Q4) You are given three IP addresses: 192.168.10.5, 172.20.15.1, and 8.8.8.8. Identify the class of each IP address. Determine if it is private or public. Explain how NAT would handle a private IP when accessing the internet.

192.168.10.5

Class: Class C

- Class C addresses range from 192.0.0.0 to 223.255.255.255
- The first octet (192) falls within this range

Private or Public: Private

- This address is part of the 192.168.0.0/16 private address range (192.168.0.0 - 192.168.255.255)

172.20.15.1

Class: Class B

- Class B addresses range from 128.0.0.0 to 191.255.255.255
- The first octet (172) falls within this range

Private or Public: Private

- This address is part of the 172.16.0.0/12 private address range (172.16.0.0 - 172.31.255.255)

8.8.8.8

Class: Class A

- Class A addresses range from 1.0.0.0 to 126.255.255.255
- The first octet (8) falls within this range

Private or Public: Public

- This is a well-known public IP address (Google's public DNS server)

How NAT handles private IP addresses accessing the internet

Network Address Translation (NAT) works as follows:

1. **Address Translation:** When a device with a private IP address (like 192.168.10.5 or 172.20.15.1) attempts to access the internet, the NAT device (typically a router) intercepts the outgoing packet.
2. **Source Address Modification:** The NAT device replaces the source IP address (the private IP) with its own public IP address in the packet header.
3. **Translation Table:** The NAT device records this translation in a NAT table, storing:
    a. Original private IP address
    b. Original internal port
    c. Translated public IP address
    d. Translated external port
4. **Packet Forwarding:** The modified packet with the public source IP is sent to the internet destination.
5. **Return Traffic Handling:** When response packets arrive at the NAT device:
    a. The NAT device consults its translation table
    b. It identifies which internal device the response should go to
    c. It replaces the destination address with the correct private IP
    d. It forwards the packet to the internal device

This process allows multiple devices with private IP addresses to share a single public IP address for internet access, while maintaining proper two-way communication.