## ****Unit 2 Subnetting Lab 2****

Read the Lab details listed below, and then fill out the table listed in the lab exercise.

Technically you can get away with not knowing binary mathematics if you want to only subnet your network. As you understand that all IP addresses are in binary, and that each octet can only go from 0 to 255, then you should be fine. If you have any IT exams coming up, especially Cisco or Microsoft, then you could be asked to work out binary numbers and convert them to decimal or even hexadecimal.

How Binary Works

We use the decimal counting system as humans because we have ten digits on our hands and that is how humans learned to count. Computers only have electrical currents so they can only see a current or no current; no current is 0 and current is 1. The only numbering system that can cater for this is binary.

Binary numbering starts with a 1 and then doubles in columns. You can count from 0 to infinity and beyond with this numbering system. Just keep adding columns (from right to left). A 0 means don’t use that number and a 1 means do use that number.

Here you have a 1 or “on” number in the 2 column and a 0 or “off” in the 1 column so your number is two.

|  |  |  |
| --- | --- | --- |
| Numbers | 2 | 1 |
| Binary | 1 | 0 |

Now we have a 1 in the 1 and 4 columns so we simply add that together to get 5 as the answer.

|  |  |  |  |
| --- | --- | --- | --- |
| Numbers | 4 | 2 | 1 |
| Binary | 1 | 0 | 1 |

This time we have a 1 in the 8, 4, and 1 columns so adding them together we have 13.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Numbers | 8 | 4 | 2 | 1 |
| Binary | 1 | 1 | 0 | 1 |

We could keep going, but we should stop at eight columns because current IP addresses use eight binary places or an octet. In fact, IP version 4 or IPv4 address uses four octets of 0 to 255.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Numbers | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| Binary | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |

In the above example we add 128+16+8+4+1 to get 157.

An IP address in binary would look like this to a computer or router:

11010010.11101101.11000010.11110110 which is four octets.

190 . 237 . 194 . 246

Converting Binary to Decimal

Just write out the binary number putting it into the above chart. Add the numbers together and you have your answer.

Converting Decimal to Binary

Write out the above chart again and put a 1 in the numbers which add up to your required binary number. If you wanted to work out 203 in binary you would tick the 128 and 64 columns (192), ticking the 32 column would give it too much, tick the 8 column (200) and then the 2 and 1 columns. If you prefer you can start from the other end adding 1 to 2 to 4 and so on but it does work better from the left to right.

Your answer would look like this:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Numbers | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| Binary | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 |

## Subnetting Lab 2 Exercise

Using this table fill in the binary equivalent values of 1 and 0 to represent the decimal value indicated.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Numbers | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| 232 |  |  |  |  |  |  |  |  |
| 167 |  |  |  |  |  |  |  |  |
| 196 |  |  |  |  |  |  |  |  |
| 212 |  |  |  |  |  |  |  |  |
| 241 |  |  |  |  |  |  |  |  |
| 202 |  |  |  |  |  |  |  |  |