

Multiplying Radical Expressions

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WHAT'S COVERED

In this lesson, you will learn how to multiply binomial radical expressions using FOIL. Specifically, this lesson will cover:

1. Review of Distributive Rule and FOIL with Integers

The distributive rule allows us to distribute an outside factor into all terms of another factor.

→ EXAMPLE

$$2(4 + 3) \quad \text{Distribute 2 into 4 and 3}$$

$$(2 \cdot 4) + (2 \cdot 3) \quad \text{Multiply inside the parentheses}$$

$$8 + 6 \quad \text{Add 8 to 6}$$

$$14 \quad \text{Our Solution}$$

If we have two factors in the form $(a + b)$, we can use the distributive property in a different way, commonly referred to as the **FOIL** method.

→ EXAMPLE

$$(6 - 3)(3 + 2) \quad \text{Apply steps to FOIL}$$

$$18 + 12 - 9 - 6 \quad \text{Add and subtract}$$

$$15 \quad \text{Our Solution}$$



TERM TO KNOW

FOIL

An acronym to remember the steps for distributing factors in binomial multiplication: first, outside, inside, last.

2. Multiplying Radical Expressions using

Distribution and FOIL

The distributive rule and FOIL method can be applied to multiply expressions with radicals as well. First, we will look at an example of distribution, where two identical radicals are multiplied together.

➞ EXAMPLE

$$\begin{aligned}\sqrt{2}(3+\sqrt{2}) & \text{ Distribute the square root of 2} \\ 3\sqrt{2}+\sqrt{2}\sqrt{2} & \sqrt{2}\sqrt{2} \text{ simplifies to the integer 2} \\ 3\sqrt{2}+2 & \text{ Our Solution}\end{aligned}$$

We can also use the FOIL method to distribute across two binomials in multiplication when there are radicals. This is illustrated in the following example:

➞ EXAMPLE

$$\begin{aligned}(\sqrt{3}+5)(2-\sqrt{3}) & \text{ Apply the steps to FOIL} \\ 2\sqrt{3}-\sqrt{3}\sqrt{3}+10-5\sqrt{3} & \sqrt{3}\sqrt{3} \text{ simplifies to the integer 3} \\ 2\sqrt{3}-3+10-5\sqrt{3} & \text{ Combine like terms} \\ 7-3\sqrt{3} & \text{ Our Solution}\end{aligned}$$



BIG IDEA

The distributive rule and the FOIL method can be applied to expressions containing radicals as well. When two identical square roots are multiplied by each other, it evaluates to the expression underneath the square root. This property also applies to other roots, such as cube roots, but the identical radical needs to be multiplied by itself 3 times, and so on.



SUMMARY

A **review of the distributive property and FOIL** allows us to distribute outside factors into all terms of another factor. A helpful hint when **multiplying radical expressions using distribution and FOIL** is to remember that multiplying 2 square root terms together will cancel out the square root operation. For example, the square root of 8 times the square root of 8 is just 8.

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TERMS TO KNOW

FOIL

An acronym to remember the steps for distributing factors in binomial multiplication: first, outside, inside, last.



FOIL Method

$$(a + b)(c + d) = ac + ad + bc + bd$$