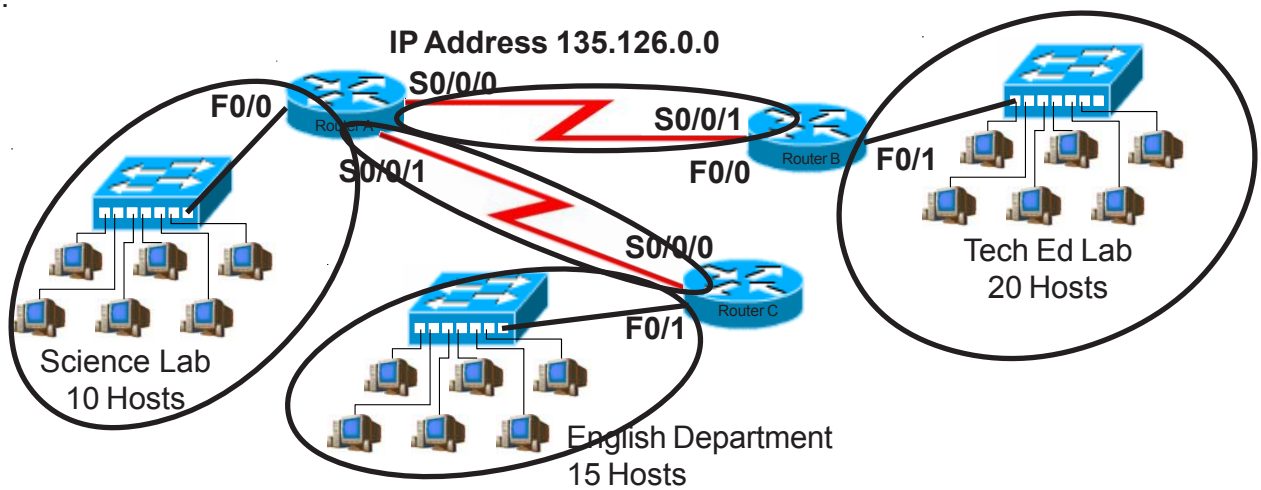
Number of Hosts –		65,536	32,768	16,384	8,192	4,096	2,048	1,024	512	.256	128	64	32	16	8	4	2
Number of Subnets –		2	4	8	16	32	64	128	256.	512	1024	2048	4,096	8,192	16,384	32,768	65,536
Binary values –		128	64	32	16	8	4	2	1 .	128	64	32	16	8	4	2	1
172 .	16 .	0	0	0	0	0	0	0	0 .	0	0	0	0	0	0	0	0

(0)			0	172.16.0.0	to	172.16.31.255
(1)			1	172.16.32.0	to	172.16.63.255
(2)		1	0	172.16.64.0	to	172.16.95.255
(3)		1	1	172.16.96.0	to	172.16.127.255
(4)	1	0	0	172.16.128.0	to	172.16.159.255
(5)	1	0	1	172.16.160.0	to	172.16.191.255
(6)	1	1	0	172.16.192.0	to	172.16.223.255
(7)	1	1	1	172.16.224.0	to	172.16.255.255

$$\begin{array}{r} 4 \\ \times 1.0 \\ \hline 4 \end{array} \qquad \begin{array}{r} 60 \\ \times 1.0 \\ \hline 60 \end{array}$$

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 <u>Problem 2</u> 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
135. 126 .	0	0	0	0	0	0	0	0 .	0	0	0	0	0	0	0	0

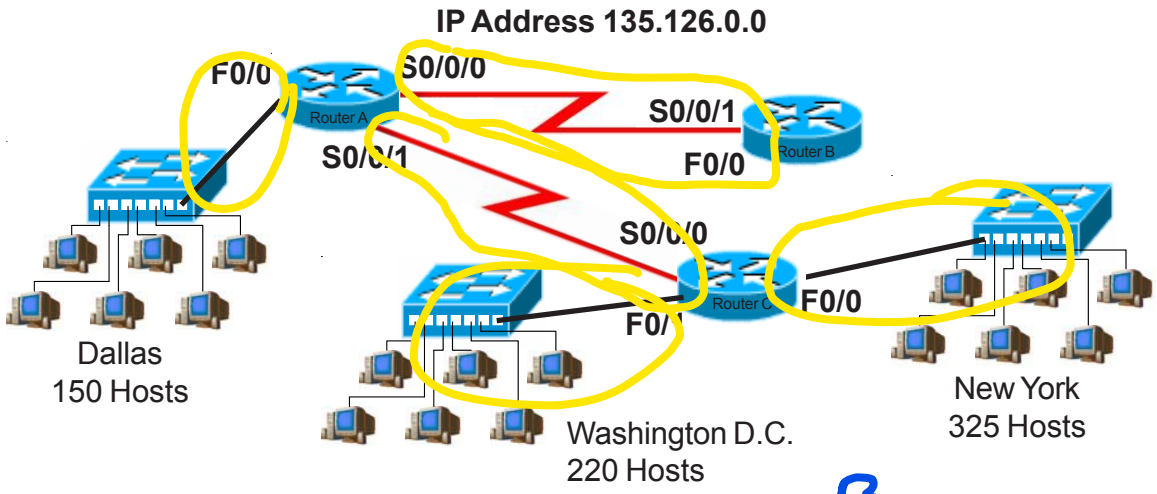
Subnet	1	.	128	64	32	Start		End
(0)		.			0	135.126.0.0	to	135.126.0.31
(1)					1	135.126.0.32	to	135.126.0.63
(2)				1	0	135.126.0.64	to	135.126.0.95
(3)				1	1	135.126.0.96	to	135.126.0.127
(4)			1	0	0	135.126.0.128	to	135.126.0.159
(5)			1	0	1	135.126.0.160	to	135.126.0.191
(6)			1	1	0	135.126.0.192	to	135.126.0.223
(7)			1	1	1	135.126.0.224	to	135.126.0.255
(8)	1	.	0	0	0	135.126.1.0	to	135.126.1.31
(9)	1	.	0	0	1	135.126.1.32	to	135.126.1.63
(10)	1	.	0	1	0	135.126.1.64	to	135.126.1.95
(11)	1	.	0	1	1	135.126.1.96	to	135.126.1.127
(12)	1	.	1	0	0	135.126.1.128	to	135.126.1.159
(13)	1	.	1	0	1	135.126.1.160	to	135.126.1.191
(14)	1	.	1	1	0	135.126.1.192	to	135.126.1.223
(15)	1	.	1	1	1	135.1261.224	to	135.126.1.255

5
x.3
1.5
(Round up to 2)

20
x.3
6

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 + 4
(Round up to the next whole number)

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 + 228
(Round up to the next whole number)

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

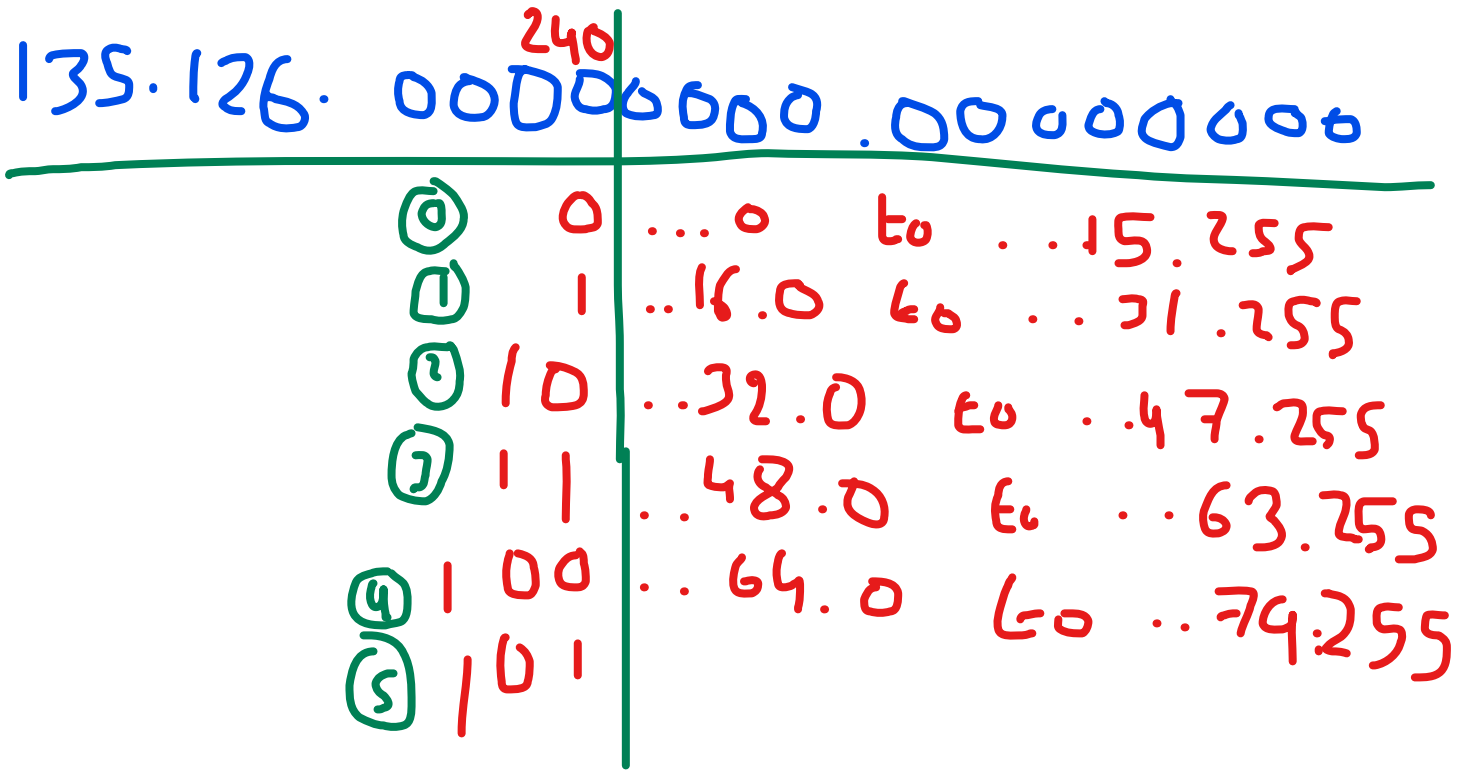
IP address range for Dallas 135.126.32.0 to 135.126.47.255

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 to

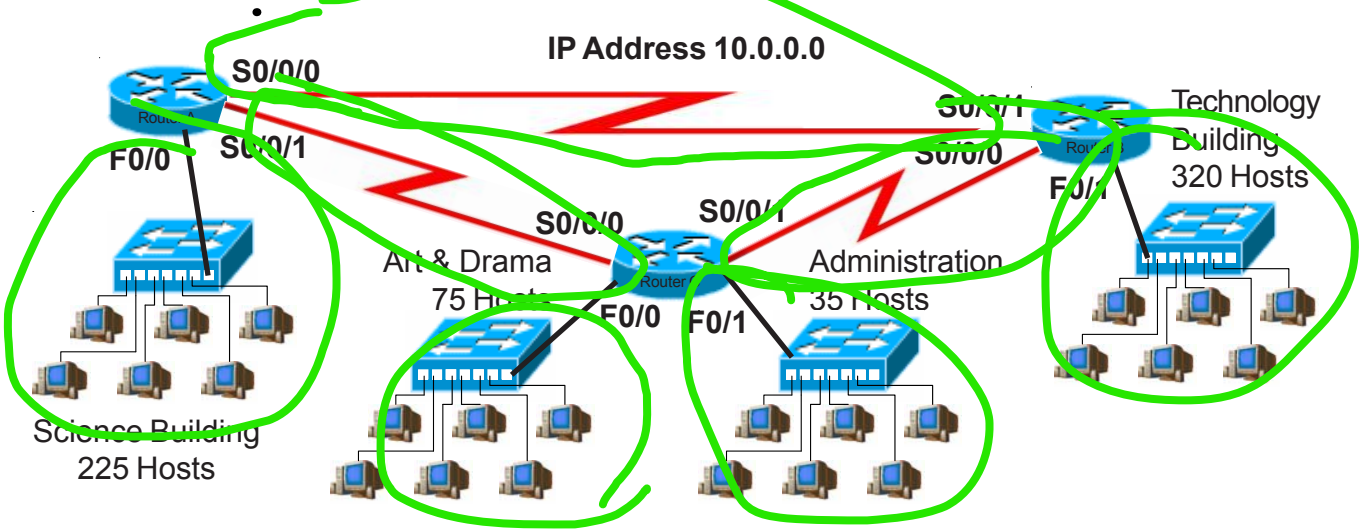
135.126.79.255

Show your work for <u>Problem 4</u> in the space below.



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 255.240.0.0

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

10.0000.0000.00000000.00000000

0	10.0.0.0 → 10.15.255.255
1	10.16.0.0 → 10.31.11.11
10	10.32.0.0 → 10.47.11.11
11	10.48.0.0 → 10.63.11.11
100	10.64.0.0 → 10.79.11.11
101	10.80.00 → 10.95.11.11
110	10.96.0.0 → 10.111.11.11

Show your work for Problem 6 in the space below.