Prime and composite

We've already learned several ways to classify integers, including as positive, negative, or 0. But now we'll look at another way to classify integers that are greater than 1, in other words, the counting numbers 2, 3, 4, 5, etc.

Any whole number greater than 1 can be classified as either a "prime" number or a "composite" number. A number can be either prime or composite, but it can't be both.

A prime number is a whole number greater than 1 that's divisible by only 1 and itself. We already know that every whole number is divisible by 1, because if we divide any whole number by 1, we'll get the original number as the result. Here are some examples:

$$10 \div 1 = 10$$

$$7 \div 1 = 7$$

$$316 \div 1 = 316$$

And every whole number other than 0 is divisible by itself, because if we divide any whole number other than 0 by itself, we'll get 1 (a whole number) as the result. Here are some examples:

$$10 \div 10 = 1$$

$$7 \div 7 = 1$$

$$316 \div 316 = 1$$

Prime numbers

Prime numbers are divisible by only 1 and themselves. As an example, 7 is a prime number because it's divisible by 1 ($7 \div 1 = 7$) and by itself ($7 \div 7 = 1$), but not by anything else. It's not divisible by 2, 3, 4, 5, or 6, because none of these numbers divides evenly into 7 (we don't get a whole number result when we divide 7 by any number other than 1 or 7):

$$7 \div 2 = 3.5$$

$$7 \div 3 \approx 2.33$$

$$7 \div 4 = 1.75$$

$$7 \div 5 = 1.4$$

$$7 \div 6 \approx 1.17$$

We don't have to check numbers greater than 7 (8, 9, 10, etc.) because dividing 7 by any number greater than 7 will give a decimal number between 0 and 1.

The number 11 is also a prime number, because the only numbers that divide evenly into 11 are 1 and 11.

Because 7 and 11 are divisible only by 1 and themselves, we call them "prime" numbers.

Composite numbers

Contrast this with **composite numbers**, which are numbers greater than 1 that are divisible by something other than just 1 and themselves. For example, 6 is a composite number; it's divisible by 1 ($6 \div 1 = 6$) and by itself ($6 \div 6 = 1$), but it's also divisible by 2 ($6 \div 2 = 3$) and by 3 ($6 \div 3 = 2$). Because 6 is divisible by more than just 1 and itself, we call it a "composite" number.

So to determine whether a number is prime or composite, we only need to determine whether that number is evenly divisible by a number other than 1 and itself. If we find any whole number that divides evenly into the number in question (other than 1 or the number itself), then we determine that the number is composite. Otherwise, the number is prime.

Let's look at an example.

Example

Say whether 21 is prime or composite.

The number 21 is divisible by 1 ($21 \div 1 = 21$) and by itself ($21 \div 21 = 1$), but it's also divisible by 3 ($21 \div 3 = 7$) and by 7 ($21 \div 7 = 3$). Because 21 is divisible by more than just 1 and itself, it's a composite number, not a prime number.

In the next lesson, we'll look at a systematic way to determine whether a number is prime or composite, which will take the guesswork out of trying to find a number that divides evenly into the number we're investigating.