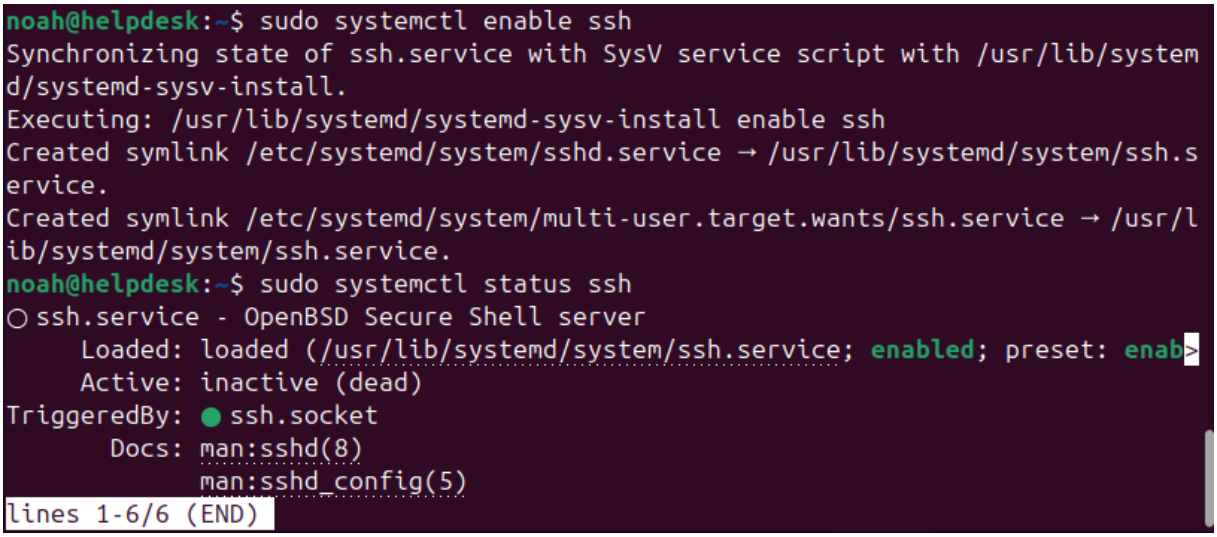
Template Week 6 – Networking

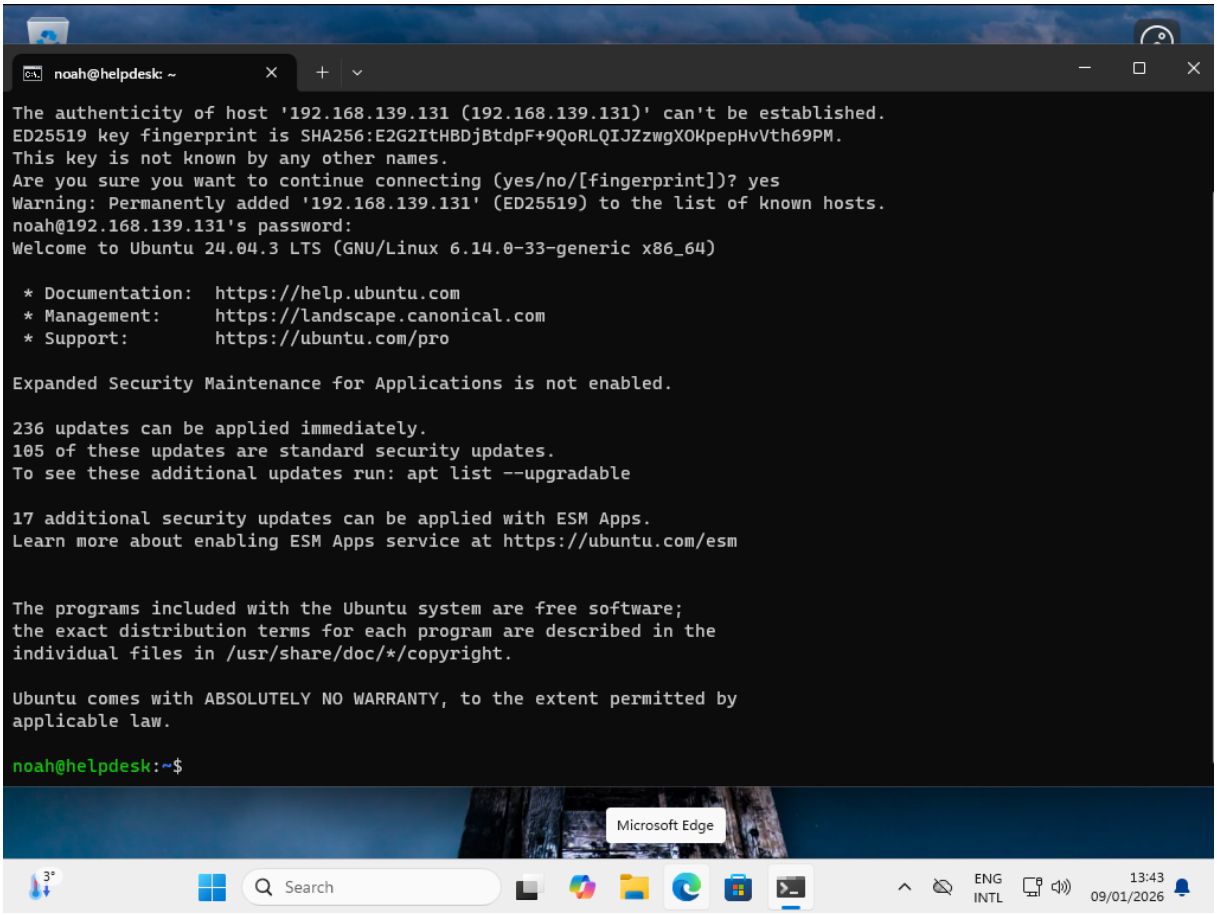
Student number: 499193

Assignment 6.1: Working from home

Screenshot installation openssh-server:



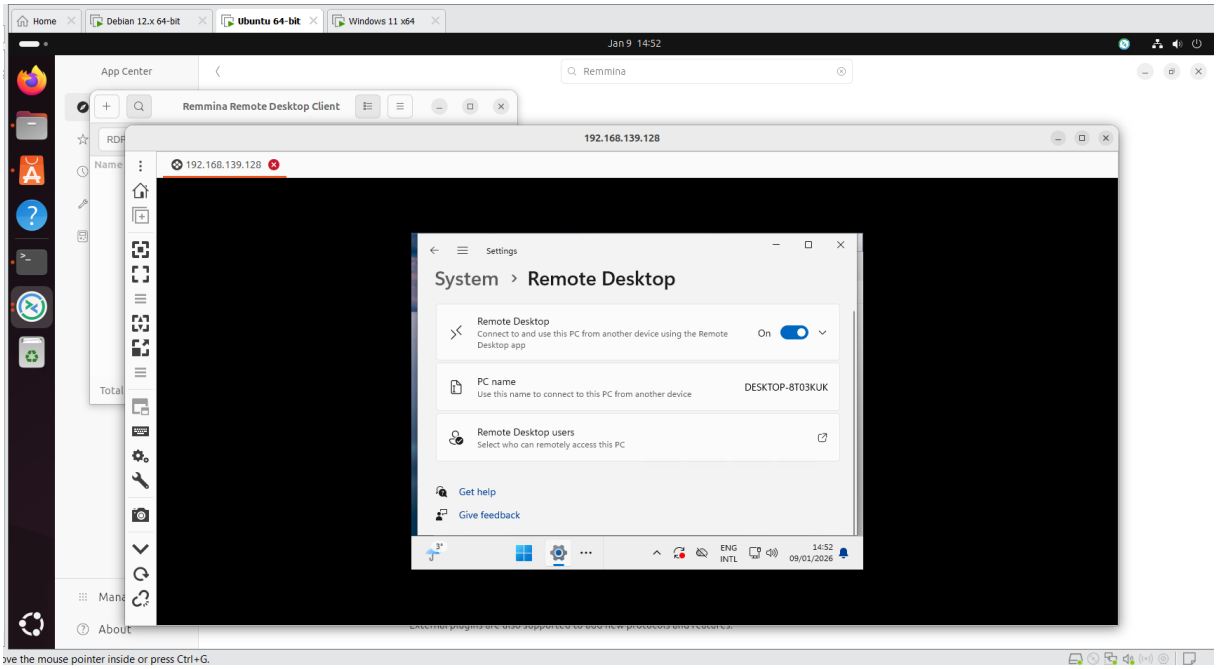
Screenshot successful SSH command execution:



Screenshot successful execution SCP command:

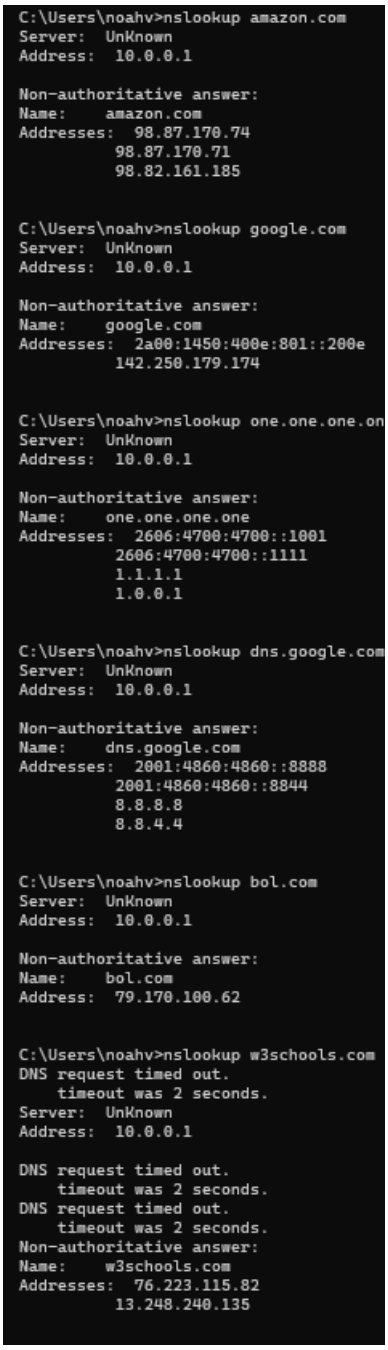
```
C:\Users\noah>"%LOCALAPPDATA%\Programs\WinSCP\winscp.com"/command "open sftp://noah:Welkom01@192.168.139.131"
"put C:\Users\noah\Documents\bestand.txt /home/noah/" exit
Searching for host...
Connecting to host...
Authenticating...
Using username "noah".
Authenticating with pre-entered password.
Authenticated.
Starting the session...
Session started.
Active session: [1] noah@192.168.139.131
C:\...\bestand.txt        |            7 B |    0,0 KB/s | binary | 100%

C:\Users\noah>
```

Screenshot remmina:

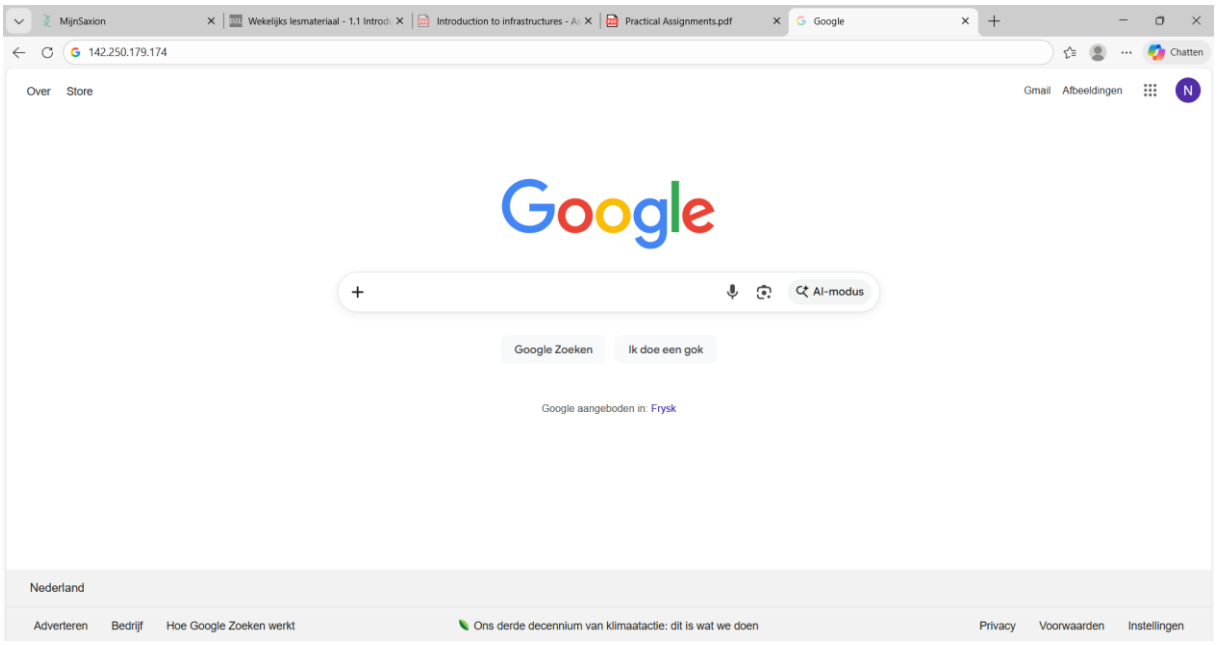


Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:



Screenshot website visit via IP address:



Assignment 6.3: subnetting

How many IP addresses are in this network configuration 192.168.110.128/25?

32 - 25 = 7
2 ^7 = <u>128</u>

What is the usable IP range to hand out to the connected computers?

192.168.110.129 – 192.168.110.254
.128 network address
.255 broadcast

Check your two previous answers with this Linux command: `ipcalc 192.168.110.128/25`

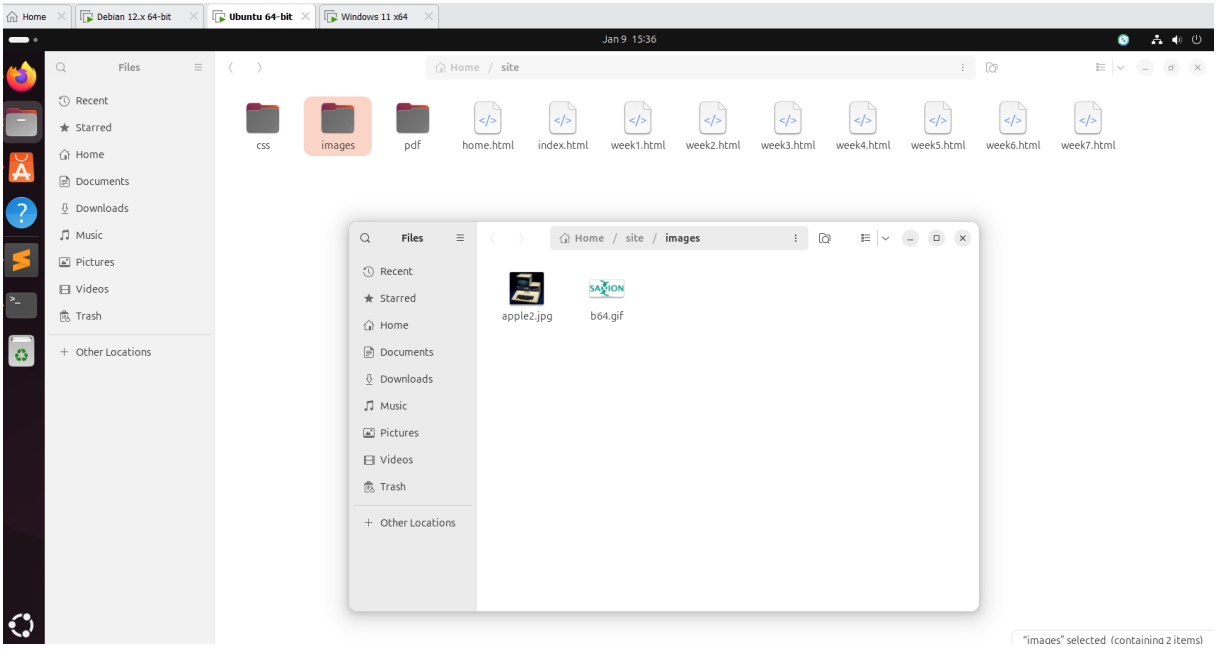
```
noah@helpdesk:~$ ipcalc 192.168.110.128/25
Address:   192.168.110.128      11000000.10101000.01101110.1 0000000
Netmask:   255.255.255.128 = 25 11111111.11111111.11111111.1 0000000
Wildcard:  0.0.0.127            00000000.00000000.00000000.0 1111111
=>
Network:   192.168.110.128/25   11000000.10101000.01101110.1 0000000
HostMin:   192.168.110.129      11000000.10101000.01101110.1 0000001
HostMax:   192.168.110.254      11000000.10101000.01101110.1 1111110
Broadcast: 192.168.110.255      11000000.10101000.01101110.1 1111111
Hosts/Net: 126                   Class C, Private Internet
```

Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

```
noah@helpdesk:~/site$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:45:dd:1c brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.139.131/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
       valid_lft 1392sec preferred_lft 1392sec
noah@helpdesk:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET / HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /css/mypdfstyle.css HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /home.html HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] code 404, message File not found
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /favicon.ico HTTP/1.1" 404 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /images/b64.gif HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /images/apple2.jpg HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:34:07] "GET / HTTP/1.1" 304 -
192.168.139.128 - - [09/Jan/2026 15:34:07] "GET /home.html HTTP/1.1" 200 -
```

Screenshot of Site directory contents:



Screenshot python3 webserver command:

```
noah@helpdesk:~/site$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: ens33: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 00:0c:29:45:dd:1c brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.139.131/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
       valid_lft 1392sec preferred_lft 1392sec
noah@helpdesk:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET / HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /css/mypdfstyle.css HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /home.html HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] code 404, message File not found
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /favicon.ico HTTP/1.1" 404 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /images/b64.gif HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:32:56] "GET /images/apple2.jpg HTTP/1.1" 200 -
192.168.139.128 - - [09/Jan/2026 15:34:07] "GET / HTTP/1.1" 304 -
192.168.139.128 - - [09/Jan/2026 15:34:07] "GET /home.html HTTP/1.1" 200 -
```

Screenshot web browser visits your site

Assignment 6.5: Network segment

Remember that bitwise java application you've made in week 2? Expand that application so that you can also calculate a network segment as explained in the PowerPoint slides of week 6. Use the bitwise & AND operator. You need to be able to input two Strings. An IP address and a subnet.

IP: 192.168.1.100 and subnet: 255.255.255.224 for /27

```
Example: 192.168.1.100/27
Calculate the network segment
IP Address:   11000000.10101000.00000001.01100100
Subnet Mask:  11111111.11111111.11111111.11100000
-----------------------------------------------
Network Addr: 11000000.10101000.00000001.01100000

This gives 192.168.1.96 in decimal as the network address.
For a /27 subnet, each segment (or subnet) has 32 IP addresses (2⁵).
The range of this network segment is from 192.168.1.96 to 192.168.1.127.
```

Paste source code here, with a screenshot of a working application.

```
import java.util.Scanner;

public class Main {

   public static void main(String[] args) {
      Scanner userInput = new Scanner(System.in);
      boolean continueProgram = true;

      while (continueProgram) {
         System.out.println("\nPlease select an option: ");
         System.out.println("1) Bit Calculations");
         System.out.println("2) Calculate Network Segment");
         System.out.println("0) Exit");
         int choice = userInput.nextInt();
         userInput.nextLine();

         if (choice == 1) {
            bitMenu(userInput);

         } else if (choice == 2) {
            System.out.println("Enter IP address: ");
            String ip = userInput.nextLine();

            System.out.println("Enter subnet mask: ");
            String subnet = userInput.nextLine();

            calculateNetworkDetails(ip, subnet);
```

```
        } else if (choice == 0) {
            continueProgram = false;
        }
    }
}

// ---------------------------------------------------------
// BIT CALCULATIONS MENU
// ---------------------------------------------------------
public static void bitMenu(Scanner userInput) {
    System.out.println("Enter a number for bit calculations: ");
    int number = userInput.nextInt();
    userInput.nextLine();

    boolean back = false;

    while (!back) {
        System.out.println("\nBit Calculation Menu");
        System.out.println("1) Is number odd?");
        System.out.println("2) Is number a power of two?");
        System.out.println("3) Show two's complement");
        System.out.println("0) Back to main menu");

        int input = userInput.nextInt();
        userInput.nextLine();

        if (input == 1) {
            if ((number & 1) == 1)
                System.out.println("Number is odd");
            else
                System.out.println("Number is even");

        } else if (input == 2) {
            if (number > 0 && (number & (number - 1)) == 0)
                System.out.println("Number is a power of 2");
            else
                System.out.println("Number isn't a power of 2");

        } else if (input == 3) {
            int twocomp = ~number + 1;
            System.out.println("Two's complement: " + twocomp);

        } else if (input == 0) {
            back = true;
        }
    }
}
```

```
// NETWORK CALCULATION
// ------------------------------------------------------
public static void calculateNetworkDetails(String ip, String subnet) {

    String[] ipParts = ip.split("\\.");
    String[] subnetParts = subnet.split("\\.");

    int[] ipOctets = new int[4];
    int[] maskOctets = new int[4];
    int[] networkOctets = new int[4];

    int cidr = 0;

    for (int i = 0; i < 4; i++) {
        ipOctets[i] = Integer.parseInt(ipParts[i]);
        maskOctets[i] = Integer.parseInt(subnetParts[i]);
        networkOctets[i] = ipOctets[i] & maskOctets[i];

        cidr += Integer.bitCount(maskOctets[i]); // count 1-bits
    }

    // Convert to binary strings
    String ipBinary = toBinary(ipOctets);
    String maskBinary = toBinary(maskOctets);
    String networkBinary = toBinary(networkOctets);

    // Subnet size
    int hostBits = 32 - cidr;
    int totalIPs = (int) Math.pow(2, hostBits);

    // Range
    int firstIP = networkOctets[3];
    int lastIP = networkOctets[3] + totalIPs - 1;

    System.out.println("\n-----------------------------------------------");
    System.out.println("IP Address:   " + ipBinary);
    System.out.println("Subnet Mask:  " + maskBinary);
    System.out.println("-----------------------------------------------");
    System.out.println("Network Addr: " + networkBinary);

    System.out.println("This gives " +
            networkOctets[0] + "." +
            networkOctets[1] + "." +
            networkOctets[2] + "." +
            networkOctets[3] +
            " in decimal as the network address.");
```

```
        System.out.println("For a /" + cidr + " subnet, each segment has " +
                totalIPs + " IP addresses.");

        System.out.println("The range of this network segment is from " +
                networkOctets[0] + "." + networkOctets[1] + "." +
                networkOctets[2] + "." + firstIP +
                " to " +
                networkOctets[0] + "." + networkOctets[1] + "." +
                networkOctets[2] + "." + lastIP);
    }


    // Convert 4 octets to binary
    // ----------------------------------------------------------
    public static String toBinary(int[] octets) {
        return String.format("%8s.%8s.%8s.%8s",
                Integer.toBinaryString(octets[0]).replace(' ', '0'),
                Integer.toBinaryString(octets[1]).replace(' ', '0'),
                Integer.toBinaryString(octets[2]).replace(' ', '0'),
                Integer.toBinaryString(octets[3]).replace(' ', '0')
        ).replace(' ', '0');
    }
}
```

```
C:\Users\noahv\.jdks\ms-21.0.8\bin\java.exe "-javaagent:C:\Program Files\J

Please select an option:
1) Bit Calculations
2) Calculate Network Segment
0) Exit
2
Enter IP address:
192.168.1.100
Enter subnet mask:
255.255.255.224

------------------------------------------------
IP Address:   11000000.10101000.00000001.01100100
Subnet Mask:  11111111.11111111.11111111.11100000
------------------------------------------------
Network Addr: 11000000.10101000.00000001.01100000
This gives 192.168.1.96 in decimal as the network address.
For a /27 subnet, each segment has 32 IP addresses.
The range of this network segment is from 192.168.1.96 to 192.168.1.127

Please select an option:
1) Bit Calculations
2) Calculate Network Segment
0) Exit
```

Ready? Save this file and export it as a pdf file with the name: **week6.pdf**