

10.250.1.0
192.168.10.96
172.31.15.0

VLSM
Variable-Length Subnet Mask
Workbook
Version 2.0

192.168.10.126

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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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

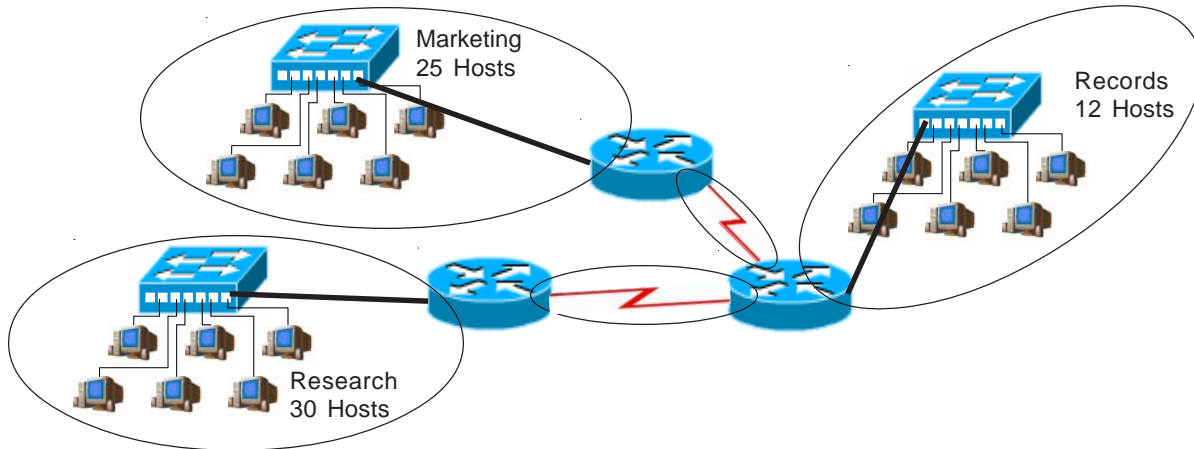
This workbook explores three different methods to figure out sub-subnets: the box method, the circle method, and a VLSM chart.

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.

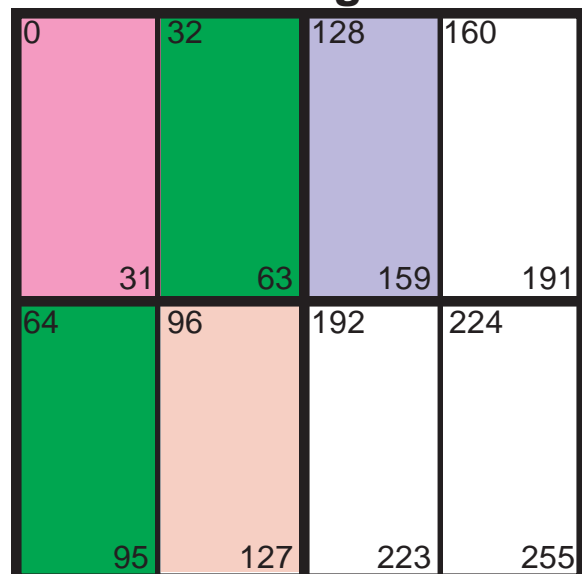
IP Address: 192.168.1.0



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		

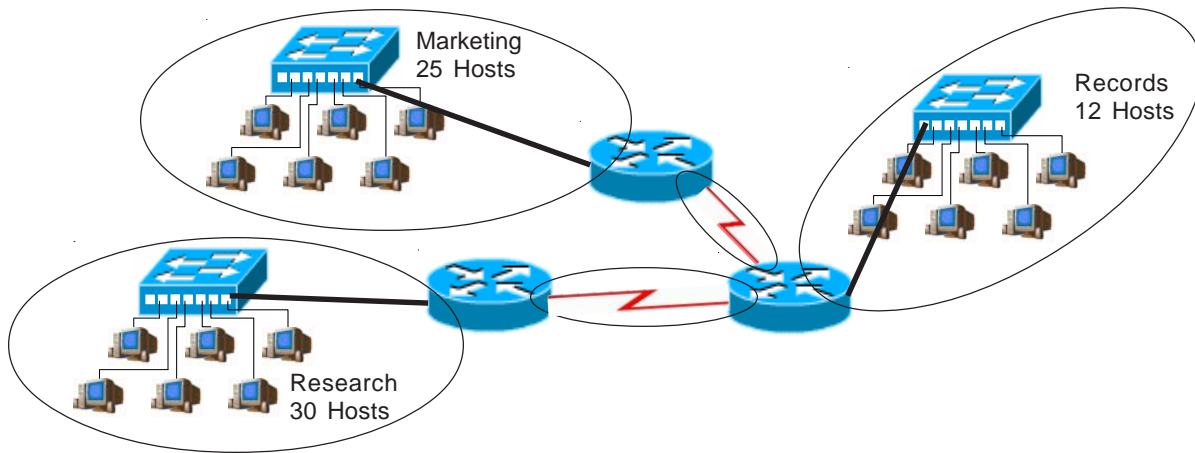


Classless Subnetting Example

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 a 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

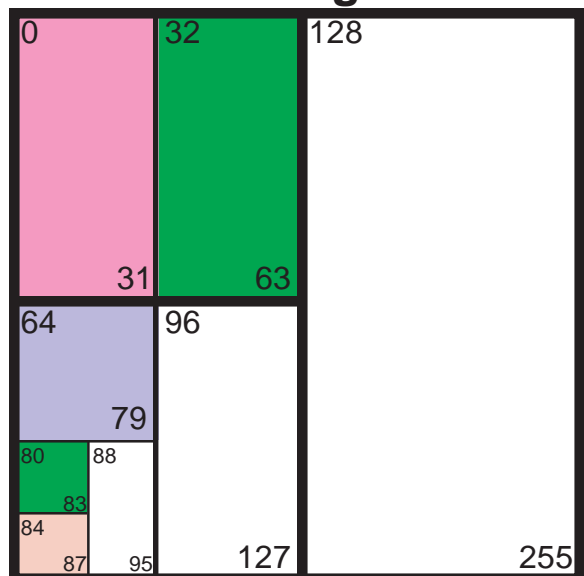


By adjusting the subnet masks you can cut your address usage by almost half in this example. This type of subnetting requires a network protocol which will support it such as: RIP version 2, EIGRP, OSPF, or BGP.

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	192.168.1.82	/30
192.168.1.84	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

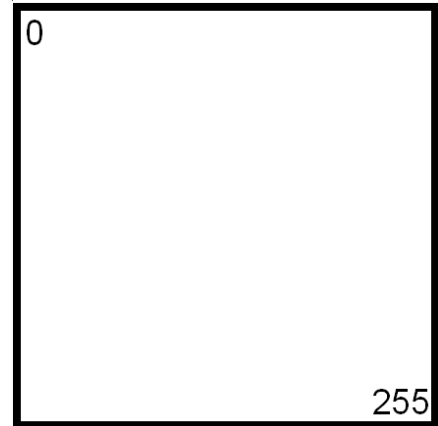


Visualizing Subnets Using The Box Method

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.

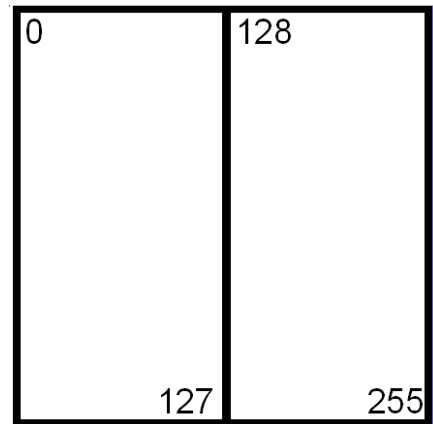
Start with a square. The whole square is a single subnet comprised of 256 addresses.

/24
255.255.255.0
256 Hosts
1 Subnet



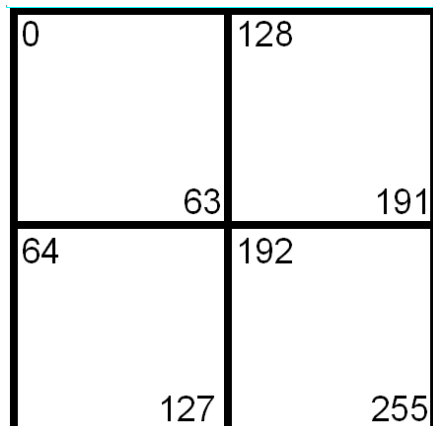
Split the box in half and you get two subnets with 128 addresses.

/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

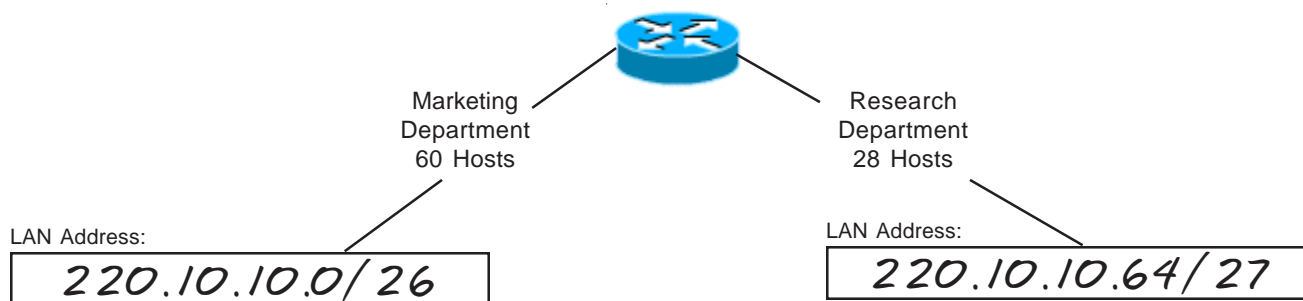
VLSM Addressing

Box Method

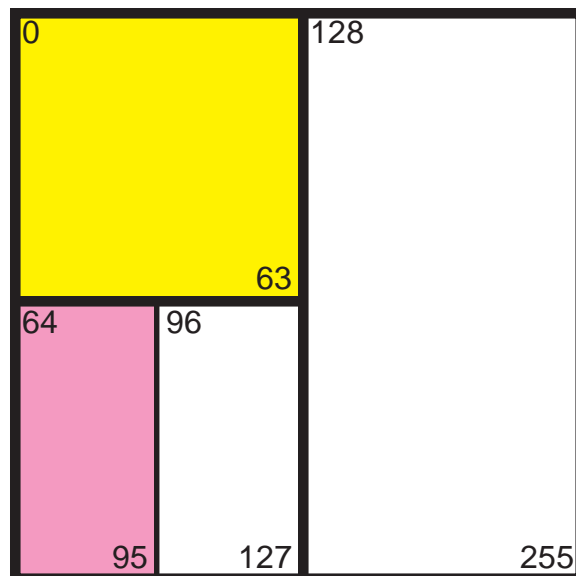
(Sample)

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.



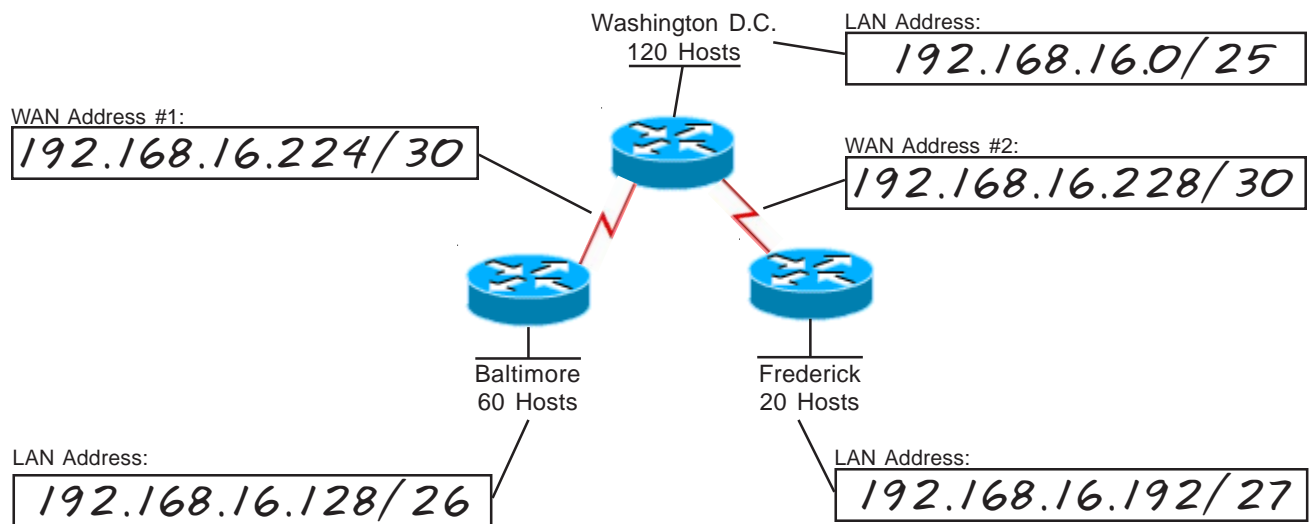
VLSM Addressing

Box Method

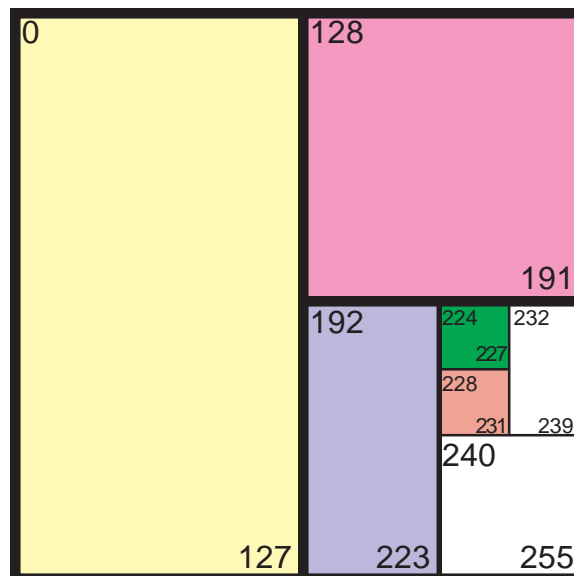
(Sample)

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.

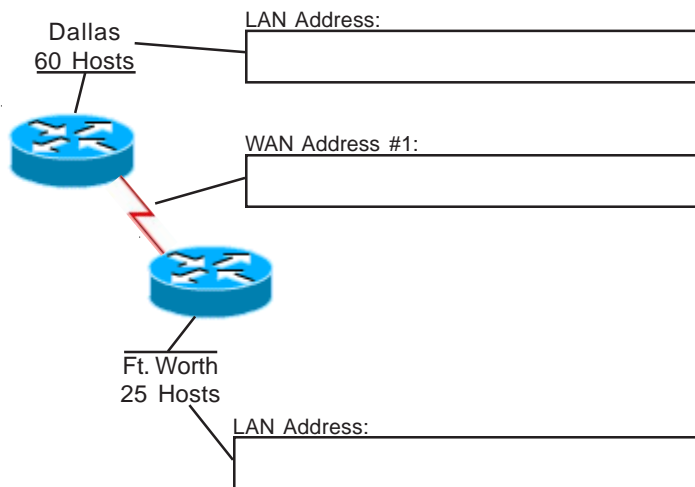


VLSM Addressing

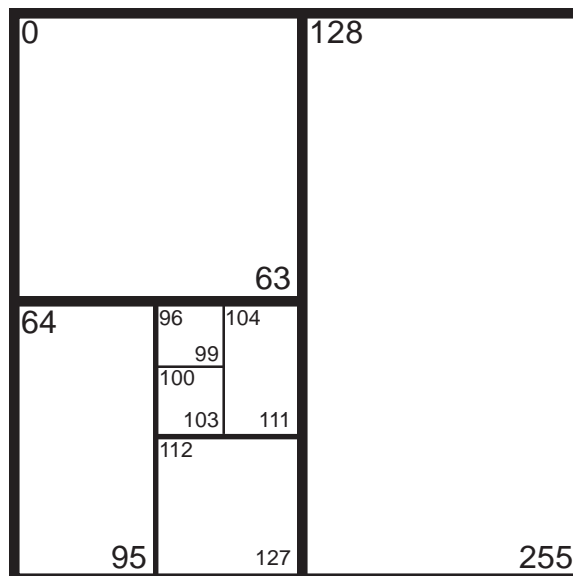
Box Method

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.

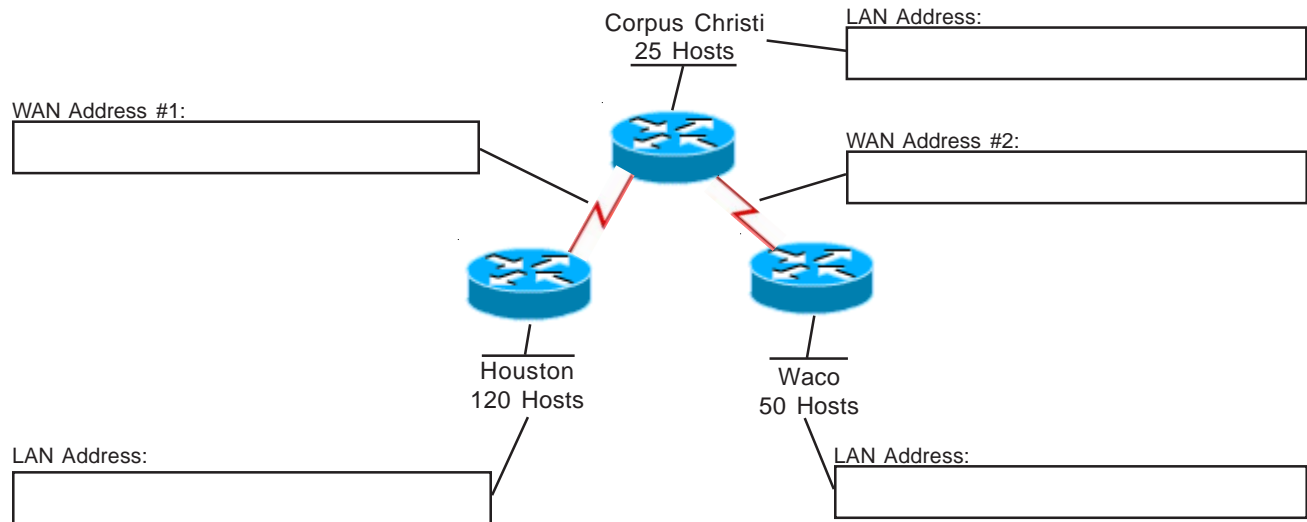


VLSM Addressing

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.

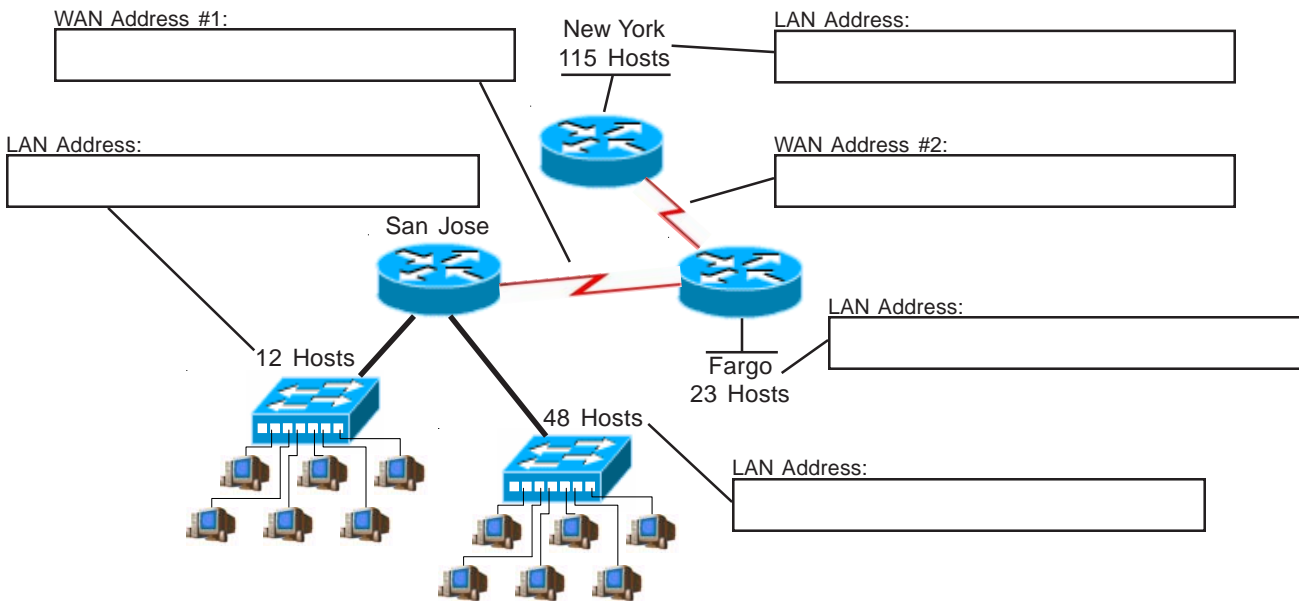
0	8	32	40	128	136	160	168
	3	11	35	43	131	139	163
4	12	36	44	132	140	164	172
	7	15	39	47	135	143	167
16	24	48	56	144	152	176	184
	19	27	51	59	147	155	179
20	28	52	60	148	156	180	188
	23	31	55	63	151	159	183
64	72	96	104	192	200	224	232
	67	75	99	107	195	203	227
68	76	100	108	196	204	228	236
	71	79	103	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.

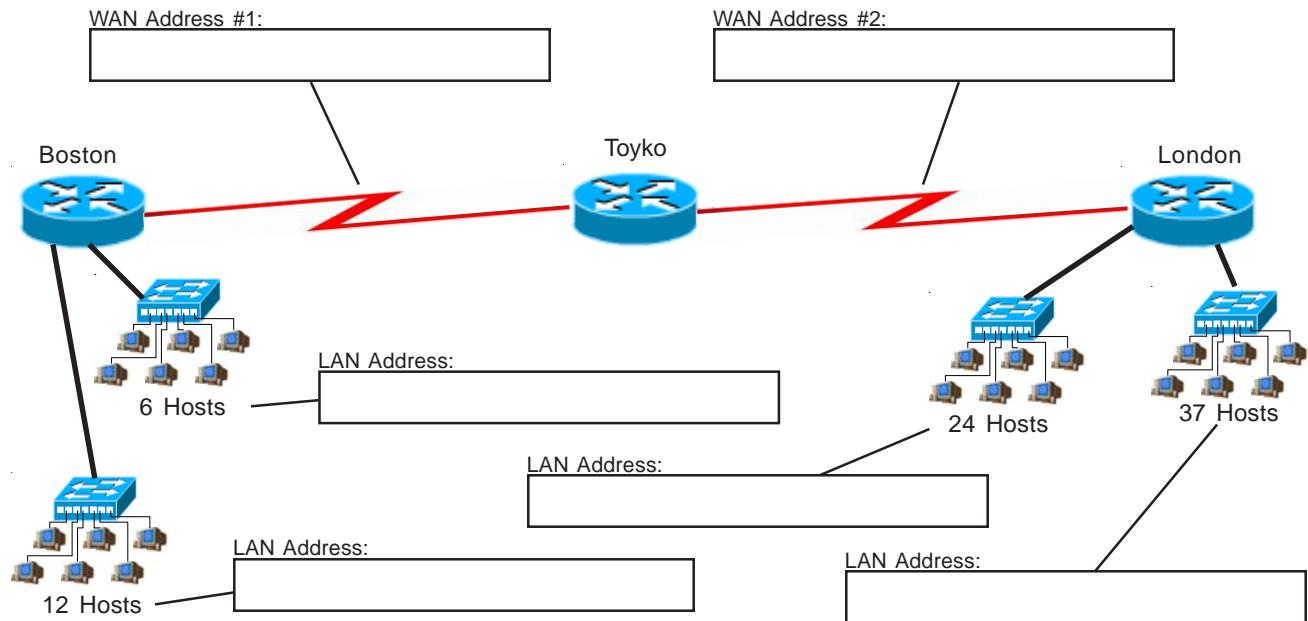
0	8	32	40	128	136	160	168
	3	11	35	43	131	139	163
4	12	36	44	132	140	164	172
	7	15	39	47	135	143	167
16	24	48	56	144	152	176	184
	19	27	51	59	147	155	179
20	28	52	60	148	156	180	188
	23	31	55	63	151	159	183
64	72	96	104	192	200	224	232
	67	75	99	107	195	203	227
68	76	100	108	196	204	228	236
	71	79	103	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 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.

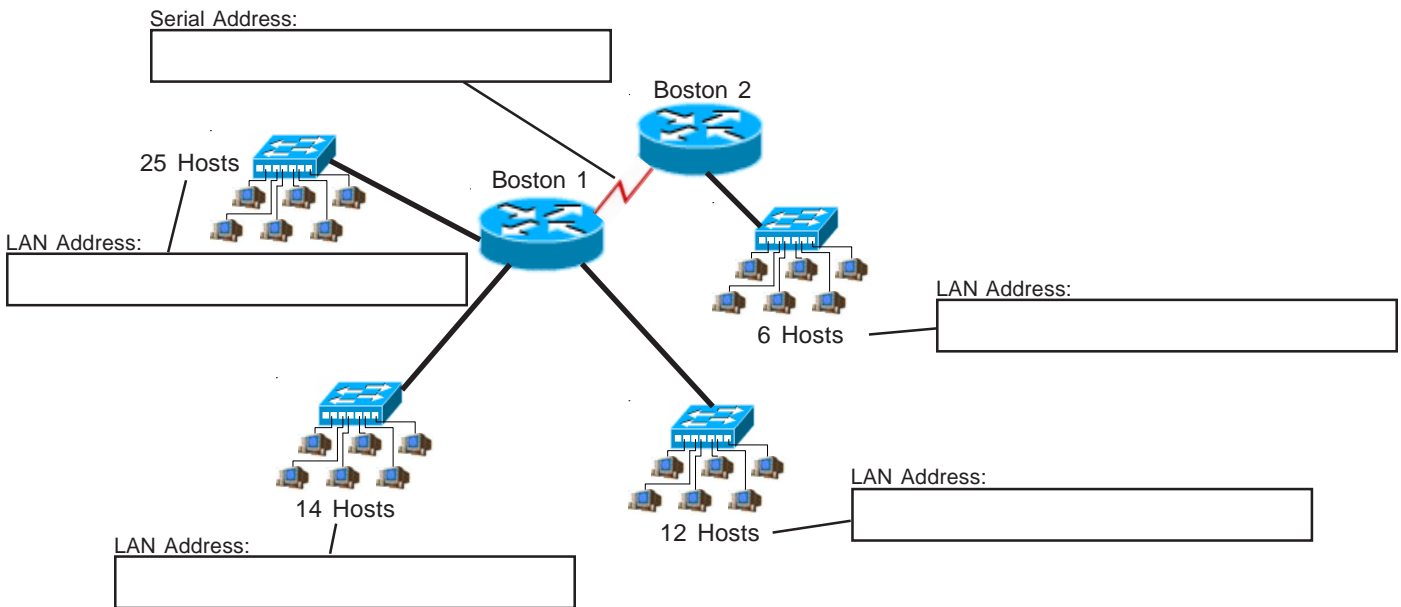
0	32	128	160
	31	63	159
64	96	192	224
	95	127	255

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.

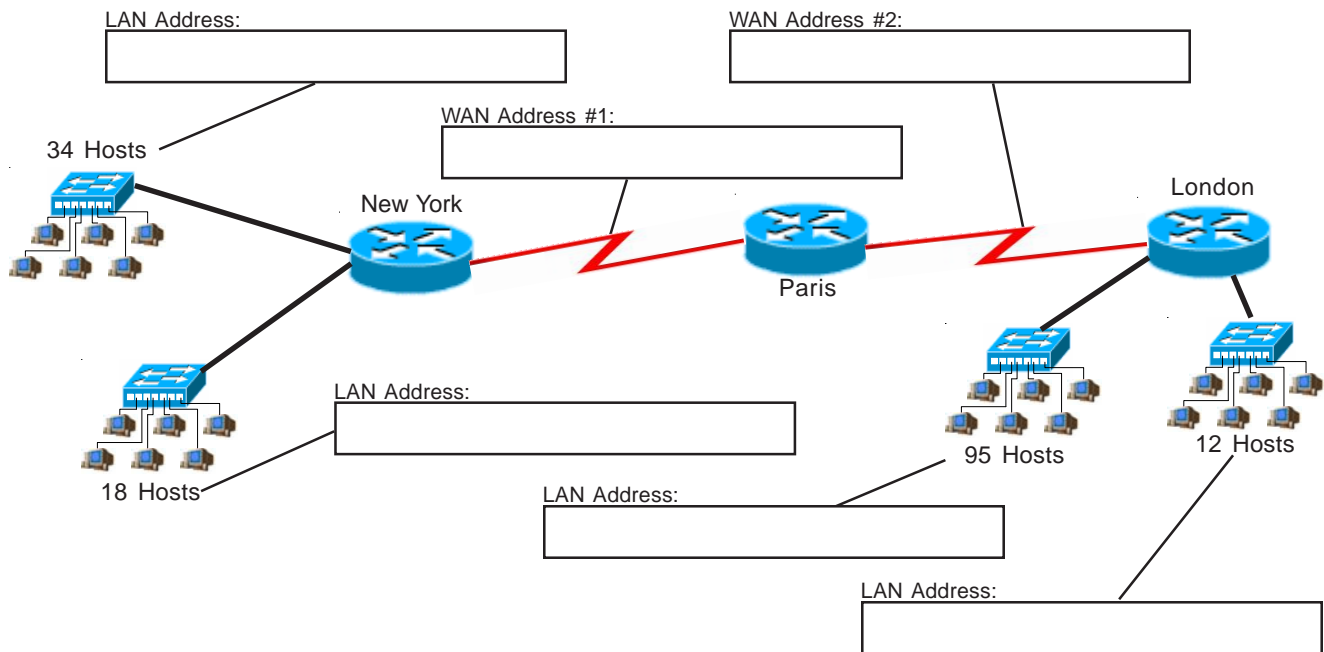
0	128
63	191
64	192
127	255

VLSM Addressing

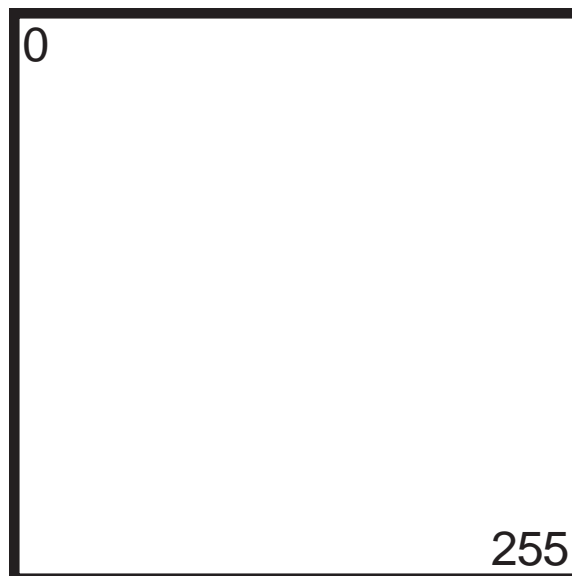
Box Method

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.

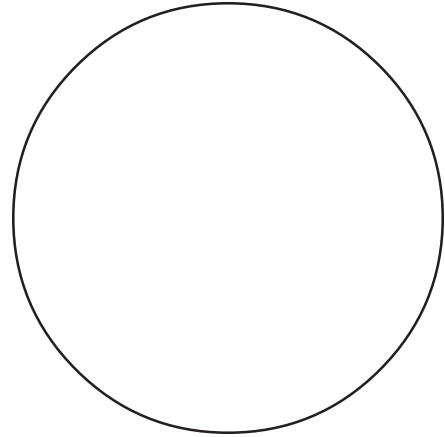


Visualizing Subnets Using The Circle Method

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.

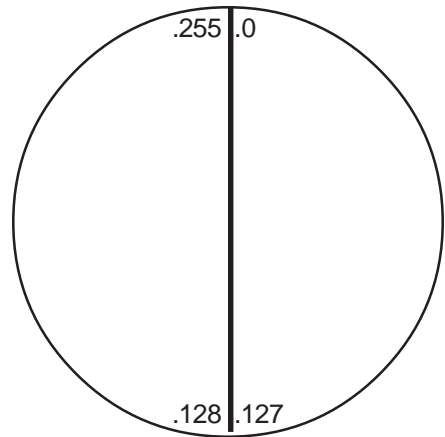
Start with a circle. The whole circle is a single subnet comprised of 256 addresses.

/24
255.255.255.0
256 Hosts
1 Subnet



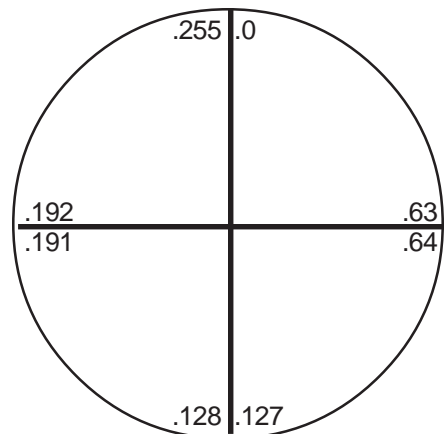
Split the circle in half and you get two subnets with 128 addresses.

/25
255.255.255.128
128 Hosts
2 Subnets



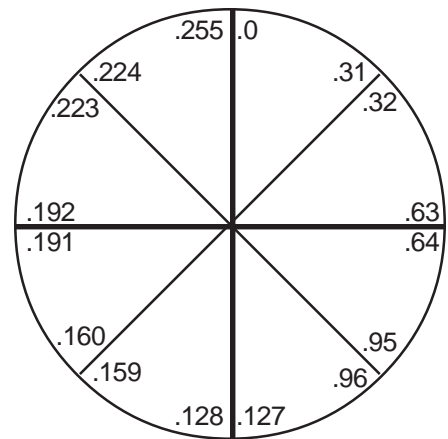
Divide the circle into quarters and you get four subnets with 64 addresses.

/26
255.255.255.192
64 Hosts
4 Subnets



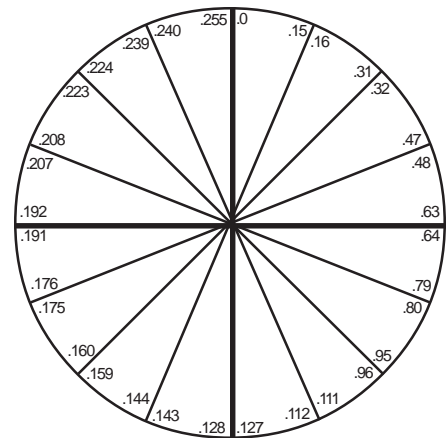
Split each quarter and you get eight subnets with 32 addresses.

/27
255.255.255.224
32 Hosts
8 Subnets



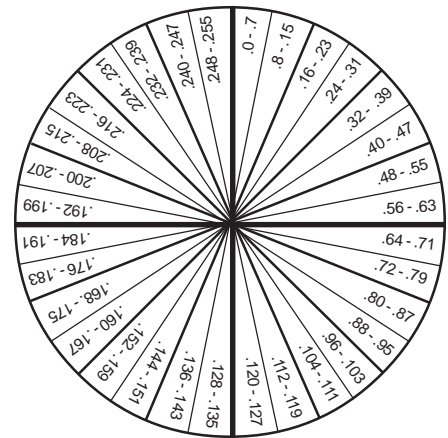
Split the boxes in half again and you get sixteen subnets with sixteen addresses.

/28
255.255.255.240
16 Hosts
16 Subnets



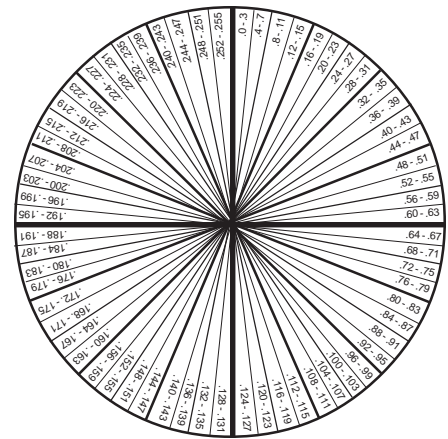
The next split gives you thirty two subnets with eight addresses.

/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



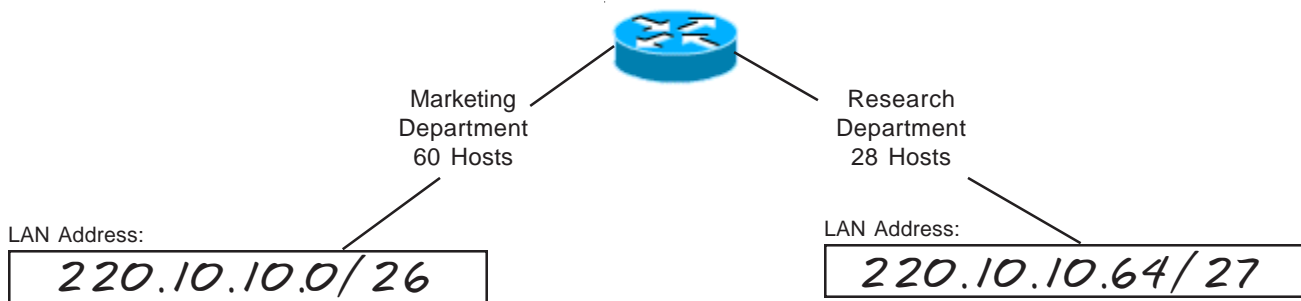
VLSM Addressing

Circle Method

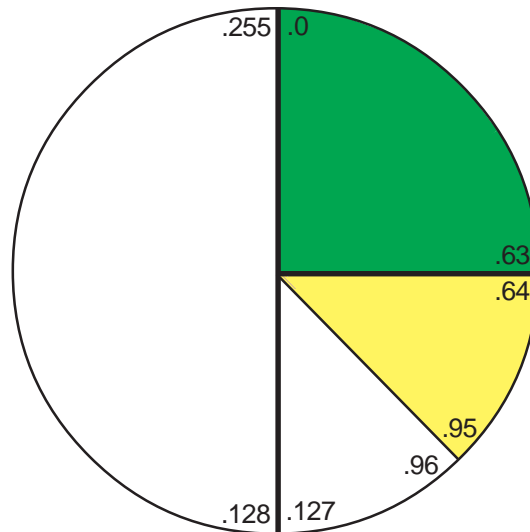
(Sample)

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.



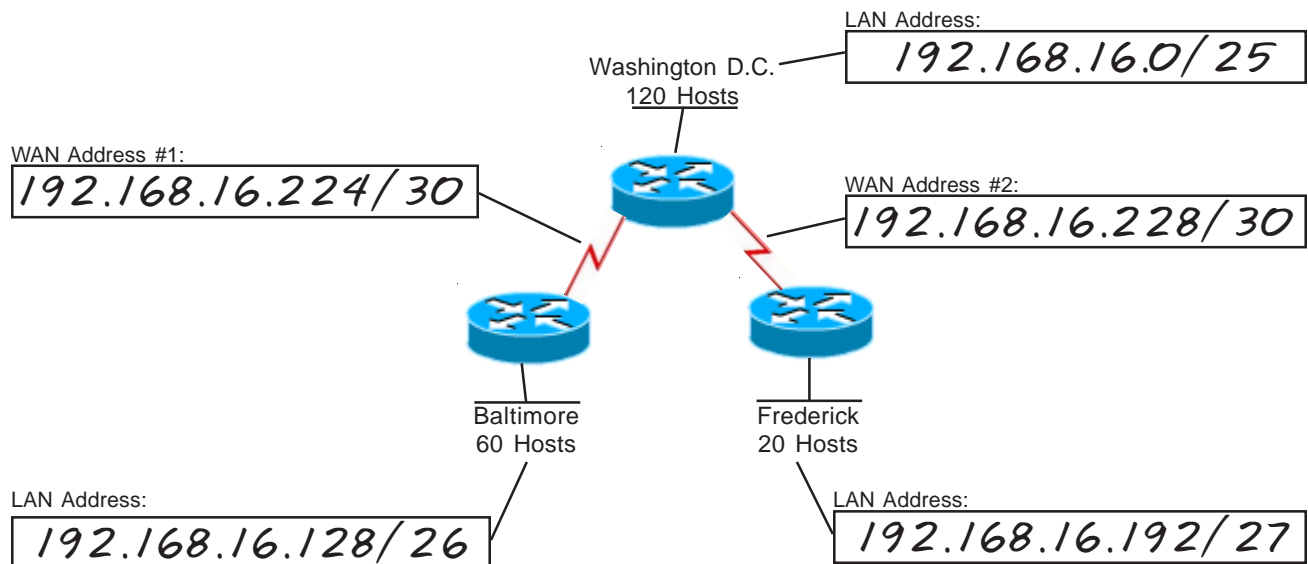
VLSM Addressing

Circle Method

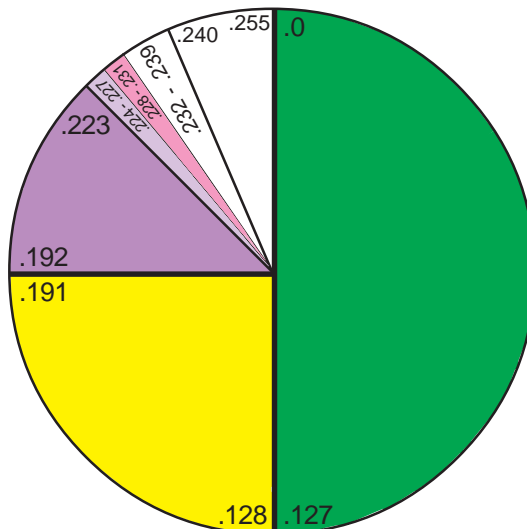
(Sample)

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.

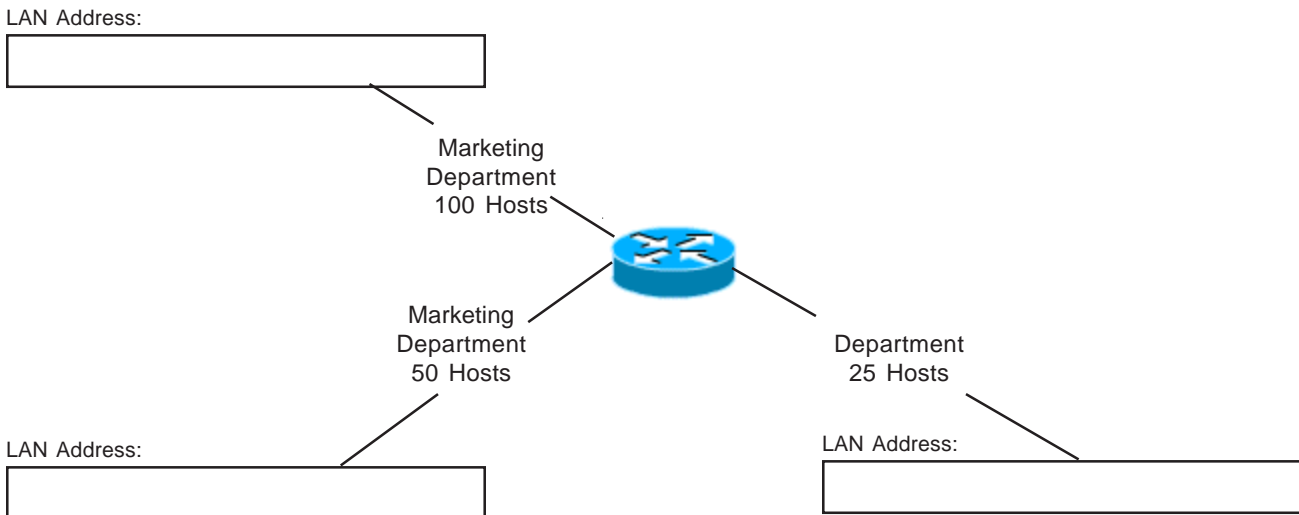


VLSM Addressing

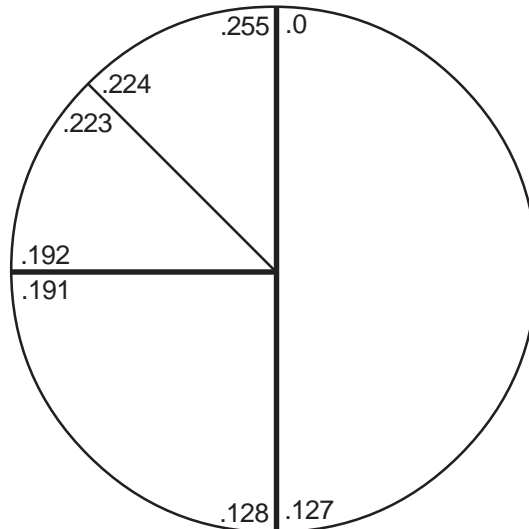
Circle Method

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.

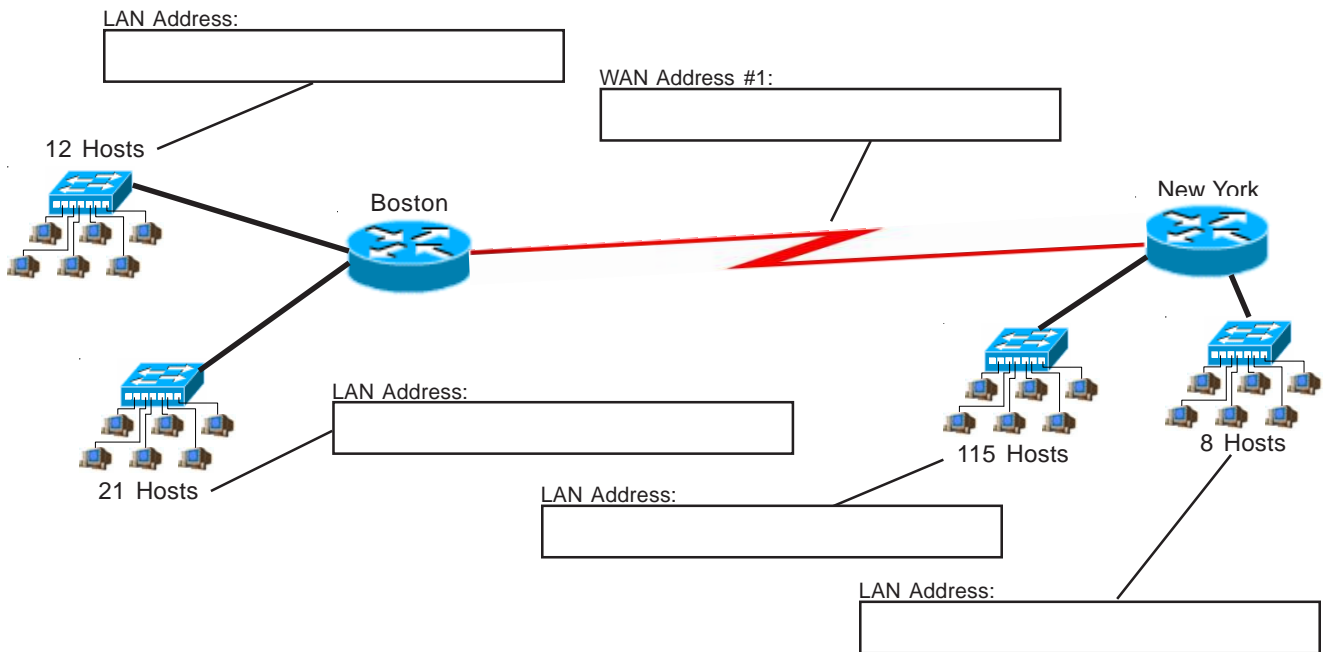


VLSM Addressing

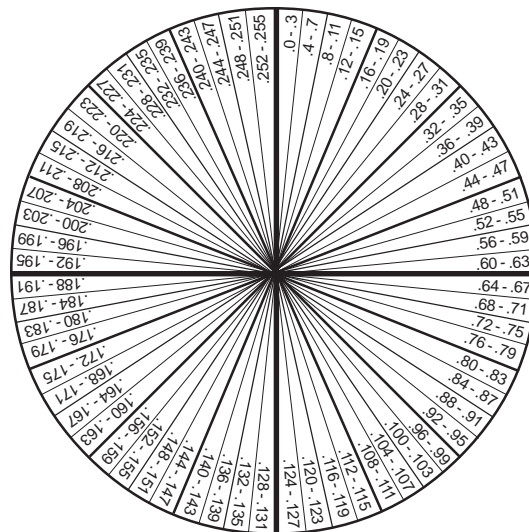
Circle Method

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.

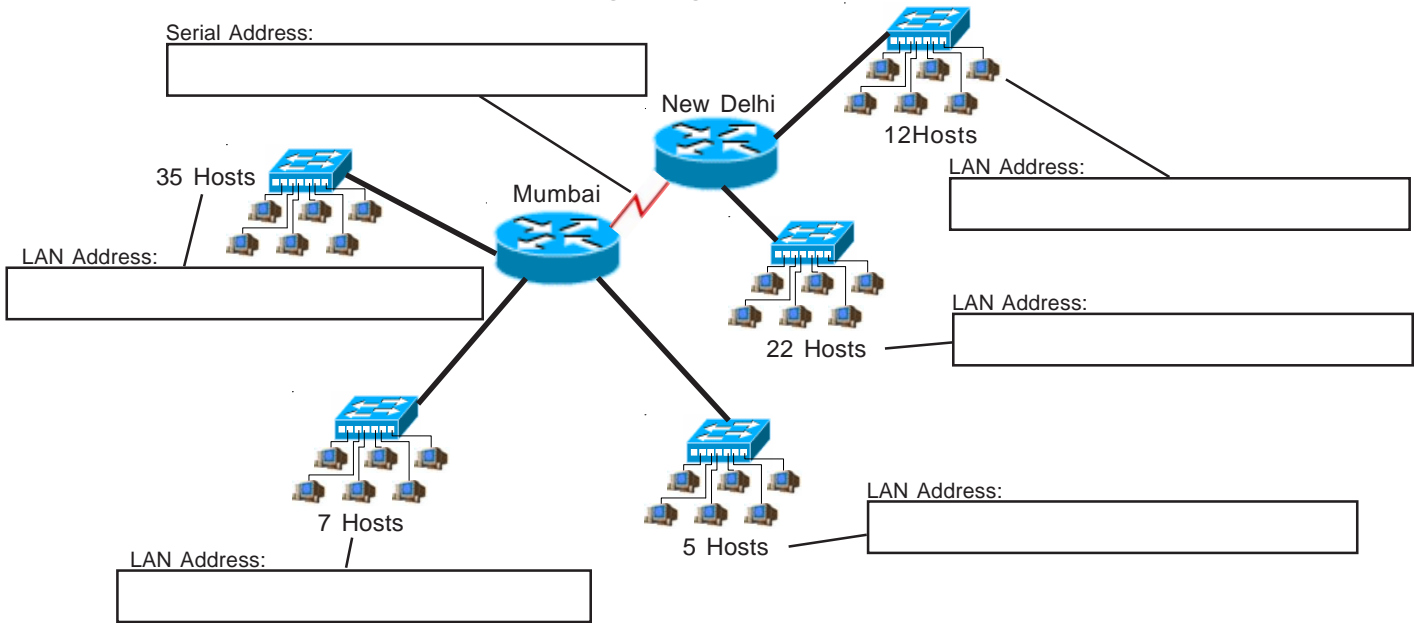


VLSM Addressing

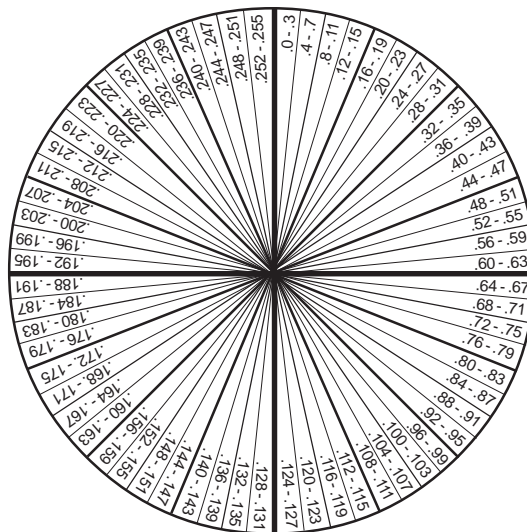
Circle Method

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.

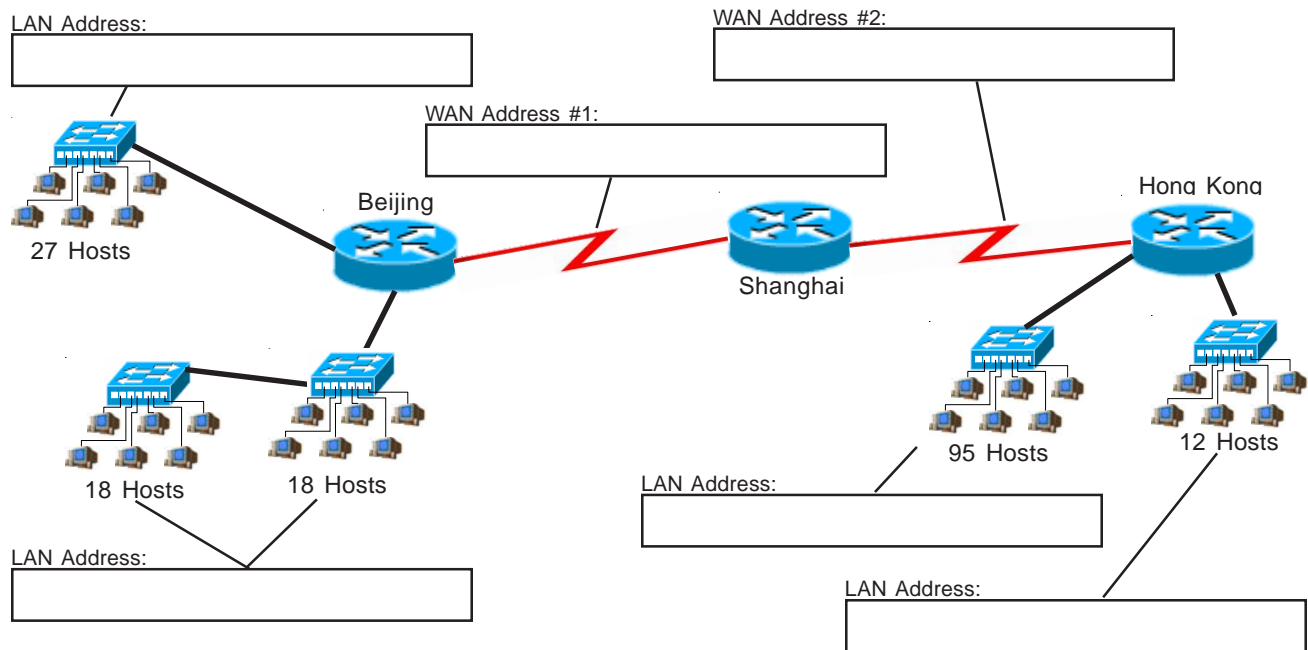


VLSM Addressing

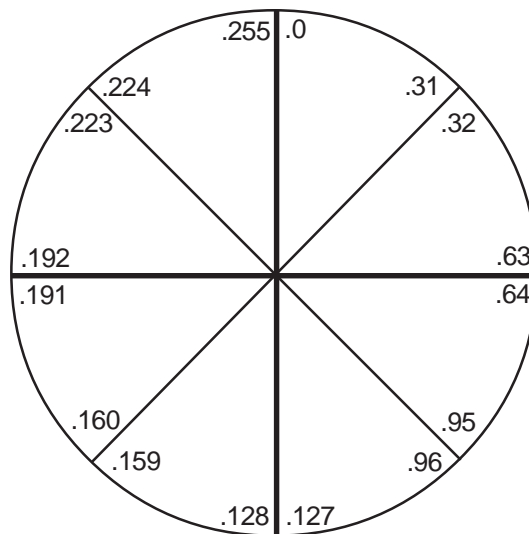
Circle Method

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.

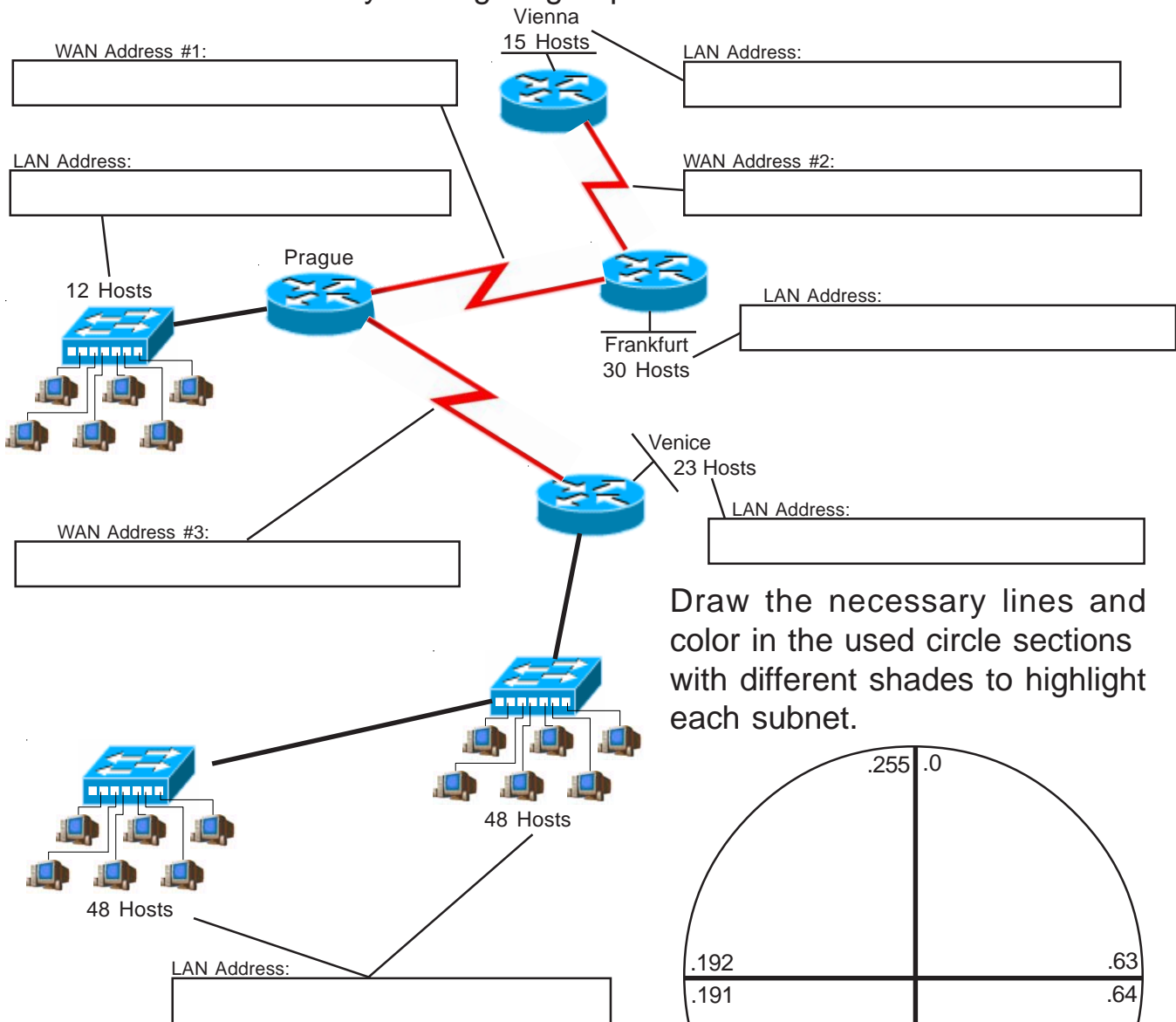


VLSM Addressing

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.

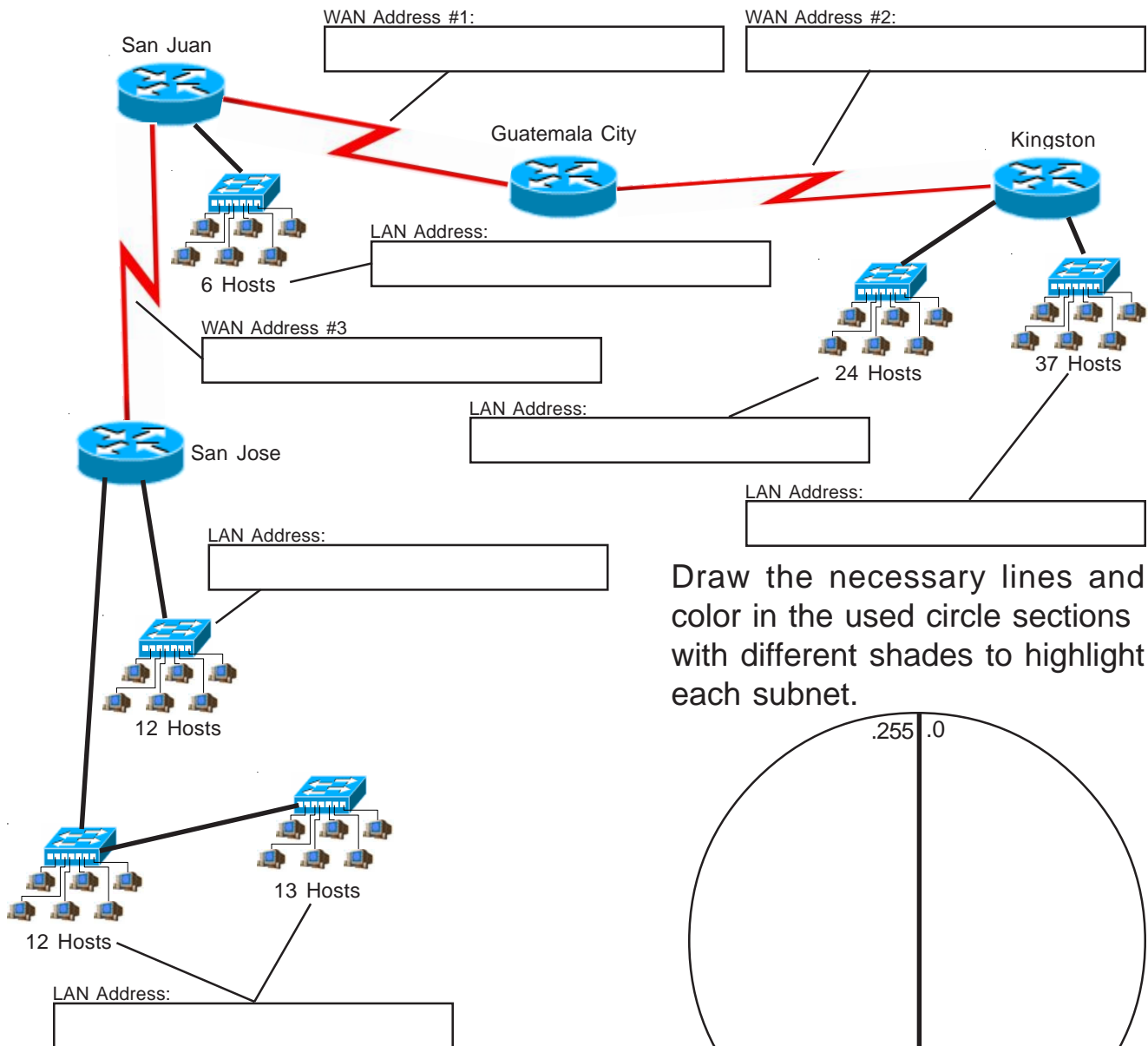


VLSM Addressing

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.

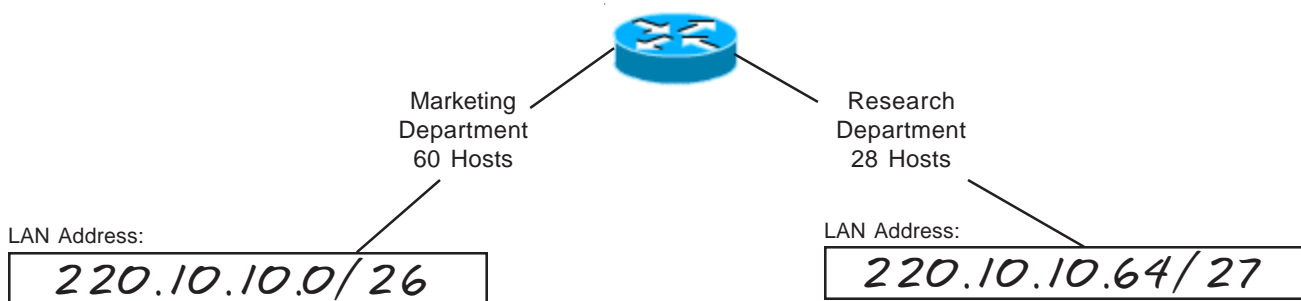
VLSM Addressing

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	
					8-15	4-7	
				16-31	8-11	12-15	
					16-19	20-23	
				24-31	24-27		
					28-31		
			32-63	32-39	32-35		
				40-47	36-39		
		48-63		40-43	44-47		
				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
					80-95	76-79	80-83
						80-87	84-87
				88-95	88-91		
					92-95		
	96-111			96-103	96-99		
				104-111	100-103		
				104-107			
				108-111			
	96-127		112-119	112-115			
			112-127	116-119	120-123		
				120-127	124-127		
					128-131		
	128-255		128-191	128-159	128-143	128-135	132-135
						136-143	136-139
		144-159			144-151	140-143	
					152-159	144-147	
					148-151		
					152-155		
160-191		160-175		156-159			
		160-175		16-167	160-163		
			168-175	164-167			
			176-191	168-171			
			172-175				
			176-179				
			180-183				
192-255		192-223	192-207	184-191	184-187	188-191	
				192-199	192-195	196-199	
			208-223	200-207	200-203	204-207	
	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			

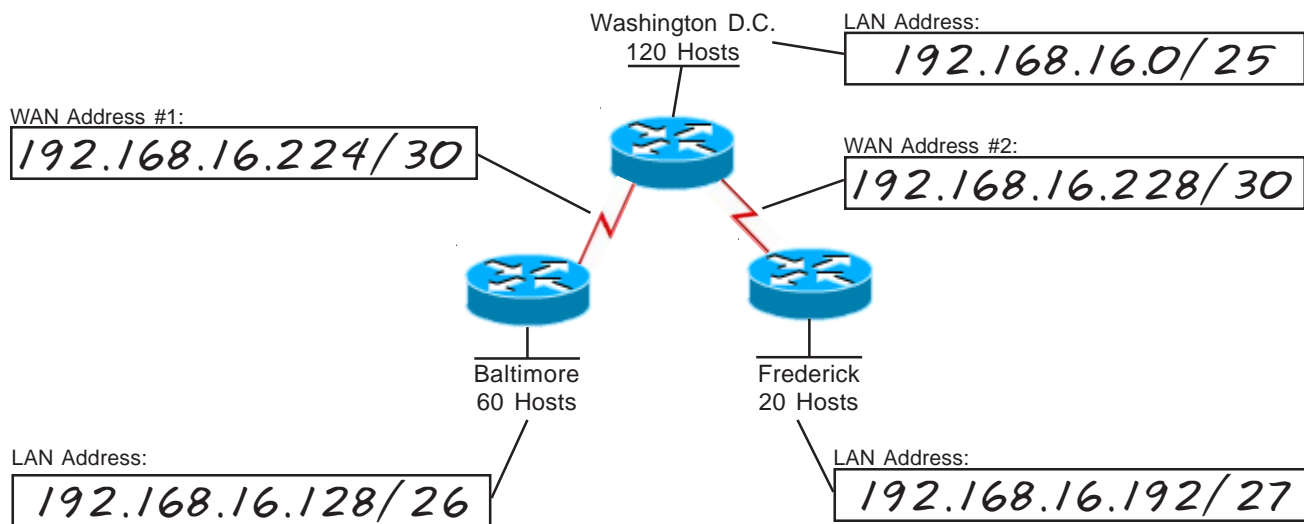
VLSM Addressing

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)

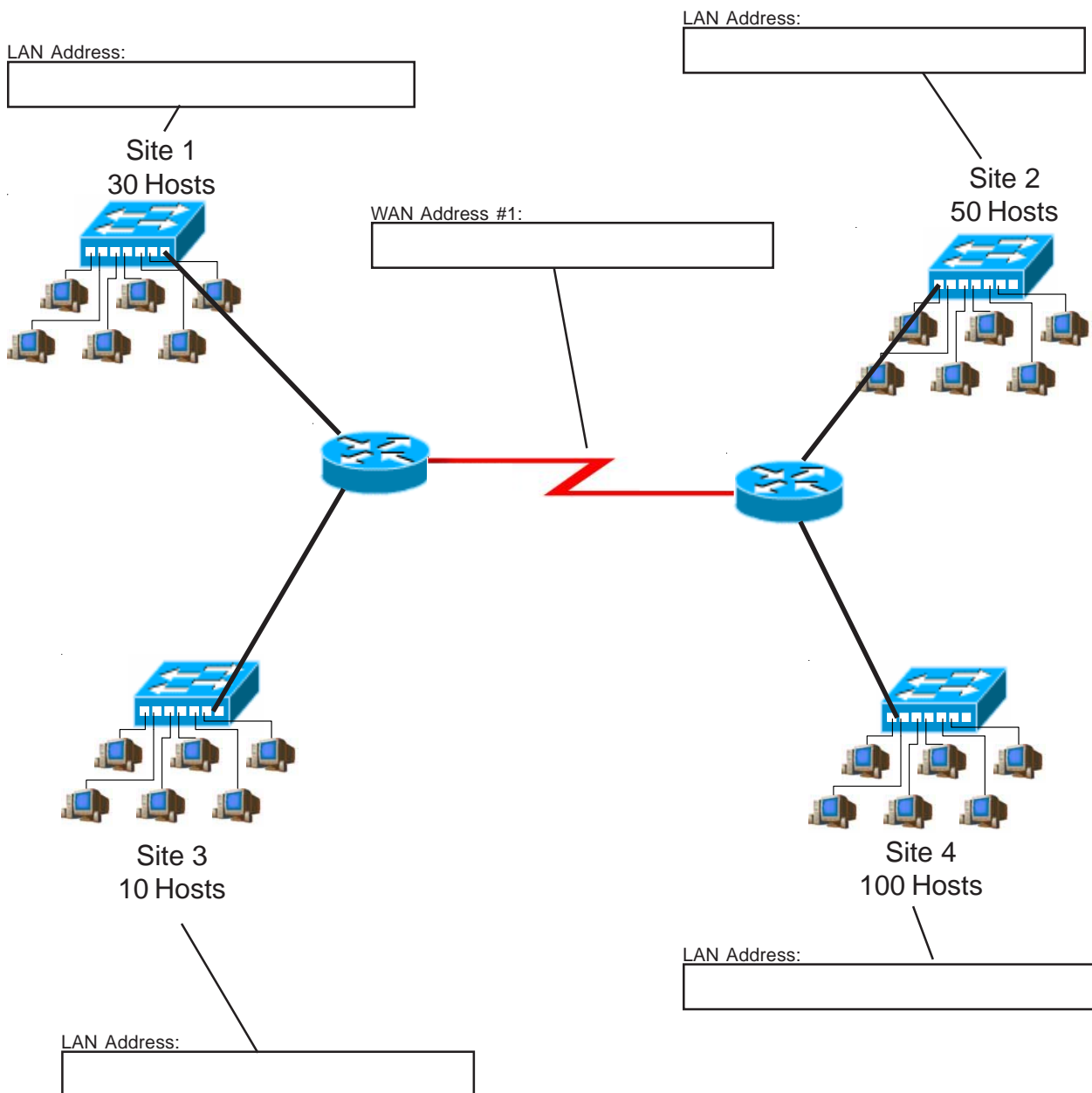
/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
					4-7	4-7
				8-15	8-11	
				12-15	12-15	
			16-31	16-19	16-19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

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)

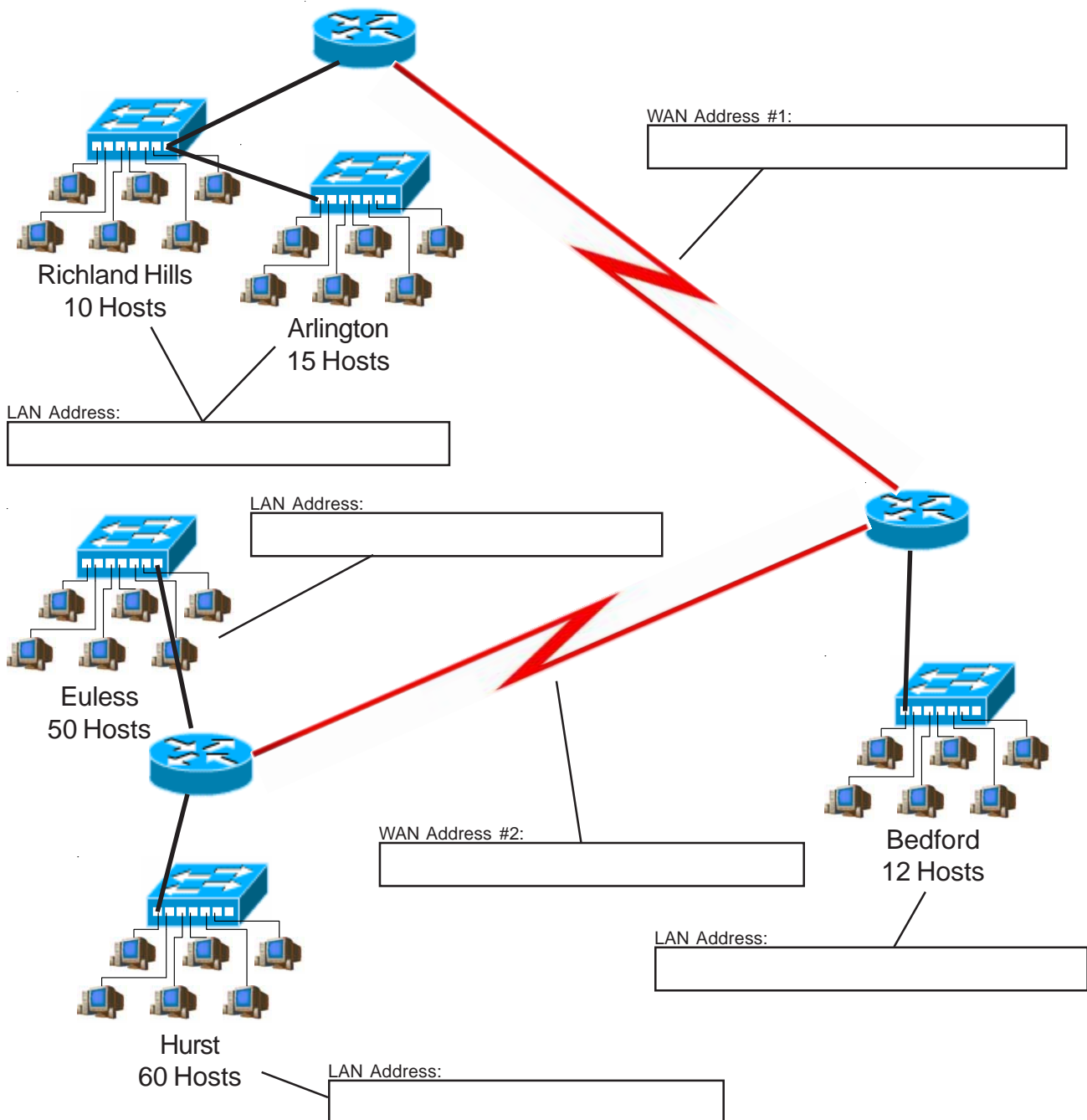
/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts		
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3		
					8-15	4-7	8-11	
				16-31	16-23	12-15	16-19	
					24-31	20-23	24-27	
			32-63	32-47	32-39	28-31	32-35	
					40-47	36-39	40-43	
					48-63	44-47	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 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)

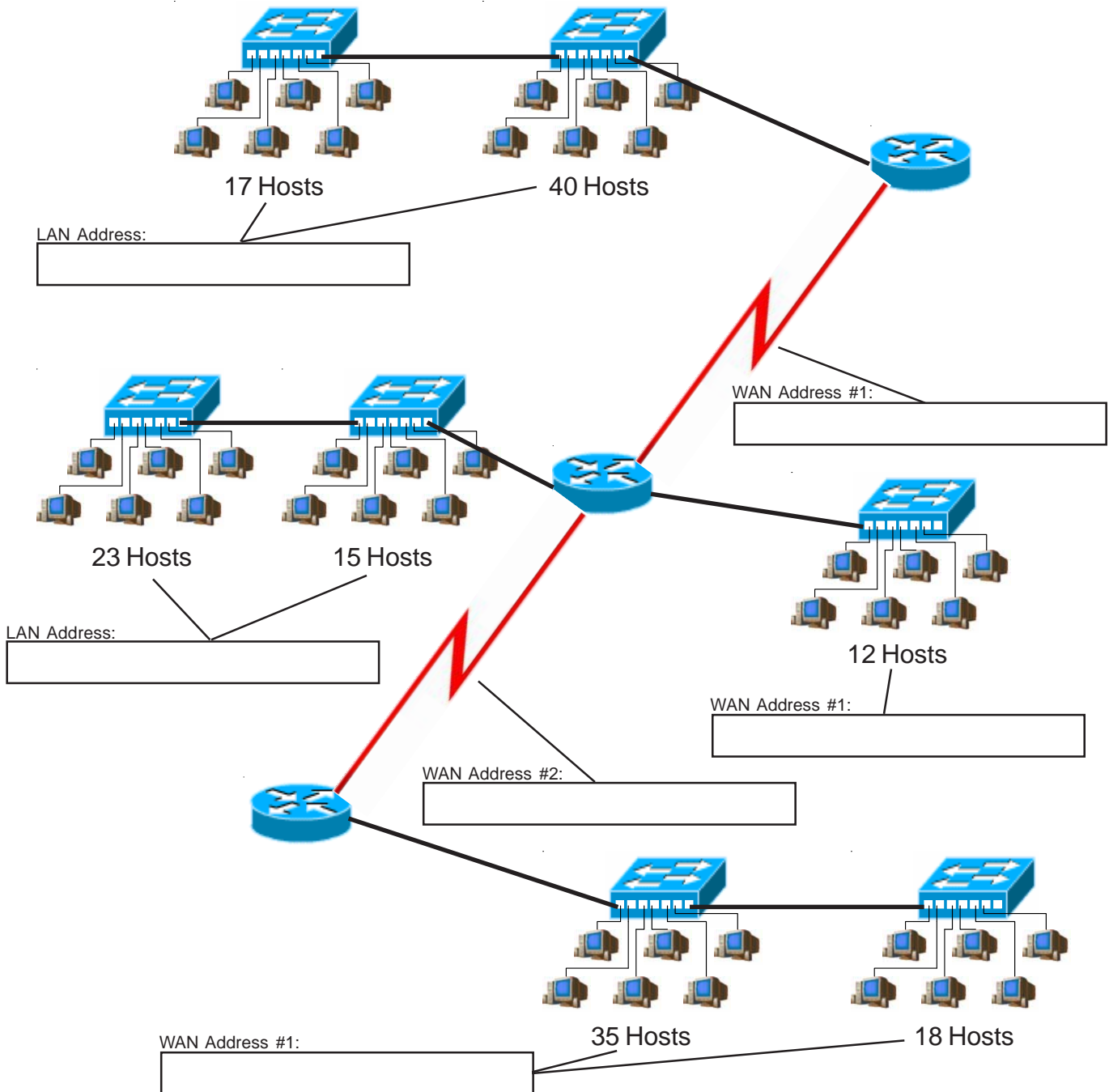
/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts			
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3			
					8-15	4-7	8-11		
				16-31	16-23	12-15	16-19		
					24-31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

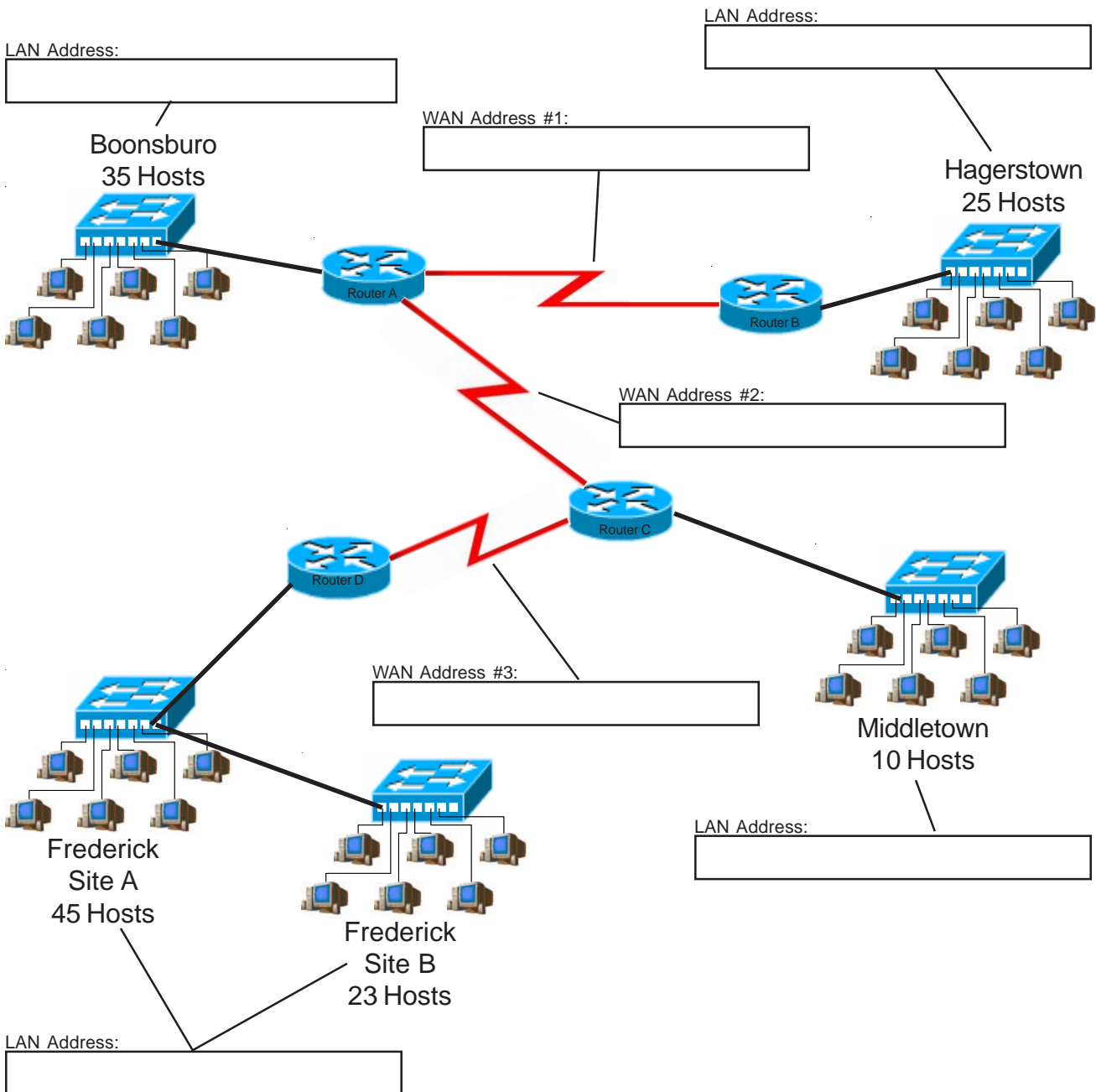
/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts		
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3		
					8-15	4-7	8-11	
				16-31	16-23	12-15	16-19	
					24-31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

/24 255.255.255.0 256 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		
					8-15	4-7	8-11	
				16-31	16-23	12-15	16-19	
					24-31	20-23	24-27	
			32-63	32-47	32-39	28-31	32-35	
					40-47	36-39	40-43	
					48-63	44-47	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	

Class C Addresses

VLSM Chart 24-30 Bits (4th octet)

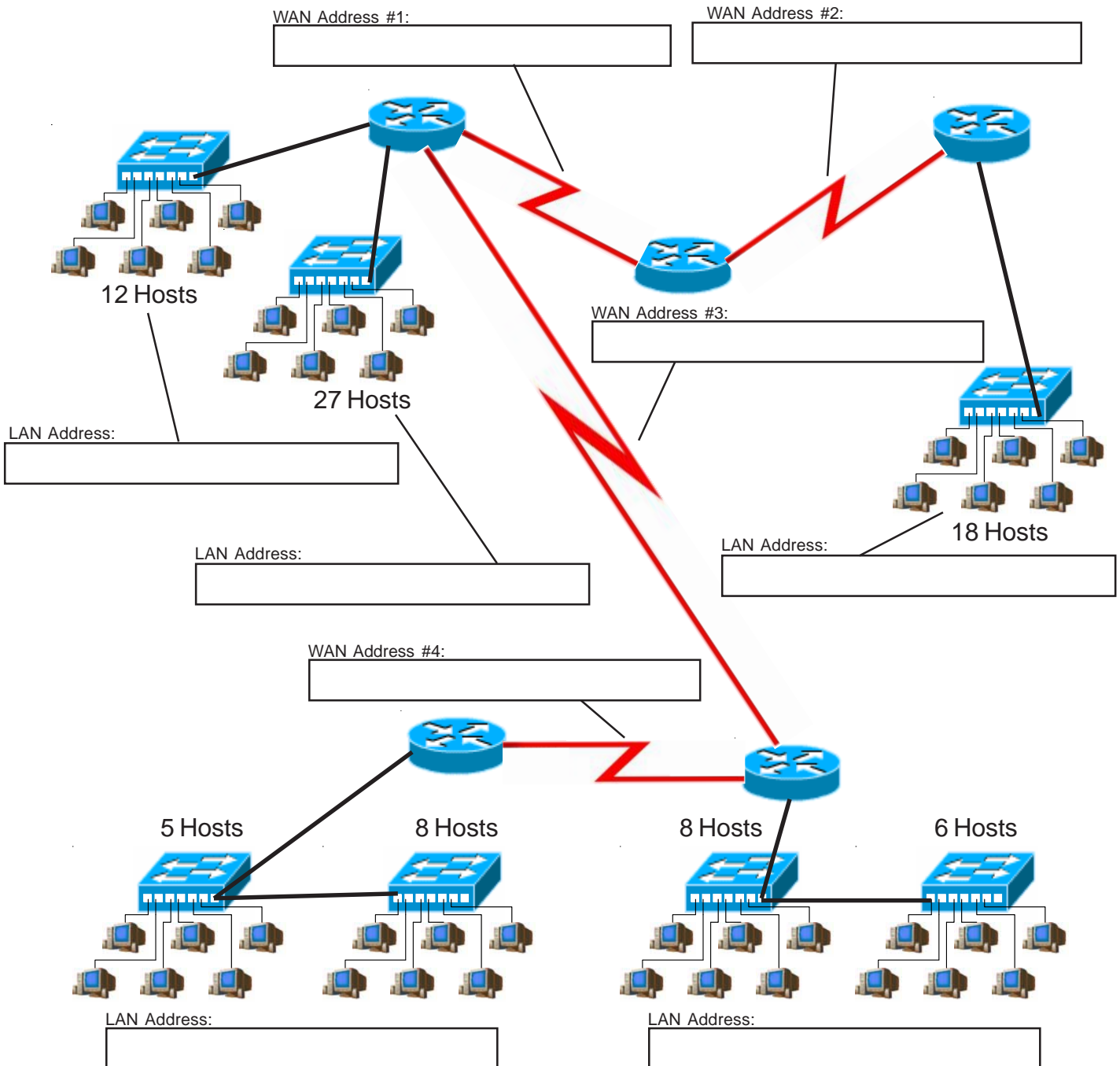
/24 255.255.255.0 256 Hosts	/25 255.255.255.128 128 Hosts	/26 255.255.255.192 64 Hosts	/27 255.255.255.224 32 Hosts	/28 255.255.255.240 16 Hosts	/29 255.255.255.248 8 Hosts	/30 255.255.255.252 4 Hosts
0 - 255	0-127	0-63	0-31	0-15	0-7	0-3
						4-7
					8-15	8-11
						12-15
			16-31	16-23	16-19	
					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	
					72-75	
					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	128-131		
				132-135		
				136-139		
				140-143		
		144-159	144-151	144-147		
				148-151		
			152-159	152-155		
				156-159		
	160-191	160-175	160-163			
			164-167			
		168-175	168-171			
			172-175			
	176-191	176-191	176-183	176-179		
				180-183		
				184-187		
				188-191		
192-207		192-199	192-195			
			196-199			
		200-207	200-203			
			204-207			
192-255	208-223	208-215	208-211			
			212-215			
		216-223	216-219			
			220-223			
	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

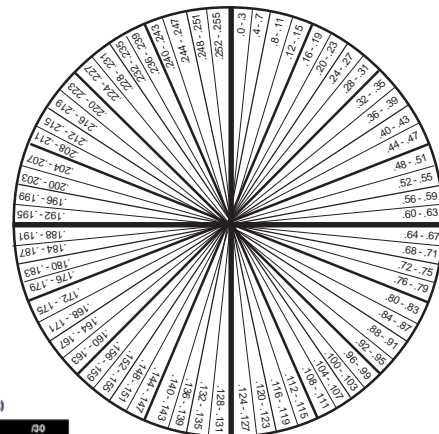
VLSM Chart 24-30 Bits (4th octet)

/24 255.255.255.0 256 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	
					72-75	
					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	128-131		
				132-135		
				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		
				168-171		
				172-175		
		176-191	176-183	176-179		
				180-183		
			184-191	184-187		
				188-191		
192-255	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			
			232-235			
			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	
4	3	11	35	43	131	139	163	171
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 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
				8-15	8-11	8-9
			16-31	16-23	16-19	16-17
				24-31	24-27	24-25
				32-39	32-35	32-33
				40-47	40-43	40-41
				48-55	48-51	48-49
				56-63	56-59	56-57
				64-71	64-67	64-65
				72-79	72-75	72-73
				80-87	80-83	80-81
				88-95	88-91	88-89
				96-103	96-99	96-97
				104-111	104-107	104-105
				112-119	112-115	112-113
				120-127	120-123	120-121
				128-135	128-131	128-129
				136-143	136-139	136-137
				144-151	144-147	144-145
				152-159	152-155	152-153
				160-167	160-163	160-161
				168-175	168-171	168-169
				176-183	176-179	176-177
				184-191	184-187	184-185
				192-199	192-195	192-193
				200-207	200-203	200-201
				208-215	208-211	208-209
				216-223	216-219	216-217
				224-231	224-227	224-225
				232-239	232-235	232-233
				240-247	240-243	240-241
				248-255	248-251	248-249

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.

Class A and B VLSM Problems

10.0.0.0

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

Hosts	IP	Mask	Network	First IP	Last IP
8-15	10.0.0.0	255.255.0.0	10.0.0.0	10.0.0.0	10.0.255.255
8-9	10.0.0.0	255.255.252.0	10.0.0.0	10.0.0.0	10.0.0.3
8-9	10.0.0.4	255.255.252.0	10.0.0.4	10.0.0.4	10.0.0.7
8-9	10.0.0.8	255.255.252.0	10.0.0.8	10.0.0.8	10.0.0.11
8-9	10.0.0.12	255.255.252.0	10.0.0.12	10.0.0.12	10.0.0.15
8-10	10.0.0.16	255.255.254.0	10.0.0.16	10.0.0.16	10.0.0.31
8-10	10.0.0.32	255.255.254.0	10.0.0.32	10.0.0.32	10.0.0.63
8-10	10.0.0.64	255.255.254.0	10.0.0.64	10.0.0.64	10.0.0.127
8-11	10.0.0.128	255.255.255.0	10.0.0.128	10.0.0.128	10.0.0.255

Class B Addresses
VLSM Chart 16-23 Bits (3rd octet)

Hosts	IP	Mask	Network	First IP	Last IP
16-23	10.0.0.0	255.255.255.0	10.0.0.0	10.0.0.0	10.0.0.255
16-17	10.0.0.0	255.255.255.128	10.0.0.0	10.0.0.0	10.0.0.127
16-17	10.0.0.128	255.255.255.128	10.0.0.128	10.0.0.128	10.0.0.255
16-18	10.0.0.0	255.255.255.192	10.0.0.0	10.0.0.0	10.0.0.63
16-18	10.0.0.64	255.255.255.192	10.0.0.64	10.0.0.64	10.0.0.127
16-18	10.0.0.128	255.255.255.192	10.0.0.128	10.0.0.128	10.0.0.191
16-18	10.0.0.192	255.255.255.192	10.0.0.192	10.0.0.192	10.0.0.255
16-19	10.0.0.0	255.255.255.224	10.0.0.0	10.0.0.0	10.0.0.31
16-19	10.0.0.32	255.255.255.224	10.0.0.32	10.0.0.32	10.0.0.63
16-19	10.0.0.64	255.255.255.224	10.0.0.64	10.0.0.64	10.0.0.95
16-19	10.0.0.96	255.255.255.224	10.0.0.96	10.0.0.96	10.0.0.127
16-19	10.0.0.128	255.255.255.224	10.0.0.128	10.0.0.128	10.0.0.159
16-19	10.0.0.160	255.255.255.224	10.0.0.160	10.0.0.160	10.0.0.191
16-19	10.0.0.192	255.255.255.224	10.0.0.192	10.0.0.192	10.0.0.223
16-19	10.0.0.224	255.255.255.224	10.0.0.224	10.0.0.224	10.0.0.255

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

Hosts	IP	Mask	Network	First IP	Last IP
24-30	10.0.0.0	255.255.255.255	10.0.0.0	10.0.0.0	10.0.0.255
24-25	10.0.0.0	255.255.255.252	10.0.0.0	10.0.0.0	10.0.0.3
24-25	10.0.0.4	255.255.255.252	10.0.0.4	10.0.0.4	10.0.0.7
24-25	10.0.0.8	255.255.255.252	10.0.0.8	10.0.0.8	10.0.0.11
24-25	10.0.0.12	255.255.255.252	10.0.0.12	10.0.0.12	10.0.0.15
24-26	10.0.0.16	255.255.255.254	10.0.0.16	10.0.0.16	10.0.0.31
24-26	10.0.0.32	255.255.255.254	10.0.0.32	10.0.0.32	10.0.0.63
24-26	10.0.0.64	255.255.255.254	10.0.0.64	10.0.0.64	10.0.0.127
24-27	10.0.0.128	255.255.255.255	10.0.0.128	10.0.0.128	10.0.0.255

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		
				16-31	16-23	8-11	4-5		
					24-31	12-15	6-7		
			32-63	32-47	32-39	16-19	8-9		
					40-47	20-23	10-11		
				48-63	48-55	24-27	12-13		
					56-63	28-31	14-15		
		64-127	64-95	64-79	64-71	30-31	16-17	18-19	
					80-87	32-35	20-21	22-23	
					88-95	36-39	24-25	26-27	
						40-43	28-29	30-31	
				96-111	96-103	44-47	32-33	32-33	34-35
						104-111	36-37	36-37	38-39
					112-127	100-103	40-41	40-41	42-43
						104-111	42-43	44-45	46-47
	128-159		128-143	112-119	44-47	48-49	50-51		
				120-127	48-51	52-53	54-55		
				128-135	128-131	52-55	56-57	58-59	
					136-143	56-59	60-61	62-63	
			144-159	144-151	140-143	60-63	64-65	66-67	
					144-147	64-67	68-69	70-71	
				152-159	148-151	68-71	72-73	74-75	
					152-155	72-75	76-77	78-79	
	160-191	160-175	160-167	160-167	76-79	80-81	82-83		
				168-171	80-83	84-85	86-87		
				172-175	84-87	88-89	90-91		
					176-179	88-91	92-93	94-95	
			176-191	176-183	180-183	92-95	96-97	98-99	
					184-191	96-99	100-101	102-103	
				184-191	188-191	100-103	104-105	106-107	
					192-199	104-107	108-109	110-111	
192-207		192-199	112-119	108-111	112-113	114-115			
			200-207	112-115	116-117	118-119			
			208-215	120-123	116-119	120-121	122-123		
				216-223	120-123	124-125	126-127		
		208-223	208-215	124-127	124-127	128-129	130-131		
				220-223	128-131	132-133	134-135		
			224-231	128-135	132-135	136-137	138-139		
				136-143	136-139	140-141	142-143		
224-239	224-231	144-147	140-141	144-145	146-147				
		232-239	144-147	148-149	150-151				
		240-247	148-151	148-149	152-153	154-155			
			244-247	152-155	156-157	158-159			
	240-255	240-247	156-159	156-159	160-161	162-163			
			248-251	160-163	164-165	166-167			
		248-255	164-167	164-167	168-169	170-171			
			252-255	168-171	172-173	174-175			
128-255	192-255	192-223	192-207	168-171	172-175	176-177	178-179		
				208-215	176-179	180-181	182-183		
			208-223	180-183	180-183	184-185	186-187		
				216-223	184-187	188-189	190-191		
		224-239	224-231	188-191	188-191	192-193	194-195		
				232-239	192-195	196-197	198-199		
			240-247	196-199	196-199	200-201	202-203		
				244-247	200-203	204-205	206-207		
	240-255	240-247	204-207	204-207	208-209	210-211			
			248-251	208-211	212-213	214-215			
			248-251	212-215	212-215	216-217	218-219		
				220-223	216-219	220-221	222-223		
		248-251	224-227	224-231	220-223	224-225	226-227		
				232-239	224-227	228-229	230-231		
			240-247	228-231	228-231	232-233	234-235		
				244-247	232-235	236-237	238-239		
248-251	244-247	236-239	236-239	240-241	242-243				
		248-251	240-243	244-245	246-247				
	248-251	244-247	244-247	248-249	250-251				
		252-255	248-251	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	<i>15.208.0.0 to 15.208.31.255</i>	<i>/19</i>
Client #2	5,000	<i>15.208.32.0 to 15.208.63.255</i>	<i>/19</i>
Client #3	4,500	<i>15.208.64.0 to 15.208.95.255</i>	<i>/19</i>
Client #4	2,000	<i>15.208.96.0 to 15.208.103.255</i>	<i>/21</i>
Client #5	1,450	<i>15.208.104.0 to 15.208.111.255</i>	<i>/21</i>
Client #6	1,150	<i>15.208.112.0 to 15.208.119.255</i>	<i>/21</i>
Client #7	900	<i>15.208.120.0 to 15.208.123.255</i>	<i>/22</i>
Client #8	750	<i>15.208.124.0 to 15.208.127.255</i>	<i>/22</i>
Client #9	450	<i>15.208.128.0 to 15.208.129.255</i>	<i>/23</i>

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

/24 255.255.255.0 256 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
					8-15	4-7
				16-31	16-23	8-11
					24-31	12-15
			32-63	32-47	16-19	
					20-23	
					24-27	
					28-31	
		48-63		32-35		
				36-39		
				40-43		
				44-47		
		64-127	64-95	64-79	48-51	
					52-55	
					56-59	
					60-63	
	80-95			64-67		
				68-71		
				72-75		
				76-79		
	96-127		96-111	80-83		
				84-87		
				88-91		
				92-95		
			112-127	96-99		
				100-103		
				104-107		
				108-111		
	128-255	128-191	128-159	112-115		
				116-119		
				120-123		
				124-127		
144-159			128-131			
			132-135			
			136-139			
			140-143			
192-255		160-191	144-147			
			148-151			
			152-155			
			156-159			
		208-223	160-163			
			164-167			
			168-171			
			172-175			
224-255	224-239	176-179				
		180-183				
		184-187				
		188-191				
	240-255	192-195				
		196-199				
		200-203				
		204-207				
	208-211					
	212-215					
	216-219					
	220-223					
	224-227					
	228-231					
	232-235					
	236-239					
	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		
					8-15	4-7	4-5		
				16-31	16-23	8-11	6-7		
					24-31	12-15	8-9		
					32-47	32-39	16-19	10-11	
						40-47	20-23	12-13	
			48-63			48-55	24-27	14-15	
						56-63	28-31	16-17	
				64-127		64-95	64-71	30-31	18-19
							80-95	32-35	20-21
					96-111		96-103	36-39	22-23
							104-111	40-43	24-25
		112-127	112-119				44-47	26-27	
			120-127				48-51	28-29	
			128-191			128-159	128-143	52-55	30-31
							144-159	56-59	32-33
					160-191		160-175	60-63	34-35
							176-191	64-67	36-37
		192-223					192-199	68-71	38-39
							200-207	72-75	40-41
				192-255		192-207	76-79	42-43	
						208-215	80-83	44-45	
					224-239	208-223	84-87	46-47	
						216-223	88-91	48-49	
	240-255	224-231				92-95	50-51		
		232-239				96-99	52-53		
		240-247	240-247	100-103		54-55			
			248-255	248-251		104-107	56-57		
				248-255	248-251	108-111	58-59		
					248-255	248-251	112-115	60-61	
	248-255					248-251	116-117	62-63	
						248-255	248-251	118-119	64-65
		248-255					248-251	120-123	66-67
			248-255				248-251	122-123	68-69
				248-255			248-251	124-127	70-71
					248-255		248-251	126-127	72-73
	248-255						248-251	128-129	74-75
						248-255	248-251	130-131	76-77
		248-255					248-251	132-133	78-79
			248-255				248-251	134-135	80-81
				248-255			248-251	136-137	82-83
					248-255		248-251	138-139	84-85
	248-255						248-251	140-141	86-87
						248-255	248-251	142-143	88-89
		248-255					248-251	144-145	90-91
			248-255				248-251	146-147	92-93
				248-255			248-251	148-149	94-95
					248-255		248-251	150-151	96-97
	248-255						248-251	152-153	98-99
						248-255	248-251	154-155	100-101
		248-255					248-251	156-157	102-103
			248-255				248-251	158-159	104-105
248-255				248-251			160-161	106-107	
				248-255	248-251		162-163	108-109	
	248-255				248-251		164-167	110-111	
					248-255	248-251	166-167	112-113	
		248-255				248-251	168-171	114-115	
			248-255			248-251	170-171	116-117	
248-255						248-251	172-173	118-119	
				248-255		248-251	174-175	120-121	
	248-255					248-251	176-177	122-123	
					248-255	248-251	178-179	124-125	
		248-255				248-251	180-181	126-127	
			248-255			248-251	182-183	128-129	
248-255						248-251	184-187	130-131	
				248-255		248-251	186-187	132-133	
	248-255					248-251	188-191	134-135	
					248-255	248-251	190-191	136-137	
		248-255				248-251	192-195	138-139	
			248-255			248-251	196-199	140-141	
248-255						248-251	200-203	142-143	
				248-255		248-251	204-207	144-145	
	248-255					248-251	208-211	146-147	
					248-255	248-251	212-215	148-149	
		248-255				248-251	216-219	150-151	
			248-255			248-251	220-223	152-153	
248-255						248-251	224-227	154-155	
				248-255		248-251	228-231	156-157	
	248-255					248-251	232-235	158-159	
					248-255	248-251	236-239	160-161	
		248-255				248-251	240-243	162-163	
			248-255			248-251	244-247	164-165	
248-255						248-251	248-251	166-167	
				248-255		248-251	252-255	168-169	
	248-255					248-251	252-255	170-171	
					248-255	248-251	252-255	172-173	
		248-255				248-251	252-255	174-175	
			248-255			248-251	252-255	176-177	
248-255						248-251	252-255	178-179	
				248-255		248-251	252-255	180-181	
	248-255					248-251	252-255	182-183	
					248-255	248-251	252-255	184-185	
		248-255				248-251	252-255	186-187	
			248-255			248-251	252-255	188-189	
248-255						248-251	252-255	190-191	
				248-255		248-251	252-255	192-193	
	248-255					248-251	252-255	194-195	
					248-255	248-251	252-255	196-197	
		248-255				248-251	252-255	198-199	
			248-255			248-251	252-255	200-201	
248-255						248-251	252-255	202-203	
				248-255		248-251	252-255	204-205	
	248-255					248-251	252-255	206-207	
					248-255	248-251	252-255	208-209	
		248-255				248-251	252-255	210-211	
			248-255			248-251	252-255	212-213	
248-255						248-251	252-255	214-215	
				248-255		248-251	252-255	216-217	
	248-255					248-251	252-255	218-219	
					248-255	248-251	252-255	220-221	
		248-255				248-251	252-255	222-223	
			248-255			248-251	252-255	224-225	
248-255						248-251	252-255	226-227	
				248-255		248-251	252-255	228-229	
	248-255					248-251	252-255	230-231	
					248-255	248-251	252-255	232-233	
		248-255				248-251	252-255	234-235	
			248-255			248-251	252-255	236-237	
248-255						248-251	252-255	238-239	
				248-255		248-251	252-255	240-241	
	248-255					248-251	252-255	242-243	
					248-255	248-251	252-255	244-245	
		248-255				248-251	252-255	246-247	
			248-255			248-251	252-255	248-249	
248-255						248-251	252-255	250-251	
				248-255		248-251	252-255	252-253	
	248-255					248-251	252-255	254-255	
					248-255	248-251	252-255	254-255	

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

/24 255.255.255.0 256 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
					8-15	4-7
				16-31	16-23	8-11
					24-31	12-15
			32-63	32-47	16-19	
					20-23	
					24-27	
					28-31	
		48-63		32-35		
				36-39		
				40-43		
				44-47		
		64-127	64-95	48-51		
				52-55		
				56-59		
				60-63		
	96-127		64-67			
			68-71			
			72-75			
			76-79			
	128-255	128-191	128-159	80-83		
				84-87		
				88-91		
				92-95		
			160-191	96-99		
				100-103		
				104-107		
				108-111		
		192-255	192-223	112-115		
				116-119		
				120-123		
				124-127		
224-255			128-131			
			132-135			
			136-139			
			140-143			
	144-147					
	148-151					
	152-155					
	156-159					
	160-163					
	164-167					
	168-171					
	172-175					
	176-179					
	180-183					
	184-187					
	188-191					
	192-195					
	196-199					
	200-203					
	204-207					
	208-211					
	212-215					
	216-219					
	220-223					
	224-227					
	228-231					
	232-235					
	236-239					
	240-243					
	244-247					
	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
					8-15	4-7	4-5
				16-31	16-23	8-11	6-7
					24-31	12-15	8-9
				32-63	32-39	16-19	10-11
						20-23	12-13
			40-47		24-27	14-15	
					28-31	16-17	
					32-35	18-19	
			64-127	64-79	36-39	20-21	
						22-23	
					40-43	24-25	
				44-47		26-27	
		80-95		48-51	28-29		
				52-55	30-31		
				56-59	32-33		
		96-127		96-111	48-55	34-35	
						56-57	
			60-63		36-37		
					64-67		
			104-111		38-39		
					68-71		
				70-71			
			112-127	80-87	40-41		
					42-43		
				88-95	44-45		
	92-93						
	120-127			94-95			
				96-97			
		98-99					
	128-255	128-191	128-159	100-101			
				136-143	102-103		
					144-159	104-105	
				140-141			
				160-191	142-143		
					160-175	144-145	
			146-147				
			176-191		148-149		
					152-153		
			192-255	192-223	160-167	154-155	
						168-175	156-157
					208-223		158-159
						164-165	
		224-255			166-167		
					224-239	168-169	
				170-171			
				240-247	172-173		
					174-175		
				248-255	176-177		
					178-179		
		180-181					
		192-223		192-207	176-183	182-183	
184-191			184-185				
			208-223		186-187		
188-189							
192-193							
224-255	200-207		184-187	194-195			
				208-215	196-197		
	216-223		198-199				
			202-203				
	224-239		204-205				
			206-207				
			208-209				
	240-247		224-231	216-217	210-211		
232-239		212-213					
		240-247	214-215				
216-217							
218-219							
248-255		220-221					
		222-223					
	224-225						
	226-227						
252-255	228-229						
	230-231						
	232-233						
	234-235						
252-255	236-237						
	238-239						
	240-241						
	242-243						
252-255	244-245						
	246-247						
	248-249						
	250-251						
252-255	252-253						
	254-255						
	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		
					8-15	4-7	4-5		
				16-31	16-23	8-11	6-7		
					24-31	12-15	8-9		
					32-47	32-39	16-19	10-11	
						40-47	20-23	12-13	
			48-63			48-55	24-27	14-15	
						56-63	28-31	16-17	
				64-127		64-95	64-71	30-31	18-19
							80-95	32-35	20-21
					96-127		96-103	36-39	22-23
							104-111	40-43	24-25
		128-159	128-143				112-119	44-47	26-27
							120-127	48-51	28-29
						128-143	52-55	30-31	
			144-159			136-143	56-59	32-33	
					144-151	60-63	34-35		
					152-159	64-67	36-37		
		128-191	160-191		160-175	160-167	68-71	38-39	
						168-175	72-75	40-41	
				176-183		76-79	42-43		
				192-207	192-199	184-191	80-83	44-45	
						192-199	84-87	46-47	
						200-207	88-91	48-49	
	192-223		200-207		208-215	92-95	50-51		
					216-223	96-99	52-53		
					224-231	100-103	54-55		
			224-255	224-239	232-239	104-107	56-57		
					240-247	108-111	58-59		
					248-255	112-115	60-61		
	240-255	240-247		248-255	116-119	62-63			
				248-255	120-123	64-65			
				248-255	124-127	66-67			
		248-255	248-255	252-255	128-131	68-69			
				252-255	132-135	70-71			
				252-255	136-139	72-73			
	252-255		252-255	252-255	140-143	74-75			
				252-255	144-147	76-77			
				252-255	148-151	78-79			
		252-255	252-255	252-255	152-155	80-81			
				252-255	156-159	82-83			
				252-255	160-163	84-85			
	252-255		252-255	252-255	164-167	86-87			
				252-255	168-171	88-89			
				252-255	172-175	90-91			
		252-255	252-255	252-255	176-179	92-93			
				252-255	180-183	94-95			
				252-255	184-187	96-97			
	252-255		252-255	252-255	188-191	98-99			
				252-255	192-195	100-101			
				252-255	196-199	102-103			
		252-255	252-255	252-255	200-203	104-105			
252-255				204-207	106-107				
252-255				208-211	108-109				
252-255	252-255		252-255	212-215	110-111				
			252-255	216-219	112-113				
			252-255	220-223	114-115				
	252-255	252-255	252-255	224-227	116-117				
			252-255	228-231	118-119				
			252-255	232-235	120-121				
252-255		252-255	252-255	236-239	122-123				
			252-255	240-243	124-125				
			252-255	244-247	126-127				
	252-255	252-255	252-255	248-251	128-129				
			252-255	252-255	130-131				
			252-255	252-255	132-133				
252-255		252-255	252-255	252-255	134-135				
			252-255	252-255	136-137				
			252-255	252-255	138-139				
	252-255	252-255	252-255	252-255	140-141				
			252-255	252-255	142-143				
			252-255	252-255	144-145				
252-255		252-255	252-255	252-255	146-147				
			252-255	252-255	148-149				
			252-255	252-255	150-151				
	252-255	252-255	252-255	252-255	152-153				
			252-255	252-255	154-155				
			252-255	252-255	156-157				
252-255		252-255	252-255	252-255	158-159				
			252-255	252-255	160-161				
			252-255	252-255	162-163				
	252-255	252-255	252-255	252-255	164-165				
			252-255	252-255	166-167				
			252-255	252-255	168-169				
252-255		252-255	252-255	252-255	170-171				
			252-255	252-255	172-173				
			252-255	252-255	174-175				
	252-255	252-255	252-255	252-255	176-177				
			252-255	252-255	178-179				
			252-255	252-255	180-181				
252-255		252-255	252-255	252-255	182-183				
			252-255	252-255	184-185				
			252-255	252-255	186-187				
	252-255	252-255	252-255	252-255	188-189				
			252-255	252-255	190-191				
			252-255	252-255	192-193				
252-255		252-255	252-255	252-255	194-195				
			252-255	252-255	196-197				
			252-255	252-255	198-199				
	252-255	252-255	252-255	252-255	200-201				
			252-255	252-255	202-203				
			252-255	252-255	204-205				
252-255		252-255	252-255	252-255	206-207				
			252-255	252-255	208-209				
			252-255	252-255	210-211				
	252-255	252-255	252-255	252-255	212-213				
			252-255	252-255	214-215				
			252-255	252-255	216-217				
252-255		252-255	252-255	252-255	218-219				
			252-255	252-255	220-221				
			252-255	252-255	222-223				
	252-255	252-255	252-255	252-255	224-225				
			252-255	252-255	226-227				
			252-255	252-255	228-229				
252-255		252-255	252-255	252-255	230-231				
			252-255	252-255	232-233				
			252-255	252-255	234-235				
	252-255	252-255	252-255	252-255	236-237				
			252-255	252-255	238-239				
			252-255	252-255	240-241				
252-255		252-255	252-255	252-255	242-243				
			252-255	252-255	244-245				
			252-255	252-255	246-247				
	252-255	252-255	252-255	252-255	248-249				
			252-255	252-255	250-251				
			252-255	252-255	252-253				
252-255		252-255	252-255	252-255	254-255				
			252-255	252-255	254-255				
			252-255	252-255	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	/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		
					8-15	4-7	8-11	
				16-31	16-23	12-15	16-19	
					24-31	20-23	24-27	
			32-63	32-47	32-39	28-31	32-35	
					40-47	36-39	40-43	
					48-63	48-55	44-47	48-51
						56-63	52-55	56-59
		64-127		64-95	64-79	64-71	60-63	64-67
						72-79	68-71	72-75
					80-95	80-87	76-79	80-83
						88-95	84-87	88-91
			96-127	96-111	96-103	92-95	96-99	
					104-111	100-103	104-107	
				112-127	112-119	108-111	112-115	
					120-127	116-119	120-123	
	128-255	128-191	128-159	128-143	128-135	124-127	128-131	
					136-143	132-135	136-139	
				144-159	144-151	140-143	144-147	
					152-159	148-151	152-155	
			160-191	160-175	160-167	156-159	160-163	
					168-175	164-167	168-171	
				176-191	176-183	172-175	176-179	
					184-191	180-183	184-187	
		192-255	192-223	192-207	192-199	188-191	192-195	
					200-207	196-199	200-203	
				208-223	208-215	204-207	208-211	
					216-223	212-215	216-219	
			224-255	224-239	224-231	220-223	224-227	
					232-239	228-231	232-235	
				240-255	240-247	236-239	240-243	
					248-255	244-247	248-251	
				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	16-23	8-11	4-5
					24-31	12-15	6-7
					32-39	16-19	8-9
				32-63	40-47	20-23	10-11
			24-27			12-13	
			48-55		28-31	14-15	
					32-35	16-17	
					36-39	18-19	
			56-63		40-41	20-21	
					42-43	22-23	
			64-127	64-95	64-79	44-45	24-25
		46-47				26-27	
		48-49				28-29	
		80-95			50-51	30-31	
					52-53	32-33	
					54-55	34-35	
		96-127		96-111	56-57	36-37	
					58-59	38-39	
				112-127	60-61	40-41	
					62-63	42-43	
					64-65	44-45	
				128-159	66-67	46-47	
					68-69	48-49	
		128-191	128-159	128-143	70-71	50-51	
	136-143				52-53		
	140-141				54-55		
	160-191			142-143	56-57		
				144-145	58-59		
				146-147	60-61		
	176-191		160-175	148-149	62-63		
				168-175	64-65		
			176-183	150-151	66-67		
				152-153	68-69		
				154-155	70-71		
			184-191	156-157	72-73		
				158-159	74-75		
	192-255	192-223	192-207	160-161	76-77		
				200-207	78-79		
				204-207	80-81		
			208-223	206-207	82-83		
				208-211	84-85		
				212-215	86-87		
		224-255	224-239	216-217	88-89		
				220-223	90-91		
			240-247	218-219	92-93		
				222-223	94-95		
				224-227	96-97		
			248-255	226-227	98-99		
				228-231	100-101		
				102-103	100-103	102-103	104-105
			104-105	104-107	104-107	106-107	108-109
			106-107	108-111	108-111	110-111	112-113
			108-111	112-119	112-115	112-113	114-115
			112-127	116-119	116-119	116-117	118-119
			120-127	120-123	120-123	120-121	122-123
				124-127	124-127	124-125	126-127
				128-135	128-131	128-129	130-131
				136-143	132-135	132-133	134-135
					136-139	136-137	138-139
					140-143	140-141	142-143
					144-147	144-145	146-147
					148-151	148-149	150-151
					152-155	152-153	154-155
					156-159	156-157	158-159
					160-163	160-161	162-163
					164-167	164-165	166-167
					168-171	168-169	170-171
					172-175	172-173	174-175
					176-179	176-177	178-179
					180-183	180-181	182-183
					184-187	184-185	186-187
					188-191	188-189	190-191
					192-195	192-193	194-195
					196-199	196-197	198-199
					200-203	200-201	202-203
					204-207	204-205	206-207
					208-211	208-209	210-211
					212-215	212-213	214-215
					216-219	216-217	218-219
					220-223	220-221	222-223
					224-227	224-225	226-227
					228-231	228-229	230-231
					232-235	232-233	234-235
					236-239	236-237	238-239
					240-243	240-241	242-243
					244-247	244-245	246-247
					248-251	248-249	250-251
					252-255	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		

Class A Addresses

VLSM Chart 8-15 Bits (2nd octet)

/8	/9	/10	/11	/12	/13	/14	/15	
255.0.0.0 16,777,216 Hosts	255.128.0.0 8,388,608 Hosts	255.192.0.0 4,194,304 Hosts	255.224.0.0 2,097,152 Hosts	255.240.0.0 1,048,576 Hosts	255.248.0.0 524,288 Hosts	255.252.0.0 262,144 Hosts	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	16-23	8-11	5	
					24-31	12-15	6-7	
				32-63	32-47	32-39	16-19	8-9
						40-47	20-23	10-11
			48-63		48-55	24-27	12-13	
					56-63	28-31	14-15	
					64-71	30-31	16-17	
			64-127	64-95	64-79	64-71	32-35	18-19
						80-95	36-39	20-21
					96-111	80-87	40-43	22-23
						88-95	44-47	24-25
		96-111				96-103	48-51	26-27
						104-111	52-55	28-29
		96-127		112-127	112-119	56-59	30-31	
					120-127	60-63	32-33	
				128-159	128-143	128-135	64-67	34-35
						136-143	68-71	36-37
					144-159	144-151	72-75	38-39
						152-159	76-79	40-41
						160-175	80-83	42-43
		128-255	128-191	160-191	160-167	84-87	44-45	
					168-175	88-91	46-47	
					176-191	176-183	92-95	48-49
						184-191	96-99	50-51
	192-255			192-223	192-207	192-199	100-103	52-53
						200-207	104-107	54-55
					208-223	208-215	108-111	56-57
						216-223	112-115	58-59
			224-255	224-239	224-231	116-119	60-61	
					232-239	120-123	62-63	
				240-255	240-247	124-127	64-65	
					248-255	128-129	66-67	

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 fourth 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	8-11	4-7	2-3				
				16-31	16-23	12-15	8-7	4-5			
					24-31	16-19	8-9	6-7			
					32-63	32-39	20-23	10-11	12-13		
						40-47	24-27	14-15	16-17		
			48-63			48-55	28-31	18-19	18-19		
						56-63	32-33	20-21	20-21		
				64-127		64-95	64-71	32-35	22-23	22-23	
							72-79	36-39	24-25	24-25	
					80-95		38-39	26-27	26-27		
					96-127	96-103	40-41	28-29	28-29		
		104-111	42-43			30-31	30-31				
		112-127	44-45			32-33	32-33				
		128-255	128-191	128-159	128-143	46-47	34-35	34-35			
					136-143	48-49	36-37	36-37			
					144-159	144-151	50-51	38-39	38-39		
						152-159	52-53	40-41	40-41		
						160-191	160-167	54-55	42-43	42-43	
							168-175	56-57	44-45	44-45	
				176-191			176-183	58-59	46-47	46-47	
							184-191	60-61	48-49	48-49	
					192-255		192-223	192-199	62-63	50-51	50-51
								200-207	64-65	52-53	52-53
	208-223					208-215		66-67	54-55	54-55	
						216-223		68-69	56-57	56-57	
			224-255	224-231		70-71		58-59	58-59		
				232-239		72-73		60-61	60-61		
				240-255		240-247	74-75	62-63	62-63		
						248-255	76-77	64-65	64-65		
	252-255					252-253	78-79	66-67	66-67		
						254-255	80-81	68-69	68-69		
			256-259			256-257	82-83	70-71	70-71		
						258-259	84-85	72-73	72-73		
				260-263	260-261	86-87	74-75	74-75			
					262-263	88-89	76-77	76-77			
	264-267				264-265	90-91	78-79	78-79			
					266-267	92-93	80-81	80-81			
			268-271		268-269	94-95	82-83	82-83			
					270-271	96-97	84-85	84-85			
				272-275	272-273	98-99	86-87	86-87			
					274-275	100-101	88-89	88-89			
	276-279	276-277			102-103	90-91	90-91				
		278-279			104-105	92-93	92-93				
		280-283	280-281		106-107	94-95	94-95				
			282-283		108-109	96-97	96-97				
			284-287	284-285	110-111	98-99	98-99				
				286-287	112-113	100-101	100-101				
	288-291			288-289	114-115	102-103	102-103				
				290-291	116-117	104-105	104-105				
		292-295		292-293	118-119	106-107	106-107				
				294-295	120-121	108-109	108-109				
296-299			296-297	122-123	110-111	110-111					
			298-299	124-125	112-113	112-113					
	300-303		300-301	126-127	114-115	114-115					
			302-303	128-129	116-117	116-117					
		304-307	304-305	130-131	118-119	118-119					
			306-307	132-133	120-121	120-121					
308-311			308-309	134-135	122-123	122-123					
			310-311	136-137	124-125	124-125					
	312-315		312-313	138-139	126-127	126-127					
			314-315	140-141	128-129	128-129					
		316-319	316-317	142-143	130-131	130-131					
			318-319	144-145	132-133	132-133					
320-323			320-321	146-147	134-135	134-135					
			322-323	148-149	136-137	136-137					
	324-327		324-325	150-151	138-139	138-139					
			326-327	152-153	140-141	140-141					
		328-331	328-329	154-155	142-143	142-143					
			330-331	156-157	144-145	144-145					
332-335			332-333	158-159	146-147	146-147					
			334-335	160-161	148-149	148-149					
	336-339		336-337	162-163	150-151	150-151					
			338-339	164-165	152-153	152-153					
		340-343	340-341	166-167	154-155	154-155					
			342-343	168-169	156-157	156-157					
344-347			344-345	170-171	158-159	158-159					
			346-347	172-173	160-161	160-161					
	348-351		348-349	174-175	162-163	162-163					
			350-351	176-177	164-165	164-165					
		352-355	352-353	178-179	166-167	166-167					
			354-355	180-181	168-169	168-169					
356-359			356-357	182-183	170-171	170-171					
			358-359	184-185	172-173	172-173					
	360-363		360-361	186-187	174-175	174-175					
			362-363	188-189	176-177	176-177					
		364-367	364-365	190-191	178-179	178-179					
			366-367	192-193	180-181	180-181					
368-371			368-369	194-195	182-183	182-183					
			370-371	196-197	184-185	184-185					
	372-375		372-373	198-199	186-187	186-187					
			374-375	200-201	188-189	188-189					
		376-379	376-377	202-203	190-191	190-191					
			378-379	204-205	192-193	192-193					
380-383			380-381	206-207	194-195	194-195					
			382-383	208-209	196-197	196-197					
	384-387		384-385	210-211	198-199	198-199					
			386-387	212-213	200-201	200-201					
		388-391	388-389	214-215	202-203	202-203					
			390-391	216-217	204-205	204-205					
392-395			392-393	218-219	206-207	206-207					
			394-395	220-221	208-209	208-209					
	396-399		396-397	222-223	210-211	210-211					
			398-399	224-225	212-213	212-213					
		400-403	400-401	226-227	214-215	214-215					
			402-403	228-229	216-217	216-217					
404-407			404-405	230-231	218-219	218-219					
			406-407	232-233	220-221	220-221					
	408-411		408-409	234-235	222-223	222-223					
			410-411	236-237	224-225	224-225					
		412-415	412-413	238-239	226-227	226-227					
			414-415	240-241	228-229	228-229					
416-419			416-417	242-243	230-231	230-231					
			418-419	244-245	232-233	232-233					
	420-423		420-421	246-247	234-235	234-235					
			422-423	248-249	236-237	236-237					
		424-427	424-425	250-251	238-239	238-239					
			426-427	252-253	240-241	240-241					
428-431			428-429	254-255	242-243	242-243					
			430-431	256-257	244-245	244-245					
	432-435		432-433	258-259	246-247	246-247					
			434-435	260-261	248-249	248-249					
		436-439	436-437	262-263	250-251	250-251					
			438-439	264-265	252-253	252-253					
440-443			440-441	266-267	254-255	254-255					
			442-443	268-269							
	444-447		444-445	270-271							
			446-447	272-273							
		448-451	448-449	274-275							
			450-451	276-277							
452-455			452-453	278-279							
			454-455	280-281							
	456-459		456-457	282-283							
			458-459	284-285							
		460-463	460-461	286-287							
			462-463	288-289							
464-467			464-465	290-291							
			466-467	292-293							
	468-471		468-469	294-295							
			470-471	296-297							
		472-475	472-473	298-299							
			474-475	300-301							
476-479			476-477	302-303							
			478-479	304-305							
	480-483		480-481	306-307							
			482-483	308-309							
		484-487	484-485	310-311							
			486-487	312-313							
488-491			488-489	314-315							
			490-491	316-317							
	492-495		492-493	318-319							
			494-495	320-321							
		496-499	496-497	322-323							
			498-499	324-325							
500-503			500-501	326-327							
			502-503	328-329							
	504-507		504-505	330-331							
			506-507	332-333							
		508-511	508-509	334-335							
			510-511	336-337							
512-515			512-513	338-339							
			514-515	340-341							
	516-519		516-517	342-343							
			518-519	344-345							
		520-523	520-521	346-347							
			522-523	348-349							
524-527			524-525	350-351							
			526-527	352-353							
	528-531		528-529	354-355							
			530-531	356-357							
		532-535	532-533	358-359							
			534-535	360-361							
536-539			536-537	362-363							
			538-539	364-365							
	540-543		540-541	366-367							
			542-543	368-369							
		544-547	544-545	370-371							
			546-547	372-373							
548-551			548-549	374-375							
			550-551	376-377							
	552-555		552-553	378-379							
			554-555	380-381							
		556-559	556-557	382-383							
			558-559	384-385							
560-563			560-561	386-387							
			562-563	388-389							
	564-567		564-565	390-391							
			566-567	392-393							
		568-571	568-569	394-395							
			570-571	396-397							
572-575			572-573	398-399							
			574-575	400-401							
	576-579		576-577	402-403							
			578-579	404-405							
		580-583	580-581	406-407							
			582-583	408-409							
584-587			584-585	410-411							
			586-587	412-413							
	588-591		588-589	414-415							
			590-591	416-417							
		592									

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

Reference Charts and Support Materials

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

10	11	12	13	14	15	
208.208.0.0 8,192 Hosts	208.208.64.0 4,096 Hosts	208.208.128.0 2,048 Hosts	208.208.192.0 1,024 Hosts	208.208.256.0 512 Hosts	208.208.320.0 256 Hosts	
0-127	0-63	0-31	0-15	0-7	0-3	
		32-63	32-47	48-63	64-79	
		64-127	64-79	80-95	96-111	112-127
			128-143	144-159	160-175	176-191
			192-207	208-223	224-239	240-255
			256-271	272-287	288-303	304-319
		128-255	128-143	144-159	160-175	176-191
			192-207	208-223	224-239	240-255
	256-271		272-287	288-303	304-319	
	320-335		336-351	352-367	368-383	
	384-399		400-415	416-431	432-447	
	448-463		464-479	480-495	496-511	
	512-527		528-543	544-559	560-575	
	576-591		592-607	608-623	624-639	

Class B Addresses
VLSM Chart 16-23 Bits (3rd octet)

16	17	18	19	20	21	22	23		
208.208.0.0 65,536 Hosts	208.208.128.0 32,768 Hosts	208.208.256.0 16,384 Hosts	208.208.384.0 8,192 Hosts	208.208.512.0 4,096 Hosts	208.208.640.0 2,048 Hosts	208.208.768.0 1,024 Hosts	208.208.896.0 512 Hosts		
0-127	0-63	0-31	0-15	0-7	0-3	0-1	0-0		
		32-63	32-47	48-63	64-79	80-95	96-111	112-127	
		64-127	64-79	80-95	96-111	112-127	128-143	144-159	160-175
			176-191	192-207	208-223	224-239	240-255	256-271	272-287
			288-303	304-319	320-335	336-351	352-367	368-383	384-399
			400-415	416-431	432-447	448-463	464-479	480-495	496-511
		128-255	128-143	144-159	160-175	176-191	192-207	208-223	224-239
			240-255	256-271	272-287	288-303	304-319	320-335	336-351
	352-367		368-383	384-399	400-415	416-431	432-447	448-463	
	464-479		480-495	496-511	512-527	528-543	544-559	560-575	
	576-591		592-607	608-623	624-639	640-655	656-671	672-687	
	688-703		704-719	720-735	736-751	752-767	768-783	784-799	
	800-815		816-831	832-847	848-863	864-879	880-895	896-911	
	912-927		928-943	944-959	960-975	976-991	992-1007	1008-1023	

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

24	25	26	27	28	29	30		
208.208.0.0 2,048 Hosts	208.208.128.0 1,024 Hosts	208.208.256.0 512 Hosts	208.208.384.0 256 Hosts	208.208.512.0 128 Hosts	208.208.640.0 64 Hosts	208.208.768.0 32 Hosts		
0-127	0-63	0-31	0-15	0-7	0-3	0-1		
		32-63	32-47	48-63	64-79	80-95	96-111	
		64-127	64-79	80-95	96-111	112-127	128-143	144-159
			160-175	176-191	192-207	208-223	224-239	240-255
			256-271	272-287	288-303	304-319	320-335	336-351
			352-367	368-383	384-399	400-415	416-431	432-447
		128-255	128-143	144-159	160-175	176-191	192-207	208-223
			224-239	240-255	256-271	272-287	288-303	304-319
	320-335		336-351	352-367	368-383	384-399	400-415	
	416-431		432-447	448-463	464-479	480-495	496-511	
	512-527		528-543	544-559	560-575	576-591	592-607	
	608-623		624-639	640-655	656-671	672-687	688-703	
	704-719		720-735	736-751	752-767	768-783	784-799	
	800-815		816-831	832-847	848-863	864-879	880-895	

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	16-23	8-11	4-5	
					24-31	12-15	6-7	
				32-63	32-47	32-39	16-19	8-9
						40-47	20-23	10-11
			48-63			24-27	12-13	
			56-63		56-59	28-31	14-15	
					60-63	30-31	16-17	
					64-79	32-35	18-19	
			64-127	64-95	64-79	64-71	36-39	20-21
						80-95	40-43	22-23
		88-95				44-47	24-25	
		96-111			96-103	46-47	26-27	
					104-111	48-49	28-29	
					112-127	50-51	30-31	
		128-255		128-191	128-143	128-135	52-55	32-33
						136-143	56-57	34-35
						144-151	58-59	36-37
					144-159	144-151	60-61	38-39
						152-159	62-63	40-41
						160-175	64-65	42-43
			160-191	160-175	160-167	66-67	44-45	
					168-175	68-69	46-47	
	176-191				70-71	48-49		
	176-191			176-183	72-73	50-51		
				184-191	74-75	52-53		
				188-191	76-77	54-55		
	192-255	192-223	192-207	192-199	78-79	56-57		
				200-207	80-81	58-59		
				208-215	82-83	60-61		
			208-223	208-215	84-85	62-63		
				216-223	86-87	64-65		
				224-231	88-89	66-67		
		224-255	224-239	224-231	90-91	68-69		
				232-239	92-95	70-71		
				240-247	96-99	72-73		
			240-255	240-247	100-103	74-75		
				248-255	104-107	76-77		
				252-255	108-111	78-79		

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

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	32-35		
					36-39	
					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	
					72-75	
					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	
					104-107	
					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		
				132-135		
				136-139		
				140-143		
		144-159	144-151	144-147		
				148-151		
			152-159	152-155		
				156-159		
	160-191	160-175	160-163			
			164-167			
		168-175	168-171			
			172-175			
	176-191	176-191	176-183	176-179		
				180-183		
				184-187		
				188-191		
192-207		192-199	192-195			
			196-199			
		200-207	200-203			
			204-207			
192-223	208-223	208-215	208-211			
			212-215			
	216-223	216-219	216-219			
			220-223			
192-255	224-239	224-231	224-227			
			228-231			
			232-235			
			236-239			
	224-255	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