CS & IT ENGINEERING

COMPUTER NETWORKS

Classless Addressing

Lecture No-18

By- Ankit Doyla Sir

Classless Addressing Part-1

Problem Solving on Subnetting Part – 3

Q.16 Suppose computers A and B have IP addresses 10.105.1.113 and 10.105.1.91 respectively and they both use the same netmask N. Which of the values of N given below should not be used if A and B should belong to the same network? [GATE CS 2010]

A. 255.255.255.0

B. 255.255.255.128

C. 255.255.255.192

D. 255.255.255.224

A: 10.105.1.113 → 10.105.1.01110001

B: 10.105.1.91 → 10.105.1.01011011

(1) ~~255.255.255.0~~
NID SID

(3) ~~255.255.255.10000000~~
NID

(4) ~~255.255.255.11000000~~
NID SID

(2) 255.255.255.11100000
NID SID

Q.17 The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet? [GATE CS 2007]

A. 62 subnets and 262142 hosts.

B. 64 subnets and 262142 hosts.

C. 62 subnets and 1022 hosts.

D. 64 subnets and 1024 hosts.

Class-B

NID	HID
16	16

NID	SID	10
16	6	HID

$2^6 = 64$ subnet

$2^{10} - 2 = 1022$ Hosts

According to RFC-950

SID = n bit (n = 6)

No. of subnet = $2^n - 2$

$= 2^6 - 2$

$= 62$

According to RCF-1812

SID = n bit

No. of subnet = 2^n

Q.18

Host X has IP address 192.168.1.97 and is connected through two routers R1 and R2 to another host Y with IP address 192.168.1.80. Router R1 has IP addresses 192.168.1.135 and 192.168.1.110. R2 has IP addresses 192.168.1.67 and 192.168.1.155. The netmask used in the network is 255.255.255.224.

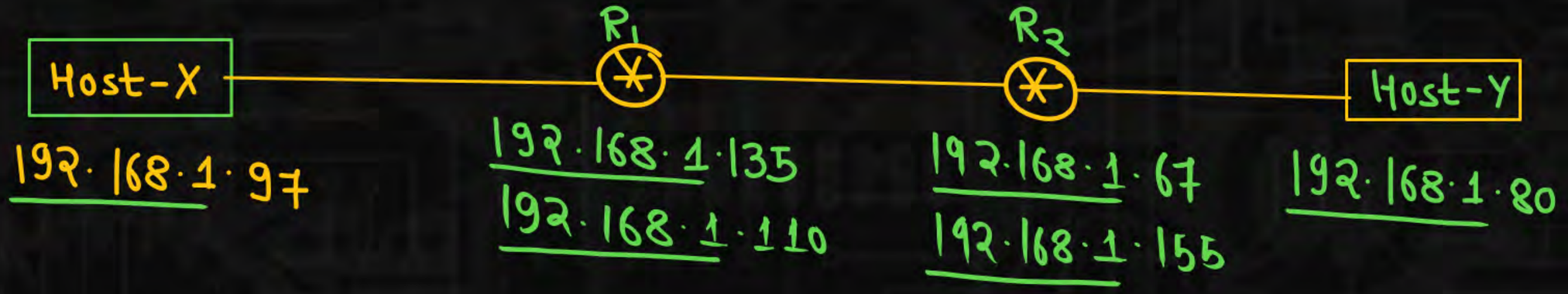
Given the information above, how many distinct subnets are guaranteed to already exist in the network? [GATE CS 2008]

A. 1

B. 2

C. 3

D. 6



SM: 255.255.255.11100000

NID | SID | HID

AD Rule

128 64 32

97 : 0 1 1

135 : 1 0 0

110 : 0 1 1

67 : 0 1 0

155 : 1 0 0

80 : 0 1 0

∴

Different subnet-id's

96 ← SID 011

128 ← SID 100

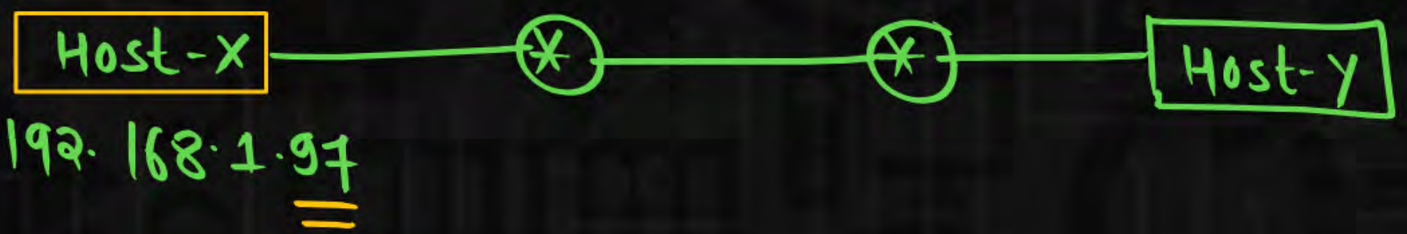
64 ← SID 010

} 3 different subnet

Q.19 Host X has IP address 192.168.1.97 and is connected through two routers R1 and R2 to another host Y with IP address 192.168.1.80. Router R1 has IP addresses 192.168.1.135 and 192.168.1.110. R2 has IP addresses 192.168.1.67 and 192.168.1.155. The netmask used in the network is 255.255.255.224.

Which IP Address should X Configure its gateway as ?

[GATE IT 2008]



A. 192.168.1.67

B. 192.168.1.110

C. 192.168.1.135

D. 192.168.1.155

X → 192.168.1.97 (64+32+1)

AND

255.255.255.224 (128+64+32)

SID = 192.168.1.96

(a) 192.168.1.67 (64+2+1)

AND

255.255.255.224 (128+64+32)

SID = 192.168.1.64

Gateway must also have the same subnet-id

(b) 192.168.1.110 (64+32+....

AND

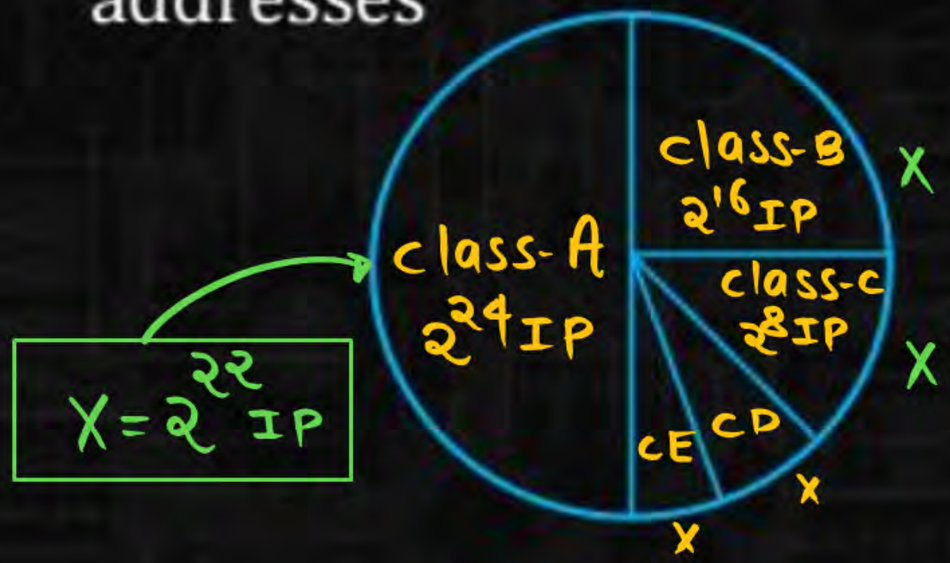
255.255.255.224 (128+64+32)

SID = 192.168.1.96

Classful Addressing

Class A $\rightarrow 2^{24}$ IP Addresses in one network
Class B $\rightarrow 2^{16}$ IP Addresses in one network
Class C $\rightarrow 2^{8}$ IP Addresses in one network

I: Organization X need = 2^{22} IP addresses



$X = 2^{22}$ IP

$A = 2^{22}$ IP

$B = 2^{22}$ IP

$C = 2^{22}$ IP

$4 * 2^{22} = 2^{24}$ IP

IP addresses wasted = $2^{24} - 2^{22}$

$= 2^2 * 2^{22} - 2^{22}$

$= 4 * 2^{22} - 2^{22}$

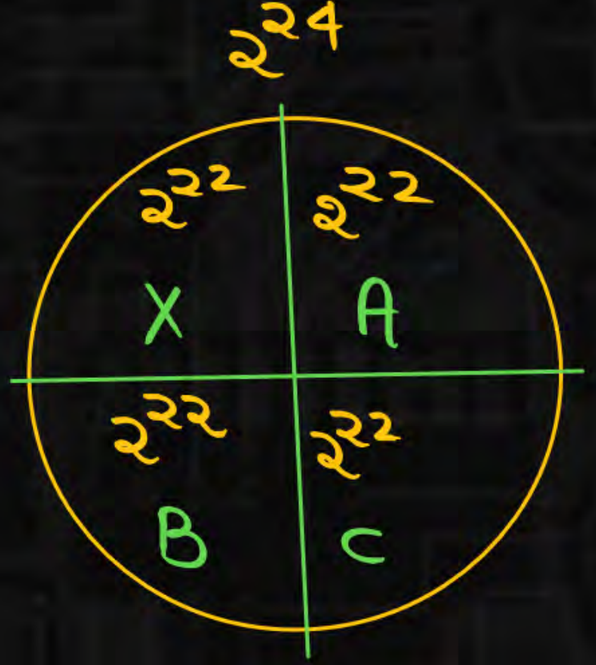
$= 3 * 2^{22}$

$= 3 * 2^2 * 2^{20}$

$= 12 * 2^{20}$

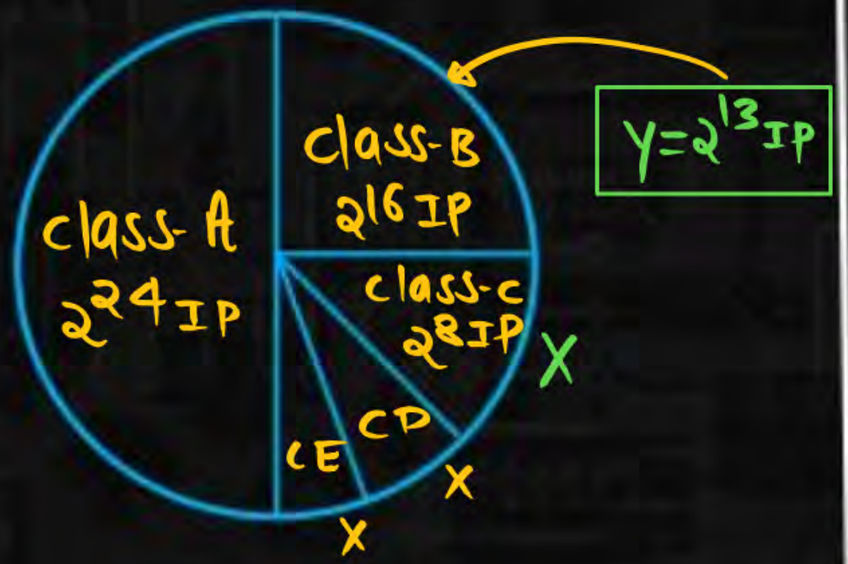
$= 12M$

$= 12, 582, 912$



$\frac{2^{24}}{4} = \frac{2^{24}}{2^2} = 2^{24-2} = 2^{22}$

II: Organization Y need = 2^{13} IP addresses



$\frac{2^{16}}{8} = \frac{2^{16}}{2^3} = 2^{13}$

IP addresses wasted = $2^{16} - 2^{13}$

$= 2^3 * 2^{13} - 2^{13}$

$= 8 * 2^{13} - 2^{13}$

$= 7 * 2^{13}$

$= 7 * 2^3 * 2^{10}$

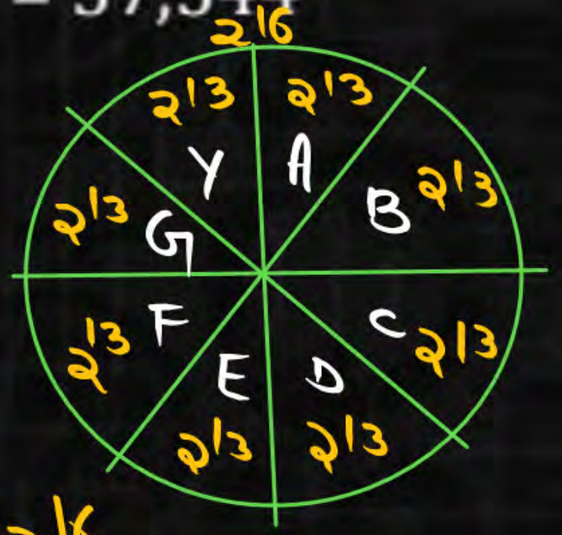
$= 56 * 2^{10}$

$= 56K$

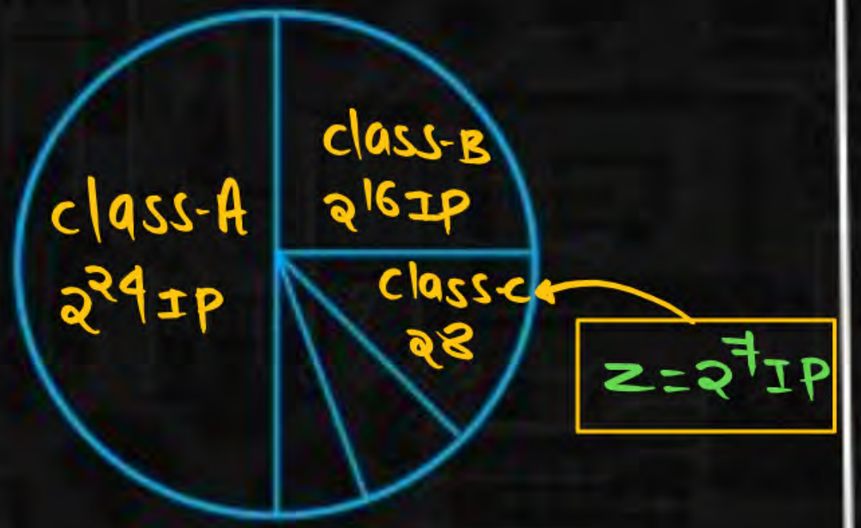
$= 57,344$

Y = 2^{13}
A = 2^{13}
B = 2^{13}
C = 2^{13}
D = 2^{13}
E = 2^{13}
F = 2^{13}
G = 2^{13}

$8 * 2^{13} = 2^3 * 2^{13} = 2^{16}$

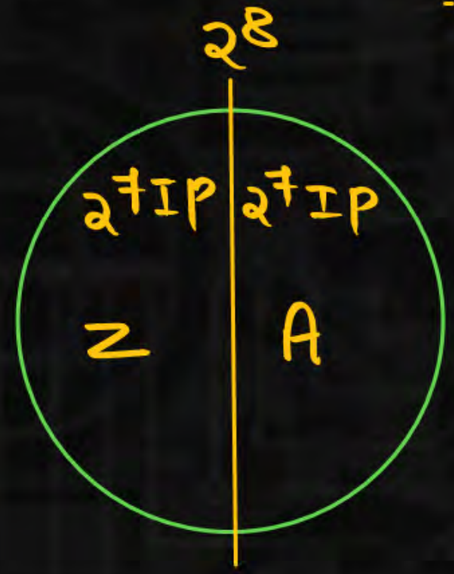


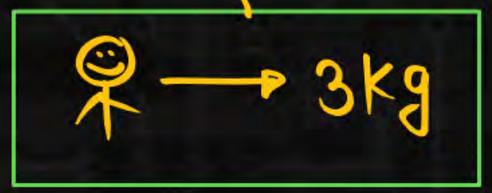
III: Organization Z need = 2^7 IP addresses



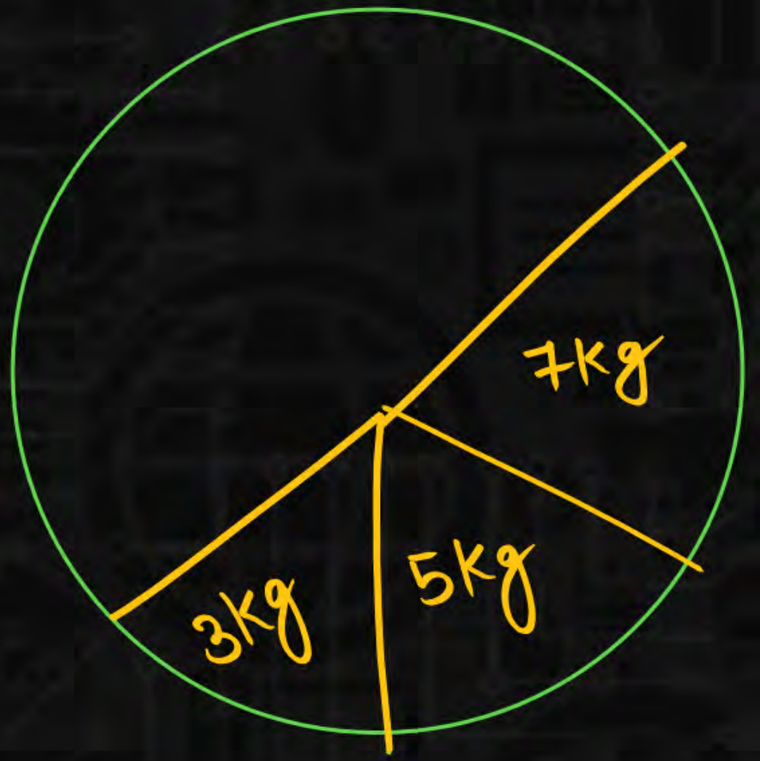
IP addresses wasted = $2^8 - 2^7$
= 128

Z = 2^7 IP
A = 2^7 IP
$2 * 2^7 = 2^8$ IP



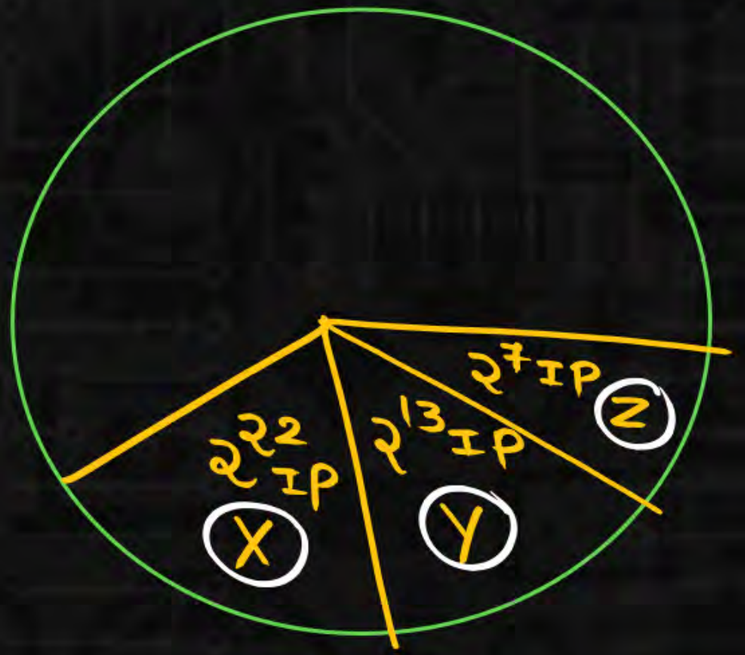


Wastage = 10kg - 3kg
= 7kg



Classless Addressing

2^{32} IP Addresses

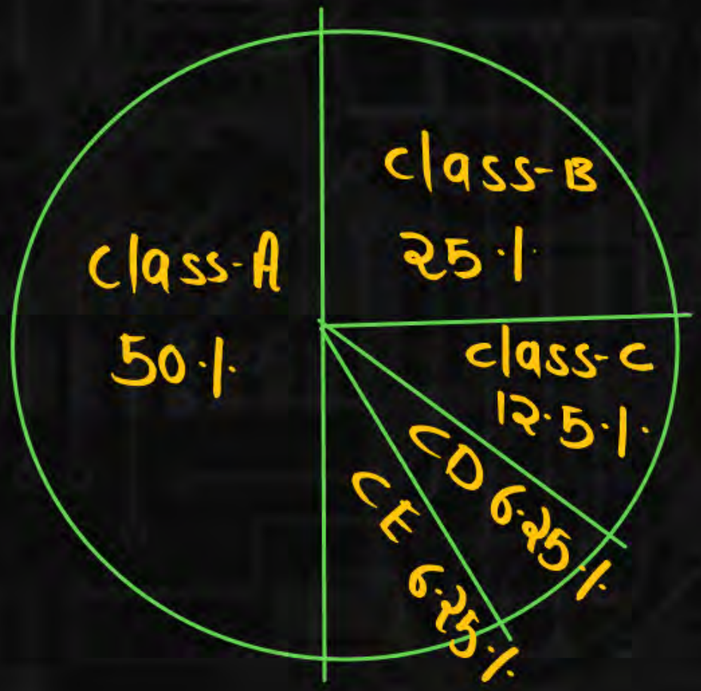


IANA or ISP

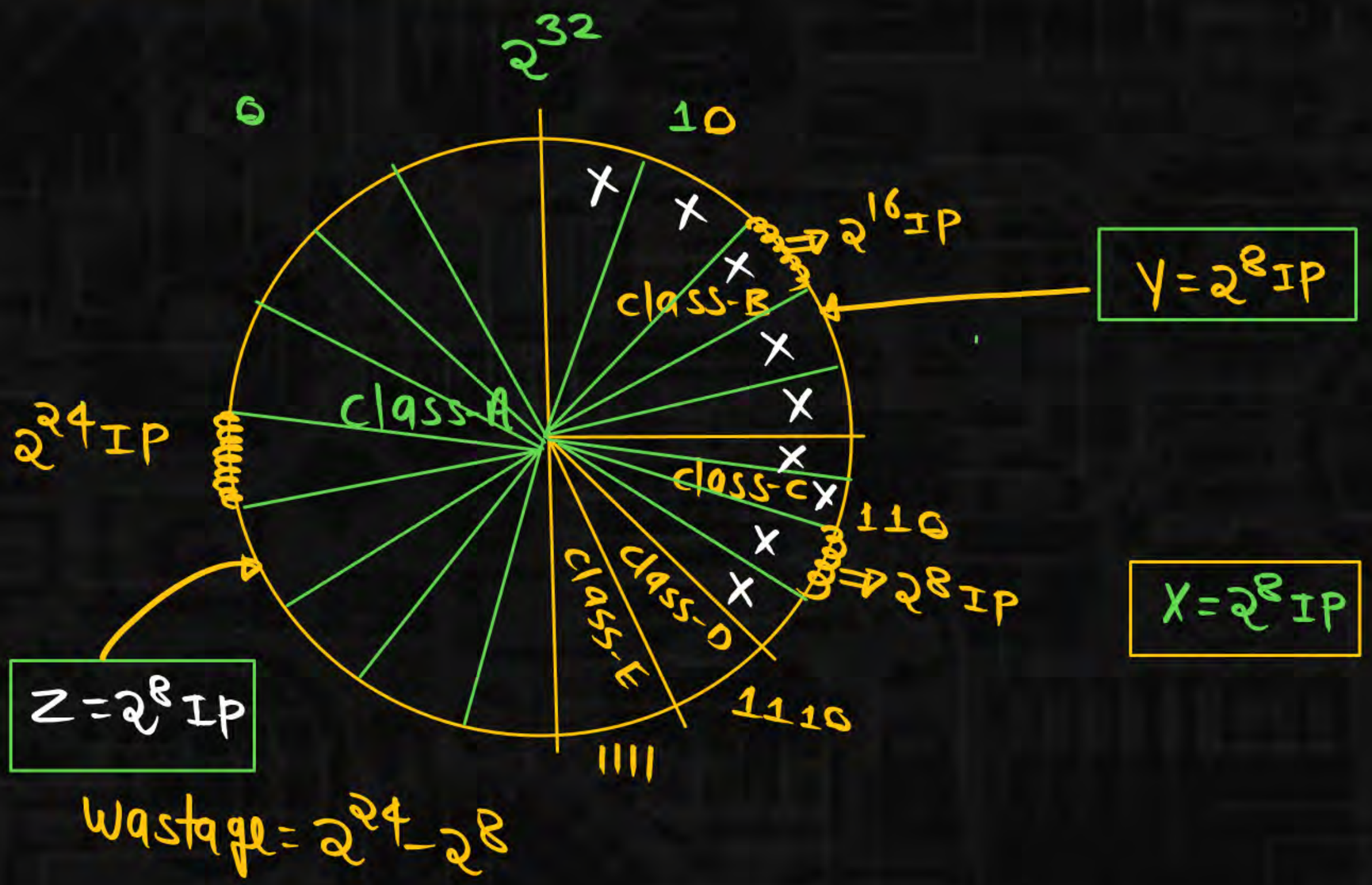
No. of IP Addresses in class-A = 2^{31}

" " " " " class-B = 2^{30}

" " " " " class-C = 2^{29}



Classful Addressing



Y = 2^8 IP

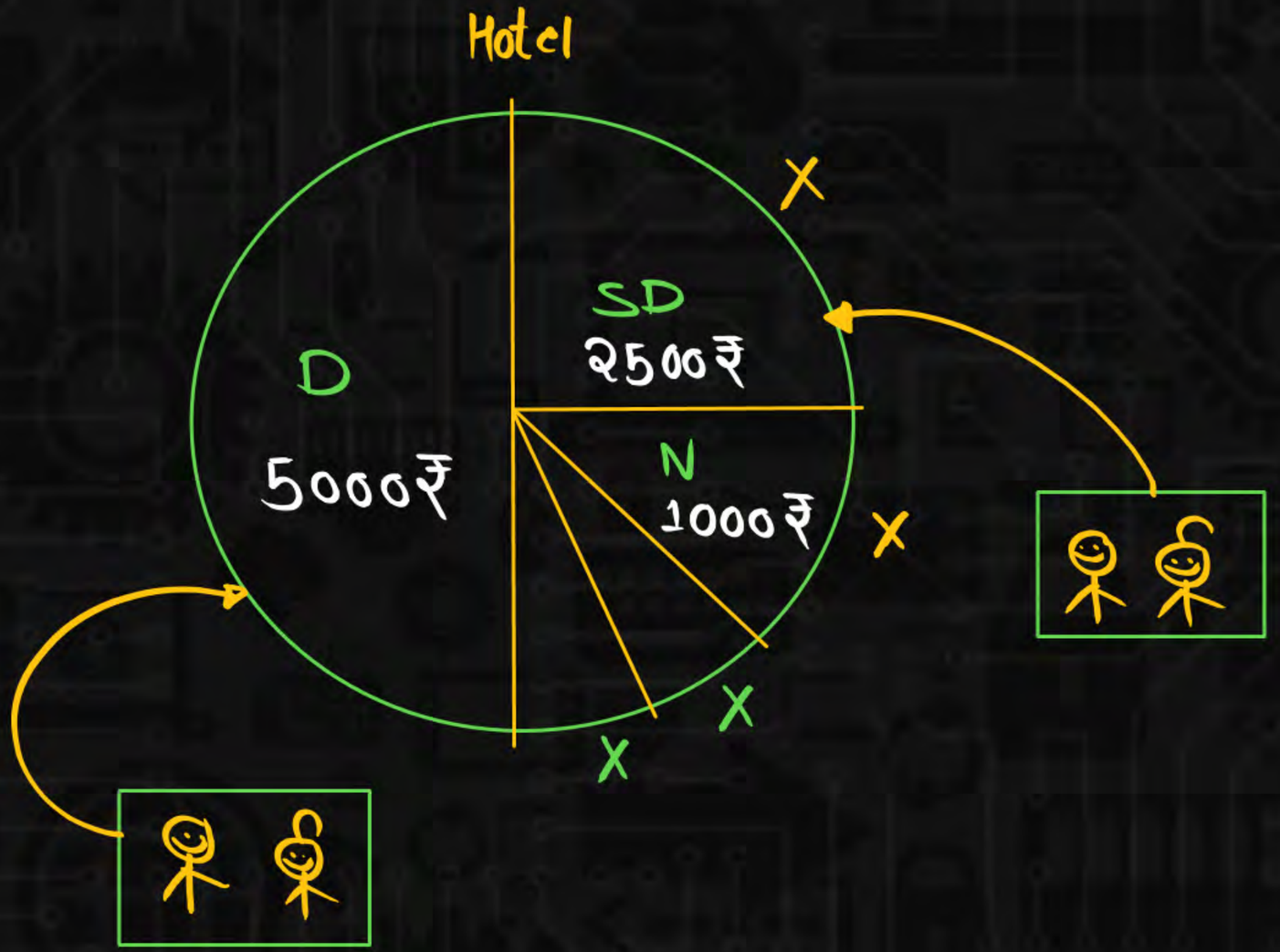
Wastage = $2^{16} - 2^8$

$= 2^8 * 2^8 - 2^8$

$= 256 * 2^8 - 2^8$

$= 255 * 2^8$

X = 2^8 IP


Hotel
D
5000₹
SD
2500₹
N
1000₹

Disadvantage of Classful Addressing

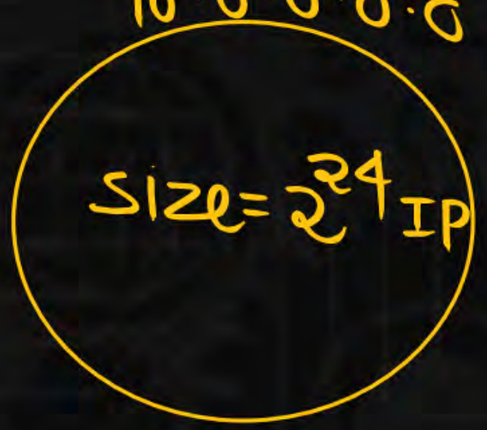
1. Wastage of IP Addresses
2. class-C was generally more used in comparison of class A and class-B.

Advantage of classful Addressing

① 10.43.96.45
NID HID

class-A

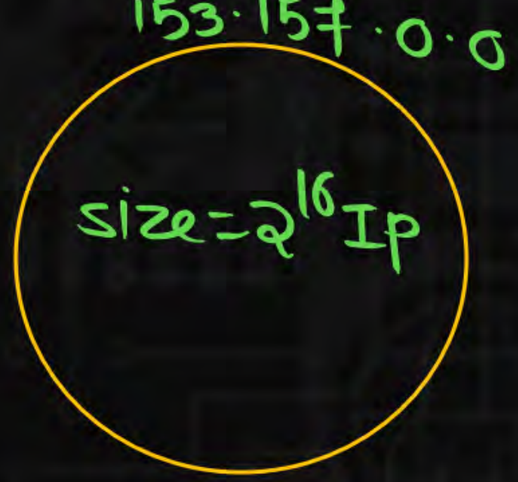
NID	HID
8	24



② 153.157.92.13
NID HID

class-B

NID	HID
16	16



3. 200.190.30.50

NID HID

class-c

NID	HID
24	8

200.0.0.0

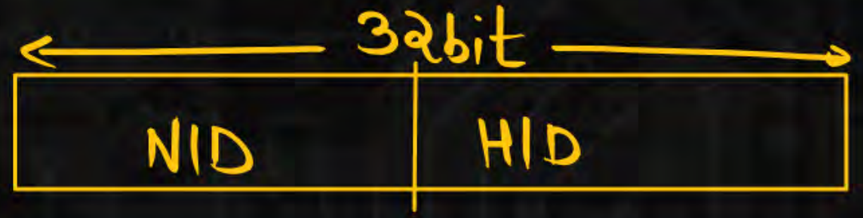
Size = 2^8 IP

8 . 8 . 8 . 8

0 to 255 0 to 255 0 to 255 0 to 255

classful Addressing

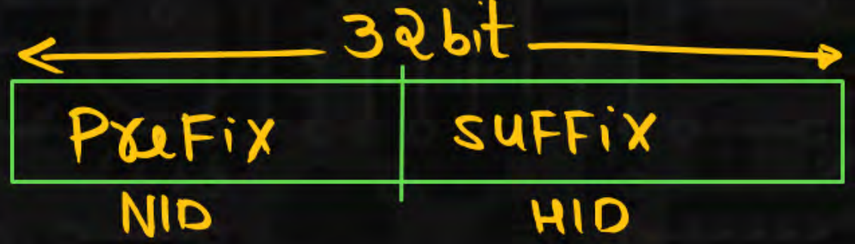
a.b.c.d



classless Addressing

a.b.c.d/n

n → NID or Subnet mask



① 10.23.94.64 | 22

$n = 22$

NID = 22 bit

HID = 32-22 = 10 bit

No. of IP Addresses Possible = 2^{10} or $2^{32-n} = 2^{32-22} = 2^{10}$

No. of Host Possible = $2^{10} - 2$

10.23.010111 | 10.01000000

8 + 8 + 6 — NID | HID

10.23.010111 ---------- HID

10.23.010111 00.00000000 → 10.23.92.0 (First Add)

:

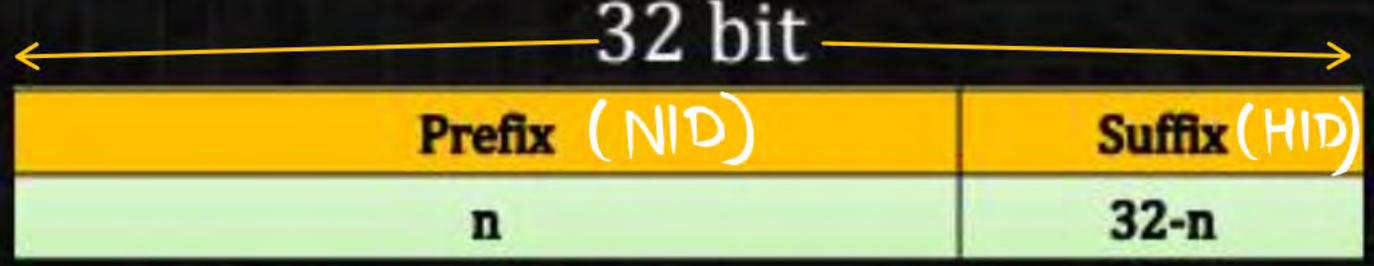
10.23.01011111 11111111 → 10.23.95.255 (Last Add)

$4 * 256 = 2^2 * 2^8 = 2^{10}$ IP

CIDR Notation or slash notation

a.b.c.d/n

n→ NID or subnet mask



1. No of IP addresses in the Block = 2^{32-n}
2. To find first address, we keep the 'n' leftmost bits and set the (32-n) right most bit all to o's.
3. To find last address, we keep the 'n' left most bits and set the (32-n) right most bit all to 1's.


THANK YOU
GW
SOLDIERS !