

## “Sub-netting Made Easy (Using The Sub-net, Host and Mask Table)”

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										2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	2 <sup>4</sup>	2 <sup>5</sup>	2 <sup>6</sup>	2 <sup>7</sup>	2 <sup>8</sup>										
		Sub-nets Minus 2								(	2	4	8	16	32	64	128	256	)	512	1,024	2,048	4,096	8,192	16,384	32,768	65,536
32,768	16,384	8,192	4,096	2,048	1,024	512	256	(	128	64	32	16	8	4	2	1	)	Hosts Minus 2									
128	192	224	240	248	252	254	255	(	128	192	224	240	248	252	254	255	)	128	192	224	240	248	252	254	255		
										2 <sup>7</sup>	2 <sup>6</sup>	2 <sup>5</sup>	2 <sup>4</sup>	2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>										

- Rules:**
1. Only use actual sub-netted bits, (not default subnet mask bits) borrowed.
  2. When determining sub-nets and hosts don't forget to subtract two from the number on the host and sub-net lines.
  3. The center octet (**BETWEEN RED PARENTHESES**) is the first octet of a 24 bits possible for use on the **HOST LINE** right to left. Or the first octet of 24 bits possible for the sub-net line going from left to right.
  4. Always count host bit places from the "2" not the RED 1.
  5. Don't make this too complicated or it won't work, remember this table is the vulgate of ip sub-netting. This is a useful table that can be memorized and jotted down before the CCNA exam

### Examples:

You have a network ID of 128.0.124.0 and you want to divide it into multiple sub-nets, and you need 700 usable hosts for each sub-net. What would the subnet mask be? We look at the middle host line and follow it over to 1024 and subtract 2. As we can see this gives us 1022 usable hosts. What is the sub-net mask? Drop down one line and we see 252. For the sub-nets we look and see that the bit position where the 1024 and the 252 reside are the sixth bit in that octet (Counting from the left). We now count from the YELLOW highlighted 128 six places to the right, look up to the sub-net line and see 64, subtract 2 and we see that we have 62 sub-nets. Our sub-net mask is 255.255.252.0

Suppose you have a 19 bit sub-net mask, how many sub-nets and how many hosts do you have? First of all to have a 19 bit sub-net mask that would indicate a class "A" address, because it can use the maximum number of bits for sub-netting (24). So subtract the first 16 because the 2<sup>nd</sup> and 3<sup>rd</sup> octets have been completely used up (remember the first octet is the default sub-net mask). This leaves you with 3 sub-netted bits remaining in the last octet, so we now count from the YELLOW highlighted 128 (Sub-net Mask Line) 3 places and our sub-net mask is 224. We know from just looking that to figure sub-nets or hosts higher than two octets we would run off page, so we look up to our host line directly above 224 and we see 32, then subtract 2 which equals 30 usable hosts. Remember that half an answer can usually give rise to the whole answer.

We only need to know our sub-net mask to determine sub-net and host range so we use the table above as follows: We will use the first example of the class B address, with the sub-net mask of 255.255.252.0. We subtract the 252 from the total number of bits possible, which is 256 or 2<sup>8</sup>. 256-252=4. Our first sub-net starts with 4, (also known as sub-net 0) so we will list them in order as follows:

- 4
- 8
- 12
- 16
- 20

**Our host range numbers are the numbers between the sub-net numbers minus the allowance for the next sub-net and broadcast address.**

4	4-7
8	8-11
12	12-15
16	16-19
20	20-23

**The following addresses are only a partial listing, as we could keep going until all the 62 sub-nets are used up. Notice that the hosts are numbered 1-254. Don't forget this at test time. 128.0.7.255 is the broadcast address for sub-net 0. 128.0.4.0 is the network address for sub-net 0. Please note that in most addressing schemes sub-net 0 would not be used, you would simply skip this sub-net, and use the next one.**

<b>Sub-net</b>	<b>Host Range</b>
0	128.0.4.1 - 128.0.7.254
1	128.0.8.1 - 128.0.11.254
2	128.0.12.1 - 128.0.15.254
3	128.0.16.1 - 128.0.19.254
4	128.0.20.1 - 128.0.23.254

**It is my hope that anyone preparing to sit for the CCNA exam will memorize the table and find it useful. I came up with this just before I was going to take the test. I looked everywhere on the Internet and to no avail. I was sweating bullets thinking I was going to get 10 questions on sub-netting. I only got 3 !!**

**Good Luck,**

**Tom Baldyga, CCNA**