

Name: _____

Date: _____

Class/Home worksheet: Alg2H
 Quadratic equation (II): Quadratic formula.
 (book chapter 8, page 350 and onward)

(Warmup) Solve using complete the square

$$4x^2 - 8x + 3 = 0$$

Steps:

1. Move the 3 to the other side

$$4x^2 - 8x = -3$$

2. Divide by 4

$$x^2 - 2x = -\frac{3}{4}$$

3. Complete the square

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

\downarrow
 $\frac{2}{2} = 1$

4. Write as $(\cdot)^2$

$$(x-1)^2 = +\frac{1}{4}$$

5. Solve (taking + and - of square root)

$$x-1 = \frac{1}{2} \quad \text{or} \quad x-1 = -\frac{1}{2}$$

$$\boxed{x = 1\frac{1}{2} \quad \text{or} \quad x = \frac{1}{2}}$$

$$ax^2 + bx + c = 0$$

$$ax^2 + bx = -c$$

$$x^2 + \frac{b}{a}x = -\frac{c}{a}$$

$$x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = \left(\frac{b}{2a}\right)^2 - \frac{c}{a}$$

$$\left(x + \frac{b}{2a}\right)^2 = \frac{b^2}{4a^2} - \frac{c}{a} = \frac{b^2 - 4ac}{4a^2}$$

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

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

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

$$ax^2 + bx + c = 0$$

where a, b , and c are constants, and $a \neq 0$, is called standard form of the quadratic equation.

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Write it again

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1. Solve:

$$4x^2 - 4x - 15 = 0$$

$$\begin{aligned} x_{1,2} &= \frac{9 \pm \sqrt{16 + 240}}{8} = \\ &= \frac{9 \pm \sqrt{256}}{8} = \frac{9 \pm 16}{8} = \begin{cases} \frac{25}{8} = \boxed{\frac{21}{2}} \\ -\frac{7}{8} = \boxed{-\frac{1}{2}} \end{cases} \end{aligned}$$

2. Solve:

$$9x^2 - 3x - 2 = 0$$

$$\begin{aligned} x_{1,2} &= \frac{3 \pm \sqrt{9 + 72}}{18} = \\ &= \frac{3 \pm 9}{18} = \begin{cases} \frac{12}{18} = \boxed{\frac{2}{3}} \\ -\frac{6}{18} = \boxed{-\frac{1}{3}} \end{cases} \end{aligned}$$

3. Solve (using the quadratic equation):

$$\begin{aligned} 4x^2 - \cancel{15} &= 0 \\ x_{1,2} &= \frac{0 \pm \sqrt{0 + 4 \cdot 4 \cdot 9}}{8} = \\ &= \frac{12}{8} = \frac{3}{2} = \boxed{\frac{1}{2}} \end{aligned}$$

4. Solve (using the quadratic equation):

$$16x^2 - x = 0$$

$$\begin{aligned} x_{1,2} &= \frac{1 \pm \sqrt{1 - 0}}{32} = \frac{1 \pm 1}{32} = \\ &= \begin{cases} \frac{2}{32} = \boxed{\frac{1}{16}} \\ \frac{0}{32} = \boxed{0} \end{cases} \end{aligned}$$

5. Solve:

$$x^2 + x(\sqrt{8} - \sqrt{2}) - 4 = 0$$

$$\begin{aligned} x_{1,2} &= \begin{cases} 1.414 = \boxed{\sqrt{2}} \\ -2.828 = \boxed{-\sqrt{2}} \end{cases} \end{aligned}$$

6. Solve:

$$\pi x^2 - 3x - 1 = 0$$

$$\begin{aligned} x_{1,2} &= \begin{cases} -0.262 \\ 1.217 \end{cases} \end{aligned}$$

*Desmos activity

Quadratic formula and the MATH method

1. Solve using quadratic equation:

$$x^2 - 7x + 12 = 0$$

$$x_{1,2} = \frac{7 \pm \sqrt{49-48}}{2} = \frac{7 \pm 1}{2} =$$

$$= \boxed{\begin{array}{l} \rightarrow 4 \\ \rightarrow 3 \end{array}}$$

2. Factor using MATH method:

$$x^2 - 7x + 12$$

$$\begin{array}{c|c|c} M & A & T \\ \hline 1 & -7 & -4, -3 \end{array}$$

$$\boxed{(x-4)(x-3)}$$

3. Solve using quadratic equation:

$$4x^2 - 1 = 0$$

$$x_{1,2} = \frac{0 \pm \sqrt{0+16}}{8} =$$

$$= \frac{\pm 4}{8} = \boxed{\begin{array}{l} \rightarrow \boxed{+2} \\ \rightarrow \boxed{-2} \end{array}}$$

4. Factor using MATH method:

$$4x^2 - 1$$

$$(2x+1)(2x-1)$$

5. Solve using quadratic equation:

$$x^2 + 6x + 9 = 0$$

$$x_{1,2} = \frac{-6 \pm \sqrt{36-36}}{2} =$$

$$= \boxed{-3}$$

6. Factor using MATH method:

$$x^2 + 6x + 9$$

$$\begin{array}{c|c|c} M & A & T \\ \hline 1 & 6 & 3, 3 \end{array}$$

$$(x+3)^2$$

*Desmos

Write it again

$$X_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

(3) Solve:

$$x^2 + 4x - 5 = 0$$

$$X_{1,2} = \frac{-4 \pm \sqrt{16+20}}{2} = \frac{-4 \pm 6}{2}$$

$$\boxed{X_{1,2} = \begin{cases} 1 \\ -5 \end{cases}}$$

(4) Solve:

$$x^2 - 2x - 15 = 0$$

$$X_{1,2} = \frac{2 \pm \sqrt{4+60}}{2} = \frac{2 \pm 8}{2}$$

$$\boxed{X_{1,2} = \begin{cases} 5 \\ -3 \end{cases}}$$

(5) Solve:

$$y^2 + 7y = 30$$

$$y_{1,2} = \frac{-7 \pm \sqrt{49+120}}{2} = \frac{-7 \pm 13}{2} = \boxed{\begin{cases} 3 \\ -10 \end{cases}}$$

(6) Solve:

$$y^2 - 7y = 30$$

$$y_{1,2} = \frac{7 \pm \sqrt{49+120}}{2} = \frac{7 \pm 13}{2} = \boxed{\begin{cases} 10 \\ -3 \end{cases}}$$

(7) Solve :

$$2t^2 - 3t - 2 = 0$$

$$t_{1,2} = \frac{3 \pm \sqrt{9+16}}{4} = \frac{3 \pm 5}{4} = \boxed{\begin{cases} 2 \\ -\frac{1}{2} \end{cases}}$$

(8) Solve:

$$5m^2 + 3m - 2 = 0$$

$$m_{1,2} = \frac{-3 \pm \sqrt{9+40}}{10} = \frac{-3 \pm 7}{10} = \boxed{\begin{cases} 0.4 \\ -1 \end{cases}}$$