LONG DIVISION

During early childhood development we all learned a computational process called LONG DIVISION. An example of such a long division problem is shown here.

```
   37975
7 ) 265829
    210000
     55829
     49000
      6829
      6300
       529
       490
        39
        35
         4
```

We were taught to check our work by muliplying the divisor 7 by the quotient 37975 and adding the remainder 4 to that product. If the result of that computation was the dividend 265829, then we concluded that we had correctly performed the division.

In the example at thr right we check by verifying that the equality (7)(37975) + 4 = 265829

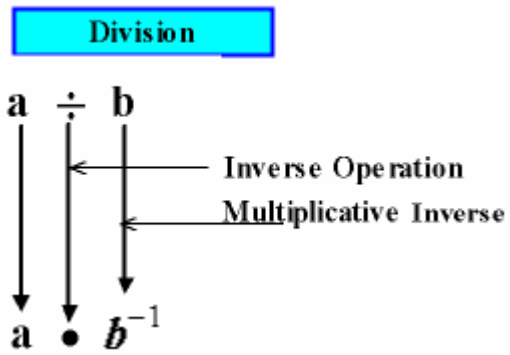
The long division process is nothing more than a method for computing the quotient and remainder which are gauranteed by the Division Algorithm for Natural Numbers when we are given the divisor and dividend. The check is simply an examination of the equality dq + r = n assured in the Division Algorithm. The check merely verifies that the arithmetic in the Long Division Process is error free.

Division Algorithm for Natural Numbers: If d and n are natural numbers then there unique natural numbers q and r such that $dq + r = n$ and $0 \leq r < d$.

A slight modification of the Long Division process shown above is used to produce the decimal equivalent of a fraction $\frac{m}{d}$.

It should be emphasized that Long Division is a computational process for finding the decimal equivalent of a fraction or for finding the quotient and remainder assured by the Division Algorithm but the Long Division process is not equivalent to the binary operation of division.

Division: For mathematical objects **division is always defined in terms of multiplication** as shown in the following diagram.



In some instances, division is not defined because not all mathematical objects have multiplicative inverses.