1. Powers of 2

1024	512	256	128	64	32	16	8	4	2	1
2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0

2. The number of host-bits + (sub)network bits is 32

#N + #H = 32

Example 1: /17 -> what is the number of Host bits?
Solution 1: #H = 32 – 17 = 15

Here #H = the number of host bits
Here #N = the number of (sub)network bits

3. How do I calculate the number of (sub)networks?

$\#N = 2^n$

Here n is the number of (sub)network bits

Example 1: How many subnets can you create if you extend your subnet mask from /16 → /19?
Solution 1: Subnetting from /16 -> /19 → n bits are 19 – 16 = 3
So $\#N = 2^3 = 8$ subnets

Example 2: How many subnets bits do I need to support 160 subnets?
Solution 2: # $N = 2^N$ → this should be >= 160 → $2^8 = 256$, so n = 8. The number of subnets bits required is 8.

4. How do I calculate the number of hosts per (sub)network?

$\#H = (2^h-2)$

Here h is the number of host bits

Example 1: How many hosts can you support with 7 host-bits?
Solution 1: h = 7 → $\#H = (2^7 – 2) = 128 - 2 = 126$.

Example 2: How many host-bits do I need to support 160 hosts?
Solution 2: $\#H = (2^h – 2)$ → this should be >= 160 → $(2^8 - 2) = 254$, so h =8. The number of host-bits required is 8. (so the number of (sub)network bits are 32 – 8 = /24, see paragraph 8)

5. How do I convert Netmasks from / (=cidr or vlsm) notation to dotted decimal?

Divide in groups of 8 bits and the remainder can be found in the following table:

/1 /9	/17 /25	→	.128	/5 /13 /21 /29	→	.248
/2 /10	/18 /26	→	.192	/6…	→	.252
/3..		→	.224	/7…	→	.254
/4…		→	.240	/8 /16 /24 /32	→	.255

Example 1: Convert /28 to dotted decimal notation.
Solution 1: /28 = /8 + /8 + /8 + /4 = 255.255.255.240

Example 2: Convert /30 to dotted decimal notation.
Solution 2: /30 = /8 + /8 + /8 + /6 = 255.255.255.252

Example 3: Convert /15 to dotted decimal notation.
Solution 2: /15 = /8 + /7 + /0 + /0 = 255.254.0.0

6. Using the "Magic" number

The magic number allows you to easily calculate the sizes of various subnets.
Example 1: What are the possible subnets if you subnet 192.168.0.0/24 to /26?

Write "**256**" above the netmask value in the octet that is being subnetted and subtract the value. The result is the "Magic" number – or subnet size:

→ **256** → this number is fixed
255.255.255.192
---------- -
64

So 64 is the Magic number. You can now easily deduct the corresponding subnets:

1st subnet: 192.168.0.0 → **add 64 to step to the 2nd subnet:**
2nd subnet: 192.168.0.64 → **add 64 to step to the 3rd subnet:**
3rd subnet: 192.168.0.128 → **add 64 to step to the 4th subnet:**
4th subnet: 192.168.0.192

→ can you perform this as well for 172.16.1.0/19?..

7. Calculation the subnet mask left-to-right

If you are calculating the netmask and the number of subnet-bits is known, then calculate left-to-right.

Example 1: You want to create 8 subnets within 192.168.1.0/26
Solution 1: As $2^3 = 8$, this will require 3 subnet-bits.

Then to the /26 (the left 26 subnet bits), you add 3 subnet bits. /26 + 3 = /29. Your new subnet mask will be 255.255.255.248.

8. Calculating the subnet mask right-to-left

This is done when you are calculating your subnet by looking at the number of hosts-per-subnet.

Example 1: You want to create subnets within 192.168.16.0/23 that support 28 hosts.
Solution 1: As (2^5-2)>= 28, your number of host-bits is 5. The number of host bits will now be deducted from all 32 netmask bits (working right-to-left) : /32 – 5 = /27. Your new subnets mask will be 255.255.255.224.

9. Calculating a wildcard mask

For the Cisco fans: the wildcard mask (used in ACL's, OSPF etc.) are calculated by deducting a netmask from the entire /32 bits.

Example 1: what is the wildcard mask for /27 = 255.255.255.224?

Solution 1:
```
  255.255.255.255
  255.255.255.224      –
  ----------------------
    0 .  0 .  0 . 31   will be the corresponding wildcard mask.
```