

# How to Calculate Subnets

Subnets and Hosts

## Borrow 2 bits

S	S	H	H	H	H	H	H
---	---	---	---	---	---	---	---

# of subnets =  $2^2 = 4$

Subnet mask = 2 bits = 128 + 64 = 192

Range of hosts =  $2^6 = 64$

	Range	Useable Range
Network ID	0 – 63	
	64 – 127	65 - 126
	128 – 191	129 - 190
Broadcast Address	192 – 255	

## Borrow 3 bits

S	S	S	H	H	H	H	H
---	---	---	---	---	---	---	---

# of subnets =  $2^3 = 8$

Subnet mask = 3 bits = 128 + 64 + 32 = 224

Range of hosts =  $2^5 = 32$

	Range	Useable Range
Network ID	0 – 31	
	32 – 63	33 - 62
	64 – 95	65 - 94
	96 – 127	97 -126
	128 – 159	129 -158
	160 – 191	161 -190
	192 – 223	193 -222
Broadcast Address	224 – 255	

# How to Calculate Subnets

## Decimal/Binary Subnet Ranges

### Borrow 2 bits

S	S	H	H	H	H	H	H
---	---	---	---	---	---	---	---

# of subnets =  $2^2 = 4 = 00000100$

Subnet mask = 2 bits =  $128 + 64 = 192 = 11000000$

Range of hosts =  $2^6 = 64 = 01000000$

	[Range .....	]	[Useable Range .....	]
Network ID	0 – 63	00 000000 – 00 111111		
	64 – 127	01 000000 – 01 111111	65 - 126	01 000001 – 01 111110
	128 – 191	10 000000 – 10 111111	129 – 190	10 000001 – 10 111110
Broadcast	192 – 255	11 000000 – 11 111111		
Address				

### Borrow 3 bits

S	S	S	H	H	H	H	H
---	---	---	---	---	---	---	---

# of subnets =  $2^3 = 8$

Subnet mask = 3 bits =  $128 + 64 + 32 = 224 = 11100000$

Range of hosts =  $2^5 = 32 = 00100000$

	[Range .....	]	[Useable Range .....	]
Network ID	0 – 31	000 00000 – 000 11111		
	32 – 63	001 00000 – 001 11111	33 – 62	001 00001 – 001 11110
	64 – 95	010 00000 – 010 11111	65 – 94	010 00001 – 010 11110
	96 – 127	011 00000 – 011 11111	97 – 126	011 00001 – 011 11110
	128 – 159	100 00000 – 100 11111	129 – 158	100 00001 – 100 11110
	160 – 191	101 00000 – 101 11111	161 – 190	101 00001 – 101 11110
	192 – 223	110 00000 – 110 11111	193 – 222	110 00001 – 110 11110
Broadcast	224 – 255	111 00000 – 111 11111		
Address				

# How to Calculate Subnets

## Binary Subnet Ranges

### Borrow 2 bits

S	S	H	H	H	H	H	H
---	---	---	---	---	---	---	---

# of subnets =  $2^2 = 4 = 00000100$

Subnet mask = 2 bits = 128 + 64 = 192 = 11000000

Range of hosts =  $2^6 = 64 = 01000000$

[Net]	[Useable]	[Broadcast]	[Network]	[Useable Range .....	[Broadcast]
[ID]	[Range]		[ID]		
0		63	00 000000		00 111111
64	65 – 126	127	01 000000	01 000001 – 01 111110	01 111111
128	129 – 190	191	10 000000	10 000001 – 10 111110	10 111111
192		255	11 000000		11 111111

### Borrow 3 bits

S	S	S	H	H	H	H	H
---	---	---	---	---	---	---	---

# of subnets =  $2^3 = 8$

Subnet mask = 3 bits = 128 + 64 + 32 = 224 = 11100000

Range of hosts =  $2^5 = 32 = 00100000$

[Net]	[Useable]	[Broadcast]	[Network]	[Useable Range .....	[Broadcast]
[ID]	[Range]		[ID]		
0		31	000 00000		000 11111
32	33 – 62	63	001 00000	001 00001 – 001 11110	001 11111
64	65 – 94	95	010 00000	010 00001 – 010 11110	010 11111
96	97 – 126	127	011 00000	011 00001 – 011 11110	011 11111
128	129 – 158	159	100 00000	100 00001 – 100 11110	100 11111
160	161 – 190	191	101 00000	101 00001 – 101 11110	101 11111
192	193 – 222	223	110 00000	110 00001 – 110 11110	110 11111
224		255	111 00000		111 11111

# HOW TO SUBNET IN YOUR HEAD.

## SUBNET PATTERNS

### STEP ONE

COUNT



### STEP TWO

DOCUMENT  
BINARY PLACE  
VALUE

$2^7$   $2^6$   $2^5$   $2^4$   $2^3$   $2^2$   $2^1$   $2^0$   
128 64 32 16 8 4 2 1

RIGHT TO LEFT

### STEP THREE

ADD

128 "+64" "+32" "+16" "+8" "+4" "+2" "+1"

LEFT TO RIGHT

EQUALS

128 192 224 240 248 252 254 255

### STEP FOUR

CLOSE YOUR EYES AND REPEAT STEPS 1-3

BITS BORROWED

1 2 3 4 5 6 7 8

RANGE OF  
HOSTS

128 64 32 16 8 4 2 1

SUBNET MASK

128 192 224 240 248 252 254 255

# HOW TO SUBNET IN YOUR HEAD.

<b>1 BIT BORROWED</b>	<b>1</b>	2	3	4	5	6	7	8
<b>RANGE OF HOSTS</b>	<b>128</b>	64	32	16	8	4	2	1
<b>SUBNET MASK</b>	<b>128</b>	192	224	240	248	252	254	255

  

<b>2 BITS BORROWED</b>	<b>1</b>	<b>2</b>	3	4	5	6	7	8
<b>RANGE OF HOSTS</b>	<b>128</b>	<b>64</b>	32	16	8	4	2	1
<b>SUBNET MASK</b>	<b>128</b>	<b>192</b>	224	240	248	252	254	255

  

<b>3 BITS BORROWED</b>	<b>1</b>	2	<b>3</b>	4	5	6	7	8
<b>RANGE OF HOSTS</b>	<b>128</b>	64	<b>32</b>	16	8	4	2	1
<b>SUBNET MASK</b>	<b>128</b>	192	<b>224</b>	240	248	252	254	255

  

<b>4 BITS BORROWED</b>	<b>1</b>	2	3	<b>4</b>	5	6	7	8
<b>RANGE OF HOSTS</b>	<b>128</b>	64	32	<b>16</b>	8	4	2	1
<b>SUBNET MASK</b>	<b>128</b>	192	224	<b>240</b>	248	252	254	255

  

<b>5 BITS BORROWED</b>	<b>1</b>	2	3	4	<b>5</b>	6	7	8
<b>RANGE OF HOSTS</b>	<b>128</b>	64	32	16	<b>8</b>	4	2	1
<b>SUBNET MASK</b>	<b>128</b>	192	224	240	<b>248</b>	252	254	255

  

<b>6 BITS BORROWED</b>	<b>1</b>	2	3	4	5	<b>6</b>	7	8
<b>RANGE OF HOSTS</b>	<b>128</b>	64	32	16	8	<b>4</b>	2	1
<b>SUBNET MASK</b>	<b>128</b>	192	224	240	248	<b>252</b>	254	255

  

<b>7 BITS BORROWED</b>	<b>1</b>	2	3	4	5	6	<b>7</b>	8
<b>RANGE OF HOSTS</b>	<b>128</b>	64	32	16	8	4	<b>2</b>	1
<b>SUBNET MASK</b>	<b>128</b>	192	224	240	248	252	<b>254</b>	255

  

<b>8 BITS BORROWED</b>	<b>1</b>	2	3	4	5	6	7	<b>8</b>
<b>RANGE OF HOSTS</b>	<b>128</b>	64	32	16	8	4	2	<b>1</b>
<b>SUBNET MASK</b>	<b>128</b>	192	224	240	248	252	254	<b>255</b>