Prime Numbers 3

Any number can be expressed as a product of primes.

For example the number 12 = 2x2x3

To express a number as a product of primes, try dividing it by 2 (the first prime) as many times as you can. Then try dividing it by the next prime (3) as many times as you can. Then try the next prime (5) as many times as you can and so on until you are left with 1.

eg   Express 48 as a product of primes.   eg   Express 100 as a product of primes

2	48
2	24
2	12
2	6
3	3
	1

So 48 = 2x2x2x2x3

2	100
2	50
5	25
5	5
	1

So 100 = 2x2x5x5

Your teacher will show you some more examples.

Exercise.
Express each of the following as a product of prime factors.

1. 40   2. 58   3. 84   4. 95   5. 108   6. 312   7. 400

8. 600   9. 294   10. 1078   11. 1029   12. 1715   13. 3125   14. 550

15. 3185   16. 363   17. 384   18. 3375   19. 7875   20. 4096

21. Try this one ...   4093   (but don't try too hard!)

    What is special about the number 4093?

22.   Often $2^n - 1$ is prime.
       For example, if n=2, $2^2 - 1 = 2 \times 2 - 1 = 3$ **3 is prime**
                   if n=3, $2^3 - 1 = 2 \times 2 \times 2 - 1 = 7$ **7 is prime**
                   if n=4, $2^4 - 1 = 2 \times 2 \times 2 \times 2 - 1 = 15$ 15 not prime
                   if n=5, $2^5 - 1 = 2 \times 2 \times 2 \times 2 \times 2 - 1 = 31$ **31 is prime**
                   if n=6, $2^6 - 1 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 - 1 = 63$ 63 is not prime
                   if n=7, $2^7 - 1 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 - 1 = 127$ **127 is prime**
                   if n=8, $2^8 - 1 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 - 1 = 255$ 255 is not prime

       Often $2^n + 1$ is prime.
       In the same way as above, test to see if it gives prime numbers for n=1, n=2, ...
       n=8.