

Rationalizing Radical Expressions

Rationalize each expression and simplify completely. Show your work.

1. Rationalizing Simple Radical Denominators

Rationalize the denominator and simplify completely. Simplify the radical first when possible.

1. $\frac{1}{\sqrt{2}}$

5. $\frac{7}{\sqrt{6}}$

2. $\frac{3}{\sqrt{5}}$

6. $\frac{4}{3\sqrt{5}}$

3. $\frac{2}{\sqrt{3}}$

7. $\frac{5}{\sqrt{12}}$

4. $\frac{5}{2\sqrt{3}}$

8. $\frac{7}{2\sqrt{18}}$

2. Rationalizing Radical Quotients

Simplify each quotient first when possible. Rationalize any remaining radical denominator and reduce completely.

1. $\frac{\sqrt{3}}{\sqrt{5}}$

5. $\frac{3\sqrt{6}}{2\sqrt{12}}$

2. $\frac{2\sqrt{3}}{\sqrt{7}}$

6. $\frac{6\sqrt{14}}{5\sqrt{21}}$

3. $\frac{5\sqrt{3}}{\sqrt{5}}$

7. $\frac{22\sqrt{15}}{\sqrt{363}}$

4. $\frac{4\sqrt{10}}{3\sqrt{5}}$

8. $\frac{18\sqrt{75}}{5\sqrt{24}}$

3. Multi-Term Numerators & Sums

Simplify first. Rationalize each denominator, distribute when needed, and combine terms completely.

1. $\frac{1+\sqrt{2}}{\sqrt{2}}$

5. $\frac{1}{2} + \frac{1}{\sqrt{2}}$

2. $\frac{5\sqrt{2}+6\sqrt{2}}{\sqrt{2}}$

6. $\frac{1}{2} + \frac{\sqrt{7}}{\sqrt{2}}$

3. $\frac{\sqrt{5}+\sqrt{12}}{\sqrt{5}}$

7. $\frac{2}{\sqrt{3}} + \frac{1}{\sqrt{12}}$

4. $\frac{2+\sqrt{3}}{\sqrt{6}}$

8. $\frac{2+\sqrt{3}}{\sqrt{6}} + \frac{1}{\sqrt{2}}$

4. Rationalizing Expressions with Variables

Assume $x > 0$. Simplify before rationalizing whenever possible. Rationalize any remaining radical denominators and reduce completely.

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

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

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

4. $\frac{x+\sqrt{x}}{\sqrt{x}}$

5. $\frac{x+\sqrt{2}}{\sqrt{2x}}$

6. $\frac{x\sqrt{3x}+x\sqrt{2}}{\sqrt{2x}}$

7. $\frac{3x\sqrt{2x}+2\sqrt{3x}}{\sqrt{6x}}$

8. $\frac{2x\sqrt{7}+x\sqrt{5}}{x\sqrt{7x}}$

Word Problems — Rationalizing Radical Expressions

For each problem:

- Write an expression for the quantity being asked for.
- Rationalize any radical denominator.**
- Simplify completely.**

- A remote-controlled car travels 4 m at a constant speed of $\sqrt{3}$ m/s. How long does the trip take?
- A pump transfers 7 L of water at a constant rate of $3\sqrt{2}$ L/min. How long will the transfer take?
- A runner travels $4\sqrt{5}$ m at a constant speed of $\sqrt{3}$ m/s. How long does the run take?
- A cart travels $8\sqrt{6}$ m at a constant speed of $3\sqrt{2}$ m/s. How long is the cart moving?
- A trip has two stages. The first takes $\frac{1}{3}$ h and the second takes $\frac{1}{\sqrt{5}}$ h. Find the total travel time. Give an exact answer with no radical in the denominator.
- A machine moves a load a distance of $3 + \sqrt{2}$ m at a constant speed of $\sqrt{5}$ m/s. How long does the movement take?
- A cart travels $2x$ m at a constant speed of $\sqrt{x}$ m/s. Write and simplify an exact expression for the travel time.
- A conveyor moves material a distance of $5x$ m at a constant speed of $\sqrt{3x}$ m/s. Write and simplify an exact expression for the travel time.