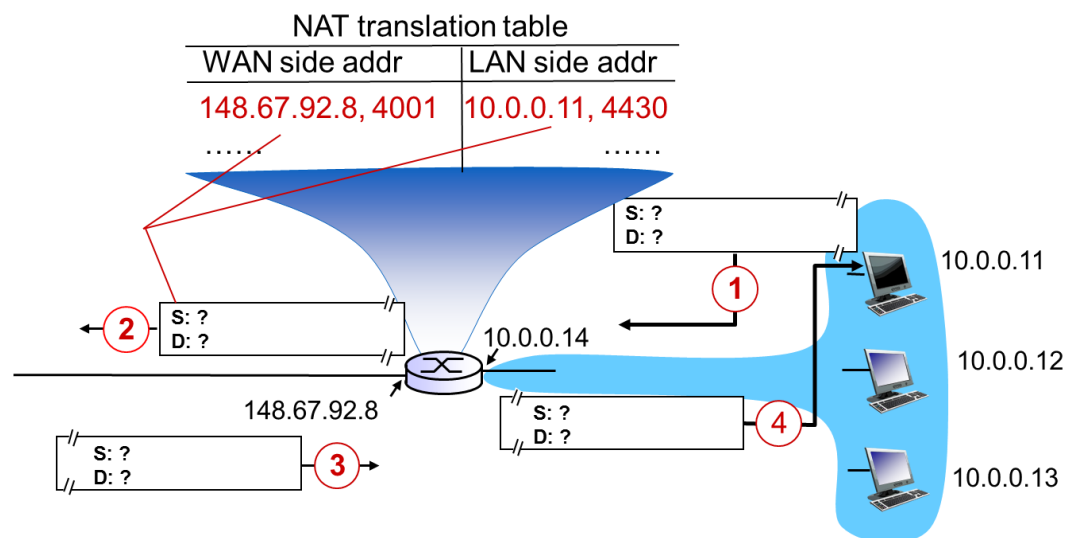


1. An ISP owns a block of addresses of the form 140.142.91.40/25. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets? **[5 marks]**
2. How does Traceroute work? **[5 marks]**
3. Explain how IP fragmentation and reassembly works using the term 'MTU'. **[4 marks]**
4. Suppose your browser is sending a datagram to IP 138.117.30.168, port 80. Given the following diagram:



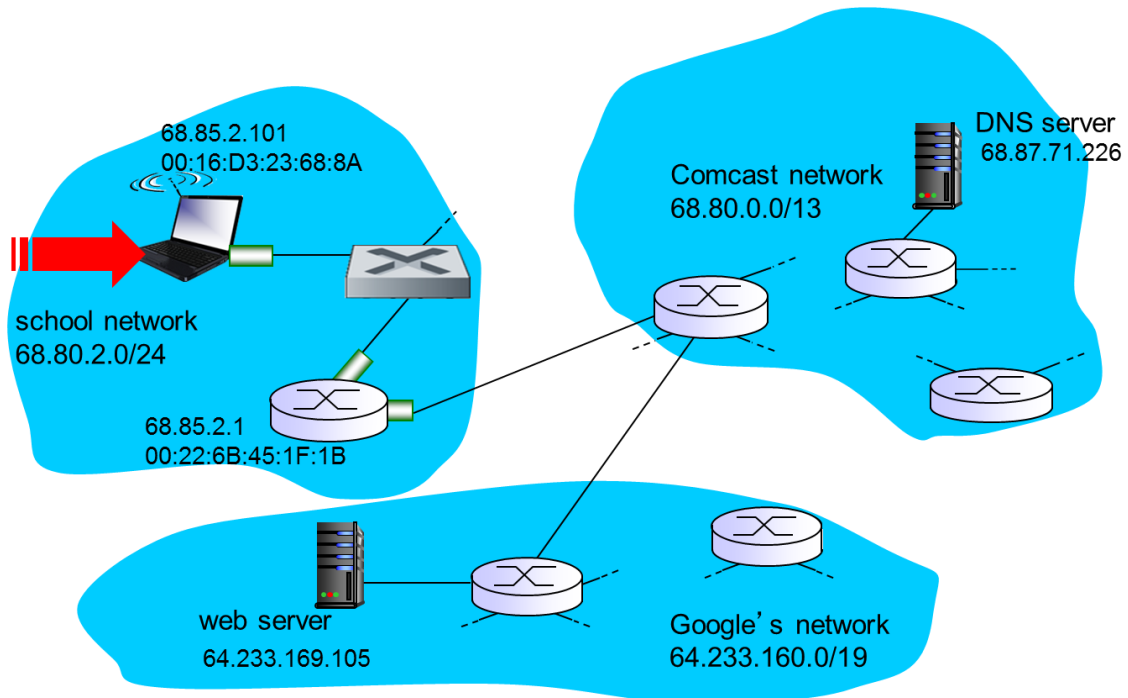
The diagram shows the 4 steps of Network Address Translation. What are the Source and Destination IP addresses and port numbers for each of the steps?

[4 marks]

5. Consider the following scenario. There are two user machines—h1.a.com and h2.a.com in the network www.a.com. Suppose the user at h1.a.com types in the URL www.b.com/somefile.htm into a browser to retrieve a file from www.b.com. List the sequence of DNS messages sent/received from/by h1.a.com, as well as any other messages that leave/enter the www.a.com network that are not directly sent/received by h1.a.com from the point that the URL is entered into the browser until the file is completely received. Indicate the source and destination of each message. You can assume that all DNS requests are recursive queries and any cache is empty.

[4 marks]

6. You are a student at a university and you connect your laptop to your university's network to download a webpage (www.google.com). Assume that your laptop is connected to an Ethernet cable which is connected to the university's Ethernet switch, which in turn is connected to the university's router. Assume that the DHCP server is running within the router.



Outline the steps taken to run the DHCP protocol to obtain an IP address from the local DHCP server. Ensure you use the IP and MAC addresses in the diagram in your answer. Also, ensure you use the following terms in your answer: DHCP Request message, UDP segment, IP datagram, Ethernet frame, demultiplexed, DHCP ACK message, IP forwarding table. **[9 marks]**

Instructions

- **Individual Assignment**
- Type your answer or write **legibly**
- **Show all working**
- Include a cover page with your **name, ID, Course code and Assignment number**
- Your submission **must include** a completed and **signed plagiarism declaration form**. Submissions without this form will **not** be marked.
- Upload a single .pdf file and the signed plagiarism .pdf file to the submission link for Assignment 1. For example the student with ID number 29384090 will upload **29384090.pdf** and **29384090-Plagiarism.pdf** to the submission link
- **Absolutely NO late assignments**