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Subnetting

A = 10.0.0.0/8 ·
↘ CIDR – Classless Inter-Domain Routing

Subnet Range/Subnet Mask

A = 8-15
B = 16-23
C = 24-31
] Classfull

Ex. 10.0.0.0/8
Subnet mask = 255.0.0.0

Ex. 10.0.0.0/9 ← more than 8 bit value
mask = 255.128.0.0

Ex. 10.0.0.0/10
255.192.0.0

Ex. 10.0.0.0/11
255.224.0.0

Ex. 10.0.0.0/27
255.255.255.224

Ex 10.0.0.0/13
255.248.0.0

Ex. 10.0.0.0/16
255.255.0.0

Ex. 10.0.0.0/17
255.255.128.0

bit value
1 = 128
2 = 192
3 = 224
4 = 240
5 = 248
6 = 252
7 = 254
8 = 255

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Subnetting

Block size

10.0.0.0/10

255.192.0.0 = Subnet Mask

Block size is used to identify the next network.

IP address Range ⇒ 0-255

∴ Total = 256

1 = 128
2 = 192
3 = 224
4 = 240
5 = 248
6 = 252
7 = 254
8 = 255

Block size = 256 − extra bit size

Class A = N.H.H.H (8 | 24)

Class B = N.N.H.H

Class C = N.N.N.H (24 | 8)

Ex. 10.0.0.0/10

Block size ⇒ 256 − 192 = 64

255.192.0.0

ex. 10.0.0.0/14

subnet mask = 255.252.0.0

Block size ⇒ 256 − 252 = 4

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Ex. 10.0.0.0/19

subnet mask = 255.255.224.0

Block size = 256 - 224

= 32

Ex. 10.0.0.0/27

Mask = 255.255.255.224

Block size = 256 - 224

= 32

Q. Given block size = 16

Class A IP

CIDR?

Ans. Block size = 16

= 256 - 16 ⇒ 240

↓

4 bit extra

∴ 10.0.0.0/12

Subnet Range

Class A = 8 - 15

B = 16 - 23

C = 24 - 31

Q. 10.0.0.0/?

Block size = 8

Ans. Block size = 256 - 8

= 248

↓

5 bit extra

∴ 10.0.0.0/13

↓

8+5

↓

by default in class A

1	= 128
2	= 192
3	= 224
4	= 240
5	= 248
6	= 252
7	= 254
8	= 255

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Q. 170.0.0.0/?
Block size = 8

Ans. Block size = 8
= 256 - 8
= 248 → 5 bit extra

Class B
∴ 170.0.0.0/21
subnet mask = 255.255.248.0

Network ID & No. of Host Addresses

Q. 192.168.0.0/26

subnet mask = 255.255.255.192

Block size = 256 - 192
= 64

Network ID = 2^n

Host address = $(2^H - 2)$

extra bit = 2 (from base value of class)

N.N.N.H
24 8-2
= 6

- Network ID = $2^n = 2^2 = 4$

- Host address = $(2^H - 2)$
= $(2^6 - 2)$
= 62

A = N.H.H.H
B = N.N.H.H
C = N.N.N.H

1 = 128
2 = 192
3 = 224
4 = 240
5 = 248
6 = 252
7 = 254
8 = 255

A - 8-15
B - 16-23
C - 24-31

Q. 192.168.0.0/28

subnet mask = 255.255.255.240

Block size = 256 - 240 = 16

Network ID = $2^n = 2^4 = 16$

Host Address = $2^H - 2$
= $2^4 - 2$
= 14

A = 1 - 126
B = 128 - 191
C = 192 - 223

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Q. 192.168.0.0
Host Address = 126
CIDR = ?

Ans. $2^H - 2 = 126$

$2^H = 128$

$2^H = 2^7$

$H = 7$

$\therefore$ 192.168.0.0/25

Q. 192.168.0.0/27

Ans Subnet Mask = 255.255.255.224

Block size = 256 − 224 = 32

Network ID = $2^h = 2^3 = 8$

Host Addresses = $2^H - 2$

$= 2^5 - 2$

$= 30$

Q. 192.168.0.0/?

Network ID = 32

Ans. Network ID $\Rightarrow 2^h = 32$

$h = 5$

$\therefore$ extra 5 bit $\therefore$ 24 + 5 = 29

mask = 192.168.0.0/29

Host Address $\Rightarrow 2^H - 2 \Rightarrow 2^3 - 2 = 6$

Block size = 256 − 248

$= 8$

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Q. Class C : 192.168.0.0/26

Ans. Subnet Mask = 255.255.255.192

Block size = 256 − 192

= 64

Network ID = $2^n = 2^2 = 4$

Host ID = $2^H - 2$

= $2^6 - 2$

= 62

	Network ID	Host Address Range	Broadcast Address
1	192.168.0.0	192.168.0.1 − 192.168.0.62	192.168.0.63
2.	192.168.0.64	192.168.0.65 − 192.168.0.126	192.168.0.127
3.	192.168.0.128	192.168.0.129 − 192.168.0.190	192.168.0.191
4.	192.168.0.192	192.168.0.193 − 192.168.0.254	192.168.0.255

Q. 192.168.0.0/27

Ans. Subnet mask = 255.255.255.224

Block size = 256 − 224 = 32

Network ID = $2^n = 2^3 = 8$

Host ID = $2^H - 2 \Rightarrow 2^5 - 2 \Rightarrow 30$

	Network ID	Host Address Range	Broadcast Address
1.	192.168.0.0	192.168.0.1 − 192.168.0.30	192.168.0.31
2.	192.168.0.32	192.168.0.33 − 192.168.0.62	192.168.0.63
3.	192.168.0.64	192.168.0.65 − 192.168.0.94	192.168.0.95

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Q. Class B : 172.16.0.0/18

A : 8-15
B : 16-23
C : 24-31

Ans: Subnet Mask = 255.255.192.0
Block size = 256 - 192
= 64

N.N. H.H
16 14

Network ID = $2^n = 2^2 = 4$
Host Address = $2^H - 2$
= $2^{14} - 2$
= 16382

Q. 172.16.0.0/20

Ans: Subnet Mask = 255.255.240.0
Block size = 256-240
= 16
Network ID = $2^n = 2^4 = 16$
Host Address ⇒ $2^4 - 2$ ⇒ $2^{12} - 2$ ⇒ 4094

	Network ID	Host Addresses	Broadcast Address
1.	172.16.0.0	172.16.0.1 - 172.16.15.254	172.16.15.255
2	172.16.16.0	172.16.16.1 - 172.16.31.254	172.16.31.255
3.	172.16.32.0	172.16.32.01 - 172.16.47.254	172.16.47.255
4.	172.16.48.0		

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8. Class A: 10.0.0.0/10

Ans Subnet Mask = 255.192.0.0

Block size = 256 - 192

= 64

Network ID = $2^m \Rightarrow 2^2 = 4$

Host ID = $2^H - 2$

= $2^{22} - 2$

= 4194302

	Network ID	Host Addresses	Broadcast IP
1.	10.0.0.0	10.0.0.1 - 10.63.255.254	10.63.255.255
2	10.64.0.0	10.64.0.1 - 10.127.255.254	10.127.255.255
3.	10.128.0.0	10.128.0.1 - 10.191.255.254	10.191.255.255
4.	10.192.0.0	10.192.0.1 - 10.255.255.254	10.255.255.255
5.	10.256.0.0		

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Q. Class C : 192.168.0.0
Host Required = 100

Ans. Host $\Rightarrow 2^H - 2$
$= 2^7 - 2 = \underline{126}$

N.N. N.H
24 8
25 7

$\therefore 192.168.0.0/25$

Q. 192.168.0.0
Network ID = 16

Ans: Network ID $\Rightarrow 2^n = 16$
$n = 4$

N.N.N.H
24
+4
28

$192.168.0.0/28$

Q. 192.168.0.0
2nd network Broadcast address = 192.168.0.15

Ans:

	Network ID	Host Address	Broadcast IP
1.	0.0		
2.	0.8		192.168.0.15
3.	192.168.0.16		

Block size = 8 $\Rightarrow$ 256 − 8 = 248
↓
5 bit

$\therefore$ CIDR = 24 + 5
$\therefore 192.168.0.0/29$
Network ID = $2^n = 2^5 = 32$
Host Addresses $\Rightarrow 2^H - 2 \Rightarrow 2^3 - 2 \Rightarrow 6$