Solving Quadratic Equations by taking Square Root.

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$x^2 = 25$

$x = \pm\sqrt{25}$

$x = \pm 5$

$x^2 = 25$

$x^2 - 25 = 0$

$(x+5)(x-5) = 0$

$x = -5, 5$

$2x^2 + 3 = 7$

$-3 \quad -3$

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

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

$x = \pm\sqrt{2}$

if the answer is irrational, leave it in radical form

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

$x + 2 = \pm\sqrt{8}$

$x = -2 \pm 2\sqrt{2}$

Solve $\sqrt{(x-3)^2} = \sqrt{10}$

$x - 3 = \pm\sqrt{10}$

$x = 3 \pm \sqrt{10}$

$5x^2 + 15 = 0$

$\frac{5x^2}{5} = \frac{-15}{5}$

$x^2 = -3$

no real roots

We can solve any quadratic equation that we can write in the form $(x+p)^2 = q$ if $q \geq 0$ by taking the square root.

$(x+9)^2 = x^2+18x+81$

Solve $x^2+8x = 14$

make into a perfect sq. trinomial

$\frac{8}{2} = 4$

$4^2 = 16$

$x^2+8x+16 = 14+16$

$\sqrt{(x+4)^2} = \sqrt{30}$

$x+4 = \pm\sqrt{30}$

$x = -4 \pm \sqrt{30}$

Solve $x^2-12x+5=0$

$\frac{-12}{2} = -6$

$(-6)^2 = 36$

$x^2-12x+36 = -5+36$

$\sqrt{(x-6)^2} = \sqrt{31}$

$x-6 = \pm\sqrt{31}$

$x = 6 \pm \sqrt{31}$

this process is called completing the square.

1. move constant to the right
2. divide middle term by 2, then square it. Add that # to both sides.
3. Factor left simplify right
4. Take square root of both sides
5. Isolate x.

Try $x^2+16x-7=0$

$\frac{16}{2} = 8$

$8^2 = 64$

$x^2+16x+64 = 7+64$

$\sqrt{(x+8)^2} = \sqrt{71}$

$x+8 = \pm\sqrt{71}$

$x = -8 \pm \sqrt{71}$

$x = -6 \pm \sqrt{\quad}$

$-2\left(-\frac{1}{2}x^2 + 3x - 2\right) = (0)\,-2$

$x^2 - 6x + 4 = 0$

$x^2 - 6x + 9 = -4 + 9$

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

$x - 3 = \pm\sqrt{5}$

$x = 3 \pm \sqrt{5}$

★ need x^2 to have a coefficient of 1.

$\frac{-6}{2} = -3$

$(-3)^2 = 9$

$\frac{2x^2}{2} - \frac{12x}{2} - \frac{7}{2} = \frac{0}{2}$

$x^2 - 6x - \frac{7}{2} = 0$

$x^2 - 6x + 9 = \frac{7}{2} + 9$ $\quad \frac{7}{2} + \frac{18}{2}$

$\frac{-6}{2} = -3$

$(-3)^2 = 9$

$\sqrt{(x-3)^2} = \sqrt{\frac{25}{2}}$

$x - 3 = \frac{\pm 5}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$\sqrt{\frac{25}{2}} = \frac{\sqrt{25}}{\sqrt{2}}$

$x - 3 = \pm\frac{5\sqrt{2}}{2}$

$3 = \frac{6}{2}$

$x = \frac{6 \pm 5\sqrt{2}}{2}$

$3 \pm \frac{5\sqrt{2}}{2}$

$\frac{6}{2} \pm \frac{5\sqrt{2}}{2}$

Try $\frac{-5x^2}{-5} - \frac{10x}{-5} + \frac{2}{-5} = \frac{0}{-5}$

$x^2 + 2x - \frac{2}{5} = 0$

$$x^2 + 2x + 1 = \frac{2}{5} + 1$$

$$\sqrt{(x+1)^2} = \sqrt{\frac{7}{5}}$$

$$x + 1 = \pm\frac{\sqrt{7}\cdot\sqrt{5}}{\sqrt{5}\cdot\sqrt{5}}$$

$$x + 1 = \pm\frac{\sqrt{35}}{5}$$

$$x = -1 \pm \frac{\sqrt{35}}{5}$$

$$x = \frac{-5}{5} \pm \frac{\sqrt{35}}{5}$$

$$x = \frac{-5 \pm \sqrt{35}}{5}$$

$x = \frac{-5 \pm \sqrt{35}}{5}$ means $\frac{-5 + \sqrt{35}}{5}$ and $\frac{-5 - \sqrt{35}}{5}$

Solve $\frac{3x^2}{3} + \frac{8x}{3} - \frac{6}{3} = \frac{0}{3}$

$$x^2 + \frac{8}{3}x - 2 = 0$$

$\frac{8}{3} \times \frac{1}{2} = \frac{4}{3}$

$\left(\frac{4}{3}\right)^2 = \frac{16}{9}$

$$x^2 + \frac{8}{3}x + \frac{16}{9} = 2 + \frac{16}{9} \quad \left(\frac{18}{9} + \frac{16}{9}\right)$$

$$\sqrt{\left(x + \frac{4}{3}\right)^2} = \sqrt{\frac{34}{9}}$$

$$x + \frac{4}{3} = \frac{\pm\sqrt{34}}{3}$$

$$x = \frac{-4 \pm \sqrt{34}}{3}$$

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