NAME 10 problems from each side DATE PERIOD

10-2 Study Guide and Intervention

Operations with Radical Expressions

Add and Subtract Radical Expressions When adding or subtracting radical expressions, use the Associative and Distributive Properties to simplify the expressions. If radical expressions are not in simplest form, simplify them.

Example 1 **Simplify $10\sqrt{6} - 5\sqrt{3} + 6\sqrt{3} - 4\sqrt{6}$.**

$10\sqrt{6} - 5\sqrt{3} + 6\sqrt{3} - 4\sqrt{6} = (10 - 4)\sqrt{6} + (-5 + 6)\sqrt{3}$ Associative and Distributive Properties

$= 6\sqrt{6} + \sqrt{3}$ Simplify.

Example 2 **Simplify $3\sqrt{12} + 5\sqrt{75}$.**

$3\sqrt{12} + 5\sqrt{75} = 3\sqrt{2^2 \cdot 3} + 5\sqrt{5^2 \cdot 3}$ Simplify.

$= 3 \cdot 2\sqrt{3} + 5 \cdot 5\sqrt{3}$ Simplify.

$= 6\sqrt{3} + 25\sqrt{3}$ Simplify.

$= 31\sqrt{3}$ Distributive Property

Exercises **Simplify.**

1. $2\sqrt{5} + 4\sqrt{5}$ $6\sqrt{5}$
2. $\sqrt{6} - 4\sqrt{6}$ $-3\sqrt{6}$
3. $\sqrt{8} - \sqrt{2}$ $\sqrt{2}$
4. $3\sqrt{75} + 2\sqrt{5}$ $15\sqrt{3} + 2\sqrt{5}$
5. $\sqrt{20} + 2\sqrt{5} - 3\sqrt{5}$ $\sqrt{5}$
6. $2\sqrt{3} + \sqrt{6} - 5\sqrt{3}$ $-3\sqrt{3} + \sqrt{6}$
7. $\sqrt{12} + 2\sqrt{3} - 5\sqrt{3}$ $-\sqrt{3}$
8. $3\sqrt{6} + 3\sqrt{2} - \sqrt{50} + \sqrt{24}$ $-2\sqrt{2} + 5\sqrt{6}$
9. $\sqrt{8a} - \sqrt{2a} + 5\sqrt{2a}$ $6\sqrt{2a}$
10. $\sqrt{54} + \sqrt{24}$ $5\sqrt{6}$
11. $\sqrt{3} + \sqrt{\frac{1}{3}}$ $\frac{4\sqrt{3}}{3}$
12. $\sqrt{12} + \sqrt{\frac{1}{3}}$ $\frac{7\sqrt{3}}{3}$
13. $\sqrt{54} - \sqrt{\frac{1}{6}}$ $\frac{17\sqrt{6}}{6}$
14. $\sqrt{80} - \sqrt{20} + \sqrt{180}$ $8\sqrt{5}$
15. $\sqrt{50} + \sqrt{18} - \sqrt{75} + \sqrt{27}$ $8\sqrt{2} - 2\sqrt{3}$
16. $2\sqrt{3} - 4\sqrt{45} + 2\sqrt{\frac{1}{3}}$ $\frac{8\sqrt{3}}{3} - 12\sqrt{5}$
17. $\sqrt{125} - 2\sqrt{\frac{1}{5}} + \sqrt{\frac{1}{3}}$ $\frac{23\sqrt{5}}{5} + \frac{\sqrt{3}}{3}$
18. $\sqrt{\frac{2}{3}} + 3\sqrt{3} - 4\sqrt{\frac{1}{12}}$ $\frac{7\sqrt{3}}{3} + \frac{\sqrt{6}}{3}$

Lesson 10-2

NAME Pick any 10 DATE PERIOD

10-2 Study Guide and Intervention *(continued)*

Operations with Radical Expressions

Multiply Radical Expressions Multiplying two radical expressions with different radicands is similar to multiplying binomials.

Example **Multiply $(3\sqrt{2} - 2\sqrt{5})(4\sqrt{20} + \sqrt{8})$.**

Use the FOIL method.

$$(3\sqrt{2} - 2\sqrt{5})(4\sqrt{20} + \sqrt{8}) = (3\sqrt{2})(4\sqrt{20}) + (3\sqrt{2})(\sqrt{8}) + (-2\sqrt{5})(4\sqrt{20}) + (-2\sqrt{5})(\sqrt{8})$$

$= 12\sqrt{40} + 3\sqrt{16} - 8\sqrt{100} - 2\sqrt{40}$ Multiply.

$= 12\sqrt{2^2 \cdot 10} + 3 \cdot 4 - 8 \cdot 10 - 2\sqrt{2^2 \cdot 10}$ Simplify.

$= 24\sqrt{10} + 12 - 80 - 4\sqrt{10}$ Simplify.

$= 20\sqrt{10} - 68$ Combine like terms.

Exercises **Find each product.**

1. $2(\sqrt{3} + 4\sqrt{5})$ $2\sqrt{3}+8\sqrt{5}$
2. $\sqrt{6}(\sqrt{3} - 2\sqrt{6})$ $-12+3\sqrt{2}$
3. $\sqrt{5}(\sqrt{5} - \sqrt{2})$ $5-\sqrt{10}$
4. $\sqrt{2}(3\sqrt{7} + 2\sqrt{5})$ $2\sqrt{10}+3\sqrt{14}$
5. $(2 - 4\sqrt{2})(2 + 4\sqrt{2})$ -28
6. $(3 + \sqrt{6})^2$ $15+6\sqrt{6}$
7. $(2 - 2\sqrt{5})^2$ $24-8\sqrt{5}$
8. $3\sqrt{2}(\sqrt{8} + \sqrt{24})$ $12+12\sqrt{3}$
9. $\sqrt{8}(\sqrt{2} + 5\sqrt{8})$ 44
10. $(\sqrt{5} - 3\sqrt{2})(\sqrt{5} + 3\sqrt{2})$ -13
11. $(\sqrt{3} + \sqrt{6})^2$ $9+6\sqrt{2}$
12. $(\sqrt{2} - 2\sqrt{3})^2$ $14-4\sqrt{6}$
13. $(\sqrt{5} - \sqrt{2})(\sqrt{2} + \sqrt{6})$ $-2-2\sqrt{3}+\sqrt{10}+\sqrt{30}$
14. $(\sqrt{8} - \sqrt{2})(\sqrt{3} + \sqrt{6})$ $2\sqrt{3}+\sqrt{6}$
15. $(\sqrt{5} - \sqrt{18})(7\sqrt{5} + \sqrt{3})$ $35-3\sqrt{2}-21\sqrt{10}+\sqrt{15}$
16. $(2\sqrt{3} - \sqrt{45})(\sqrt{12} + 2\sqrt{6})$ $12+12\sqrt{2}-6\sqrt{15}-6\sqrt{30}$
17. $(2\sqrt{5} - 2\sqrt{3})(\sqrt{10} + \sqrt{6})$ $14\sqrt{2}$
18. $(\sqrt{2} + 3\sqrt{3})(\sqrt{12} - 4\sqrt{8})$ $2-22\sqrt{6}$

10-2 Add/Subtract Radicals Practice Key

3. $\sqrt{8} - \sqrt{2}$

$2\sqrt{2} - \sqrt{2} = \boxed{\sqrt{2}}$

4. $3\sqrt{75} + 2\sqrt{5}$

$3 \cdot 25$

$\boxed{15\sqrt{3} + 2\sqrt{5}}$

5. $\sqrt{20} + 2\sqrt{5} - 3\sqrt{5}$

$4 \cdot 5$

$2\sqrt{5} + 2\sqrt{5} - 3\sqrt{5} = \boxed{\sqrt{5}}$

6. $\sqrt{12} + 2\sqrt{3} - 5\sqrt{3}$

$2 \cdot 2 \cdot 3$

$2\sqrt{3} + 2\sqrt{3} - 5\sqrt{3} = \boxed{-\sqrt{3}}$

8. $3\sqrt{6} + 3\sqrt{2} - \sqrt{50} + \sqrt{24}$

$2 \cdot 25$; $4 \cdot 6$

$5 \cdot 5$; $2 \cdot 2$

$3\sqrt{6} + 3\sqrt{2} - 5\sqrt{2} + 2\sqrt{6} = \boxed{-2\sqrt{2} + 5\sqrt{6}}$

9. $\sqrt{8a} - \sqrt{2a} + 5\sqrt{2a}$

$2 \cdot 4$

$2 \cdot 2$

$2\sqrt{2a} - \sqrt{2a} + 5\sqrt{2a} = \boxed{6\sqrt{2a}}$

10. $\sqrt{54} + \sqrt{24}$

$2 \cdot 27$; $2 \cdot 12$

$3 \cdot 9$; $2 \cdot 6$

$3 \cdot 3$; $2 \cdot 3$

$3\sqrt{6} + 2\sqrt{6} = \boxed{5\sqrt{6}}$

11. $\sqrt{3} + \sqrt{\frac{1}{3}}$

$\sqrt{3} + \frac{\sqrt{1}}{\sqrt{3}}$

$\sqrt{3} + \frac{1}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right)$

$1\sqrt{3} + \frac{\sqrt{3}}{3} = \frac{4\sqrt{3}}{3}$

12. $\sqrt{12} + \sqrt{\frac{1}{3}}$

$2\sqrt{3} + \frac{1}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right)$

$2\sqrt{3} + \frac{\sqrt{3}}{3} = \boxed{\frac{7\sqrt{3}}{3}}$

$\frac{6\sqrt{3}}{3}$

13. $\sqrt{54} - \sqrt{\frac{1}{6}}$

$3\sqrt{6} - \frac{1}{\sqrt{6}}\left(\frac{\sqrt{6}}{\sqrt{6}}\right)$

$3\sqrt{6} - \frac{\sqrt{6}}{6}$

$\frac{18\sqrt{6}}{6} - \frac{1\sqrt{6}}{6} = \frac{17\sqrt{6}}{6}$

14. $\sqrt{80} - \sqrt{20} + \sqrt{180}$

$80 = 2 \cdot 40 = 2 \cdot 2 \cdot 20 = 2 \cdot 2 \cdot 2 \cdot 10 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5$

$20 = 2 \cdot 10 = 2 \cdot 2 \cdot 5$

$180 = 2 \cdot 90 = 2 \cdot 2 \cdot 45 = 2 \cdot 2 \cdot 3 \cdot 15 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$

$4\sqrt{5} - 2\sqrt{5} + 6\sqrt{5} = \boxed{8\sqrt{5}}$

15. $\sqrt{50} + \sqrt{18} - \sqrt{75} + \sqrt{27}$

$50 = 2 \cdot 25 = 2 \cdot 5 \cdot 5$

$18 = 2 \cdot 9 = 2 \cdot 3 \cdot 3$

$75 = 3 \cdot 25 = 3 \cdot 5 \cdot 5$

$27 = 3 \cdot 9 = 3 \cdot 3 \cdot 3$

$5\sqrt{2} + 3\sqrt{2} - 5\sqrt{3} + 3\sqrt{3}$

$\boxed{8\sqrt{2} - 2\sqrt{3}}$

16. $2\sqrt{3} - 4\sqrt{45} + 2\sqrt{\frac{1}{3}}$

$45 = 3 \cdot 15 = 3 \cdot 3 \cdot 5$

$2\left(\frac{\sqrt{1}}{\sqrt{3}}\right) = \frac{2}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right) = \frac{2\sqrt{3}}{3}$

$2\sqrt{3} - 12\sqrt{5} + \frac{2\sqrt{3}}{3} = \boxed{\frac{8\sqrt{3}}{3} - 12\sqrt{5}}$

17. $\sqrt{125} - 2\sqrt{\frac{1}{5}} + \sqrt{\frac{1}{3}}$

$125 = 5 \cdot 25 = 5 \cdot 5 \cdot 5$

$-2\left(\frac{1}{\sqrt{5}}\right)\left(\frac{\sqrt{5}}{\sqrt{5}}\right) = \frac{-2\sqrt{5}}{5}$

$5\sqrt{5} - \frac{2\sqrt{5}}{5} + \frac{\sqrt{3}}{3} = \boxed{\frac{23\sqrt{5}}{5} + \frac{\sqrt{3}}{3}}$

$\frac{25\sqrt{5}}{5} - \frac{2\sqrt{5}}{5}$

18. $\sqrt{\frac{2}{3}} + 3\sqrt{3} - 4\sqrt{\frac{1}{12}}$

$\frac{\sqrt{2}}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right) = \frac{\sqrt{6}}{3}$

$\frac{-4\sqrt{1}}{\sqrt{12}} = \frac{-4}{\sqrt{12}} = \frac{-4}{2\sqrt{3}} = \frac{-2}{\sqrt{3}}\left(\frac{\sqrt{3}}{\sqrt{3}}\right) = \frac{-2\sqrt{3}}{3}$

$\frac{\sqrt{6}}{3} + 3\sqrt{3} - \frac{2\sqrt{3}}{3}$

$\frac{9\sqrt{3}}{3} - \frac{2\sqrt{3}}{3}$

$\frac{7\sqrt{3}}{3} + \frac{\sqrt{6}}{3}$

10-2 Multiply Radicals Practice Key

1. $2(\sqrt{3}+4\sqrt{5}) = \boxed{2\sqrt{3}+8\sqrt{5}}$

2. $\sqrt{6}(\sqrt{3}-2\sqrt{6}) = \sqrt{18}-2\sqrt{36} = \boxed{3\sqrt{2}-12}$ or $\boxed{-12+3\sqrt{2}}$
   ($\sqrt{18}$: $2\cdot 9$, $9 = 3\cdot 3$; $2\sqrt{36} = 2(6)$)

3. $\sqrt{5}(\sqrt{5}-\sqrt{2}) = \sqrt{25}-\sqrt{10} = \boxed{5-\sqrt{10}}$

4. $\sqrt{2}(3\sqrt{7}+2\sqrt{5}) = \boxed{3\sqrt{14}+2\sqrt{10}}$

5. $(2-4\sqrt{2})(2+4\sqrt{2})$ F O I L: $4 + 8\sqrt{2} - 8\sqrt{2} - 32 = \boxed{-28}$

6. $(3+\sqrt{6})^2 = (3+\sqrt{6})(3+\sqrt{6})$ $\boxed{15+6\sqrt{6}}$

	3	$\sqrt{6}$	
3	9	$3\sqrt{6}$	OUT
$\sqrt{6}$	$3\sqrt{6}$	6	OUT
	IN	IN	

7. $(2-2\sqrt{5})^2$
   $(2-2\sqrt{5})(2-2\sqrt{5})$ F O I L: $4 - 4\sqrt{5} - 4\sqrt{5} + 4\sqrt{25} = \boxed{24-8\sqrt{5}}$
   ($\sqrt{25} = 5$, $4\cdot 5 = 20$)

8. $3\sqrt{2}(\sqrt{8}+\sqrt{24}) = 3\sqrt{16}+3\sqrt{48} = \boxed{12+12\sqrt{3}}$
   ($\sqrt{16} = 4\cdot 4$; $48 = 2\cdot 24$, $24 = 2\cdot 12$, $12 = 2\cdot 2\cdot 3$)

9. $\sqrt{8}(\sqrt{2}+5\sqrt{8}) = \sqrt{16}+5\sqrt{64} = \boxed{44}$
   ($\sqrt{16} = 4\cdot 4$, $\sqrt{64} = 8\cdot 8$)

10. $(\sqrt{5}-3\sqrt{2})(\sqrt{5}+3\sqrt{2})$ F O I L: $5 + 3\sqrt{10} - 3\sqrt{10} - 18$
    $\boxed{-13}$

11. $(\sqrt{3}+\sqrt{6})^2 = (\sqrt{3}+\sqrt{6})(\sqrt{3}+\sqrt{6})$ F O I L $= 3+\sqrt{18}+\sqrt{18}+6$

$9+2\sqrt{18} = \boxed{9+6\sqrt{2}}$ ($18 = 2\cdot 9$, $9 = 3\cdot 3$)

12. $(\sqrt{2}-2\sqrt{3})^2 = (\sqrt{2}-2\sqrt{3})(\sqrt{2}-2\sqrt{3})$ F O I L

$2-2\sqrt{6}-2\sqrt{6}+4\sqrt{9}$ ($9 = 3\cdot 3$)

12

$\boxed{14-4\sqrt{6}}$

13. $(\sqrt{5}-\sqrt{2})(\sqrt{2}+\sqrt{6}) = \sqrt{10}+\sqrt{30}-\sqrt{4}-\sqrt{12}$ F O I L ($30 = 2\cdot 15$, $4 = 2\cdot 2$, $12 = 2\cdot 6$, $6 = 2\cdot 3$)

$\sqrt{10}+\sqrt{30}-2-2\sqrt{3}$

14. $(\sqrt{8}-\sqrt{2})(\sqrt{3}+\sqrt{6}) = \sqrt{24}+\sqrt{48}-\sqrt{6}-\sqrt{12}$ F O I L ($24 = 2\cdot 12$, $6 = 2\cdot 3$, $48 = 2\cdot 24$, $12 = 2\cdot 6$, $12 = 3\cdot 4$)

$2\sqrt{6}+4\sqrt{3}-\sqrt{6}-2\sqrt{3}$

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

15. $(\sqrt{5}-\sqrt{18})(7\sqrt{5}+\sqrt{3})$

	$\sqrt{5}$	$-\sqrt{18}$
$7\sqrt{5}$	~~$7\sqrt{25}$~~ 35	$-7\sqrt{90}$ $-21\sqrt{10}$
$\sqrt{3}$	$\sqrt{15}$	$-\sqrt{54}$ $-3\sqrt{6}$

$\boxed{35-3\sqrt{6}-21\sqrt{10}+\sqrt{15}}$

16. $(2\sqrt{3}-\sqrt{45})(\sqrt{12}+2\sqrt{6})$ → Simplify 먼저! $(2\sqrt{3}-3\sqrt{5})(2\sqrt{3}+2\sqrt{6})$

F O I L

$4\sqrt{9}+4\sqrt{18}-6\sqrt{15}-6\sqrt{30}$ ($18 = 2\cdot 9$, $15 = 3\cdot 5$, $30 = 2\cdot 15$)

$\boxed{12+12\sqrt{2}-6\sqrt{15}-6\sqrt{30}}$