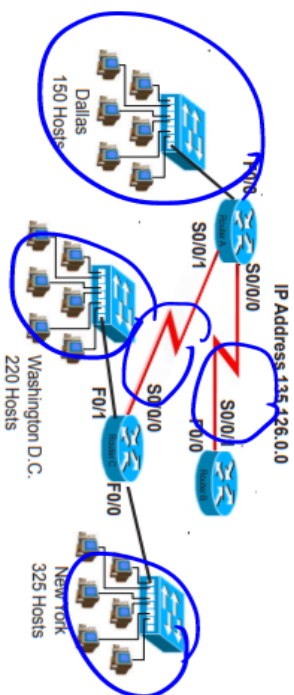# Practical Subnetting 4

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**



Dallas
150 Hosts

Washington D.C.
220 Hosts

New York
325 Hosts

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

| | |
|---|---|
| Address class | B |
| Custom subnet mask | 255.255.240.0 |
| Minimum number of subnets needed | 5 |
| Extra subnets required for 70% growth (Round up to the next whole number) | +4     5 x .7 = 3.5 |
| Total number of subnets needed | = 9 |
| Number of host addresses in the largest subnet group | 325 |
| Number of addresses needed for 70% growth in the largest subnet (Round up to the next whole number) | +228     325 * .7 = 227.5 |
| 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.

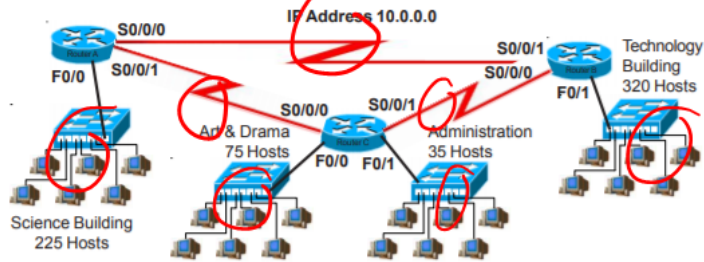| | |
|---|---|
| IP address range for New York | 135.126.0.0 → 135.126.15.255 |
| IP address range for Washington D. C. | 135.126.16.0 → 135.126.31.255 |
| IP address range for Dallas | 135.126.32.0 → 135.126.47.255 |
| IP address range for Router A to Router B serial connection | 135.126.48.0 → 135.126.63.255 |
| IP address range for Router A to Router C serial connection | 135.126.64.0 → 135.126.79.255 |

135.126.0000 0000 . 0000 0000

Borrow

R

## 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.

IP Address 10.0.0.0

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

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

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

Science Building
225 Hosts

Address class ___A___

Custom subnet mask ___255.240.0.0___

Minimum number of subnets needed ___7___

Extra subnets required for 20% growth + ___7 x .2 = 1.4 => 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 => 10 . 0 . 15.255___

IP address range for Science ___10 . 0 . 16 . 0 => 10 . 0 . 31.255___

IP address range for Arts & Drama ___10 . 0 . 32 . 0 =>___ 47.255

IP Address range Administration ___10 . 0 . 48 . 0 =>___ 63.255

IP address range for Router A to Router B serial connection ___10 . 0 . 64 . 0 =>___ 79.255

IP address range for Router A to Router C serial connection ___10 . 0 . 80 . 0 =>___ 95

IP address range for Router B to Router C serial connection ___10 . 0 . 96 . 0 =>___ 111.255

68

# 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 ___$2048 = 2^{11}$___

Total number of host addresses ___$32 = 2^5$___

Number of usable addresses ___30___     $32-2$

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 – | | | | | | | | | | | 512 | 1024 | 2048 | 4,096 | 8,192 | 16,384 | 32,768 | 65,536 |

Number of
Subnets  –   2   4   8   16  32  64  128 256.

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

11 Borrowed          5 Remaining

## Problem 11

Number of needed usable hosts **8,000**

Network Address **135.70.0.0**

Address class __B__

Default subnet mask __255.255.0.0__

Custom subnet mask __255.255.224.0__

Total number of subnets __8__

Total number of host addresses __8192__

Number of usable addresses __8190__

Number of bits borrowed __3__

160 - 191   What is the 6th subnet range? __135.70.0.160 → 135.70.0.191__

What is the subnet number for the 7th subnet? __135.70.0.192 → 135.70.0.223__

What is the subnet broadcast address for the 3rd subnet? __135.70.0.64 → 135.70.0.95__

What are the assignable addresses for the 5th subnet? __135.70.0.128 → 135.70.0.159__

48 128

64 32

135.70.000 0 0000.0 0 0 0 0 0 0 0 0 |

$2^3$
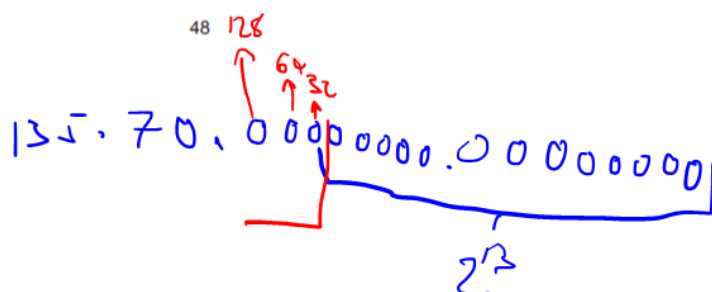
| 0 | 000 | 135.70.0.0 → 135.70.0.31 |
| 1 | 001 | 32 → 63 |
| 2 | 010 | 64 → 95 |
| 3 | 011 | 96 → 127 |
| 4 | 100 | 128 → 159 |
| 5 | 101 | 160 → 191 |
| 6 | 110 | 192 → 223 |
| 7 | 111 | 224 → 255 |

## 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 _____

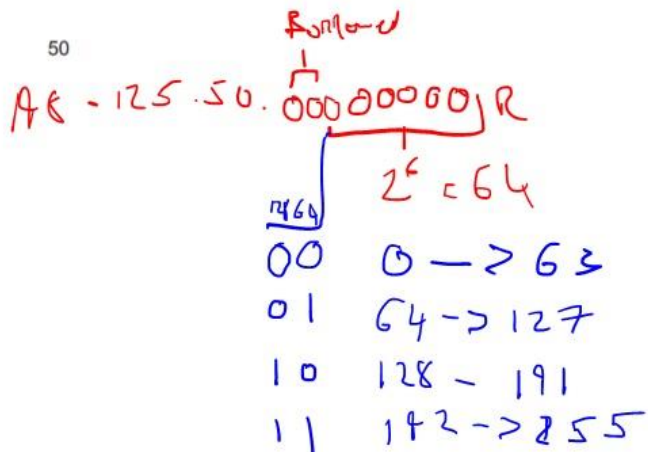Number of bits borrowed _____ 2 _____

What is the 2nd subnet range? _____ 198.125.50.64 → 198.125.50.127 _____

What is the subnet number for the 2nd subnet? 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 → 198.125.50.190 _____

50

Borrowed

$A8.125.50.\overset{\frown}{00}000000 \rceil R$

$2^6 = 64$

| n64 | |
|-----|------------|
| 00  | 0 → 63     |
| 01  | 64 → 127   |
| 10  | 128 — 191  |
| 11  | 192 → 255  |

# 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__      $64-2$

Number of bits borrowed __10__

**Show your work for Problem 15 in the space below.**

$$172.59.\underbrace{00000000.00}_{2^{10}=1024}\overbrace{000000}^{}$$

$2^{10} = 1024$

6 remaining

Leaves

64 host addresses