## Lesson 8: Rewriting Quadratic Expressions in Factored Form (Part 3)

* Let’s look closely at some special kinds of factors.

### 8.1: Math Talk: Products of Large-ish Numbers

Find each product mentally.

### 8.2: Can Products Be Written as Differences?

1. Clare claims that is equivalent to and is equivalent to . Do you agree? Show your reasoning.
   1. Use your observations from the first question and evaluate . Show your reasoning.
   2. Check your answer by computing .
2. Is equivalent to ? Support your answer:

* With a diagram:

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| --- | --- | --- |
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* Without a diagram:

1. Is equivalent to ? Support your answer, either with or without a diagram.

#### Are you ready for more?

1. Explain how your work in the previous questions can help you mentally evaluate and .
2. Here is a shortcut that can be used to mentally square any two-digit number. Let’s take , for example.
   * 83 is .
   * Compute and , which give 6,400 and 9. Add these values to get 6,409.
   * Compute , which is 240. Double it to get 480.
   * Add 6,409 and 480 to get 6,889.

* Try using this method to find the squares of some other two-digit numbers. (With some practice, it is possible to get really fast at this!) Then, explain why this method works.

### 8.3: What If There is No Linear Term?

Each row has a pair of equivalent expressions.

Complete the table.

If you get stuck, consider drawing a diagram. (Heads up: one of them is impossible.)

|  |  |
| --- | --- |
| factored form | standard form |
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### Lesson 8 Summary

Sometimes expressions in standard form don’t have a linear term. Can they still be written in factored form?

Let’s take as an example. To help us write it in factored form, we can think of it as having a linear term with a coefficient of 0: . (The expression is equivalent to because 0 times any number is 0, so is 0.)

We know that we need to find two numbers that multiply to make -9 and add up to 0. The numbers 3 and -3 meet both requirements, so the factored form is .

To check that this expression is indeed equivalent to , we can expand the factored expression by applying the distributive property: . Adding and gives 0, so the expanded expression is .

In general, a quadratic expression that is a difference of two squares and has the form:

can be rewritten as:

Here is a more complicated example: . This expression can be written , so an equivalent expression in factored form is .

What about ? Can it be written in factored form?

Let’s think about this expression as . Can we find two numbers that multiply to make 9 but add up to 0? Here are factors of 9 and their sums:

* 9 and 1, sum: 10
* -9 and -1, sum: -10
* 3 and 3, sum: 6
* -3 and -3, sum: -6

For two numbers to add up to 0, they need to be opposites (a negative and a positive), but a pair of opposites cannot multiply to make positive 9, because multiplying a negative number and a positive number always gives a negative product.

Because there are no numbers that multiply to make 9 and also add up to 0, it is not possible to write in factored form using the kinds of numbers that we know about.



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