Part A [1]

Provided network: 190.11.40.0/23 – Minimum of 50 hosts per subnet (all 0s and 1s ARE usable)

<u>Before Subnetting:</u>

- Network Addresses (range)
    - 190.11.40.0 → 190.11.41.255
- Broadcast Address
    - 190.11.41.255
- Netmask
    - 255.255.11111110.0 (decimal in cyan, binary in yellow)
    - 255.255.254.0
- Maximum number of hosts
    - There are a **total of 9 host bits**
    - This means there can be a total of 512 hosts before subnetting (given the statement that we are **able** to use all 0s and 1s)

<u>After Subnetting:</u>

- Netmask
    - We will use a total of **3 bits to create the subnets**
    - We can create a total of 8 subnets (given the statement that we are **able** to use all 0s and 1s)
    - New netmask will be /26 (23 + 3)
    - 255.255.255.11000000 (decimal in cyan, binary in yellow)
    - 255.255.255.192
- Maximum number of hosts per subnet
    - **6 host bits** are needed to achieve a minimum of 50 hosts per subnet
    - This means that we have a maximum number of 64 hosts per subnet (given the statement that we are **able** all 0s and 1s)

Part A [1]

Subnet Number	Subnet ID Binary Value	Network bits 3rd octet	3rd octet decimal value	Host bits binary range (4th octet)		4th octet binary range		4th octet decimal value	IP Range (From)	IP Range (To)
0	0 00	0010100 0	40	000000 - 111111		00 000000 - 00 111111		0-63	190.11.40.0	190.11.40.63
1	0 01	0010100 0	40	000000 - 111111		01 000000 - 01 111111		64-127	190.11.40.64	190.11.40.127
2	0 10	0010100 0	40	000000 - 111111		10 000000 - 10 111111		128-191	190.11.40.128	190.11.40.191
3	0 11	0010100 0	40	000000 - 111111		11 000000 - 11 111111		192-255	190.11.40.192	190.11.40.255
4	1 00	0010100 1	41	000000 - 111111		00 000000 - 00 111111		0-63	190.11.41.0	190.11.41.63
5	1 01	0010100 1	41	000000 - 111111		01 000000 - 01 111111		64-127	190.11.41.64	190.11.41.127
6	1 10	0010100 1	41	000000 - 111111		10 000000 - 10 111111		128-191	190.11.41.128	190.11.41.191
7	1 11	0010100 1	41	000000 - 111111		11 000000 - 11 111111		192-255	190.11.41.192	190.11.41.255

Part A [2]

Provided network: 175.21.0.0/16 (Class B) – 11 usable subnets (all 0s and 1s <u>NOT</u> usable)

<u>Before Subnetting:</u>

- **Network Addresses (range)**
    - o 175.21.0.0 → 175.21.255.255
- **Broadcast Address**
    - o 175.21.255.255
- **Netmask**
    - o 255.255. 0.0 (decimal)
- **Maximum number of hosts**
    - o There are a total of 16 host bits
    - o This means there can be a total of 65536 hosts before subnetting
    - o 65534 hosts are usable (given the statement that we are **unable** to use all 0s and 1s)

<u>After Subnetting:</u>

- **New netmask**
    - o Since we need a minimum number of 11 usable subnets, 4 bits are required
    - o We can create a total of 16 subnets, 14 of which are usable (given the statement that we are **unable** to use all 0s and 1s)
    - o New netmask will be /20 (16 + 4)
    - o 255.255.11110000.0 (decimal in cyan, binary in yellow)
    - o 255.255.240.0
- **Maximum number of hosts per subnet**
    - o After subnetting, there is a total of **12 host bits per subnet**
    - o This means that we have a maximum number of 4096 hosts per subnet
    - o 4094 hosts are usable (given the statement that we are **unable** to use all 0s and 1s)

Part A [2]

Subnet Number	Subnet ID Binary Value	Host bits binary range (3rd octet)	3rd octet binary range	3rd octet decimal value	IP Range (From)	IP Range (To)	Usable
0	0000	0000 - 1111	0000 0000 – 0000 1111	0-15	175.21.0.0	175.21.15.255	No
1	0001	0000 - 1111	0001 0000 – 0001 1111	16-31	175.21.16.0	175.21.31.255	Yes
2	0010	0000 - 1111	0010 0000 – 0010 1111	32-47	175.21.32.0	175.21.47.255	Yes
3	0011	0000 - 1111	0011 0000 – 0011 1111	48-63	175.21.48.0	175.21.63.255	Yes
4	0100	0000 - 1111	0100 0000 – 0100 1111	64-79	175.21.64.0	175.21.79.255	Yes
5	0101	0000 - 1111	0101 0000 – 0101 1111	80-95	175.21.80.0	175.21.95.255	Yes
6	0110	0000 - 1111	0110 0000 – 0110 1111	96-111	175.21.96.0	175.21.111.255	Yes
7	0111	0000 - 1111	0111 0000 – 0111 1111	112-127	175.21.112.0	175.21.127.255	Yes
8	1000	0000 - 1111	1000 0000 – 1000 1111	128-143	175.21.128.0	175.21.143.255	Yes
9	1001	0000 - 1111	1001 0000 – 1001 1111	144-159	175.21.144.0	175.21.159.255	Yes
10	1010	0000 - 1111	1010 0000 – 1010 1111	160-175	175.21.160.0	175.21.175.255	Yes
11	1011	0000 - 1111	1011 0000 – 1011 1111	176-191	175.21.176.0	175.21.191.255	Yes
12	1100	0000 - 1111	1100 0000 – 1100 1111	192-207	175.21.192.0	175.21.207.255	Yes
13	1101	0000 - 1111	1101 0000 – 1101 1111	208-223	175.21.208.0	175.21.223.255	Yes
14	1110	0000 - 1111	1110 0000 – 1110 1111	224-239	175.21.224.0	175.21.239.255	Yes
15	1111	0000 - 1111	1111 0000 – 1111 1111	240-255	175.21.240.0	175.21.255.255	No