

Simplifying and Rationalizing Radicals

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Simplifying Radicals:

STEP 1: Create a factor tree

- If Even: Divide by 2 until you can't anymore
- If Odd: Divide by 3 or 5 until you get an even answer. Then start dividing by 2.

STEP 2: Group outside numbers into "couples"

- For every "couple", they get to come out of the house (radical) and get married.
- For every number without a partner, they must stay in the house.

STEP 3: Simplify

- If you have more than 1 number out of the house, these numbers get multiplied.
- If you have more than 1 number in the house, these numbers get multiplied.

Another Method... You don't always have to start by dividing by smaller numbers. If you know a perfect square that will divide evenly into your number you can always start there instead and still couple them up.

1. $\sqrt{24}$
 $\sqrt{2 \cdot 12}$
 $\sqrt{2 \cdot 4 \cdot 3}$
 $\sqrt{2 \cdot 2 \cdot 3}$
 $2\sqrt{6}$

2. $\sqrt{27}$
 $\sqrt{3 \cdot 9}$
 $\sqrt{3 \cdot 3 \cdot 3}$
 $3\sqrt{3}$

3. $\sqrt{76}$
 $\sqrt{2 \cdot 38}$
 $\sqrt{2 \cdot 19}$
 $2\sqrt{19}$

4. $\sqrt{120}$
 $\sqrt{2 \cdot 60}$
 $\sqrt{2 \cdot 30}$
 $\sqrt{2 \cdot 15}$
 $\sqrt{3 \cdot 5}$
 $2\sqrt{2 \cdot 3 \cdot 5}$
 $2\sqrt{30}$

5. $\sqrt{80}$
 $\sqrt{2 \cdot 40}$
 $\sqrt{2 \cdot 20}$
 $\sqrt{2 \cdot 10}$
 $\sqrt{2 \cdot 5}$
 $2 \cdot 2\sqrt{5}$
 $4\sqrt{5}$

6. $\sqrt{30}$
 $\sqrt{2 \cdot 15}$
 $\sqrt{3 \cdot 5}$
 $\sqrt{2 \cdot 3 \cdot 5}$
 $\sqrt{30}$

7. $\sqrt{75}$
 $\sqrt{3 \cdot 25}$
 $\sqrt{3 \cdot 5 \cdot 5}$
 $5\sqrt{3}$

8. $\sqrt{36}$
 6

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

9. $\sqrt{18}$
 $\sqrt{3 \cdot 6}$
 $\sqrt{3 \cdot 3 \cdot 2}$
 $3\sqrt{2}$

10. $\sqrt{125}$
 $\sqrt{5 \cdot 25}$
 $\sqrt{5 \cdot 5 \cdot 5}$
 $5\sqrt{5}$

11. $\sqrt{64}$
 8

12. $\sqrt{12}$
 $\sqrt{2 \cdot 6}$
 $\sqrt{2 \cdot 3 \cdot 2}$
 $2\sqrt{3}$

Rationalizing Radicals

STEP 1: Multiply the numerator and denominator by the radical in the denominator.

STEP 2: Simplify where appropriate. Remember you should not end up with a radical in the denominator.

$$1. \frac{4}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$\frac{4\sqrt{3}}{3}$$

$$2. \frac{10}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\frac{10\sqrt{5}}{5} = 2\sqrt{5}$$

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

$$\frac{2\sqrt{2}}{3 \cdot 2} = \frac{2\sqrt{2}}{6}$$

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

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

$$\frac{2\sqrt{10}}{3 \cdot 2} = \frac{2\sqrt{10}}{6}$$

$$= \frac{\sqrt{10}}{3}$$

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

$$\frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{2}$$

$$6. \frac{1}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}}$$

$$\frac{\sqrt{7}}{7} = \frac{\sqrt{7}}{7}$$

$$7. \frac{4}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\frac{4\sqrt{5}}{5}$$

$$8. \frac{6}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\frac{6\sqrt{2}}{2} = 3\sqrt{2}$$

$$9. \frac{1}{3\sqrt{16}} \cdot \frac{\sqrt{16}}{\sqrt{16}}$$

$$\frac{\sqrt{16}}{3 \cdot 16} = \frac{4}{48}$$

$$= \frac{1}{12}$$

$$10. \frac{8}{3\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\frac{8\sqrt{2}}{3 \cdot 2}$$

$$\frac{8\sqrt{2}}{6}$$

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

$$11. \frac{2}{5\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

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

$$\frac{2\sqrt{3}}{15}$$

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

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

$$\frac{2\sqrt{15}}{25}$$

For a Grade: Simplify the following, rationalizing if needed.

$$1. \frac{\sqrt{20}}{\sqrt{12}}$$

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

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

$$2. \frac{\sqrt{72}}{\sqrt{2}}$$

$$\frac{\sqrt{6} \cdot \sqrt{6}}{\sqrt{2}}$$

$$6\sqrt{2}$$

$$3. \frac{\sqrt{108}}{\sqrt{2}}$$

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

$$6\sqrt{3}$$

$$4. \sqrt{16}$$

$$4$$

$$5. \frac{7}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

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

$$6. \frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$\frac{8\sqrt{2}}{2}$$

$$4\sqrt{2}$$

$$7. \frac{7}{3\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\frac{7\sqrt{5}}{3 \cdot 3}$$

$$\frac{7\sqrt{5}}{9}$$

$$8. \frac{3\sqrt{5}}{4\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$\frac{3\sqrt{15}}{4 \cdot 3}$$

$$\frac{\sqrt{15}}{4}$$