Algebra 2
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The properties of rational exponents and radicals can also be applied to expressions involving variables. Because a variable can be positive, negative, or zero, sometimes absolute value is needed when simplifying a variable expression.

	Rule	Example
When n is odd	$\sqrt[n]{x^n} = x$	$\sqrt[7]{5^7} = 5$ and $\sqrt[7]{(-5)^7} = -5$
When n is even	$\sqrt[n]{x^n} = \lvert x\rvert$	$\sqrt[4]{3^4} = 3$ and $\sqrt[4]{(-3)^4} = 3$

Simplify the following

1. $\sqrt[3]{64y^6} =$ $\sqrt[3]{4^3\left(y^2\right)^3} = 4y^2$

2. $\sqrt[4]{\frac{x^4}{y^8}} =$ $\frac{\lvert x\rvert}{y^2}$

3. $\sqrt[5]{4a^8b^{14}c^5} =$ $\sqrt[5]{a^5b^{10}c^5} \bullet \sqrt[5]{4a^3b^4} = ab^2c\sqrt[5]{4a^3b^4}$

4. $\frac{x}{\sqrt[3]{y^8}} =$ $\frac{x}{\sqrt[3]{y^8}} \bullet \frac{\sqrt[3]{y}}{\sqrt[3]{y}} = \frac{x\sqrt[3]{y}}{y^3}$

5. $\frac{14xy^{1/3}}{2x^{3/4}z^{-6}} =$ $7x^{1/4}y^{1/3}z^6$

6. $5\sqrt{y} + 6\sqrt{y} =$ $11\sqrt{y}$

7. $12\sqrt[3]{2z^5} - z\sqrt[3]{54z^2} =$ $12z\sqrt[3]{2z^2} - 3z\sqrt[3]{2z^2} = 9z\sqrt[3]{2z^2}$

Simplify the following, assuming all variables are positive.

1. $\sqrt[3]{27q^9} =$ $3q^3$

2. $\sqrt[5]{\frac{x^{10}}{y^5}} =$ $\frac{x^2}{y}$

3. $\frac{6xy^{3/4}}{3x^{1/2}y^{1/2}} =$ $2x^{1/2}y^{1/4}$

4. $\sqrt{9w^5} - w\sqrt{w^3} =$ $3w^2\sqrt{w} - w^2\sqrt{w} = 2w^2\sqrt{w}$

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Simplify the following expressions.

1. $\sqrt[4]{81y^8} =$

2. $\sqrt[3]{64r^3t^6} =$

3. $\sqrt[5]{\dfrac{m^{10}}{n^5}} =$

4. $\sqrt[4]{\dfrac{k^{16}}{16z^4}} =$

5. $\sqrt[6]{\dfrac{g^6h}{h^7}} =$

6. $\sqrt[8]{\dfrac{n^{18}p^7}{n^2p^{-1}}} =$

Simplify the following, assuming all variables are positive.

7. $\sqrt{81a^7b^{12}c^9} =$

8. $\sqrt[4]{\dfrac{405x^3y^3}{5x^{-1}y}} =$

9. $\dfrac{\sqrt[3]{w} \bullet \sqrt{w^5}}{\sqrt{25w^{16}}} =$

10. $\dfrac{7x^{-3/4}y^{5/2}z^{-2/3}}{56x^{-1/2}y^{1/4}} =$

11. $11\sqrt{2z} - 5\sqrt{2z} =$

12. $7\sqrt[3]{m^7} + 3m^{7/3} =$

13. $\sqrt[4]{16w^{10}} + 2w\sqrt[4]{w^6} =$