Mathematics 10D

Q.08 – Solving By Quadratic Formula

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The quadratic formula is the formula that solves all. In order to use it, you need to setup the quadratic in standard form. The quadratic formula is derived by completing the square, then solving from the vertex form.

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

Stadard Form

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

Let's give it a try.

$$\underset{a}{5}x^2 + \underset{b}{12}x - \underset{c}{32} = 0$$

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

$$x = \frac{-12 \pm \sqrt{12^2 - 4(5)(-32)}}{2(5)}$$

$$x = \frac{-12 \pm \sqrt{144 + 640}}{10}$$

$$x = \frac{-12 \pm \sqrt{784}}{10}$$

$$x = \frac{-12 \pm 28}{10}$$

$\oplus$ $\quad x = \frac{-12 + 28}{10} = \frac{16}{10} = \frac{8}{5}$

$$x = 1.6$$

$\ominus$ $\quad x = \frac{-12 - 28}{10} = \frac{-40}{10} = -4$

$\therefore$ $x = 1.6$ and $x = -4$ are the Solutions!

Give it another go.

$$\overset{a}{5}x^2 + \overset{b}{5}x + \overset{c}{8} = 0$$

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

$$x = \frac{-5 \pm \sqrt{5^2 - 4(5)(8)}}{2(5)}$$

$$x = \frac{-5 \pm \sqrt{25 - 160}}{10}$$

$$x = \frac{-5 \pm \sqrt{-135}}{10} \quad ??$$

∴ no solutions

You cannot take the Square root of negative

Example 3.

$$4x^2 + 8x - 10 = 11$$

-11   -11

$$4x^2 + 8x - 21 = 0$$

a   b   c

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

$$x = \frac{-8 \pm \sqrt{8^2 - 4(4)(-21)}}{2(4)}$$

$$x = \frac{-8 \pm \sqrt{64 + 336}}{8}$$

$$x = \frac{-8 \pm \sqrt{400}}{8}$$

$$\rightarrow x = \frac{-8 \pm 20}{8}$$

(+) $x = \frac{-8 + 20}{8} = \frac{12}{8} = \frac{3}{2} = 1.5$

(−) $x = \frac{-8 - 20}{8} = \frac{-28}{8} = \frac{-7}{2} = -3.5$

∴ $x = \frac{3}{2}$ and $\frac{-7}{2}$ are the solutions.

Are the answers always neat?

$$11x^2 + 7x - 20 = 6x + 8x^2$$

Over the first term: $-8x^2$ $-6x$ $-6x$ $-8x^2$

$$3x^2 + 1x - 20 = 0$$

a b c

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

$$x = \frac{-1 \pm \sqrt{1^2 - 4(3)(-20)}}{2(1)}$$

$$x = \frac{-1 \pm \sqrt{241}}{2}$$

$$x = \frac{-1 \pm 15.52}{2}$$

(+) $x = \frac{-1 + 15.52}{2}$

$x = 7.26$

(−) $x = \frac{-1 - 15.52}{2}$

$x = -8.26$