Derivation: Quadratic Formula
Generalization of Completing the Square

1. $ax^2 + bx + c = 0$ **Given**

2. $x^2 + \dfrac{b}{a}x + \dfrac{c}{a} = 0$ **Div Prop =**

3. $x^2 + \dfrac{b}{a}x = -\dfrac{c}{a}$ **Sub Prop =**

$$\tfrac{1}{2}\left(\dfrac{b}{a}\right) = \dfrac{b}{2a};\quad then\quad \left(\dfrac{b}{2a}\right)^2 = \dfrac{b^2}{4a^2}$$

4. $x^2 + \dfrac{b}{a}x + \dfrac{b^2}{4a^2} = -\dfrac{c}{a} + \dfrac{b^2}{4a^2}$ **Add Prop =**

5. $\left(x + \dfrac{b}{2a}\right)^2 = \dfrac{b^2}{4a^2} - \dfrac{c}{a}$ **Factor/Com. Prop +**

6. $\left(x + \dfrac{b}{2a}\right)^2 = \dfrac{b^2 - 4ac}{4a^2}$ **CD**

7. $\left(x + \dfrac{b}{2a}\right) = \pm\sqrt{\dfrac{b^2 - 4ac}{4a^2}}$ **Sq. Root, $x^2 = n$**

8. $x = -\dfrac{b}{2a} \pm \dfrac{\sqrt{b^2 - 4ac}}{2a}$ **Sub Prop=/Simplify radical**

9. $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ **Add Fractions**