MATHEMATICS · GRADES 10-12

Dividing radicals

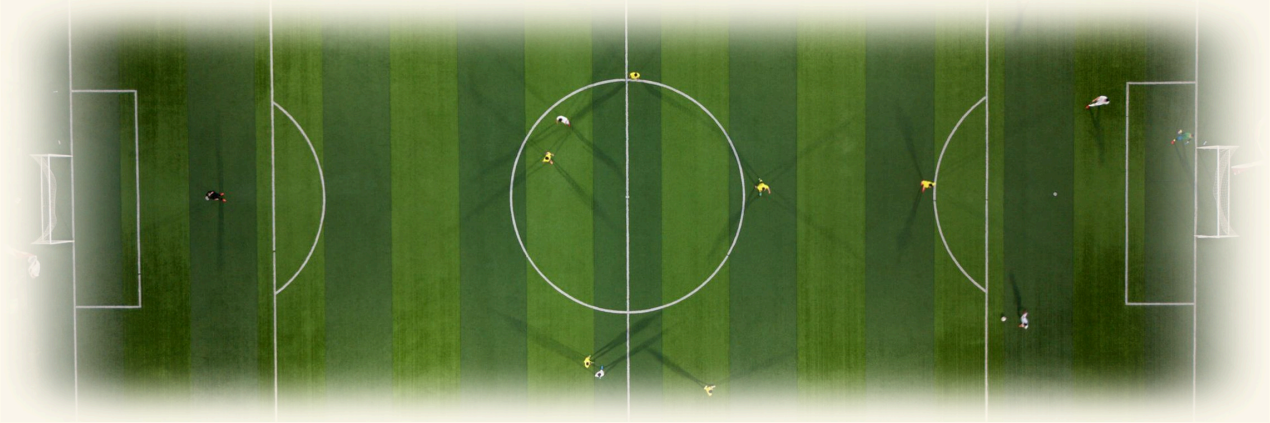
Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you simplify a fraction made of roots so you can work out the answer cleanly. Roots show up in formulas for distances and diagonals, and a fraction full of them is hard to use as it stands. Dividing them properly leaves you with a simpler form that a calculator can handle. It is a tidy-up step that makes the real calculation possible.



Rule

Quotient rule for radicals: $\frac{\sqrt{a}}{\sqrt{b}}$ **is** $\sqrt{\frac{a}{b}}$.

Divide inside one root, then simplify. It works whenever a and b are not negative and b is not 0.

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Worked examples

EXAMPLE 1

Q Simplify $\frac{\sqrt{18}}{\sqrt{2}}$

SOLUTION

Use the quotient rule: $\frac{\sqrt{18}}{\sqrt{2}} = \sqrt{\left(\frac{18}{2}\right)}$

Divide inside: $\sqrt{9}$

Simplify: $\sqrt{9} = 3$

EXAMPLE 2

Q Simplify $\frac{\sqrt{50}}{\sqrt{2}}$

SOLUTION

Use the quotient rule: $\frac{\sqrt{50}}{\sqrt{2}} = \sqrt{\left(\frac{50}{2}\right)}$

Divide inside: $\sqrt{25}$

Simplify: $\sqrt{25} = 5$

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Practice questions

1 Simplify $\frac{\sqrt{20}}{\sqrt{5}}$.

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2 How many $\sqrt{3}$ m pieces are in $\sqrt{27}$ m?

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3 Which single square root equals $\frac{\sqrt{72}}{\sqrt{8}}$?

A $\sqrt{9}$

B $\sqrt{64}$

C $\sqrt{80}$

D $\sqrt{10}$

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4 Simplify $\frac{2\sqrt{45}}{\sqrt{5}}$.

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5 How many $\sqrt{8}$ m pieces are in $\sqrt{50}$ m?

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6 What is the width of a rectangle with area $\sqrt{72}$ m² and length $\sqrt{8}$ m?

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7 One of these quotients is 4. Which one?

A $\frac{\sqrt{32}}{\sqrt{2}}$

B $\frac{\sqrt{50}}{\sqrt{2}}$

C $\frac{\sqrt{75}}{\sqrt{3}}$

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8 Nora divides $\sqrt{20}$ by $\sqrt{5}$. She writes $\frac{\sqrt{4}}{\sqrt{1}} = 4$. What did she do wrong?

- **A** She multiplied the numbers instead of dividing them.
- **B** She divided the numbers but forgot that $\sqrt{4} = 2$
- **C** She should have added the numbers under the square roots.
- **D** She forgot to rationalise the denominator.

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9 What is $\frac{\sqrt{72}}{\sqrt{3}}$?

- **A** $2\sqrt{6}$
- **B** 6
- **C** $\sqrt{12}$
- **D** 4

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10 Three of these quotients are whole numbers and one is not. Which one is not a whole number?

- **A** $\frac{\sqrt{20}}{\sqrt{5}}$
- **B** $\frac{\sqrt{27}}{\sqrt{3}}$
- **C** $\frac{\sqrt{32}}{\sqrt{2}}$
- **D** $\frac{\sqrt{45}}{\sqrt{9}}$

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ANSWER KEY

1. 2

2. 3

3. $\sqrt{9}$

4. 6

5. 2.5

6. 3

7. $\frac{\sqrt{32}}{\sqrt{2}}$

8. She divided the numbers but forgot that $\sqrt{4} = 2$

9. $2\sqrt{6}$

10. $\frac{\sqrt{45}}{\sqrt{9}}$

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