Solving Quadratics by Square-Roots

MGSE9-12.A.REI.4 Solve quadratic equations in one variable.

MGSE9–12.A.REI.4b Solve quadratic equations by inspection (e.g., for x 2 = 49), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation (limit to real number solutions). Build a function that models a relationship between two quantities.

What am I learning today?

How to solve a quadratic by taking a square-root

How will I show that I learned it?

Isolate x by taking a square-root and simplifying the radical

Simplifying Square-Roots

$\pm\sqrt{144}$

± 12

$\pm\sqrt{108}$

$\sqrt{36 \cdot 3}$

$\pm 6\sqrt{3}$

$4 \pm \sqrt{60}$

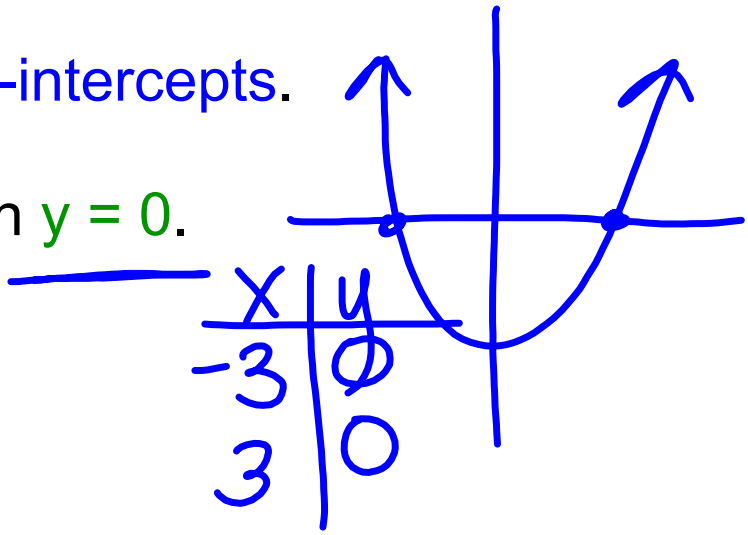
$4 \pm \sqrt{4 \cdot 15}$

$4 \pm 2\sqrt{15}$

Solving Quadratic Equations

We're looking for x-intercepts.

This happens when y = 0.



There are SEVERAL methods of solving these (but some of them only work in some special cases).

- Taking Square Roots
- Factoring ✓
- Completing the Square
- Quadratic Formula ✓

The Square Root method

Can only be used when there is no "b" term
(only an x^2 and constant).
Called **VERTEX FORM**.

Looks like:

$y = 2x^2 + 90$ or $y = (x+2)^2 - 25$

no solution

We CANNOT solve by taking square roots when the problem looks like this:

$$x^2 - x + 15 = 4$$

Steps to Solving by Taking Square Root

1. Replace the "y" with a zero (if necessary)

2. Isolate the squared term (get rid of all numbers "dangling" (added/subtracted) outside of it or attached (multiplied) to it)

3. Take the square root of both sides (remember: we are dealing with a variable so there are 2 different answers!)

4. You now have 2 problems. Simplify them separately.

Example 1

$5x^2 + 7 = 47$

$-7 \quad -7$

$\frac{5x^2}{5} = \frac{40}{5}$

$x^2 = 8$

$\sqrt{x^2} = \sqrt{8}$ 4.2

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

2.8 $2\sqrt{2}, -2\sqrt{2}$ -2.8

S.F. in calculator

$5x^2 - 40$

Example 2

$3x^2 - 6 = 21$

$+6 \quad +6$

$\frac{3x^2}{3} = \frac{27}{3}$

$x^2 = 9$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

Example 3

$-3(x-2)^2 + 75 = 0$

$-75 \quad -75$

$\frac{-3(x-2)^2}{-3} = \frac{-75}{-3}$

$(x-2)^2 = 25$

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

$x-2 = \pm 5$

$x-2=5$ | $x-2=-5$

$+2 \quad +2$ | $+2 \quad +2$

$x=7$ | $x=-3$

Example 4

$f(x) = 2(x - 5)^2 - 36$

$0 = 2(x-5)^2 - 36$

$+36 \qquad +36$

$36 = 2(x-5)^2$

$\frac{36}{2} = \frac{2(x-5)^2}{2}$

$\sqrt{18} = \sqrt{(x-5)^2}$

$9 \cdot 2$

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

$x - 5 = 3\sqrt{2}$ | $x - 5 = -3\sqrt{2}$

$+5 \quad +5$ | $+5 \quad +5$

$x = 5 + 3\sqrt{2}$ | $x = 5 - 3\sqrt{2}$

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

Example 5

$(3x - 1)^2 + 24 = 12$

$-24 \quad -24$

$\sqrt{(3x-1)^2} = \sqrt{-12}$

not possible

$3x - 1$

no solution

Example 6 $(2x + 4)^2 - 12 = 12$

$+12 \quad +12$

$\sqrt{(2x+4)^2} = \sqrt{24}$

$2x + 4 = \pm 2\sqrt{6}$

$2x + 4 = 2\sqrt{6}$ $\quad -4 \quad -4$

$\frac{2x}{2} = \frac{-4 + 2\sqrt{6}}{2}$

$x = -2 + \sqrt{6}$

$2x + 4 = -2\sqrt{6}$ $\quad -4 \quad -4$

$\frac{2x}{2} = \frac{-4 - 2\sqrt{6}}{2}$

$x = -2 - \sqrt{6}$

Skills Ck

1) Solve by Factor
2) Discriminant
   Nature of Roots
3) Solve Q.F.