7.5) Solving Equation with radicals:

Basic principle \((\sqrt{x})^2 = x\)

\[ (\sqrt[3]{x})^3 = x \]

Use the power that matches the index of the radical to cancel the radical.

Solve:

Example \(3\sqrt[3]{x^3 + 7} = (x+1) \quad \text{apply cube power both sides.}\)

\[ \left(\sqrt[3]{x^3 + 7}\right)^3 = (x+1)^3 \]

Right side:

\[ x^3 + 7 = (x+1)(x+1)(x+1) \]
\[ x^3 + 7 = (x^2 + 2x + 1)(x+1) \]
\[ x^3 + 7 = x^3 + 2x^2 + x + x^2 + 2x + 1 \]
\[ x^3 + 7 = x^3 + 3x^2 + 3x + 1 \]

Check our answers:

\[ \sqrt[3]{(-2)^3 + 7} = 2 \]
\[ \sqrt[3]{(-8) + 7} = -1 \]
\[ \sqrt[3]{-1} = -1 \]
\[ -1 = -1 \]

\[ \sqrt[3]{(1)^3 + 7} = 2 \]
\[ \sqrt[3]{8} = 2 \]
\[ 2 = 2 \]
Solve: 
\[ \sqrt{-x+2} = x-2 \]

\[ (\sqrt{-x+2})^2 = (x-2)^2 \]. To cancel \( \sqrt{\quad} \) we need power 2

\[ -x + 2 = (x-2)(x-2) \]

\[ -x + 2 = x^2 - 4x + 4 \]

\[ x^2 - 4x + 4 + x - 2 = 0 \]

\[ x^2 - 3x + 2 = 0 \]

\[ (x-2)(x-1) = 0 \]

\[ x-2 = 0 \]

\[ x-1 = 0 \]

\[ x = 2 \quad x = 1 \]

the solution \( \{1, 2\} \).

We have to check the solutions.

\( x = 2 \)

\[ \sqrt{-x+2} = x-2 \]

\[ \sqrt{-2+2} = 2-2 \]

\[ \sqrt{0} = 0 \quad \checkmark \]

\( x = 1 \)

\[ \sqrt{-1+2} = 1-2 \]

\[ \sqrt{1} = -1 \]

\( 1 \neq -1 \)

not correct.

The only acceptable solution is \( \{2\} \).

In class Problem:

\[ r-9 = \sqrt{2r-3} \]
7. Geometric Applications of Radical

Pythagorean Theorem
for Right Triangles

\[ a^2 + b^2 = c^2 \]

#21) \[ a = 10 \text{ cm} \] and \[ c = 26 \text{ cm} \] find \[ b \].

\[ c^2 = a^2 + b^2 \]
\[ (26)^2 = (10)^2 + b^2 \]
\[ 676 = 100 + b^2 \]
\[ 576 = b^2 \]
\[ b = 24 \text{ cm} \]

#69) a bone \( \rightarrow (34) \text{ inch} \)
ship in a box \( \rightarrow 4 \text{ inch tall} \) box and it has
a 24\text{-inch square base.

\[ C^2 = a^2 + b^2 \]
\[ (24)^2 + (24)^2 \]
\[ = 1152 \]
\[ C^2 = 1152 \Rightarrow C = 33.9 \]

C will not fit sitting on the bottom.

Use the diagonal from lower corner to upper corner.

\[ C^2 = (33.9)^2 + (4)^2 \]
\[ = 1152 + 16 \]
\[ C^2 = 1168 \]
\[ C = 34.2 \Rightarrow \text{it will just fit}\]
\[ b = 90 + 10 = 100 \text{ ft}. \]
\[ a = 90 \]

\[ C^2 = a^2 + b^2 \]
\[ = (90)^2 + (100)^2 = 8100 + 10000 \]
\[ C^2 = 18100 \]
\[ C = 134.54 \text{ ft}. \]

**Special Triangles:**

\[ a = b \]

\[ a = \frac{1}{2} c \]

Find \( a, b \).

\[ a = \frac{1}{2} c = 25 \text{ cm}. \]
2nd In Class Problem

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#37) Given the right triangle

Find c and x.