Radicals, Simplifying with Variables

Procedure

1. **Rewrite the radicand as a product of perfect square and another number**
   a. **Take the square root of the perfect square and write that number outside the radical**
   b. **With variables, rewrite as a product so the index is a factor of the exponent**
   c. **Divide the exponent by the index and write outside the radical**
2. **Leave the other number and variables inside the radical**

Example Simplify $\sqrt[2]{18x^5}$

a. $\sqrt[2]{9 \cdot 2x^5}$

b. $\sqrt[2]{9 \cdot 2x^4 x}$

c. $3x^2 \sqrt[2]{2x}$

Example Simplify $\sqrt[3]{54x^7y^{12}z^8}$

a. $\sqrt[3]{27 \cdot 2x^7\, y^{12}\, z^8}$

b. $\sqrt[3]{27 \cdot 2x^6 x\, y^{12}\ z^2 z^6}$

c. $3x^2\, y^4\, z^2 \sqrt[3]{2xz^2}$

Simplify the following.

When the index is not written, it is understood to be 2.

1. $\sqrt{50}$
2. $\sqrt{45}$
3. $\sqrt{48}$
4. $\sqrt{12}$
5. $\sqrt{63}$
6. $\sqrt{200}$
7. $\sqrt{x^2}$
8. $\sqrt{y^6}$
9. $\sqrt{x^{10}y^6}$
10. $\sqrt{36x^{14}y^6}$

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11. $\sqrt{20x^4y^{10}}$

12. $\sqrt{12x^3y^{10}}$

13. $\sqrt{80x^9y^5}$

14. $\sqrt[3]{8x^6y^{12}}$

15. $\sqrt[3]{24x^{12}y^{10}}$

16. $\sqrt[5]{x^5y^{15}z^{12}}$