

Simplifying Radicals

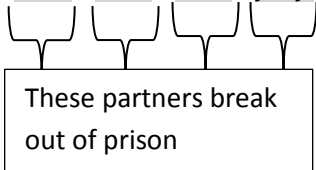
The following is a way to “think” about the process of simplifying radicals.

The prisoners need each other’s help to get out of prison. Only one ever makes it out alive. If all the prisoners are gone, the prison closes down. If a guy doesn’t have enough helpers to get out, he stays inside the prison.

Low Security Prison: Need only one other guy to help you escape, but only one survives.

1. $\sqrt{\text{needs a partner to escape}}$ Then on the way out, one gets shot, and one makes it out alive.

$$\text{Ex: } \sqrt{50x^4y^3} = \sqrt{2 \cdot 5 \cdot 5 \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y} = 5 \cdot x \cdot x \cdot y \sqrt{2 \cdot y} = 5x^2y \sqrt{2y}$$



This 2 does not have a partner so he must stay inside.

This y does not have a partner so he must stay inside.

High Security Prison – Need more helpers to escape – several get shot on the way out.

2. $\sqrt[3]{\text{need three guys to escape}}$ Then, on the way out, two get shot, and one makes it out alive.

$$\begin{aligned} \text{Ex: } \sqrt[3]{8x^4y^6z^2} &= \sqrt[3]{2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot z \cdot z} \\ &= 2 \cdot x \cdot y \cdot y \sqrt[3]{x \cdot z \cdot z} = 2xy^2 \sqrt[3]{xz^2} \end{aligned}$$

3. $\sqrt[4]{\text{need four guys to escape}}$ Then, on the way out, three get shot, and one makes it out alive.

$$\begin{aligned} \text{Ex: } 5 \sqrt[4]{324x^5y^3} &= 5 \sqrt[4]{2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y} = \\ &= 5 \cdot 3 \cdot x \sqrt[4]{2 \cdot 2 \cdot x \cdot y \cdot y \cdot y} = 15x \sqrt[4]{4xy^3} \end{aligned}$$

4. $\sqrt[5]{\text{need five guys to escape}}$ Then, on the way out, four get shot, and one makes it out alive.

$$\text{Ex: } \sqrt[5]{32x^{10}} = \sqrt[5]{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x} = 2 \cdot x \cdot x \sqrt[5]{1} = 2x^2$$