

2. Solve by completing the square.

a.) $x^2 - 2x - 5 = 0$

$$x = 1 \pm \sqrt{6}$$

b.) $y^2 + 6y - 2 = 0$

$$y = -3 \pm \sqrt{11}$$

c.) $t^2 + 8 = 4t$

$$t = 2 \pm 2i$$

d.) $3n^2 + 12n = -1$

$$n = -2 \pm \frac{\sqrt{33}}{3}$$

The Quadratic Formula

In this section we will learn a more efficient method for solving quadratic equations. It is a formula derived from the method of completing the square.

Quadratic Formula: If $ax^2 + bx + c = 0$, then

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

opposite
NOT negative →

*AKA: equation MUST
be set equal
to 0.*

Note – In order to use this formula, the problem needs to be in the form $ax^2 + bx + c = 0$.

Break for Practice: Solve each equation by using the quadratic formula.

1. $2x^2 - 3x - 5 = 0$ $a=2, b=-3, c=-5$

$$x = \frac{3 \pm \sqrt{(-3)^2 - 4(2)(-5)}}{2(2)}$$

$$x = \frac{3 \pm \sqrt{49}}{4} \rightarrow x = \frac{3-7}{4} = -\frac{4}{4}$$

$$x = \frac{3+7}{4} = \frac{10}{4}$$

$$x = \frac{5}{2} \text{ OR } 2.5$$

3. $3x^2 = -2x - 1$
 $+2x+1 \quad +2x+1$

$3x^2 + 2x + 1 = 0$ $a=3, b=2, c=1$

$$x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(1)}}{2(3)}$$

$$x = \frac{-2 \pm \sqrt{-8}}{6} \rightarrow \sqrt{4} \cdot \sqrt{2}$$

$$x = \frac{-2 \pm 2i\sqrt{2}}{6} \xrightarrow{(\div 2)} x = \frac{-1 \pm i\sqrt{2}}{3}$$

2. $k^2 - 6k - 1 = 0$ $a=1, b=-6, c=-1$

$$x = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(-1)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{40}}{2} \rightarrow \sqrt{4} \cdot \sqrt{10}$$

$$x = \frac{6 \pm 2\sqrt{10}}{2} \xrightarrow{(\div 2)} x = 3 \pm \sqrt{10}$$

4. $(3x-1)(x+4) = -9$

$$3x^2 + 12x - x - 4 + 9 = 0$$

$3x^2 + 11x + 5 = 0$ $a=3, b=11, c=5$

$$x = \frac{-11 \pm \sqrt{(11)^2 - 4(3)(5)}}{2(3)}$$

$$x = \frac{-11 \pm \sqrt{61}}{6}$$

$$x = \frac{-11 \pm \sqrt{61}}{6}$$

Extended Practice: Solve each equation using the quadratic formula. Give answers involving radicals in simplest radical form.

1. $5k^2 + 3k - 2 = 0$

$$x = \frac{2}{5}, x = -1$$

2. $2p^2 - 3p - 2 = 0$

$$x = 2, x = -\frac{1}{2}$$

$$3. 5r^2 + 8 = -12r$$

$$X = \frac{-6 \pm 2i}{5}$$

$$4. 2w^2 + 4w = -3$$

$$X = \frac{-2 \pm i\sqrt{2}}{2}$$

OR

$$X = -1 \pm i\frac{\sqrt{2}}{2}$$

$$5. 2x(x+1) = 7$$

$$X = \frac{-1 \pm \sqrt{15}}{2}$$

OR

$$X = -\frac{1}{2} \pm \frac{\sqrt{15}}{2}$$

$$6. 5 = 4r(2r+3)$$

$$X = \frac{-3 \pm \sqrt{19}}{4}$$

OR

$$X = -\frac{3}{4} \pm \frac{\sqrt{19}}{4}$$

$$7. (3n-5)(2n-2) = 6$$

$$X = \frac{4 \pm \sqrt{10}}{3}$$

OR

$$X = \frac{4}{3} \pm \frac{\sqrt{10}}{3}$$

$$8. (2x+1)(2x-1) = 4x$$

$$X = \frac{1 \pm \sqrt{2}}{2}$$

$$X = \frac{1}{2} \pm \frac{\sqrt{2}}{2}$$