EZ Divisibility Tricks for Factoring (for 7 and 11, see next page!)

With bigger numbers, it's often harder to see how to *start* the factor trees. For instance, if you have to factor the number 384, you know that you can start with 2, since it's even. But what about the number 567?

You could just start randomly dividing numbers into it and hope for the best, but that sounds time-consuming, and the last thing we want to do is spend unnecessary time doing math homework! Instead, here are some EZ divisibility tricks to help you detect right away if you can divide these factors into your number.

This chart can make factoring go *much* faster, once you're familiar with it. The best factor-divisibility tricks to memorize are the ones for 2, 3, and 5. They come up the most often. I'm also a big fan of 9.

Factor	Divisibility Trick
2	If the **last digit** of the number is even, then you know that 2 is a factor. *Example: 99,999,994 is divisible by 2, because the last digit is even.*
3	If the **sum of the digits** is divisible by 3, then you know 3 is a factor. *Example: 270. Add up the digits: 2 + 7 + 0 = 9. Since 9 is divisible by 3, we know that 270 is divisible by 3.*
4	If the **last two digits** of the number are divisible by 4, then 4 is a factor. *Example: 712. Since 12 (the last two digits) is divisible by 4, we know that 712 is divisible by 4.*
5	If the **number ends** in 0 or 5, then you know 5 is a factor. *Example: 765 ends in a 5, so it's divisible by 5.*
6	If the **number passes the tests** for 2 and 3, then 6 is a factor. *Example: 504. It's even, and 5 + 0 + 4 = 9, which is divisible by 3, so 504 is divisible by 2 and 3, which means 504 is divisible by 6.*
8	If the **last three digits** of the number are divisible by 8, then 8 is a factor. *Example: 70,008 is divisible by 8 because 008 is divisible by 8.*
9	If the **sum of the digits** is divisible by 9, then you know 9 is a factor. *Example: 981 is divisible by 9 because 9 + 8 + 1 = 18, which is divisible by 9.*
10	If the **number ends in 0**, then you know that 10 is a factor. *Example: 111,110 ends in a 0, so 111,110 is divisible by 10.*

Divisibility by 7

Here's the rule:
Remove the last digit of the number, double it, and then subtract it from the rest of the number (not including that last digit which was removed). If you get a number divisible by 7, then your original number is divisible by 7!

For example: 273: Take the last digit 3, double it to get 6, and then subtract it from 27: 27 – 6 = 21.

Pretty wild, huh? Who figures this stuff out, anyway?

Divisibility by 11

Here's the rule:
Starting with the first digit of the number, take **every other digit** of the number (the first digit, the third digit, the fifth digit, etc) and **add them up**. Now take the digits you didn't use the first time (the second digit, the fourth digit, etc.) and add THEM up. Now **subtract** these two sums from each other. **If the difference between the two sums is divisible by 11**, then the number is divisible by 11.

A lot of the time, two sums will be equal, so their difference equals 0, which is divisible by everything, so certainly is divisible by 11. (note: this rule only works for divisibility by 11!)

For example: 121: Add up 1 + 1 = **2** And then the other digit(s) not used is just 2. Since 2 – 2 = 0, which is divisible by 11, 121 is divisible by 11.

Another example: 6160: Add up 6 + 6 = 12, and the other digits not being used: 1 + 0 = 1. Now subtract these two sums: 12 – 1 = 11, which is divisible by 11, so 6160 is divisible by 11.

Personally, I like it when the sums are the same, so their difference is 0, which happens all the time.

Can you make up your own number that's divisible by 11? How about 1342? Add up 1 + 4 = *5*, and then add up the digits you didn't use yet: 3 + 2 = *5*. Now try dividing 11 into 1342, and you'll see that 1342 = 11 $\times$ 122. Yep! We made a number that's divisible by 11.

Let's make up another number we know is going to be divisible by 11, a really long one.

How about 789,987?

We know that 7 + 8 + 9 = 8 + 9 + 7, so the number will be divisible by 11! Pretty nifty, eh? Maybe nifty's the wrong word, but I thought it was kinda interesting anyway.

Can you make up a number that is divisible by 9 and 11?
(email me!)