

## 8.1A Plus/Minus

### A. $\pm$ and $\mp$

#### 1. Notation

$\pm$  plus or minus

$\mp$  minus or plus

These are a shorthand way of writing two solutions.

#### 2. Minus Signs:

$$-(\pm) = \mp$$

$$-(\mp) = \pm$$

3. In expressions involving  $\pm$  or  $\mp$ , we have two solutions. One by taking the “top” sign and one by taking the “bottom” sign.

## B. Examples

**Example 1:** Write the individual expressions for  $\frac{8 \mp \sqrt{2}}{4 \pm \sqrt{3}}$  and simplify.

**Solution**

a. “Top signs”:  $\frac{8 - \sqrt{2}}{4 + \sqrt{3}}$

Now rationalize:

$$\frac{8 - \sqrt{2}}{4 + \sqrt{3}} \cdot \frac{4 - \sqrt{3}}{4 - \sqrt{3}} = \frac{32 - 8\sqrt{3} - 4\sqrt{2} + \sqrt{6}}{16 - 3} = \boxed{\frac{32 - 8\sqrt{3} - 4\sqrt{2} + \sqrt{6}}{13}}$$

b. “Bottom signs”:  $\frac{8 + \sqrt{2}}{4 - \sqrt{3}}$

Now rationalize:

$$\frac{8 + \sqrt{2}}{4 - \sqrt{3}} \cdot \frac{4 + \sqrt{3}}{4 + \sqrt{3}} = \frac{32 + 8\sqrt{3} + 4\sqrt{2} + \sqrt{6}}{16 - 3} = \boxed{\frac{32 + 8\sqrt{3} + 4\sqrt{2} + \sqrt{6}}{13}}$$

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**Example 2:** Simplify  $6 - (4 \pm \sqrt{5})$  and simplify.

**Solution**

Use the distributive property and change all signs as required:

$$6 - (4 \pm \sqrt{5}) = 6 - 4 \mp \sqrt{5} = \boxed{2 \mp \sqrt{5}}$$

### C. Comment on Difference

$\pm$  and  $\mp$  are the same **provided** only **one** of them is present in an expression:

a. Thus  $2 \mp \sqrt{5} = 2 \pm \sqrt{5}$ .

b. However,  $\frac{8 \mp \sqrt{2}}{4 \pm \sqrt{3}} \neq \frac{8 \pm \sqrt{2}}{4 \pm \sqrt{3}}$  (Why?)