Solving Quadratic Equations with Quadratic Formula - Intermediate

Objective 1: Use the Quadratic Formula to get Rational Solutions

Simplify Solutions when the Discriminant is a Perfect Square

1. Gather all terms on one side of the equation into the form: $ax^2 + bx + c = 0$.
2. Plug the coefficients into the Quadratic Formula, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. If the Discriminant, $b^2 - 4ac$, is a perfect square, then the solutions will be ***rational***. They may be written as:
   - Exact answers in simplest form.
   - Approximate answers by using a calculator and rounding.

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form.

$$x^2 = 10 - 3x$$

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form and approximate answers rounded to hundredths place.

$$9x^2 + 1 = 6x$$

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form.

$$3 - 7x = -2x^2$$

Objective 1 Extra Practice

Solve each equation using the Quadratic Formula.

1. $10x^2 = 3x + 4$ (Exact answers)

2. $x = 2 - 3x^2$ (Approximate answers to the nearest hundredth)

Objective 2: Use the Quadratic Formula to get Irrational Solutions

Simplify Solutions when the Discriminant is NOT a Perfect Square

1. Gather all terms of the equation on one side, into the form: $ax^2 + bx + c = 0$.
2. Plug the coefficients into the Quadratic Formula, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. If the Discriminant, $b^2 - 4ac$, is positive but not a perfect square, then the solutions will be ***irrational***. They may be written as:
   - Exact answers in simplest form.
   - Approximate answers by using a calculator and rounding.

IRRATIONALS
Numbers that cannot be expressed as a terminating or repeating decimal.

RATIONALS
Numbers that can be expressed as a terminating or repeating decimal.

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form and approximate answers rounded to thousandths place.

$$x^2 + 7 = 6x$$

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form and approximate answers rounded to hundredths place.

$$5x - 3 = x^2$$

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form and approximate answers rounded to thousandths place.

$$6x = 1 - 3x^2$$

Objective 2 Extra Practice

Solve each equation using the Quadratic Formula.

1. $-6x = -x^2 - 3$ (Exact answers)

2. $3x^2 = x^2 - 4x + 5$ (Approximate answers to the nearest thousandth)

3. $-1 = -3x^2 + 6x$ (Exact answers)

Objective 3: Use the Quadratic Formula to get Complex Solutions

Simplify Solutions when the Discriminant is Negative

1. Gather all terms of the equation on one side, into the form: $ax^2 + bx + c = 0$.
2. Plug the coefficients into the Quadratic Formula, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. If the Discriminant, $b^2 - 4ac$, is negative, then the solutions will be ***Complex Nonreal (Complex Numbers with an Imaginary Part).*** They may be written as:
   - Exact answers in simplest form.
   - Approximate answers by using a calculator and rounding.

Complex Numbers are written in the form: $a + bi$

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form and if appropriate, approximate answers rounded to hundredths place.

$$2x = 6 + x^2$$

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form and if appropriate, approximate answers rounded to hundredths place.

$$5x^2 = 3x - 2$$

Ex) Solve the equation using the Quadratic Formula. Write exact answers in simplest form and if appropriate, approximate answers rounded to hundredths place.

$$3x + 38 = -4x^2 - x + 1$$

Objective 3 Extra Practice

Solve each equation using the Quadratic Formula.

1. $2x = 4x^2 + 1$ (Exact answers)

2. $3x^2 + 4x + 2 = 3x$ (Approximate answers to the nearest hundredth)

3. $9 + 6x = -2x^2$ (Exact answers)

Objective 4: Determine the Type of Solutions in a Quadratic Equation

Decide if an Equation has Rational, Irrational or Complex Nonreal Solutions

1. Gather all terms of the equation on one side, into the form: $ax^2 + bx + c = 0$.
2. Plug the coefficients into the Quadratic Formula, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. Use the value of the Discriminant, $b^2 - 4ac$, to determine the type of solutions.
   - If $b^2 - 4ac$ is a perfect square, then solutions are ***Rational.***
   - If $b^2 - 4ac$ is positive but not a perfect square, then solutions are ***Irrational.***
   - If $b^2 - 4ac$ is negative, then solutions are ***Complex Nonreal (Complex Numbers with an Imaginary Part).*** They may be written as:
   - Exact answers in simplest form.
   - Approximate answers by using a calculator and rounding.

Ex) Solve the equation using Quadratic Formula. Name the type of solutions. Write exact answers in simplest form, and if needed round approximate answers to tenths.

$$4x^2 = 10x - 3$$

Ex) Solve the equation using Quadratic Formula. Name the type of solutions. Write exact answers in simplest form, and if needed round approximate answers to thousandths.

$$2x = -1 - 3x^2$$

Ex) Solve the equation using Quadratic Formula. Name the type of solutions. Write exact answers in simplest form, and if needed round approximate answers to hundredths.

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

Objective 4 Extra Practice

State the type of solutions and solve each equation using the Quadratic Formula.

1. $x^2 = x - 7$ (Exact answers)

2. $6x^2 + 4x = -3x + 3$ (Exact answers)

3. $3x^2 = 2x + 2$ (Approximate answers to the nearest thousandth)