Intro to College Math: Chapter 12.2
Quadratic Formula

Quadratic formula: $x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

1. Solve the equation using factoring or quadratic formula. $x^2 - 10x + 16 = 0$

$x^2 - 10x + 16 = 0$

$a=1$ $b=-10$ $c=16$

$\dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$ } Quadratic formula

$\dfrac{-(-10) \pm \sqrt{(-10)^2-4(1)(16)}}{2(1)}$

$x = 8, 2$

* make sure it "= 0", then...
a = # in front of x^2
b = # in front of x
c = # by itself.

* Replace each letter in the quadratic formula with it's corresponding #.

To type into calculator

1. Press fraction button $\boxed{\frac{n}{d}}$
2. Press negative button $\boxed{(-)}$
3. Press parenthesis button $\boxed{(}$
4. Type in # for "b"
5. Press close parenthesis button $\boxed{)}$
6. Press plus sign $\boxed{+}$
7. Press $\boxed{2^{nd}}$ button then $\boxed{x^2}$ button for $\sqrt{}$
8. Press open parenthesis $\boxed{(}$, type in # for "b", press close parenthesis $\boxed{)}$, then press $\boxed{x^2}$.
9. Press minus button, then #'s for "a" + "c" in parenthesis.
10. Go down & type 2 & number for "a" in ()

2. Solve the following. $x^2 - 6x + 5 = 0$

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

$a=1$, $b=-6$, $c=5$

* make sure it "$= 0$", then...
  - a = # in front of x^2
  - b = # in front of x
  - c = # by itself.

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ Quadratic formula

$$\frac{-(-6) \pm \sqrt{(-6)^2-4(1)(5)}}{2(1)}$$

* Replace each letter in the quadratic formula with it's corresponding #.
* Type into calculator.

$x = 5, 1$

* The answers will be the same for "a" + "b"

3. Solve the equation using factoring or quadratic formula. $a^2 - 9a = 0$

$a^2 - 9a = 0$

$a=1$, $b=-9$, $c=0$

* make sure it "$= 0$", then...
  - a = # in front of a^2
  - b = # in front of a
  - c = # by itself.

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ Quadratic formula

$$\frac{-(-9) \pm \sqrt{(-9)^2-4(1)(0)}}{2(1)}$$

* Replace each letter in the quadratic formula with its corresponding #.
* Then type into calculator.

$x = 9, 0$

4. Solve the following. $5x^2 + 4x = 0$

$5x^2 + 4x = 0$

$a = 5 \quad b = 4 \quad c = 0$

* make sure it "= 0", then...
  a = # in front of x^2
  b = # in front of x
  c = # by itself.

* Since there is no # by itself, "c = 0".

Quadratic formula: $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\dfrac{-4 \pm \sqrt{4^2 - 4(5)(0)}}{2(5)}$

* Replace each letter in the quadratic formula with its corresponding #.
- Then type into calculator.

$x = 0, -4/5$

To type into calculator

1. Press fraction button $\boxed{\frac{n}{d}}$
2. Press negative button $\boxed{(-)}$
3. Press parenthesis button $\boxed{(}$
4. Type in # for "b"
5. Press close parenthesis button $\boxed{)}$
6. Press plus sign $\boxed{+}$
7. Press $\boxed{2^{nd}}$ button then $\boxed{x^2}$ button for $\sqrt{}$
8. Press open parenthesis $\boxed{(}$, type in # for "b", press close parenthesis $\boxed{)}$, then press $\boxed{x^2}$.
9. Press minus button, then #'s for "a" + "c" in parenthesis.
10. Go down + type 2 + number for "a" in ( )

5. Solve the equation. $(z-2)^2 = 36$

$(z-2)^2 = 36$

* First the square outside the () means, write down the set of () twice + then multiply.

$(z-2)(z-2) = 36$

* Use foil method to multiply each term in 1st set of () by each term in 2nd set of ().

$z^2 - 2z - 2z + 4 = 36$

* combine like terms

$z^2 - 4z + 4 = 36$

$-36 \quad -36$

* move number from right side to left side.

$z^2 - 4z - 32 = 0$

* Now since it "= 0"

a = # in front of x^2

b = # in front of x

c = # by itself.

$a = 1 \quad b = -4 \quad c = -32$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Quadratic formula

$$\frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-32)}}{2(1)}$$

* Replace each letter in the quadratic formula with its corresponding #.
- Then type into calculator.

$x = 8, -4$

6. Solve the equation. $(x-2)^2 = 9$

$(x-2)^2 = 9$

$(x-2)(x-2) = 9$ ← * Use foil method to multiply each term in 1st set of ( ) by each term in 2nd set of ( ).

$x^2 - 2x - 2x + 4 = 9$ ← * combine like terms

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

$-9 \quad -9$ ← * move number from right side to left side.

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

$a = 1 \quad b = -4 \quad c = -5$

* Now since it " $=0$ ":

a = # in front of x^2

b = # in front of x

c = # by itself.

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ } Quadratic formula

$$\frac{-(-4) \pm \sqrt{(-4)^2-4(1)(-5)}}{2(1)}$$ ← * Replace each letter in the quadratic formula with its corresponding #.
- Then type into calculator.

$x = 5, -1$

7. Solve by the quadratic formula. List the solutions, separated by a comma. $-4x^2 = -18x + 20$

$$-4x^2 = -18x + 20$$

$+18x \quad +18x$

$$-4x^2 + 18x = 20$$

$-20 \quad -20$

$$-4x^2 + 18x - 20 = 0$$

$a = -4 \quad b = 18 \quad c = -20$

* move everything on the right side to the left side by adding / subtracting.

* Now since it " $=0$ ":

a = # in front of x^2

b = # in front of x

c = # by itself.

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Quadratic formula

$$\frac{-18 \pm \sqrt{(18)^2 - 4(-4)(-20)}}{2(-4)}$$

* Replace each letter in the quadratic formula with its corresponding #.
- Then type into calculator.

$x = 2, \frac{5}{2}$

8. Solve by the quadratic formula. List the solutions, separated by a comma. $15x^2 = 7x + 2$

$15x^2 = 7x + 2$

$-7x \quad -7x$

$15x^2 - 7x = 2$

$-2 \quad -2$

$15x^2 - 7x - 2 = 0$

$a = 15 \quad b = -7 \quad c = -2$

* move everything on the right side to the left side by adding / subtracting.

* Now since it " $=0$ ":

a = # in front of x^2

b = # in front of x

c = # by itself.

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Quadratic formula

$$\frac{-(-7) \pm \sqrt{(-7)^2 - 4(15)(-2)}}{2(15)}$$

* Replace each letter in the quadratic formula with it's corresponding #.
- Then type into calculator.

$x = \frac{2}{3}, -\frac{1}{5}$

9. Find all solutions of the equation by using the quadratic formula. $x^2 - 6x + 36 = 0$

$x^2 - 6x + 36 = 0$

$a = 1 \quad b = -6 \quad c = 36$

* make sure it "= 0", then...
  a = # in front of x^2
  b = # in front of x
  c = # by itself.

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ (Quadratic formula)

* If you type it all in to calculator, you get a "domain error"; so we must solve it differently.

$$\frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(36)}}{2(1)}$$

* Type into calculator every under √.

$$\frac{6 \pm \sqrt{-108}}{2}$$

* Since there is a (-) under the √, it comes out + becomes an "i"

$$\frac{6 \pm i\sqrt{108}}{2}$$

* Type √ and # into calculator

$$\frac{6 \pm 6\sqrt{3}\,i}{2}$$

* Now separate into 2 fractions, with the same denominator.

$$\frac{6}{2} \pm \frac{6\sqrt{3}}{2}\,i$$

* Simplify each fraction.

$$3 \pm 3\sqrt{3}\,i$$

$$3 + 3\sqrt{3}\,i \;,\; 3 - 3\sqrt{3}\,i$$

* For computer, must write down the equation twice, with (+) in 1st one, and (-) in 2nd one. Separate with a comma.

10. Find all solutions of the equation by using the quadratic formula. $4k^2 - 3k + 11 = 7$

$$4k^2 - 3k + 11 = 7$$
$$-7 \quad -7$$
$$4k^2 - 3k + 4 = 0$$

$a=4$ $b=-3$ $c=4$

* First move number on right to left by adding or subtracting so that it all "$=0$".

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$ Quadratic formula

* If you type it all in to calculator, you get a "domain error"; so we must solve it differently.

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

* Type into calculator every under $\sqrt{}$.

$$\frac{3 \pm \sqrt{-55}}{8}$$

* Since there is a $(-)$ under the $\sqrt{}$, it comes out + becomes an "i"

$$\frac{3 \pm i\sqrt{55}}{8}$$

* If you type $\sqrt{55}$ into calculator, it doesn't simplify

$$\frac{3}{8} \pm \frac{\sqrt{55}}{8} i$$

* Now separate into 2 fractions, with the same denominator.
- Simplify if able.

$$\frac{3}{8} + \frac{\sqrt{55}}{8} i, \quad \frac{3}{8} - \frac{\sqrt{55}}{8} i$$

* For computer, must write down the equation twice, with $(+)$ in 1st one, and $(-)$ in 2nd one. Separate with a comma.