Name ________________________________ Class _____________ Date _____________

10-3 Reteaching

Operations with Radical Expressions

You can use the Distributive Property with radical expressions.

Problem

What is the simplified form of $4\sqrt{2}-\sqrt{18}$?

You need to simplify the radical expressions before you know if there are any like radicals that can be subtracted.

Solve $4\sqrt{2}-\sqrt{18}$ — Look for a common radical in $4\sqrt{2}$ and $\sqrt{18}$. $4\sqrt{2}$ is factored completely, but $\sqrt{18}$ can be factored further.

$\sqrt{18}=\sqrt{3\cdot 3\cdot 2}$ — Factor $\sqrt{18}$ completely.

$=\sqrt{3\cdot 3\cdot 2}=\sqrt{3^2\cdot 2}$ — Find pairs of factors that you can factor out. These are perfect-square factors.

$=3\sqrt{2}$ — Remove the perfect-square factor.

$4\sqrt{2}-\sqrt{18}=4\sqrt{2}-3\sqrt{2}$ — Now you can see that each term in the expression shares the common radical $\sqrt{2}$.

$=(4-3)\sqrt{2}$ — Use the Distributive Property to combine like radicals. $a\sqrt{b}\ \text{Ğ}c\sqrt{b}=(a-c)\sqrt{b}$

$=1\cdot\sqrt{2}$ — Subtract.

$=\sqrt{2}$ — Simplify.

Check $4\sqrt{2}-\sqrt{18}=\sqrt{2}$ — Check your solution.

$3\sqrt{2}-\sqrt{18}=0$ — Subtract from both sides.

$3\sqrt{2}=\sqrt{18}$ — Add to both sides.

$3\sqrt{2}=3\sqrt{2}$ ✓ — Simplify

Solution: The simplified form of $4\sqrt{2}-\sqrt{18}$ is $\sqrt{2}$.

Exercises

Simplify each sum or difference.

1. $2\sqrt{5}-4\sqrt{5}$

2. $\sqrt{7}+\sqrt{7}$

3. $3\sqrt{6}+2\sqrt{6}$

4. $5\sqrt{2}+\sqrt{32}$

5. $3\sqrt{3}-\sqrt{75}$

6. $4\sqrt{54}+2\sqrt{24}$

7. $10\sqrt{5}-5\sqrt{20}$

8. $2\sqrt{8}+\sqrt{200}$

9. $3\sqrt{12}+\sqrt{108}$

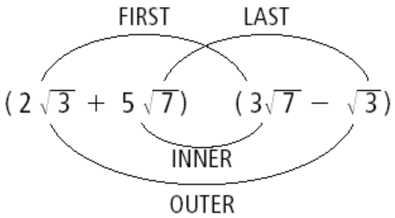
When you have two binomial factors that include radical expressions, treat them like any other binomials and multiply using a box or FOIL (**F**irst, **O**uter, **I**nner, **L**ast).

Problem

What is the simplified form of $(2\sqrt{3}+5\sqrt{7})(3\sqrt{7}-\sqrt{3})$?

Solve

Use FOIL to find the product of each pair of terms. Multiply the coefficients and then multiply the radicals. Remove all perfect-square factors.



First: $(2\sqrt{3}\cdot 3\sqrt{7}) = 6\sqrt{21}$

Outer: $(2\sqrt{3}\cdot(-\sqrt{3}) = -2\sqrt{9} = -2\cdot 3 = -6$

Inner: $5\sqrt{7}\cdot 3\sqrt{7}) = 15\sqrt{49} = 15\cdot 7 = 105$

Last: $(5\sqrt{7}\cdot(-\sqrt{3}) = -5\sqrt{21}$

$= 6\sqrt{21} - 6 + 105 - 5\sqrt{21}$

$= (6\sqrt{21} - 5 + \sqrt{21}) + (-6 + 105)$ — Group like terms.

$= (6-5)\sqrt{21} + 99$ — Distributive Property

$= 1\sqrt{21} + 99 = \sqrt{21} + 99$ — Simplify.

Solution: The simplified form of $(2\sqrt{3}+5\sqrt{7})(3\sqrt{7}-\sqrt{3})$ is $\sqrt{21}+99$.

Exercises

Simplify each radical expression.

10. $\sqrt{4}(\sqrt{3}+\sqrt{5})$

11. $\sqrt{10}(\sqrt{8}-9)$

12. $2\sqrt{3}(2-\sqrt{3})$

13. $-\sqrt{8}(5-3\sqrt{5})$

14. $4\sqrt{6}(\sqrt{2}+4\sqrt{3}$

15. $2\sqrt{6}(\sqrt{11}+7)$

16. $(3\sqrt{7}+\sqrt{3})^2$

17. $(1+\sqrt{3})(1-\sqrt{3})$

18. $(3\sqrt{6}+2\sqrt{2})(\sqrt{2}-4\sqrt{6})$