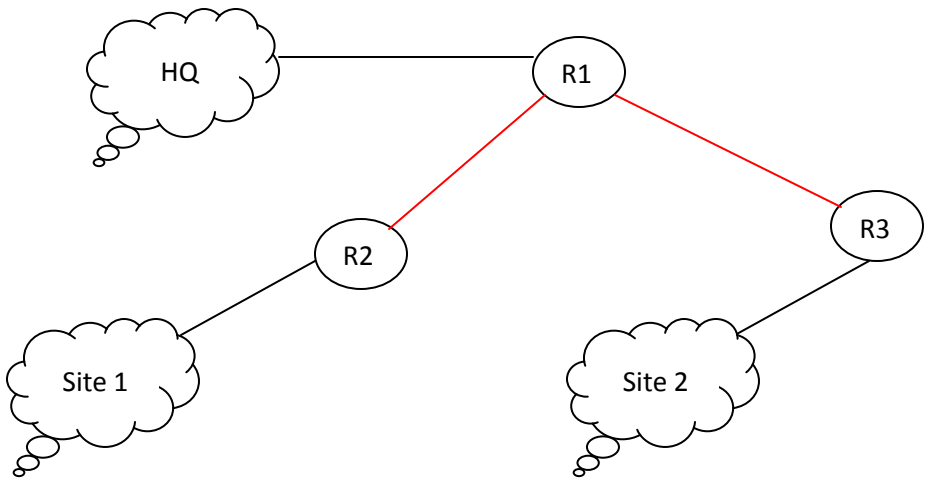
As I mentioned in class, the subnets that you divide your network into need NOT be of the same size. In this case, the SM will be of variable length (sometime called VLSM: Variable length Subnet Mask). VLSM allows you (actually allows the Network Administrator) to divide an IP address space into subnets of different sizes. You can think of it as "subnetting a subnet". Let us take an example:

An ISP allocated a block of 192.168.1.0/24 to an organization. This block is of size 2^8 = 256 addresses (only 254 of them can be used for host IP addresses)

The organization has a need for three LANS and two WANs as follows:

- The headquarter LAN has a need for 50 usable IP addresses
- Remote Site #1 LAN requires 30 usable IP addresses
- Remote Site #2 LAN requires 10 usable IP addresses
- A couple of WAN links to interconnect R1 with R2 and R1 with R3 respectively as shown below (in red)

The question asks you to design the IP addressing scheme for this organization (i.e. think of yourself as being the Admin)



Solution:

a. Let us look at the HQ LAN first. It requires 50 hosts and a router (R1) which means that we need to have 6 bits for the host (That is the closest to 50). So we need to "steal 2 bits" from the last digit to represent the subnet. The block assigned to this subnet will therefore be **192.168.1.0/26** (which is of course the Network Address). Assign 192.168.1.1 to be the address of R1 on the HQ LAN (It is usually customary to assign the first "usable" address in a block to the router). The first host on this subnet will have an IP address of 192.168.1.2, and the last usable IP address is 192.168.1.62. The broadcast address on this Subnet will be 192.168.1.63 and of course the SM is 255.255.255.192

b. Next let us consider Remote Site #1. This site requires 30 usable IP addresses, so we need to "steal" 3 bits from the last digit leaving 5 bits for the host. The block assigned to this subnet is **192.168.1.64/27** (which is of course the Network Address). Assign 192.168.1.65 to be the address of R2 on the remote site #1 LAN. The first host on this subnet will have an IP address of 192.168.1.66, and the last usable IP address is 192.168.1.94. The broadcast address on this Subnet will be 192.168.1.95 and of course the SM is 255.255.255.224.

c. Next let us consider Remote Site #2. This site requires 10 usable IP addresses, so we need to "steal" 4 bits from the last digit leaving 4 bits for the host. The block assigned to this subnet is **192.168.1.96/28** (which is of course the Network Address). Assign 192.168.1.97 to be the address of R3 on the remote site #2 LAN. The first host on this subnet will have an IP address of 192.168.1.98, and the last usable IP address is 192.168.1.110. The broadcast address on this Subnet will be 192.168.1.111 and of course the SM is 255.255.255.240

d. Next let us consider WAN Link #1 (Connecting R1 to R2). This WAN requires only 2 usable IP addresses, so we need to "steal" 6 bits from the last digit leaving 2 bits for the host. The block assigned to this subnet is **192.168.1.112/30** (which is of course the Network Address). Assign 192.168.1.113 to be the address of R1 on the WAN side. Assign 192.168.1.114 to be the address of R2 on the WAN side. The broadcast address on this WAN will be 192.168.1.115 and of course the SM is 255.255.255.252

e. Next let us consider WAN Link #2 (Connecting R1 to R3). This WAN requires only 2 usable IP addresses, so we need to "steal" 6 bits from the last digit leaving 2 bits for the host. The block assigned to this subnet is **192.168.1.116/30** (which is of course the Network Address). Assign 192.168.1.117 to be the address of R1 on the WAN side. Assign 192.168.1.118 to be the address of R3 on the WAN side. The broadcast address on this WAN will be 192.168.1.119 and of course the SM is 255.255.255.252

Clear???? Yes or No???