CHAPTER 5

Classless Addressing

Exercises

1.

With the information given, the first address is found by ANDing the host address with the mask 255.255.0.0 (/16).

Host Address:	**25**	.	**34**	**.**	**12**	**.**	**56**
Mask (ANDed):	**255**	.	**255**	**.**	**0**	**.**	**0**
Network Address (First):	**25**	.	**34**	**.**	**0**	**.**	**0**

The last address can be found by ORing the host address with the mask complement 0.0.255.255.

Host Address:	**25**	.	**34**	**.**	**12**	**.**	**56**
Mask Complement (ORed):	**0**	.	**0**	**.**	**255**	**.**	**255**
Last Address:	**25**	.	**34**	**.**	**255**	**.**	**255**

However, we need to mention that this is the largest possible block with 2^{16} addresses. We can have many small blocks as long as the number of addresses divides this number.

3.

See below. The number of created subnets are equal to or greater than required.

a. $\log_2 2 = 1$ Number of 1's = **1** Number of created subnets: 2
b. $\log_2 62 = 5.95$ Number of 1's = 6 Number of created subnets: 64
c. $\log_2 122 = 6.93$ Number of 1's = 7 Number of created subnets: 128
d. $\log_2 250 = 7.96$ Number of 1's = 8 Number of created subnets: 256

5.

a. $\log_2 500 = 8.95$ Extra 1s = **9** Possible subnets: **512** Mask: **/17**

b. $2^{32-17} = 2^{15} = 32{,}768$ Addresses per subnet

c.

First subnet:
The first address is the beginning address of the block.

first address in subnet 1:	**16**	.	**0**	.	**0**	.	**0**

To find the last address, we need to write 32,767 (one less than the number of addresses in each subnet) in base 256 (0.0.127.255) and add it to the first address (in base 256).

first address in subnet 1:	**16**	.	**0**	.	**0**	.	**0**
number of addresses:	**0**	.	**0**	.	**127**	.	**255**
last address in subnet 1:	**16**	.	**0**	.	**127**	.	**255**

d.

Last subnet (Subnet 500):
Note that the subnet 500 is not the last possible subnet; it is the last subnet used by the organization. To find the first address in subnet 500, we need to add 16,351,232 (499 × 32678) in base 256 (0. 249.128.0) to the first address in subnet 1.

first address in subnet 1	**16**	.	**0**	.	**0**	.	**0**
number of addresses:	**0**	.	**249**	.	**128**	.	**0**
first address in subnet 500:	**16**	.	**249**	.	**128**	.	**0**

Now we can calculate the last address in subnet 1024.

first address in subnet 500:	**16**	.	**249**	.	**128**	.	**0**
number of addresses:	**0**	.	**0**	.	**127**	.	**255**
last address in subnet 500:	**16**	.	**249**	.	**255**	.	**255**

7.

a. $\log_2 32 = 10$ Extra 1s = **5** Possible subnets: **32** Mask: **/29**

b. $2^{32-29} = 8$

c.

First subnet:
The first address is the beginning address of the block.

first address in subnet 1:	**211**	.	**17**	.	**180**	.	**0**

To find the last address, we need to write 7 (one less than the number of addresses in each subnet) in base 256 (0.0.0.7) and add it to the first address (in base 256).

first address in subnet 1:	**211**	.	**17**	.	**180**	.	**0**
number of addresses:	**0**	.	**0**	.	**0**	.	**7**
last address in subnet 1:	**211**	.	**17**	.	**180**	.	**7**

d.

Last subnet (Subnet 5):
To find the first address in subnet 5, we need to add 32 (4 × 8) in base 256 (0.0.0.32) to the first address in subnet 1.

first address in subnet 1	**211**	.	**17**	.	**180**	.	**0**
number of addresses:	**0**	.	**0**	.	**0**	.	**32**
first address in subnet 5:	**211**	.	**17**	.	**180**	.	**32**

Now we can calculate the last address in subnet 5 as we did for the first address.

first address in subnet 5:	**211**	.	**17**	.	**180**	.	**32**
number of addresses:	**0**	.	**0**	.	**0**	.	**7**
last address in subnet 5:	**211**	.	**17**	.	**180**	.	**39**

9.

a. The number of address in this block is $2^{32-29} = 8$. We need to add 7 (one less) addresses (0.0.0.7 in base 256) to the first address.

From:	**123**	.	**56**	.	**77**	.	**32**
	0	.	**0**	.	**0**	.	**7**
To:	**123**	.	**56**	.	**77**	.	**39**

b. The number of address in this block is $2^{32-27} = 32$. We need to add 31 (one less) addresses (0.0.0.31 in base 256) to the first address.

From:	**200**	.	**17**	.	**21**	.	**128**
	0	.	**0**	.	**0**	.	**31**
To:	**200**	.	**17**	.	**21**	.	**159**

c. The number of address in this block is $2^{32-23} = 512$. We need to add 511 (one less) addresses (0.0.1.255 in base 256) to the first address.

From:	**17**	.	**34**	.	**16**	.	**0**
	0	.	**0**	.	**1**	.	**255**
To:	**17**	.	**34**	.	**17**	.	**255**

d. The number of address in this block is $2^{32-30} = 4$. We need to 3 (one less) addresses (0.0.0.3 in base 256) to the first address.

From:	**180**	.	**34**	.	**64**	.	**64**
	0	.	**0**	.	**0**	.	**7**
To:	**180**	.	**34**	.	**64**	.	**67**

11. The site has $2^{32-20} = 2^{12} = 4096$ addresses. We need to add 7 more 1s to the site prefix ($2^x \geq 100$; $x = 7$). $2^{32-27} = 2^5 = 32$. Each of the 100 organizations has 32 addresses, but only 8 are needed. We add 2 more 1s to the site prefix. $2^{32-29} = 8$.
Subnets:

1st subnet:	**120.60.4.0/29**	**to**	**120.60.4.7/29**
...	**...**		**...**
32nd subnet:	**120.60.4.248/29**	**to**	**120.60.4.255/29**
33rd subnet:	**120.60.5.0/29**	**to**	**120.60.5.7/29**
...	**...**		**...**
64th subnet:	**120.60.5.248/29**	**to**	**120.60.5.255/29**
...	**...**		**...**
99th subnet:	**120.60.7.16/29**	**to**	**120.60.7.23/29**
100th subnet:	**120.60.7.24/29**	**to**	**120.60.7.31/29**

4096 – 800 = 3296 addresses left