Template Week 6 – Networking

Student number: 586146

Assignment 6.1: Working from home

Screenshot installation openssh-server:

```
david@david586146:~$ sudo apt install openssh-server -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  ncurses-term openssh-sftp-server ssh-import-id
Suggested packages:
  molly-guard monkeysphere ssh-askpass
```

Screenshot successful SSH command execution:

```
david@david586146:~$ sudo systemctl start ssh
david@david586146:~$ sudo systemctl status ssh
● ssh.service - OpenBSD Secure Shell server
     Loaded: loaded (/usr/lib/systemd/system/ssh.service; enabled; preset: enab
     Active: active (running) since Fri 2026-01-09 14:41:01 CET; 6s ago
TriggeredBy: ● ssh.socket
       Docs: man:sshd(8)
             man:sshd_config(5)
    Process: 3725 ExecStartPre=/usr/sbin/sshd -t (code=exited, status=0/SUCCESS
   Main PID: 3727 (sshd)
      Tasks: 1 (limit: 4545)
     Memory: 1.2M (peak: 1.4M)
        CPU: 15ms
     CGroup: /system.slice/ssh.service
             └─3727 "sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups"

Jan 09 14:41:01 david586146 systemd[1]: Starting ssh.service - OpenBSD Secure S
Jan 09 14:41:01 david586146 sshd[3727]: Server listening on 0.0.0.0 port 22.
Jan 09 14:41:01 david586146 sshd[3727]: Server listening on :: port 22.
```

```
david586146@192.168.79.130's password:
Permission denied, please try again.
david586146@192.168.79.130's password:

C:\Users\David>ssh david@192.168.79.130
david@192.168.79.130's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-36-generic aarch64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

Expanded Security Maintenance for Applications is not enabled.

167 updates can be applied immediately.
80 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

6 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm


The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

david@david586146:~$
```
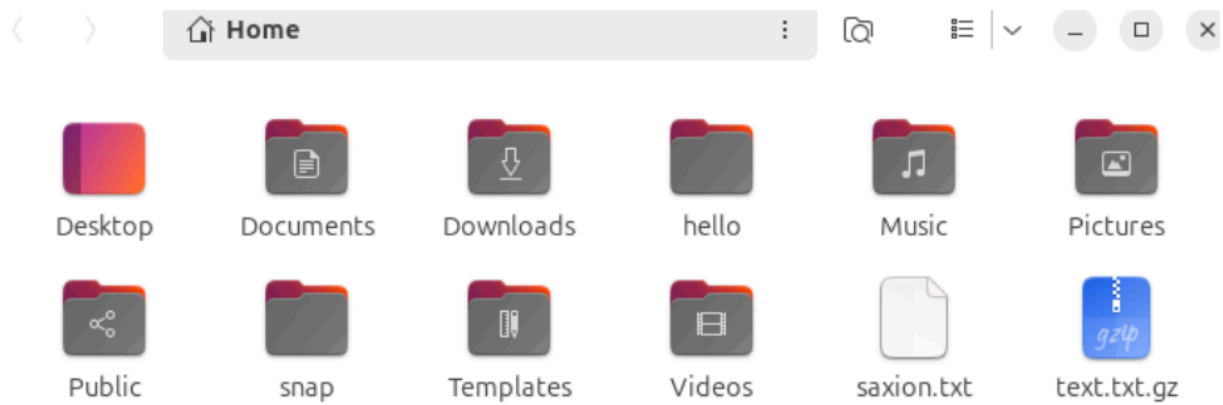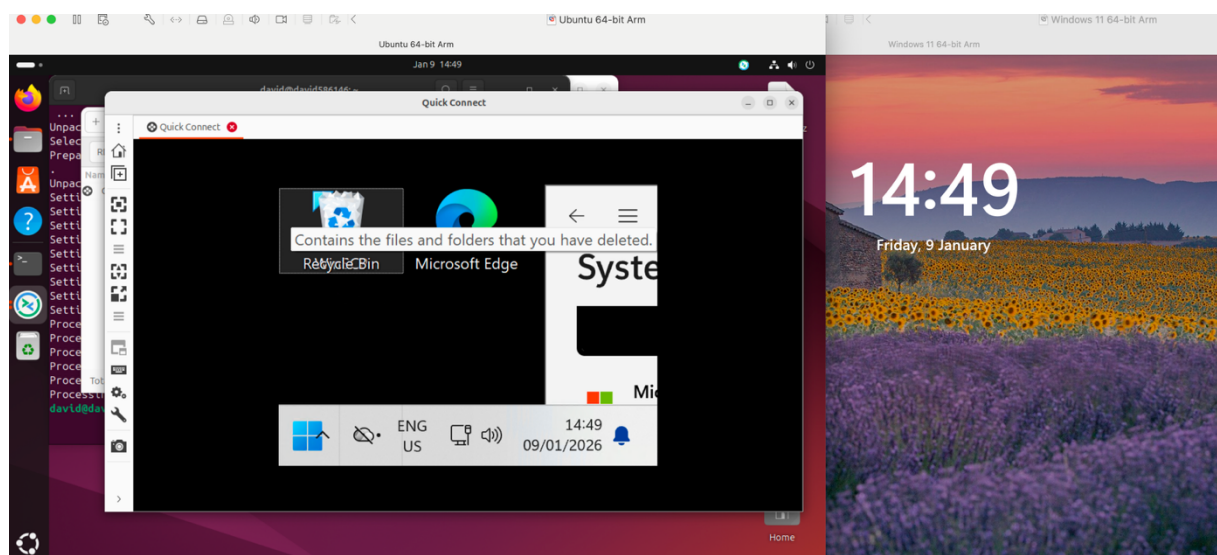
Screenshot successful execution SCP command:

```
C:\Users\David\Desktop>scp saxion.txt david@192.168.79.130:/home/david/
david@192.168.79.130's password:
saxion.txt                                    100%    0    0.0KB/s   00:00

C:\Users\David\Desktop>
```

Screenshot remmina:

Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:


```
Microsoft Windows [Version 10.0.26100.1742]
(c) Microsoft Corporation. All rights reserved.

C:\Users\David>nslookup
Default Server:  UnKnown
Address:  192.168.79.2

>
```

```
C:\Users\David>nslookup
Default Server:   UnKnown
Address:   192.168.79.2

> nslookup amazon.com
Server:   amazon.com.localdomain
Addresses:   98.82.161.185
             98.82.161.185

DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
*** Request to amazon.com timed-out
> nslookup google.com
Server:   google.com.localdomain
Addresses:   142.250.179.206
             142.250.179.206

DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
*** Request to google.com timed-out
> nslookup bol.com
Server:   bol.com.localdomain
Addresses:   79.170.100.62
             79.170.100.62

DNS request timed out.
    timeout was 2 seconds.
DNS request timed out.
    timeout was 2 seconds.
*** Request to bol.com timed-out
```
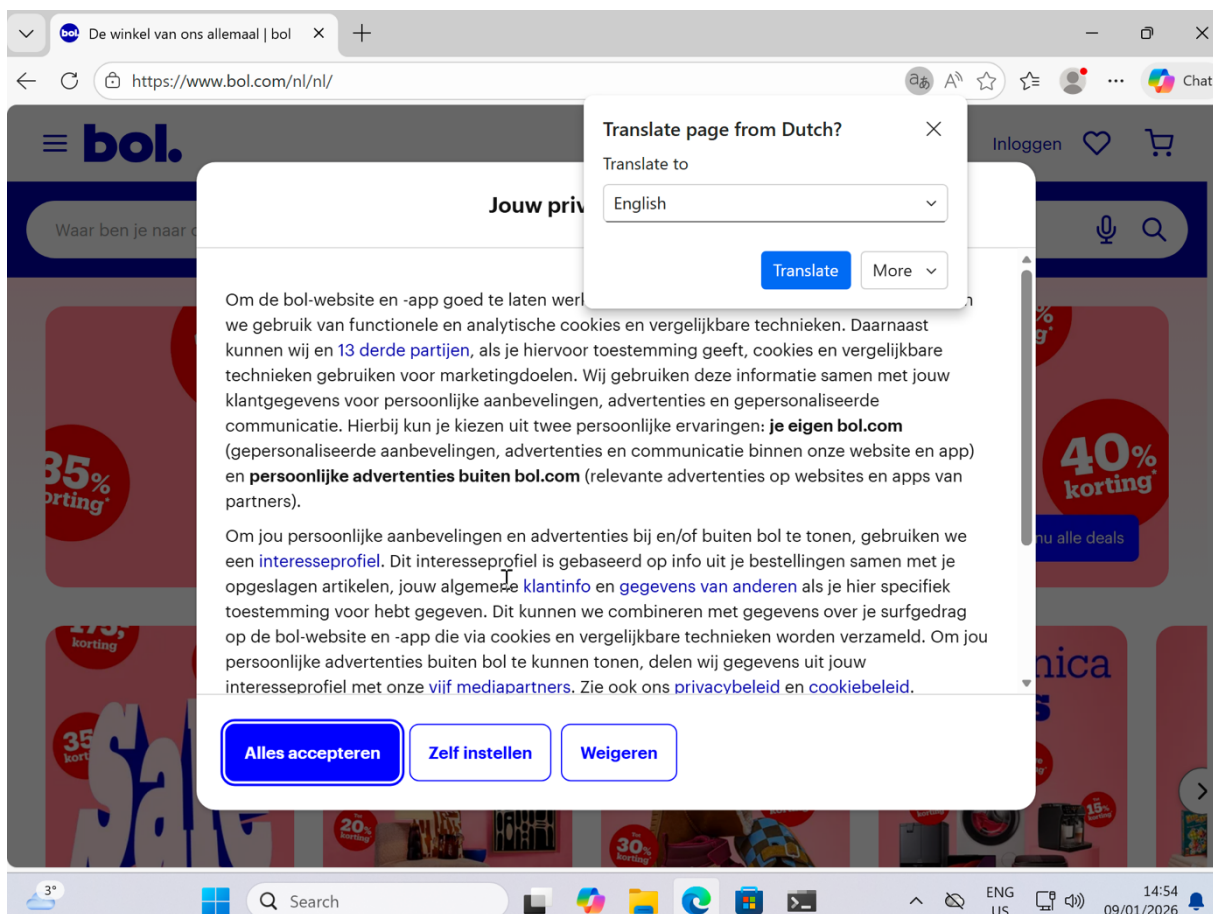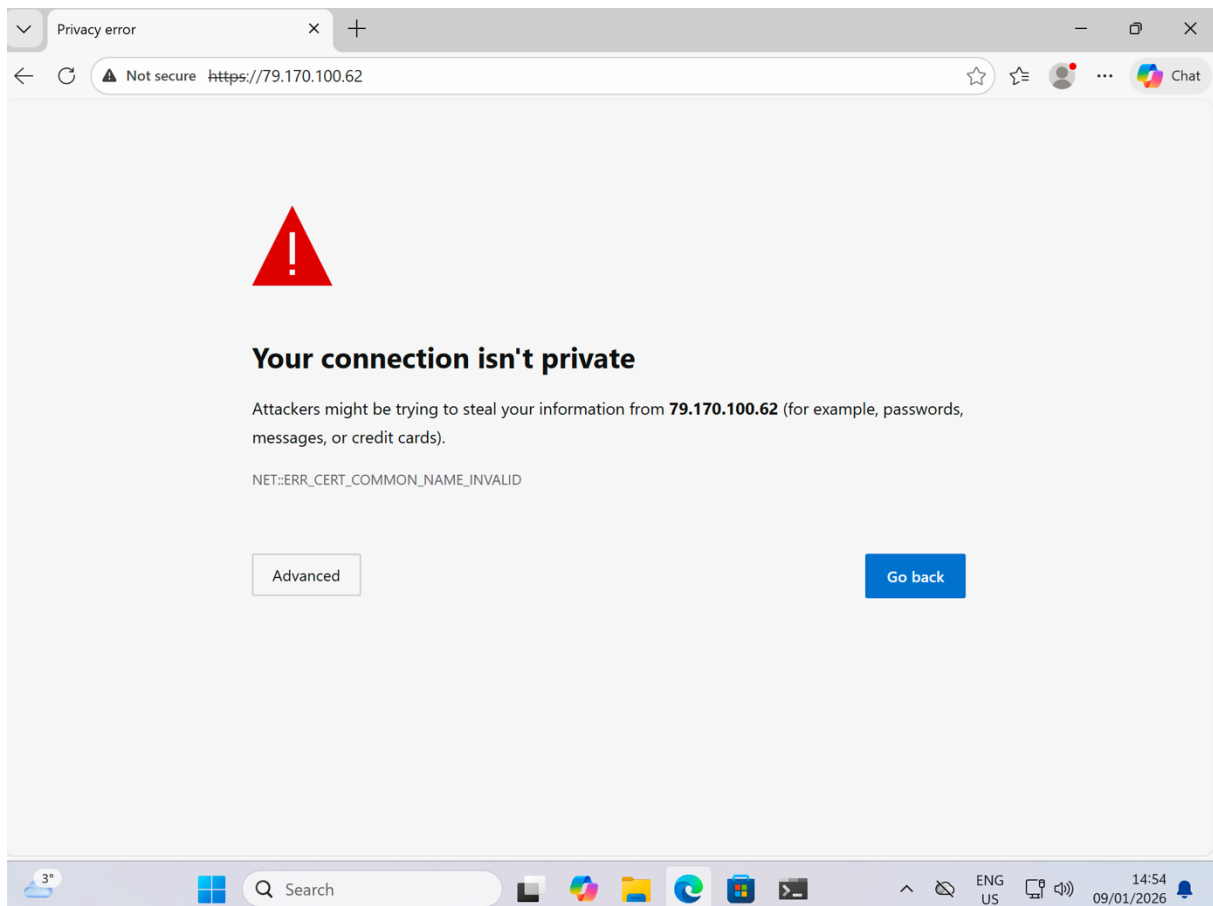
Screenshot website visit via IP address:

Assignment 6.3: subnetting

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

128 IP addresses in this subnet.

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

192.168.110.129 to 192.168.110.254

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

Explain the above calculation in your own words.

There are two networks that we cannot use, the .128 and the broadcast one which ends on .255. Those addresses cannot be assigned to a computer.

Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

```
david@david586146:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t 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: ens160: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP gr
oup default qlen 1000
    link/ether 00:0c:29:0a:bd:79 brd ff:ff:ff:ff:ff:ff
    altname enp2s0
    inet 192.168.79.130/24 brd 192.168.79.255 scope global dynamic noprefixroute
 ens160
       valid_lft 1160sec preferred_lft 1160sec
    inet6 fe80::20c:29ff:fe0a:bd79/64 scope link
       valid_lft forever preferred_lft forever
david@david586146:~$
```

Screenshot of Site directory contents:

```
david@david586146:~$ mv ~/Downloads/site.zip ~/
david@david586146:~$ unzip site.zip
Archive:  site.zip
   creating: site/css/
  inflating: site/css/mypdfstyle.css
  inflating: site/home.html
   creating: site/images/
  inflating: site/index.html
   creating: site/pdf/
  inflating: site/pdf/week1.pdf
  inflating: site/pdf/week2.pdf
  inflating: site/pdf/week3.pdf
  inflating: site/pdf/week4.pdf
  inflating: site/pdf/week5.pdf
  inflating: site/pdf/week6.pdf
  inflating: site/pdf/week7.pdf
  inflating: site/week1.html
  inflating: site/week2.html
  inflating: site/week3.html
  inflating: site/week4.html
  inflating: site/week5.html
  inflating: site/week6.html
  inflating: site/week7.html
david@david586146:~$
```
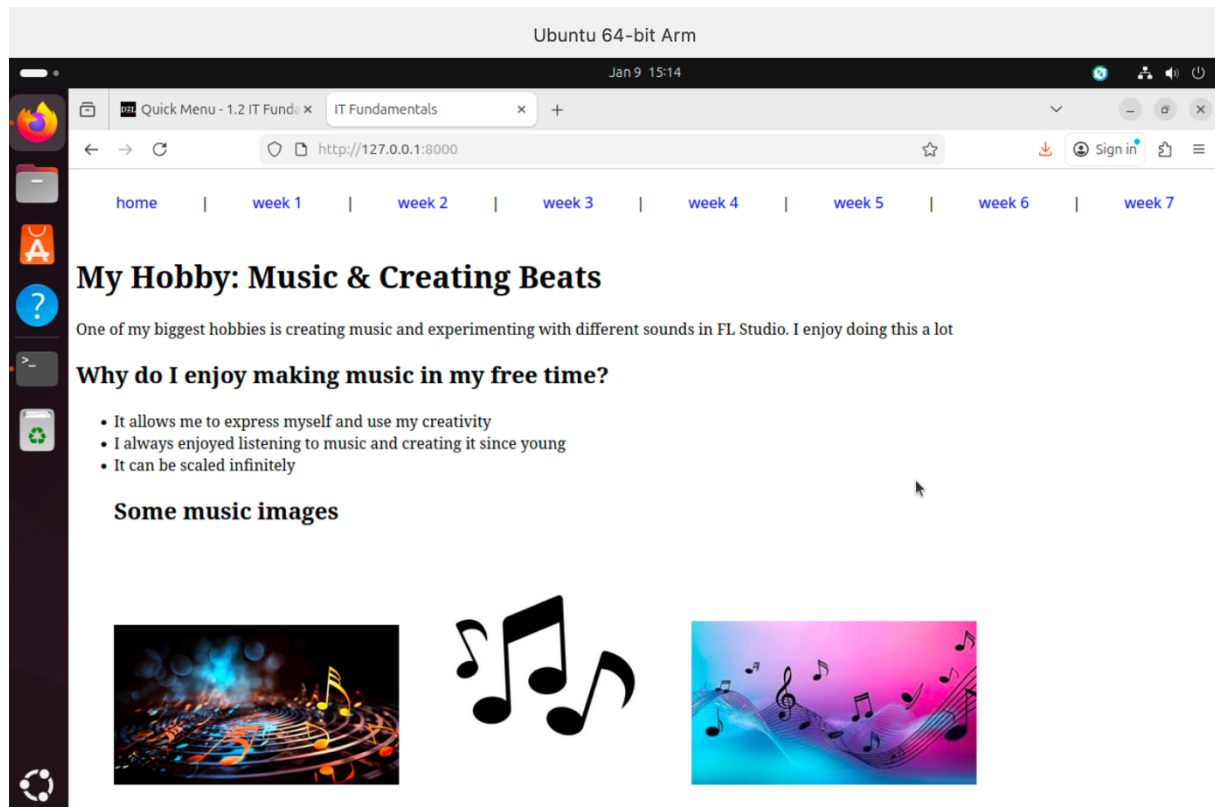
Screenshot python3 webserver command:

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
----------------------------------------------------
```
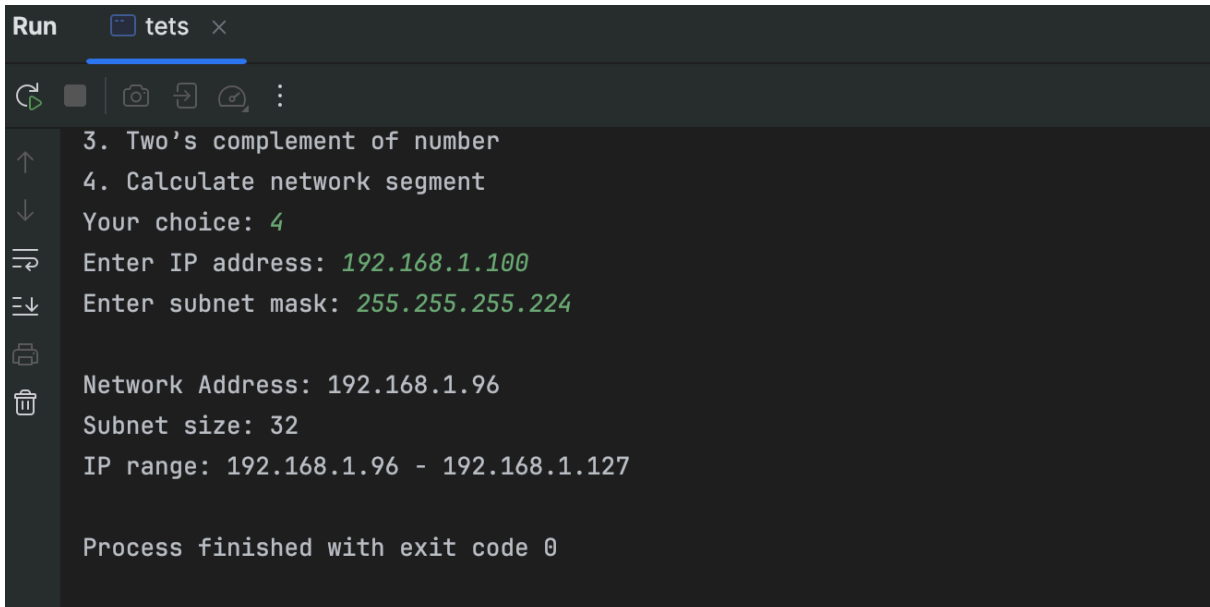
```
Network Addr: 11000000.10101000.00000001.01100000
```

This gives 192.168.1.96 in decimal as the network address.
For a /27 subnet, each segment (or subnet) has 32 IP addresses (2^5).
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.

```
Run        tets  ×

  ⟳  ■   ◎  ⇥  ⊘  ⋮

        3. Two's complement of number
  ↑
        4. Calculate network segment
  ↓
        Your choice: 4
  ⇥
        Enter IP address: 192.168.1.100
  ⇥↓
        Enter subnet mask: 255.255.255.224
  ⎙
        Network Address: 192.168.1.96
  🗑
        Subnet size: 32
        IP range: 192.168.1.96 - 192.168.1.127

        Process finished with exit code 0
```

import java.util.Scanner;

public class tets {

    // Even or Odd

    public static boolean isOdd(int n) {

        return (n & 1) == 1;

    }

    // Power of 2

    public static boolean isPowerOfTwo(int n) {

        return n > 0 && (n & (n - 1)) == 0;

    }

```java
    // Two's complement
    public static int twosComplement(int n) {

        return (~n) + 1;

    }


    public static int ipToInt(String ip) {

        String[] parts = ip.split("\\.");

        int result = 0;


        for (String part : parts) {

            result = (result << 8) | Integer.parseInt(part);

        }

        return result;

    }


    public static String intToIp(int ip) {

        return String.format("%d.%d.%d.%d",

                (ip >> 24) & 0xFF,

                (ip >> 16) & 0xFF,

                (ip >> 8) & 0xFF,

                ip & 0xFF);

    }


    public static void main(String[] args) {

        Scanner scanner = new Scanner(System.in);


        System.out.println("Choose an option:");

        System.out.println("1. Is number odd?");

        System.out.println("2. Is number a power of 2?");

        System.out.println("3. Two's complement of number");

        System.out.println("4. Calculate network segment");
```

```java
System.out.print("Your choice: ");

int choice = scanner.nextInt();

scanner.nextLine();


switch (choice) {
    case 1:
        System.out.print("Enter a number: ");

        int number1 = scanner.nextInt();

        System.out.println(isOdd(number1) ? "Number is odd." : "Number is even.");

        break;


    case 2:
        System.out.print("Enter a number: ");

        int number2 = scanner.nextInt();

        System.out.println(isPowerOfTwo(number2) ? "Number is a power of 2." : "Number isn't a
power of 2.");

        break;


    case 3:
        System.out.print("Enter a number: ");

        int number3 = scanner.nextInt();

        System.out.println("Two's complement: " + twosComplement(number3));

        break;


    case 4:
        System.out.print("Enter IP address: ");

        String ip = scanner.nextLine();


        System.out.print("Enter subnet mask: ");

        String subnet = scanner.nextLine();
```

```java
            int ipInt = ipToInt(ip);

            int subnetInt = ipToInt(subnet);


            int networkInt = ipInt & subnetInt;

            String networkAddress = intToIp(networkInt);


            int hostBits = 5;

            int subnetSize = 1 << hostBits;


            String rangeStart = networkAddress;

            String rangeEnd = intToIp(networkInt + subnetSize - 1);


            System.out.println("\nNetwork Address: " + networkAddress);

            System.out.println("Subnet size: " + subnetSize);

            System.out.println("IP range: " + rangeStart + " - " + rangeEnd);

            break;


        default:

            System.out.println("Invalid option.");

    }


    scanner.close();

  }

}
```

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