CSIS 330 – Lab 14

This lab is in two phases:

Phase 1: IPV4 Addressing

**Lab 14 Instructions**

**IPv4 Addressing**

Fill in all of the host bits with 0s to determine the network address.

This tells you how many bits make up the network portion.

**Network Address:**

Network Address for the 192.168.20.0 /25 network

This tells the router how many bits make up the network portion.

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| 192 | | | | | | | | 168 | | | | | | | | 20 | | | | | | | | 0 | | | | | | | |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Network Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 255 | | | | | | | | 255 | | | | | | | | 255 | | | | | | | | 128 | | | | | | | |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subnet Mask | | | | | | | | | | | | | | | | | | | | | | | | | Host | | | | | | |

Fill in the last host bit with a 1 to determine the lowest host address.

**Lowest Host Address:**

Lowest Host Address for the 192.168.20.0 /25 network

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 192 | | | | | | | | 168 | | | | | | | | 20 | | | | | | | | 1 | | | | | | | |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Network | | | | | | | | | | | | | | | | | | | | | | | | | Host | | | | | | |

Fill in all the host bits with 1s to determine the broadcast address.

**Broadcast Address:**

Broadcast Address for the 192.168.20.0 /25 network

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 192 | | | | | | | | 168 | | | | | | | | 20 | | | | | | | | 127 | | | | | | | |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Network | | | | | | | | | | | | | | | | | | | | | | | | | Host | | | | | | |

Fill in the last host bit with a 0 to determine the highest host address.

**Highest Host Address:**

Highest Host Address for the 172.16.20.0 /25 network

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 192 | | | | | | | | 168 | | | | | | | | 20 | | | | | | | | 126 | | | | | | | |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| Network | | | | | | | | | | | | | | | | | | | | | | | | | Host | | | | | | |

### Calculate all the following addresses in both BINARY and DECIMAL format. Put your answers in the template provided.

**Network Address:**

Network Address for the 192.168.1.0 /26 network

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Network Address | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Subnet Mask | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

**Lowest Host Address:**

Lowest Host Address for the 192.168.1.0 /26 network

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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**Broadcast Address:**

Broadcast Address for the 192.168.1.0 /26 network

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**Highest Host Address:**

Highest Host Address for the 192.168.1.0 /26 network

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**Deliverables:**

Save your answer template using the following convention: [your first initial] + [your last name] + “\_Lab14a”. For example, Joe Smith will save his file template as “JSmith\_Lab14a.doc”.

Submit your answer template to Blackboard by attaching it to the appropriate assignment link.

Phase 2

Fundamentals of Subnetting in IPV4

**Fundamentals of Subnetting in IPv4**

**Assignment Instructions:**

After reading the chapter on Subnetting IP Networks, complete the tables in the following problems and answer the questions provided. Note that you will only be assessed on your **answers to the questions**. The tables are provided to guide you through the process.

To assist you in this assignment, Problem 1 has already been done for you. Information on how to work these problems is presented in Problem 1.

*[A Word template is provided for your answers.]*

# Problem 1

# You are given an IP address of 192.168.10.0 /27.

# Allow these instructions to guide you through your thought process:

1. **Determine the Class.**

To perform subnetting, you must know the address ranges for class A, class B, and class C addresses. Recall from your textbook the following ranges for the first octet:

Class A 1-127

Class B 128-191

Class C 192-223

1. **Determine the default subnet mask.**

The default subnet mask assumes a classful addressing system where an entire octet (as opposed to part of an octet) comprises the network portion of an IPv4 address. The following default subnet masks are used for each class:

Class A 255.0.0.0

Class B 255.255.0.0

Class C 255.255.255.0

1. **Determine the custom subnet mask.**

Because of the vast number of wasted addresses in the classful system of IPv4 addressing schemes, another system, classless inter-domain routing (CIDR), was introduced. CIDR allows part of an octet that would once have been assigned to only hosts in classful addressing to now be assigned to the network. This allows for more networks and fewer hosts per network – and hence, fewer wasted host addresses.

Creating a custom subnet mask is easy once you understand the concept of CIDR. An example will help here…

You are given the address of 192.168.10.0 and are told that it needs to be subnetted using a /27 prefix.

First ask yourself to whick class does this address belong? Given the number of the first octet, 192, you know that it is a Class C address.

The default subnet mask for a Class C address is 255.255.255.0.

To find the custom subnet mask, let’s first review the concepts of network bits, host bits, and slash prefixes.

An IPv4 address is a 32-bit address consisting of four 8-bit octets. The /27 is the slash prefix, and it tells you how many bits are in the network portion of the address and how many bits are in the host portion. (Recall this from the previous chapter.) The slash prefix is the way humans are able to easily determine how many bits are in the network portion of the address. For a computer, however, the slash prefix does not help. A computer needs the information in binary form. Thus, the computer uses a subnet mask. (This is typically written in dotted decimal format, but ultimately, the computer translates this into binary.)

The network portion of an IP address consists of all 1s. The host portion consists of all 0s. That is how the computer knows how much of the address is network and how much is host. If we know that the first 27 bits belong to the network portion, we know that the remaining 5 belong to the host portion.

Writing this in binary form yields the following result:

11111111 11111111 11111111 11100000

What is this number in dotted decimal format? It is 255.255.255.224. (Refer back to your lesson on binary conversions if you have difficulty translating this IP address.) This number is known as the custom subnet mask (or just subnet mask, for short).

Therefore, 255.255.255.224 is the subnet mask in this problem.

1. **Determine the number of bits borrowed.**

Ask yourself the following question: With a /27 prefix, how many bits are being borrowed from the host portion of this address? Hint: What would be the prefix if this were a “classful” address? It would be /24. That means you would have 24 bits in the network portion and 8 bits in the host portion. However, with a /27 prefix, you are “borrowing” some of the bits from the host portion to make it part of the network address. Thus, 27 bits are in the network portion. How many does that leave for the host portion? It leaves 5 (32 total bits – 27 network bits = 5 host bits). Therefore, how many bits are being “borrowed” for the network portion from this octet? The answer is 3. That is, there are 8 total bits in the last octet. 5 of them represent the host portion, and 3 are being borrowed to use in the network portion.

Thus, the answer to the question “How many bits are being borrowed?” is 3.

1. **Determine how many subnets are possible.**

Using the number of bits borrowed, you can easily determine the number of possible subnets by using the formula (2Number of Bits Borrowed). Therefore, the number of valid subnets in this example is 8 (i.e., 23 bits borrowed ).

1. **Determine the number of valid hosts per subnet.**

To determine the number of hosts per subnet, you first determine the number of bits that make up the host portion of the IP address. As mentioned above, the number of bits that make up the host portion in this example is 5. Using the formula, 2 Number of Host bits, you can determine the “magic number.” The magic number is something you can use to determine the network address of each subnet, but this will be discussed in the next step. For now, you will use this magic number to arrive at the number of valid hosts per subnet.

Once you determine the magic number, the number of valid hosts is simply that number minus 2. Why is 2 subtracted from it? It is because there are two addresses in a subnet that can never be assigned to a host device. One address must always be assigned to the network itself, and the other must be assigned to the broadcast address. (Recall this also from the previous chapter.)

Therefore, the “magic number” in this example is 32 (i.e., 25), and the number of valid (“usable”, “assignable”) hosts per subnet is 30 (i.e., 32 – 2).

1. **Determine the network address, the broadcast address, the first host address, and the last host address in each subnet.**

To determine the network address of each subnet, start with the network address given. Then, in each row of the table, add the magic number to the previous row’s sub-network address. This will give you the sub-network addresses for each row (subnet).

Next, add 1 to each row’s sub-network address. This will give you the first usable host in each subnet.

Next, subtract 1 from each sub-network address. This will give you the broadcast address for the previous row (subnet).

Finally, subtract 1 from each broadcast address. This will give you the last usable host in each subnet.

All these fields have been filled in for you in the first problem. Trace through them until you understand the algorithm. Once you understand this, you should be able to easily complete the remaining problems. Note that some problems require you to work backwards. For example, instead of having the IP address with the slash prefix, you might be given the number of hosts needed per subnet. You will then need to figure out the slash prefix, number of bits borrowed, etc. The key is to understand how all these addresses (network, broadcast, and usable hosts) fit together.

Although you will not have to complete any tables that involve borrowing bits in the second or third octets, you need to be able to answer some basic questions. First, you must know that the algorithm remains virtually the same. The only differences are in the calculations of the magic number and the number of usable hosts per subnet.

The magic number is related to the octet from which you are borrowing bits. For example, in the IP address 172.168.0.0/21, you know that you are working with a Class B address in which the first two octets would normally represent the network portion of the address. Given that this example tells you that you have a /21 prefix, you know that you are working in the third octet rather than the fourth. How do you know this? The classful address of this IP address is /16. (Note that classful addresses are /8, /16, and /24.) Your reference point is /16 because you are working with a class B address. From there, you can tell that 5 bits are being borrowed from this third octet to make the subnet mask 255.255.248.0. The magic number is 23, or 8, and the first and second sub-network addresses are 172.168.0.0 and 172.168.8.0 respectively. Notice that the magic number (8) is added to the previous sub-network address in the third octet rather than the fourth. The number of usable hosts per subnet is 211-2, or 2046. Why is the exponent 11 used rather than 3? It is because the TOTAL number of bits in the host portion is used to determine the number of hosts per subnet – not merely the number of host bits in the third octet.

As you can see, when you subnet, the algorithm is virtually the same. You need to merely be aware of the octet in which you are working to determine the magic number, number of hosts per subnet, etc. Again, although you will not have to work any subnetting problems that are this extensive in this assignment, you need to be able to answer some basic questions (i.e., number of hosts per subnet, magic number, etc.). Be aware that you will encounter this in real world systems and in subsequent networking classes, so it is best if you can achieve a basic understanding of it now.

Now, it is your turn. Think of this as a puzzle and have fun with it. Problem 1 is already worked for you.

# Problem 1:

# IP address: 192.168.10.0 /27 (given)

Ask yourself “What Class is this?” This is a Class C network with a default subnet mask of 255.255.255.0.

Therefore, your reference point is /24. Anything over /24 represents the number of bits borrowed from the fourth octet.

This is how your custom subnet mask looks in binary form: 11111111 11111111 11111111 11100000.

1. Custom Subnet Mask: **255.255.255.224**
2. Bits Borrowed: **3**
3. Number of subnets: **8**
4. Magic number: **32**
5. Number of valid hosts per subnet: **30**
6. (Sub) network address of subnet 0: **192.168.10.0**
7. First usable host address in subnet 0: **192.168.10.1**
8. Last usable host address in subnet 0: **192.168.10.30**
9. Broadcast address in subnet 0: **192.168.10.31**
10. (Sub) Network address in subnet 2: **192.168.10.64**
11. Last usable host address in subnet 4: **192.168.10.158**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Subnet | Subnet address | 1st Host address | Last Host address | Broadcast |
| 0 | **192.168.10.0** | **192.168.10.1** | **192.168.10.30** | **192.168.10.31** |
| 1 | **192.168.10.32** | **192.168.10.33** | **192.168.10.62** | **192.168.10.63** |
| 2 | **192.168.10.64** | **192.168.10.65** | **192.168.10.94** | **192.168.10.95** |
| 3 | **192.168.10.96** | **192.168.10.97** | **192.168.10.126** | **192.168.10.127** |
| 4 | **192.168.10.128** | **192.168.10.129** | **192.168.10.158** | **192.168.10.159** |
| 5 | **192.168.10.160** | **192.168.10.161** | **192.168.10.190** | **192.168.10.191** |
| 6 | **192.168.10.192** | **192.168.10.193** | **192.168.10.222** | **192.168.10.223** |
| 7 | **192.168.10.224** | **192.168.10.225** | **192.168.10.254** | **192.168.10.255** |

**Problem 2:**

# IP address: 192.168.10.0 / 26 (given)

1. Custom Subnet Mask: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. Bits Borrowed: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. Number of subnets: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. Magic number: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
5. Number of valid hosts per subnet: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
6. (Sub) network address of subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. First usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Last usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Broadcast address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. (Sub) Network address in subnet 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Last usable host address in subnet 2: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| --- | --- | --- | --- | --- |
| Subnet | Subnet address | 1st Host address | Last Host address | Broadcast |
| 0 |  |  |  |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| Etc. |  |  |  |  |
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|  |  |  |  |  |

# Problem 3:

# IP address: 192.168.10.0 (given)

# Subnet Mask: 255.255.255.240

1. Slash prefix: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. Bits Borrowed: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. Number of possible subnets: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. Magic number: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
5. Number of usable hosts per subnet: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
6. (Sub) network address of subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. First usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Last usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Broadcast address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. (Sub) Network address in subnet 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Last usable host address in subnet 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- |
| Subnet | Subnet address | 1st Host address | Last Host address | Broadcast |
| 0 |  |  |  |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| Etc. |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

# Problem 4:

# IP address: 192.168.10.0 (given)

# Minimum number of subnets needed: 31

1. Slash prefix: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. Subnet Mask: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. Bits Borrowed: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. Number of possible subnets: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
5. Magic number: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
6. Number of valid hosts per subnet: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
7. (Sub) network address of subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. First usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Last usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Broadcast address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. (Sub) Network address in subnet 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. Last usable host address in subnet 2: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Subnet | Subnet address | 1st Host address | Last Host address | Broadcast |
| 0 |  |  |  |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| Etc. |  |  |  |  |
|  |  |  |  |  |

# Problem 5:

# IP address: 192.168.10.0 (given) (Note that this address is slightly different than above)

# Minimum number of hosts needed per subnet: 16

(Remember that the goal is to find a solution that will waste as few host addresses as possible but still satisfy the requirements.)

1. Slash prefix: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. Subnet Mask: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. Bits Borrowed: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. Number of possible subnets: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
5. Magic number: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
6. Number of valid hosts per subnet: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
7. (Sub) network address of subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. First usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Last usable host address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Broadcast address in subnet 0: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. (Sub) Network address in subnet 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. Last usable host address in subnet 2: **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Subnet | Subnet address | 1st Host address | Last Host address | Broadcast |
| 0 |  |  |  |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| Etc. |  |  |  |  |
|  |  |  |  |  |

**Answer the following questions. Try to answer them without using tables to guide you:**

1. How many usable hosts per sub-network will you have using a /20 address? \_\_\_\_\_\_
2. Given a Class B address, what is the magic number if you need to subnet using a /23 prefix? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. In a Class B address, how many sub-networks can you have with a /18 prefix? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. How many total addresses per network can you have with a subnet mask of 255.255.224.0? (Note that total addresses include network and broadcast addresses.)\_\_\_\_\_\_\_\_\_\_\_

**Final Steps:**

**Save your Template**

Save your answer template using the following convention: [your first initial] + [your last name] + “\_Lab14b”. For example, Joe Smith will save his file template as “JSmith\_Lab14b.doc”.

**Deliverables:** **Submit your assignment by attaching your answer template to the appropriate assignment link in Blackboard.**