

Quadratics 4a- Solving Quadratic Equations Using Square Roots

Standards: A-REI.4b, F-IF.8a

Math Practices: Look for and make use of structure

GLOs: #3 Complex Thinker **HW#14**

Learning Target:

- How do you solve Quadratics using square roots?

Example 1

Given $x^2 - 5 = 0$, solve for x.

Describe steps used to solve for x below.

$$+ \cancel{5} = + \cancel{5}$$

Property of equality : Add 5 to each side

$$x^2 = \underline{5}$$

Simplify

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

Find the square root. Note: There are two answers, the square root, which is always positive, and the negative of that same value.

$$x \approx \pm \underline{2.236}$$

If necessary, approximate the two answers to three decimal places using a calculator

Practice Problems - Solve for x:

a) $x^2 - 121 = 0$
 $+121 \quad +121$

$$\sqrt{x^2} = \sqrt{121}$$

$$x = \pm 11 \text{ or}$$

$$x = 11 \text{ \& } -11$$

b) $x^2 - 16 = 0$
 $+16 \quad +16$

$$\sqrt{x^2} = \sqrt{16}$$

$$x = \pm 4$$

c) $x^2 = 7$

$$x = 2.6457$$

$$x \approx \pm 2.646$$

Find the x-intercepts for the following quadratic functions. Be sure to give both coordinates.

d) $f(x) = x^2 - 81$
x-int: (set $y=0$ & solve)

$$0 = x^2 - 81$$

$$+81 \quad +81$$

$$\sqrt{81} = \sqrt{x^2}$$

$$x = \pm 9$$

$$(9,0) \text{ \& } (-9,0)$$

e) $g(x) = x^2 - 2$

$$0 = x^2 - 2$$

$$+2 \quad +2$$

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

$$x = \pm 1.414$$

$$(1.414,0) \text{ \& } (-1.414,0)$$

f) $h(x) = x^2 - 169$
x-int: ($y=0$ & solve)

$$0 = x^2 - 169$$

$$+169 \quad +169$$

$$\sqrt{169} = \sqrt{x^2}$$

$$x = \pm 13$$

$$(13,0) \text{ \& } (-13,0)$$

Ex 2: Given $3x^2 - 12 = 0$, solve for x.

Describe steps:

$$+ \underline{12} = + \underline{12}$$

add 12 to both sides

$$3x^2 = \underline{12}$$

simplify

$$\frac{\cancel{3}x^2}{\cancel{3}} = \frac{12}{\cancel{3}}$$

÷ both sides by 3

$$\sqrt{x^2} = \pm \sqrt{\underline{4}}$$

square root both sides

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

2. Practice Problems - Solve for x:

a) $4x^2 - 36 = 0$
 $\quad \quad \quad +36 \quad +36$

$$\frac{\cancel{4}x^2}{\cancel{4}} = \frac{36}{\cancel{4}}$$

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

$$\boxed{x = \pm 3}$$

b) $3x^2 - 300 = 0$
 $\quad \quad \quad +300 \quad +300$

$$\frac{\cancel{3}x^2}{\cancel{3}} = \frac{300}{\cancel{3}}$$

$$\sqrt{x^2} = \sqrt{100}$$

$$\boxed{x = \pm 10}$$

c) $5x^2 - 720 = 0$
 $\quad \quad \quad +720 \quad +720$

$$\frac{\cancel{5}x^2}{\cancel{5}} = \frac{720}{\cancel{5}}$$

$$\sqrt{x^2} = \sqrt{144}$$

$$\boxed{x = \pm 12}$$

EX 3:Given $(x-3)^2 - 81 = 0$, solve for x.

Describe steps:

$$+ \underline{81} = + \underline{81}$$

add 81 to both sides

$$(x-3)^2 = \underline{81}$$

Simplify

$$\sqrt{(x-3)^2} = \pm \sqrt{81}$$

square root both sides

$$(x-3) = \pm \underline{9}$$

$$(x-3) = \frac{+9}{+3} \text{ or } (x-3) = \frac{-9}{+3}$$

*There are 2 answers and you need solve for both!

$$x = \underline{12 \text{ \& } -6}$$

EX 4:Given $3(x-2)^2 - 48 = 0$, solve for x.

Describe steps:

$$+ \underline{48} = + \underline{48}$$

add 48 to both sides

$$3(x-2)^2 = \underline{48}$$

Simplify

$$\frac{3(x-2)^2}{3} = \frac{48}{3}$$

÷ both sides by 3

$$(x-2)^2 = \underline{16}$$

simplify

$$\sqrt{(x-2)^2} = \pm \sqrt{16}$$

square root both sides

$$x-2 = \frac{+4}{+2} \text{ or } x-2 = \frac{-4}{+2}$$

There are 2 answers and you need solve for both!

$$x = \underline{6 \text{ \& } -2}$$

Practice Problems - Solve for x:

$$a) 4(x-5)^2 - 144 = 0$$

~~+144 +144~~

$$\frac{4(x-5)^2}{4} = \frac{144}{4}$$

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

$$x-5 = \pm 6$$

$$x-5 = 6 \quad x-5 = -6$$

~~+5 +5~~ ~~+5 +5~~

$$x = 11 \quad x = -1$$

$$\boxed{x = 11 \text{ \& } -1}$$

$$b) 3(x-7)^2 - 300 = 0$$

~~+300 +300~~

$$\frac{3(x-7)^2}{3} = \frac{300}{3}$$

$$\sqrt{(x-7)^2} = \sqrt{100}$$

$$x-7 = \pm 10$$

$$x-7 = 10 \quad x-7 = -10$$

~~+7 +7~~ ~~+7 +7~~

$$x = 17 \quad x = -3$$

$$\boxed{x = 17 \text{ \& } -3}$$

$$c) 5(x+13)^2 - 720 = 0$$

~~+720 +720~~

$$\frac{5(x+13)^2}{5} = \frac{720}{5}$$

$$\sqrt{(x+13)^2} = \sqrt{144}$$

$$x+13 = \pm 12$$

$$x+13 = 12 \quad x+13 = -12$$

~~-13 -13~~ ~~-13 -13~~

$$x = -1 \quad x = -25$$

$$\boxed{x = -1 \text{ \& } -25}$$