NAME ______________________________

Module 17 Simplifying Radical Expressions
Lesson 3 Multiplying Radicals

independent practice

Simplify the following radical expressions.

1. $\sqrt{3} \cdot \sqrt{5}$ $\sqrt{15}$
2. $\sqrt{6} \cdot \sqrt{3}$ $3\sqrt{2}$
3. $\sqrt{x} \cdot \sqrt{x}$ x
4. $\sqrt{10} \cdot \sqrt{8}$ $4\sqrt{5}$
5. $\sqrt{12} \cdot \sqrt{3}$ 6
6. $\sqrt[3]{32} \cdot \sqrt[3]{2}$ 4
7. $\sqrt[3]{24} \cdot \sqrt[3]{3}$ $2\sqrt[3]{9}$
8. $\sqrt[3]{2} \cdot \sqrt[3]{-4}$ -2
9. $\sqrt{5}(2 + \sqrt{5})$ $5 + 2\sqrt{5}$
10. $\sqrt{3}(\sqrt{5} + \sqrt{27})$ $9 + \sqrt{15}$
11. $\sqrt{m}(\sqrt{7} + \sqrt{m})$ $m + \sqrt{7m}$
12. $\sqrt{2}(\sqrt{18} + \sqrt{6})$ $6 + 2\sqrt{3}$
13. $\sqrt[3]{2}(\sqrt[3]{16} - \sqrt[3]{7})$ $2\sqrt[3]{4} - \sqrt[3]{14}$
14. $\sqrt[3]{3}(\sqrt[3]{9} - \sqrt[3]{2})$ $3 - \sqrt[3]{6}$
15. $(\sqrt{11} + \sqrt{5})^2$

    $16 + 2\sqrt{55}$
16. $(\sqrt{12} + \sqrt{y}) \cdot (\sqrt{12} - \sqrt{y})$

    $12 - y$
17. $(\sqrt{3} + \sqrt{4})^2$

    $7 + 4\sqrt{3}$
18. $(\sqrt{10} + \sqrt{7}) \cdot (\sqrt{7} - \sqrt{10})$

    -3
19. $(\sqrt{7} + \sqrt{3}) \cdot (\sqrt{7} - \sqrt{3})$

    4
20. $(\sqrt{8} + \sqrt{5}) \cdot (\sqrt{6} - \sqrt{8})$

    $4\sqrt{3} + \sqrt{30} - 8 - 2\sqrt{10}$

Journal

1. Luke states the expression $\sqrt{8} \cdot \sqrt{5}$ in simplest form is $\sqrt{40}$. Why is this incorrect?
2. Is $(\sqrt{6} + \sqrt{x}) \cdot (\sqrt{6} + \sqrt{x})$ equal to $6 + \sqrt{6x} + x$? Explain how the answer is determined.
3. Define and demonstrate the Product Property of Squares Roots.
4. Is the expression $(\sqrt{3} + \sqrt{y}) \cdot (\sqrt{3} - \sqrt{y})$ written in simplest form $3 + 2\sqrt{3y} + y$? Why or why not?
5. Describe each step of the process for writing $(\sqrt{4} + \sqrt{3})^2$ in simplest form.

Cumulative Review

1. Find the restricted value(s) in the domain of the expression $\frac{12}{a^2 - 3a - 4}$.

The variable *a* may not equal –1 or 4.

2. Solve for x: $x - 16 = \frac{3x}{5}$.

$x = 40$

3. Determine whether y varies directly as x. If so, find the constant of variation.

x	y
14	42
9	27
24	–72
–16	–48

The variable *y* does not vary directly as *x* because $\frac{-72}{24} = -3$, and all other *xy* ratios equal 3. Therefore, there is no constant of variation.

4. Solve for x: $\frac{x}{4} = \frac{2}{16}$

$x = \frac{1}{2}$

5. Working together, Paul and Diane can create an 80-page travel guide in 10 hours. It would take Diane 18 hours to create this by herself. How long would it take Paul to complete the travel guide by himself?

22.5 hours

6. One car travels at a rate 12 mi/h faster than another car. In the same amount of time, the slower car travels 80 mi, and the faster car travels 96 mi. Find the rates of speed of each car.

The slower car drives at a rate of 60 mi/h, and the faster car drives at a rate of 72 mi/h.

Simplify.

7. $\sqrt{128}$ **$8\sqrt{2}$**

8. $-\sqrt[3]{-216}$ **6**

9. $\sqrt[3]{2} + \sqrt[3]{27} - \sqrt[3]{16}$ **$3 - \sqrt[3]{2}$**

10. $-\sqrt{45x^2} + \sqrt{80x}$ **$-3x\sqrt{5} + 4\sqrt{5x}$**

Possible Journal Answers

1. The value $\sqrt{40}$ can be rewritten as $\sqrt{4} \cdot \sqrt{10}$. This value in simplest form is $2\sqrt{10}$.

2. The expression $(\sqrt{6} + \sqrt{x}) \cdot (\sqrt{6} + \sqrt{x})$ equals $\sqrt{6} \cdot \sqrt{6} + \sqrt{6} \cdot \sqrt{x} + \sqrt{x} \cdot \sqrt{6} + \sqrt{x} \cdot \sqrt{x}$. This simplifies to $6 + 2\sqrt{6x} + x$. The answer given in the question is incorrect.

3. The Product Property of Square Roots states the square root of the product of two non-negative numbers is equal to the product of the square roots of those numbers and vice versa. For example, $\sqrt{5 \cdot 7} = \sqrt{5} \cdot \sqrt{7}$.

4. The solution would be correct if both sets of parentheses contained an addition symbol. The second set of parentheses, however, contains a subtraction symbol. Because the respective terms in each set of parentheses are the same, the simplified form of this expression may be written as $(\sqrt{3})^2 - (\sqrt{y})^2$ or $3 - y$.

5. By the order of operations, simplify what is inside the parenthesis first: $(\sqrt{4} + \sqrt{3})^2 = (2 + \sqrt{3})^2$. Then, rewrite the exponential expression in expanded form: $(2 + \sqrt{3}) \cdot (2 + \sqrt{3})$. Multiply the first value in each set of parentheses, $2 \cdot 2 = 4$. Multiply the outside values of the parentheses, $2 \cdot \sqrt{3} = 2\sqrt{3}$ and the inside values of the parentheses, $\sqrt{3} \cdot 2 = 2\sqrt{3}$. Then, multiply the last value in each set of parentheses, $\sqrt{3} \cdot \sqrt{3} = 3$. This gives $4 + 2\sqrt{3} + 2\sqrt{3} + 3$. Add like terms: $4 + 3 = 7$; $2\sqrt{3} + 2\sqrt{3} = 4\sqrt{3}$. The answer is $7 + 4\sqrt{3}$.