Subnetting Speed Kit — Method sheet

Answer IPv4 subnetting questions in about 30 seconds: one chart, one 4-step method, no long binary.

1 · The chart to write from memory

bit value	128	64	32	16	8	4	2	1
mask octet	128	192	224	240	248	252	254	255
block size	128	64	32	16	8	4	2	1
prefix, 4th octet	/25	/26	/27	/28	/29	/30	/31	/32
prefix, 3rd octet	/17	/18	/19	/20	/21	/22	/23	/24
prefix, 2nd octet	/9	/10	/11	/12	/13	/14	/15	/16

Build it in three moves: halve from 128 for the bit values, add them up for the mask octets, the block size is the bit value again. Prefixes count up by one per column.

2 · The 4-step method

1. **Interesting octet:** the mask octet that isn't 255 (or 0). /25–/32 → 4th, /17–/24 → 3rd, /9–/16 → 2nd.
2. **Block size** (the "magic number") = 256 − that mask octet.
3. **Network:** round the address's octet *down* to a multiple of the block. Octets to the right become 0.
4. **Broadcast** = next network − 1 (octets to the right become 255). **Usable** = everything in between.

3 · /24 to /32 (4th octet)

CIDR	Mask	Block	Usable
/24	255.255.255.0	256	254
/25	255.255.255.128	128	126
/26	255.255.255.192	64	62
/27	255.255.255.224	32	30
/28	255.255.255.240	16	14
/29	255.255.255.248	8	6
/30	255.255.255.252	4	2
/31	255.255.255.254	2	2*
/32	255.255.255.255	1	1**

* /31: both addresses usable on a point-to-point link (RFC 3021). ** /32: one address, a host route.

/16 to /23 (3rd octet — the common miss)

CIDR	Mask	Block	Usable
/16	255.255.0.0	256	65,534
/17	255.255.128.0	128	32,766
/18	255.255.192.0	64	16,382
/19	255.255.224.0	32	8,190
/20	255.255.240.0	16	4,094
/21	255.255.248.0	8	2,046
/22	255.255.252.0	4	1,022
/23	255.255.254.0	2	510

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4 · Two 30-second examples

A · 192.168.50.100/28 (4th octet)

1. Mask 255.255.255.240: interesting octet 4th (240).
2. Block = 256 − 240 = **16**. Networks: 0, 16, 32, 48, 64, 80, 96, 112, ...
3. 100 sits in 96–111.
4. Network **192.168.50.96**, broadcast **192.168.50.111**, usable 192.168.50.97–192.168.50.110 (14 hosts).

B · 172.16.50.200/21 (3rd octet — the trap)

1. Mask 255.255.248.0: interesting octet 3rd (248).
2. Block = 256 − 248 = **8**.
3. 50 ÷ 8 = 6 r2 → block starts at 48. 4th octet: 0 on the network, 255 on the broadcast.
4. Network **172.16.48.0**, broadcast **172.16.55.255**, usable 172.16.48.1–172.16.55.254 (2,046 hosts).

Binary vs shortcut, Example A

Binary (why it works)	Block-size shortcut (under the clock)
/28 = 28 ones. Last mask octet `11110000` = 240. AND: `01100100` (100) AND `11110000` = `01100000` = 96. Broadcast last octet: 96 + 16 − 1 = 111.	Block = 256 − 240 = 16. Largest multiple of 16 not above 100: 96. Broadcast = 112 − 1 = 111.

Learn why the bits work once; then use the shortcut. With the chart in your head you don't need to write 32 bits for every question.

5 · VLSM in 4 steps

1. Sort the host counts, largest first.
2. For each: hosts + 2 → next power of two → prefix.
3. Place it on the next free address that is a multiple of its block size.
4. Check: no overlaps, everything inside the parent.

192.168.10.0/24 for 60, 25, 10 and 2 hosts:

Need	Prefix	Usable	Subnet	Block
60	/26	62	192.168.10.0/26	.0–.63
25	/27	30	192.168.10.64/27	.64–.95
10	/28	14	192.168.10.96/28	.96–.111
2	/30	2	192.168.10.112/30	.112–.115

Free space starts at 192.168.10.116.

6 · Common mistakes

- **Broadcast off by one:** for the .96 block of 16 it's .111, not .112 (.112 is the next network).
- **Wrong octet:** on a /21 the block of 8 is in the 3rd octet; the 4th octet of the broadcast is 255.
- **The two reserved addresses:** 60 hosts fit a /26 (62 usable); 63 hosts need a /25. /31 and /32 are the special cases.
- **VLSM order:** place the largest block first, on a multiple of its size.

More practice: **subnetcalculator.dev/practice/** (instant feedback) and this kit's five timed drill sets.

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