Achievable

CCNA DUMP SHEET

IPv4 addressing and subnetting

Subnet table

Prefix	Mask	Host bits	Hosts	Block
/18	255.255.192.0	14	16,382	64
/19	255.255.224.0	13	8,190	32
/20	255.255.240.0	12	4,094	16
/21	255.255.248.0	11	2,046	8
/22	255.255.252.0	10	1,022	4
/23	255.255.254.0	9	510	2
/24	**255.255.255.0**	**8**	**254**	**1**
/25	255.255.255.128	7	126	128
/26	255.255.255.192	6	62	64
/27	255.255.255.224	5	30	32
/28	255.255.255.240	4	14	16
/29	255.255.255.248	3	6	8
/30	255.255.255.252	2	2	4

- **Block** counts in octet 3 through /24, then in octet 4
- **Networks:** 2^n, n = host bits borrowed
- **Usable hosts:** $2^H - 2$, H = host bits left
- **Trade-off:** more networks means fewer hosts in each

Bits in octet	1	2	3	4	5	6	7	8
Block	128	64	32	16	8	4	2	1
Mask octet	128	192	224	240	248	252	254	255

Network, broadcast, host range

Step	192.168.1.100/26	172.16.5.10/23
Block: 256 minus mask octet	256 - 192 = 64	256 - 254 = 2
Network: multiple at or below	192.168.1.64	172.16.4.0
Next network: add the block	192.168.1.128	172.16.6.0
Broadcast: next minus 1	192.168.1.127	172.16.5.255
First host: network plus 1	192.168.1.65	172.16.4.1
Last host: broadcast minus 1	192.168.1.126	172.16.5.254

- **In binary:** network = host bits all 0, broadcast = host bits all 1
- **Same network:** every network bit matches
- **Mask:** contiguous 1s then 0s, never a 0 between 1s
- **Octet to binary:** 168 = 128 + 32 + 8 = 10101000

↔ VLSM

Hosts needed	Prefix	Usable	From 192.168.1.0/24
100	/25	126	192.168.1.0/25
40	/26	62	192.168.1.128/26
12	/28	14	192.168.1.192/28
2	/30	2	192.168.1.208/30

- **VLSM:** different masks in one block; use the smallest that fits
- **Assign the largest first,** each from the next free address

Classes and RFC 1918

Class	Range	Default mask	Private range
A	1.0.0.0 to 126.255.255.255	255.0.0.0 (/8)	10.0.0.0 to 10.255.255.255
B	128.0.0.0 to 191.255.255.255	255.255.0.0 (/16)	172.16.0.0 to 172.31.255.255
C	192.0.0.0 to 223.255.255.255	255.255.255.0 (/24)	192.168.0.0 to 192.168.255.255

- **Private prefixes:** 10.0.0.0/8, 172.16.0.0/12, 192.168.0.0/16
- **Trap:** 172.32.0.0 is public; private stops at 172.31
- **Private:** not routed on the Internet; NAT translates at the edge
- **Loopback:** 127.0.0.1; not in the ranges above
- **Prefix:** the network address. **Prefix length:** the mask, as /n
- **IPv4:** 32 bits, 4 octets, each 0-255

Configure and verify

```
R1(config)# interface g0/0
R1(config-if)# ip address 192.168.1.1 255.255.255.0
R1(config-if)# no shutdown
```

Command	What it does
`show ip interface brief`	IP and status, no mask
`show ip interface g0/0`	IP with its mask
`show ip route`	Connected route

- **Router interfaces** are shut down by default

Verify IP parameters on a client

OS	Command	What it does
Windows	`ipconfig`	IP, mask, gateway
Windows	`ipconfig /all`	Adds MAC, DHCP, DNS
Linux	`ip address show`, `ifconfig`	IP and MAC
Linux	`ip route`	Default gateway
Mac OS	`ifconfig en0`	IP and MAC
Mac OS	`ipconfig getsummary en0`	Adds gateway, DNS
Any	`netstat`	TCP, UDP connections