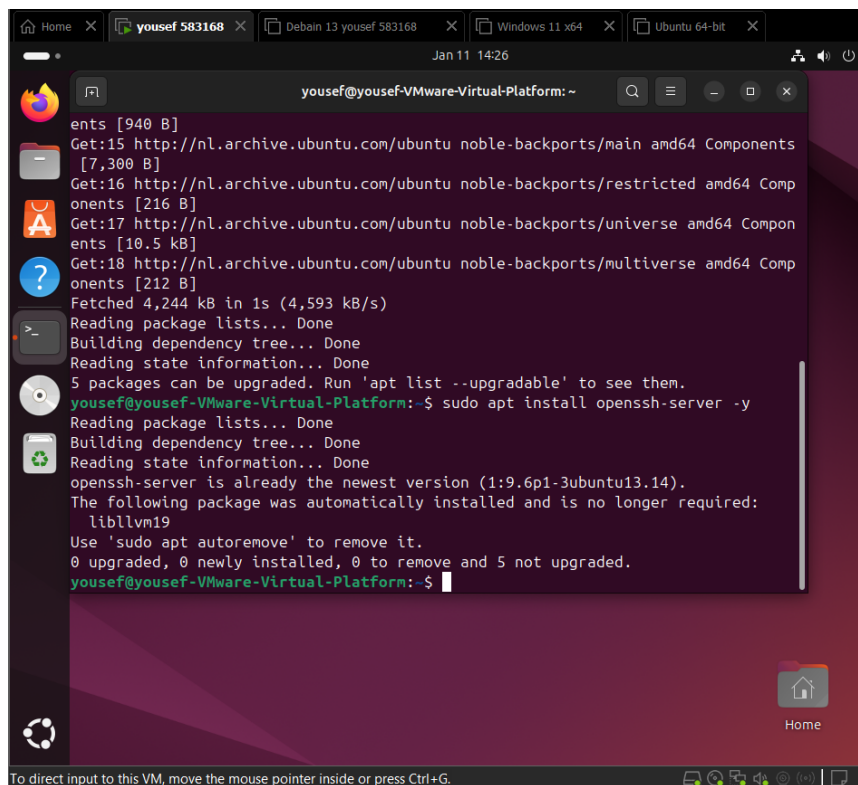


Template Week 6 – Networking

Student number: 583168

Assignment 6.1: Working from home

Screenshot installation openssh-server:



The screenshot shows a terminal window titled 'yousef@yousef-VMware-Virtual-Platform:~' with a search bar and window controls. The terminal output shows the following commands and results:

```
ents [940 B]
Get:15 http://nl.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components
[7,300 B]
Get:16 http://nl.archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Comp
onents [216 B]
Get:17 http://nl.archive.ubuntu.com/ubuntu noble-backports/universe amd64 Compon
ents [10.5 kB]
Get:18 http://nl.archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Comp
onents [212 B]
Fetched 4,244 kB in 1s (4,593 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
5 packages can be upgraded. Run 'apt list --upgradable' to see them.
yousef@yousef-VMware-Virtual-Platform:~$ sudo apt install openssh-server -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssh-server is already the newest version (1:9.6p1-3ubuntu13.14).
The following package was automatically installed and is no longer required:
  libllvm19
Use 'sudo apt autoremove' to remove it.
0 upgraded, 0 newly installed, 0 to remove and 5 not upgraded.
yousef@yousef-VMware-Virtual-Platform:~$
```

The terminal window is part of a virtual machine interface. The top bar shows the date 'Jan 11 14:26' and system icons. The bottom bar has a message: 'To direct input to this VM, move the mouse pointer inside or press Ctrl+G.' and various VM controls.

Screenshot successful SSH command execution:


```
yousef@yousef-VMware-Virt x + v
Microsoft Windows [Version 10.0.26200.7462]
(c) Microsoft Corporation. All rights reserved.

C:\Users\youssef>ssh yousef@192.168.139.132
The authenticity of host '192.168.139.132 (192.168.139.132)' can't be established.
ED25519 key fingerprint is SHA256:EybCwY7XueoXuF80pxMx+H9EjghsHfZNsx9kEJXuHXw.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '192.168.139.132' (ED25519) to the list of known hosts.
yousef@192.168.139.132's password:
Welcome to Ubuntu 24.04.3 LTS (GNU/Linux 6.14.0-37-generic x86_64)

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

Expanded Security Maintenance for Applications is not enabled.

1 update can be applied immediately.
To see these additional updates run: apt list --upgradable

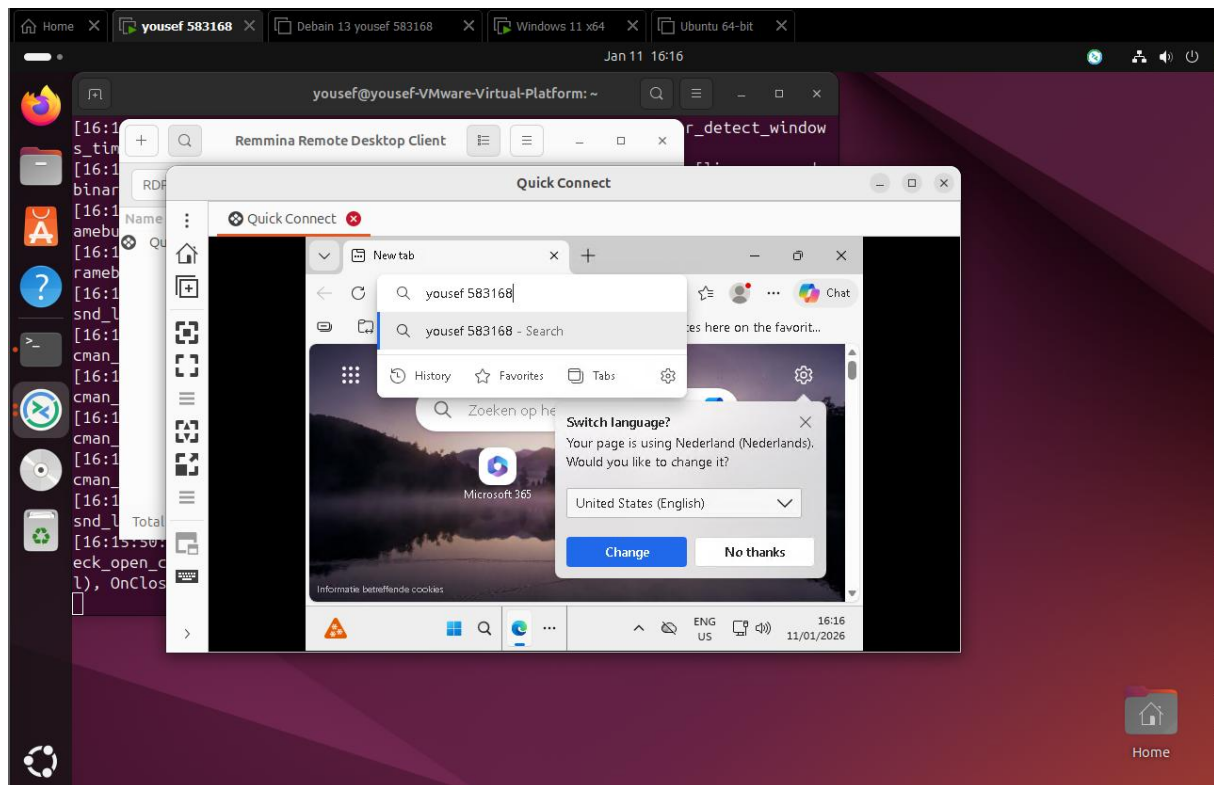
17 additional security updates can be applied with ESM Apps.
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Fri Jan  9 22:14:07 2026 from 192.168.139.132
yousef@yousef-VMware-Virtual-Platform:~$ yousef 583168|
```

Screenshot successful execution SCP command:

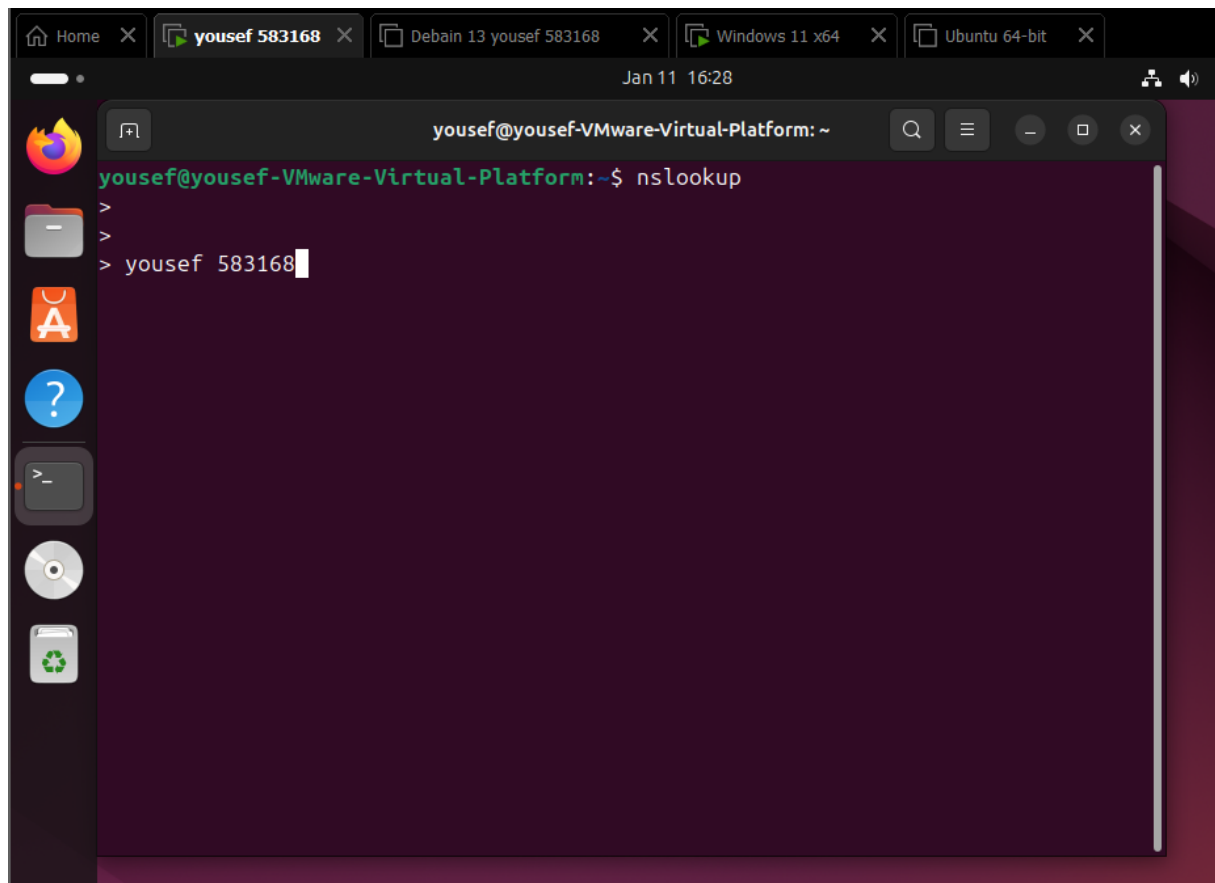
```
yousef@yousef-VMware-Virtual-Platform:~$ echo Hello from Windows > testfile.txt
yousef@yousef-VMware-Virtual-Platform:~$ dir
5.4example.txt  Documents  hello      Pictures  test2.txt  website
archive.tar     Downloads  home       Public   testfile.txt
archive.tar.gz  file2.txt  message.txt snap     test.txt
Desktop         file.txt  Music      Templates Videos
yousef@yousef-VMware-Virtual-Platform:~$ scp testfile.txt yousef@192.168.139.132:/home/yousef/
yousef@192.168.139.132's password:
testfile.txt                                100%  19    24.3KB/s   00:00
yousef@yousef-VMware-Virtual-Platform:~$ |
```

Screenshot remmina:

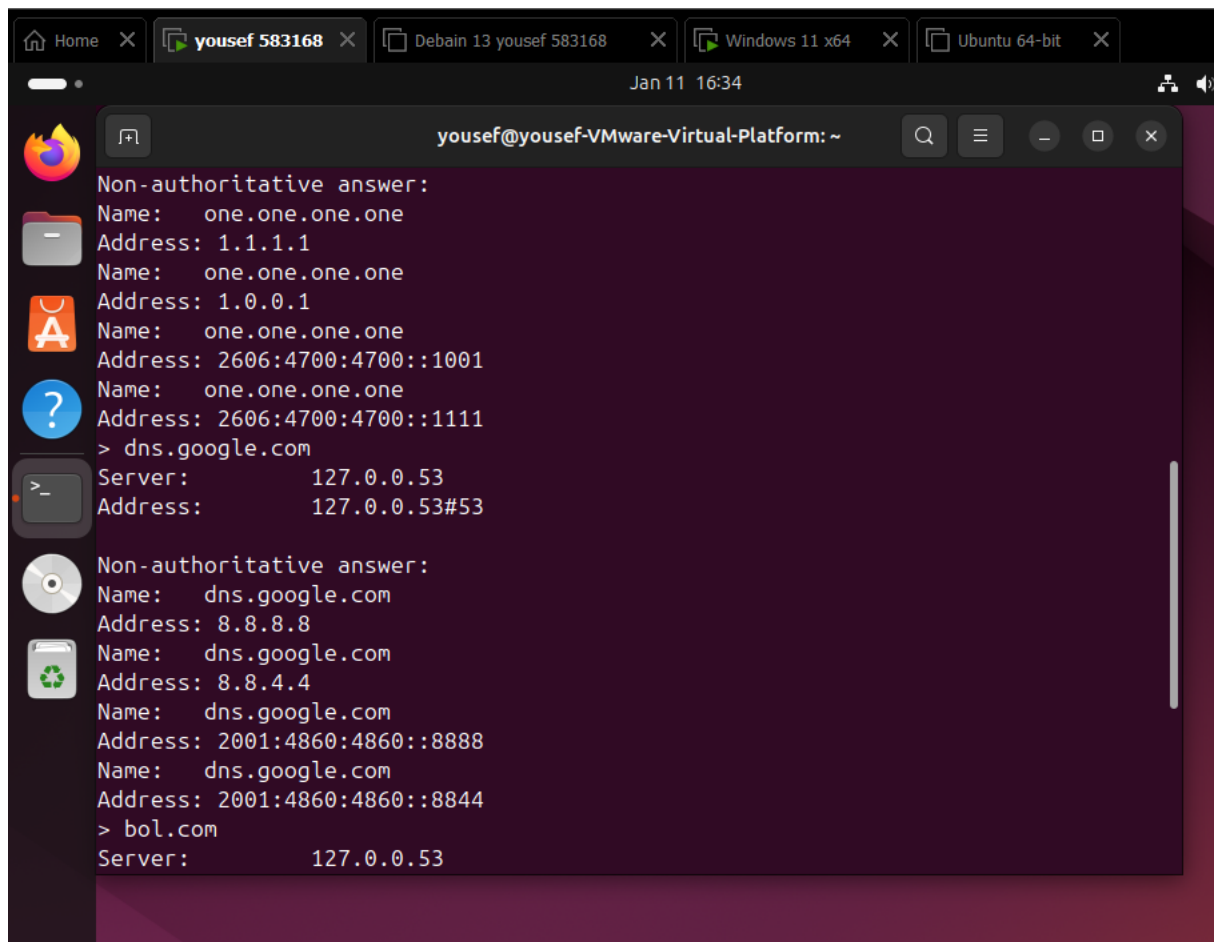


Assignment 6.2: IP addresses websites

Relevant screenshots nslookup command:



Screenshot website visit via IP address:




```
yousef@yousef-VMware-Virtual-Platform: ~  
Address: 8.8.8.8  
Name: dns.google.com  
Address: 8.8.4.4  
Name: dns.google.com  
Address: 2001:4860:4860::8888  
Name: dns.google.com  
Address: 2001:4860:4860::8844  
> bol.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
Non-authoritative answer:  
Name: bol.com  
Address: 79.170.100.62  
> w3schools.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
Non-authoritative answer:  
Name: w3schools.com  
Address: 13.248.240.135  
Name: w3schools.com  
Address: 76.223.115.82  
>
```

```
yousef@yousef-VMware-Virtual-Platform: ~  
Non-authoritative answer:  
Name: amazon.com  
Address: 98.87.170.74  
Name: amazon.com  
Address: 98.87.170.71  
Name: amazon.com  
Address: 98.82.161.185  
> google.com  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
Non-authoritative answer:  
Name: google.com  
Address: 142.251.39.142  
Name: google.com  
Address: 2a00:1450:400e:804::200e  
> one.one.one.one  
Server: 127.0.0.53  
Address: 127.0.0.53#53  
Non-authoritative answer:  
Name: one.one.one.one  
Address: 1.1.1.1
```


Assignment 6.3: subnetting

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

/25 means 25 bits for the network, leaving 7 bits for the host as $32-25=7$

$2^7 = 128$ ip addresses

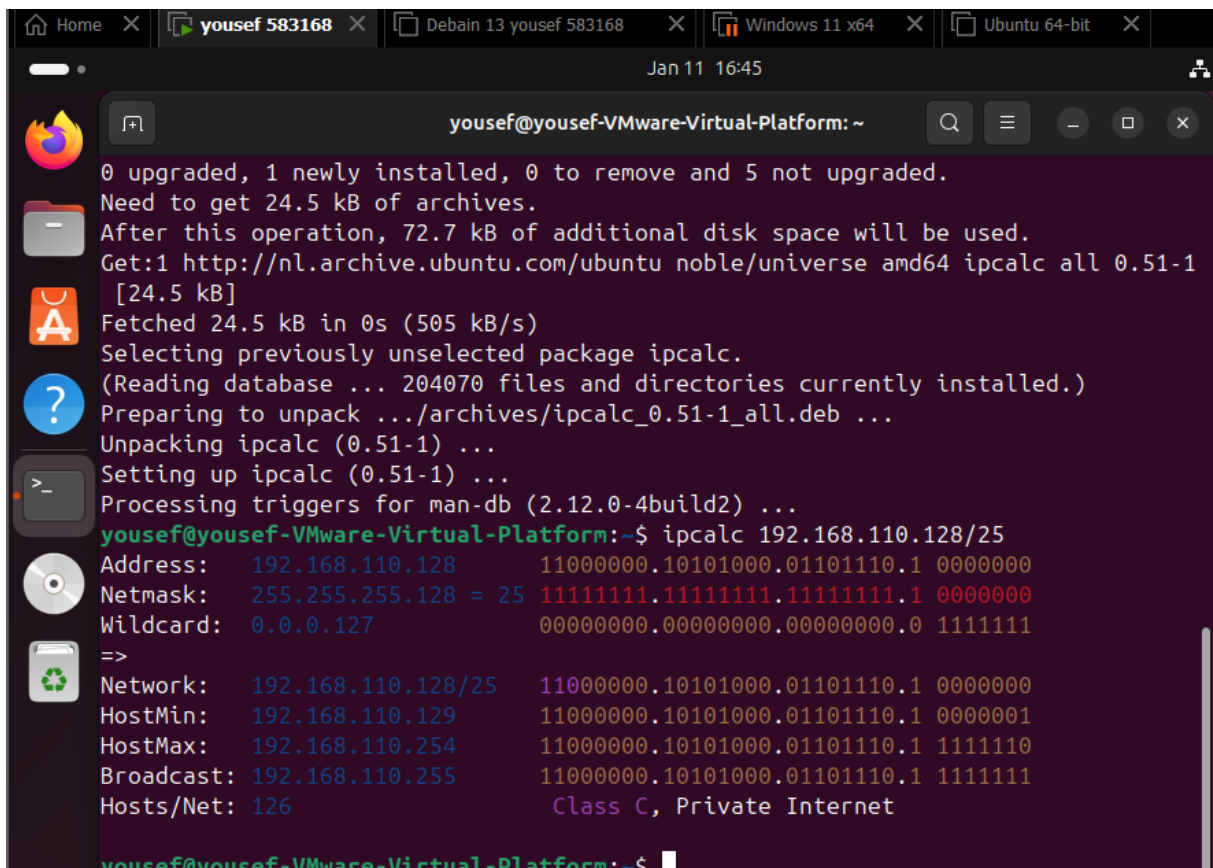
What is the usable IP range to hand out to the connected computers?

The first address is the network address 192.168.110.128 (not usable)

The **last address** is the broadcast address 192.168.110.255 (not usable)

Usable IP addresses = addresses in between

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



```
yousef@yousef-VMware-Virtual-Platform: ~  
0 upgraded, 1 newly installed, 0 to remove and 5 not upgraded.  
Need to get 24.5 kB of archives.  
After this operation, 72.7 kB of additional disk space will be used.  
Get:1 http://nl.archive.ubuntu.com/ubuntu noble/universe amd64 ipcalc all 0.51-1  
[24.5 kB]  
Fetched 24.5 kB in 0s (505 kB/s)  
Selecting previously unselected package ipcalc.  
(Reading database ... 204070 files and directories currently installed.)  
Preparing to unpack ../archives/ipcalc_0.51-1_all.deb ...  
Unpacking ipcalc (0.51-1) ...  
Setting up ipcalc (0.51-1) ...  
Processing triggers for man-db (2.12.0-4build2) ...  
yousef@yousef-VMware-Virtual-Platform:~$ ipcalc 192.168.110.128/25  
Address: 192.168.110.128 11000000.10101000.01101110.1 00000000  
Netmask: 255.255.255.128 = 25 11111111.11111111.11111111.1 00000000  
Wildcard: 0.0.0.127 00000000.00000000.00000000.0 11111111  
=>  
Network: 192.168.110.128/25 11000000.10101000.01101110.1 00000000  
HostMin: 192.168.110.129 11000000.10101000.01101110.1 00000001  
HostMax: 192.168.110.254 11000000.10101000.01101110.1 11111110  
Broadcast: 192.168.110.255 11000000.10101000.01101110.1 11111111  
Hosts/Net: 126 Class C, Private Internet  
yousef@yousef-VMware-Virtual-Platform:~$
```

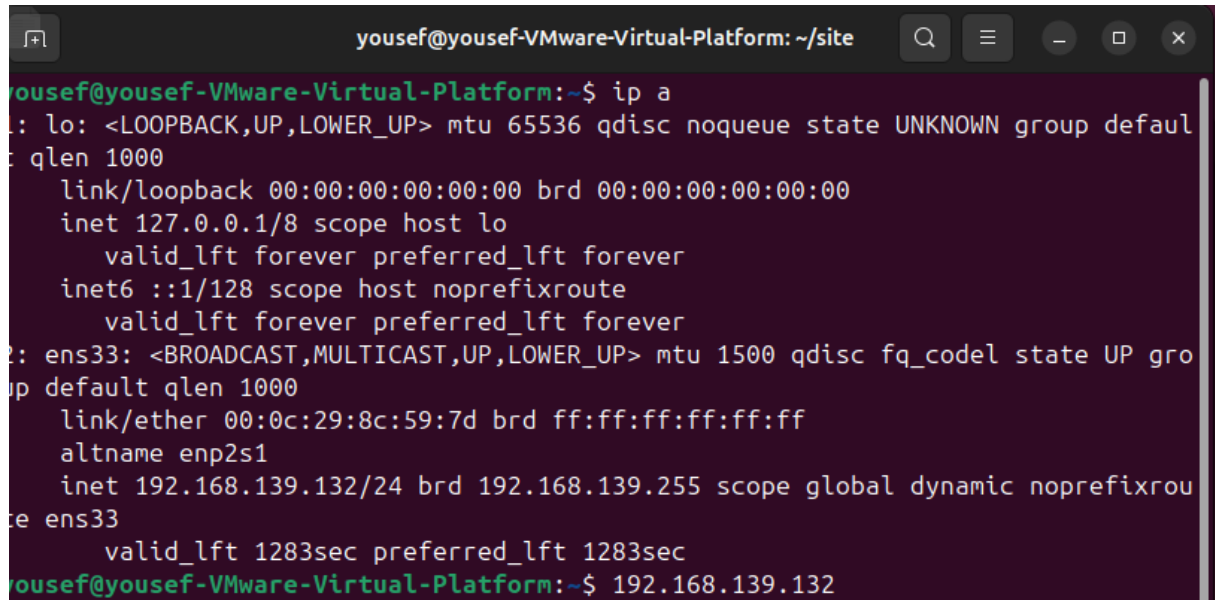
Explain the above calculation in your own words.

The network 192.168.110.128/25 has 25 bits for the network and 7 bits for hosts, giving $2^7 = 128$ IP addresses. The first (192.168.110.128) is the network address, the last (192.168.110.255) is the

broadcast address, so the usable IPs are 192.168.110.129–192.168.110.254. This can be checked with `ipcalc 192.168.110.128/25`

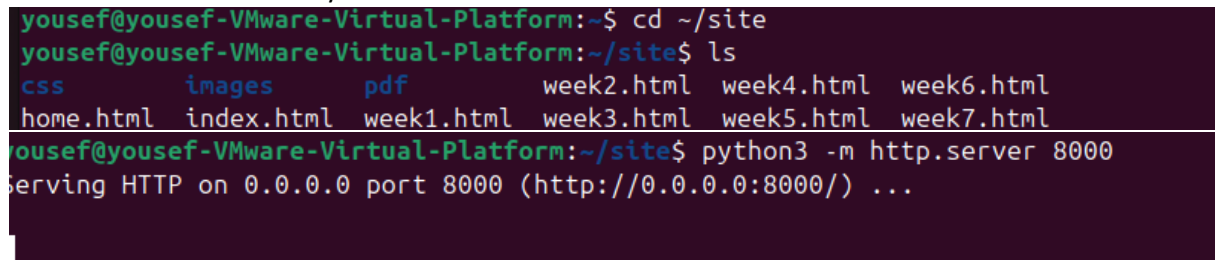
Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:



```
yousef@yousef-VMware-Virtual-Platform: ~/site
yousef@yousef-VMware-Virtual-Platform:~$ 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:29:8c:59:7d brd ff:ff:ff:ff:ff:ff
    altname enp2s1
    inet 192.168.139.132/24 brd 192.168.139.255 scope global dynamic noprefixroute ens33
        valid_lft 1283sec preferred_lft 1283sec
yousef@yousef-VMware-Virtual-Platform:~$ 192.168.139.132
```

Screenshot of Site directory contents:



```
yousef@yousef-VMware-Virtual-Platform:~$ cd ~/site
yousef@yousef-VMware-Virtual-Platform:~/site$ ls
css      images  pdf      week2.html  week4.html  week6.html
home.html  index.html  week1.html  week3.html  week5.html  week7.html
yousef@yousef-VMware-Virtual-Platform:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
```

Screenshot python3 webserver command:



```
yousef@yousef-VMware-Virtual-Platform:~/site$ python3 -m http.server 8000
Serving HTTP on 0.0.0.0 port 8000 (http://0.0.0.0:8000/) ...
```

Screenshot web browser visits your site

My Favorite Hobbies

My favorite hobbies are basketball and football. i played basketball for my highschool team in lebanon where we won competitions against other highschool teams. I also played football for my local team in lebanon and even won competitions for U18 nationwide

Basketball



Football



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.

```
import java.util.Scanner;
```

```
class Main {
```

```
    public static void main(String[] args) {
```

```
        Scanner sc = new Scanner(System.in);
```

```
        boolean running = true;
```

```
        while (running) {
```

```
            System.out.println("Select 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");
```

```
            System.out.println("5. Exit");
```

```
            System.out.print("Enter your choice (1-5): ");
```

```
            int choice = sc.nextInt();
```

```
            sc.nextLine();
```

```
            switch (choice) {
```

```
                case 1:
```

```
                    System.out.print("Enter an integer: ");
```

```
                    int num1 = sc.nextInt();
```

```
                    if ((num1 & 1) == 1) {
```

```
                        System.out.println(num1 + " is odd.");
```

```
                    } else {
```



```
        System.out.println(num1 + " is even.");
    }
    break;
```

case 2:

```
    System.out.print("Enter an integer: ");
    int num2 = sc.nextInt();
    if (num2 > 0 && (num2 & (num2 - 1)) == 0) {
        System.out.println(num2 + " is a power of 2.");
    } else {
        System.out.println(num2 + " is NOT a power of 2.");
    }
    break;
```

case 3:

```
    System.out.print("Enter an integer: ");
    int num3 = sc.nextInt();
    int twos = ~num3 + 1;
    System.out.println("Two's complement of " + num3 + " is " + twos);
    break;
```

case 4:

```
    System.out.print("Enter IP address (e.g., 192.168.1.100): ");
    String ipStr = sc.nextLine();
    System.out.print("Enter subnet mask (e.g., 255.255.255.224): ");
    String subnetStr = sc.nextLine();

    String[] ipParts = ipStr.split("\\.");
    String[] subnetParts = subnetStr.split("\\.");
    int[] ip = new int[4];
    int[] subnet = new int[4];
```



```

int[] network = new int[4];

for (int i = 0; i < 4; i++) {
    ip[i] = Integer.parseInt(ipParts[i]);
    subnet[i] = Integer.parseInt(subnetParts[i]);
    network[i] = ip[i] & subnet[i];
}

System.out.println("Network Address: " + network[0] + "." + network[1] + "." + network[2]
+ "." + network[3]);

int hostBits = 0;
for (int i = 0; i < 4; i++) {
    hostBits += Integer.bitCount(~subnet[i] & 0xFF);
}

int numAddresses = (int) Math.pow(2, hostBits);
int lastAddr = network[3] + numAddresses - 1;

System.out.println("Address range: " + network[0] + "." + network[1] + "." + network[2] +
"." + network[3]
+ " to " + network[0] + "." + network[1] + "." + network[2] + "." + lastAddr);
break;

case 5:
    running = false;
    System.out.println("Exiting program.");
    break;

default:
    System.out.println("Invalid choice! Please enter 1-5.");
}

```



```
        System.out.println();
    }

    sc.close();
}
}
```

```
C:\Users\youssef\.jdk\openjdk-24.0.2+12-54\bin\java.exe "-javaagent:C:\Program Files\IntelliJ IDEA Community Edition 2025.2.1\lib\idea_
Select an option:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number
4. Calculate network segment
5. Exit
Enter your choice (1-5): 4
Enter IP address (e.g., 192.168.1.100): 192.168.1.1
Enter subnet mask (e.g., 255.255.255.224): 255.255.255.0
Network Address: 192.168.1.0
Address range: 192.168.1.0 to 192.168.1.255

Select an option:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number
4. Calculate network segment
5. Exit
Enter your choice (1-5):
```

Ready? Save this file and export it as a pdf file with the name: [week6.pdf](#)