Radicals can only be added or subtracted if they are *like radicals*. Radicals are *like radicals* if two conditions are met:

1) The root indexes are the same.
2) The radicands are the same.

Like Radicals

$5\sqrt[4]{3x^2}$, $-3\sqrt[4]{3x^2}$

$17\sqrt{7x}$, $\frac{1}{2}\sqrt{7x}$

Not Like Radicals

$\sqrt{2}$, $\sqrt[3]{2}$

$\sqrt{5}$, $\sqrt{7}$

etc.

Ex 1) Simplify:

1a) $11\sqrt{5} + 3\sqrt{5} = (11+3)\sqrt{5} = \boxed{14\sqrt{5}}$

1b) $3\sqrt{8} - 5\sqrt{2}$

$= 3\sqrt{4}\sqrt{2} - 5\sqrt{2}$

$= 3 \cdot 2\sqrt{2} - 5\sqrt{2}$

$= 6\sqrt{2} - 5\sqrt{2}$

$= \boxed{\sqrt{2}}$

1c) $\sqrt{12} + \sqrt{108}$

$= \sqrt{4}\sqrt{3} + \sqrt{36}\sqrt{3}$

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

$= \boxed{8\sqrt{3}}$

1d) $\sqrt[3]{54} - \sqrt[3]{16}$

$= \sqrt[3]{27}\sqrt[3]{2} - \sqrt[3]{8}\sqrt[3]{2}$

$= 3\sqrt[3]{2} - 2\sqrt[3]{2}$

$= \boxed{\sqrt[3]{2}}$

1e) $\sqrt{\frac{32}{3}} + \sqrt{\frac{2}{3}} = \frac{\sqrt{32}}{\sqrt{3}} + \frac{\sqrt{2}}{\sqrt{3}}$

$= \frac{\sqrt{32}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} + \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{\sqrt{96}}{3} + \frac{\sqrt{6}}{3}$

$= \frac{\sqrt{16}\sqrt{6}}{3} + \frac{\sqrt{6}}{3}$

$= \frac{4\sqrt{6}}{3} + \frac{\sqrt{6}}{3}$

$\frac{5\sqrt{6}}{3}$

Ex 2) Simplify:

2a) $\sqrt{6}(\sqrt{2}+\sqrt{3})$

$= \sqrt{6}(\sqrt{2}+\sqrt{3})$

$= \sqrt{12}+\sqrt{18}$

$= \sqrt{4}\sqrt{3}+\sqrt{9}\sqrt{2}$

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

2b) $\dfrac{\sqrt{10}+\sqrt{22}}{\sqrt{2}}$

$= \dfrac{\sqrt{10}}{\sqrt{2}}+\dfrac{\sqrt{22}}{\sqrt{2}}$

$= \sqrt{\dfrac{10}{2}}+\sqrt{\dfrac{22}{2}}$

$= \sqrt{5}+\sqrt{11}$