Name : Jawad Ahmed

Roll No : 20P-0165

Section : BCS-5A

LAB TASK 10

Task 1 : Determine Network Address of the following IP Address

IP address : 10.128.240.50/30. Also, determine broadcast and range of host addresses.

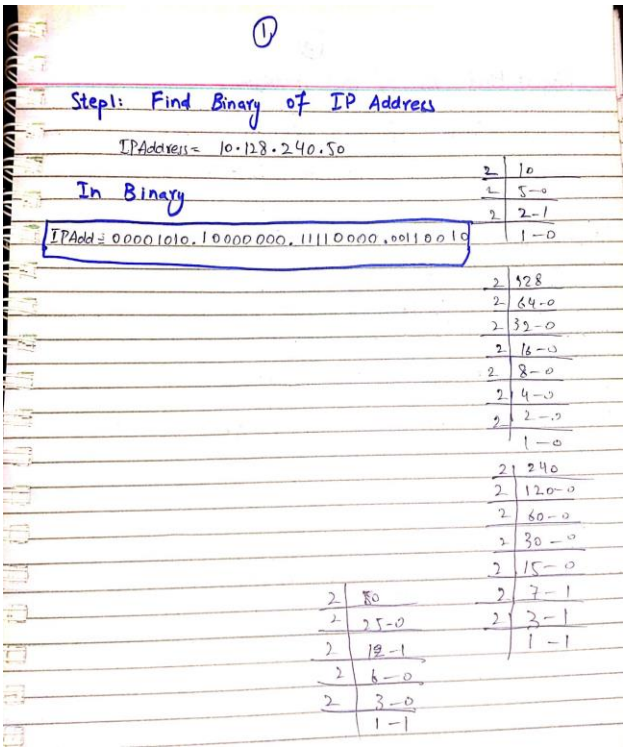
Solution:

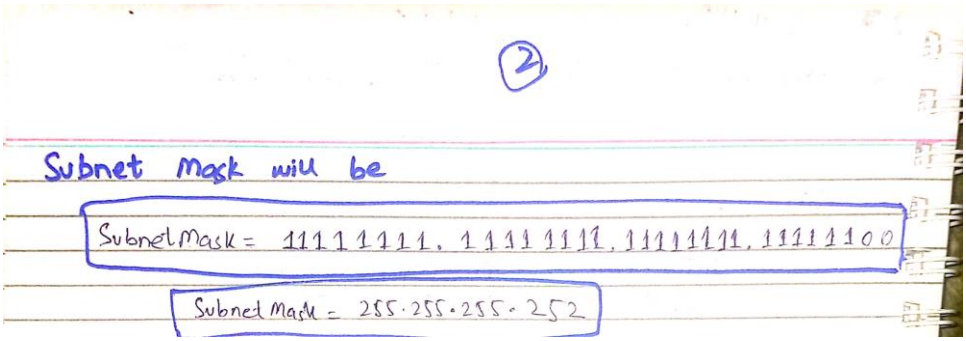
Given Data:

IP Address = 10.128.240.50

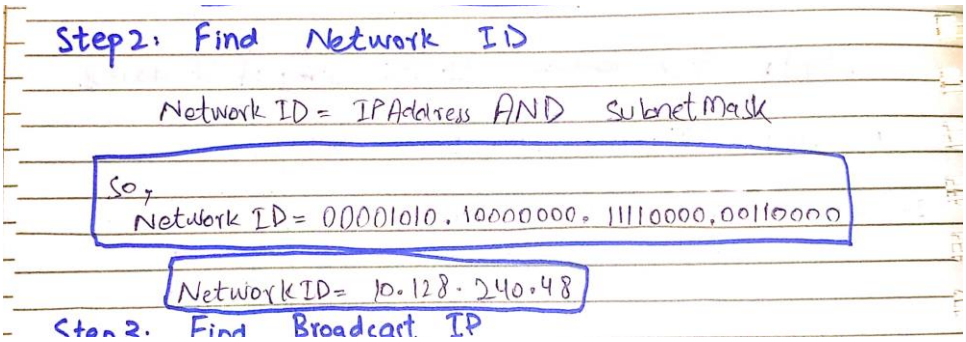
Subnet Mask = 11111111.11111111.11111111.11111100

Step1: Find Binary of IP Address

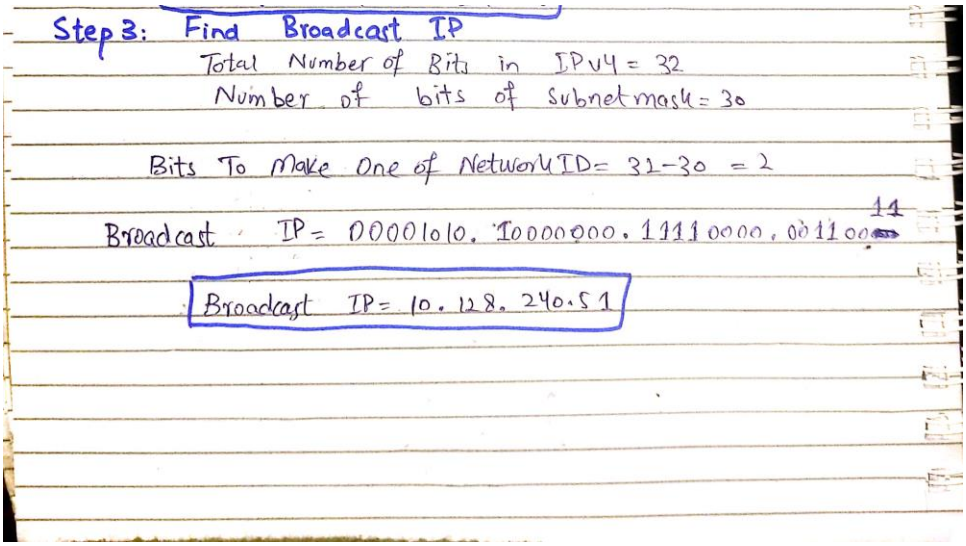




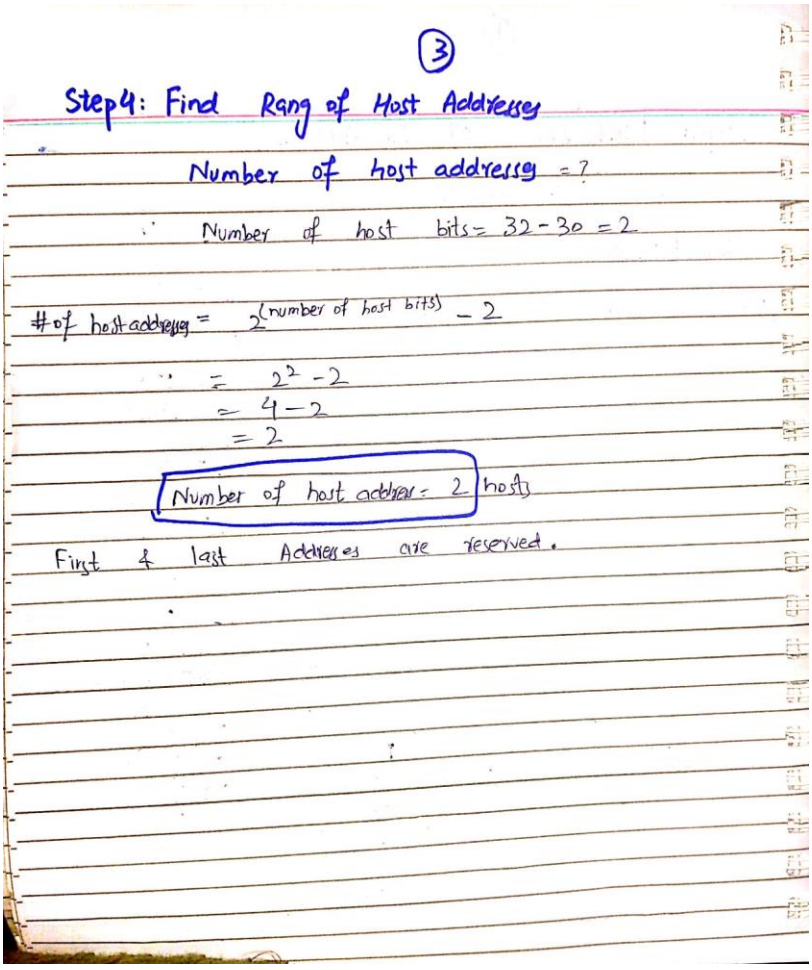
Step2: Find Network ID



Step3: Find Broadcast IP



Step4: Find Range of Host Addresses



Task 2 : Determine the network and broadcast addresses and number of hosts bits and hosts for the given IPv4 addresses and prefixes in the following table.

IPV4 Addresses/Prefix	Network Address	Broadcast Address	Total Number of Hosts Bits	Total Number of Hosts
192.168.100.25/28	192.168.100.16	192.168.100.31	4 bits	14
172.30.10.130/30	172.30.10.128	172.30.10.131	2 bits	2
10.1.113.75/19	10.1.96.0	10.1.127.255	13 bits	8190
198.133.219.250/24	198.133.219.0	198.133.219.255	8 bits	254

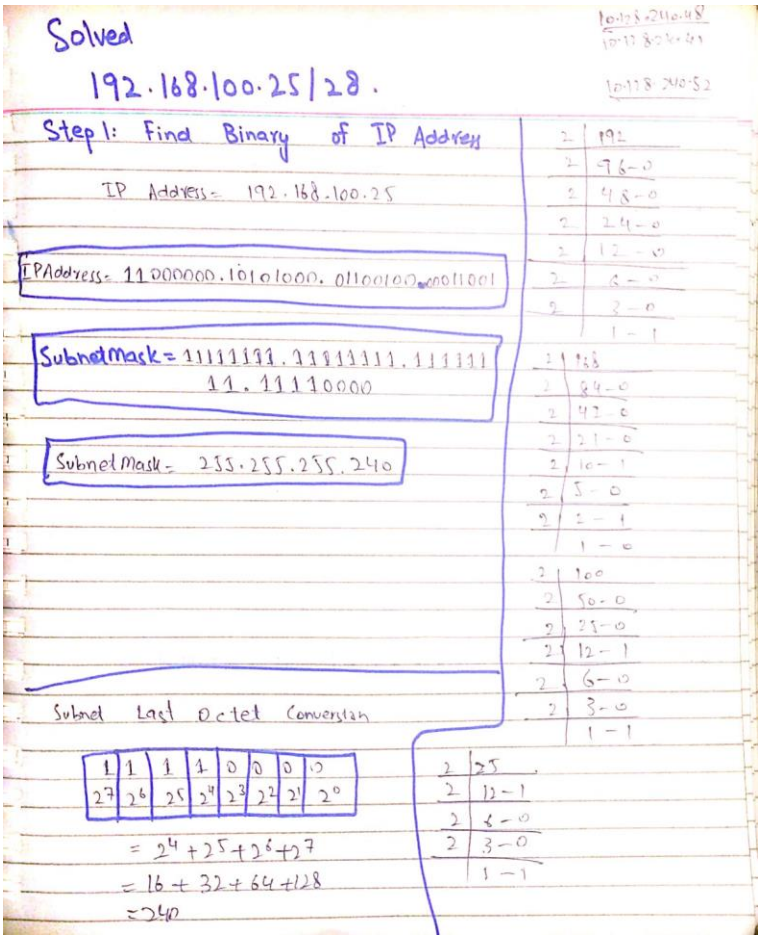
Solve 192.168.100.25/28.

Given Data

IP Address = 192.168.100.25

Subnet Mask = 255.255.255.240

Solution:



Step2: Find Network ID

Network ID = IP Address AND Subnet mask.

⇒ Network ID = 11000000.10101000.01100100.00010000

Network ID = 192.168.100.16

Step3: Find Broadcast IP

Total Number of Bits in IPv4 = 32 bits

Number of bits in subnetmask = 28 bits

Bits to make one of Network ID = 32 - 28 = 4 bits

Broadcast IP = 11000000.10101000.01100100.00011111

Broad Cast IP = 192.168.100.31

Converting 00011111 to Decimal

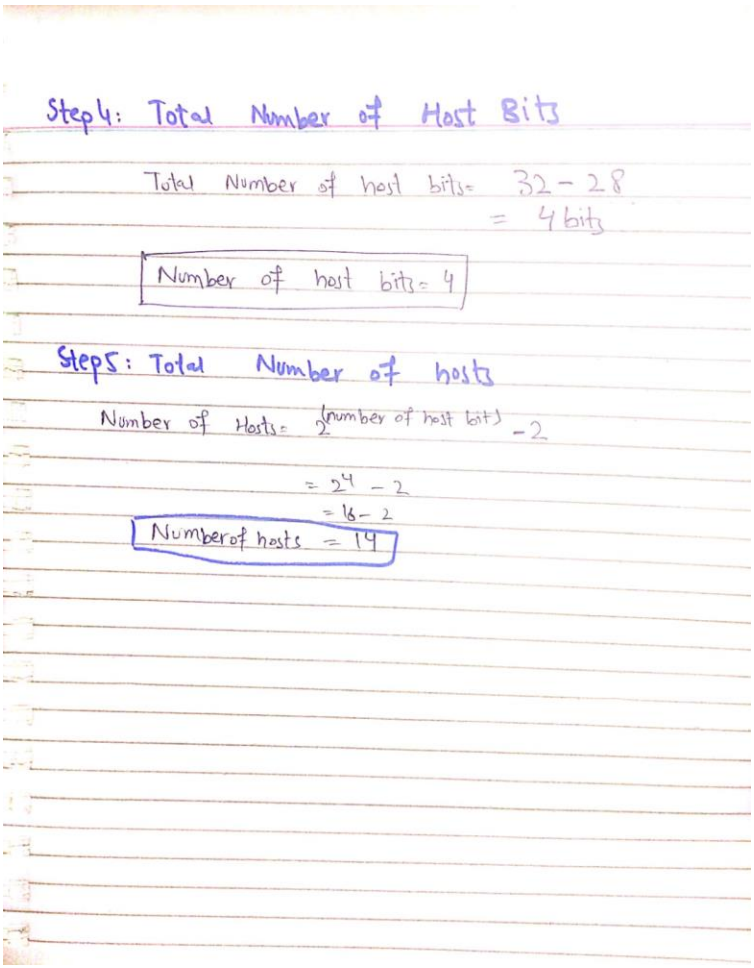
0 0 0 1 1 1 1 1

$2^4\ 2^3\ 2^2\ 2^1\ 2^0$

$= 2^4 + 2^3 + 2^2 + 2^1 + 2^0$

$= 16 + 8 + 4 + 2 + 1$

$= 31$



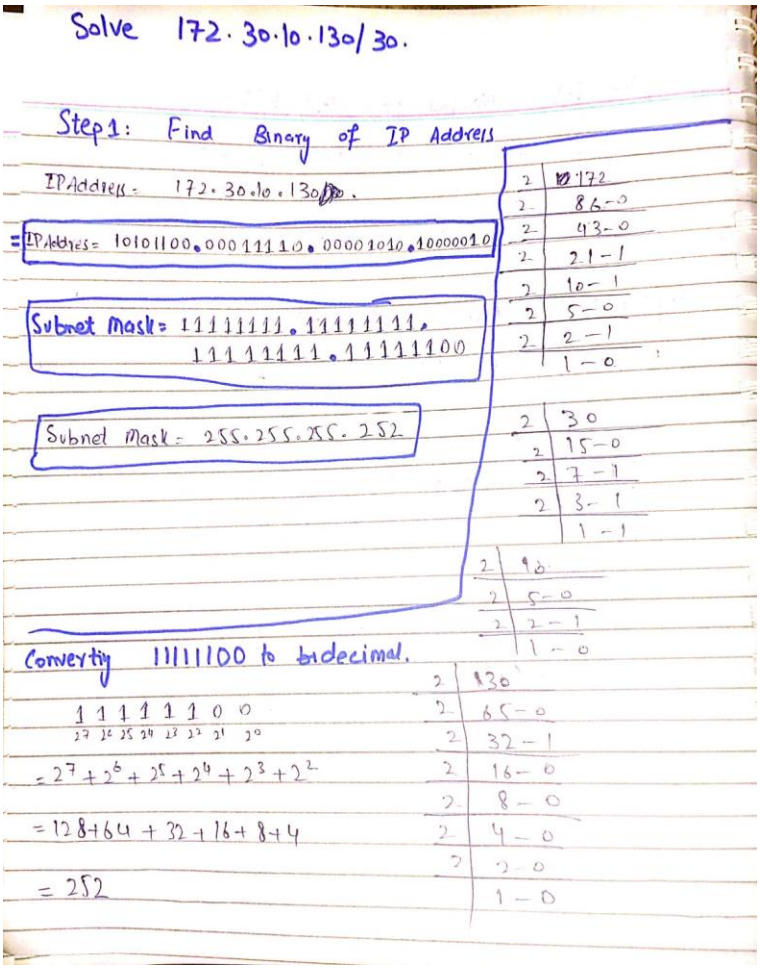
Solve 172.30.10.130/30.

Given Data

IP address = 172.30.10.130

Subnet Mask = 255.255.255.252

Solution:


Solve 172.30.10.130/30.
Step1: Find Binary of IP Address
IP Address = 172.30.10.130/30.
= IP Address = 10101100.00011110.00001010.10000010
Subnet Mask = 11111111.11111111.11111111.11111100
Subnet Mask = 255.255.255.252
Convertig 11111100 to bidecimal.
1 1 1 1 1 1 0 0
2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0
$= 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2$
$= 128 + 64 + 32 + 16 + 8 + 4$
$= 252$

Step2: Find Network Address

Network Address = IP Address AND Subnet mask.

Network Address = 10101100.00011110.00001010.10000000

Network Address = 172 . 30 . 10 . 128

Step3: Find Broadcast IP

Total Bits in IPV4 = 32

Number of bits in subnet mask = 30

last # Bits to make 1's = 32 - 30 = 2 bits

Broadcast IP = ~~#####~~

BroadCast IP = 10101100.00011110.00001010.10000011

Broadcast IP = 172 . 30 . 10 . 131

Convert 1000011 to decimal

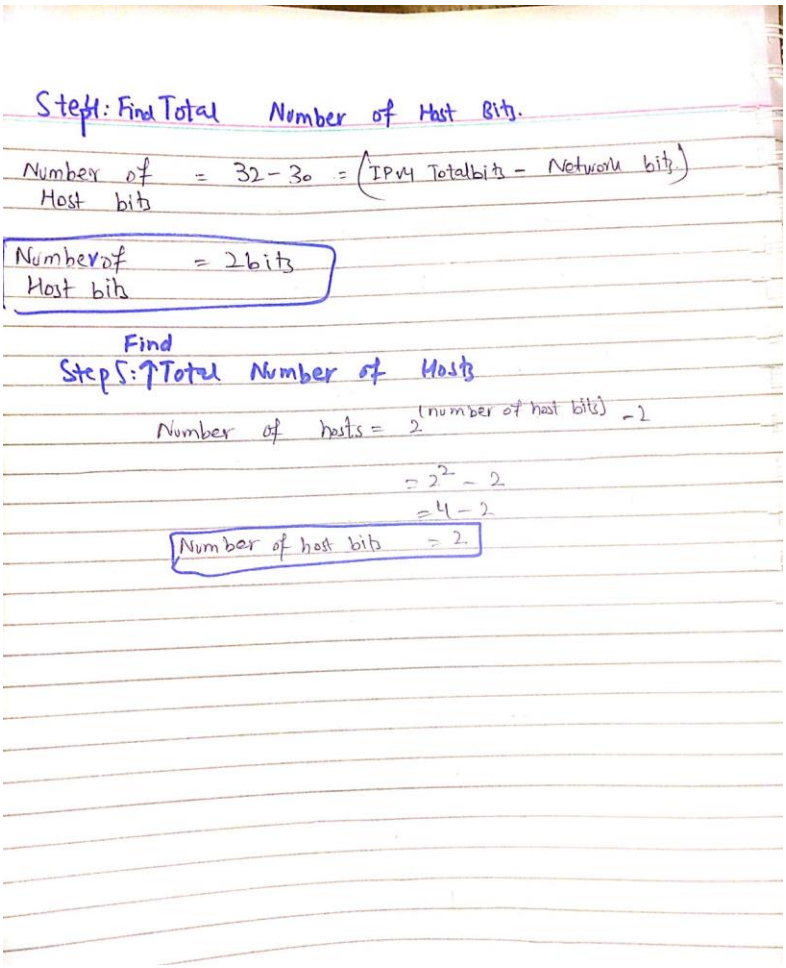
1 0 0 0 0 1 1

2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

$= 2^7 + 2^1 + 2^0$

$= 128 + 2 + 1$

$= 131$



Solve 10.1.113.75/19.

Given Data:

IP Address = 10.1.113.75

Subnet Mask = 255.255.224.0

Solution:

Solve 10.1.113.75/19.

Step1: Find Binary of IP Address.

IP address = 10.1.113.75

~~IPaddres= 00001010.01110001. 1~~

IPaddress = 00001010.00000001.01110001.01101011

Subnet Mask = 11111111.11111111.
11100000.00000000

Subnet Mask = 255.255.224.0

2	10
2	5-0
2	2-1
	1-0

2	113
2	56-1
2	28-0
2	14-0
2	7-0
2	3-1
	1-1

2	75
2	37-1
2	18-1
2	9-0
2	4-1
2	2-0
	1-1

Convert 11100000 to decimal.

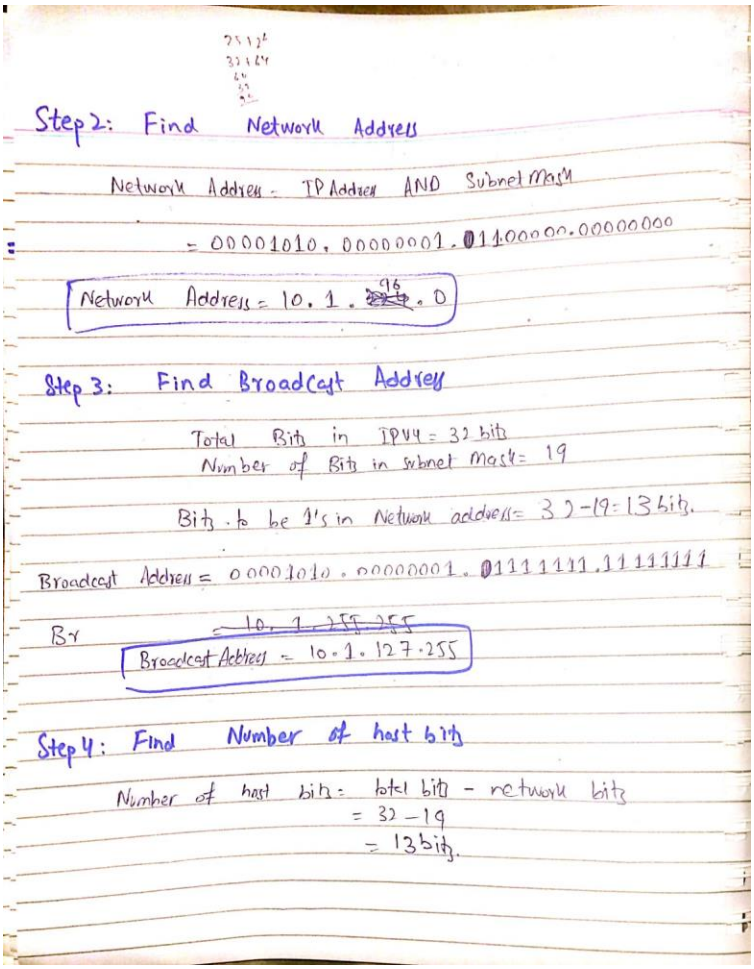
1 1 1 0 0 0 0 0

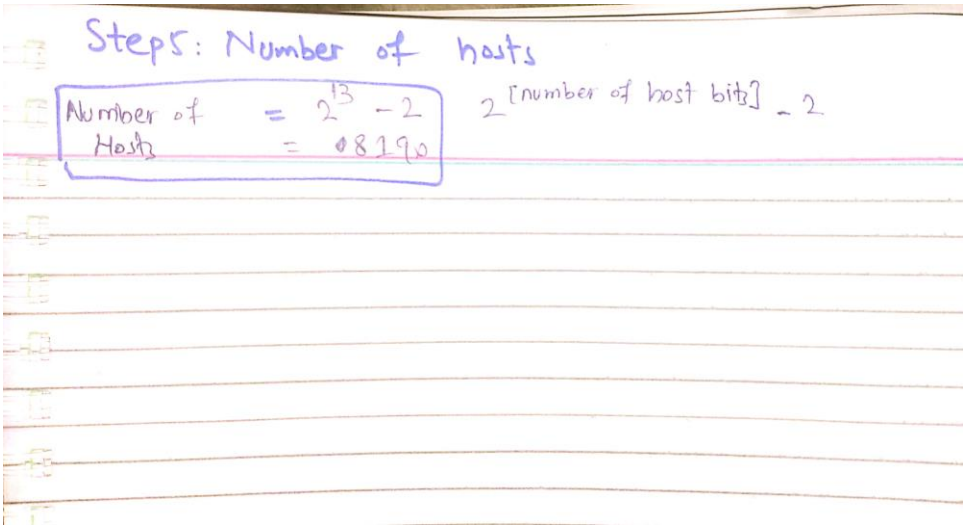
2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

$= 2^7 + 2^6 + 2^5$

$= 128 + 64 + 32$

$= 224$





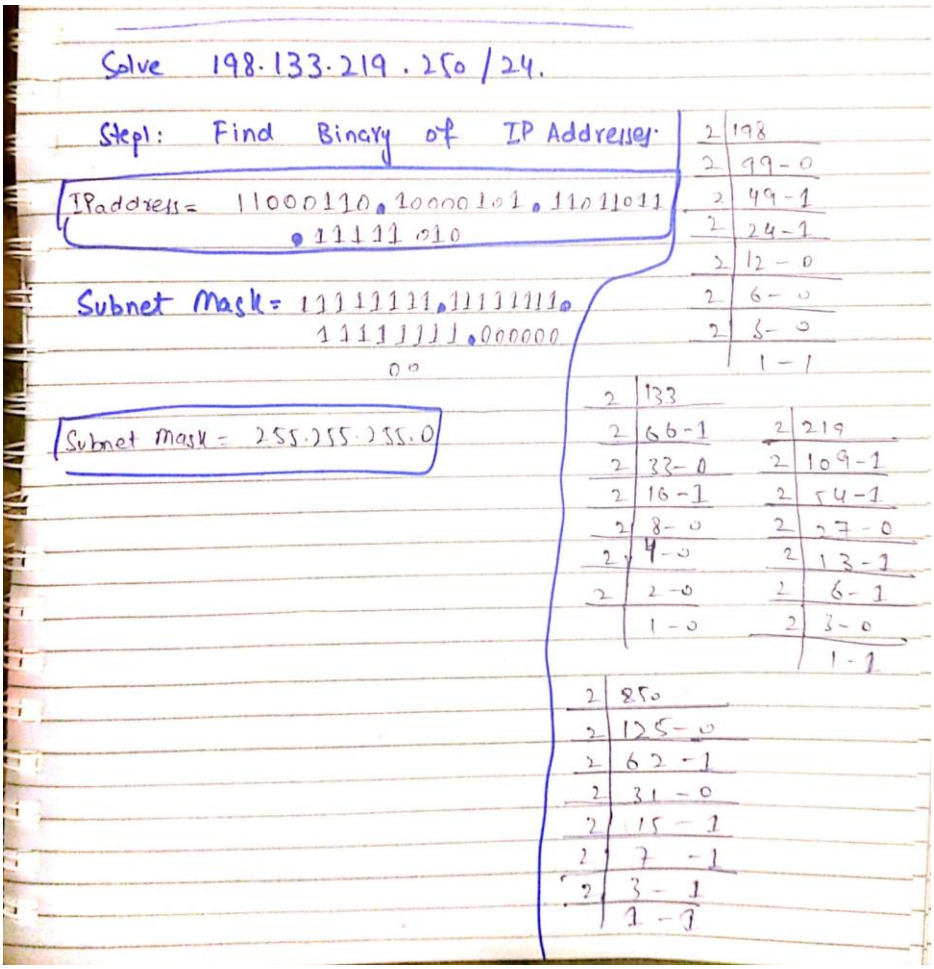
Solve 198.133.219.250/24.

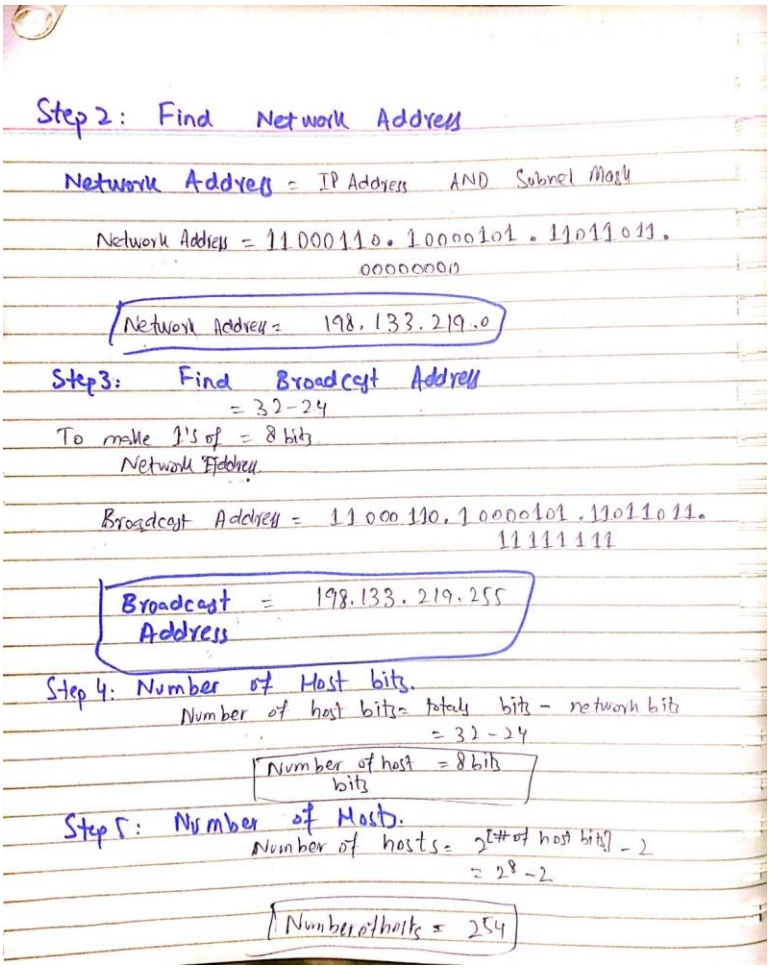
Given Data:

IP address = 198.133.219.250

Subnet Mask = 255.255.255.0

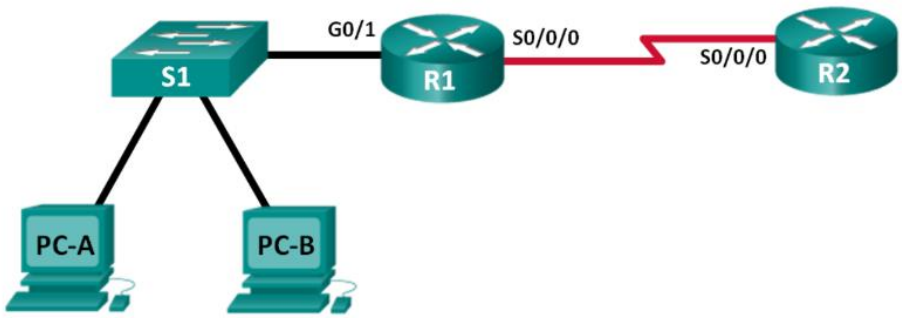
Solution:





Task 3: Network Topology A

In Part 1, you have been given the 192.168.10.0/24 network address to subnet, with the following topology. Determine the number of networks needed and then design an appropriate addressing Scheme.



Step 1: Determine the number of subnets in Network Topology A.

a. How many subnets are there?

Ans: There are **two** subnets are there.

b. How many bits should you borrow to create the required number of subnets?

Ans: One bit needs to borrow from host part to create two subnets.

Reason:

If we borrow one bit from host part then we can create 2^1 subnets. So, as we require two subnets so according to the formula, we will be needing one bit to borrow to create two subnets.

c. How many usable host addresses per subnet are in this addressing scheme?

Ans: There are **126** usable host addresses per subnet in this addressing scheme.

Reason:

From the eight host bits we have taken one bit to create two subnets. There are seven bits left for host so for each subnet the possible combinations will be **2^7**. That will be **128** but the first and last address are reserved and they cannot be used. So, there are **126** hosts possible.

d. What is the new subnet mask in dotted decimal format?

Ans: The new subnet mask will be **255.255.255.128**.

Reason:

We have reserved 25 bits for network. Its binary become **11111111.11111111.11111111.10000000.**

(11111111)2 = 255

(10000000)2 = 128

So the new subnet mask will be 255.255.255.128.

e. How many subnets are available for future use?

Ans: Zero

Reason:

We have reserved one bit to create two subnets and according to the formula **2^1** there are only two subnets possible and that we already using so not subnets left for future use.

Step 2: Record the subnet information.

Fill in the following table with the subnet information:

Subnet Number	Subnet Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
1	**192.168.10.0**	**192.168.10.1**	**192.168.10.126**	**192.168.10.127**
2	**192.168.10.128**	**192.168.10.129**	**192.168.10.254**	**192.168.10.255**

Subnet Address:

1. The subnet address will be **192.168.10.0** because the host bit that we reserved for network will be 0. The complete octet is zero so it will be 192.168.10.0.
2. The subnet address will be **192.168.10.128** because the host bit that we reserved for network will be 1. The binary of **10000000** will be **128**. So the second subnet address will be **192.168.10.128**.

First Usable Host Address:

1. The first useable host cannot be used because that address is used to identify the complete network. So, the first useable host address for **192.168.10.0** is **192.168.10.1**.
2. The first useable host cannot be used because that address is used to identify the complete network. So, the first useable host address for **192.168.10.128** is **192.168.10.129**.

Last Usable Host Address:

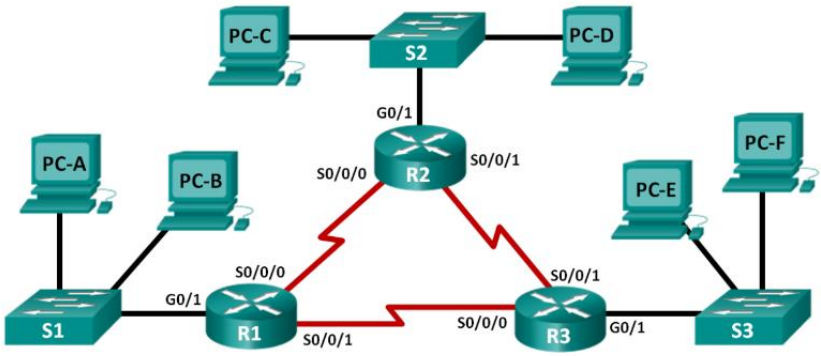
1. The last useable host cannot be used because that address is used to for broadcasting. So, the last useable host address for **192.168.10.0** is **192.168.10.126**.
2. The last useable host cannot be used because that address is used to for broadcasting. So, the last useable host address for **192.168.10.128** is **192.168.10.255**.

Broadcast Address for 192.168.10.128:

- Network Address = IP Address AND Subnet Mask => 192.168.10.128 => 192.168.10.10000000
- Bits to make 1 of network address = 32 – 25 => 7
- **Broadcast Address = 192.168.10.11111111 => 192.168.10.255**

Task 4: Network Topology B

The topology has changed again with a new LAN added to R2 and a redundant link between R1 and R3. Use the 192.168.10.0/24 network address to provide addresses to the network devices. Also provide an IP address scheme that will accommodate these additional devices. For this topology, assign a subnet to each Network.



Step 1: Determine the number of subnets in Network Topology B.

a. How many subnets are there?

Ans: There are **six** subnets in the given Network Topology.

b. How many bits should you borrow to create the required number of subnets?

Ans: Three bits to borrow to create the required number of subnets.

c. How many usable host addresses per subnet are in this addressing scheme?

Ans: 2 ^ 5 = 32 => 32 – 2 => 30 usable host addresses per subnet in this addressing scheme.

Reason:

Subtracting 2 from it as first and last address cannot be used.

d. What is the new subnet mask in dotted decimal format?

Ans: 255.255.255.224

Reason:

Binary representation of the subnet mask => **11111111.11111111.11111111.11100000.**

(11111111)2 = 255

(11100000)2 = 224

e. How many subnets are available for future use?

Ans: Two subnets are available for future use.

Reason:

Possible subnets = 2 ^ 3 = 8

Six are used in the given network topology. So (8 – 6) => 2 available for future use.

Step 2: Record the subnet information.

Fill in the following table with the subnet information:

Subnet Number	Subnet Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
1	192.168.10.0	192.168.10.1	192.168.10.30	192.168.10.31
2	192.168.10.32	192.168.10.33	192.168.10.62	192.168.10.63
3	192.168.10.64	192.168.10.65	192.168.10.94	192.168.10.95
4	192.168.10.96	192.168.10.97	192.168.10.126	192.168.10.127
5	192.168.10.128	192.168.10.129	192.168.10.158	192.168.10.159
6	192.168.10.160	192.168.10.161	192.168.10.190	192.168.10.191
7	192.168.10.192	192.168.10.193	192.168.10.222	192.168.10.223
8	192.168.10.224	192.168.10.225	192.168.10.254	192.168.10.255

Calculation:

First Usable Host for 192.168.10.0.

- First address cannot be used because it is used to identify the network so 192.168.10.1 will be going to be the first usable host address.

Last Usable Host for 192.168.10.0.

- To calculate the last usable host address that will be first three bits of the last octets will be zero. The next five bits will be one.
- 192.168.10.00011111 => 192.168.10.31
- Last address is used for broadcasting so the last usable host will be **192.168.10.30**.

Broadcast Address for 192.168.10.0:

- Network Address = IP Address AND Subnet Mask => 192.168.10.0
- **Bits to make 1 of network addres**s = (IPV4 total bits) - (Network Bits)
- = 32 – 27
- **Bits to make 1 of network address = 5**
- **Network Address = 192.168.10.00000000**
- **Broadcast Address = 192.168.10.00011111**
- **Result => Broadcast Address = 192.168.10.31**

Step 3: Assign addresses to network devices in the subnets.

a. Fill in the following table with IP addresses and subnet masks for the router interfaces:

Device	Interface	IP Address	Subnet Mask
R1	GigabitEthernet 0/1	192.168.10.1	255.255.255.224
	Serial 0/0/0	192.168.10.33	255.255.255.224
	Serial 0/0/1	192.168.10.65	255.255.255.224
R2	GigabitEthernet 0/1	192.168.10.97	255.255.255.224
	Serial 0/0/0	192.168.10.34	255.255.255.224
	Serial 0/0/1	192.168.10.129	255.255.255.224
R3	GigabitEthernet 0/1	192.168.10.161	255.255.255.224
	Serial 0/0/0	192.168.10.66	255.255.255.224
	Serial 0/0/1	192.168.10.130	255.255.255.224

…….