

6-2

Multiplying and Dividing Radical Expressions

Name: _____

Date: _____ Hour: _____

$$2^3 \cdot 2^4 = 2^7$$

We know that we can simplify the product of powers that have the same exponent.

Example: $2^2 \cdot 3^2 = (2 \cdot 3)^2$

Similarly you can simplify the product of radicals that have the same index.

Example: $\sqrt[3]{4} \cdot \sqrt[3]{5} = \sqrt[3]{20}$

Product Property If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers, then $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$



Problem 1 Multiplying Radical Expressions

Got It? Can you simplify the product of the radical expression? Explain.

$\sqrt[4]{7} \cdot \sqrt[5]{7}$
 No 😞

$$\sqrt[5]{-5} \cdot \sqrt[5]{-2} = \sqrt[5]{10}$$

Multiply, if possible. Then simplify.

1. $\sqrt[3]{-4} \cdot \sqrt[3]{2}$

$$\sqrt[3]{-8} = -2$$

2. $\sqrt[3]{6} \cdot \sqrt{2}$

Can't

3. $\sqrt[4]{9} \cdot \sqrt[4]{27}$

$$\sqrt[4]{3 \cdot 3} \cdot \sqrt[4]{3 \cdot 3 \cdot 3} = 3 \sqrt[4]{3}$$

Multiply, if possible. Then simplify.

10. $\sqrt{8} \cdot \sqrt{32}$

11. $\sqrt[3]{4} \cdot \sqrt[3]{16}$

12. $\sqrt[3]{9} \cdot \sqrt[3]{-81}$

13. $\sqrt[4]{8} \cdot \sqrt[3]{32}$

14. $\sqrt{-5} \cdot \sqrt{5}$

15. $\sqrt[3]{-5} \cdot \sqrt[3]{-25}$



Problem 2 Simplifying a Radical Expression

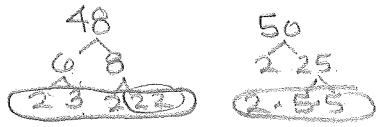
Got It? What is the simplest form of $\sqrt[3]{128x^7}$? (Hint: Remember $\sqrt[3]{b^3} = b$.)

$$\begin{array}{l} 128 \\ \swarrow \searrow \\ 2 \quad 64 \\ \swarrow \searrow \\ 8 \quad 8 \\ \swarrow \searrow \swarrow \searrow \\ 2 \quad 2 \quad 2 \quad 2 \quad 2 \quad 2 \end{array} \quad \sqrt[3]{\underbrace{2 \cdot 2 \cdot 2}_{2^3} \cdot \underbrace{2 \cdot 2 \cdot 2 \cdot 2}_{2^4} \cdot x^7}$$

$$4x^2 \sqrt[3]{2x}$$

Simplify

~~(x)(x)(x)(x)~~



4. $\sqrt[3]{6x^2} \cdot \sqrt[3]{9x^3}$
 $\frac{2 \cdot 3}{2 \cdot 3} \cdot \frac{3 \cdot 3}{3 \cdot 3}$
 $-3x \sqrt[3]{2x^2}$

5. $\sqrt{48x^5y^2} \cdot \sqrt{50x^2y^4}$
 $2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5$
 $20x^3y^3 \sqrt{6x}$
 x^7

6. $\sqrt[2]{12x^3y} \cdot \sqrt[4]{27x^6y^5}$
 $2 \cdot 2 \cdot 3 \cdot 3 \cdot 3$
 $x^9 = \cancel{(x)(x)(x)(x)(x)(x)(x)(x)(x)}$
 $8 \cdot 3$
 $24x^2y \sqrt[4]{4xy^2}$

Simplify.

19. $\sqrt[2]{20x^3}$
 $\sqrt{2 \cdot 2 \cdot 5 \cdot x \cdot x \cdot x}$
 $2x \sqrt{5x}$

20. $\sqrt[3]{81x^3}$
 $\sqrt[3]{3 \cdot 3 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x}$
 $3x \sqrt[3]{3}$

21. $\sqrt{50x^5}$

22. $\sqrt[3]{32a^5}$

23. $\sqrt[3]{54y^{10}}$

24. $\sqrt{200a^6}$



Problem 3 Simplifying a Product

Got It? What is the simplest form of $\sqrt{45x^5y^3} \cdot \sqrt{35xy^4}$?

$3 \cdot 3 \cdot 5$
 $5 \cdot 7$
 $15x^3y^3 \sqrt{7y}$

x^6

Multiply and simplify.

28. $\sqrt[3]{6} \cdot \sqrt[3]{16}$

29. $\sqrt{8y^5} \cdot \sqrt{40y^2}$

30. $\sqrt{8x^5} \cdot \sqrt{3x}$

31. $4\sqrt{2x} \cdot 5\sqrt{6xy^2}$

32. $3\sqrt[3]{5y^3} \cdot 2\sqrt[3]{50y^4}$

33. $-\sqrt[3]{2x^2y^2} \cdot 2\sqrt[3]{15x^5y}$

Take Note

Property Combining Radical Expressions: Quotients

If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and $b \neq 0$, then $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$.

Quotient Property If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers and $b \neq 0$, then $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$

Remember for a radical to be simplified:

- there can not be a radical in the denominator of a fraction
- there can not be a fraction inside of a radical

To take care of the radical in the denominator, we **RATIONALIZE** the denominator. Get rid of the radical in the denominator.

7. $\frac{3}{\sqrt{5}}$

8. $\frac{2}{\sqrt{6}}$

9. $\frac{\sqrt{7}}{\sqrt{18x}}$



Problem 4 Dividing Radical Expressions

Got It? What is the simplest form of $\frac{\sqrt{50x^6}}{\sqrt{2x^4}}$?

Divide and simplify.

8. $\frac{\sqrt{18x^5}}{\sqrt{2x^3}}$

9. $\frac{\sqrt[3]{96y^5}}{\sqrt[3]{4y}}$

10. $\frac{\sqrt[3]{54x^4y}}{\sqrt[3]{2x^6y^2}}$

11. $\frac{15\sqrt{3}}{2\sqrt{5x}}$

12. $\frac{3\sqrt[3]{5x^6y}}{12\sqrt[3]{15x^2y^5}}$

Divide and simplify.

$$37. \frac{\sqrt{500}}{\sqrt{5}}$$

$$38. \frac{\sqrt{48x^3}}{\sqrt{3xy^2}}$$

$$39. \frac{\sqrt{56x^5y^5}}{\sqrt{7xy}}$$

$$40. \frac{\sqrt[3]{250x^7y^3}}{\sqrt[3]{2x^2y}}$$

$$41. \frac{\sqrt[3]{48x^3y^2}}{\sqrt[3]{6x^4y}}$$

$$42. \frac{\sqrt{20ab}}{\sqrt{45a^2b^3}}$$



Problem 5 Rationalizing the Denominator

Got It? What is the simplest form of $\frac{\sqrt[3]{7x}}{\sqrt[3]{5y^2}}$?

Rationalize the denominator of each expression.

$$43. \frac{\sqrt{x}}{\sqrt{2}}$$

$$44. \frac{\sqrt{5}}{\sqrt{8x}}$$

$$45. \frac{\sqrt[3]{x}}{\sqrt[3]{2}}$$

$$49. \frac{\sqrt{3xy^2}}{\sqrt{5xy^3}}$$

$$50. \frac{\sqrt{5x^4y}}{\sqrt{2x^2y^3}}$$

$$51. \frac{\sqrt[3]{12ab^3c^2}}{\sqrt[3]{10a^3bc}}$$