Adding and Subtracting Radical Expressions

To combine radical expressions, the radicals must have the same root index AND the same radicand. If they have both, they are called LIKE RADICALS. Then we combine like terms (which is really using the distributive property).

Example 1:

a) Simplify $6\sqrt{2}+7\sqrt{2}$

The radicals have the same root index of 2 and the same radicand of 2.

To add, just combine like terms OR think the distributive property:

$6\sqrt{2}+7\sqrt{2} = (6+7)\sqrt{2} = 13\sqrt{2}$

b) Simplify $8\sqrt{5}-3\sqrt{5}$

Sometime the radicals need to be simplified to get like radicands before adding or subtracting.

Example 2:

a) Add $\sqrt{8}-\sqrt{2}$

b) Add $3\sqrt{12} + 4\sqrt{27}$

c) Combine $3\sqrt{8} - 6\sqrt{50} + 2\sqrt{200}$

Follow the same procedure when adding or subtracting radicals with higher indexes. Remember to write the index when working with cube roots, fourth roots, and so on.

Example 3: Combine assuming all variables represent positive real number.

a) $15\sqrt[3]{81} - 4\sqrt[3]{24}$

b) $-2\sqrt[4]{32} - 7\sqrt[4]{162}$

c) $7\sqrt[3]{a^4b^3c^2} - 6ab\sqrt[3]{ac^2}$

If radicals involve fractions, simplify first.

Example 4: Combine assuming all variables represent positive real numbers.

a) $\sqrt{\frac{12}{16}} + \frac{\sqrt{48}}{\sqrt{64}}$

b) $\sqrt{\frac{80}{y^4}} + \sqrt{\frac{81}{y^{10}}}$

c) $2a\sqrt[4]{\frac{a}{16}} - 5a\sqrt[4]{\frac{a}{81}}$