12 Solve by Square Root Principle

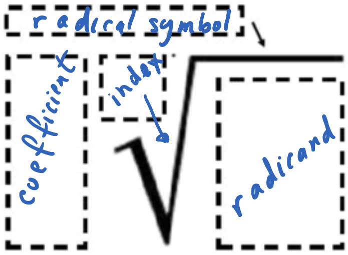
October 31, 2019 7:13 PM

FOM 11 Ch 7 Day 12 Solving Quadratic Equations by the Square Root Principle (7.5)

Methods for solving a Quadratic Equation:

- Graphing ✓
- Factoring ✓
- Square Root Principle ←
- Quadratic Formula

Parts of a Radical



$3\sqrt{5}$

$\sqrt{7}$

$\sqrt[3]{27}$

If the index is not written, it is automatically a 2.

↳ square root

What is a prime number?

can only be divided by 1 & itself

(but 1 is not prime!)

Write the prime numbers under 50 here:

2, 3, 5, 7, 11, 13,

To take the square root of a number, we need to write the *prime factorization* of it (i.e., break it down into prime number factors).

FACTOR TREE METHOD

- Write the given number to begin.
- Choose two numbers which multiply to the given number. These two numbers will form your first two branches.
- If the number is prime, circle it. You will not need to do anything else to this number.
- If the number is composite, find two numbers which multiply to the other number. These new numbers will form new branches.
- Continue until all branches have ended in prime numbers.

EXAMPLE: FIND THE PRIME FACTORIZATION OF 120.

☆ $\sqrt{\text{negative number}}$

$\Rightarrow$ No Solution!

ex. $\sqrt{-4}$

$\sqrt{2\cdot 2} = \sqrt{4}$

$\sqrt{(-2)(-2)} = \sqrt{4}$

Find the prime factorization of:

a) 48 $\quad 4 \times 12$

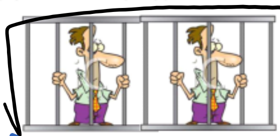
$= 2\cdot 2\cdot 2\cdot 2\cdot 3$

b) 38 $= 2 \times 19$

c) 88 $= 2 \times 44$

$= 2\cdot 2\cdot 2\cdot 11$

When taking the square root of a number, write its prime factorization. "Twins" can "escape" from square root jail but only 1 twin makes it out alive!



Square root jail

Find the square root of each number from above:

a) $\sqrt{48} = \sqrt{2\cdot 2\cdot 2\cdot 2\cdot 3}$

$= 2\cdot 2\sqrt{3}$

$= 4\sqrt{3}$

b) $\sqrt{38} = \sqrt{2\cdot 19}$

If no twins, multiply the numbers back!

$= \sqrt{38}$

c) $\sqrt{88} = \sqrt{2\cdot 2\cdot 2\cdot 11}$

$= 2\sqrt{2\cdot 11}$

$= 2\sqrt{22}$

$\sqrt{25} = \sqrt{5\cdot 5} = 5$

Solving Quadratic Equations by the Square Root Principle

$\sqrt{16} = \sqrt{4 \cdot 4} = 4$

The Square Root Principle: If $x^2 = k$, then $x = \pm\sqrt{k}$.

$x = \pm\sqrt{k}$ means "$x = +\sqrt{k}$ or $x = -\sqrt{k}$"

$\sqrt{\text{something}^2} = \text{something}$

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

$x = 5$ because $5 \cdot 5 = 25$

$x = -5$ because $(-5)(-5) = 25$

$\boxed{x = \pm 5}$

When $b = 0$, the quadratic equation $ax^2 + bx + c = 0$ becomes $ax^2 + c = 0$. If this equation has a solution, it can be solved by the SQUARE ROOT PRINCIPLE.

Use this method when $x^2 = \#$

$(x + \square)^2 = \#$

Example 1: Solved each equation by the Square Root Principle.

a. $3x^2 - 7 = 8$ Isolate the square

$+7 \quad +7$

$3x^2 = 15$

$\frac{3x^2}{3} = \frac{15}{3}$

$\sqrt{x^2} = \sqrt{5}$ Take $\sqrt{\ }$ of both sides.

$x = \pm\sqrt{5}$

b. $\sqrt{(x+3)^2} = \sqrt{20}$

$x + 3 = \pm\sqrt{20}$

$-3 \quad -3$

$x = -3 \pm \sqrt{20}$

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

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

20

2 10

2 5

$\sqrt{20} = \sqrt{2 \cdot 2 \cdot 5}$

$2\sqrt{5}$

c. $2x^2 + 5 = 25$

$-5 \quad -5$

$2x^2 = 20$

$\frac{2x^2}{2} = \frac{20}{2}$

$\sqrt{x^2} = \sqrt{10}$

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

e) $\sqrt{(x+2)^2} = \sqrt{64}$

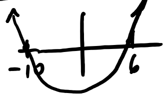
$x + 2 = \pm 8$

$-2 \quad -2$

$x = -2 \pm 8$

$x = -2 + 8$ $\quad$ $x = -2 - 8$

$\boxed{x = 6}$ $\quad$ $\boxed{x = -10}$



d) $\sqrt{(x-1)^2} = \sqrt{8}$

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

$+1 \quad +1$

$\boxed{x = 1 \pm 2\sqrt{2}}$

8

2 4

2 2

$\sqrt{2 \cdot 2 \cdot 2}$

$= 2\sqrt{2}$

Assignment: Square Root Principle Worksheet.