IP Addressing and Subnetting

Workbook

Version 1.5

11111110

10010101

00011011

10000110

11010011

Student Name:
Lyndon Renaud
104 566 776

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

Workbooks included in the series:

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

Inside Cover

Binary To Decimal Conversion

Lyndon Renard
104 566 776

128	64	32	16	8	4	2	1	Answers
1	0	0	1	0	0	1	0	146
0	1	1	1	0	1	1	1	119
1	1	1	1	1	1	1	1	255
1	1	0	0	0	1	0	1	197
1	1	1	1	0	1	1	0	246
0	0	0	1	0	0	1	1	19
1	0	0	0	0	0	0	1	129
0	0	1	1	0	0	0	1	49
0	1	1	1	1	0	0	0	120
1	1	1	1	0	0	0	0	240
0	0	1	1	1	0	1	1	59
0	0	0	0	0	1	1	1	7

Binary	Answers
00011011	27
10101010	170
01101111	111
11111000	248
00100000	32
01010101	85
00111110	62
00000011	3
11101101	237
11000000	192

Scratch Area

```
128   64
16    32
 2    16
146    4
       2
       1
      119
```

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104 566 776

Decimal To Binary Conversion
Use all 8 bits for each problem

128	64	32	16	8	4	2	1	= 255
1	1	1	0	1	1	1	0	238
0	0	1	0	0	0	1	0	34
0	1	1	1	1	0	1	1	123
0	0	1	1	0	0	1	0	50
1	1	1	1	1	1	1	1	255
1	1	0	0	1	0	0	0	200
0	0	0	0	1	0	1	0	10
1	0	0	0	1	0	1	0	138
0	0	0	0	0	0	0	1	1
0	0	0	0	1	1	0	1	13
1	1	1	1	1	0	1	0	250
0	1	1	0	1	0	1	1	107
1	1	1	0	0	0	0	0	224
0	1	1	1	0	0	1	0	114
1	1	0	0	0	0	0	0	192
1	0	1	0	1	1	0	0	172
0	1	1	0	0	1	0	0	100
0	1	1	1	0	1	1	1	119
0	0	1	1	1	0	0	1	57
0	1	1	0	0	0	1	0	98
1	0	1	1	0	0	1	1	179
0	0	0	0	0	0	1	0	2

Scratch Area

```
 238        34     64+32 = 96+11
-128       -32     128+64 =192
 110         2
 -64        -2
  46         0
 -32
  14
  -8
   6
  -4
   2
  -2
   0
```

114 - 96 = 18

172 - 128 = 44

32 + 16 = 48

128 + 32 = 160

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Class A 0xxx...
Class B 10xx...
Class C 110x...
Class D 1110
Class E 1111

Address Class Identification

Address	Class
0000 1010	
10.250.1.1	A
1001 0110	
150.10.15.0	B
1100 0010	
192.14.2.0	C
1001 0100	
148.17.9.1	B
1100 0001	
193.42.1.1	C
0111 1110	
126.8.156.0	A
1101 1100	
220.200.23.1	C
1110 0110	
230.230.45.58	D
1011 0001	
177.100.18.4	B
0111 0111	
119.18.45.0	A
1111 1001	
249.240.80.78	E
1100 0111	
199.155.77.56	C
0111 0101	
117.89.56.45	A
1101 0111	
215.45.45.0	C
1100 0111	
199.200.15.0	C
0101 1111	
95.0.21.90	A
0010 0001	
33.0.0.0	A
1001 0110	
158.98.80.0	B
1101 1011	
219.21.56.0	C

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Lyndon Renard
104 566 776

Network & Host Identification

Circle the network portion of these addresses:	Circle the host portion of these addresses:

1011 001-0110 0100. 0001 0010. 0000 0100
(177.100.1)8.4

0110111
(119.1)8.45.0

1101 0001
(209.240.80)78

1100 0111
(199.155.77)56

0111 0101
(117)89.56.45

1101 0111
(215.45.45)0

1100 0800
(192.200.15)0

0101
(95)0.21.90

0010
(33)0.0.0

1001 1110
(158.98)80.0

1101 1001
(217.21.56)0

0000 1000
(10)250.1.1

1001 0110
(150.10)15.0

1100 000
(192.14.2)0

1001 0100
(148.17)9.1

1100 0001
(193.42.1)1

0111 1110
(126)8.156.0

1101 1100
(220.200.23)1

0000 1000
10.**(15.123.50)**

171.2.**(199.31)**

1100 0110
198.125.87.**(177)**

1101 1111
223.250.200**(222)**

0001 0001
17.**(45.222.45)**

0111 1110
126**(201.54.231)**

1011 1111
191.41.**(35.112)**

1001 1011
155.25.**(169.227)**

1100 0000
192.15.155**(2)**

0111 1011
123.**(102.45.254)**

1001 0100
148.17.**(9.155)**

0110 0100
100.**(25.1.1)**

1100 0011
195.0.21.**(98)**

0001 1001
25.**(250.135.46)**

1010 1011
171.102.**(77.77)**

0011 0111
55.**(250.5.5)**

1101 1010
218.155.230.**(14)**

0000 1010
10.**(250.1.1)**

Lyndan Renaud
104 566 776

Network Addresses

Using the IP address and subnet mask shown write out the network address:

188.10.18.2
255.255.0.0
          _188 . 10 . 0 . 0_

10.10.48.80
255.255.255.0
          _10 . 10 . 48 . 0_

192.149.24.191
255.255.255.0
          _192.149.24.0_

150.203.23.19
255.255.0.0
          _150.203.0.0_

10.10.10.10
255.0.0.0
          _10.0.0.0_

186.13.23.110
255.255.255.0
          _186.13.23.0_

223.69.230.250
255.255.0.0
          _223.69.0.0_

200.120.135.15
255.255.255.0
          _200.120.135.0_

27.125.200.151
255.0.0.0
          _27.0.0.0_

199.20.150.35
255.255.255.0
          _199.20.150.0_

191.55.165.135
255.255.255.0
          _191.55.165.0_

28.212.250.254
255.255.0.0
          _28.212.0.0_

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Lyndon Renaud
104 566 776

Host Addresses

Using the IP address and subnet mask shown write out the host address:

188.10.18.2
255.255.0.0

0 . 0 . 18 . 2

10.10.48.80
255.255.255.0

0 . 0 . 0 . 80

222.49.49.11
255.255.255.0

0.0.0.11

128.23.230.19
255.255.0.0

0.0.230.19

10.10.10.10
255.0.0.0

0.10.10.10

200.113.123.11
255.255.255.0

0.0.0.11

223.169.23.20
255.255.0.0

0.0.23.20

203.20.35.215
255.255.255.0

0.0.0.215

117.15.2.51
255.0.0.0

0.15.2.51

199.120.15.135
255.255.255.0

0.0.0.135

191.55.165.135
255.255.255.0

0.0.0.135

48.21.25.54
255.255.0.0

0.0.25.54

Default Subnet Masks

Write the correct default subnet mask for each of the following addresses:

177.100.18.4   255 . 255 . 0 . 0

119.18.45.0   255 . 0 . 0 . 0

10111111 ClassB
191.249.234.191   255 . 255 . 0 . 0

11011111 ClassC
223.23.223.109   255 . 255 . 255 . 0

00001010 Class A
10.10.250.1   255 . 0 . 0 . 0

0111110 Class A
126.123.23.1   255 . 0 . 0 . 0

11011111 Class C
223.69.230.250   255 . 255 . 255 . 0

11000000 Class C
192.12.35.105   255 . 255 . 255 . 0

01001101 Class A
77.251.200.51   255 . 0 . 0 . 0

10111101 Class B
189.210.50.1   255 . 255 . 0 . 0

01011000 Class A
88.45.65.35   255 . 0 . 0 . 0

1000 0000 Class B
128.212.250.254   255 . 255 . 0 . 0

1100 0001 Class C
193.100.77.83   255 . 255 . 255 . 0

0111 1101 Class A
125.125.250.1   255 . 0 . 0 . 0

0000 0001 Class A
1.1.10.50   255 . 0 . 0 . 0

1101 1100 Class C
220.90.130.45   255 . 255 . 255 . 0

1000 0110 Class B
134.125.34.9   255 . 255 . 0 . 0

0101 1111 Class A
95.250.91.99   255 . 0 . 0 . 0

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Custom Subnet Masks

Problem 4

Number of needed subnets **6**
Number of needed usable hosts **30**
Network Address **210.100.56.0**
11010001

Address class ___C___

Default subnet mask $255 \cdot 255 \cdot 255 \cdot 0$

Custom subnet mask $255 \cdot 255 \cdot 255 \cdot 224$

Total number of subnets ___8___

Total number of host addresses ___32___

Number of usable addresses ___30___

Number of bits borrowed ___3___

Show your work for <u>Problem 4</u> in the space below.

									Number of Hosts
	256	128	64	32	16	8	4	2	—
Number of Subnets —	2	4	8	16	32	64	128	256	
	128	64	32	16	8	4	2	1	— Binary values

210 . 100 . 56 . 0 0 0 | 0 0 0 0 0

$128 + 64 + 32$
$= 224$

$2^5 - 2 = 30$ usable hosts / subnet
$2^5 = 32$ total hosts / subnet

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