

Why Study Prime and Composite Numbers?

Date: 01/25/2001 at 21:43:23

From: Kim Howell

Subject: What is the purpose of studying Prime and Composite numbers?

My daughter is in Grade 6. She is learning about prime and composite numbers but my husband and I wonder why this is taught in school at all. Who uses this in the real world? Why does someone need to know whether a number is a prime number or not?

Date: 01/26/2001 at 00:12:55

From: Doctor Ian

Subject: Re: What is the purpose of studying Prime and Composite numbers?

Hi Kim,

Every time you send a credit card number over the Internet, it gets encrypted by your browser, and the encryption algorithm is based on the theory of prime numbers. At some point, electronic money will become as common as paper money, and _that_ will also be based on the theory of prime numbers. And what's used more in the real world than money?

The importance of prime numbers is that any integer can be decomposed into a product of primes. For example, if you want to know how many different pairs of numbers can be multiplied to get 360, you can start trying to write them down,

$$1 * 360$$

$$2 * 180$$

$$3 * 120$$

$$4 * 90$$

$$5 * 72$$

$$6 * 60$$

checking every single number up to 180, and hope that you don't miss any; or you can decompose 360 into its prime factors,

$$360 = 2 * 2 * 2 * 3 * 3 * 5$$

with the assurance that every factor of 360 will be a product of a subset of these prime factors.

This kind of analysis is extremely convenient when working with fractions (since prime factorization tells you which common denominators are available for any two fractions), when factoring polynomials... when doing just about anything where integers are involved, really.

Think of it this way. You don't need to learn to multiply, since you can always use repeated addition to solve any multiplication problem, right? If you want to know what 398 times 4612 is, you can just start adding:

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398 (1)
398 (2)
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796
398 (3)
----
1194
398 (4)
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etc.
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Knowing about multiplication saves you time. That's all it does... but that's a lot!

Mostly, prime numbers are good for quickly transforming a situation with zillions of possible outcomes into an equivalent situation with only a handful of possible outcomes.

Here is another way to think about it: If you're looking for some needles in a haystack, you can start picking up each piece of straw, checking to see if it's a needle, and then tossing it over your shoulder. Or you can use a magnet to find the needles right away.

In mathematics, prime numbers serve the same function as a really, Really, REALLY big magnet.

In short, knowing about prime and composite numbers will save your daughter enormous amounts of time in her later math classes - and possibly over the course of her life, if she goes into a technical field.

I hope this helps. Let me know if you'd like to talk about this some more, or if you have any other questions.

- Doctor Ian, The Math Forum