MATHEMATICS · GRADES 10-12

Converting radicals to exponents

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you rewrite a root as a power so a formula becomes easier to work with. A formula with roots, like one for the length of a pendulum or the size of a pipe, is awkward to type into a calculator as a root. Written as a power, you can use the power button and get the answer in one go. It also lets you combine roots with powers in the same formula without switching back and forth.



Rule

A root is a fractional exponent: the nth root of x^m is $x^{(\frac{m}{n})}$.

The root tells you the denominator of the exponent, and the power inside tells you the numerator. So $\sqrt{x}$ is $x^{(\frac{1}{2})}$.

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Worked examples

EXAMPLE 1

Q How do you write $\sqrt{x}$ in exponent form?

SOLUTION

The one rule to remember first: the root is the denominator, and the power inside is the numerator.

$\sqrt{x}$ has no power written inside, so the power is 1, and the square root is root 2.

So $\sqrt{x} = x^{\frac{1}{2}}$

EXAMPLE 2

Q How do you write $\sqrt[3]{(x^2)}$ in exponent form?

SOLUTION

Root 3 goes to the denominator, power 2 goes to the numerator.

So the exponent is $\frac{2}{3}$

So $\sqrt[3]{(x^2)} = x^{\frac{2}{3}}$

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Practice questions

1 Write $\sqrt[3]{x}$ in exponent form.

- **A** $x^{\frac{1}{2}}$
- **B** x^{3}
- **C** $x^{\frac{1}{3}}$
- **D** $x^{\frac{2}{3}}$

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2 Write $\sqrt{(x^{3})}$ in exponent form.

- **A** $x^{\frac{2}{3}}$
- **B** $x^{\frac{3}{2}}$
- **C** $x^{\frac{1}{2}}$
- **D** x^{3}

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3 Simplify $x^{\frac{1}{2}}$ times $x^{\frac{1}{2}}$.

- **A** $x^{\frac{1}{4}}$
- **B** x
- **C** $x^{\frac{1}{2}}$
- **D** $2x$

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4 Write $x^{\frac{2}{3}}$ as a radical.

- **A** $\sqrt[3]{(x^2)}$
- **B** $\sqrt{(x^3)}$
- **C** $\sqrt{(x^2)}$
- **D** $\sqrt[3]{(x^3)}$

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5 Write $y^{\frac{1}{5}}$ as a radical.

- **A** Square root of y
- **B** Fifth root of y
- **C** Cube root of y
- **D** y to the fifth power

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6 Simplify $25^{\frac{1}{2}}$

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7 Simplify $27^{\frac{2}{3}}$

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8 What is $\sqrt[3]{(x^3)}$?

A x

B $x^{\frac{1}{3}}$

C x^3

D $x^{\frac{1}{9}}$

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9 Write $\frac{1}{\sqrt{x}}$ in exponent form.

A $x^{\frac{1}{2}}$

B $x^{-\frac{1}{2}}$

C x^2

D x^{-1}

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10 Write $x^{-\frac{1}{2}}$ as a radical.

A $\sqrt{x}$

B $\frac{1}{x}$

C $\frac{-1}{\sqrt{x}}$

D $\frac{1}{\sqrt{x}}$

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ANSWER KEY

1. $x^{\frac{1}{3}}$

2. $x^{\frac{3}{2}}$

3. x

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

5. Fifth root of y

6. 5

7. 9

8. x

9. $x^{-\frac{1}{2}}$

10. $\frac{1}{\sqrt{x}}$

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