

1.10 Solving Quadratics

Part 2

Taking the Square Root

Q&A Solving Quadratics

$$\textcircled{1} m^2 + 7m + 10 = 0 \quad \begin{matrix} 1 \cdot 10 \\ 2 \cdot 5 \end{matrix}$$
$$(m+5)(m+2) = 0$$

$$\textcircled{2} (4m+3)(2m+3) = 0$$
$$4m+3=0 \quad \text{or} \quad 2m+3=0$$
$$\begin{array}{r} -3 = -3 \\ \hline 4m = -3 \\ \frac{4m}{4} = \frac{-3}{4} \\ m = \frac{-3}{4} \end{array} \quad \begin{array}{r} -3 = -3 \\ \hline 2m = -3 \\ \frac{2m}{2} = \frac{-3}{2} \\ m = \frac{-3}{2} \end{array}$$

$$\textcircled{3} x^2 - 11x + 19 = -5$$
$$+5 = +5$$
$$\frac{x^2 - 11x + 24 = 0}{(x-3)(x-8) = 0} \quad \begin{matrix} 1 \cdot 24 \\ 2 \cdot 12 \\ 3 \cdot 8 \\ 4 \cdot 6 \end{matrix}$$
$$x-3=0 \quad \text{or} \quad x-8=0$$
$$x=3 \quad \text{or} \quad x=8$$

$$\textcircled{4} x^2 = 25$$
$$x^2 - 25 = 0$$
$$(x+5)(x-5) = 0$$
$$x+5=0 \quad \text{or} \quad x-5=0$$
$$x=-5 \quad \text{or} \quad x=5$$

$$\textcircled{5} x^2 = 25x$$
$$x^2 - 25x = 0$$
$$x(x-25) = 0$$
$$x=0 \quad \text{or} \quad x-25=0$$
$$x=0 \quad \text{or} \quad x=25$$

WAYS TO SOLVE QUADRATICS

(Quad & Linear or Constant) 2 Terms

- GCF Factoring (set = 0)
- Difference of Squares (set = 0)

3 Terms (Quad, Linear, Constant)

- GCF Factoring (set = 0)
- Factoring Trinomials (set = 0)

Now Solving Quadratics - Taking the Square Root

Let's consider the equation $x^2 - 20 = 0$. Factor the equation.

$$x^2 - 20 = 0 \implies \text{This Quadratic Binomial is not factorable.}$$

How do we solve a Quadratic Binomial that is not factorable?

To use the "Taking the Square Root" method, you must:

- isolate the Quadratic Term
- Take the square root on both sides of the equal sign
- The unknown will be a plus & negative number.

note: MUST HAVE 2 terms (one Quadratic Term and Constant Term)

Let's consider $x^2 - 20 = 0$, Solve for x .

$$\begin{aligned} x^2 - 20 &= 0 \\ +20 &= +20 \\ \hline x^2 &= 20 \\ \sqrt{x^2} &= \sqrt{20} \\ x &= \pm \sqrt{20} \\ x &= \pm 2\sqrt{5}. \end{aligned}$$

[Examples] Solve for x by Taking the Square Root.

$$\begin{aligned} \textcircled{1} \quad x^2 - 25 &= 0 \\ +25 &= +25 \\ \hline x^2 &= 25 \\ \sqrt{x^2} &= \sqrt{25} \\ x &= \pm 5. \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad 4x^2 - 25 &= 0 \\ +25 &= +25 \\ \hline 4x^2 &= 25 \\ \frac{4x^2}{4} &= \frac{25}{4} \\ x^2 &= \frac{25}{4} \end{aligned}$$

$$\begin{aligned} \sqrt{x^2} &= \sqrt{\frac{25}{4}} \\ x &= \pm \frac{5}{2} \end{aligned}$$

$$\begin{aligned} \textcircled{3} \quad m^2 + 34 &= 0 \\ -34 &= -34 \\ \hline m^2 &= -34 \\ \sqrt{m^2} &= \sqrt{-34} \\ m &= \pm i\sqrt{34} \end{aligned}$$

$$\begin{aligned} \textcircled{4} \quad x^2 &= -4 \\ \sqrt{x^2} &= \sqrt{-4} \\ x &= \pm \sqrt{-1} \cdot \sqrt{4} \\ x &= \pm 2i \end{aligned}$$

$$\begin{aligned} \textcircled{5} \quad \frac{1}{2}x^2 + 3 &= 12 \\ -3 &= -3 \\ \hline \frac{1}{2}x^2 &= 9 \quad (2) \\ x^2 &= 18 \\ \sqrt{x^2} &= \sqrt{18} \\ x &= \pm 3\sqrt{2} \end{aligned}$$

$$\begin{aligned} \textcircled{6} \quad 2(x^2 - 5) &= -x^2 - 1 \\ 2x^2 - 10 &= -x^2 - 1 \\ +x^2 + 1 &= +x^2 + 1 \\ \hline 3x^2 - 9 &= 0 \\ +9 &= +9 \\ \hline 3x^2 &= 9 \\ \frac{3x^2}{3} &= \frac{9}{3} \\ x^2 &= 3 \\ \sqrt{x^2} &= \sqrt{3} \\ x &= \pm \sqrt{3}. \end{aligned}$$

$$\begin{aligned} \textcircled{7} \quad 5(x-4)^2 &= 125 \\ \frac{5(x-4)^2}{5} &= \frac{125}{5} \\ (x-4)^2 &= 25 \\ \sqrt{(x-4)^2} &= \sqrt{25} \\ x-4 &= \pm 5 \\ +4 &= +4 \\ \hline x &= 4 \pm 5 \\ \swarrow & \quad \searrow \\ x &= 4+5 \quad \text{or} \quad x = 4-5 \\ x &= 9 \quad \quad \quad x = -1. \end{aligned}$$

$$\textcircled{8} \quad 4(x+5)^2 = -64$$

$$\frac{4(x+5)^2}{4} = \frac{-64}{4}$$

$$(x+5)^2 = -16$$

$$\sqrt{(x+5)^2} = \sqrt{-16}$$

$$x+5 = \pm 4i$$

$$\underline{-5 = -5}$$

$$x = -5 \pm 4i$$

$$x = -5 + 4i \quad \text{or} \quad x = -5 - 4i$$

$$\textcircled{9} \quad 2x^2 + 338 = 0$$

$$\frac{-338 \quad -338}{2}$$

$$\frac{2x^2 = -338}{2}$$

$$x^2 = -169$$

$$\sqrt{x^2} = \sqrt{-169}$$

$$x = \pm 13i$$

WAYS TO SOLVE QUADRATICS

(Quad & Linear or Constant) 2 Terms

- GCF Factoring (set = 0)
- Difference of Squares (set = 0)
- Taking Sq. Root (isolate Quad term)

3 Terms (Quad, Linear, Constant)

- GCF Factoring (set = 0)
- Factoring Trinomials (set = 0)