New IP and Subnetting Cheat Sheet

IP Subnetting Chart Color Code	Class A	Class B	Class C

Memorize This								
1	2	3	4	5	6	7	8	BITS
128	64	32	16	8	4	2	1	BINARY (Sub-network Starting Range)
	192	224	240	248	252	254	255	MASK

Class A =	00000000 =	1.0.0.0 - 126.0.0.0	0.0.0.0 and 127.0.0.0 are reserved	255.0.0.0 - Default
Class B =	10000000 =	128.1.0.0 - 191.254.0.0	128.0.0.0 and 191.255.0.0 are reserved	255.255.0.0 - Default
Class C =	11000000 =	192.0.1.0 - 223.255.254.0	192.0.0.0 and 223.255.255.0 are reserved	255.255.255.0 - Default
Class D =	11100000 =	224	Not Used	
Class E =	11110000 =	240	Not Used	

Class A	# Useable Subnets	# Useable Subnets	# Useable Subnets	Class A Bits	Class B Bits	Class C Bits	Subnet Mask	Starting Range of Network	# Hosts Per Subnet	
	0			1			Invalid	Invalid	Invalid	
	2			2			255.192.0.0	64	4,194,302	
	6			3			255.224.0.0	32	2,097,150	
	14			4			255.240.0.0	16	1,048,574	
	30			5			255.248.0.0	8	524,286	
	62			6			255.252.0.0	4	262,142	
	126			7			255.254.0.0	2	131,070	
Double	254			8			255.255.0.0	1	65,534	Double
it ↗	510			9			255.255.128.0	128	32766	↖ it
	1022	0		10	1		Invalid	Invalid	Invalid	
and →	2046	2		11	1		255.255.192.0	64	16382	← and
Add ↘	4094	6		12	2		255.255.224.0	32	8190	↙ Add
2	8190	14		13	3		255.255.240.0	16	4094	2
	16382	30		14	4		255.255.248.0	8	2046	
	32766	62		15	5		255.255.252.0	4	1022	
	65534	126		16	6		255.255.254.0	2	510	
	131070	254		17	7		255.255.255.0	1	254	
	262142	510		18	8		255.255.255.128	128	126	
	524286	1022	0	19	9	1	Invalid	Invalid	Invalid	
	1048574	2046	2	20	10	2	255.255.255.192	64	62	
	2097150	4094	6	21	11	3	255.255.255.224	32	30	
	4194302	8190	14	22	12	4	255.255.255.240	16	14	
		16382	30		13	5	255.255.255.248	8	6	
			62		14	6	255.255.255.252	4	2	

Memorize This

!There are only 7 valid Subnet Masks!

Calculate Subnets: $2^x - 2$ (All bits included in the binary subnet mask number)

Calculate Hosts: $2^x - 2$ (All bits left after the binary subnet mask number)

Calculate Subnet multiples and starting range: 256 minus Subnet mask

Memorize This						
Class B	# Useable Subnets	Bits	Subnet Mask	Starting Range of Network ID's for Subnets	# Hosts Per Subnet Class – B	
	0	1	Invalid	Invalid	Invalid	
	2	2	255.255.192.0	64	16,382	
	6	3	255.255.224.0	32	8,190	
	14	4	255.255.240.0	16	4,094	
Double	30	5	255.255.248.0	8	2,046	Double
it ↗	62	6	255.255.252.0	4	1,022	↖ it
and →	126	7	255.255.254.0	2	510	← and
Add ↘	254	8	255.255.255.0	1	254	↙ Add
2	510	9	255.255.255.128	128	126	2
	1022	10	255.255.255.192	64	62	
	2046	11	255.255.255.224	32	30	
	4094	12	255.255.255.240	16	14	
	8190	13	255.255.255.248	8	6	
	16382	14	255.255.255.252	4	2	
Class C	# Useable Subnets	Bits	Subnet Mask	Starting Range of Network ID's for Subnets	# Hosts Per Subnet Class – C	
	0	1	Invalid	Invalid	Invalid	
Double	2	2	255.255.255.192	64	62	Double
it ↗	6	3	255.255.255.224	32	30	↖ it
and →	14	4	255.255.255.240	16	14	← and

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Add ↘	30	5	255.255.255.248	8	6	↙ Add
2	62	6	255.255.255.252	4	2	2
↱						↲

!There are only 7 valid Subnet Masks!

Calculate Subnets: $2^x - 2$ (All bits included in the binary subnet mask number)
Calculate Hosts: $2^x - 2$ (All bits left after the binary subnet mask number)
Calculate Subnet multiples and starting range: 256 minus Subnet mask

Example:

Calculate subnets given the network address and subnet mask, calculate as follows:
Network Address: 192.168.10.0 = 11000000.10101000.00001010.00000000 (Binary)
Subnet Mask: 255.255.255.224 = 11111111.11111111.11111111.00100000 (Binary)

Mask Decimal	Mask Binary	Subnets	Hosts	Calculate	Starting Range and Subnetwork number	First Valid	Last Valid	Sub-Network	Broadcast
224	00100000	001	00000	Subnets: $2^3 - 2 = 6$	256 – 224 = 32	33	62	32	63
		Bits = 3	*Bits = 5*	Hosts: $2^5 - 2 = 30$	32 + 32 = 64	65	94	64	95

First number in the subnetwork range, is the subnet number.
Last number in the subnetwork range, is the broadcast number.

Calculate the subnet given the IP host address and subnet mask, calculate as follows:
Host Address: 192.168.10.34 = 11000000.10101000.00001010.00100010 (Binary)
Subnet Mask: 255.255.255.224 = 11111111.11111111.11111111.00100000 (Binary)
Subnet for host address = Use the AND Operation to calculate - .00100000 (32)

Bit Position	8	7	6	5	4	3	2	1	
Power of 2	256	128	64	32	16	8	4	2	
High Bit Sum (reversed)	255	254	252	248	240	224	192	128	This is your mask
Subnets Available	254	126	62	30	14	6	2	0	
	To find network Id's								
Bit Position from above	1	2	3	4	5	6	7	8	
Pattern Key	128	64	32	16	8	4	2	1	

IP Address Bit Patterns

	# Bits	1	7	24	
Class A:		0	Network #	Host #	All Class A Addresses start with binary 0

	# Bits	1	1	14	16	
Class B:		1	0	Network #	Host #	All Class B Addresses start with binary 10

	# Bits	1	1	1	21	8	
Class C:		1	1	0	Network #	Host #	All Class C Addresses start with binary 110

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Class A Host/Subnet Table

Bits Borrowed	Subnet Mask	Subnets	Hosts	/Mask Bits
2	255.192.0.0	4	4194302	/10
3	255.224.0.0	8	2097150	/11
4	255.240.0.0	16	1048574	/12
5	255.248.0.0	32	524286	/13
6	255.252.0.0	64	262142	/14
7	255.254.0.0	128	131070	/15
8	255.255.0.0	256	65534	/16
9	255.255.128.0	512	32766	/17
10	255.255.192.0	1024	16382	/18
11	255.255.224.0	2048	8190	/19
12	255.255.240.0	4096	4094	/20
13	255.255.248.0	8192	2046	/21
14	255.255.252.0	16384	1022	/22
15	255.255.254.0	32768	510	/23
16	255.255.255.0	65536	254	/24
17	255.255.255.128	131072	126	/25
18	255.255.255.192	262144	62	/26
19	255.255.255.224	524288	30	/27
20	255.255.255.240	1048576	14	/28
21	255.255.255.248	2097152	6	/29
22	255.255.255.252	4194304	2	/30

Class B Host/Subnet Table

Bits Borrowed	Subnet Mask	Subnets	Hosts	/Mask Bits
2	255.255.192.0	4	16382	/18
3	255.255.224.0	8	8190	/19
4	255.255.240.0	16	4094	/20
5	255.255.248.0	32	2046	/21
6	255.255.252.0	64	1022	/22
7	255.255.254.0	128	510	/23
8	255.255.255.0	256	254	/24
9	255.255.255.128	512	126	/25
10	255.255.255.192	1024	62	/26
11	255.255.255.224	2048	30	/27
12	255.255.255.240	4096	14	/28
13	255.255.255.248	8192	6	/29
14	255.255.255.252	16384	2	/30

Class C Host/Subnet Table

Bits Borrowed	Subnet Mask	Subnets	Hosts	/Mask Bits
2	255.255.255.192	4	62	/26
3	255.255.255.224	8	30	/27
4	255.255.255.240	16	14	/28
5	255.255.255.248	32	6	/29
6	255.255.255.252	64	2	/30

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