Common Algebra Mistakes
Example: Solving a Quadratic Equation

The Goal

Solve the following equation for y:

$$x^2 + 2y^2 = c$$

The Mistake

Find the algebra mistake:

$$x^2 + 2y^2 = c \implies 2y^2 = -x^2 - c \implies y^2 = \frac{1}{2}x^2 - \frac{1}{2}c \implies y = \sqrt{\frac{1}{2}x^2 - \frac{1}{2}c}$$

Need a hint? Look carefully at the red part of the algebra:

$$x^2 + 2y^2 = c \implies 2y^2 = -x^2 - c \implies y^2 = \frac{1}{2}x^2 - \frac{1}{2}c \implies y = \sqrt{\frac{1}{2}x^2 - \frac{1}{2}c}$$

The Correction

$$x^2 + 2y^2 = c \implies 2y^2 = c - x^2 \implies y^2 = \frac{1}{2}c - \frac{1}{2}x^2 \implies y = \pm\sqrt{\frac{1}{2}c - \frac{1}{2}x^2} = \pm\sqrt{\frac{c - x^2}{2}}$$

An Explanation

There are three mistakes, all sign errors. In the first step the sign of c is changed for no reason. In the second step the sign of the x^2 term is switched. In the third step the student forgot the ± in front of the square root.
Take great care with signs!