4.2 Multiplying/Dividing Binomial Radical Expressions

Multiply

Example 1: Multiply $(1-\sqrt{5})(2+\sqrt{5})$

$1\cdot 2 + 1\cdot\sqrt{5} - 2\sqrt{5} - \sqrt{5}\cdot\sqrt{5}$

$2 + \sqrt{5} - 2\sqrt{5} - 5$

$\boxed{-3-1\sqrt{5}}$ or $-3-\sqrt{5}$

Example 2: Multiply $(1+4\sqrt{10})(2-\sqrt{10})$

$2 - 1\sqrt{10} + 8\sqrt{10} - 4\cdot 10$

$2 - \sqrt{10} + 8\sqrt{10} - 40$

$\boxed{-38+7\sqrt{10}}$

$\sqrt{10}\cdot\sqrt{10}$

$\sqrt{100}$

10

YI: Multiply $(2+\sqrt{7})(1+3\sqrt{7})$

$1\cdot 2 + 2\cdot 3\sqrt{7} + 1\sqrt{7} + 3\sqrt{7}\cdot\sqrt{7}$

$2 + 6\sqrt{7} + 1\sqrt{7} + 21$

$\boxed{23+7\sqrt{7}}$

Recall: We do not like radicals in the denominator. So when we divide by a binomial radical expression, we must RATIONALIZE THE DENOMINATOR.

Use conjugates!

Bin. Exp.	conjugates
$2+\sqrt{3}$	$2-\sqrt{3}$
$-4-\sqrt{7}$	$-4+\sqrt{7}$
$\sqrt{5}$	$-\sqrt{5}$
$\sqrt{3}-\sqrt{2}$	$\sqrt{3}+\sqrt{2}$

Example 3: Divide $\frac{5}{5-\sqrt{3}}$

$$\frac{5}{5-\sqrt{3}} \cdot \frac{(5+\sqrt{3})}{5+\sqrt{3}}$$

$$\frac{5(5+\sqrt{3})}{(5-\sqrt{3})(5+\sqrt{3})}$$

remember: $(a+b)(a-b)=a^2-b^2$

$$\frac{25+5\sqrt{3}}{25-\sqrt{3}\cdot\sqrt{3}}$$

$$\frac{25+5\sqrt{3}}{25-3}$$

$$\boxed{\frac{25+5\sqrt{3}}{22}}$$

Example 4: Divide $\frac{4}{\sqrt{7}+5}$

$$\frac{4}{\sqrt{7}+5} \cdot \frac{(\sqrt{7}-5)}{(\sqrt{7}-5)}$$

$$\frac{4\sqrt{7}-20}{7-25}$$

$$\frac{\overset{2}{\cancel{4}}\sqrt{7}-\overset{10}{\cancel{20}}}{\underset{-9}{\cancel{-18}}}$$

Sometimes we can reduce

$$\boxed{\frac{2\sqrt{7}-10}{-9}}$$

YT : Divide $\frac{7}{3-\sqrt{10}}$

$$\frac{7}{3-\sqrt{10}} \cdot \frac{3+\sqrt{10}}{3+\sqrt{10}}$$

$$\frac{21+7\sqrt{10}}{9-10}$$

$$\frac{21+7\sqrt{10}}{-1} \quad \text{or} \quad -21-7\sqrt{10}$$