Q5) Given an IP address range of 192.168.1.0/24, divide the network into 4 subnets.

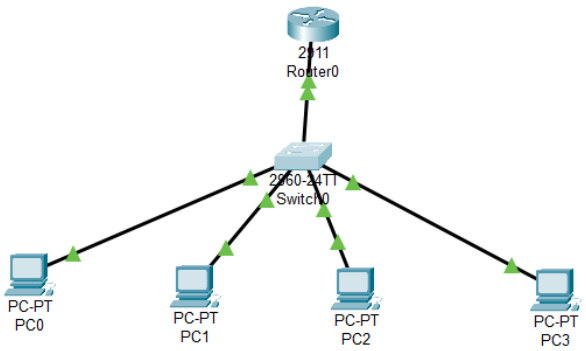
Task: Manually calculate the new subnet mask and the range of valid IP addresses for each subnet.

Assign IP addresses from these subnets to devices in Cisco Packet Tracer and verify connectivity using ping between them.

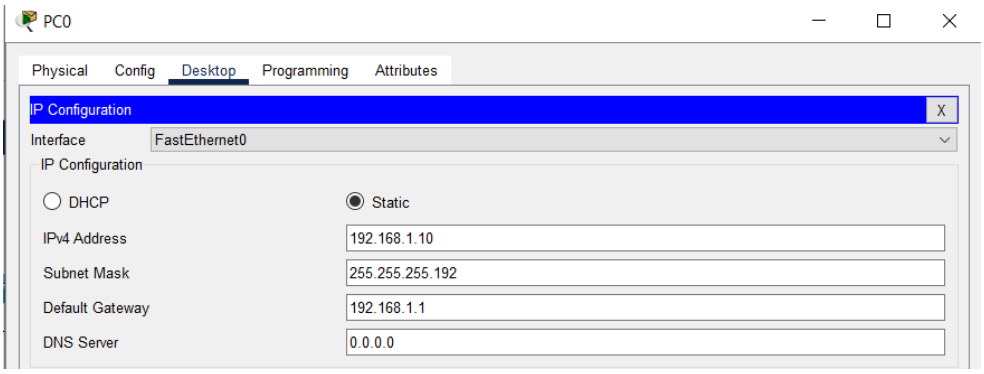
Subnet Calculation

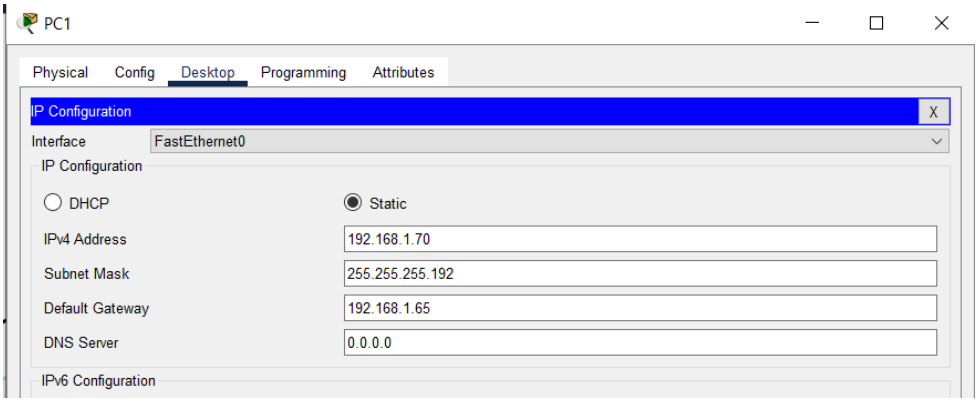
We have the network 192.168.1.0/24 and need to divide it into 4 subnets.

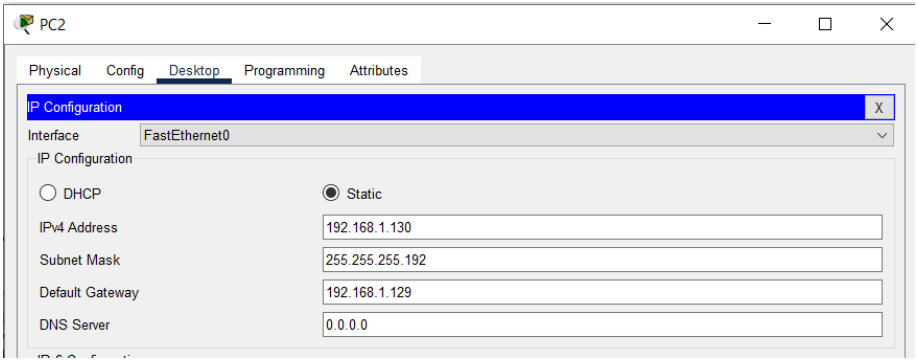
1. The default subnet mask for /24 is:
    a. 255.255.255.0 → (binary: `11111111.11111111.11111111.00000000`)
    b. Total hosts: $28-2=2542^{8}$ - $2 = 25428-2$=254 (excluding network and broadcast)
2. Finding the new subnet mask:
    a. To create 4 subnets, we need 2 extra bits for subnetting:
    b. Original /24 → New /26 (`/24 + 2 = /26`)
    c. New subnet mask: 255.255.255.192 (/26 → `11111111.11111111.11111111.11000000`)
3. Subnet breakdown (increment = 64)
    a. Subnet 1: 192.168.1.0/26 → (Valid IPs: 192.168.1.1 - 192.168.1.62, Broadcast: 192.168.1.63)
    b. Subnet 2: 192.168.1.64/26 → (Valid IPs: 192.168.1.65 - 192.168.1.126, Broadcast: 192.168.1.127)
    c. Subnet 3: 192.168.1.128/26 → (Valid IPs: 192.168.1.129 - 192.168.1.190, Broadcast: 192.168.1.191)
    d. Subnet 4: 192.168.1.192/26 → (Valid IPs: 192.168.1.193 - 192.168.1.254, Broadcast: 192.168.1.255)

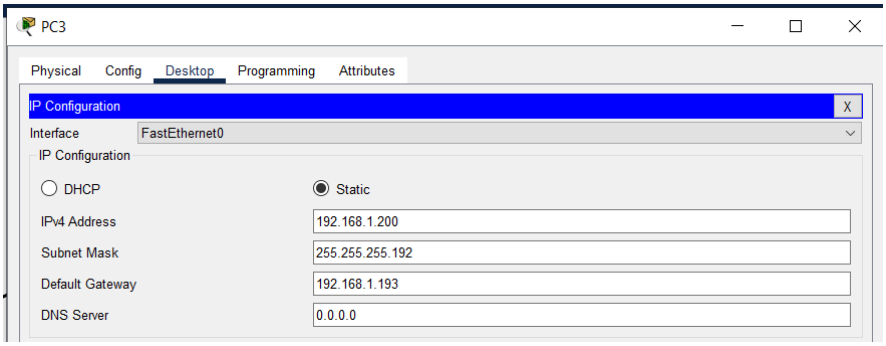


PC Configuration:









Router Configuration:

```
Router#
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface GigabitEthernet0/0.10
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip address 192.168.1.1 255.255.255.192
Router(config-subif)#no shutdown
Router(config-subif)#exit
Router(config)#interface GigabitEthernet0/0.20
Router(config-subif)#encapsulation dot1Q 20
Router(config-subif)#ip address 192.168.1.65 255.255.255.192
Router(config-subif)#no shutdown
Router(config-subif)#exit
Router(config)#interface GigabitEthernet0/0.30
Router(config-subif)#encapsulation dot1Q 30
Router(config-subif)#ip address 192.168.1.129 255.255.255.192
Router(config-subif)#no shutdown
Router(config-subif)#exit
Router(config)#interface GigabitEthernet0/0.40
Router(config-subif)#encapsulation dot1Q 40
Router(config-subif)#ip address 192.168.1.193 255.255.255.192
Router(config-subif)#no shutdown
Router(config-subif)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
```

Switch Configuration:

```
Switch(config)#interface FastEthernet 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 10
Switch(config-if)#exit
Switch(config)#interface FastEthernet 0/3
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 20
Switch(config-if)#exit
Switch(config)#interface FastEthernet 0/4
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 30
Switch(config-if)#exot
                  ^
% Invalid input detected at '^' marker.

Switch(config-if)#interface FastEthernet 0/5
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 40
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Switch#show vlan brief

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                                Gig0/2
10   VLAN10                           active    Fa0/2
20   VLAN20                           active    Fa0/3
30   VLAN30                           active    Fa0/4
40   VLAN40                           active    Fa0/5
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
```

Ping to PC1 to verify the subnetting using VLAN

```
C:\>ping 192.168.1.70

Pinging 192.168.1.70 with 32 bytes of data:

Reply from 192.168.1.70: bytes=32 time<1ms TTL=127
Reply from 192.168.1.70: bytes=32 time<1ms TTL=127
Reply from 192.168.1.70: bytes=32 time<1ms TTL=127
Reply from 192.168.1.70: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.1.70:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```