Prime Numbers 4

It is useful to have some kind of method to determine whether a number is prime or not.

Example.

Is the number 1001 prime?

Answer

It looks prime but we have to be sure. All we need to do is find a factor to show that it is not prime. If no factors can be found then it is prime.

Start with 2,	$1001 \div 2 = 500r1$	so 2 is not a factor.
now try 3,	$1001 \div 3 = 333r2$	so 3 is not a factor.
now try 4,	$1001 \div 4 = 250r1$	so 4 is not a factor.
try 5,	$1001 \div 5 = 200r1$	so 5 is not a factor.
try 6,	$1001 \div 6 = 166r5$	so 6 is not a factor.
try 7,	$1001 \div 7 = 143$	**so 7 is factor.**

1001 is NOT PRIME since 7x143=1001

Set out your division sums like this,

$$\begin{array}{r} 166\ r\ 5 \\ 6\overline{)1^{1}0^{4}0^{4}1} \end{array}$$

Exercise

In the same way as the example, show that each of the following is NOT PRIME,

1. 147 2. 715 3. 429 4. 91 5. 189

6. 343 7. 1183 8. 187 9. 847 10. 1573

11. What do you notice about the factor you find in every case? Can you draw any conclusions?

12. Try some prime looking numbers of your own but be warned...
The first factor may be large so be prepared for some long divisions!
You may of course pick a number that IS PRIME in which case you will not find any factors!

As the numbers become large it becomes much more difficult (even for powerful computers) to determine if any given number is prime or not. It is not so difficult to just find prime numbers (using very advanced mathematics).

Historical note: Largest prime found by
1588 was 524,287
1772 was 2,147,483,647
1951 was 20,988,936,657,440,586,486,151,264,256,610,222,593,863,921
all found without a computer!

By the year 2006 the largest prime found was $2^{32582657} - 1$ and contains nearly 10 million digits.