Multiplying Binary Numbers

For the base 2 system...multiply using the method you are already familiar with

Add extra zeros (0) to indicate shift for each row

```
  1 1 0 1 1
×   1 1 1
-----------
  1 1 0 1 1
1 1 0 1 1 0
+ 1 1 0 1 1 0 0
-------------
```

```
1 1 1 1 1 (carries)
  1 1 0 1 1
+ 1 1 0 1 1 0
-------------
  1 2 3 2 2 1
- 2 2 2 2 2
-----------
  1 0 1 0 0 0 1
```

```
1         (carries)
  1 0 1 0 0 0 1
+ 1 1 0 1 1 0 0
---------------
  1 2 1 1 1 1 0 1
- 2
---------------
  1 0 1 1 1 1 0 1
```

```
1 1 1 1 1 1 (carries)
  1 1 0 1 1
1 1 0 1 1 0
+ 1 1 0 1 1 0 0
---------------
  1 0 1 1 1 1 0 1
```

or add 3 rows, using the 2 row method instead...either method should result in the same product

Add 3 rows, using the techniques we have learned for multiple row addition

multiplicand
x multiplier
product

$100111_2 \times 111_2$

$1101.01_2 \times 101.1_2$

Dividing Binary Numbers

For the base 2 system...divide using the long division technique

```
   0 0 1 0 1 0   R11
101) 1 1 0 1 0 1
   - 1 0 1
     0 0 1 1
   - 0 0 0 0
     0 0 1 1 0
       - 1 0 1
     0 0 0 0 1 1
   - 0 0 0 0 0 0
             1 1
```

A good rule of thumb when using the long division technique is to keep the numbers in the quotient lined up with the numbers in the dividend.

The extra zeros (0) are added over the columns representing numbers too small for the divisor to divide into.

Keep bringing down the numbers from the dividend (1 0 1) so as to make the number large enough to be divided into by the divisor.

Quotient Remainder

Divisor) Dividend

$100011_2 \div 11_2$

$1011.101_2 \div 100_2$

$1011.111_2 \div 1.01_2$