Custom Subnet Masks

Problem 7

Number of needed subnets **2000**
Number of needed usable hosts **15**
Network Address **178.100.0.0**

Address class ___B___

Default subnet mask ___255 . 255 . 0. 0___

Custom subnet mask ___255. 255 . 255 . 224___

Total number of subnets ___2048___

Total number of host addresses ___32___

Number of usable addresses ___30___

Number of bits borrowed ___11___

Show your work for Problem 7 in the space below.

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

178 . 100 . 0 0 0 0. 0 0 0 0 . 0 0 0 0 0 0 0 0

$2^{11} = 2048$

$2^5 = 32 - 2 = 30$

255 . 1110 0000

128
+ 64
+ 32
= 224

32
-2
30

remove Network and broadcast IP

18

Custom = 255. 224

Custom Subnet Masks

Problem 15

Number of needed usable hosts **50**

Network Address **172.59.0.0**

Address class ___B___

Default subnet mask ___255.255.0.0___

Custom subnet mask ___255.255.255.192___

Total number of subnets ___1024___

Total number of host addresses ___64___

Number of usable addresses ___62___

Number of bits borrowed ___10___

Show your work for Problem 15 in the space below.

$$172.59.\overset{128\ 64\ 32\ 16\ \ 8\ 4\ 2\ 1}{0\ 0\ 0\ 0\ \ \ 0\ 0\ 0\ 0}.\overset{128\ 64\ 32\ 16\ \ 8\ 4\ 2\ 1}{0\ 0\ 0\ 0\ \ 0\ 0\ 0\ 0}$$

. 1111 1111 . 11 00 0000

255   128
            +64
           ‾‾‾‾
            192

$2^{10} = 1024$

⊘ 50 hosts needed

$2^6 = 64 - 2 = 62$

6 remaing
= 10 borrowed

Subnetting

Problem 11

Number of needed usable hosts **8,000**
Network Address **135.70.0.0**

Address class _B_

Default subnet mask _255.255.~~0.0~~_ 0.0

Custom subnet mask _255.255.224.0_

Total number of subnets _8_

Total number of host addresses _8192_

Number of usable addresses _8190_

Number of bits borrowed _3_

What is the 6th subnet range? _135.70.160.0 $\Rightarrow$ 135.70.191.255_

What is the subnet number for the 7th subnet? _135.70.192.0_

What is the subnet broadcast address for the 3rd subnet? _135.70.95.255_

What are the assignable addresses for the 5th subnet? _135.70.128.1 $\Rightarrow$ 135.70.159.254_

135.70.

2

borrow

128 64 32 16	Host 8 4 2 1	.	128 64 32 16 8 4 2 1	. 8 4 2 1
(0) 0	135.70.0.0		to	135.70.31.255
(1) 1	135.70.32.0		to	135.70.63.255
(2) 1 0	135.70.64.0		to	135.70.95.255
(3) 1 1	135.70.96.0		to	135.70.127.255
(4) 1 0 0	135.70.128.0		to	135.70.159.255
(5) 1 0 1	135.70.160.0		to	135.70.191.255
(6) 1 1 0	135.70.192.0		to	135.70.223.255
(7) 1 1 1	135.70.224.0		to	135.70.255.255

512 1024 4096
2048 8192

32
Host

hosts $2^{13} = 8192$
$2^{13} = 8192$

borrowed $2^3 = 8$

custom = 111 0 0000 0000

128
+64
+32
255.255.224.0

49

Subnetting

Problem 12

Number of needed usable hosts **45**

Network Address **198.125.50.0**

Address class ___C___

Default subnet mask ___255.255.255.0___

Custom subnet mask ___255.255.255.192___

Total number of subnets ___4___

Total number of host addresses ___64___

Number of usable addresses ___62___

Number of bits borrowed ___2___

What is the 2nd subnet range? ___198.125.50.64 to 198.125.50.127___

What is the subnet number for the 2nd subnet? ___198.125.50.64___

What is the subnet broadcast address for the 4th subnet? ___198.125.50.255___

What are the assignable addresses for the 3rd subnet? ___198.125.50.129 to 198.125.50.190___

50

198.125.50.

| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

(0) 0 0 0 0 0 0 0 0   198.125.50.0 to 198.125.50.63
(1) 0 0 0 0 0 0 0 0   198.125.50.64 to 198.125.50.127
(2) 1 0 0 0 0 0 0 0   198.125.50.128 to 198.125.50.191
(3) 1 1 0 0 0 0 0 0   198.125.50.192 to 198.125.50.255

45 hosts needed

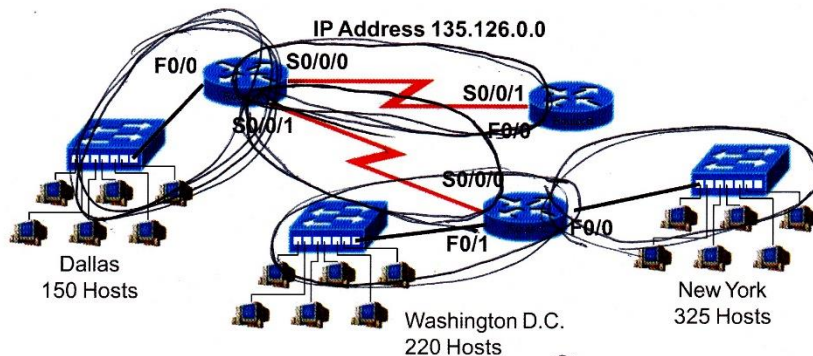$2^6 = 64 - 2 = 62$

$62 > 45$

borrow 2
$2^2 = 4$

Custom
11000011
128
+64
192

51

Practical Subnetting 4

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

IP Address 135.126.0.0

F0/0 S0/0/0
S0/0/1
F0/0
S0/0/1
S0/0/0
F0/1
F0/0

Dallas
150 Hosts

New York
325 Hosts

Washington D.C.
220 Hosts

Address class _____ B _____

Custom subnet mask ___ 255.255.240.0 ___

Minimum number of subnets needed ___ 5 ___

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

Total number of subnets needed = 9

Number of host addresses
in the largest subnet group ___ 325 ___

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

Total number of address
needed for the largest subnet = 553

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

IP address range for New York 135.126.0.0 To 135.126.31.255

IP address range for Washington D. C. 135.126.32.0 to 135.126.63.255

IP address range for Dallas 135.126.64.0 To 135.126.95.255

IP address range for Router A
to Router B serial connection 135.126.96.0 To 135.126.127.255

IP address range for Router A
to Router C serial connection 135.126.128.0 To 135.126.159.255

64

$$135.126.0.0000\ 0000\ 0000\ 0000$$

(0) 0	135.126.0.0 to 135.126.31.255
(1) 1	135.126.32.0 to 135.126.63.255
(2) 10	135.126.64.0 to 135.126.95.255
(3) 11	135.126.96.0 to 135.126.127.255
(4) 100	135.126.128.0 to 135.126.159.255
(5) 101	
(6) 110	
(7) 111	
(8) 1000	
(9) 1001	
(10) 1010	
(11) 1011	
(12) 1100	
(13) 1101	
(14) 1110	
(15) 1111	

$$325$$
$$\times 0.7$$
$$\overline{227.5} = 228$$

$$5$$
$$\times 0.7$$
$$\overline{3.5}$$
$$= 4$$

need 9
subnets

$2^4 = 16$

custom

00000000 0000 1111

$$128$$
$$+64$$
$$+32$$
$$+16$$
$$\overline{240}$$

$2^{10} = 1024$

255

65

Practical Subnetting 6

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

7

IP Address 10.0.0.0

S0/0/0 S0/0/1
F0/0 S0/0/1
S0/0/0 S0/0/1
Technology Building 320 Hosts
F0/1

Art & Drama 75 Hosts
F0/0 F0/1
Administration 35 Hosts
S0/0/0 S0/0/1

Science Building 225 Hosts
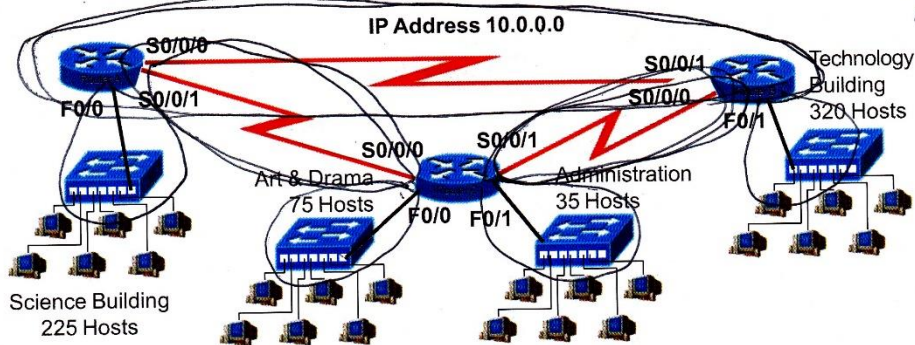
Address class ___A___

Custom subnet mask ___10.240.0.0___

Minimum number of subnets needed ___7___

Extra subnets required for 20% growth + ___2___
(Round up to the next whole number)

Total number of subnets needed = ___9___

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

IP address range for Technology	10.0.0.0	To	10.31.255.255
IP address range for Science	10.32.0.0	To	10.63.255.255
IP address range for Arts & Drama	10.64.0.0	To	10.95.255.255
IP Address range Administration	10.96.0.0	to	10.127.255.255
IP address range for Router A to Router B serial connection	10.128.0.0	to	10.159.255.255
IP address range for Router A to Router C serial connection	10.160.0.0	to	10.191.255.255
IP address range for Router B to Router C serial connection	10.192.0.0	to	10.223.255.255

10.

0000 . 0000 0000 . 0000 0000 . 0000 0000 0

(1) 000	10.0.0.0	to	10.31.255.255
(2) 001	10.32.0.0	to	10.63.255.255
(3) 010	10.64.0.0	to	10.95.255.255
(3) 011	10.96.0.0	to	10.127.255.255
(4) 100	10.128.0.0	to	10.159.255.255
(5) 101	10.160.0.0	to	10.191.255.255
(6) 110	10.192.0.0	to	10.223.255.255

$$7 \times 0.2$$
$$1.4 \rightarrow 2$$

$$2^4 = 16$$

$$2\overline{)\ }$$

Custom

10. 1111 0000 . 0000 0000 . 0000 0000 . 0000 0000 = 10.240.0.0

$$128$$
$$+64$$
$$+32$$
$$+16$$
$$\overline{240}$$