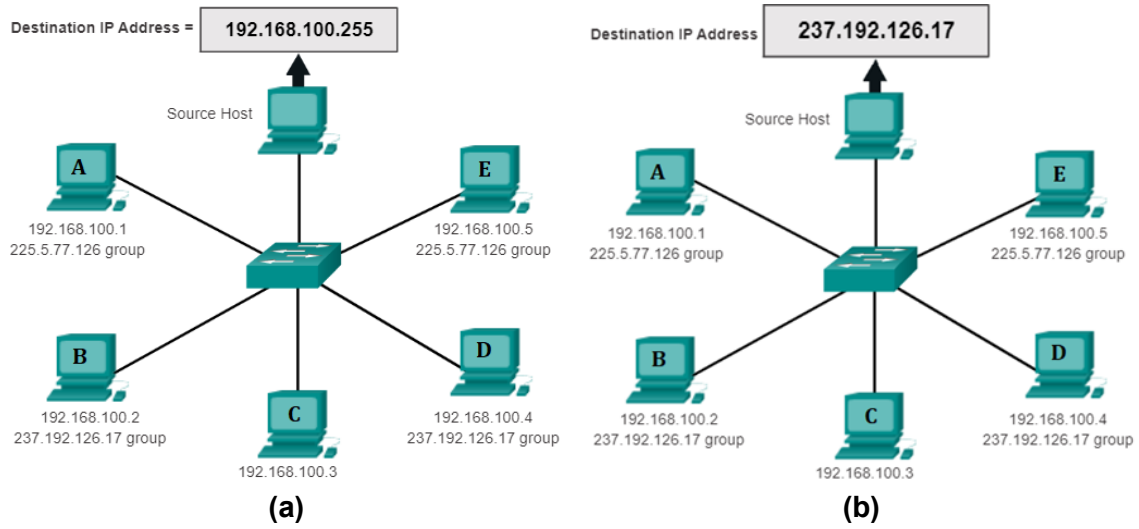
Tutorial 1: IPv4 Addressing and Subnetting

Q1. Which host(s) will receive a packet based on the address type (unicast/multicast/broadcast) given in the destination IP address?



Q2. a) Identify IPv4 Addresses:

Step 1: Analyze the table below and list the range of host and broadcast addresses given a network/prefix mask pair.

The first row shows an example of how the table should be completed.

IP Address/Prefix	First Host Address	Last Host Address	Broadcast Address
192.168.10.10/24	192.168.10.1	192.168.10.254	192.168.10.255
10.101.99.17/23			
209.165.200.227/27			
172.31.45.252/24			
10.1.8.200/26			
172.16.117.77/20			
10.1.1.101/25			
209.165.202.140/27			
192.168.28.45/28			

b) Classify IPv4 Addresses

Step 1: Analyze the table shown below and identify the type of address (network, host, multicast, or broadcast address).

The first row shows an example of how the table should be completed.

IP Address	Subnet Mask	Address Type
10.1.1.1	255.255.255.252	host
192.168.33.63	255.255.255.192	
239.192.1.100	255.252.0.0	
172.25.12.52	255.255.255.0	
10.255.0.0	255.0.0.0	

172.16.128.48	255.255.255.240	
209.165.202.159	255.255.255.224	
172.16.0.255	255.255.0.0	
224.10.1.11	255.255.255.0	

Step 2: Analyze the table shown below and identify the address as public or private.

IP Address/Prefix	Public or Private
209.165.201.30/27	
192.168.255.253/24	
10.100.11.103/16	
172.30.1.100/28	
192.31.7.11/24	
172.20.18.150/22	
128.107.10.1/16	
192.135.250.10/24	
64.104.0.11/16	

Step 3: Analyze the table shown below and identify whether the address/prefix pair is a valid host address.

IP Address/Prefix	Valid Host Address?	Reason
127.1.0.10/24		
172.16.255.0/16		
241.19.10.100/24		
192.168.0.254/24		
192.31.7.255/24		
64.102.255.255/14		
224.0.0.5/16		
10.0.255.255/8		
198.133.219.8/24		

Q3. How many possible networks are possible using Class B addresses? How many valid hosts are possible in each network?

Q4. Rewrite the IPv6 addresses with no leading zeros and compressed version.

Preferred	FE80:0000:0000:0000:0123:4567:89AB:DFEE
No leading zeros	FE80:0:0:0:123:4567:89AB:DFEE
Compressed	FE80::123:4567:89AB:DFEE
Preferred	FF02:0000:0000:0000:0000:0001:FF00:0200
No leading zeros	
Compressed	
Preferred	0000:0000:0000:0000:0000:0000:0000:0001
No leading zeros	
Compressed	

Q5. Fill up the following table:

Hosts Needed	Subnet Mask (Binary)	Subnet Mask (Decimal)	Prefix Notation (/x)
250	11111111.11111111.11111111.00000000	255.255.255.0	/24
25			
1000			
75			
10			
500			

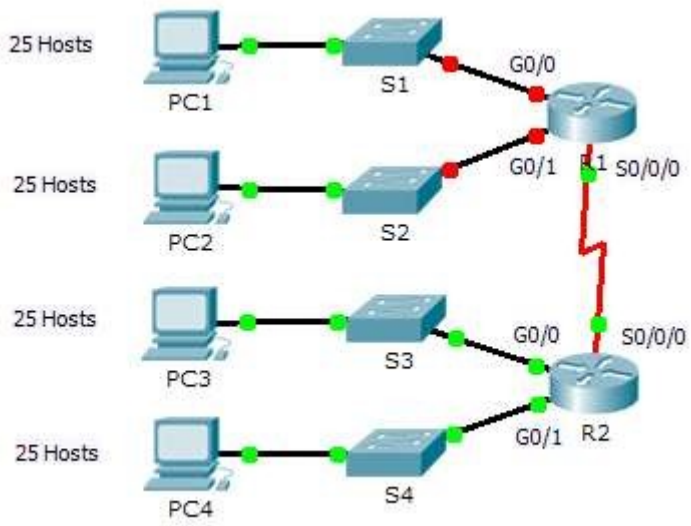
Q6. Fill up the following table:

Network Address	192	168	26	98
Subnet Mask	255	255	255	128
Network Address in Binary	11000000	10101000	00011010	01100010
Subnet Mask in Binary	11111111	11111111	11111111	10000000
Number of valid Hosts				

Q7. Fill up the following table:

Network Address	192	168	13	64
Subnet Mask in decimal	255	255	255	224
Network Address in Binary	11000000	10101000	00001101	01001111
Subnet Mask in Binary	11111111	11111111	11111111	11100000
First usable Host IP address in decimal				
Last usable Host IP address in decimal				
Broadcast address in decimal				
Next Network address in decimal				

Q8. Design an IP Addressing Scheme for the following topology (using traditional Subnetting scheme).



Step 1: Subnet the 192.168.100.0/24 network into the appropriate number of subnets.

a. Based on the topology, how many subnets are needed?

b. How many bits must be borrowed to support the number of subnets in the topology table?

c. How many subnets does this create?

d. How many usable hosts does this create per subnet?

e. Calculate the binary value for the first five subnets. The first subnet is already shown.

```
Net 0: 192. 168. 100.  0   0   0   0   0   0   0   0
Net 1: 192. 168. 100. ___ ___ ___ ___ ___ ___ ___ ___
Net 2: 192. 168. 100. ___ ___ ___ ___ ___ ___ ___ ___
Net 3: 192. 168. 100. ___ ___ ___ ___ ___ ___ ___ ___
Net 4: 192. 168. 100. ___ ___ ___ ___ ___ ___ ___ ___
```

f. Calculate the binary and decimal value of the new subnet mask.

```
11111111.11111111.11111111. ___ ___ ___ ___ ___ ___ ___ ___
255. 255. 255. ______
```

g. Fill in the **Subnet Table**, listing the decimal value of all available subnets, the first and last usable host address, and the broadcast address. Repeat until all addresses are listed.

Subnet Table

Subnet Number	Subnet Address	First Usable Host Address	Last Usable Host Address	Broadcast Address
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Step 2: Assign the subnets to the network shown in the topology.

a. Assign Subnet 0 to the LAN connected to the GigabitEthernet 0/0 interface of R1:
b. Assign Subnet 1 to the LAN connected to the GigabitEthernet 0/1 interface of R1:
c. Assign Subnet 2 to the LAN connected to the GigabitEthernet 0/0 interface of R2:
d. Assign Subnet 3 to the LAN connected to the GigabitEthernet 0/1 interface of R2:
e. Assign Subnet 4 to the WAN link between R1 to R2:

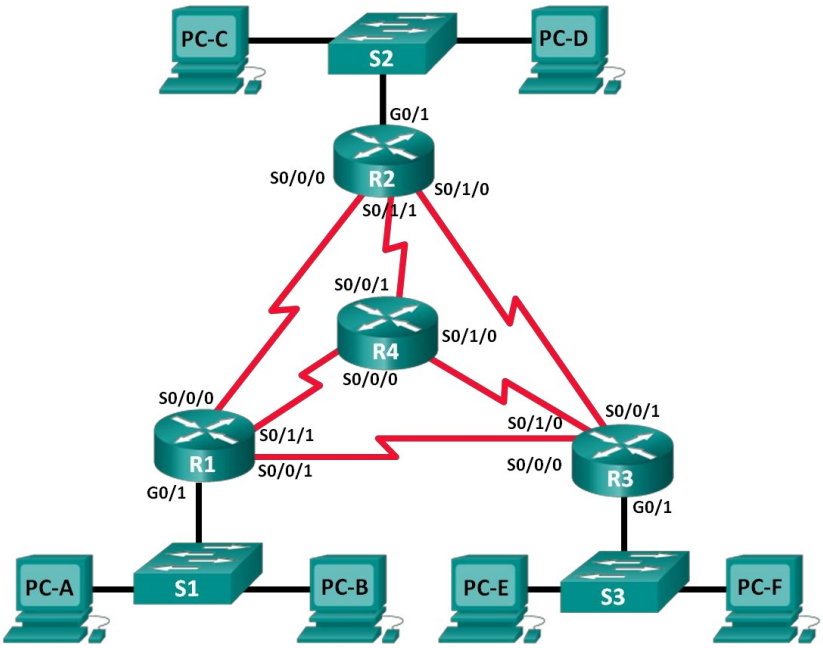
Step 3: Document the addressing scheme.

Fill in the **Addressing Table** using the following guidelines:
a. Assign the first usable IP addresses to R1 for the two LAN links and the WAN link.
b. Assign the first usable IP addresses to R2 for the LANs links. Assign the last usable IP address for the WAN link.
c. Assign the second usable IP addresses to the switches.
d. Assign the last usable IP addresses to the hosts.

Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0			
	G0/1			
	S0/0/0			
R2	G0/0			
	G0/1			
	S0/0/0			
S1	VLAN 1			
S2	VLAN 1			
S3	VLAN 1			
S4	VLAN 1			
PC1	NIC			
PC2	NIC			
PC3	NIC			
PC4	NIC			

Q9. You have been given the 192.168.10.0/24 network address to subnet, with the following topology.



Determine the number of subnets in the above Network Topology.

a. How many subnets are there?

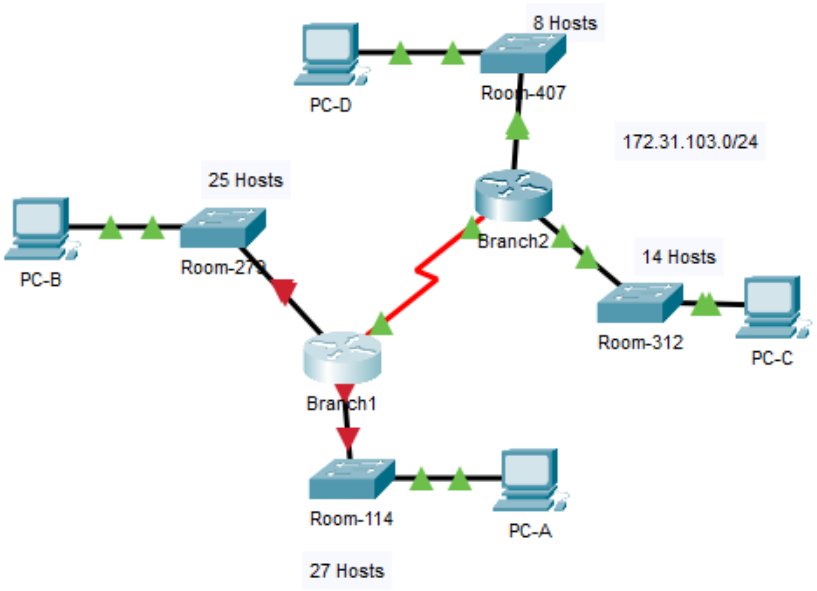
b. How many bits should you borrow to create the required number of subnets?

c. How many usable host addresses per subnet are in this addressing scheme?

d. What is the new subnet mask in dotted decimal format?

e. How many subnets are available for future use?

Q10. Design a VLSM Addressing Scheme for the following topology.



Step 1: Determine the number of subnets needed.

You will subnet the network address 172.31.103.0/24. Fill in the blanks according to the requirements:
a. PC-A LAN will require _____host IP addresses:
b. PC-B LAN will require _____host IP addresses:
c. PC-C LAN will require _____host IP addresses:
d. PC-D LAN will require _____host IP addresses:

e. How many subnets are needed in the network topology?

Step 2: Fill up the following Subnet Table:

Subnet Description	Number of Hosts Needed	Network Address/CIDR	First Usable Host Address	Last Usable Host Address	Broadcast Address
PC-A LAN					
PC-B LAN					
PC-C LAN					
PC-D LAN					
WAN Link					

Step 3: Fill up the following Address Table:

Device	Interface	Address	Subnet Mask	Default Gateway
Branch1	G0/0			
	G0/1			
	S0/0/0			
Branch2	G0/0			
	G0/1			
	S0/0/0			
Room-114	VLAN 1			
Room-279	VLAN 1			
Room-312	VLAN 1			
Room-407	VLAN 1			
PC-A	NIC			
PC-B	NIC			
PC-C	NIC			
PC-D	NIC			