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. $a\sqrt{b} - c\sqrt{b} = (a - c)\sqrt{b}$
	$= 1 \cdot \sqrt{2}$	Subtract.
	$= \sqrt{2}$	Simplify.
Check	$4\sqrt{2} - \sqrt{18} = \sqrt{2}$	Check your solution.
	$3\sqrt{2} - \sqrt{18} = 0$	Subtract $\sqrt{2}$ from both sides.
	$3\sqrt{2} = \sqrt{18}$	Add $\sqrt{18}$ to both sides.
	$3\sqrt{2} = 3\sqrt{2}$ ✓	Simplify $\sqrt{18}$.

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

Exercises

Simplify each sum or difference.

1. $2\sqrt{5} - 4\sqrt{5}$ $-2\sqrt{5}$
2. $\sqrt{7} + \sqrt{7}$ $2\sqrt{7}$
3. $3\sqrt{6} + 2\sqrt{6}$ $5\sqrt{6}$
4. $5\sqrt{2} + \sqrt{32}$ $9\sqrt{2}$
5. $3\sqrt{3} - \sqrt{75}$ $-2\sqrt{3}$
6. $4\sqrt{54} + 2\sqrt{24}$ $16\sqrt{6}$
7. $10\sqrt{5} - 5\sqrt{20}$ 0
8. $2\sqrt{8} + \sqrt{200}$ $14\sqrt{2}$
9. $3\sqrt{12} + \sqrt{108}$ $12\sqrt{3}$

Name _____ Class _____ Date _____

10-3 Reteaching (continued)

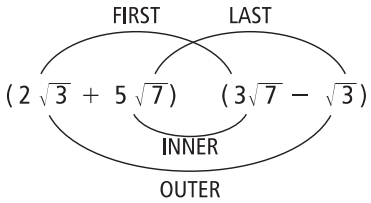
Operations with Radical Expressions

When you have two binomial factors that include radical expressions, treat them like any other binomials and multiply using 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. $\sqrt{4}(\sqrt{3} + \sqrt{5})$
$2\sqrt{3} + 2\sqrt{5}$

11. $\sqrt{10}(\sqrt{8} - 9)$
$4\sqrt{5} - 9\sqrt{10}$

12. $2\sqrt{3}(2 - \sqrt{3})$
$4\sqrt{3} - 6$

13. $-\sqrt{8}(5 - 3\sqrt{5})$
$-10\sqrt{2} + 6\sqrt{10}$

14. $4\sqrt{6}(\sqrt{2} + 4\sqrt{3})$
$8\sqrt{3} + 48\sqrt{2}$

15. $2\sqrt{6}(\sqrt{11} + 7)$
$2\sqrt{66} + 14\sqrt{6}$

16. $(3\sqrt{7} + \sqrt{3})^2$
$66 + 6\sqrt{21}$

17. $(1 + \sqrt{3})(1 - \sqrt{3})$
-2

18. $(3\sqrt{6} + 2\sqrt{2})(\sqrt{2} - 4\sqrt{6})$
$-10\sqrt{3} - 68$