**Gene Luen Yang**  a [Chinese American](http://en.wikipedia.org/wiki/Chinese_American) writer of [graphic novels](http://en.wikipedia.org/wiki/Graphic_novels) and comics. Until recently, he was the Director of Information Services and taught computer science at [Bishop O'Dowd High School](http://en.wikipedia.org/wiki/Bishop_O%27Dowd_High_School) in [Oakland, California](http://en.wikipedia.org/wiki/Oakland,_California)and travels all over the world, speaking about graphic novels and comics at comic book conventions and universities, schools, and libraries. (Source: Wikipedia)

To review factoring techniques covered in previous math courses, go to Factoring with Mr. Yang and Mosley the Alien at <http://www.geneyang.com/factoring/>

Click the “**Introduction**” tab and read the complete comic. Answer the following questions as you read the comic strip.

1. What holds true for Rodney’s gumball also holds true in math. Often, numbers, expression, and especially \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_\_\_ to work with if you “\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ \_\_\_\_\_” first.
2. We “break up” large numbers, expression, and equation by-you guessed it- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ them.

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Once you finish reading the comic strip, click on the Mosley the Alien saying “Thanks Mr. Yang! I’ll see you next time!”

Next, click the “**Lesson 1: Factors, Prime Factorization, and Greatest Common Factor**” tab and read the complete comic. Answer the following questions as you read the comic strip.

1. When we multiple two number together, we call the two numbers \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the \_\_\_\_\_\_\_\_\_\_\_\_.

\_\_\_\_\_\_ \_\_\_\_\_\_ = 10 So here you can see that \_\_\_\_ and \_\_\_\_ are factors of 10.

1. Every number can be “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_” into its factors. For example, 12 can be broken up into its factors \_\_\_\_\_ and \_\_\_\_\_\_. When we do this, we say that we are \_\_\_\_\_\_\_\_\_\_\_\_\_ 12. 12 can be factored in a variety of ways. *Write down the different ways 12 can be factored*

Numbers that be factored multiple ways are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. There’s also a kind of number that can only be factored one way: unto 1 and itself. These numbers don’t have any other \_\_\_\_\_\_\_\_\_\_\_. \_\_\_\_ is an example. These numbers are called \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_
2. When we “break up” a number into factors that are all prime, we call it the \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the number. Take a look at the prime factorization of 84 = \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_
3. The \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ (or GCF) of two numbers is the \_\_\_\_\_\_\_\_\_\_\_\_ number that is a factor of both. For example, the GCF of 24 and 36 is \_\_\_\_\_\_.
4. The GCF of 55 and 300 is \_\_\_\_\_\_.

Once you finish reading the comic strip, click on the Mosley the Alien saying “Thanks Mr. Yang! I’ll see you next time!”

Lastly, click the “**Lesson 2: Factoring with the Distributive Property**” tab and read the complete comic. Answer the following questions as you read the comic strip.

1. Let’s start with a quick look at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:

Remember that the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is also true:

1. Now look closely at the statement:

One the right are the factors of the expression! a and b + c are \_\_\_\_\_\_\_\_\_\_\_\_ of In fact, this can be expressed in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ tree (show the factor tree below):

1. Let’s find the factors of this expression:

The GCF of is \_\_\_\_\_\_\_\_\_

The “left over” factor of is \_\_\_\_\_ and of is \_\_\_\_\_\_.

1. Factor
2. Sometimes, an expression’s terms don’t have a GCF larger than \_\_\_\_\_\_. You can’t factor an expression like this with the Distributive Property. Here are two examples (Write the two examples provided):

Circle the prime expression.

1. can be broken up as \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_.

You are done working with Mr. Yang for now. We will be referring to this comic strip throughout Unit 2.

Go to: <http://www.geneyang.com/factoring/-->> complete Lesson 3: Factoring by Grouping

Factoring by Grouping will only work on expressions with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_ terms.

Here’s an example:

The first step is to put the terms into \_\_\_\_\_\_ “groups.”

\*Place parentheses around the two terms highlighted in magenta and another set of parentheses around the two terms highlighted in teal on the expression above

\*Continue to read the comic strip until you get the scene with the expression in yellow. Write the yellow expression down below the given polynomial

\_\_\_\_\_\_\_\_\_\_\_\_\_ is on both sides! This means we can apply the \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ one more time!

Now you have one more method of factoring at your disposal: Factoring by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. You have to patient with this method-sometimes you have to \_\_\_\_\_\_\_\_\_\_\_\_\_\_ with the expression to get it to work.

Neither group has a GCF larger than \_\_\_\_\_\_!

Don’t worry, there’s a solution! If we just \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the terms of the expression using the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_...

\*Rearrange the terms below the stated expression above. The comic shows the change in yellow

\*Write the steps to factor the polynomial above

There are also expressions with four or more terms that simply \_\_\_\_\_\_\_\_ be \_\_\_\_\_\_\_\_\_\_\_\_\_ using Grouping, but don’t give up until you’ve tried to rearranging the terms!

Now I want you to try a practice problems on your own. I’m going to show you the answer on the next panel, so don’t go there until you’ve tried figuring it for yourself.

Go to: <http://www.geneyang.com/factoring/-->> complete **Lesson 4: Factoring Trinomial Expressions**

So far, you’ve learned two methods of factoring expressions: Factoring with the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

and Factoring by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Factoring with the Distributive Property works on expressions with \_\_\_\_\_\_\_ or \_\_\_\_\_\_\_ terms, while Factoring by Grouping works on expressions with \_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_ terms.

Today we’re going to look at a methods that works specifically on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ expressions.

Using this method, you’ll be able to break a trinomial expression into its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ factors.

**Multiply**:

From this, you can see that the \_\_\_\_\_\_\_\_\_\_ 2x+6 and x+2 are the \_\_\_\_\_\_\_\_ of the trinomial

Now look closely at what happens in this process. We go from \_\_\_\_\_\_ binomials….to an expression with \_\_\_\_\_\_\_\_ terms…to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The method you’re going to learn in this lesson is basically the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of this process!

The first step, going from a trinomial to an \_\_\_\_\_\_\_\_\_\_\_\_\_\_ with \_\_\_\_\_\_\_\_ terms, is the more difficult one.

Notice that the first and last terms of the trinomial stay the \_\_\_\_\_\_\_\_\_\_\_\_ while the middle term gets split in two. So how do you split up the middle term? I’ve got a little trick to teach you. Take a look at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the second expression two middle terms. They follow two rules.

1st: They always \_\_\_\_\_\_\_\_\_\_ up to the coefficient of the trinomial’s middle term.

2nd: Their \_\_\_\_\_\_\_\_\_\_\_\_ is always the same as the product of the \_\_\_\_\_\_ term’s coefficient and the \_\_\_\_\_\_\_ term’s coefficient.

We can use these two rules to go from the trinomial to the expression with four terms!