8.2 Solving Quadratic Equations by the Quadratic Formula

The Quadratic Formula
The Solution(s) to the Quadratic equation $ax^2+bx+c=0, a\neq 0$ are given by the quadratic formula.

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

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

$12x^2+5x-3=0$

$a=12 \quad b=5 \quad c=-3$

$$x=\frac{-(5)\pm\sqrt{(5)^2-4(12)(-3)}}{2(12)}$$

$$x=\frac{-5\pm 13}{24}$$

$x=\frac{1}{3}, -\frac{3}{4}$

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You Try

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

$a=2 \quad b=-3 \quad c=-9$

$$x=\frac{-(-3)\pm\sqrt{(-3)^2-4(2)(-9)}}{2(2)}$$

$$x=\frac{3\pm 9}{4}$$

$x=3, -\frac{3}{2}$

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

$3p^2=6p-1$

$a=3 \quad b=-6 \quad c=1$

$3p^2-6p+1=0$

$$x=\frac{-(-6)\pm\sqrt{(-6)^2-4(3)(1)}}{2(3)}$$

$$x=\frac{6\pm\sqrt{24}}{6}$$

24 / 4 / 4 / 3 2 / 2 2

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

$x=1\pm\frac{\sqrt{6}}{3}$

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You try

$4z^2+1=8z$

$4z^2-8z+0=0$

$a=4,\ b=-8,\ c=0$

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

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Solve

$m\left(9m+\frac{4}{m}\right)=(12)m$

$9m^2+4=12m$

$9m^2-12m+4=0$

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You try

$w\left(4w+\frac{25}{w}\right)=20w$

$4w^2+25=20w$

$4w^2-20w+25=0$

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Solve

$y^2-4y+13=0$

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You try

$1z^2 + 2z + 26 = 0$

$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(26)}}{2(1)}$

$x = \frac{-2 \pm 10i}{2}$

$a + bi$

$x = -1 \pm 5i$

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Using the Discriminant.

The Discriminant is the "Stuff" inside the radical.

$b^2 - 4ac$

If $b^2 - 4ac > 0$ and is a perfect square, then you have 2 real rational solutions.

If $b^2 - 4ac > 0$ and is not a perfect square, then you have 2 real irrational solutions.

If $b^2 - 4ac = 0$ Then you have 1 real solution.

If $b^2 - 4ac < 0$ then you have no real solutions (2 Complex solutions)

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For each quadratic equation, determine the discriminant. Use the value of the discriminant to determine whether the quadratic equation has two unequal rational solutions, two irrational solutions, one repeated real solution, or two complex solutions that are not real. $b^2 - 4ac$

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

$(-5)^2 - 4(1)(2)$ 2 irrational solution

$25 - 8 = 17$

$9y^2 + 6y + 1 = 0$

$3p^2 - p = -5$

$3p^2 - p + 5 = 0$ 2 complex solutions

$(-1)^2 - 4(3)(5)$

$1 - 60 = -59$

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8.1A Square Root Property

Solve using the square root property

$p^2 - 9 = 0$

$p^2 = 9$

$p = \pm 3$

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You Try

$3b^2 = 75$

$b^2 = 25$

$b = \pm 5$

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Solve using the square root property

$y^2 + 14 = 2$

$y^2 = -12$

$y = \pm 2i\sqrt{3}$

or

$y = \pm 2\sqrt{3}\,i$

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You Try

$3q^2 + 27 = 0$

$q^2 = -9$

$q = \pm 3i$

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Solve using the square root property

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

$x - 2 = \pm 5$

$x = 7, -3$

$(x+5)^2 + 24 = 0$

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You Try

$$(q-5)^2+20=4$$

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4 different ways to solve

1. Factoring
2. Square Root Property
3. Completing the Square (Next time)
4. Quadratic Formula

$$5n^2-45=0$$

$$-2y^2+5y-6=0$$

$$3w^2+2w=5$$

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Pythagorean Theorem
In a right triangle, where c is the hypotenuse a and b are the legs:

$$c^2=a^2+b^2$$

If a right triangle has one leg that is 5 inches and the other is 12 inches, what is the length of the hypotenuse?

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