To multiply one binary number by the other using the computer multiplication method:

1.) Determine the number of bits in the largest number

1 1 0 0 1 1 = 51

1 0 1 1 0 1 = 45

- Number of bits in the largest number: 6

2.) Set up a register that is twice as many bits as the largest number
   - Number of bits of the largest number is 6 , register needs to be 12 bits.

3.) Write the largest number in the left half of the register and fill the right half with 0s.

1 1 0 0 1 1 0 0 0 0 0 0

4.) Move the whole register to the left one space and add a 0 to the end.

1 < 1 0 0 1 1 0 0 0 0 0 0 0

5.) If a 1 pops out of the register, add the smaller number to register, starting on the right side and fill in 0s when the number is fully written in, perform a binary addition, add one to the number of operations completed.

```
1 < 1 0 0 1 1 0 0 0 0 0 0 0
    0 0 0 0 0 0 1 0 1 1 0 1
    1 0 0 1 1 0 1 0 1 1 0 1
```

6.) If a 0 pops out, add one to the number of operations completed.

0 < 0 1 1 1 0 0 0 0 1 1 1 0

0 < 1 1 1 0 0 0 0 1 1 1 0 0

7.) Repeat until you have iterated through this process the number of bits of the largest number times (6 in this case).

```
    1 1 0 0 1 1 0 0 0 0 0 0
1 < 1 0 0 1 1 0 0 0 0 0 0 0
    0 0 0 0 0 0 1 0 1 1 0 1
  -------------------------
    1 0 0 1 1 0 1 0 1 1 0 1
1 < 0 0 1 1 0 1 0 1 1 0 1 0
    0 0 0 0 0 0 1 0 1 1 0 1
  -------------------------
    0 0 1 1 1 0 0 0 0 1 1 1
0 < 0 1 1 1 0 0 0 0 1 1 1 0
0 < 1 1 1 0 0 0 0 1 1 1 0 0
1 < 1 1 0 0 0 0 1 1 1 0 0 0
    0 0 0 0 0 0 1 0 1 1 0 1
  -------------------------
    1 1 0 0 0 1 1 0 0 1 0 1
1 < 1 0 0 0 1 1 0 0 1 0 1 0
    0 0 0 0 0 0 1 0 1 1 0 1
  -------------------------
    1 0 0 0 1 1 1 1 0 1 1 1
```

Converting the number from binary to decimal:

To convert the result to decimal, double dabble. This is done by starting at the left most bit containing a 1. You add 1 to 0, you get 1, then double it. Moving to the right, take the previous value (2 at present) and if the next bit is a 0, just double the value, if the next bit is a 1, add 1 to the previous value and then double it. The right-most bit just adds itself to the value. In the image below, we convert the number from the above multiplication (100011110111):

Add	1	0	0	0	1	1	1	1	0	1	1	1
	0	2	4	8	16	34	70	142	286	572	1146	2294
Double	1	2	4	8	17	35	71	143	286	573	1147	2295
	2	4	8	16	34	70	142	286	572	1146	2294	2295

This method works because when you go to the left most 1, add the one to zero, and then double it, you are essentially taking a 2 and doubling it for every bit to the right of it. Since there are 11 bits that are doubled, that yields $2^{11} = 2048$. Then you get to the next 1 bit which yields $2^7 = 128$. Then you add 64, 32, 16, 4, 2. The last bit isn't doubled, because it represents $2^0 = 1$. That gives you 2048+128+64+32+16+4+2+1 = 2295. This is the same thing as:

$$1(2^{11}) + 0(2^{10}) + 0(2^9) + 0(2^8) + 1(2^7) + 1(2^6) + 1(2^5) + 1(2^4) + 0(2^3) + 1(2^2) + 1(2^1) + 1(2^0)$$