10.4 Use Square Roots to Solve Quadratic Equations

These QE's must be in the form $x^2 = \#$

There are 3 types of solutions

Goal • Solve a quadratic equation by finding square roots.

Your Notes

SOLVING $x^2 = N$ BY TAKING SQUARE ROOTS – Where "N" is a real number.

- If $N > 0$, then $x^2 = N$ has 2 solutions: $x = \pm\sqrt{N}$
- If $N = 0$, then $x^2 = 0$ has 1 solution: $x = 0$.
- If $N < 0$, then $x^2 = N$ has NO solution.

EX $x^2 = 64$

$x = 8, -8$

EX $x^2 = 0$

$x = 0$

EX $x^2 = -100$

$x =$ NO SOLUTION

You can not take the SQ ROOT OF A NEG. #.

↳ ALG 2 $x = \pm 10i$

Example 1 *Solve quadratic equations* { NOTE: THERE ARE 3 TYPES OF SOLUTIONS.

Solve the equation. LEAVE SOLUTIONS IN SIMPLE RADICAL FORM

a $z^2 - 5 = 4$

$+5 \quad +5$

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

$z = \pm 3$

OR

$z = 3, -3$

STEP 1: ISOLATE x^2

Write original equation.

Add 5 to each side.

Take square roots of each side. ← STEP 2

Simplify. The solutions are 3 and −3.

STEP 3 Check in ORIG EQ

C: $z = 3$: $(3)^2 - 5 = 4$, $4 = 4$ ✓

C: $z = -3$: $(-3)^2 - 5 = 4$, $4 = 4$ ✓

b $r^2 + 7 = 4$

$-7 \quad -7$

$\sqrt{r^2} = \sqrt{-3}$

Write original equation.

Subtract 7 from each side.

* We can not take the SQ ROOT OF A NEGATIVE NUMBER

So, ~~X~~ R = NO SOLUTION

c $25x^2 = 9$

$\frac{25x^2}{25} = \frac{9}{25}$

$\sqrt{x^2} = \frac{\sqrt{9}}{\sqrt{25}}$

$x = \pm\frac{3}{5}$

C: $x = -\frac{3}{5}$

$9 = 9$ ✓

c $25k^2 = 9$ Write original equation.

$k^2 =$ ____ Divide each side by ____.

$k =$ ____ Take square roots of each side.

$k =$ ____ Simplify. The solutions are ____ and ____.

DO HW LIKE THESE

Your Notes

Checkpoint Solve the equation. AND CHECK!

1. $3x^2 = 108$	2. $t^2 + 17 = 17$	3. $81p^2 = 4$
$\frac{3}{3} \quad \frac{108}{3}$	$-17 \quad -17$	$\frac{81}{81} \quad \frac{4}{81}$
$\sqrt{x^2} = \sqrt{36}$	$\sqrt{t^2} = \sqrt{0}$	$\sqrt{p^2} = \frac{\sqrt{4}}{\sqrt{81}}$
$x = \pm 6$	$t = 0$	$p = \pm \frac{2}{9}$
C: $x = -6$	C: $17 = 17$ ✓	C: $x = -2/9$
$3(-6)^2 = 108$		$4 = 4$ ✓
$108 = 108$ ✓		

① ISOLATE

MUST show Taking √

② SOLVE

remember ±

Check the - #

③ Check

UNLESS OTHERWISE TOLD
ROUND TO 2 Decimals
I.E. X.XX
5+ ↓
0-4

Example 2 *Approximate solutions of a quadratic equation*

Solve $4x^2 + 3 = 23$. Round the solutions to the nearest hundredth. When do you round? ALWAYS ROUND ON THE FINAL STEP!! To minimize potential rounding error.

Solution

$4x^2 + 3 = 23$ — Write original equation.

$4x^2 =$ ____ — STEP 1 ISOLATE x^2: Subtract 3 from each side.

$x^2 =$ ____ — Divide each side by 4.

$x =$ ____ — STEP 2: Take square roots of each side.

$x \approx$ ____ — Use a calculator. Round to the nearest hundredth. APPROX SYMBOL → ≈ (Same: ≅, ≃, ≒)

The solutions are about 2.24 and −2.24.

$4x^2 + 3 = 23$
$-3 \quad -3$
$4x^2 = 20$
$\frac{4x^2}{4} = \frac{20}{4}$
$\sqrt{x^2} = \sqrt{5}$
EXACT ANSWER → $x = \pm\sqrt{5}$
$x \approx \pm 2.24$

USE CALC TO CHECK!

C: $x = 2.24$
$23.07 \approx 23$
These numbers should be very, very close

C: $x = -2.24$
$23.07 \approx 23$

Checkpoint Solve the equation. Round the solutions to the nearest hundredth.

Do HW Like These →

① Isolate x^2
② Take $\sqrt{}$
③ Check w/ Calc the negative # IN THE ORIG. EQ

4. $2x^2 - 7 = 9$
$+7 \quad +7$
$\frac{2x^2}{2} = \frac{16}{2}$
$\sqrt{x^2} = \sqrt{8}$
exact → $x = \pm\sqrt{8}$
approx. → $x \approx \pm 2.83$
C: $x = -2.83$
$9.02 \approx 9$ ✓

5. $6g^2 + 1 = 19$
$-1 \quad -1$
$\frac{6g^2}{6} = \frac{18}{6}$
$\sqrt{g^2} = \sqrt{3}$
$g = \pm\sqrt{3}$
$g \approx \pm 1.73$
C: $g = -1.73$
$18.96 \approx 19$ ✓