

Quiz 1: Binary Arithmetic Practice

| Number to convert | 128 2^7 7 | 64 2^6 6 | 32 2^5 5 | 16 2^4 4 | 8 2^3 3 | 4 2^2 2 | 2 2^1 1 | 1 2^0 0 |
|-------------------------|-------------------|------------------|------------------|------------------|-----------------|-----------------|-----------------|-----------------|
| 165 | | | | | | | | |
| 192 | | | | | | | | |
| 201 | | | | | | | | |
| 75 | | | | | | | | |
| 63 | | | | | | | | |

To see how this is done, we will convert 165 from decimal to binary.

The rule is that if your number is greater than or equal to the top number in the chart, you put a 1; if not you put a 0. If you put a 1, you subtract the top number in your chart from your number and go from there. Each time, you reduce the size. Since 165 is greater than 128, we put a 1 in the 128 slot.

| Number | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|--------|-----|----|----|----|---|---|---|---|
| 165 | 1 | | | | | | | |

Then we subtract 128 from 165 ($165 - 128 = 37$). Since 37 is < 64 , we next put a 0 and move on.

| | | | | | | | | |
|-----|---|---|--|--|--|--|--|--|
| 165 | 1 | 0 | | | | | | |
|-----|---|---|--|--|--|--|--|--|

Since $37 < 32$, we put a 1 in its slot and subtract 32 from 37, which yields 5.

| | | | | | | | | |
|-----|---|---|---|--|--|--|--|--|
| 165 | 1 | 0 | 1 | | | | | |
|-----|---|---|---|--|--|--|--|--|

Continuing, this we get two zeros next, as 5 is < 16 and also < 8 .

| | | | | | | | | |
|-----|---|---|---|---|---|--|--|--|
| 165 | 1 | 0 | 1 | 0 | 0 | | | |
|-----|---|---|---|---|---|--|--|--|

Since $5 = 4 + 1$, the final binary result for 165 is

| | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|
| 165 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
|-----|---|---|---|---|---|---|---|---|

Subnet Mask Table

| Decimal value | Binary | # of 1's | # of 0's |
|----------------------|---------------|-----------------|-----------------|
| 255 | 1111 1111 | 8 | 0 |
| 254 | 1111 1110 | 7 | 1 |
| 252 | 1111 1100 | 6 | 2 |
| 248 | 1111 1000 | 5 | 3 |
| 240 | 1111 0000 | 4 | 4 |
| 224 | 1110 0000 | 3 | 5 |
| 192 | 1100 0000 | 2 | 6 |
| 128 | 1000 0000 | 1 | 7 |
| 0 | 0000 0000 | 0 | 8 |

Some Example Masks

| Mask Value /n | #1's in Mask | #0's in Mask | Dotted Decimal |
|--------------------------------|-------------------------------|-------------------------------|-----------------------|
| /11 | 11 | 21 | 255.224.0.0 |
| /18 | 18 | 14 | 255.255.192.0 |
| /20 | 20 | 12 | 255.255.240.0 |

Quiz 2. Determine the following subnet masks

| | | | |
|------------|-----------|-----------|-----------------------|
| /12 | 12 | 20 | 255. . 0 . 0 |
| /21 | 21 | | 255. 255. . 0 |
| /29 | 29 | | 255. 255. 255. |
| /30 | | | |

Quiz 3: Network Design Problems

1. You have the address **165.56.0.0**. You need to subdivide your network into **80 networks**.
 - A. WHAT "class" is this network? _____
 - B. What is the default mask? _____
 - C. How many bits are for the network? _____
 - D. How many bits do you need for 80 subnets? _____
 - E. What is your new subnet mask? _____
 - F. List the first three networks.

2. You have the network **165.56.0.0**. You need to subdivide your network so that it has at least **400 hosts** per network.
 - A. What is the normal subnet mask? _____
 - B. How many bits do you need for 400 hosts per network? _____
 - C. What is your net subnet mask? _____
 - D. List the complete range of addresses for the first network.
 - E. List the next two networks you will have.

3. You have the network **200.1.2.0/24** and need to divide it into subnetworks with at least 20 hosts per subnet.
 - A. What is the normal mask? _____
 - B. How many bits do you need for **20 hosts** per subnetwork? _____
 - C. What is your new mask? _____
 - D. List the complete set of addresses for the first subnetwork you will have.