# Finding $n^{th}$ Roots including Variables

**Procedure for Simplifying $n^{th}$ roots:**

1. **Rewrite the radicand as a product of numbers and variables raised to the power or multiple of the index, n, and some other numbers**

2. **Take the $nt^{h}$ root of the factors raised to the nth power by dividing the exponent by the index**

3. **Leave the other numbers and variables in the radical.**

*Note, simplifying variables is very easy. You rewrite the variable in the radicand using a factor of the index, and simplify by dividing by the index.*

$\sqrt[2]{x^6}$

$\sqrt[3]{x^6}$

$\sqrt[6]{x^6}$

$\sqrt[3]{x^{13}}$

$\sqrt[3]{x^{13}\, y^{12}\, Z^{20}}$

$\sqrt[5]{x^9\ y^8\, z^{20}}$

$\sqrt{8x^5}$

$\sqrt{18x^3}$

$\sqrt[3]{8x^3}$

$\sqrt[3]{16x^5}$

*Can't make them harder – only longer*

$\sqrt[3]{\mathbf{16x^2y^7}}$

$\sqrt[5]{\mathbf{32}x^{10}y^{17}z^{39}}$