

VLSM

Variable-Length Subnet Mask

Workbook

Version 2.0

192.168

192.168.10.96

192.168.10.126

172.31.15.0

10.250.1.0

Student Name:

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

This workbook assumes you already have a background in subnetting. If you don't you may want to consider completing the [IP Addressing and Subnetting Workbook](#).

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for taking the time to check this workbook for errors.

Workbooks included in the series:

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

Classful vs. Classless Subnetting

When you're subnetting an IP address for a network you have two options: classful and classless. Classful subnetting is the simplest method. It tends to be the most wasteful because it uses more addresses than are necessary. In classful subnetting you use the same subnet mask for each subnet, and all the subnets have the same number of addresses in them.

Classless addressing allows you to use different subnet masks and create subnets tailored to the number of users in each group. This technique is referred to as VLSM, Variable Length Subnet Masks.

What is VLSM

Variable Length Subnet Masks allow you a much tighter control over your addressing scheme. If you use a class C address with a default subnet mask you end up with one subnet containing 256 addresses. By using VLSM you can adjust the number of subnets and number of addresses depending on the specific needs of your network. The same rules apply to a class A or B addresses.

VLSM is supported by the following protocols: RIP version 2, OSPF, EIGRP, Dual IS-IS, and BGP. You need to configure your router for Variable Length Subnet Masks by setting up one of these protocols. Then configure the subnet masks of the various interfaces in the IP address interface sub-command.

Benefits of VLSM

- Allows efficient use of address space
- Allows the use of multiple subnet mask lengths
- Breaks up an address block into smaller custom blocks
- Allows for route summarization
- Provides more flexibility in network design
- Supports hierarchical enterprise networks

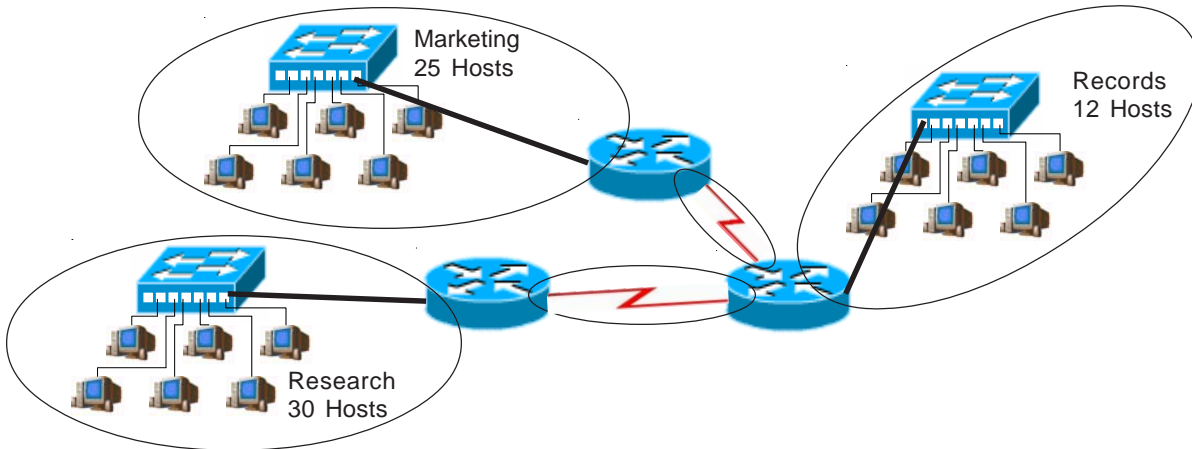
This workbook explores three different methods to figure out sub-subnets: the box method, the circle method, and a VLSM chart.

Classful Subnetting Example

When you're subnetting an IP address for a network you have two options: classful and classless. Classful subnetting is the simplest method. It also tends to be the most wasteful because it uses more addresses than are necessary. In classful subnetting you use the same subnet mask for each subnet, and all the subnets have the same number of addresses in them.

In this example you need five subnets, each one containing 30 hosts. The serial connections only require two address each so you are wasting 28 usable addresses in each of the serial subnet ranges.

IP Address: 192.168.1.0



The Box Method for visualizing subnets

Classful Subnet Ranges

192.168.1.0	to	192.168.1.31	/27
192.168.1.32	to	192.168.1.63	/27
192.168.1.64	to	192.168.1.95	/27
192.168.1.96	to	192.168.1.127	/27
192.168.1.128	to	192.168.1.159	/27
192.168.1.160	to	192.168.1.191	/27
192.168.1.192	to	192.168.1.223	/27
192.168.1.224	to	192.168.1.255	/27
/27			
255.255.255.224			
32 Hosts			
8 Subnets			

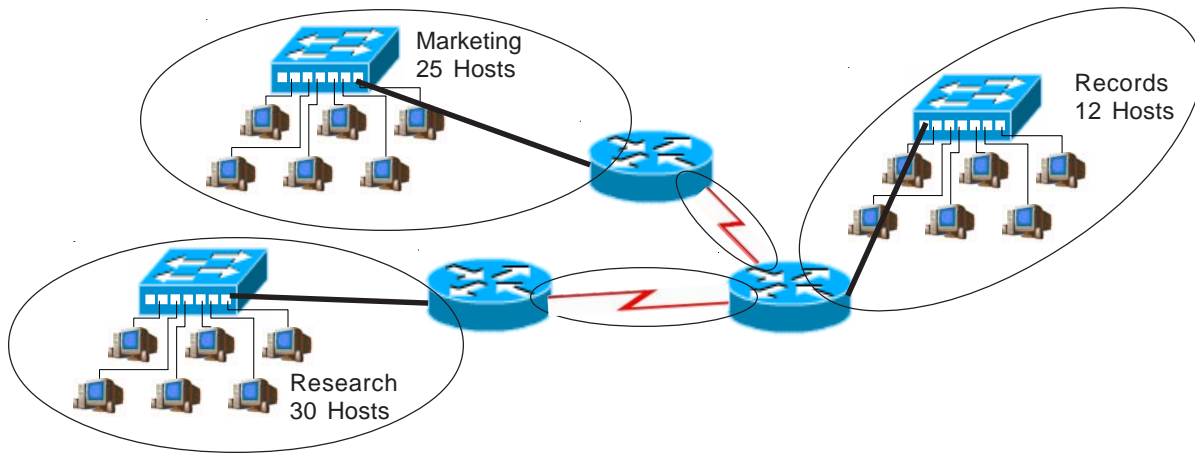
0 31	32 63	128 159	160 191
64 95	96 127	192 223	224 255

Classless Subnetting Example

Classless addressing allows you to use different subnet masks and create subnets tailored to the number of users in each subnetwork. There are fewer wasted IP addresses using smaller subnets.

In this example you need at total of five subnets, two containing 30 hosts, one containing 12 hosts, and two serial connections that only require two usable addresses each.

IP Address: 192.168.1.0

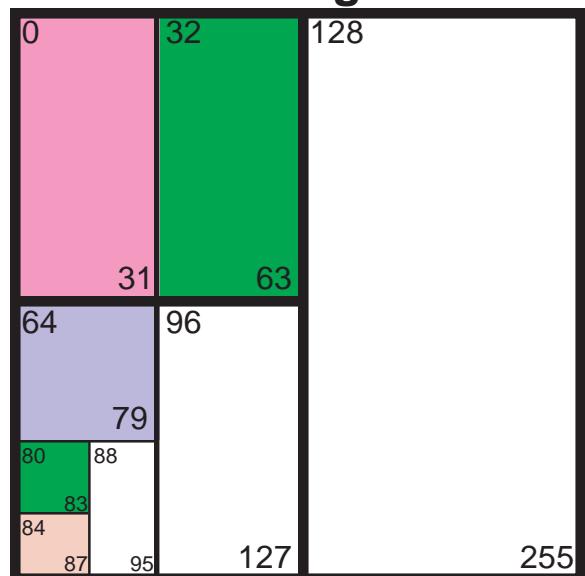


By adjusting the subnet masks you can cut your address usage by almost half in this example. This type of subnetting requires a network protocol which will support it such as: RIP version 2, EIGRP, OSPF, or BGP.

The Box Method for visualizing subnets

Classless Subnet Ranges

192.168.1.0	to	192.168.1.31	/27
192.168.1.32	to	192.168.1.63	/27
192.168.1.64	to	192.168.1.79	/28
192.168.1.80	to	192.168.1.87	/30
192.168.1.88	to	192.168.1.95	/29
192.168.1.96	to	192.168.1.127	/27
192.168.1.128	to	192.168.1.255	/25

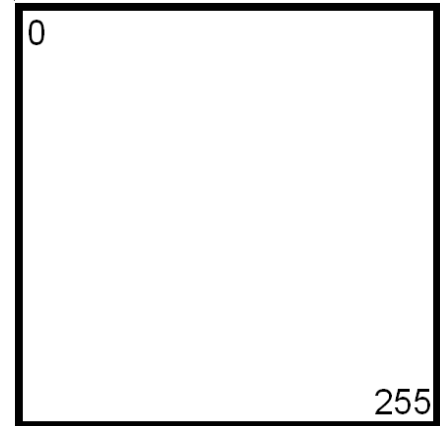


Visualizing Subnets Using The Box Method

The box method is a simple way to visualize the breakdown of subnets and addresses into smaller sizes. By shading or coloring in the boxes you can easily break up your subnets without overlapping your addresses. You adjust each subnet to the correct size needed.

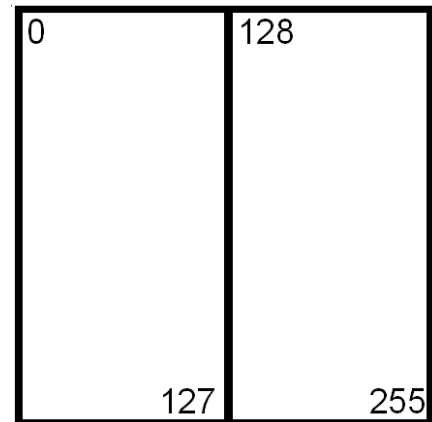
Start with a square. The whole square is a single subnet comprised of 256 addresses.

/24
255.255.255.0
256 Hosts
1 Subnet



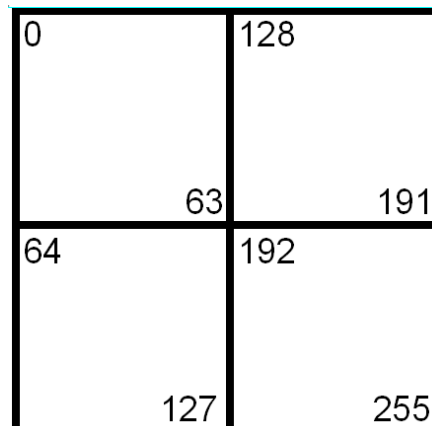
Split the box in half and you get two subnets with 128 addresses.

/25
255.255.255.128
128 Hosts
2 Subnets



Divide the box into quarters and you get four subnets with 64 addresses.

/26
255.255.255.192
64 Hosts
4 Subnets



Split each individual square and you get eight subnets with 32 addresses.

/27
255.255.255.224
32 Hosts
8 Subnets

0	32	128	160
31	63	159	191
64	96	192	224
95	127	223	255

Split the boxes in half again and you get sixteen subnets with sixteen addresses.

/28
255.255.255.240
16 Hosts
16 Subnets

0	32	128	160
15	47	143	175
16	48	144	176
31	63	159	191
64	96	192	224
79	111	207	239
80	112	208	240
95	127	223	255

The next split gives you thirty two subnets with eight addresses.

/29
255.255.255.248
8 Hosts
32 Subnets

0	8	32	40	128	136	160	168
7	15	39	47	135	143	167	175
16	24	48	56	144	152	176	184
23	31	55	63	151	159	183	191
64	72	96	104	192	200	224	232
71	79	103	111	199	207	231	239
80	88	112	120	208	216	240	248
87	95	119	127	215	223	247	255

The last split gives sixty four subnets with four addresses each.

/30
255.255.255.252
4 Hosts
64 Subnets

0	8	32	40	128	136	160	168
3	11	35	43	131	139	163	171
4	12	36	44	132	140	164	172
7	15	39	47	135	143	167	175
16	24	48	56	144	152	176	184
19	27	51	59	147	155	179	187
20	28	52	60	148	156	180	188
23	31	55	63	151	159	183	191
64	72	96	104	192	200	224	232
67	75	99	107	195	203	227	235
68	76	100	108	196	204	228	236
71	79	103	111	199	207	231	239
80	88	112	120	208	216	240	248
83	91	115	123	211	219	243	251
84	92	116	124	212	220	244	252
87	95	119	127	215	223	247	255

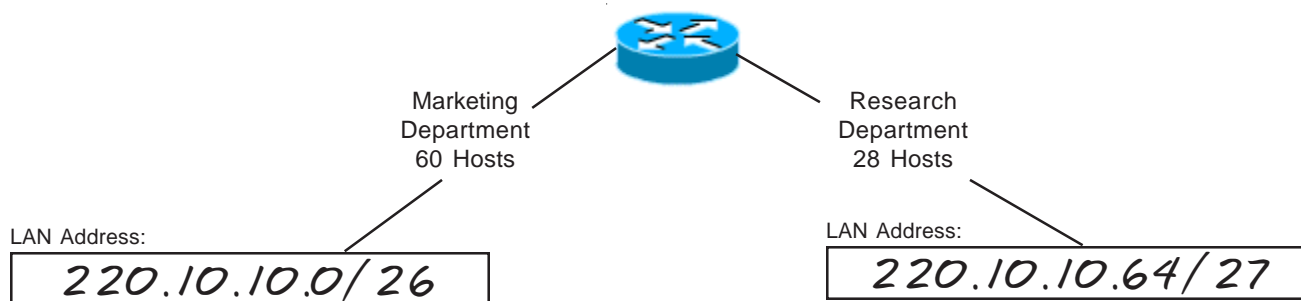
VLSM Addressing

Box Method

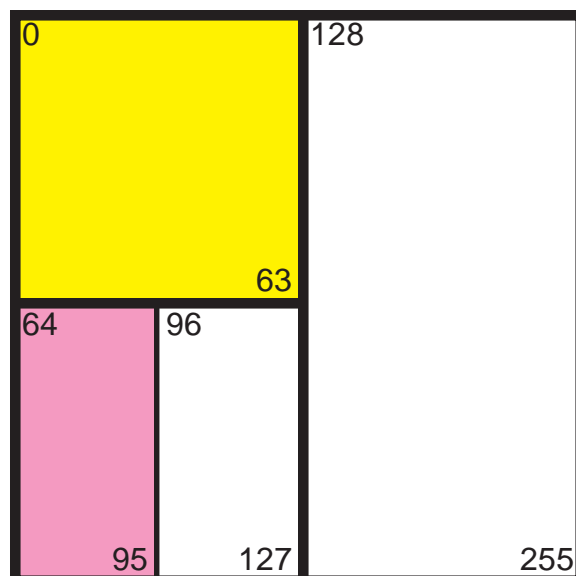
(Sample)

Problem 1

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the box. This business will be using the class C address 220.10.10.0. Remember to start with your largest groups first.



Color in the squares used with different shades to highlight each subnet.



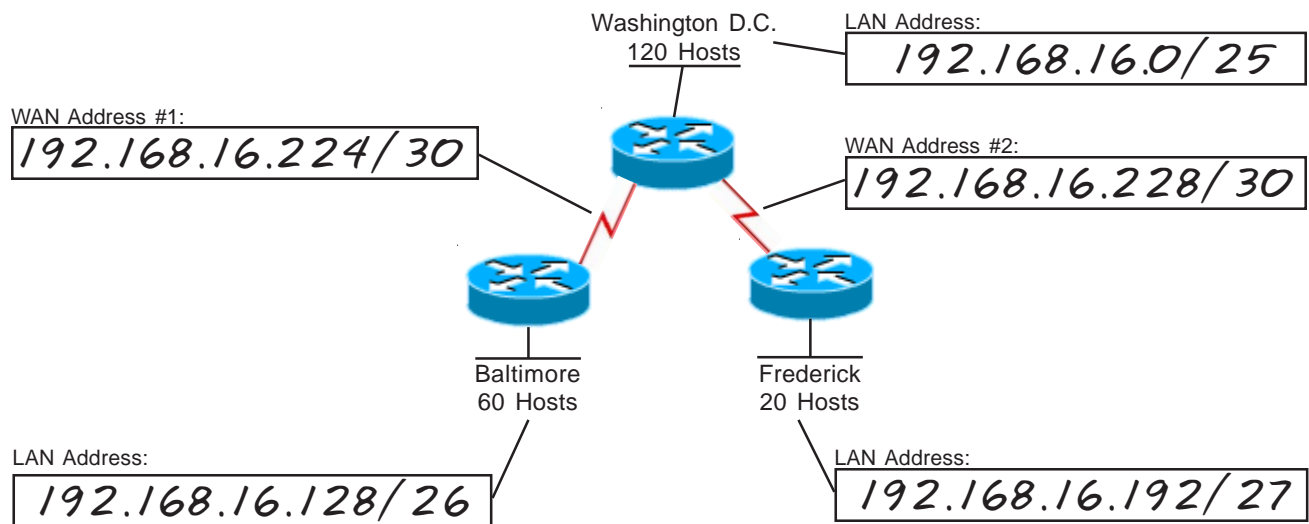
VLSM Addressing

Box Method

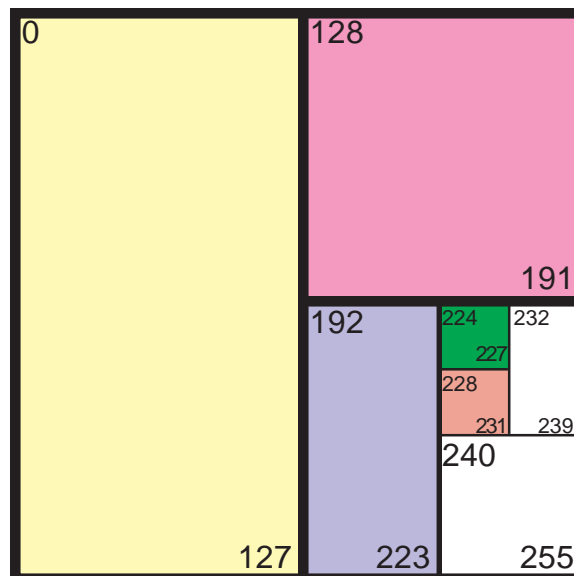
(Sample)

Problem 2

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the box. This company will be using the class C address 192.168.16.0. Remember to start with your largest groups first.



Color in the squares used with different shades to highlight each subnet.

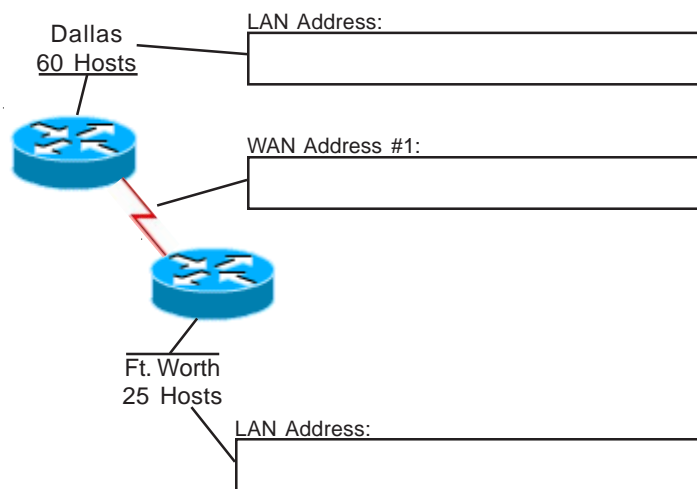


VLSM Addressing

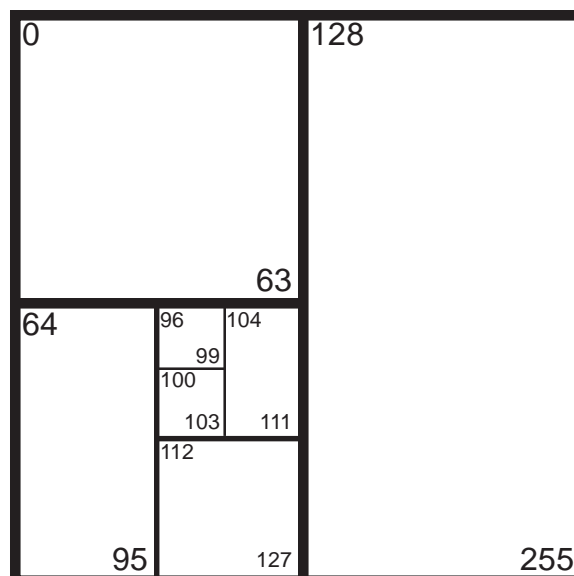
Box Method

Problem 3

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the box. This company will be using the class C address 190.10.10.0. Remember to start with your largest groups first.



Color in the squares used with different shades to highlight each subnet.

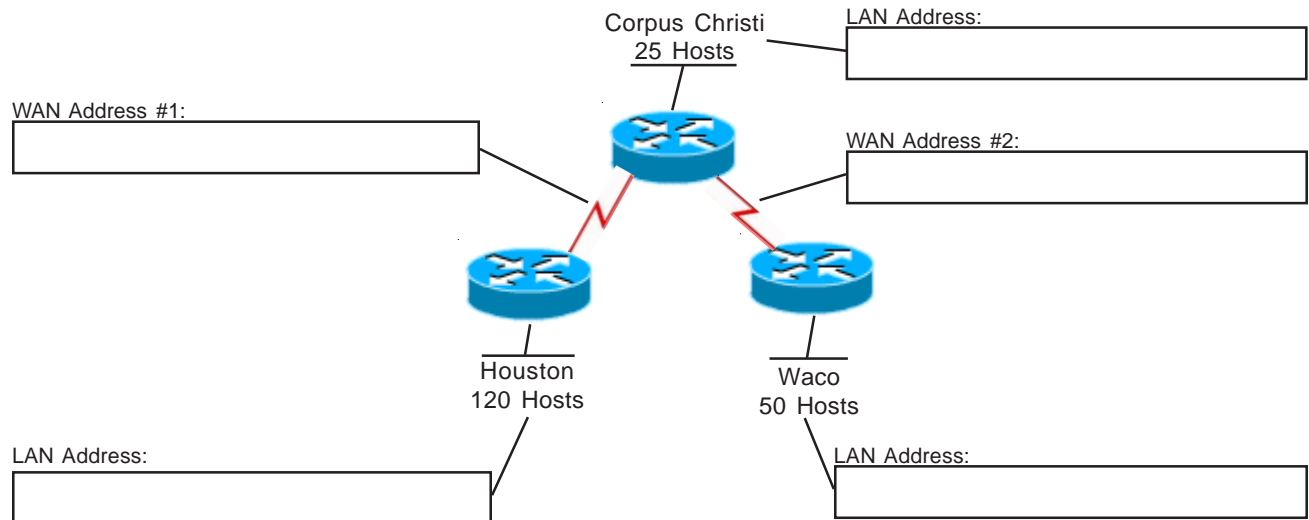


VLSM Addressing

Box Method

Problem 4

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the box. This company will be using the class C address 220.108.38.0. Remember to start with your largest groups first.



Color in the squares used with different shades to highlight each subnet.

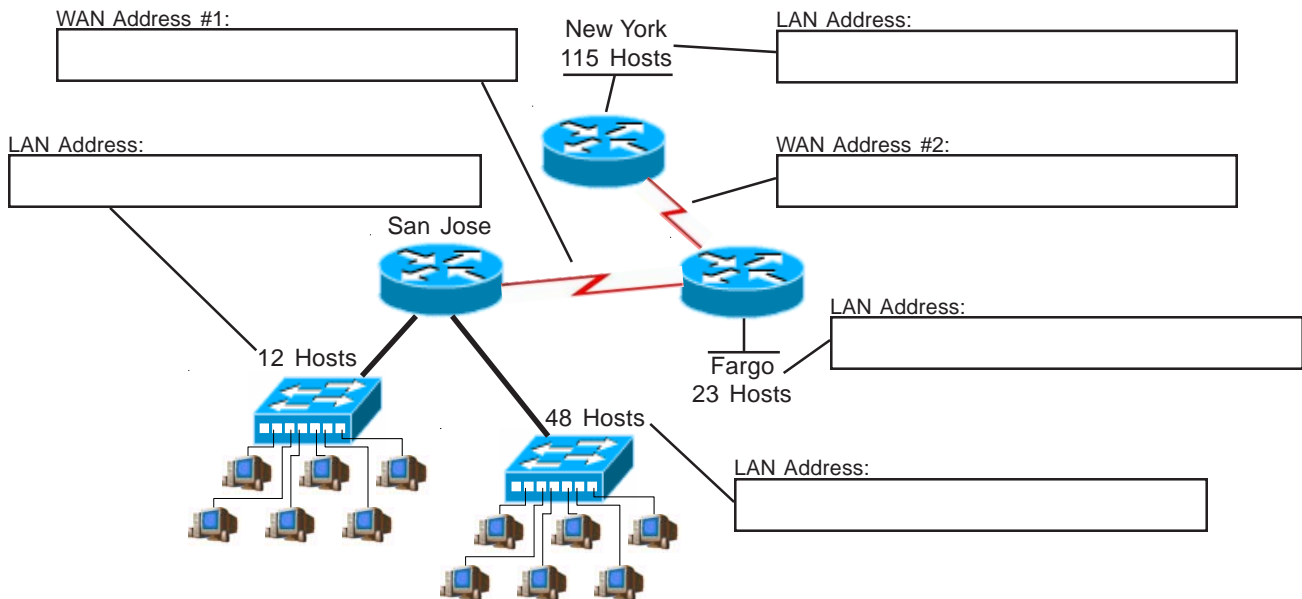
0	8	32	40	128	136	160	168
	3	11	35	43	131	139	163
4	12	36	44	132	140	164	172
	7	15	39	47	135	143	167
16	24	48	56	144	152	176	184
	19	27	51	59	147	155	179
20	28	52	60	148	156	180	188
	23	31	55	63	151	159	183
64	72	96	104	192	200	224	232
	67	75	99	107	195	203	227
68	76	100	108	196	204	228	236
	71	79	103	111	199	207	231
80	88	112	120	208	216	240	248
	83	91	115	123	211	219	243
84	92	116	124	212	220	244	252
	87	95	119	127	215	223	247

VLSM Addressing

Box Method

Problem 5

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the box. This company will be using the class C address 192.168.10.0. Remember to start with your largest groups first.



Color in the squares used with different shades to highlight each subnet.

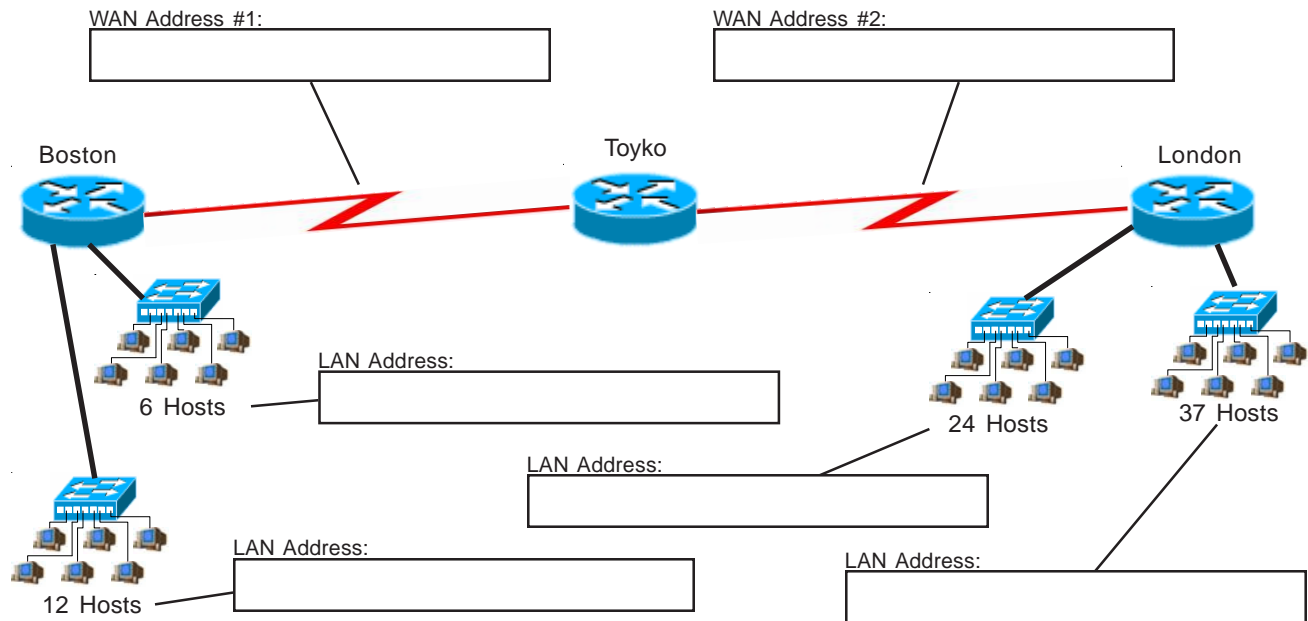
0	8	32	40	128	136	160	168
	3	11	35	43	131	139	171
4	12	36	44	132	140	164	172
	7	15	39	47	135	143	175
16	24	48	56	144	152	176	184
	19	27	51	59	147	155	179
20	28	52	60	148	156	180	188
	23	31	55	63	151	159	183
64	72	96	104	192	200	224	232
	67	75	99	107	195	203	227
68	76	100	108	196	204	228	236
	71	79	103	111	199	207	231
80	88	112	120	208	216	240	248
	83	91	115	123	211	219	243
84	92	116	124	212	220	244	252
	87	95	119	127	215	223	247

VLSM Addressing

Box Method

Problem 6

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the box. This company will be using the class C address 222.10.150.0. Remember to start with your largest groups first.



Draw the necessary lines and color in the used squares with different shades to highlight each subnet.

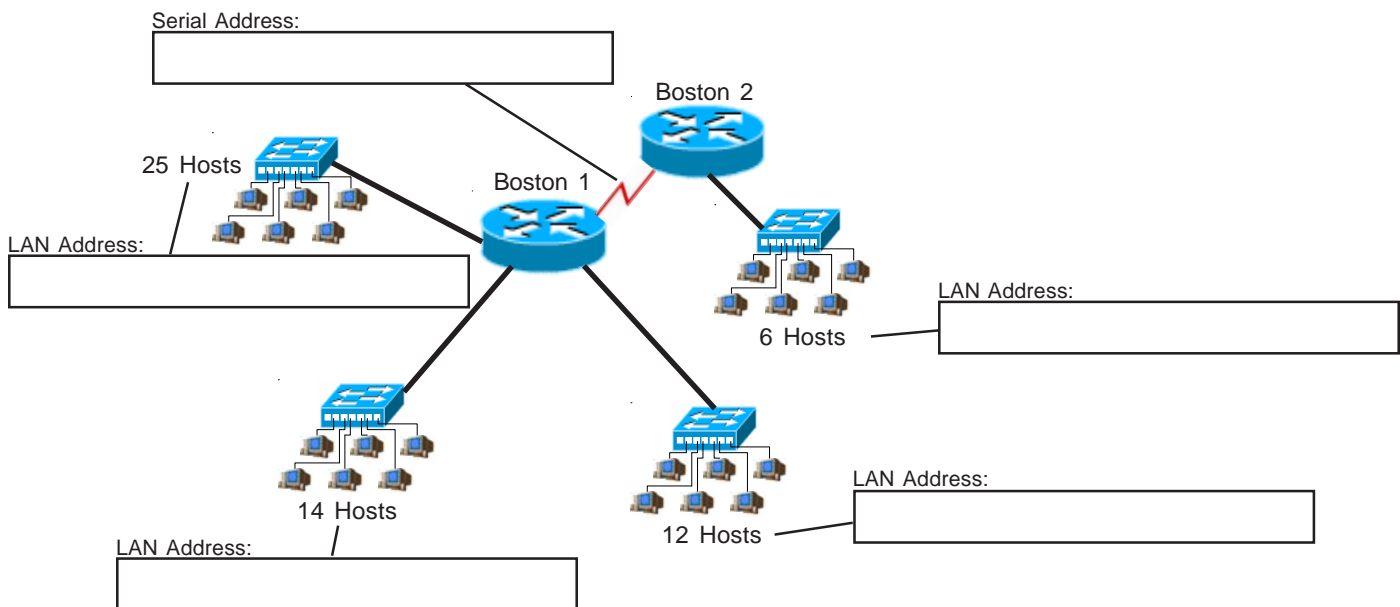
0	32	128	160
31	63	159	191
64	96	192	224
95	127	223	255

VLSM Addressing

Box Method

Problem 7

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and subnet mask in the boxes below, color or shade the sub-subnets used in the box. This company will be using the class C address 200.150.70.0. Remember to start with your largest groups first.



Draw the necessary lines and color in the used squares with different shades to highlight each subnet.

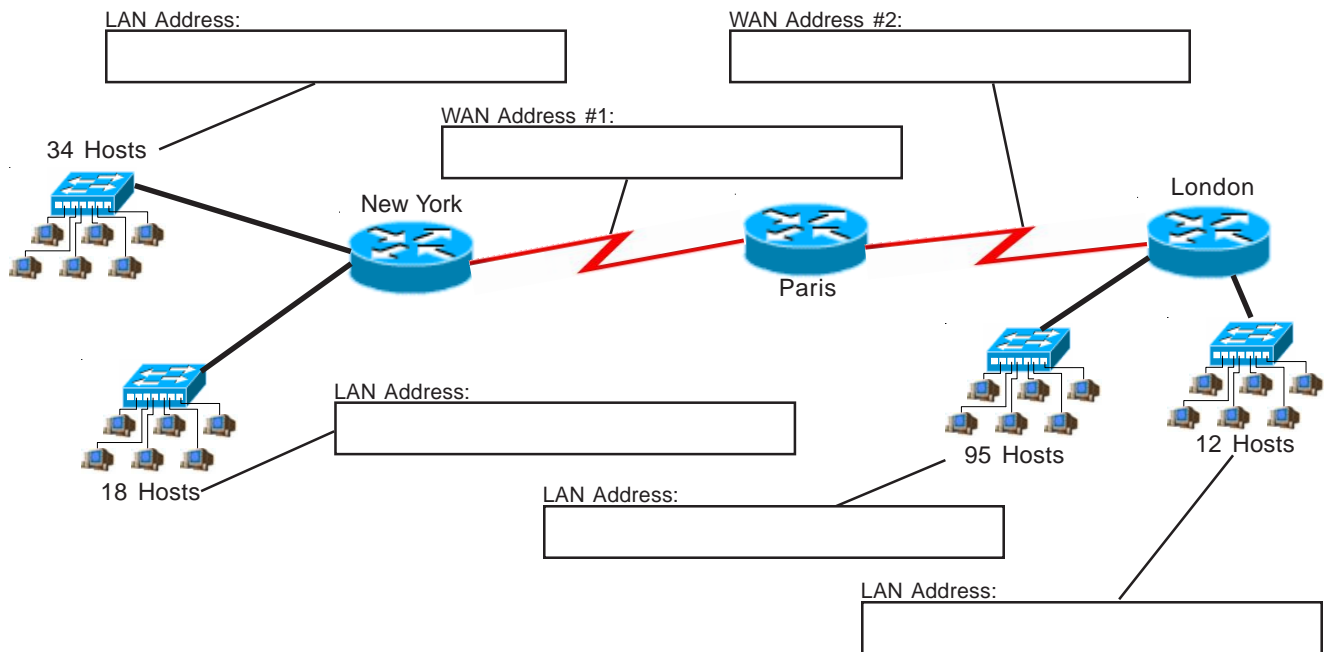
0	128
63	191
64	192
127	255

VLSM Addressing

Box Method

Problem 8

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and subnet mask in the boxes below, color or shade the sub-subnets used in the box. This company will be using the class C address 192.168.24.0. Remember to start with your largest groups first.



Draw the necessary lines and color in the used squares with different shades to highlight each subnet.

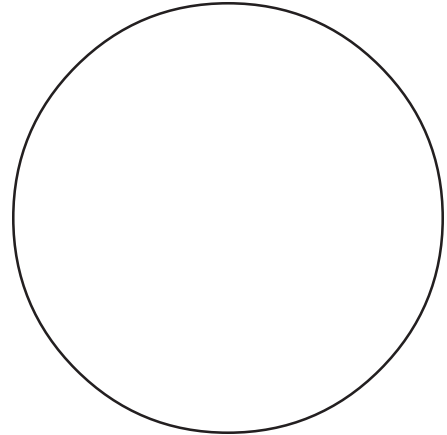
0
255

Visualizing Subnets Using The Circle Method

The circle method is another method used to visualize the breakdown of subnets and addresses into smaller sizes. By shading or coloring in the different sections of the circle you can easily break up your subnets without overlapping your addresses. You adjust each subnet to the correct size needed.

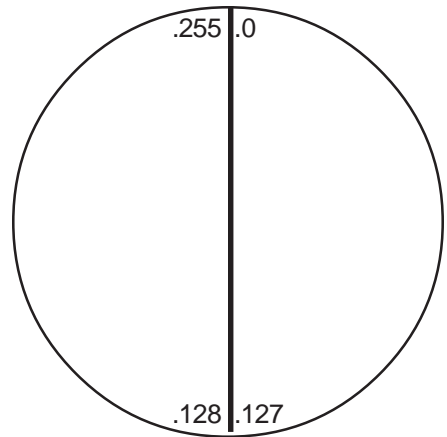
Start with a circle. The whole circle is a single subnet comprised of 256 addresses.

/24
255.255.255.0
256 Hosts
1 Subnet



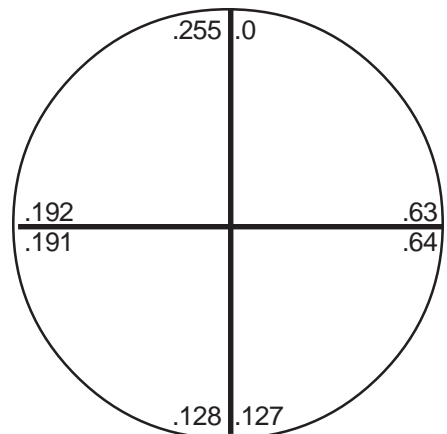
Split the circle in half and you get two subnets with 128 addresses.

/25
255.255.255.128
128 Hosts
2 Subnets



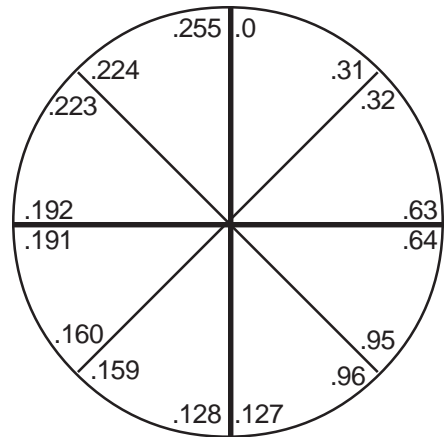
Divide the circle into quarters and you get four subnets with 64 addresses.

/26
255.255.255.192
64 Hosts
4 Subnets



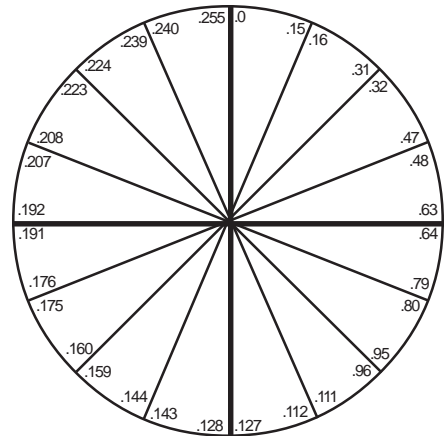
Split each quarter and you get eight subnets with 32 addresses.

/27
255.255.255.224
32 Hosts
8 Subnets



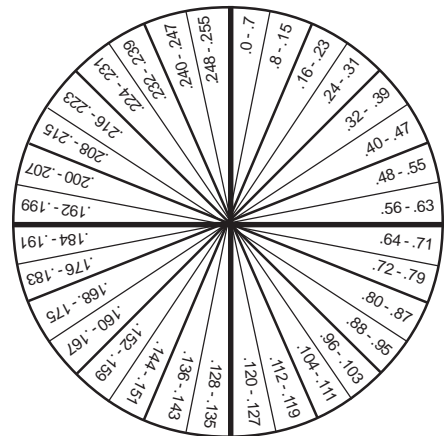
Split the boxes in half again and you get sixteen subnets with sixteen addresses.

/28
255.255.255.240
16 Hosts
16 Subnets



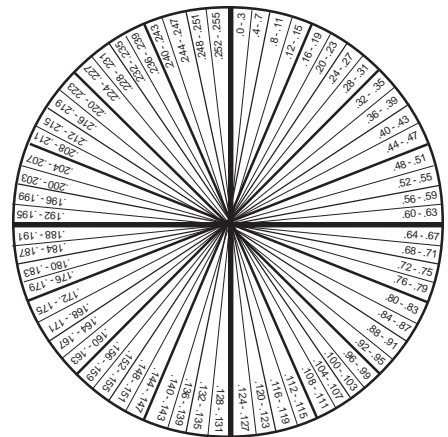
The next split gives you thirty two subnets with eight addresses.

/29
255.255.255.248
8 Hosts
32 Subnets



The last split gives sixty four subnets with four addresses each.

/30
255.255.255.252
4 Hosts
64 Subnets



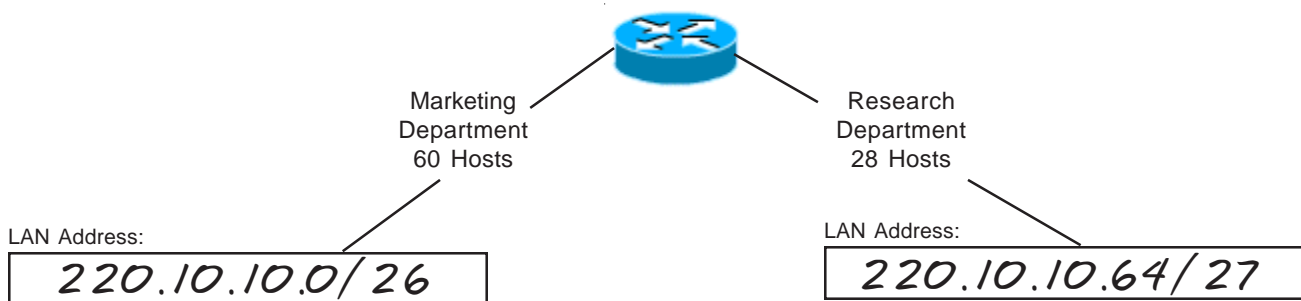
VLSM Addressing

Circle Method

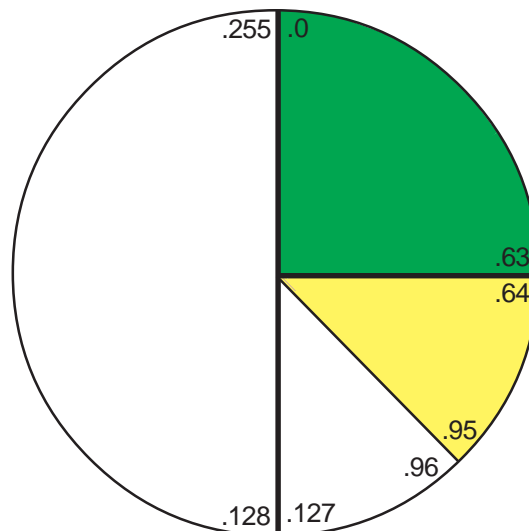
(Sample)

Problem 9

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the circle below, color or shade the sub-subnets used. This business will be using the class C address 220.10.10.0. Remember to start with your largest groups first.



Color in the necessary circle sections used with different shades to highlight each subnet.



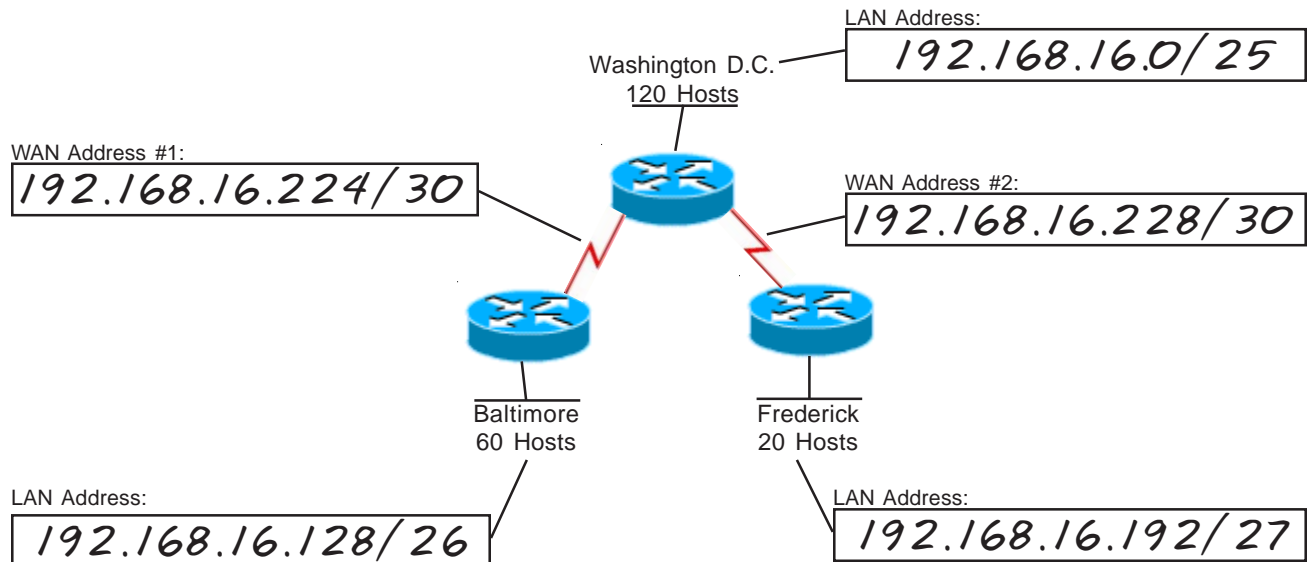
VLSM Addressing

Circle Method

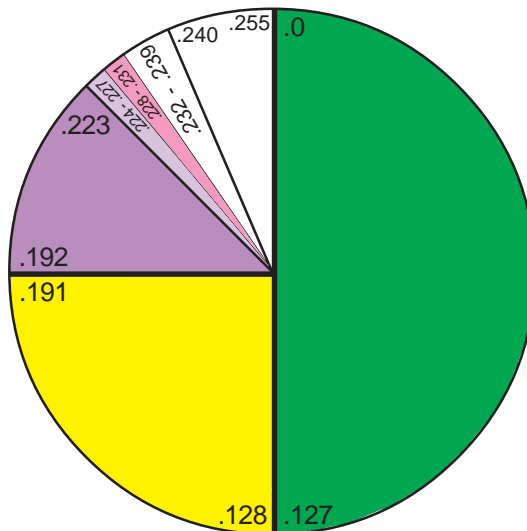
(Sample)

Problem 10

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the circle below, color or shade the sub-subnets used. This company will be using the class C address 192.168.16.0. Remember to start with your largest groups first.



Color in the necessary circle sections used with different shades to highlight each subnet.

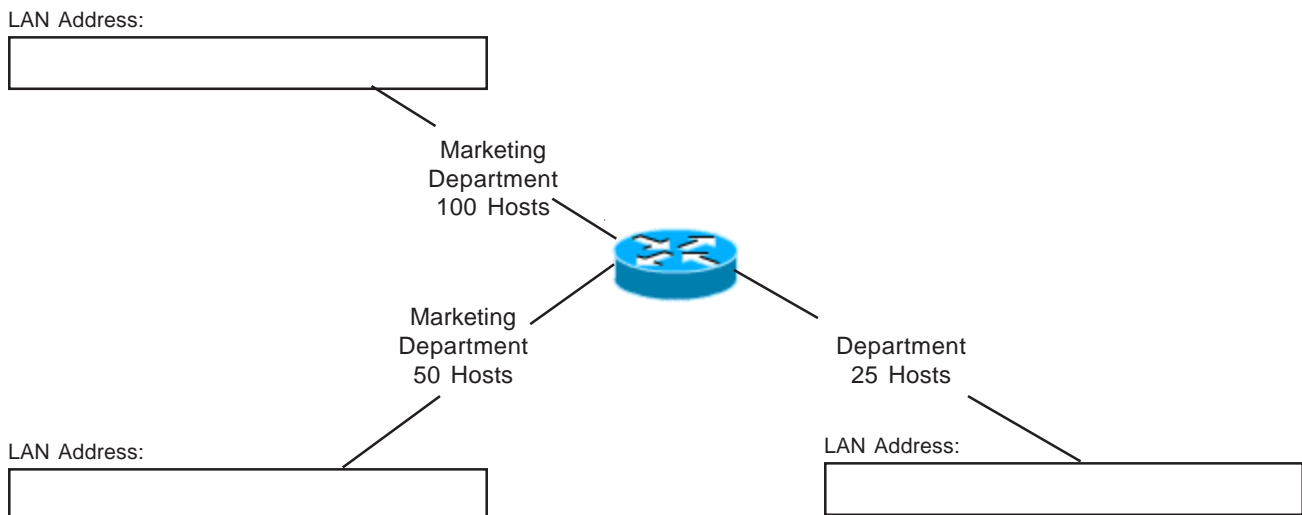


VLSM Addressing

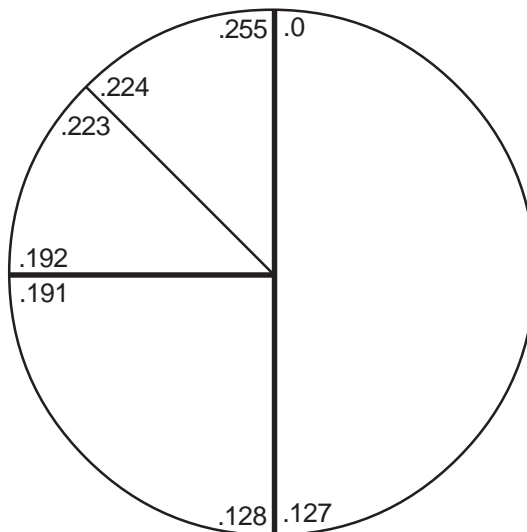
Circle Method

Problem 11

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the circle below, color or shade the sub-subnets used. This business will be using the class C address 200.20.20.0. Remember to start with your largest groups first.



Color in the necessary circle sections used with different shades to highlight each subnet.

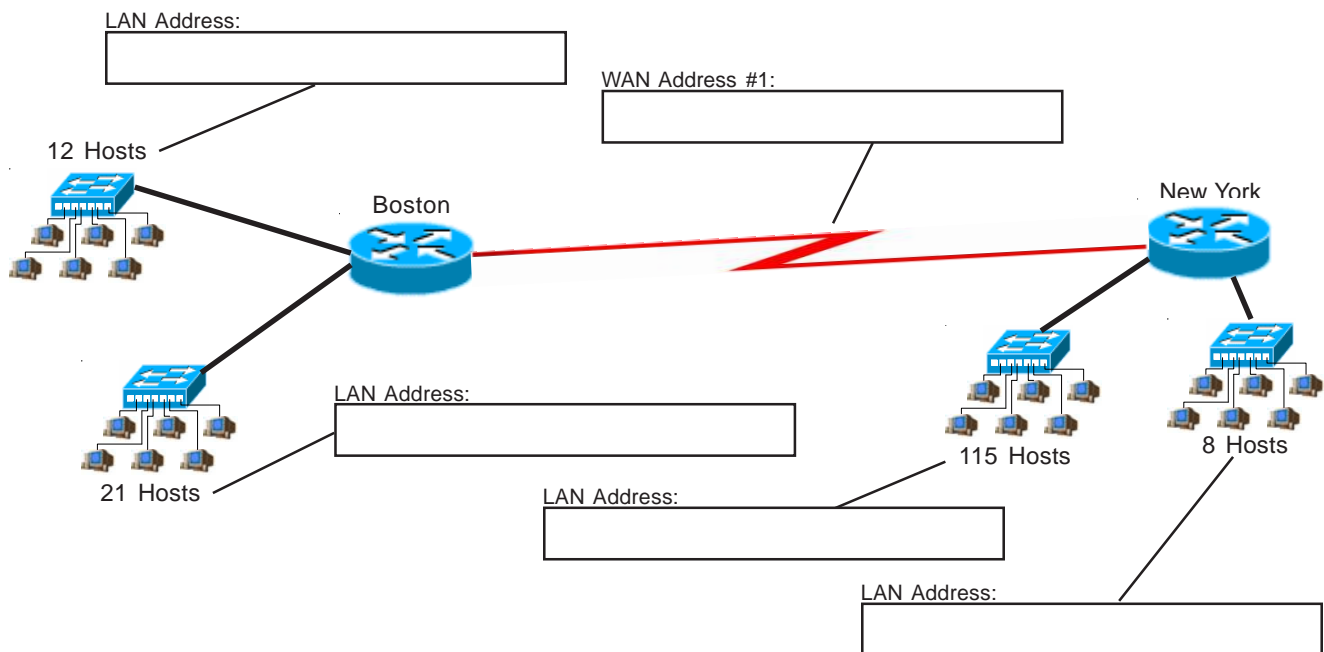


VLSM Addressing

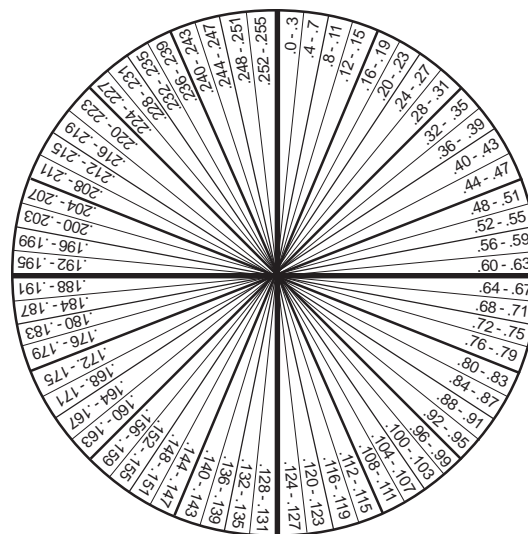
Circle Method

Problem 12

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the circle below, color or shade the sub-subnets used. This company will be using the class C address 199.55.70.0. Remember to start with your largest groups first.



Color in the necessary circle sections used with different shades to highlight each subnet.

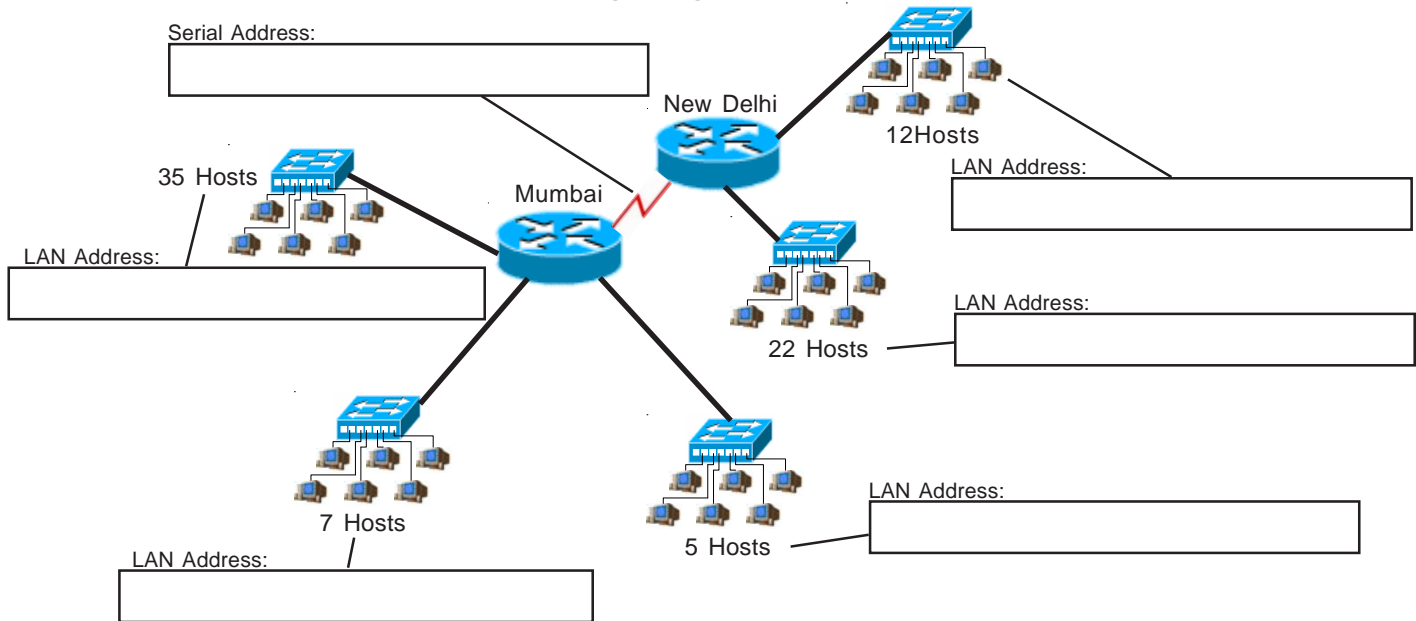


VLSM Addressing

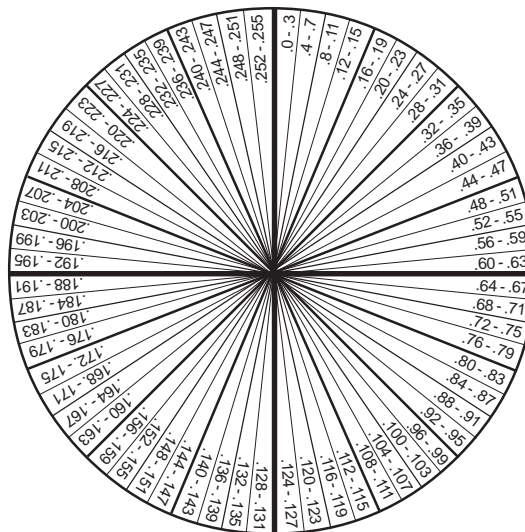
Circle Method

Problem 13

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the circle below, color or shade the sub-subnets used. This company will be using the class C address 200.150.70.0. Remember to start with your largest groups first.



Color in the necessary circle sections used with different shades to highlight each subnet.

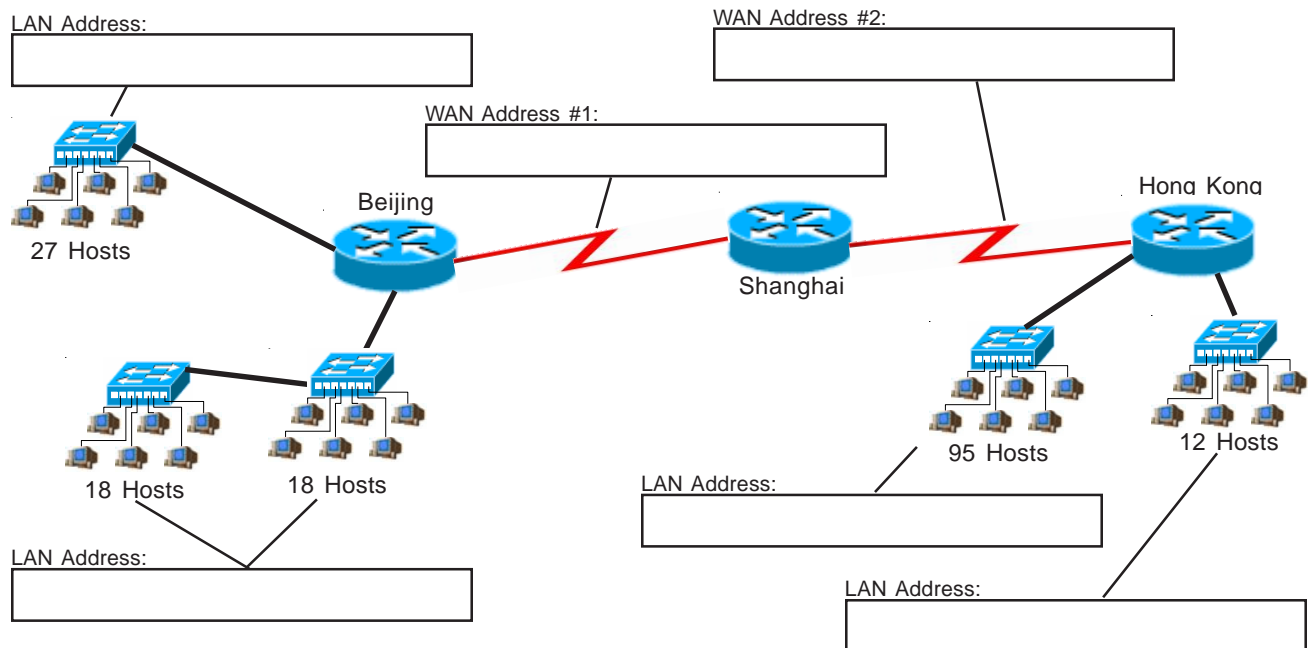


VLSM Addressing

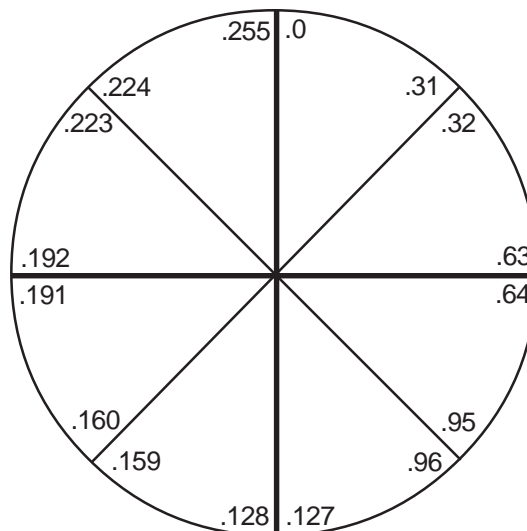
Circle Method

Problem 14

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the circle below, color or shade the sub-subnets used. This company will be using the class C address 210.10.10.0. Remember to start with your largest groups first.



Draw the necessary lines and color in the used circle sections with different shades to highlight each subnet.

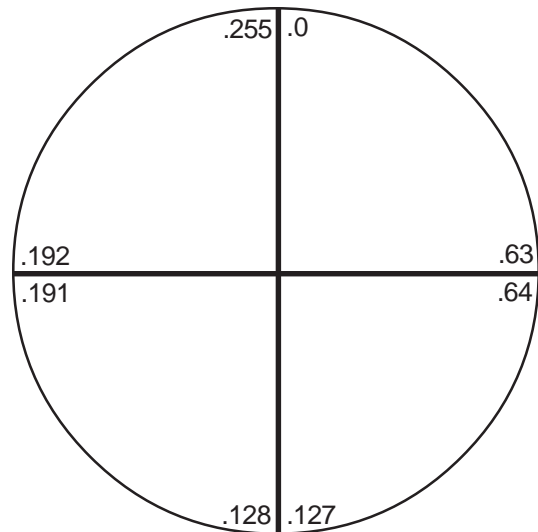
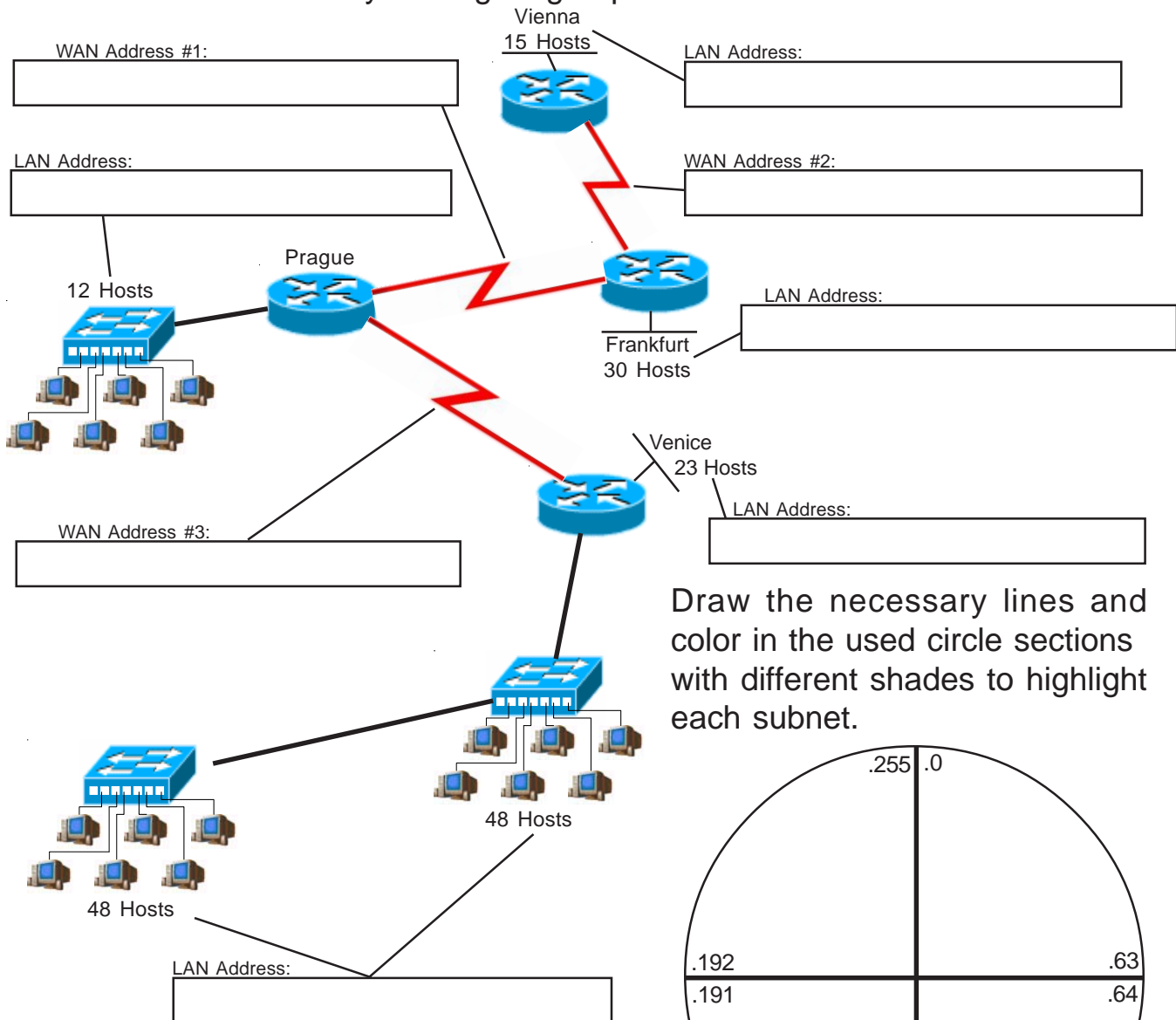


VLSM Addressing

Circle Method

Problem 15

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the circle. This company will be using the class C address 192.168.150.0. Remember to start with your largest groups first.

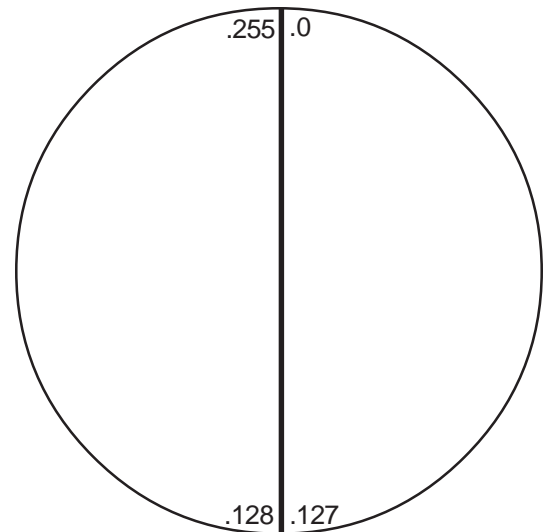
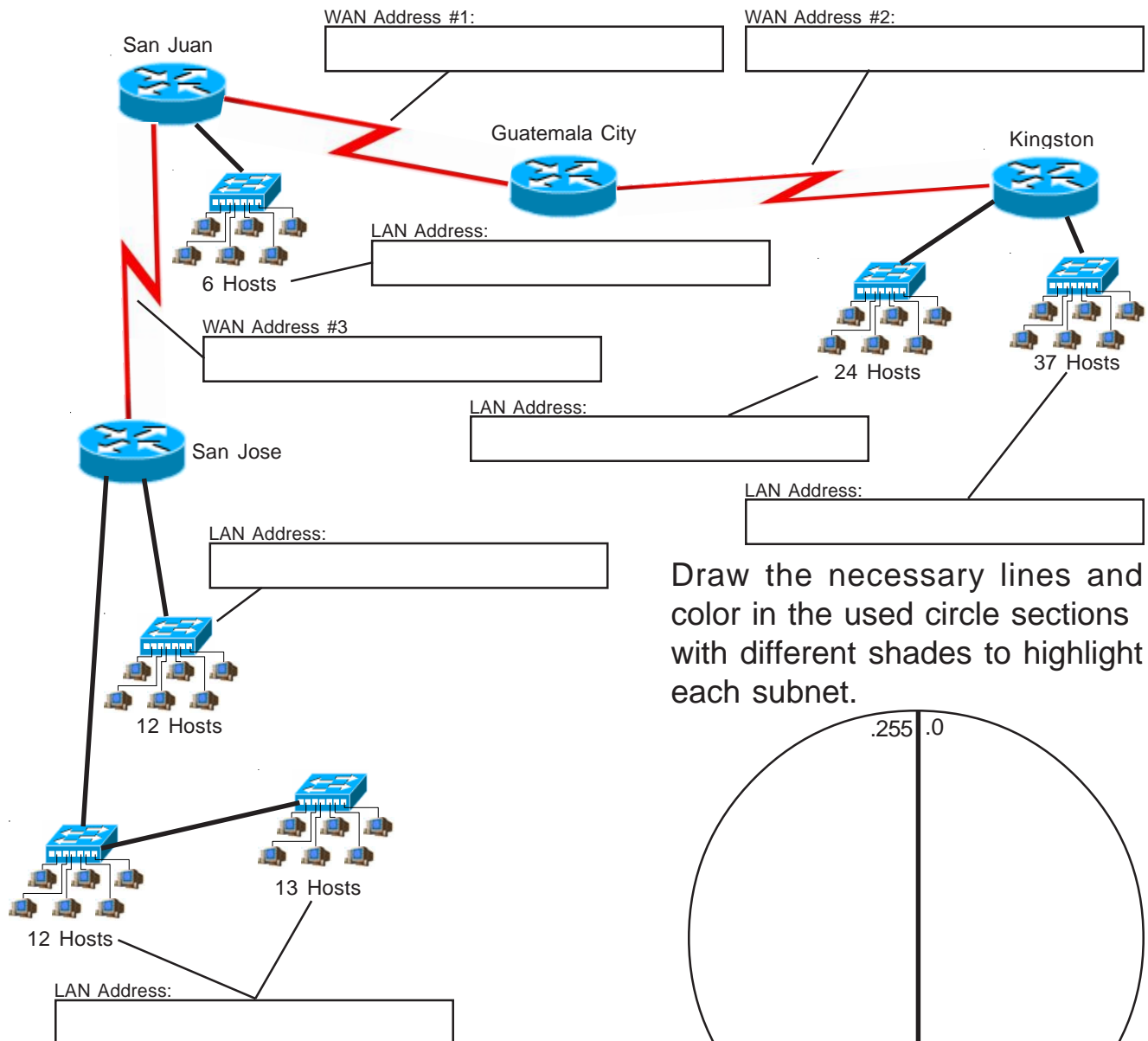


VLSM Addressing

Circle Method

Problem 16

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the circle. This company will be using the class C address 195.75.23.0. Remember to start with your largest groups first.



Visualizing Subnets Using a VLSM Chart

The VLSM chart is the third method used to visualize the breakdown of subnets and addresses into smaller sizes. By shading or coloring in the boxes you can easily break up your subnets without overlapping your addresses. You can adjust each sub-subnet to the correct size needed.

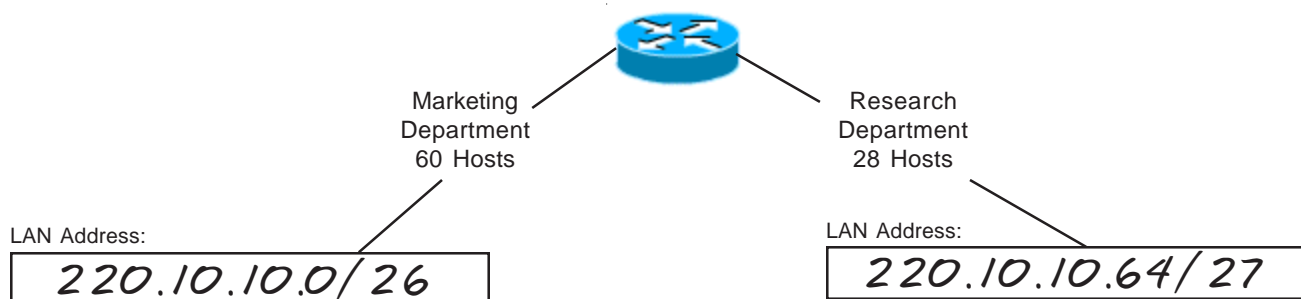
VLSM Addressing

VLSM Chart Method

(Sample)

Problem 17

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This business will be using the class C address 220.10.10.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3 4-7
					8-15	8-11 12-15
				16-31	16-23	16-19 20-23
					24-31	24-27 28-31
			32-63	32-47	32-39	32-35 36-39
					40-47	40-43 44-47
				48-63	48-55	48-51 52-55
					56-63	56-59 60-63
		64-127	64-95	64-79	64-71	64-67 68-71
					72-79	72-75 76-79
				80-95	80-87	80-83 84-87
					88-95	88-91 92-95
			96-127	96-111	96-103	96-99 100-103
					104-111	104-107 108-111
				112-127	112-119	112-115 116-119
					120-127	120-123 124-127
	128-255	128-191	128-159	128-143	128-135	128-131 132-135
					136-143	136-139 140-143
				144-159	144-151	144-147 148-151
					152-159	152-155 156-159
			160-191	160-175	16-167	160-163 164-167
					168-175	168-171 172-175
				176-191	176-183	176-179 180-183
					184-191	184-187 188-191
		192-255	192-223	192-207	192-199	192-195 196-199
					200-207	200-203 204-207
				208-223	208-215	208-211 212-215
					216-223	216-219 220-223
			224-255	224-239	224-231	224-227 228-231
					232-239	232-235 236-239
				240-255	240-247	240-243 244-247
					248-255	248-251 252-255

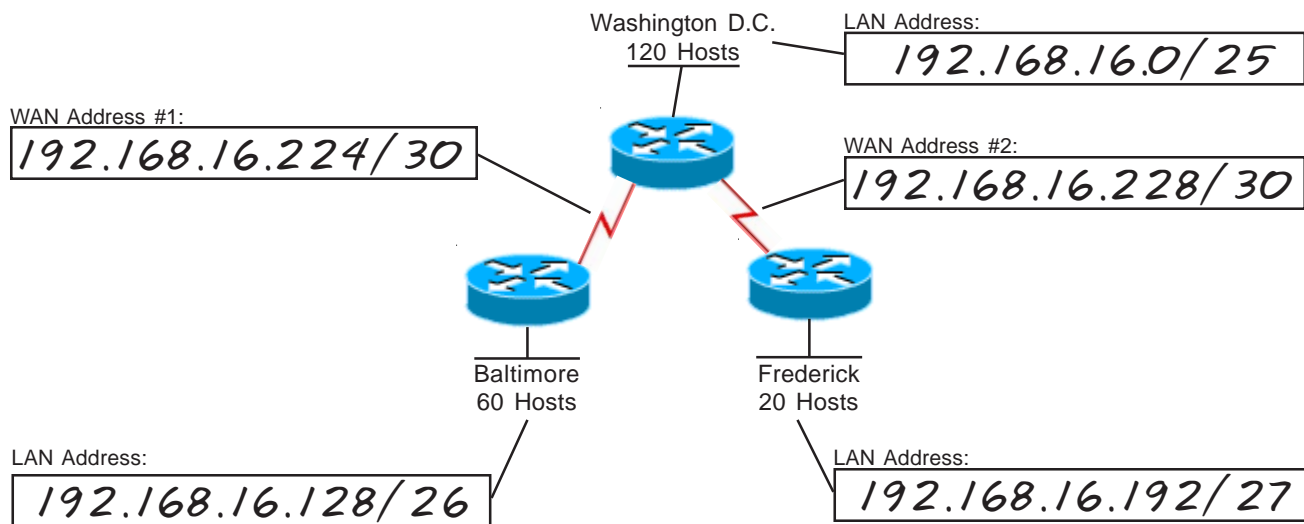
VLSM Addressing

VLSM Chart Method

(Sample)

Problem 18

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This company will be using the class C address 192.168.16.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

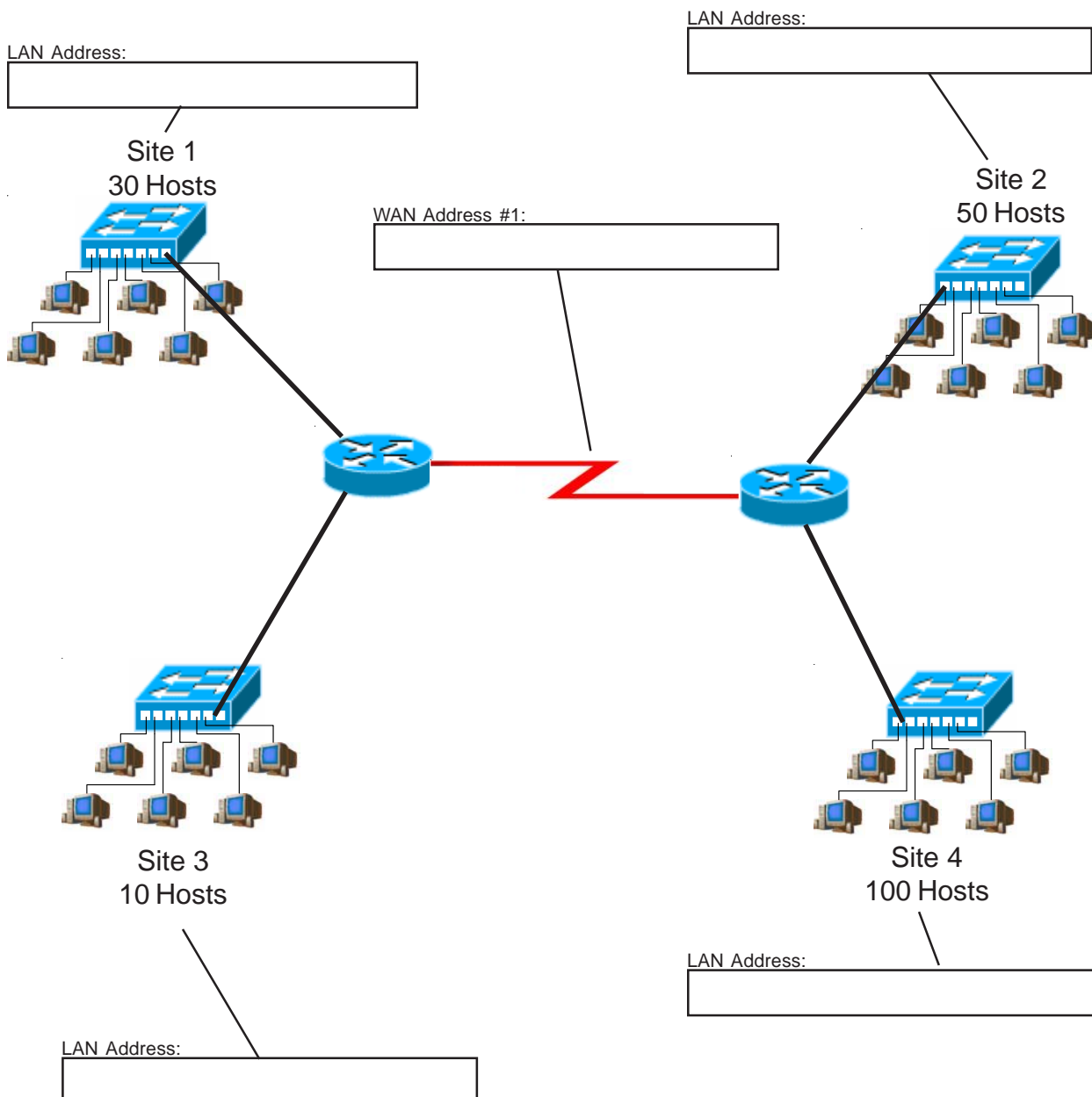
/24	/25	/26	/27	/28	/29	/30		
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts		
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3		
					4-7	4-7		
				16-31	8-15	8-11		
					12-15	12-15		
				32-63	32-47	16-23	16-19	
						20-23	20-23	
			48-63		24-31	24-27		
					28-31	28-31		
			64-127		64-95	64-79	32-39	32-35
							36-39	36-39
				80-95		40-43	40-43	
						44-47	44-47	
		96-127		96-111		48-55	48-51	
						52-55	52-55	
				112-127	56-59	56-59		
					60-63	60-63		
				128-255	128-191	128-159	64-71	64-67
							68-71	68-71
		72-75					72-75	
		76-79					76-79	
		144-159	80-83			80-83		
			84-87			84-87		
			88-91			88-91		
			92-95			92-95		
	160-191	160-175	96-99			96-99		
			100-103			100-103		
		176-191	104-107			104-107		
			108-111			108-111		
		192-255	192-223			192-207	112-115	112-115
							116-119	116-119
						208-223	120-123	120-123
							124-127	124-127
	224-255				224-239	128-131	128-131	
						132-135	132-135	
					240-255	136-139	136-139	
						140-143	140-143	
			248-255		248-251	144-147	144-147	
						148-151	148-151	
					252-255	152-155	152-155	
						156-159	156-159	

VLSM Addressing

VLSM Chart Method

Problem 19

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This company will be using the class C address 199.55.78.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

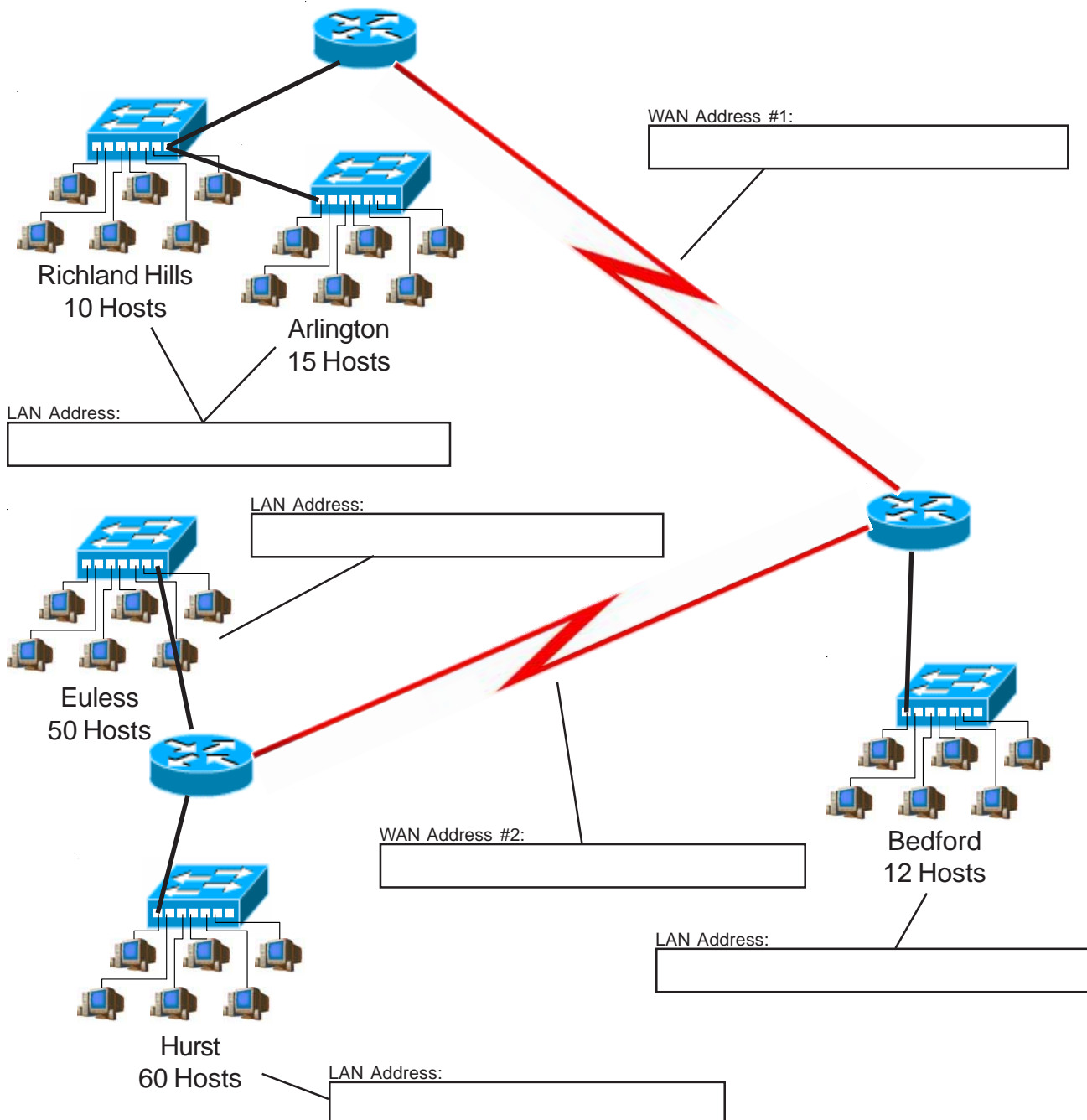
/24	/25	/26	/27	/28	/29	/30
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
					8-15	8-11
						12-15
				16-31	16-23	16-19
						20-23
					24-31	24-27
						28-31
			32-63	32-47	32-39	32-35
						36-39
					40-47	40-43
						44-47
				48-63	48-55	48-51
						52-55
					56-63	56-59
						60-63
		64-127	64-95	64-79	64-71	64-67
						68-71
					72-79	72-75
						76-79
				80-95	80-87	80-83
						84-87
					88-95	88-91
						92-95
			96-127	96-103	96-103	96-99
						100-103
					104-111	104-107
						108-111
				112-127	112-119	112-115
						116-119
					120-127	120-123
						124-127
	128-255	128-191	128-159	128-143	128-135	128-131
						132-135
					136-143	136-139
						140-143
				144-159	144-151	144-147
						148-151
					152-159	152-155
						156-159
			160-191	160-175	16-167	160-163
						164-167
					168-175	168-171
						172-175
				176-191	176-183	176-179
						180-183
					184-191	184-187
						188-191
		192-255	192-223	192-207	192-199	192-195
						196-199
					200-207	200-203
						204-207
				208-223	208-215	208-211
						212-215
					216-223	216-219
						220-223
			224-255	224-239	224-231	224-227
						228-231
					232-239	232-235
						236-239
				240-255	240-247	240-243
						244-247
					248-255	248-251
						252-255

VLSM Addressing

VLSM Chart Method

Problem 20

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This company will be using the class C address 223.150.50.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

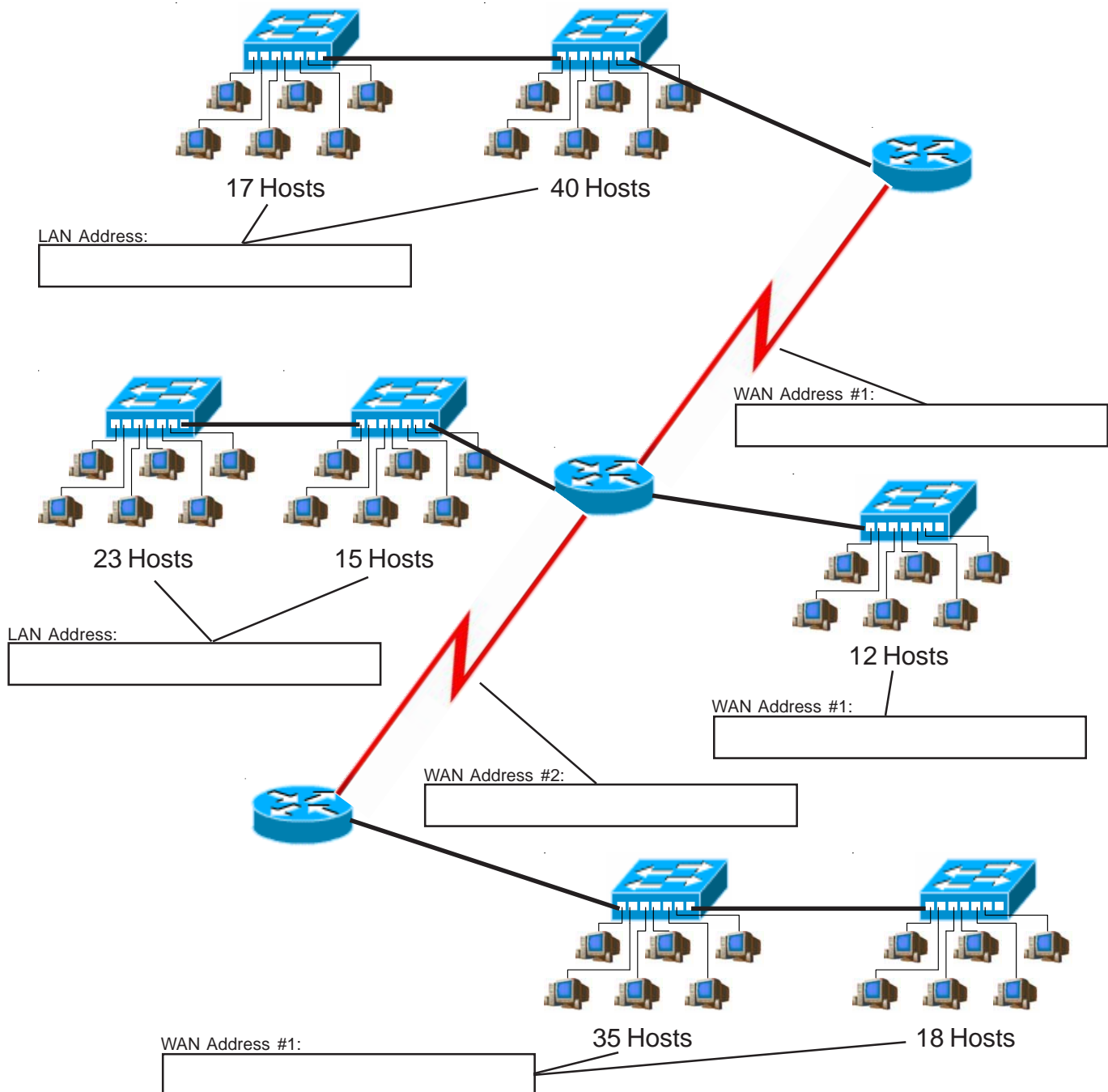
/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3 4-7
					8-15	8-11 12-15
				16-31	16-23	16-19 20-23
					24-31	24-27 28-31
			32-63	32-47	32-39	32-35 36-39
					40-47	40-43 44-47
				48-63	48-55	48-51 52-55
					56-63	56-59 60-63
		64-127	64-95	64-79	64-71	64-67 68-71
					72-79	72-75 76-79
				80-95	80-87	80-83 84-87
					88-95	88-91 92-95
			96-127	96-111	96-103	96-99 100-103
					104-111	104-107 108-111
				112-127	112-119	112-115 116-119
					120-127	120-123 124-127
	128-255	128-191	128-159	128-143	128-135	128-131 132-135
					136-143	136-139 140-143
				144-159	144-151	144-147 148-151
					152-159	152-155 156-159
			160-191	160-175	16-167	160-163 164-167
					168-175	168-171 172-175
				176-191	176-183	176-179 180-183
					184-191	184-187 188-191
		192-255	192-223	192-207	192-199	192-195 196-199
					200-207	200-203 204-207
				208-223	208-215	208-211 212-215
					216-223	216-219 220-223
			224-255	224-239	224-231	224-227 228-231
					232-239	232-235 236-239
				240-255	240-247	240-243 244-247
					248-255	248-251 252-255

VLSM Addressing

VLSM Chart Method

Problem 21

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This company will be using the class C address 222.22.2.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

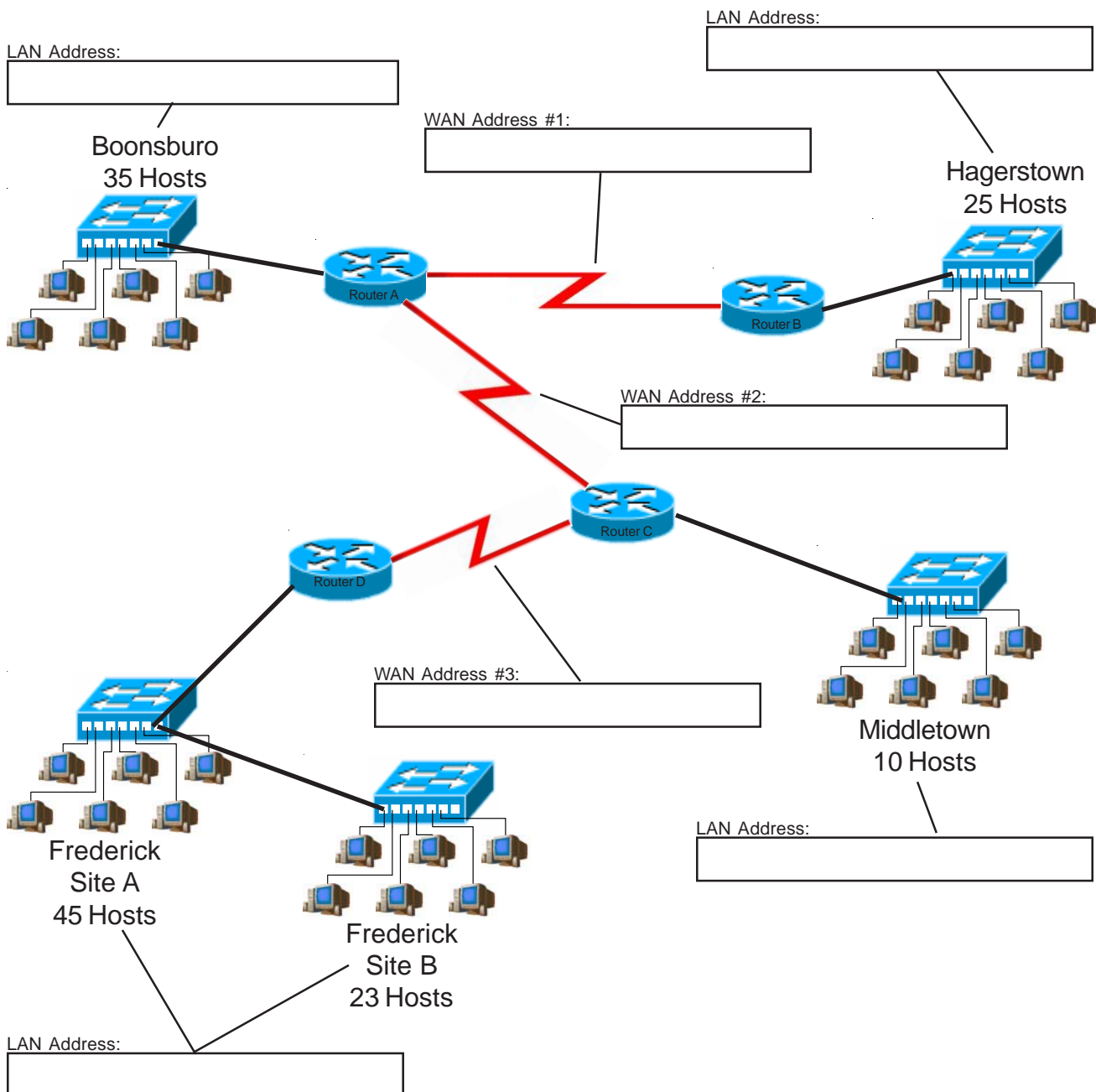
/24	/25	/26	/27	/28	/29	/30
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
					8-15	8-11
						12-15
				16-31	16-23	16-19
						20-23
					24-31	24-27
						28-31
			32-63	32-47	32-39	32-35
						36-39
					40-47	40-43
						44-47
				48-63	48-55	48-51
						52-55
					56-63	56-59
						60-63
		64-127	64-95	64-79	64-71	64-67
						68-71
					72-79	72-75
						76-79
				80-95	80-87	80-83
						84-87
					88-95	88-91
						92-95
			96-127	96-103	96-103	96-99
						100-103
					104-111	104-107
						108-111
				112-127	112-119	112-115
						116-119
					120-127	120-123
						124-127
	128-255	128-191	128-159	128-143	128-135	128-131
						132-135
					136-143	136-139
						140-143
				144-159	144-151	144-147
						148-151
					152-159	152-155
						156-159
			160-191	160-175	16-167	160-163
						164-167
					168-175	168-171
						172-175
				176-191	176-183	176-179
						180-183
					184-191	184-187
						188-191
		192-255	192-223	192-207	192-199	192-195
						196-199
					200-207	200-203
						204-207
				208-223	208-215	208-211
						212-215
					216-223	216-219
						220-223
			224-255	224-239	224-231	224-227
						228-231
					232-239	232-235
						236-239
				240-255	240-247	240-243
						244-247
					248-255	248-251
						252-255

VLSM Addressing

VLSM Chart Method

Problem 22

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This company will be using the class C address 200.20.2.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

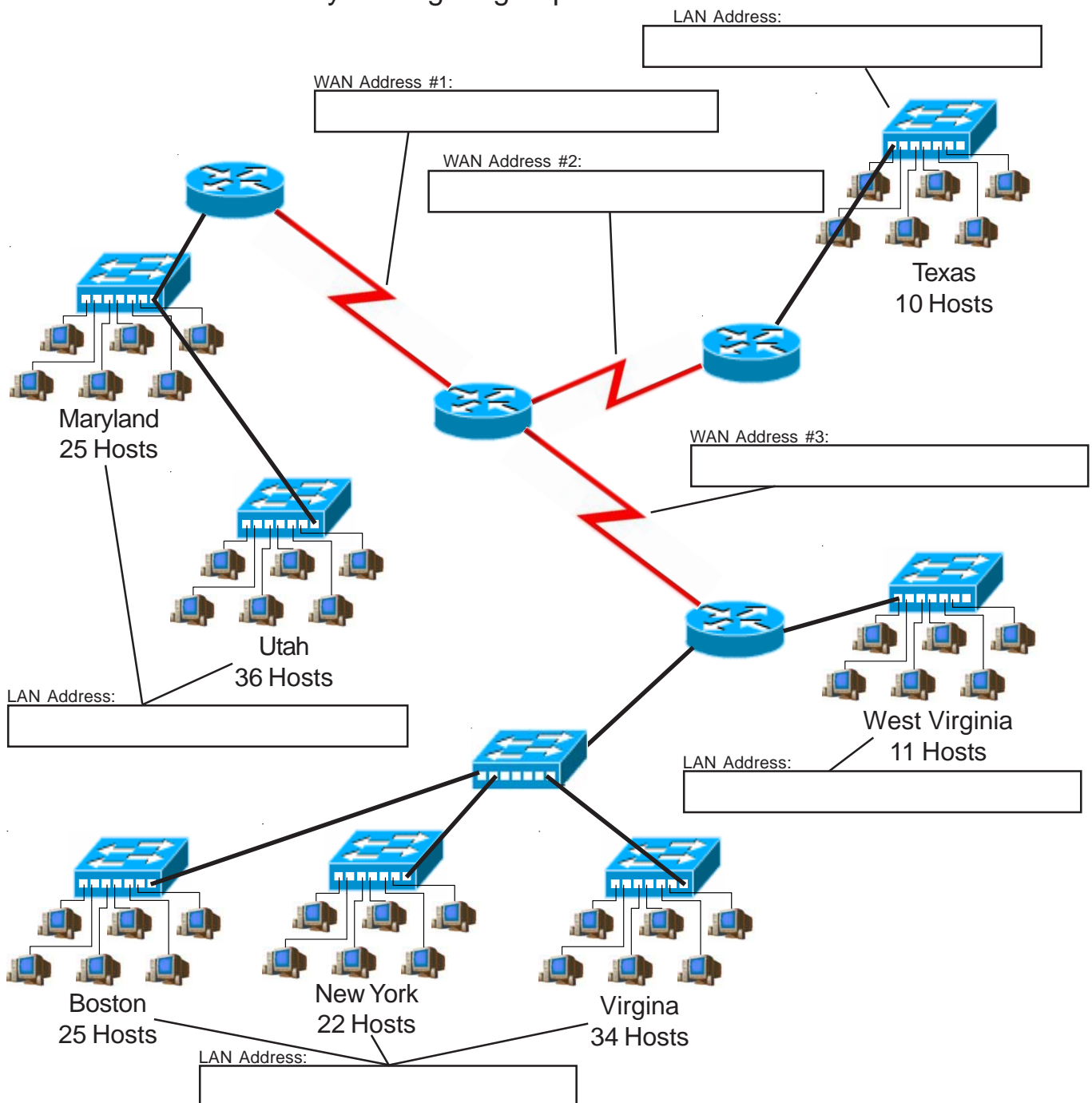
/24	/25	/26	/27	/28	/29	/30			
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts			
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3			
					4-7				
				16-31	8-15	8-11			
					12-15				
			32-63	32-47	16-23	16-19			
					20-23				
				48-63	24-31	24-27			
					28-31				
		64-127		64-95	64-79	32-39	32-35		
						36-39			
			80-95		40-47	40-43			
					44-47				
			96-127	96-111	48-55	48-51			
					52-55				
				112-127	56-63	56-59			
					60-63				
					128-191	128-159	64-71	64-67	
							68-71		
			72-75						
			76-79						
			160-191	144-159		80-87	80-83		
						84-87			
				176-191		88-95	88-91		
						92-95			
				128-255		192-255	192-223	96-103	96-99
								100-103	
	104-111	104-107							
	108-111								
	224-255	224-239	112-119		112-115				
			116-119						
		240-255	120-127		120-123				
			124-127						
		128-159	128-143		128-135		128-131		
					132-135				
	144-159		136-143		136-139				
			140-143						
	160-175		144-151		144-147				
			148-151						
	176-191		152-159		152-155				
			156-159						
	192-223	192-207	16-167		160-163				
			164-167						
			168-175	168-171					
			172-175						
		208-223	176-183	176-179					
			180-183						
			184-191	184-187					
			188-191						
			224-239	192-199	192-195				
				196-199					
	200-207	200-203							
	204-207								
	224-255	224-231	208-215	208-211					
			212-215						
			216-219						
			220-223						
		240-247	224-227	224-227					
			228-231						
			232-235						
			236-239						
	248-255	240-243	240-243						
		244-247							
		248-251							
		252-255							

VLSM Addressing

VLSM Chart Method

Problem 23

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This company will be using the class C address 190.150.23.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

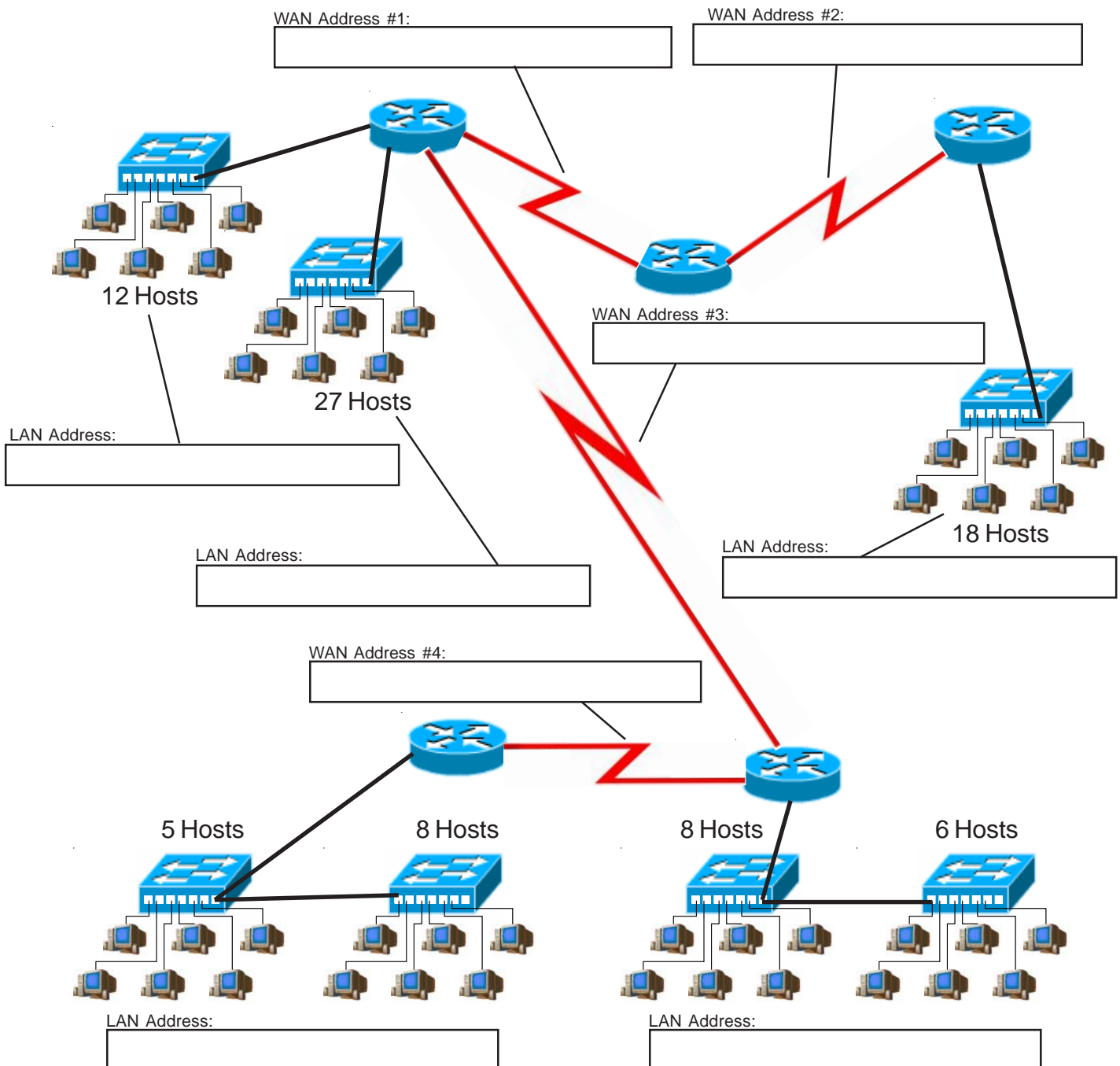
/24	/25	/26	/27	/28	/29	/30
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
					8-15	8-11
						12-15
				16-31	16-23	16-19
						20-23
					24-31	24-27
						28-31
			32-63	32-47	32-39	32-35
						36-39
					40-47	40-43
						44-47
				48-63	48-55	48-51
						52-55
					56-63	56-59
						60-63
		64-127	64-95	64-79	64-71	64-67
						68-71
					72-79	72-75
						76-79
				80-95	80-87	80-83
						84-87
					88-95	88-91
						92-95
			96-127	96-111	96-103	96-99
						100-103
					104-111	104-107
						108-111
				112-127	112-119	112-115
						116-119
					120-127	120-123
						124-127
	128-255	128-191	128-159	128-143	128-135	128-131
						132-135
					136-143	136-139
						140-143
				144-159	144-151	144-147
						148-151
					152-159	152-155
						156-159
			160-191	160-175	16-167	160-163
						164-167
					168-175	168-171
						172-175
				176-191	176-183	176-179
						180-183
					184-191	184-187
						188-191
		192-255	192-223	192-207	192-199	192-195
						196-199
					200-207	200-203
						204-207
				208-223	208-215	208-211
						212-215
					216-223	216-219
						220-223
			224-255	224-239	224-231	224-227
						228-231
					232-239	232-235
						236-239
				240-255	240-247	240-243
						244-247
					248-255	248-251
						252-255

VLSM Addressing

VLSM Chart Method

Problem 24

Using the network diagram and information given create an addressing scheme which utilizes variable-length subnet masks. Show the subnet address and CIDR in the boxes below, color or shade the sub-subnets used in the chart. This company will be using the class C address 192.168.1.0. Remember to start with your largest groups first.



Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

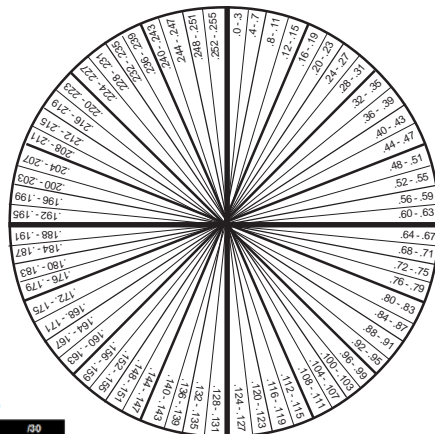
/24	/25	/26	/27	/28	/29	/30
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
					8-15	8-11
						12-15
				16-31	16-23	16-19
						20-23
					24-31	24-27
						28-31
			32-63	32-47	32-39	32-35
						36-39
					40-47	40-43
						44-47
				48-63	48-55	48-51
						52-55
					56-63	56-59
						60-63
		64-127	64-95	64-79	64-71	64-67
						68-71
					72-79	72-75
						76-79
				80-95	80-87	80-83
						84-87
					88-95	88-91
						92-95
			96-127	96-111	96-103	96-99
						100-103
					104-111	104-107
						108-111
				112-127	112-119	112-115
						116-119
					120-127	120-123
						124-127
	128-255	128-191	128-159	128-143	128-135	128-131
						132-135
					136-143	136-139
						140-143
				144-159	144-151	144-147
						148-151
					152-159	152-155
						156-159
			160-191	160-175	16-167	160-163
						164-167
					168-175	168-171
						172-175
				176-191	176-183	176-179
						180-183
					184-191	184-187
						188-191
		192-255	192-223	192-207	192-199	192-195
						196-199
					200-207	200-203
						204-207
				208-223	208-215	208-211
						212-215
					216-223	216-219
						220-223
			224-255	224-239	224-231	224-227
						228-231
					232-239	232-235
						236-239
				240-255	240-247	240-243
						244-247
					248-255	248-251
						252-255

Practical VLSM

Problems

Use the VLSM method of your choice to complete the following problems.

0	8	32	40	128	136	160	168
	3	11	35	131	139	163	171
4	12	36	44	132	140	164	172
	7	15	39	135	143	167	175
16	24	48	56	144	152	176	184
	19	27	51	147	155	179	187
20	28	52	60	148	156	180	188
	23	31	55	151	159	183	191
64	72	96	104	192	200	224	232
	67	75	99	195	203	227	235
68	76	100	108	196	204	228	236
	71	79	103	199	207	231	239
80	88	112	120	208	216	240	248
	83	91	115	211	219	243	251
84	92	116	124	212	220	244	252
	87	95	119	215	223	247	255



VLSM Chart 24-30 Bits (4th octet)

24	25	26	27	28	29	30
256 hosts	128 hosts	64 hosts	32 hosts	16 hosts	8 hosts	4 hosts
0-255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
						8-15
						16-23
						24-31
						32-39
						40-47
						48-55
						56-63
						64-71
						72-79
						80-87
						88-95
						96-103
						104-111
						112-119
						120-127
						128-135
						136-143
						144-151
						152-159
						160-167
						168-175
						176-183
						184-191
						192-199
						200-207
						208-215
						216-223
						224-231
						232-239
						240-247
						248-255

VLSM Addressing

(Sample)

Problem 25

You are developing a school network with the class C address 192.168.2.0/24. There will be three computer labs with 30 computers each that need to be on different sub-subnets. Forty eight classrooms with one computer each that will comprise a single sub-subnet. The administrative office and guidance office contain a total of seven computers which will need to be grouped together. Plan for four more mini labs with six computers to each sub-subnetwork. Divide the network using variable length subnet masks. Complete the information required below. Remember to work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1	192.168.2.0	/26	192.168.2.1	192.168.2.62	192.168.2.63
2	192.168.2.64	/27	192.168.2.65	192.168.2.94	192.168.2.95
3	192.168.2.96	/27	192.168.2.97	192.168.2.126	192.168.2.127
4	192.168.2.128	/27	192.168.2.129	192.168.2.158	192.168.2.159
5	192.168.2.160	/28	192.168.2.161	192.168.2.174	192.168.2.175
6	192.168.2.176	/29	192.168.2.177	192.168.2.182	192.168.2.183
7	192.168.2.184	/29	192.168.2.185	192.168.2.190	192.168.2.191
8	192.168.2.192	/29	192.168.2.193	192.168.2.198	192.168.2.199
9	192.168.2.200	/29	192.168.2.201	192.168.2.206	192.168.2.207
10					
11					
12					
13					
14					

VLSM Addressing

(Sample)

Problem 26

You are setting up a small business network with the class C address 220.55.80.0/24. The marketing division will need 12 computers. Research and development needs 27 computers. The reception area will need two computers. Management requires 19 computers. Divide the network using variable length subnet masks. Complete the information required below. Remember to work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1	220.55.80.0	/ 27	220.55.80.1	220.55.80.30	220.55.80.31
2	220.55.80.32	/ 27	220.55.80.	220.55.80.62	220.55.80.63
3	220.55.80.64	/ 28	220.55.80.65	220.55.80.78	220.55.80.79
4	220.55.80.80	/ 30	220.55.80.81	220.55.80.82	220.55.80.83
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

VLSM Addressing

Problem 27

You are setting up a medium sized network with the class C address 222.37.34.0/24. Marketing needs 29 computers. Research and development needs 110 computers. Bookkeeping will use 12 computers. The reception area will need three computers. Management requires 60 computers. Divide the network using variable length subnet masks. Complete the information required below. Remember to work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

VLSM Addressing

Problem 28

A shipping company needs to set up its network across several locations. The Denver office needs six computers. The Waco office needs 22 computers. The Fargo office will need five computers. The WAN links between all three locations need to be included in the solution. Using the IP address 192.168.10.0/24 divide the network using VLSM. Complete the information required below. Remember to work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

VLSM Addressing

Problem 29

A new school is being built in the local school district. It will have three computer labs with 28 computers each. There will be 58 classrooms with 2 computers each that need to be on one sub-subnet. The office staff and administrators will need 7 computers. The guidance and attendance office will have 5 computers. The school has been given the address 223.145.75.0/24. Complete the information required below. Remember to work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

VLSM Addressing

Problem 30

A local college is setting up a campus wide network. The technology wing will be on its own network address of 192.168.250.0/24. The office wing will include 15 computers. There are 2 labs of 20 computers each, 2 labs of 30 computers each and one lab of 35 computers. Complete the information required below. Remember to work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

VLSM Addressing

Problem 31

You are setting up a network for a company in four locations. Location A has 8 computers. Location B has 122 computers. Location C has 4 computers. Location D has 55 computers. There is a WAN connection between all four locations. Complete the information required below using the class C address 192.168.10.0. Remember to work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

VLSM Addressing

Problem 32

A college dormitory is being remodeled. A new network is being installed. There are 50 dorm rooms with two drops each that will be on one sub-subnet. The offices will have 5 drops. The reception desk will have three drops. A small study hall will include 30 drops. Using the IP address 192.168.12.0/24 complete the information required below using VLSM. Work from largest to smallest.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

VLSM Addressing

Problem 33

You are setting up a business network with the class C address 219.75.160.0/24. The marketing division will need 19 computers. Research and development needs 40 computers. The reception area will need four computers. Management requires 12 computers. Divide the network using variable length subnet information. On the opposite page draw a detailed map of this network. Include the name and sub-subnet IP addresses for each branch of the network with the subnet mask. One router with four ethernet ports will be used for this network.

Subnet	Subnet Address	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Problem 33 - Detailed Map

Draw a detailed map of this network. Include the name and sub-subnet IP addresses information for each branch of the network, and the subnet mask.

VLSM Addressing

Problem 34

A small company needs to set up its network across several locations. The New York branch office needs 15 computers. The San Jose office needs 66 computers. The Trinidad office will need 18 computers. You will need two WAN links between the routers. Using the IP address 195.20.5.0/24 divide the network using VLSM. On the opposite page draw a detailed map of this network. Include the name and subnet IP addresses information for each branch of the network. Label the WAN links with the same information. Complete the information required below. Work from largest to smallest.

Subnet	Subnet	Subnet Mask (/X)	First Usable Host	Last Usable Host	Broadcast Address
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Problem 34 - Detailed Map

Draw a detailed map of this network. Include the name and sub-subnet IP addresses information for each branch of the network.

10.0.0.0

Class C Addresses
VLSM Chart 24-30 Bits (4th octet)

04	05	06	07	08	09	10
200-205	206-210	211-215	216-220	221-225	226-230	231-235
0-01	0-02	0-03	0-04	0-05	0-06	0-07
0-08	0-09	0-10	0-11	0-12	0-13	0-14
0-15	0-16	0-17	0-18	0-19	0-20	0-21
0-22	0-23	0-24	0-25	0-26	0-27	0-28
0-29	0-30	0-31	0-32	0-33	0-34	0-35
0-36	0-37	0-38	0-39	0-40	0-41	0-42
0-43	0-44	0-45	0-46	0-47	0-48	0-49
0-50	0-51	0-52	0-53	0-54	0-55	0-56
0-57	0-58	0-59	0-60	0-61	0-62	0-63
0-64	0-65	0-66	0-67	0-68	0-69	0-70
0-71	0-72	0-73	0-74	0-75	0-76	0-77
0-78	0-79	0-80	0-81	0-82	0-83	0-84
0-85	0-86	0-87	0-88	0-89	0-90	0-91
0-92	0-93	0-94	0-95	0-96	0-97	0-98
0-99	0-100	0-101	0-102	0-103	0-104	0-105
0-106	0-107	0-108	0-109	0-110	0-111	0-112
0-113	0-114	0-115	0-116	0-117	0-118	0-119
0-120	0-121	0-122	0-123	0-124	0-125	0-126
0-127	0-128	0-129	0-130	0-131	0-132	0-133
0-134	0-135	0-136	0-137	0-138	0-139	0-140
0-141	0-142	0-143	0-144	0-145	0-146	0-147
0-148	0-149	0-150	0-151	0-152	0-153	0-154
0-155	0-156	0-157	0-158	0-159	0-160	0-161
0-162	0-163	0-164	0-165	0-166	0-167	0-168
0-169	0-170	0-171	0-172	0-173	0-174	0-175
0-176	0-177	0-178	0-179	0-180	0-181	0-182
0-183	0-184	0-185	0-186	0-187	0-188	0-189
0-190	0-191	0-192	0-193	0-194	0-195	0-196
0-197	0-198	0-199	0-200	0-201	0-202	0-203
0-204	0-205	0-206	0-207	0-208	0-209	0-210
0-211	0-212	0-213	0-214	0-215	0-216	0-217
0-218	0-219	0-220	0-221	0-222	0-223	0-224
0-225	0-226	0-227	0-228	0-229	0-230	0-231
0-232	0-233	0-234	0-235	0-236	0-237	0-238
0-239	0-240	0-241	0-242	0-243	0-244	0-245
0-246	0-247	0-248	0-249	0-250	0-251	0-252
0-253	0-254	0-255	0-256	0-257	0-258	0-259
0-260	0-261	0-262	0-263	0-264	0-265	0-266
0-267	0-268	0-269	0-270	0-271	0-272	0-273
0-274	0-275	0-276	0-277	0-278	0-279	0-280
0-281	0-282	0-283	0-284	0-285	0-286	0-287
0-288	0-289	0-290	0-291	0-292	0-293	0-294
0-295	0-296	0-297	0-298	0-299	0-300	0-301
0-302	0-303	0-304	0-305	0-306	0-307	0-308
0-309	0-310	0-311	0-312	0-313	0-314	0-315
0-316	0-317	0-318	0-319	0-320	0-321	0-322
0-323	0-324	0-325	0-326	0-327	0-328	0-329
0-330	0-331	0-332	0-333	0-334	0-335	0-336
0-337	0-338	0-339	0-340	0-341	0-342	0-343
0-344	0-345	0-346	0-347	0-348	0-349	0-350
0-351	0-352	0-353	0-354	0-355	0-356	0-357
0-358	0-359	0-360	0-361	0-362	0-363	0-364
0-365	0-366	0-367	0-368	0-369	0-370	0-371
0						

VLSM

with

Class A and B Addresses

We've gone over the practical applications of using VLSM on class C addresses. The same approach works with class A and B addresses. For example an ISP may have a class A address which it needs to subnet between its customers. Each customer may need to take their addresses and subnet them again in order to use them more effectively. The real trick to this is to remember which octet of the IP address you are working with.

Sample Problem 35

Part 1 of 3

Use the **Class A** address chart to break down the address for different ISP customers. At this stage of the problem you are creating subnets using the second octet of the IP address.

ISP Addresses 15.**0**.0.0

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
Customer #1	8 million	<i>15.0.0.0 to 15.127.255.255</i>	<i>/9</i>
Customer #2	2 million	<i>15.128.0.0 to 15.159.255.255</i>	<i>/11</i>
Customer #3	2,000,000	<i>15.160.0.0 to 15.191.255.255</i>	<i>/11</i>
Customer #4	1,000,000	<i>15.192.0.0 to 15.207.255.255</i>	<i>/12</i>
Customer #5	500,000	<i>15.208.0.0 to 15.215.255.255</i>	<i>/13</i>
Customer #6	450,000	<i>15.216.0.0 to 15.223.255.255</i>	<i>/13</i>
Customer #7	200,000	<i>15.224.0.0 to 15.227.255.255</i>	<i>/14</i>
Customer #8	130,000	<i>15.228.0.0 to 15.229.255.255</i>	<i>/15</i>
Customer #9	100,000	<i>15.230.0.0 to 15.231.255.255</i>	<i>/15</i>

Class A Addresses

VLSM Chart 8-15 Bits (2nd octet)

/8 255.0.0.0 16,777,216 Hosts	/9 255.128.0.0 8,388,608 Hosts	/10 255.192.0.0 4,194,304 Hosts	/11 255.224.0.0 2,097,152 Hosts	/12 255.240.0.0 1,048,576 Hosts	/13 255.248.0.0 524,288 Hosts	/14 255.252.0.0 262,144 Hosts	/15 255.254.0.0 131,072 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
					8-15	4-7	2-3
						8-11	4-5
						12-15	6-7
				16-31	16-23	16-19	8-9
					24-31	20-23	10-11
						24-27	12-13
						28-31	14-15
			32-63	32-47	32-39	32-35	16-17
					40-47	36-39	18-19
						40-43	20-21
						44-47	22-23
				48-63	48-55	48-51	24-25
						52-55	26-27
					56-63	56-59	28-29
						60-63	30-31
		64-127	64-95	64-79	64-71	64-67	32-33
					72-79	68-71	34-35
						72-75	36-37
						76-79	38-39
			80-95	80-87	80-83	84-87	40-41
					88-95	88-91	42-43
						92-95	44-45
						96-99	46-47
			96-127	96-103	100-103	104-107	48-49
					104-111	108-111	50-51
				112-127	112-119	112-115	52-53
					120-127	116-119	54-55
	128-255	128-191	128-159	128-143	128-135	128-131	56-57
					136-143	136-139	58-59
						140-143	60-61
				144-159	144-151	144-147	62-63
					152-159	148-151	64-65
						152-155	66-67
						156-159	68-69
			160-191	160-175	160-167	164-167	70-71
					168-175	168-171	72-73
				176-191	176-183	176-179	74-75
					184-191	180-183	76-77
						184-187	78-79
						188-191	80-81
		192-255	192-223	192-207	192-199	192-195	82-83
					200-207	196-199	84-85
					208-215	200-203	86-87
				208-223	216-223	204-207	88-89
						208-211	90-91
			224-255	224-239	224-231	228-231	92-93
					232-239	232-235	94-95
				240-255	240-247	236-239	96-97
					248-255	240-243	98-99
						244-247	100-101
						248-251	102-103
						252-255	104-105
							106-107
							108-109
							110-111
							112-113
							114-115
							116-117
							118-119
							120-121
							122-123
							124-125
							126-127
							128-129
							130-131
							132-133
							134-135
							136-137
							138-139
							140-141
							142-143
							144-145
							146-147
							148-149
							150-151
							152-153
							154-155
							156-157
							158-159
							160-161
							162-163
							164-165
							166-167
							168-169
							170-171
							172-173
							174-175
							176-177
							178-179
							180-181
							182-183
							184-185
							186-187
							188-189
							190-191
							192-193
							194-195
							196-197
							198-199
							200-201
							202-203
							204-205
							206-207
							208-209
							210-211
							212-213
							214-215
							216-217
							218-219
							220-221
							222-223
							224-225
							226-227
							228-229
							230-231
							232-233
							234-235
							236-237
							238-239
							240-241
							242-243
							244-245
							246-247
							248-249
							250-251
							252-253
							254-255

VLSM

with

Class A and B Addresses

Sample Problem 35

Part 2 of 3

Customer #5 has a total of 524,288 addresses. Use the **Class B** address chart to break down the sub-subnetwork addresses for their different clients. At this stage of the problem you are creating sub-subnets with the third octet of the IP address.

ISP Addresses 15.208.0.0

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
Client #1	7,500	15.208.0.0 to 15.208.31.255	/19
Client #2	5,000	15.208.32.0 to 15.208.63.255	/19
Client #3	4,500	15.208.64.0 to 15.208.95.255	/19
Client #4	2,000	15.208.96.0 to 15.208.103.255	/21
Client #5	1,450	15.208.104.0 to 15.208.111.255	/21
Client #6	1,150	15.208.112.0 to 15.208.119.255	/21
Client #7	900	15.208.120.0 to 15.208.123.255	/22
Client #8	750	15.208.124.0 to 15.208.127.255	/22
Client #9	450	15.208.128.0 to 15.208.129.255	/23

Class B Addresses

VLSM Chart 16-23 Bits (3rd octet)

/16 255.255.0.0 65,536 Hosts	/17 255.255.128.0 32,768 Hosts	/18 255.255.192.0 16,384 Hosts	/19 255.255.224.0 8,192 Hosts	/20 255.255.240.0 4,096 Hosts	/21 255.255.248.0 2,048 Hosts	/22 255.255.252.0 1,024 Hosts	/23 255.255.254.0 512 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
					8-15	4-7	2-3
						8-11	4-5
						12-15	6-7
						16-19	8-9
						20-23	10-11
						24-27	12-13
						28-31	14-15
			32-63	16-31	16-23	32-35	16-17
					24-31	36-39	18-19
						40-43	20-21
						44-47	22-23
						48-51	24-25
						52-55	26-27
						56-59	28-29
						60-63	30-31
			64-95	32-47	32-39	64-67	32-33
					40-47	68-71	34-35
						72-75	36-37
						76-79	38-39
						80-83	40-41
						84-87	42-43
						88-91	44-45
						92-95	46-47
				48-63	48-55	96-99	48-49
					56-63	100-103	50-51
				64-79	64-71	104-107	52-53
					72-79	108-111	54-55
				80-95	80-87	112-115	56-57
					88-95	116-119	58-59
			96-127	96-111	96-103	120-123	60-61
					104-111	124-127	62-63
					112-119		64-65
					120-127		66-67
				128-143	128-135		68-69
					136-143		70-71
				144-159	144-151		72-73
					152-159		74-75
				160-175	160-167		76-77
					168-175		78-79
				176-191	176-183		80-81
					184-191		82-83
				192-207	192-199		84-85
					200-207		86-87
				208-223	208-215		88-89
					216-223		90-91
			224-255	224-239	224-231		92-93
					232-239		94-95
					240-247		96-97
					248-255		98-99
				240-255	240-247		100-101
					248-255		102-103
				240-255	240-247		104-105
					248-255		106-107
				240-255	240-247		108-109
					248-255		110-111
				240-255	240-247		112-113
					248-255		114-115
				240-255	240-247		116-117
					248-255		118-119
				240-255	240-247		120-121
					248-255		122-123
				240-255	240-247		124-125
					248-255		126-127
				240-255	240-247		128-129
					248-255		130-131
				240-255	240-247		132-133
					248-255		134-135
				240-255	240-247		136-137
					248-255		138-139
				240-255	240-247		140-141
					248-255		142-143
				240-255	240-247		144-145
					248-255		146-147
				240-255	240-247		148-149
					248-255		150-151
				240-255	240-247		152-153
					248-255		154-155
				240-255	240-247		156-157
					248-255		158-159
				240-255	240-247		160-161
					248-255		162-163
				240-255	240-247		164-165
					248-255		166-167
				240-255	240-247		168-169
					248-255		170-171
				240-255	240-247		172-173
					248-255		174-175
				240-255	240-247		176-177
					248-255		178-179
				240-255	240-247		180-181
					248-255		182-183
				240-255	240-247		184-185
					248-255		186-187
				240-255	240-247		188-189
					248-255		190-191
				240-255	240-247		192-193
					248-255		194-195
				240-255	240-247		196-197
					248-255		198-199
				240-255	240-247		200-201
					248-255		202-203
				240-255	240-247		204-205
					248-255		206-207
				240-255	240-247		208-209
					248-255		210-211
				240-255	240-247		212-213
					248-255		214-215
				240-255	240-247		216-217
					248-255		218-219
				240-255	240-247		220-221
					248-255		222-223
				240-255	240-247		224-225
					248-255		226-227
				240-255	240-247		228-229
					248-255		230-231
				240-255	240-247		232-233
					248-255		234-235
				240-255	240-247		236-237
					248-255		238-239
				240-255	240-247		240-241
					248-255		242-243
				240-255	240-247		244-245
					248-255		246-247
				240-255	240-247		248-249
					248-255		250-251
				240-255	240-247		252-253
					248-255		254-255

VLSM

with

Class A and B Addresses

Sample Problem 35

Part 3 of 3

Client #8 has a total of 1,024 addresses. Use the **Class C** address chart to break down the sub-subnetwork addresses for their different branch offices. At this stage of the problem you are creating sub-subnets with the fourth octet of the IP address.

ISP Addresses 15.208.124.**0**

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
Branch #1	100	<i>15.208.124.0 to 15.208.124.127</i>	<i>/ 25</i>
Branch #2	55	<i>15.208.124.128 to 15.208.124.191</i>	<i>/ 26</i>
Branch #3	25	<i>15.208.124.192 to 15.208.124.223</i>	<i>/ 27</i>
Branch #4	6	<i>15.208.124.224 to 15.208.124.231</i>	<i>/ 29</i>
Branch #5	4	<i>15.208.124.232 to 15.208.124.239</i>	<i>/ 29</i>
Branch #6	2	<i>15.208.124.240 to 15.208.124.243</i>	<i>/ 30</i>
Branch #7	2	<i>15.208.124.244 to 15.208.124.247</i>	<i>/ 30</i>
Branch #8	2	<i>15.208.124.248 to 15.208.124.251</i>	<i>/ 30</i>
Branch #9	2	<i>15.208.124.252 to 15.208.124.255</i>	<i>/ 30</i>

Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

/24	/25	/26	/27	/28	/29	/30			
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts			
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3			
					4-7				
				16-31	8-15	8-11			
					12-15				
			32-63	32-47	16-23	16-19			
					20-23				
				48-63	24-31	24-27			
					28-31				
				64-127	64-95	64-79	32-39	32-35	
							36-39		
		80-95	40-43						
			44-47						
		96-127	96-111		48-55	48-51			
					52-55				
			112-127		56-63	56-59			
					60-63				
					128-255	128-191	128-159	64-71	64-67
								68-71	
		72-75							
		76-79							
		144-159	80-87	80-83					
			84-87						
			88-95	88-91					
			92-95						
		160-191	160-175	96-103			96-99		
				100-103					
	176-191		104-111	104-107					
			108-111						
			192-255	192-207			112-119	112-115	
							116-119		
	120-123								
	124-127								
	208-223	128-135		128-131					
		132-135							
		136-143		136-139					
		140-143							
	224-255	224-239		144-151		144-147			
				148-151					
			152-155						
			156-159						
		240-255	244-247	160-167		160-163			
				164-167					
			248-255	168-175		168-171			
				172-175					
				248-255		248-255	176-183	176-179	
							180-183		
	184-187								
	188-191								
	252-255	252-255	192-199			192-195			
			196-199						
		256-259	200-207		200-203				
			204-207						
			256-259		256-259	208-215	208-211		
						212-215			
	216-219								
	220-223								
	260-263	260-263		224-231	224-227				
				228-231					
		264-267		232-239	232-235				
				236-239					
				264-267	264-267	240-243			
						244-247			
	248-251								
	252-255								

VLSM

with

Class A and B Addresses

Problem 36

Part 1 of 3

The school system you are working for is using the private address of 172.32.0.0 to subnet the entire district. Use the **Class B** address chart to break down the sub-subnetwork addresses for the different schools and offices.

At this stage of the problem you are creating sub-subnets with the third octet of the IP address. Remember which octet of the IP address you are working in.

School System Address 172.32.0.0

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
North High	2,400		
South High	2,000		
North Middle	1,200		
South Middle	1,000		
Central Elem.	550		
Southern Elem.	475		
Eastern Elem.	450		
Central Office	400		
Western Elem.	300		

Class B Addresses

VLSM Chart 16-23 Bits (3rd octet)

/16 255.255.0.0 65,536 Hosts	/17 255.255.128.0 32,768 Hosts	/18 255.255.192.0 16,384 Hosts	/19 255.255.224.0 8,192 Hosts	/20 255.255.240.0 4,096 Hosts	/21 255.255.248.0 2,048 Hosts	/22 255.255.252.0 1,024 Hosts	/23 255.255.254.0 512 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
						4-7	4-5
					8-15	8-11	6-7
						12-15	8-9
				16-31	16-23	16-19	10-11
						20-23	4-5
			32-63	32-47	24-31	24-27	6-7
						28-31	8-9
				40-47	32-39	32-35	10-11
						36-39	4-5
				48-63	40-43	40-43	6-7
						44-47	8-9
				56-63	48-55	48-51	10-11
						52-55	4-5
		64-127	64-95	64-79	56-59	56-59	6-7
					60-63	60-63	8-9
				80-95	64-71	64-67	10-11
						68-71	4-5
				96-111	72-79	72-75	6-7
						76-79	8-9
			96-127	100-103	80-87	80-83	10-11
						84-87	4-5
				104-111	88-95	88-91	6-7
						92-95	8-9
				112-119	96-99	96-99	10-11
						100-103	4-5
			128-159	128-143	104-107	104-107	6-7
						108-111	8-9
				144-151	112-119	112-115	10-11
						116-119	4-5
			160-191	160-175	120-123	120-123	6-7
						124-127	8-9
				176-191	128-135	128-131	10-11
						132-135	4-5
	128-255	128-191	128-159	136-143	136-139	136-139	6-7
					140-143	140-143	8-9
				144-151	144-147	144-147	10-11
						148-151	4-5
			160-191	152-159	152-155	152-155	6-7
						156-159	8-9
				160-167	160-163	160-163	10-11
						164-167	4-5
			176-191	168-175	168-171	168-171	6-7
						172-175	8-9
				176-183	176-179	176-179	10-11
						180-183	4-5
			184-191	184-187	184-187	184-187	6-7
						188-191	8-9
			192-223	192-199	192-195	192-195	10-11
						196-199	4-5
				200-207	200-203	200-203	6-7
						204-207	8-9
			208-223	208-215	208-211	208-211	10-11
						212-215	4-5
				216-223	216-219	216-219	6-7
						220-223	8-9
		192-255	224-239	224-231	224-227	224-227	10-11
						228-231	4-5
				232-239	232-235	232-235	6-7
						236-239	8-9
			240-255	240-247	240-243	240-243	10-11
						244-247	4-5
				248-255	248-251	248-251	6-7
						252-255	8-9

VLSM

with

Class A and B Addresses

Problem 36

Part 2 of 3

Eastern Elementary has been given 512 hosts, with the address range of 172.32.42.0 / 21 (255.255.248.0).

Based on the information below supply the required address ranges and subnet masks for each school area. Use the **Class C** address chart to break down the sub-subnetworks.

Hint:

Another way to look at this problem is to see that with the third octet range of 42 to 43 you have access to 2 groups of 255 addresses (172.32.42.0 and 172.32.43.0). Think in terms of having two Class C VLSM charts.

Eastern Elementary School
Address Range 172.32.42.0 to 172.32.43.255

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
Students	250		
Printers	45		
Staff	40		
Network Devices	25		
Administrative	12		

Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3 4-7
					8-15	8-11 12-15
				16-31	16-23	16-19 20-23
					24-31	24-27 28-31
			32-63	32-47	32-39	32-35 36-39
					40-47	40-43 44-47
				48-63	48-55	48-51 52-55
					56-63	56-59 60-63
		64-127	64-95	64-79	64-71	64-67 68-71
					72-79	72-75 76-79
				80-95	80-87	80-83 84-87
					88-95	88-91 92-95
			96-127	96-111	96-103	96-99 100-103
					104-111	104-107 108-111
				112-127	112-119	112-115 116-119
					120-127	120-123 124-127
	128-255	128-191	128-159	128-143	128-135	128-131 132-135
					136-143	136-139 140-143
				144-159	144-151	144-147 148-151
					152-159	152-155 156-159
			160-191	160-175	160-167	160-163 164-167
					168-175	168-171 172-175
				176-191	176-183	176-179 180-183
					184-191	184-187 188-191
		192-255	192-223	192-207	192-199	192-195 196-199
					200-207	200-203 204-207
				208-223	208-215	208-211 212-215
					216-223	216-219 220-223
			224-255	224-239	224-231	224-227 228-231
					232-239	232-235 236-239
				240-255	240-247	240-243 244-247
					248-255	248-251 252-255

VLSM

with

Class A and B Addresses

Problem 36

Part 3 of 3

South High in part 1 of this problem has been given 2,048 hosts, with the address range of 172.32.16.0 / 21 (255.255.248.0).

Based on the information below supply the required address ranges and subnet masks for each school area. Use both the **Class B** and **Class C** address charts to break down the sub-subnetwork addresses for the different areas of the network.

Hint:

With this problem you are creating sub-subnets with both the third and fourth octets of the IP address. You may need to use the Class B VLSM chart for the *Students* addressing information. All the other addresses will be using the Class C VLSM chart. Another way to look at this problem is to see that with the third octet range of 16 to 23 you have access to 8 groups of 255 addresses or eight Class C VLSM charts.

South High School
Address Range 172.32.16.0 to 172.32.23.255

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
Students	1,000		
Network Devices	250		
Printers	200		
Staff	150		
Administrative	50		

Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

/24	/25	/26	/27	/28	/29	/30
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
					8-15	8-11
						12-15
				16-31	16-23	16-19
						20-23
					24-31	24-27
						28-31
			32-63	32-47	32-39	32-35
						36-39
					40-47	40-43
						44-47
				48-63	48-55	48-51
						52-55
					56-63	56-59
						60-63
		64-127	64-95	64-79	64-71	64-67
						68-71
					72-79	72-75
						76-79
				80-95	80-87	80-83
						84-87
					88-95	88-91
						92-95
			96-127	96-103	96-99	96-99
						100-103
					104-111	104-107
						108-111
				112-127	112-119	112-115
						116-119
					120-123	120-123
						124-127
	128-255	128-191	128-159	128-143	128-135	128-131
						132-135
					136-143	136-139
						140-143
				144-159	144-151	144-147
						148-151
					152-159	152-155
						156-159
			160-191	160-175	160-167	160-163
						164-167
					168-175	168-171
						172-175
				176-191	176-183	176-179
						180-183
					184-191	184-187
						188-191
		192-255	192-223	192-207	192-199	192-195
						196-199
					200-207	200-203
						204-207
				208-223	208-215	208-211
						212-215
					216-223	216-219
						220-223
			224-255	224-239	224-231	224-227
						228-231
					232-239	232-235
						236-239
				240-255	240-247	240-243
						244-247
					248-255	248-251
						252-255

VLSM

with

Class A and B Addresses

Problem 37

Part 1 of 3

The company you are working for is using the IP address 110.0.0.0 sub-subneted for multiple offices around the world. Use the **Class A** address chart to break down the sub-subnetwork addresses for the different offices.

At this stage of the problem you are creating sub-subnets with the third octet of the IP address. Remember which octet of the IP address you are working in.

Company Address 110.0.0.0

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
Moskva	3,050,000		
New York	1,540,000		
St. Petersburg	1,075,000		
London	975,000		
Ekaterinoburg	525,000		
Munchen	450,000		
Napoli	150,000		
Birmingham	130,000		
Rotterdam	95,000		

Class A Addresses

VLSM Chart 8-15 Bits (2nd octet)

/8 255.0.0.0 16,777,216 Hosts	/9 255.128.0.0 8,388,608 Hosts	/10 255.192.0.0 4,194,304 Hosts	/11 255.224.0.0 2,097,152 Hosts	/12 255.240.0.0 1,048,576 Hosts	/13 255.248.0.0 524,288 Hosts	/14 255.252.0.0 262,144 Hosts	/15 255.254.0.0 131,072 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
						4-7	4-5
					8-15	8-11	6-7
						12-15	8-9
			16-31	16-23		16-19	10-11
						20-23	12-13
					24-31	24-27	14-15
						28-31	16-17
			32-63	32-39		32-35	18-19
						36-39	20-21
				40-47		40-43	22-23
						44-47	24-25
				48-63	48-55	48-51	26-27
						52-55	28-29
					56-63	56-59	30-31
						60-63	32-33
		64-127	64-95	64-79	64-71	64-67	34-35
						68-71	36-37
				80-95	72-79	72-75	38-39
					80-87	80-83	40-41
			96-127	96-111	88-95	84-87	42-43
						88-91	44-45
						92-95	46-47
				104-111	96-103	96-99	48-49
						100-103	50-51
				112-127	104-111	104-107	52-53
						108-111	54-55
					112-119	112-115	56-57
						116-119	58-59
	128-255	128-191	128-159	128-143		124-127	60-61
						128-131	62-63
				136-143		132-135	64-65
						136-139	66-67
			144-159	144-151		140-143	68-69
						144-147	70-71
				152-159		148-151	72-73
						152-155	74-75
			160-191	160-175		156-159	76-77
						160-163	78-79
				168-175		164-167	80-81
						168-171	82-83
			176-191	176-183		172-175	84-85
						176-179	86-87
				184-191		180-183	88-89
						184-187	90-91
		192-255	192-223	192-207		188-191	92-93
						192-195	94-95
				200-207		196-199	96-97
						200-203	98-99
			208-223	208-215		204-207	100-101
						208-211	102-103
				216-223		212-215	104-105
						216-219	106-107
			224-255	224-231		220-223	108-109
						224-227	110-111
				232-239		228-231	112-113
						232-235	114-115
				240-247		236-239	116-117
						240-243	118-119
						244-247	120-121
						248-251	122-123
			248-255	248-255		252-255	124-125
							126-127
							128-129
							130-131
							132-133
							134-135
							136-137
							138-139
							140-141
							142-143
							144-145
							146-147
							148-149
							150-151
							152-153
							154-155
							156-157
							158-159
							160-161
							162-163
							164-165
							166-167
							168-169
							170-171
							172-173
							174-175
							176-177
							178-179
							180-181
							182-183
							184-185
							186-187
							188-189
							190-191
							192-193
							194-195
							196-197
							198-199
							200-201
							202-203
							204-205
							206-207
							208-209
							210-211
							212-213
							214-215
							216-217
							218-219
							220-221
							222-223
							224-225
							226-227
							228-229
							230-231
							232-233
							234-235
							236-237
							238-239
							240-241
							242-243
							244-245
							246-247
							248-249
							250-251
							252-253
							254-255

VLSM

with

Class A and B Addresses

Problem 37

Part 2 of 3

London in part 1 of this problem has been given 1,048,576 hosts, with the address range of 110.128.0.0 to 110.143.255.255 /12 (255.240.0.0).

Based on the information below supply the required address ranges and subnet masks for each office. Use the **Class B** address chart to break down the sub-subnetwork addresses for the different areas of the network.

London
Address Range 110.128.0.0 to 110.143.255.255

Customer Name	Number of Addresses	Address Range (Include subnet & broadcast addresses)	CIDR
Office #1	6,450		
Office #2	3,780		
Office #3	2,750		
Office #4	2,000		
Office #5	1,000		
Office #6	845		
Office #7	500		
Office #8	450		
Office #9	300		

Class B Addresses

VLSM Chart 16-23 Bits (3rd octet)

/16 255.255.0.0 65,536 Hosts	/17 255.255.128.0 32,768 Hosts	/18 255.255.192.0 16,384 Hosts	/19 255.255.224.0 8,192 Hosts	/20 255.255.240.0 4,096 Hosts	/21 255.255.248.0 2,048 Hosts	/22 255.255.252.0 1,024 Hosts	/23 255.255.254.0 512 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
						4-7	4-5
					8-15	8-11	6-7
						12-15	8-9
			16-31	16-23		16-19	10-11
						20-23	12-13
					24-31	24-27	14-15
						28-31	16-17
			32-63	32-39		32-35	18-19
						36-39	20-21
				40-47		40-43	22-23
						44-47	24-25
				48-63	48-55	48-51	26-27
						52-55	28-29
					56-63	56-59	30-31
						60-63	32-33
		64-127	64-95	64-79	64-71	64-67	34-35
						68-71	36-37
				80-95	72-79	72-75	38-39
					80-87	80-83	40-41
			96-127	96-103	88-95	84-87	42-43
						88-91	44-45
				104-111	92-95	92-95	46-47
						96-99	48-49
			112-127	112-119	100-103	100-103	50-51
						104-107	52-53
				120-127	108-111	108-111	54-55
						112-115	56-57
	128-255	128-191	128-159	128-143	116-119	116-119	60-61
					120-123	120-123	62-63
				136-143	124-127	124-127	64-65
						128-131	66-67
			144-159	144-151	128-135	128-135	68-69
						132-135	70-71
				152-159	136-139	136-139	72-73
					140-143	140-143	74-75
			160-191	160-175	142-145	142-145	76-77
					144-147	144-147	78-79
				168-175	146-149	146-149	80-81
					150-153	150-153	82-83
			176-191	176-183	152-155	152-155	84-85
					154-157	154-157	86-87
				184-191	156-159	156-159	88-89
					160-163	160-163	90-91
	192-255	192-223	192-207	192-199	162-165	162-165	92-93
					164-167	164-167	94-95
				200-207	166-169	166-169	96-97
					170-173	170-173	98-99
			208-223	208-215	172-175	172-175	100-101
					176-179	176-179	102-103
				216-223	180-183	180-183	104-105
					184-187	184-187	106-107
		224-255	224-239	224-231	186-189	186-189	108-109
					190-193	190-193	110-111
				232-239	192-195	192-195	112-113
					196-199	196-199	114-115
			240-255	240-247	200-203	200-203	116-117
					204-207	204-207	118-119
				248-255	208-211	208-211	120-121
					212-215	212-215	122-123
			252-255	252-249	216-219	216-219	124-125
					220-223	220-223	126-127
				252-255	224-227	224-227	128-129
					228-231	228-231	130-131
				252-255	232-235	232-235	132-133
					236-239	236-239	134-135
				252-255	240-243	240-243	136-137
					244-247	244-247	138-139
				252-255	248-251	248-251	140-141
					252-255	252-255	142-143
							144-145
							146-147
							148-149
							150-151
							152-153
							154-155
							156-157
							158-159
							160-161
							162-163
							164-165
							166-167
							168-169
							170-171
							172-173
							174-175
							176-177
							178-179
							180-181
							182-183
							184-185
							186-187
							188-189
							190-191
							192-193
							194-195
							196-197
							198-199
							200-201
							202-203
							204-205
							206-207
							208-209
							210-211
							212-213
							214-215
							216-217
							218-219
							220-221
							222-223
							224-225
							226-227
							228-229
							230-231
							232-233
							234-235
							236-237
							238-239
							240-241
							242-243
							244-245
							246-247
							248-249
							250-251
							252-253
							254-255

VLSM

with

Class A and B Addresses

Problem 37

Part 3 of 3

Office #7 in part 2 of this problem has been given 512 hosts, with the address range of 110.128.80.0 / 23 (255.255.254.0).

Based on the information below supply the required address ranges and subnet masks for each school area. Use the **Class C** address chart to break down the sub-subnetwork addresses for the different areas of the network. **Hint:** Another way to look at this problem is to see that with the third octet range of 80 to 81 you have access to 2 groups of 255 addresses or two Class C VLSM charts.

Office #7
Address Range 110.128.**80.0** to 110.128.**81.255**

Customer Name	Number of Addresses	Address Range	CIDR
1st Floor	125		
2nd Floor	75		
5th Floor	50		
8th Floor	45		
4th Floor	30		
Basement	14		
7th Floor	12		
3rd Floor	6		
6th Floor	4		

Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
					4-7	4-7
				16-31	8-15	8-11
					12-15	12-15
			32-63	32-47	16-23	16-19
					20-23	20-23
					24-31	24-27
					28-31	28-31
				48-63	32-39	32-35
					36-39	36-39
					40-47	40-43
					44-47	44-47
		64-127	64-95	64-79	48-55	48-51
					52-55	52-55
					56-59	56-59
					60-63	60-63
				80-95	64-71	64-67
					68-71	68-71
					72-75	72-75
					76-79	76-79
			96-127	96-111	80-83	80-83
					84-87	84-87
					88-91	88-91
					92-95	92-95
				112-127	96-99	96-99
					100-103	100-103
					104-107	104-107
					108-111	108-111
	128-255	128-191	128-159	128-143	112-115	112-115
					116-119	116-119
				144-159	120-123	120-123
					124-127	124-127
			160-191	160-175	128-131	128-131
					132-135	132-135
				176-191	136-139	136-139
					140-143	140-143
		192-255	192-223	192-207	144-147	144-147
					148-151	148-151
				208-223	152-155	152-155
					156-159	156-159
			224-255	224-239	160-163	160-163
					164-167	164-167
				240-255	168-171	168-171
					172-175	172-175
				248-255	176-179	176-179
					180-183	180-183
				252-255	184-187	184-187
					188-191	188-191
				256-259	192-195	192-195
					196-199	196-199
				260-263	200-203	200-203
					204-207	204-207
				264-267	208-211	208-211
					212-215	212-215
				268-271	216-219	216-219
					220-223	220-223
				272-275	224-227	224-227
					228-231	228-231
				276-279	232-235	232-235
					236-239	236-239
				280-283	240-243	240-243
					244-247	244-247
				284-287	248-251	248-251
					252-255	252-255

VLSM

with

Class A and B Addresses

Problem 38

Part 1 of 4

Use the **Class A** address chart to break down the address for different business customers by country. At this stage of this problem you are creating subnets in the second octet of the IP address.

Addresses 75.0.0.0

Customer Name	Number of Addresses	Address Range	CIDR
United States	6.5 million		
China	4 million		
Japan	1 million		
Germany	500,000		
Russia	455,000		
Australia	450,000		
Brazil	125,000		
Canda	90,000		
Denmark	88,000		

Class A Addresses

VLSM Chart 8-15 Bits (2nd octet)

/8 255.0.0.0 16,777,216 Hosts	/9 255.128.0.0 8,388,608 Hosts	/10 255.192.0.0 4,194,304 Hosts	/11 255.224.0.0 2,097,152 Hosts	/12 255.240.0.0 1,048,576 Hosts	/13 255.248.0.0 524,288 Hosts	/14 255.252.0.0 262,144 Hosts	/15 255.254.0.0 131,072 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
					8-15	4-7	2-3
					16-31	8-11	4-5
						12-15	6-7
			32-63	32-47	16-23	16-19	8-9
					24-31	20-23	10-11
					48-63	24-27	12-13
						28-31	14-15
				80-95	32-39	32-35	16-17
					40-47	36-39	18-19
				96-111	48-55	40-43	20-21
					56-63	44-47	22-23
			128-159	128-143	48-51	48-51	24-25
					52-55	52-55	26-27
				144-159	56-59	60-63	28-29
					64-71	64-67	30-31
				160-175	64-71	68-71	32-33
					72-79	72-75	34-35
				176-191	80-87	76-79	36-37
					88-95	80-83	38-39
			192-223	192-199	84-87	84-87	40-41
					88-91	88-91	42-43
				200-207	92-95	92-95	44-45
					96-99	96-99	46-47
				208-215	100-103	100-103	48-49
					104-107	104-107	50-51
				216-223	108-111	108-111	52-53
					112-119	112-115	54-55
			224-255	224-231	116-119	116-119	56-57
					120-127	120-123	58-59
				232-239	124-127	124-127	60-61
					128-131	128-131	62-63
				240-247	132-135	132-133	64-65
					136-139	136-139	66-67
				248-255	140-143	140-143	68-69
					144-147	144-147	70-71
	128-255	128-191	128-159	128-143	148-151	148-151	72-73
					152-155	152-155	74-75
				144-159	156-159	156-159	76-77
					160-163	160-163	78-79
			160-191	160-175	164-167	164-167	80-81
					168-171	168-171	82-83
				176-191	172-175	172-175	84-85
					176-179	176-179	86-87
			192-223	192-199	180-183	180-183	88-89
					184-187	184-187	90-91
				200-207	188-191	188-191	92-93
					192-195	192-195	94-95
			192-223	200-207	196-199	196-199	96-97
					200-203	200-203	98-99
				208-215	204-207	204-207	100-101
					208-211	208-211	102-103
			224-255	216-223	212-215	212-215	104-105
					216-219	216-219	106-107
				224-231	220-223	220-223	108-109
					224-227	224-227	110-111
			240-255	232-239	228-231	228-231	112-113
					232-235	232-235	114-115
				240-247	236-239	236-239	116-117
					240-243	240-243	118-119
				248-255	244-247	244-247	120-121
					248-251	248-251	122-123
					252-255	252-255	124-125
							126-127
							128-129
							130-131
							132-133
							134-135
							136-137
							138-139
							140-141
							142-143
							144-145
							146-147
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							150-151
							152-153
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							210-211
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							214-215
							216-217
							218-219
							220-221
							222-223
							224-225
							226-227
							228-229
							230-231
							232-233
							234-235
							236-237
							238-239
							240-241
							242-243
							244-245
							246-247
							248-249
							250-251
							252-253
							254-255

VLSM

with

Class A and B Addresses

Sample Problem 38

Part 2 of 4

The United States customers have a total of 8,388,608 addresses. Use the **Class A** address chart to break down the sub-subnetwork addresses for their different areas. At this stage of this problem you are creating sub-subnets in the second octet of the IP address.

Addresses Range: 75.0.0.0 to 75.127.255.255

Customer Name	Number of Addresses	Address Range	CIDR
Client #1	1,950,000		
Client #2	1,000,000		
Client #3	950,000		
Client #4	700,000		
Client #5	550,000		
Client #6	500,000		
Client #7	450,000		

VLSM

with

Class A and B Addresses

Sample Problem 38

Part 3 of 4

Client #7 has a total of 524,288 addresses. Use the **Class B** address chart to break down the sub-subnetwork addresses for their different clients. At this stage of this problem you are creating sub-subnets in the third or forth octet of the IP address.

Hint: Another way to look at this problem is to see that with the second octet range of 104 to 111 you have access to 8 groups of 65,536 addresses or 8 Class B VLSM charts.

ISP Addresses 75.104.0.0 to 75.111.255.255

Customer Name	Number of Addresses	Address Range	CIDR
Office #1	60,000		
Office #2	45,000		
Office #3	30,000		
Office #4	24,000		
Office #5	15,000		
Office #6	10,000		
Office #7	8,000		
Office #8	2,000		
Office #9	1,000		

Class B Addresses

VLSM Chart 16-23 Bits (3rd octet)

/16 255.255.0.0 65,536 Hosts	/17 255.255.128.0 32,768 Hosts	/18 255.255.192.0 16,384 Hosts	/19 255.255.224.0 8,192 Hosts	/20 255.255.240.0 4,096 Hosts	/21 255.255.248.0 2,048 Hosts	/22 255.255.252.0 1,024 Hosts	/23 255.255.254.0 512 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
					8-15	4-7	2-3
					16-31	8-11	4-5
						12-15	6-7
						16-19	8-9
						20-23	10-11
		32-63	32-47	24-31	24-27	24-25	12-13
					28-31	26-27	14-15
					32-39	32-35	16-17
						36-39	18-19
						40-43	20-21
						44-47	22-23
			48-63	40-47	48-51	48-49	24-25
					52-55	50-51	26-27
				48-55	56-59	52-53	28-29
					60-63	54-55	30-31
					64-71	64-67	32-33
						68-71	34-35
		64-127	64-95	72-79	72-75	72-73	36-37
					76-79	74-75	38-39
				80-95	80-83	80-81	40-41
					84-87	82-83	42-43
					88-91	84-85	44-45
					92-95	86-87	46-47
			96-127	96-103	96-99	88-89	48-49
					100-103	90-91	50-51
				104-111	104-107	92-93	52-53
					108-111	94-95	54-55
			112-127	112-119	112-115	96-97	56-57
					116-119	98-99	58-59
				120-127	120-123	100-101	60-61
					124-127	102-103	62-63
	128-255	128-191	128-159	128-143	128-135	104-105	64-65
					136-143	106-107	66-67
				144-159	144-147	108-109	68-69
					148-151	110-111	70-71
					152-155	112-113	72-73
					156-159	114-115	74-75
		160-191	160-175	160-167	160-163	116-117	76-77
					164-167	118-119	78-79
				168-175	168-171	120-121	80-81
					172-175	122-123	82-83
			176-191	176-183	176-179	124-125	84-85
					180-183	126-127	86-87
				184-191	184-187	128-129	88-89
					188-191	130-131	90-91
		192-255	192-223	192-199	192-195	132-133	92-93
					196-199	134-135	94-95
				200-207	200-203	136-137	96-97
					204-207	138-139	98-99
			208-223	208-215	208-211	140-141	100-101
					212-215	142-143	102-103
				216-223	216-219	144-145	104-105
					220-223	146-147	106-107
		224-255	224-239	224-231	224-227	148-149	108-109
					228-231	150-151	110-111
				232-239	232-235	152-153	112-113
					236-239	154-155	114-115
			240-255	240-247	240-243	156-157	116-117
					244-247	158-159	118-119
				248-255	248-251	160-161	120-121
					252-255	162-163	122-123
					252-253	164-165	124-125
						166-167	126-127
						168-169	128-129
						170-171	130-131
						172-173	132-133
						174-175	134-135
						176-177	136-137
						178-179	138-139
						180-181	140-141
						182-183	142-143
						184-185	144-145
						186-187	146-147
						188-189	148-149
						190-191	150-151
						192-193	152-153
						194-195	154-155
						196-197	156-157
						198-199	158-159
						200-201	160-161
						202-203	162-163
						204-205	164-165
						206-207	166-167
						208-209	168-169
						210-211	170-171
						212-213	172-173
						214-215	174-175
						216-217	176-177
						218-219	178-179
						220-221	180-181
						222-223	182-183
						224-225	184-185
						226-227	186-187
						228-229	188-189
						230-231	190-191
						232-233	192-193
						234-235	194-195
						236-237	196-197
						238-239	198-199
						240-241	200-201
						242-243	202-203
						244-245	204-205
						246-247	206-207
						248-249	208-209
						250-251	210-211
						252-253	212-213
						254-255	214-215
							216-217
							218-219
							220-221
							222-223
							224-225
							226-227
							228-229
							230-231
							232-233
							234-235
							236-237
							238-239
							240-241
							242-243
							244-245
							246-247
							248-249
							250-251
							252-253
							254-255

VLSM

with

Class A and B Addresses

Sample Problem 38

Part 4 of 4

Office #7 from part 3 of 4 has a total of 8,192 addresses. Use the **Class B** address chart to break down the sub-subnetwork addresses for the different branch offices. At this stage of this problem you are creating sub-subnets in the third octet of the IP address.

Hint: Remember that the range of this problem is between 128 and 159 in the third octet. Your subnetting will start in the middle of the chart not at the top for this range.

ISP Addresses 75.107.128.0 to 75.107.159.255

Customer Name	Number of Addresses	Address Range	CIDR
Branch #1	4,000		
Branch #2	2,000		
Branch #3	1,000		
Branch #4	500		
Branch #5	450		

Class B Addresses

VLSM Chart 16-23 Bits (3rd octet)

/16 255.255.0.0 65,536 Hosts	/17 255.255.128.0 32,768 Hosts	/18 255.255.192.0 16,384 Hosts	/19 255.255.224.0 8,192 Hosts	/20 255.255.240.0 4,096 Hosts	/21 255.255.248.0 2,048 Hosts	/22 255.255.252.0 1,024 Hosts	/23 255.255.254.0 512 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
					8-15	4-7	2-3
						8-11	4-5
						12-15	6-7
			16-31	16-23		16-19	8-9
						20-23	10-11
					24-31	24-27	12-13
						28-31	14-15
			32-63	32-39		32-35	16-17
						36-39	18-19
				40-47		40-43	20-21
						44-47	22-23
				48-63	48-55	48-51	24-25
						52-55	26-27
					56-63	56-59	28-29
						60-63	30-31
		64-127	64-95	64-79		64-67	32-33
						68-71	34-35
				80-95	80-87	84-87	36-37
					88-95	88-91	38-39
			96-127	96-103		92-95	40-41
						96-99	42-43
				104-111		100-103	44-45
						104-107	46-47
			112-127	112-119		108-111	48-49
						112-115	50-51
				120-127		116-119	52-53
						120-123	54-55
	128-255	128-191	See Hint 128-159	128-143		124-127	56-57
						128-131	58-59
				136-143		132-135	60-61
						136-139	62-63
			144-159	144-151		140-143	64-65
						144-147	66-67
				152-159		148-151	68-69
						152-155	70-71
		160-191	160-175	160-167		156-159	72-73
						160-163	74-75
				168-175		164-167	76-77
						168-171	78-79
			176-191	176-183		172-175	80-81
						176-179	82-83
				184-191		180-183	84-85
						184-187	86-87
		192-255	192-207	192-199		188-191	88-89
						192-195	90-91
			208-223	200-207		196-199	92-93
						200-203	94-95
				208-215		204-207	96-97
						208-211	98-99
			224-239	216-223		212-215	100-101
						216-219	102-103
				224-231		220-223	104-105
						224-227	106-107
			240-255	232-239		228-231	108-109
						232-235	110-111
				240-247		236-239	112-113
						240-243	114-115
			248-255	248-251		244-247	116-117
						248-251	118-119
				252-255		252-255	120-121
							122-123

Reference Charts and Support Materials

Class A Addresses
VLSM Chart 8-15 Bits (2nd octet)

[illegible]

Class B Addresses

VLSM Chart 16-23 Bits (3rd octet)

16 16-20 20,000 seeds	17 17-21 21,700 seeds	18 18-22 22,500 seeds	19 19-23 23,100 seeds	20 20-24 24,000 seeds	21 21-25 25,000 seeds	22 22-26 26,000 seeds	23 23-27 27,000 seeds
			9-81	3-15	6-15	2-15	
				13-21	5-21	2-21	
			9-81	13-21	13-21	13-21	
				50-47	50-47	50-47	
				41-47	41-47	41-47	
				40-55	40-55	40-55	
				50-55	50-55	50-55	
				64-71	64-71	64-71	
				71-75	71-75	71-75	
				80-87	80-87	80-87	
				88-95	88-95	88-95	
				96-111	96-111	96-111	
				913-107	152-179	152-179	
				108-145	128-145	128-145	
				156-181	166-181	166-181	
				191-192	192-192	192-192	
				193-198	193-198	193-198	
				199-175	199-175	199-175	
				176-191	176-191	176-191	
				176-191	184-191	184-191	
				192-207	192-207	192-207	
				208-215	208-215	208-215	
				216-223	216-223	216-223	
				224-239	224-239	224-239	
				240-255	240-255	240-255	

Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

	04	05	06	07	08	09	10	11	12
	200 000	100 000 150	100 000 150	100 000 150	100 000 150	100 000 150	100 000 150	100 000 150	100 000 150
	200 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000
					0-15	0-7	0-7	0-7	0-7
						0-15	0-15	0-15	0-15
						10-25	10-25	10-25	10-25
						20-31	20-31	20-31	20-31
						32-39	32-39	32-39	32-39
						40-47	40-47	40-47	40-47
						48-56	48-56	48-56	48-56
						56-63	56-63	56-63	56-63
						64-71	64-71	64-71	64-71
						72-79	72-79	72-79	72-79
						80-87	80-87	80-87	80-87
						88-95	88-95	88-95	88-95
						96-103	96-103	96-103	96-103
						104-111	104-111	104-111	104-111
						112-119	112-119	112-119	112-119
						120-127	120-127	120-127	120-127
						128-135	128-135	128-135	128-135
						136-143	136-143	136-143	136-143
						144-151	144-151	144-151	144-151
						152-159	152-159	152-159	152-159
						160-167	160-167	160-167	160-167
						168-175	168-175	168-175	168-175
						176-183	176-183	176-183	176-183
						184-191	184-191	184-191	184-191
						192-199	192-199	192-199	192-199
						200-207	200-207	200-207	200-207
						208-215	208-215	208-215	208-215
						216-223	216-223	216-223	216-223
						224-231	224-231	224-231	224-231
						232-239	232-239	232-239	232-239
						240-247	240-247	240-247	240-247
						248-255	248-255	248-255	248-255
						256-263	256-263	256-263	256-263
						264-271	264-271	264-271	264-271
						272-279	272-279	272-279	272-279
						280-287	280-287	280-287	280-287
						288-295	288-295	288-295	288-295
						296-303	296-303	296-303	296-303
						304-311	304-311	304-311	304-311
						312-319	312-319	312-319	312-319
						320-327	320-327	320-327	320-327
						328-335	328-335	328-335	328-335
						336-343	336-343	336-343	336-343
						344-351	344-351	344-351	344-351
						352-359	352-359	352-359	352-359
						360-367	360-367	360-367	360-367
						368-375	368-375	368-375	368-375
						376-383	376-383	376-383	376-383
						384-391	384-391	384-391	384-391
						392-399	392-399	392-399	392-399
						400-407	400-407	400-407	400-407
						408-415	408-415	408-415	408-415
						416-423	416-423	416-423	416-423
						424-431	424-431	424-431	424-431
						432-439	432-439	432-439	432-439
						440-447	440-447	440-447	440-447
						448-455	448-455	448-455	448-455
						456-463	456-463	456-463	456-463
						464-471	464-471	464-471	464-471
						472-479	472-479	472-479	472-479
						480-487	480-487	480-487	480-487
						488-495	488-495	488-495	488-495
						496-503	496-503	496-503	496-503
						504-511	504-511	504-511	504-511
						512-519	512-519	512-519	512-519
						520-527	520-527	520-527	520-527
						528-535	528-535	528-535	528-535
						536-543	536-543	536-543	536-543
						544-551	544-551	544-551	544-551
						552-559	552-559	552-559	552-559
						560-567	560-567	560-567	560-567
						568-575	568-575	568-575	568-575
						576-583	576-583	576-583	576-583
						584-591	584-591	584-591	584-591
						592-599	592-599	592-599	592-599
						600-607	600-607	600-607	600-607
						608-615	608-615	608-615	608-615
						616-623	616-623	616-623	616-623
						624-631	624-631	624-631	624-631
						632-639	632-639	632-639	632-639
						640-647	640-647	640-647	640-647
						648-655	648-655	648-655	648-655
						656-663	656-663	656-663	656-663
						664-671	664-671	664-671	664-671
						672-679	672-679	672-679	672-679
						680-687	680-687	680-687	680-687
						688-695	688-695	688-695	688-695
						696-703	696-703	696-703	696-703
						704-711	704-711	704-711	704-711
						712-719	712-719	712-719	712-719
						720-727	720-727	720-727	720-727
						728-735	728-735	728-735	728-735
						736-743	736-743	736-743	736-743
						744-751	744-751	744-751	744-751
						752-759	752-759	752-759	752-759
						760-767	760-767	760-767	760-767
						768-775	768-775	768-775	768-775
						776-783	776-783	776-783	776-783
						784-791	784-791	784-791	784-791
						792-799	792-799	792-799	792-799
						800-807	800-807	800-807	800-807
						808-815	808-815	808-815	808-815
						816-823	816-823	816-823	816-823
						824-831	824-831	824-831	824-831
						832-839	832-839	832-839	832-839
						840-847	840-847	840-847	840-847
						848-855	848-855	848-855	848-855
						856-863	856-863	856-863	856-863
						864-871	864-871	864-871	864-871
						872-879	872-879	872-879	872-879
						880-887	880-887	880-887	880-887
						888-895	888-895	888-895	888-895
						896-903	896-903	896-903	896-903
						904-911	904-911	904-911	904-911
						912-919	912-919	912-919	912-919
						920-927	920-927	920-927	920-927
						928-935	928-935	928-935	928-935
						936-943	936-943	936-943	936-943
						944-951	944-951	944-951	944-951
						952-959	952-959	952-959	952-959
						960-967	960-967	960-967	960-967
						968-975	968-975	968-975	968-975
						976-983	976-983	976-983	976-983
						984-991	984-991	984-991	984-991
						992-999	992-999	992-999	992-999
						1000-1007	1000-1007	1000-1007	1000-1007
						1008-1015	1008-1015	1008-1015	1008-1015
						1016-1023	1016-1023	1016-1023	1016-1023
						1024-1031	1024-1031	1024-1031	1024-1031
						1032-1039	1032-1039	1032-1039	1032-1039
						1040-1047	1040-1047	1040-1047	1040-1047
						1048-1055	1048-1055	1048-1055	1048-1055
						1056-1063	1056-1063	1056-1063	1056-1063
						1064-1071	1064-1071	1064-1071	1064-1071
						1072-1079	1072-1079	1072-1079	1072-1079
						1080-1087	1080-1087	1080-1087	1080-1087
						1088-1095	1088-1095	1088-1095	1088-1095
						1096-1103	1096-1103	1096-1103	1096-1103
						1104-1111	1104-1111	1104-1111	1104-1111
						1112-1119	1112-1119	1112-1119	1112-1119
						1120-1127	1120-1127	1120-1127	1120-1127
						1128-1135	1128-1135	1128-1135	1128-1135
						1136-1143	1136-1143	1136-1143	1136-1143
						1144-1151	1144-1151	1144-1151	1144-1151
						1152-1159	1152-1159	1152-1159	1152-1159
						1160-1167	1160-1167	1160-1167	1160-1167
						1168-1175	1168-1175	1168-1175	1168-1175
						1176-1183	1176-1183	1176-1183	1176-1183
						1184-1191	1184-1191	1184-1191	1184-1191
						1192-1199	1192-1199	1192-1199	1192-1199
						1200-1207	1200-1207	1200-1207	1200-1207
						1208-1215	1208-1215	1208-1215	1208-1215
						1216-1223	1216-1223	1216-1223	1216-1223
						1224-1231	1224-1231	1224-1231	1224-1231
						1232-1239	1232-1239	1232-1239	1232-1239
						1240-1247	1240-1247	1240-1247	1240-1247
						1248-1255	1248-125		

Class A Addresses

VLSM Chart 8-15 Bits (2nd octet)

/8 255.0.0.0 16,777,216 Hosts	/9 255.128.0.0 8,388,608 Hosts	/10 255.192.0.0 4,194,304 Hosts	/11 255.224.0.0 2,097,152 Hosts	/12 255.240.0.0 1,048,576 Hosts	/13 255.248.0.0 524,288 Hosts	/14 255.252.0.0 262,144 Hosts	/15 255.254.0.0 131,072 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
					8-15	4-7	2-3
					16-31	8-11	4-5
						12-15	6-7
						16-19	8-9
						20-23	10-11
		32-63	32-47	24-31	24-27	20-23	12-13
					28-31	24-25	14-15
					32-39	26-27	16-17
					40-47	36-39	18-19
						40-43	20-21
			48-63	48-55	44-47	40-41	22-23
					48-51	42-43	24-25
					52-55	44-45	26-27
				56-63	56-59	46-47	28-29
					60-63	48-49	30-31
		64-127	64-95	64-79	64-67	50-51	32-33
					68-71	52-53	34-35
					72-75	54-55	36-37
					76-79	56-57	38-39
				80-95	80-83	58-59	40-41
					84-87	60-61	42-43
			96-127	88-95	88-91	62-63	44-45
					92-95	64-65	46-47
				96-103	96-99	66-67	48-49
					100-103	68-69	50-51
			104-111	104-111	104-107	70-71	52-53
					108-111	72-73	54-55
				112-119	112-115	74-75	56-57
					116-119	76-77	58-59
			120-127	120-123	120-121	78-79	60-61
					122-123	80-81	62-63
				124-127	124-125	82-83	64-65
					126-127	84-85	66-67
	128-255	128-191	128-159	128-143	128-135	86-87	68-69
					132-135	88-89	70-71
					136-139	90-91	72-73
					140-143	92-93	74-75
			144-159	144-151	144-147	94-95	76-77
					148-151	96-97	78-79
			160-191	152-159	152-155	98-99	80-81
					156-159	100-101	82-83
				160-175	160-163	102-103	84-85
					164-167	104-105	86-87
			176-191	168-175	168-171	106-107	88-89
					172-175	108-109	90-91
				176-183	176-179	110-111	92-93
					180-183	112-113	94-95
			184-191	184-187	184-187	114-115	96-97
					188-191	116-117	98-99
				192-199	192-195	118-119	100-101
					196-199	120-121	102-103
			192-223	200-207	200-203	122-123	104-105
					204-207	124-125	106-107
				208-215	208-211	126-127	108-109
					212-215	128-129	110-111
			216-223	216-219	216-219	130-131	112-113
					220-223	132-133	114-115
				224-231	224-227	134-135	116-117
					228-231	136-137	118-119
			232-239	232-235	232-235	138-139	120-121
					236-239	140-141	122-123
			240-247	240-243	240-243	142-143	124-125
					244-247	144-145	126-127
				248-251	248-251	146-147	128-129
					252-255	148-149	130-131
				252-255	252-255	150-151	132-133
						152-153	134-135
						154-155	136-137
						156-157	138-139
						158-159	140-141
						160-161	142-143
						162-163	144-145
						164-165	146-147
						166-167	148-149
						168-169	150-151
						170-171	152-153
						172-173	154-155
						174-175	156-157
						176-177	158-159
						178-179	160-161
						180-181	162-163
						182-183	164-165
						184-185	166-167
						186-187	168-169
						188-189	170-171
						190-191	172-173
						192-193	174-175
						194-195	176-177
						196-197	178-179
						198-199	180-181
						200-201	182-183
						202-203	184-185
						204-205	186-187
						206-207	188-189
						208-209	190-191
						210-211	192-193
						212-213	194-195
						214-215	196-197
						216-217	198-199
						218-219	200-201
						220-221	202-203
						222-223	204-205
						224-225	206-207
						226-227	208-209
						228-229	210-211
						230-231	212-213
						232-233	214-215
						234-235	216-217
						236-237	218-219
						238-239	220-221
						240-241	222-223
						242-243	224-225
						244-245	226-227
						246-247	228-229
						248-249	230-231
						250-251	232-233
						252-253	234-235
						254-255	236-237
							238-239
							240-241
							242-243
							244-245
							246-247
							248-249
							250-251
							252-253
							254-255

Class B Addresses

VLSM Chart 16-23 Bits (3rd octet)

/16 255.255.0.0 65,536 Hosts	/17 255.255.128.0 32,768 Hosts	/18 255.255.192.0 16,384 Hosts	/19 255.255.224.0 8,192 Hosts	/20 255.255.240.0 4,096 Hosts	/21 255.255.248.0 2,048 Hosts	/22 255.255.252.0 1,024 Hosts	/23 255.255.254.0 512 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3	0-1
					8-15	4-7	2-3
						8-11	4-5
						12-15	6-7
						16-19	8-9
						20-23	10-11
			16-31	16-31	16-23	16-19	12-13
					24-31	20-23	14-15
						24-27	16-17
						28-31	18-19
						32-35	20-21
						36-39	22-23
			32-63	32-47	32-39	32-35	24-25
					40-47	40-43	26-27
						44-47	28-29
						48-51	30-31
						52-55	32-33
						56-59	34-35
			48-63	48-55	56-63	60-63	36-37
						64-67	38-39
						68-71	40-41
						72-75	42-43
						76-79	44-45
						80-83	46-47
		64-127	64-95	64-79	80-87	84-87	48-49
					88-95	88-91	50-51
						92-95	52-53
						96-99	54-55
						100-103	56-57
						104-107	58-59
			96-127	96-111	108-111	112-115	60-61
					112-119	116-119	62-63
					120-127	124-127	64-65
						128-131	66-67
						132-135	68-69
						136-139	70-71
	128-255	128-191	128-159	128-143	144-151	148-151	72-73
					152-159	156-159	74-75
						160-163	76-77
						164-167	78-79
						168-171	80-81
						172-175	82-83
			160-191	160-175	176-179	180-183	84-85
					184-187	188-191	86-87
						192-195	88-89
						196-199	90-91
						200-203	92-93
						204-207	94-95
			192-223	192-207	208-211	212-215	96-97
					216-219	220-223	98-99
						224-227	100-101
						228-231	102-103
						232-235	104-105
						236-239	106-107
		192-255	224-255	224-239	240-243	244-247	108-109
					248-251	252-255	110-111
							112-113
							114-115
							116-117
							118-119
			240-255	240-247	248-251	252-255	120-121
					252-255		122-123
							124-125
							126-127
							128-129
							130-131
							132-133
							134-135
							136-137
							138-139
							140-141
							142-143
							144-145
							146-147
							148-149
							150-151
							152-153
							154-155
							156-157
							158-159
							160-161
							162-163
							164-165
							166-167
							168-169
							170-171
							172-173
							174-175
							176-177
							178-179
							180-181
							182-183
							184-185
							186-187
							188-189
							190-191
							192-193
							194-195
							196-197
							198-199
							200-201
							202-203
							204-205
							206-207
							208-209
							210-211
							212-213
							214-215
							216-217
							218-219
							220-221
							222-223
							224-225
							226-227
							228-229
							230-231
							232-233
							234-235
							236-237
							238-239
							240-241
							242-243
							244-245
							246-247
							248-249
							250-251
							252-253
							254-255

Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

/24	/25	/26	/27	/28	/29	/30
255.255.255.0 256 Hosts	255.255.255.128 128 Hosts	255.255.255.192 64 Hosts	255.255.255.224 32 Hosts	255.255.255.240 16 Hosts	255.255.255.248 8 Hosts	255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
					8-15	8-11
						12-15
				16-31	16-23	16-19
						20-23
					24-31	24-27
						28-31
			32-63	32-47	32-39	32-35
						36-39
					40-47	40-43
						44-47
				48-63	48-55	48-51
						52-55
					56-63	56-59
						60-63
		64-127	64-95	64-79	64-71	64-67
						68-71
					72-79	72-75
						76-79
				80-95	80-87	80-83
						84-87
					88-95	88-91
						92-95
			96-127	96-111	96-103	96-99
						100-103
					104-111	104-107
						108-111
				112-127	112-119	112-115
						116-119
					120-127	120-123
						124-127
	128-255	128-191	128-159	128-143	128-135	128-131
						132-135
					136-143	136-139
						140-143
				144-159	144-151	144-147
						148-151
					152-159	152-155
						156-159
			160-191	160-175	160-167	160-163
						164-167
					168-175	168-171
						172-175
				176-191	176-183	176-179
						180-183
					184-191	184-187
						188-191
		192-255	192-223	192-207	192-199	192-195
						196-199
					200-207	200-203
						204-207
				208-223	208-215	208-211
						212-215
					216-223	216-219
						220-223
			224-255	224-239	224-231	224-227
						228-231
					232-239	232-235
						236-239
				240-255	240-247	240-243
						244-247
					248-255	248-251
						252-255

Class A Addressing Guide					
CIDR	# of Bits Borrowed	Subnet Mask	Total # of Subnets	Total # of Hosts	Usable # of Hosts
/8	0	255.0.0.0	1	16,777,216	16,777,214
/9	1	255.128.0.0	2	8,388,608	8,388,606
/10	2	255.192.0.0	4	4,194,304	4,194,302
/11	3	255.224.0.0	8	2,097,152	2,097,150
/12	4	255.240.0.0	16	1,048,576	1,048,574
/13	5	255.248.0.0	32	524,288	524,286
/14	6	255.252.0.0	64	262,144	262,142
/15	7	255.254.0.0	128	131,072	131,070
/16	8	255.255.0.0	256	65,536	65,534
/17	9	255.255.128.0	512	32,768	32,766
/18	10	255.255.192.0	1,024	16,384	16,382
/19	11	255.255.224.0	2,048	8,192	8,190
/20	12	255.255.240.0	4,096	4,096	4,094
/21	13	255.255.248.0	8,192	2,048	2,046
/22	14	255.255.252.0	16,384	1,024	1,022
/23	15	255.255.254.0	32,768	512	510
/24	16	255.255.255.0	65,536	256	254
/25	17	255.255.255.128	131,072	128	126
/26	18	255.255.255.192	262,144	64	62
/27	19	255.255.255.224	524,288	32	30
/28	20	255.255.255.240	1,048,576	16	14
/29	21	255.255.255.248	2,097,152	8	6
/30	22	255.255.255.252	4,194,304	4	2

Class B Addressing Guide					
CIDR	# of Bits Borrowed	Subnet Mask	Total # of Subnets	Total # of Hosts	Usable # of Hosts
/16	0	255.255.0.0	1	65,536	65,534
/17	1	255.255.128.0	2	32,768	32,766
/18	2	255.255.192.0	4	16,384	16,382
/19	3	255.255.224.0	8	8,192	8,190
/20	4	255.255.240.0	16	4,096	4,094
/21	5	255.255.248.0	32	2,048	2,046
/22	6	255.255.252.0	64	1,024	1,022
/23	7	255.255.254.0	128	512	510
/24	8	255.255.255.0	256	256	254
/25	9	255.255.255.128	512	128	126
/26	10	255.255.255.192	1,024	64	62
/27	11	255.255.255.224	2,048	32	30
/28	12	255.255.255.240	4,096	16	14
/29	13	255.255.255.248	8,192	8	6
/30	14	255.255.255.252	16,384	4	2

Class C Addressing Guide					
CIDR	# of Bits Borrowed	Subnet Mask	Total # of Subnets	Total # of Hosts	Usable # of Hosts
/24	0	255.255.255.0	1	256	254
/25	1	255.255.255.128	2	128	126
/26	2	255.255.255.192	4	64	62
/27	3	255.255.255.224	8	32	30
/28	4	255.255.255.240	16	16	14
/29	5	255.255.255.248	32	8	6
/30	6	255.255.255.252	64	4	2