

Math Sheet

Name _____ Score _____ / 12 Teacher _____ Date _____

Dividing Radical Expressions

Simplify each quotient exactly. Rationalize square-root denominators, preserve the original real domain, and use every printed case when an answer is conditional.

1. $\frac{\sqrt{396}}{7 \cdot \sqrt{11}}$

7. $\frac{4}{2 + \sqrt{10 \cdot x^2}}$

2. $\frac{2 \cdot \sqrt{5}}{2 + \sqrt{15}}$

8. $\frac{9}{2 \cdot x^2 + 9 \cdot \sqrt{x^4}}$

3. $\frac{4 \cdot \sqrt{11}}{7 \cdot \sqrt{15}}$

9. $\frac{\sqrt[3]{512}}{3 \cdot \sqrt[3]{729}}$

4. $\frac{5 \cdot \sqrt{2} + \sqrt{2}}{9 \cdot \sqrt{15}}$

10. $\frac{5 + \sqrt{7}}{8 - 1 \cdot 2 \cdot \sqrt{14}}$

5. $\frac{\sqrt{240}}{1 \cdot \sqrt{60}}$

11. $\frac{\sqrt{48}}{4 \cdot \sqrt{1}}$

6. $\frac{8 \cdot \sqrt{15}}{5 - 1 \cdot 3 \cdot \sqrt{10}}$

12. $\frac{\sqrt{24}}{6 \cdot \sqrt{16}}$

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Worked answer key

Simplify each quotient exactly. Rationalize square-root denominators, preserve the original real domain, and use every printed case when an answer is conditional.

1.
$$\frac{\sqrt{396}}{7 \cdot \sqrt{11}}$$
$$\frac{\sqrt{396}}{7 \cdot \sqrt{11}} = \frac{6}{7}$$

Original domain: All displayed radicands and denominators are defined.

$$\frac{6}{7}$$

2.
$$\frac{2 \cdot \sqrt{5}}{2 + \sqrt{15}}$$
$$\frac{2 \cdot \sqrt{5}}{2 + \sqrt{15}} = \frac{2 \cdot \sqrt{5} \cdot (2 - 1 \cdot \sqrt{15})}{(2 + \sqrt{15})(2 - 1 \cdot \sqrt{15})}$$
$$\frac{2 \cdot \sqrt{5} \cdot (2 - 1 \cdot \sqrt{15})}{(2 + \sqrt{15})(2 - 1 \cdot \sqrt{15})} = \frac{10 \cdot \sqrt{3} - 4 \cdot \sqrt{5}}{11}$$

Original domain: The generated conjugate norm is nonzero.

$$\frac{10 \cdot \sqrt{3} - 4 \cdot \sqrt{5}}{11}$$

3.
$$\frac{4 \cdot \sqrt{11}}{7 \cdot \sqrt{15}}$$
$$\frac{4 \cdot \sqrt{11}}{7 \cdot \sqrt{15}} = \frac{4 \cdot \sqrt{165}}{105}$$

Original domain: All displayed radicands and denominators are defined.

$$\frac{4 \cdot \sqrt{165}}{105}$$

4.
$$\frac{5 \cdot \sqrt{2} + \sqrt{2}}{9 \cdot \sqrt{15}}$$
$$\frac{5 \cdot \sqrt{2} + \sqrt{2}}{9 \cdot \sqrt{15}} = \frac{2 \cdot \sqrt{30}}{45}$$

Original domain: All displayed radicands and denominators are defined.

$$\frac{2 \cdot \sqrt{30}}{45}$$

5.
$$\frac{\sqrt{240}}{1 \cdot \sqrt{60}}$$
$$\frac{\sqrt{240}}{1 \cdot \sqrt{60}} = 2$$

Original domain: All displayed radicands and denominators are defined.

$$2$$

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6.
$$\frac{8\sqrt{15}}{5 - 1 \cdot 3 \cdot \sqrt{10}}$$

$$\frac{8\sqrt{15}}{5 - 1 \cdot 3 \cdot \sqrt{10}} = \frac{8\sqrt{15} \cdot (5 + 3 \cdot \sqrt{10})}{(5 - 1 \cdot 3 \cdot \sqrt{10})(5 + 3 \cdot \sqrt{10})}$$

$$\frac{8\sqrt{15} \cdot (5 + 3 \cdot \sqrt{10})}{(5 - 1 \cdot 3 \cdot \sqrt{10})(5 + 3 \cdot \sqrt{10})} = \frac{- 24 \cdot \sqrt{6} - 8 \cdot \sqrt{15}}{13}$$

Original domain: The generated conjugate norm is nonzero.

$$\frac{- 24 \cdot \sqrt{6} - 8 \cdot \sqrt{15}}{13}$$

7.
$$\frac{4}{2 + \sqrt{10 \cdot x^2}}$$

$$\sqrt{10 \cdot x^2} = \sqrt{10} |x|$$

Original domain: All real x; the norm-zero boundary remains valid in the original plus denominator.

Case: when the conjugate norm is not zero

$$4 - 10 \cdot x^2 \neq 0$$

$$\frac{4 - 2 \cdot \sqrt{10} |x|}{2 - 5 \cdot x^2}$$

Case: when the conjugate norm is zero

$$4 - 10 \cdot x^2 = 0$$

$$1$$

8.
$$\frac{9}{2 \cdot x^2 + 9 \cdot \sqrt{x^4}}$$

$$\sqrt{x^4} = x^2$$

$$\frac{9}{2 \cdot x^2 + 9 \cdot \sqrt{x^4}} = \frac{9}{11 \cdot x^2}$$

Original domain: x is not zero in the original denominator; the coefficient 11 is nonzero.

$$\frac{9}{11 \cdot x^2}$$

9.
$$\frac{\sqrt[3]{512}}{3 \cdot \sqrt[3]{729}}$$

$$\frac{\sqrt[3]{512}}{3 \cdot \sqrt[3]{729}} = \frac{8}{27}$$

Original domain: Both higher roots are deliberately exact perfect powers.

$$\frac{8}{27}$$

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10.
$$\frac{5 + \sqrt{7}}{8 - 1 \cdot 2 \cdot \sqrt{14}}$$
$$\frac{5 + \sqrt{7}}{8 - 1 \cdot 2 \cdot \sqrt{14}} = \frac{(5 + \sqrt{7})(8 + 2 \cdot \sqrt{14})}{(8 - 1 \cdot 2 \cdot \sqrt{14})(8 + 2 \cdot \sqrt{14})}$$
$$\frac{(5 + \sqrt{7})(8 + 2 \cdot \sqrt{14})}{(8 - 1 \cdot 2 \cdot \sqrt{14})(8 + 2 \cdot \sqrt{14})} = \frac{20 + 7 \cdot \sqrt{2} + 4 \cdot \sqrt{7} + 5 \cdot \sqrt{14}}{4}$$

Original domain: The generated conjugate norm is nonzero.

$$\frac{20 + 7 \cdot \sqrt{2} + 4 \cdot \sqrt{7} + 5 \cdot \sqrt{14}}{4}$$

11.
$$\frac{\sqrt{48}}{4 \cdot \sqrt{1}}$$
$$\frac{\sqrt{48}}{4 \cdot \sqrt{1}} = \sqrt{3}$$

Original domain: All displayed radicands and denominators are defined.

$$\sqrt{3}$$

12.
$$\frac{\sqrt{24}}{6 \cdot \sqrt{16}}$$
$$\frac{\sqrt{24}}{6 \cdot \sqrt{16}} = \frac{\sqrt{6}}{12}$$

Original domain: All displayed radicands and denominators are defined.

$$\frac{\sqrt{6}}{12}$$