```
import java.util.Scanner;


public class Subnet {

	public static void main(String[] args) {
		// TODO Auto-generated method stub

		String ip;
		String mask="";
		int host=8;
		Scanner sc=new Scanner(System.in);
		System.out.println("Enter ip address :");
		ip=sc.next();
		String split_ip[]=ip.split("\\.");

		String Split_bip[]={"","","",""};
		String bip="";
		for(int i=0;i<4;i++)
		{
			Split_bip[i]=appendZeros(Integer.toBinaryString(Integer.parseInt(split_ip[i])));
			bip+=Split_bip[i];
		}
		System.out.println("IP in binary :"+bip);

		int firstoctet=Integer.parseInt(split_ip[0]);
		if(firstoctet<128)
		{
			host=24;
			mask="255.0.0.0";
		}
		else if(firstoctet<192)
		{
			host=16;
			mask="255.255.0.0";
		}
		else if(firstoctet<224)
		{
			host=8;
			mask="255.255.255.0";
		}
		System.out.println("Default subnet mask :"+mask);

		System.out.println("\n\n\nEnter no. of subnets :");
		int n=sc.nextInt();

		int x=(int)Math.ceil(Math.log(n)/Math.log(2));
		System.out.println("\n\n\nNo. of bits borrowed from host :"+x);
```

```
        int z=host-x;
        int mask1=256-(int)Math.pow(2, (8-x));
        //System.out.println("Subnetmask :"+mask1);
        System.out.println("Subentmask after Subnetting :"+newSubnet(mask1,firstoctet));
        int size=(int)Math.pow(2, z)-2;
        System.out.println("Subnet size :"+size);


        System.out.println("\n\n\nFirst subnet Details :");
        //First Network address
        int fbip[]=new int[32];
        String t[]={"","","",""};
        for(int i=0;i<32;i++)
        {
                fbip[i]=bip.charAt(i)-48;
        }
        for(int i=31;i>31-z;i--)
                fbip[i]&=0;
        for(int i=0;i<32;i++)
                t[i/8]=new String(t[i/8]+fbip[i]);
        System.out.println("First network address :");
        for(int i=0;i<4;i++)
        {
                System.out.print(Integer.parseInt(t[i],2));
                if(i!=3)
                        System.out.print(".");
        }

        //Broadcast Address
        int lbip[]=new int[32];
        String t1[]={"","","",""};
        for(int i=0;i<32;i++)
        {
                lbip[i]=bip.charAt(i)-48;
        }
        for(int i=31;i>31-z;i--)
                lbip[i]|=1;
        for(int i=0;i<32;i++)
                t1[i/8]=new String(t1[i/8]+lbip[i]);
        System.out.println("\nBroadcast address :");
        for(int i=0;i<4;i++)
        {
                System.out.print(Integer.parseInt(t1[i],2));
                if(i!=3)
                        System.out.print(".");
        }

}
```

```
	static String appendZeros(String s)
	{
		String temp="00000000";
		return temp.substring(s.length())+s;
	}

	static String newSubnet(int m,int firstoctet)
	{

		String mask="";
		if(firstoctet<128)
		{
			mask="255."+m+".0.0";
		}
		else if(firstoctet<192)
		{
			mask="255.255."+m+".0";
		}
		else if(firstoctet<224)
		{
			mask="255.255.255."+m;
		}
		return mask;
	}

}

/*Output
Enter ip address :
192.168.4.125
IP in binary :11000000101010000000010001111101
Default subnet mask :255.255.255.0
Enter no. of subnets :
4
No. of bits borrowed from host :2
Subentmask after Subnetting :255.255.255.192
Subnet size :62
First subnet Details :
First network address :
192.168.4.64
Broadcast address :
192.168.4.127
*/
```

Assignment 04

- Title: Subnetting

- Problem Statement:
  Write a program to demostrate subnetting & find subnet masks.

- Objectives:
  - To learn concept of classful IP address.
  - To learn concept of subnetting a network.
  - To calculate subnets for a given network.

- Software & Hardware packages.
  - Gcc, text editor.
  - Ubuntu 20.04
  - intel i5 64 bit
  - i/o devices.

- Theory:
  Subnetting is a process of dividing any classfull IP network (Class A, B, C into smaller networks.
  An IPV4 address has 2 components; the network part & the host part.

If we take an example for class C network, 192.168.10.0, the address & subnet mask can be represented as follows.

address port : 11000 000.10101000.00001010.00000000
SN mask : 11111111.11111111.11111111.00000000

Decimal : 192.168.10.0
255.255.255.0

For a class C iPV4 address, the first three octets are used to represent the network part and the last octet is used to represent the host part.

The default subnet mask for a class C IP address is 255.255.255.0

Class B ip address
255.255.0.0
Class A IP address
255.0.0.0

Network address.
A network address is used to identify the subnet that a host maybe placed on & is used to represent that network.

Subnets:
If we include one bit from the host part the subnet mask is changed into
255.255.255.128
ie: 11000000.10101000.00001010.00000000
11111111.11111111.11111111.10000000

Description	Binary
1) Network Addr.	11000000.10101000.00001010.00000000
First IPV4 Addr.	11000000.10101000.00001010.00000001
Last IPV4 Addr.	11000000.10101000.00001010.01111110
Broadcast Addr.	11000000.10101000.00001010.01111111
2) Network Addr.	11000000.10101000.00001010.10000000
First IPV4 Addr.	11000000.10101000.00001010.10000001
last IPV4 Addr.	11000000.10101000.00001010.11111110
Broadcast Addr.	11000000.10101000.00001010.11111111

- Class C Subnetting can be summarised as below:

Subnet bits	Subnet Mask	CIDR	Subnets	Usable IPs
0	255.255.255.0	124	1	254
1	255.255.255.128	125	2	126
2	255.255.255.192	126	4	62
3	255.255.255.224	127	8	30
4	255.255.255.240	128	16	14
5	255.255.255.248	129	32	6
6	255.255.255.252	130	64	2

- TEST CASES

1) IPV4: 98.63.64.146
IPV4 Class: A
Default Subnet Mask: 255.0.0.0
11111111.00000000.00000000.00000000
No. of addr. per Subnet: 500
Subnet mask: 255.255.254.0
11111111.11111111.11111110.00000000
Network Addr.: 98.63.64.0
01100010.00111111.01000001.11111111
No. of Subnets: 32768
no. of hosts per Subnet: 510

2) IPV4: 192.168.25.48
IPV4 Class: C
Default Subnet Mask: 255.255.255.0
11111111.11111111.11111111.00000000
No. of addr. per Subnet: 50
Subnet Mask: 255.255.255.192
11111111.11111111.11111111.11000000
Network addr. 192.168.25.0
11000000.10101000.00011001.00000000
Direct Broadcast: 192.168.25.63
11000000.10101000.00011001.00111111
no. of subnets: 4
no. of hosts per subnet: 62

- Conclusion: We studied about classful IP address & CIDR notation for classless address with subnetting & the same for Net. address & direct broadcast Addr. for an IP