MATHEMATICS · GRADES 10-12

Multiplying radicals

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you combine roots into a single root, the shortcut that keeps a calculation with square roots tidy, like working out a diagonal length. Two roots multiplied together can often be written as one root, which makes the rest of the calculation much simpler. You use it when you work out a diagonal or a distance that involves square roots, or when you simplify a formula in geometry or physics that has roots in it.



Rule

$\sqrt{a} \times \sqrt{b} = \sqrt{(a \times b)}.$

Multiply any numbers outside the roots separately, then simplify the root.

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Worked examples

EXAMPLE 1

Q Simplify $\sqrt{(3)} \times \sqrt{(5)}$

SOLUTION

Use the product rule: $\sqrt{(3)} \times \sqrt{(5)} = \sqrt{(3 \times 5)}$.

Multiply inside: $\sqrt{(15)}$.

Check for perfect square factors: 15 has none, so the answer is $\sqrt{(15)}$.

EXAMPLE 2

Q Simplify $2\sqrt{(3)} \times 3\sqrt{(2)}$

SOLUTION

Multiply the coefficients: $2 \times 3 = 6$.

Multiply the roots: $\sqrt{(3)} \times \sqrt{(2)} = \sqrt{(6)}$.

Put them together: $6\sqrt{(6)}$

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Practice questions

1 Simplify $\sqrt{(2)} \times \sqrt{(7)}$.

- **A** $\sqrt{(9)}$
- **B** $\sqrt{(14)}$
- **C** $2\sqrt{(7)}$
- **D** $7\sqrt{(2)}$

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2 Simplify $\sqrt{(5)} \times \sqrt{(5)}$.

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3 Simplify $2\sqrt{(5)} \times 3\sqrt{(2)}$.

A $6\sqrt{(10)}$

B $5\sqrt{(10)}$

C $6\sqrt{(7)}$

D $6\sqrt{(5)}$

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4 Simplify $2\sqrt{(3)} \times 3\sqrt{(3)}$.

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5 Simplify $4\sqrt{(3)} \times \sqrt{(2)}$.

A $4\sqrt{(5)}$

B $8\sqrt{(6)}$

C $4\sqrt{(6)}$

D $4\sqrt{(3)}$

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6 Simplify $\sqrt{(3)} \times \sqrt{(12)}$.

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7 **The product is $6\sqrt{(10)}$. Which multiplication gives it?**

- **A** $2\sqrt{(5)} \times 3\sqrt{(2)}$
- **B** $\sqrt{(10)} \times \sqrt{(6)}$
- **C** $2\sqrt{(3)} \times 3\sqrt{(5)}$

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8 **Tara multiplies $\sqrt{(2)} \times \sqrt{(3)}$ and writes $\sqrt{(5)}$. What is Tara's mistake?**

- **A** She added the numbers under the roots; the product is $\sqrt{(6)}$
- **B** She multiplied the numbers under the roots; the product is $\sqrt{(5)}$
- **C** She added the roots instead of multiplying them
- **D** She multiplied 2 by 3 and got 5

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9 Simplify $2\sqrt{(2)} \times \sqrt{(8)}$.

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10 Which product gives a whole number?

A $\sqrt{(2)} \times \sqrt{(7)}$

B $\sqrt{(3)} \times \sqrt{(5)}$

C $\sqrt{(2)} \times \sqrt{(2)}$

D $\sqrt{(7)} \times \sqrt{(3)}$

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ANSWER KEY

1. $\sqrt{(14)}$

2. 5

3. $6\sqrt{(10)}$

4. 18

5. $4\sqrt{(6)}$

6. 6

7. $2\sqrt{(5)} \times 3\sqrt{(2)}$

8. She added the numbers under the roots; the product is $\sqrt{(6)}$

9. 8

10. $\sqrt{(2)} \times \sqrt{(2)}$

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