

More Than One Radical

“Sometimes we will encounter a problem with more than one radical. What do you think we should do here? Same idea applies, we will square (cube, raise to the power needed) both sides to eliminate the radical.”

Ex 4: $\sqrt{x-3} = \sqrt{2x+4}$			You Try: $\sqrt{3x+5} = \sqrt{x-6}$ (Use any method)
$\sqrt{x-3} = \sqrt{2x+4}$ $x-3 = 2x+4$ $x-3 = x+x+4$ $x-3 = x+x+4$ $-3 = x+4$ $-3+4-4 = x+4$ $-3+4-4 = x+4$ $-7 = x$ $x = -7$	$\sqrt{x-3} = \sqrt{2x+4}$ $(\sqrt{x-3})^2 = (\sqrt{2x+4})^2$ $x-3 = 2x+4$ $x-x-3 = 2x-x+4$ $-3 = x+4$ $-3-4 = x+4-4$ $-7 = x$ $x = -7$	$\sqrt{x-3} = \sqrt{2x+4}$ $\left[(x-3)^{\frac{1}{2}}\right]^2 = \left[(2x+4)^{\frac{1}{2}}\right]^2$ $x-3 = 2x+4$ $x-3 = x+x+4$ $-3 = x+4$ $-3-4 = x+4-4$ $-7 = x$ $x = -7$	$\sqrt{3x+5} = \sqrt{x-6}$ $(\sqrt{3x+5})^2 = (\sqrt{x-6})^2$ $3x+5 = x-6$ $3x-x+5 = x-x-6$ $2x+5 = -6$ $2x = -11$ $\frac{2x}{2} = \frac{-11}{2}$ $x = \frac{-11}{2}$
Check!	Check!	Check!	Check!

Ex. 5: $\sqrt{x-1} = x-7$		
$\sqrt{x-1} = x-7$ $(\sqrt{x-1})^2 = (x-7)^2$ $x-1 = (x-7)(x-7)$ $x-1 = x^2 - 14x + 49$ $x-x-1+1 = x^2 - 14x - x + 49 + 1$ $0 = x^2 - 15x + 50$ $0 = (x-5)(x-10)$ $\therefore x = 5 \text{ and } 10$	Extraneous Solutions: Solutions that do not satisfy the original equation. Must check each solution in the original equation.	
	Let $x = 5$ $\sqrt{x-1} = x-7$ $\sqrt{5-1} = 5-7$ $\sqrt{4} \neq -2$	Let $x = 10$ $\sqrt{x-1} = x-7$ $\sqrt{10-1} = 10-7$ $\sqrt{9} = 3$

You Try: $\sqrt{x-2} = -x+4$

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

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

$$x-2 = (-x+4)(-x+4)$$

$$x-2 = x^2 - 8x + 16$$

$$0 = x^2 - 9x + 18$$

$$0 = (x-3)(x-6)$$

$$x = 3 \text{ and } 6$$

Check for Extraneous Solutions

Let $x = 3$

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

$$\sqrt{3-2} = -3+4$$

$$\sqrt{1} = 1$$

Let $x = 6$

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

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

$$\sqrt{4} \neq -2$$

Activity:**Group/pair Activity**

Directions: Put students into groups of 2-4. Cut out pieces (steps and reasons are not in order except for the given equation and check). Students will put the solution steps in order as well as matching the reason to each step. Have them copy examples into their notebook (or glue pieces in their notebook).

Proof 1

Steps	Reasons
$\sqrt{2x-1} + 5 = 8$	Given Equation
$2x - 1 = 9$	Simplify
$\sqrt{2x-1} = 3$	Square both sides to eliminate the square root.
$2x = 10$	Division Property of Equality
$\sqrt{2x-1} + 5 - 5 = 8 - 5$	Isolated square root
$(\sqrt{2x-1})^2 = (3)^2$	Addition Property of Equality
$x = 5$	Subtraction Property of Equality

$\frac{2x}{2} = \frac{10}{2}$	Simplify
$2x - 1 + 1 = 9 + 1$	Simplify
$\sqrt{2(5) - 1} + 5 = 8$ $\sqrt{10 - 1} + 5 = 8$ $\sqrt{9} + 5 = 8$ $3 + 5 = 8$	Check

Proof 2

Steps	Reasons
$x - 1 = \sqrt{5x - 9}$	Given Equation
$x^2 - 2x + 1 = 5x - 9$	Binomial Expansion
$(x - 1)(x - 1) = 5x - 9$	Factored

$(x - 1)^2 = (\sqrt{5x - 9})^2$	Used Zero Product Property
$x = 5$ or 3	Square both sides to eliminate the square root.
$(x - 5)(x - 3) = 0$	Set equal to zero
$x^2 - 7x + 10 = 0$	Multiplied Binomials
$5 - 1 = \sqrt{5(5) - 9}$ $3 - 1 = \sqrt{5(3) - 9}$ $4 = \sqrt{16}$ $2 = \sqrt{4}$ $2 \neq \sqrt{6}$ $2 = 2$	Check for Extraneous Solutions!

Answer Key:

Steps	Reasons
$\sqrt{2x-1}+5=8$	Given Equation
$\sqrt{2x-1}+5-5=8-5$	Subtraction Property of Equality
$\sqrt{2x-1}=3$	Isolate square root
$(\sqrt{2x-1})^2=(3)^2$	Square both sides to eliminate the square root.
$2x-1=9$	Simplify
$2x-1+1=9+1$	Addition Property of Equality
$2x=10$	Simplify
$\frac{2x}{2}=\frac{10}{2}$	Division Property of Equality
$x=5$	Simplify
$\sqrt{2(5)-1}+5=8$ $\sqrt{10-1}+5=8$ $\sqrt{9}+5=8$ $3+5=8$	Check

Steps	Reasons
$x-1=\sqrt{5x-9}$	Given Equation
$(x-1)^2=(\sqrt{5x-9})^2$	Square both sides to eliminate the square root.
$(x-1)(x-1)=5x-9$	Binomial Expansion
$x^2-2x+1=5x-9$	Multiplied Binomials
$x^2-7x+10=0$	Set equal to zero
$(x-5)(x-3)=0$	Factored
$x=5$ or 3	Used Zero Product Property
$5-1=\sqrt{5(5)-9}$ $3-1=\sqrt{5(3)-9}$ $4=\sqrt{16}$ $2=\sqrt{4}$ $2\neq\sqrt{6}$ $2=2$	Check for Extraneous Solutions!

Assessment:

Exit Ticket:

Match the reasons to the steps. Pick the step the step one would take to get to the next line in the equation. Reason could be used more than once and some not at all.

1) $2\sqrt{x-7} - 6 = 12$

Given

2) $2\sqrt{x-7} = 18$

3) $\sqrt{x-7} = 9$

4) $x - 7 = 81$

5) $x = 88$

a) Take the square root

b) Division Property of Equality

c) Addition Property of Equality

d) Subtraction Property of Equality

e) Square both sides

Warm-Up:

CST/CAHSEE:	Review:
<p>Which of the following conclusions is true about the statement below?</p> $x^2 = \sqrt{x}$ <p>A The statement is always true. B The statement is true when x is negative. C The statement is true when $x = 0$. D The statement is never true.</p> <p>What are some issues that arise when teaching students about a variable as a radicand?</p>	<p>Let $x = 3$ and $x = 5$. Determine if both numbers are solutions to the equation</p> $x - 1 = \sqrt{5x - 9}$
Current:	

Solve $2(3x + 5) + 6 = 10$ using two different methods. Describe the method.

Today's Objective/Standards: Common Core Standard: A-REI-2: Solve simple rational and radical equations in one variable and give examples how extraneous solutions may arise.

Warm-Up: Answer Key

CST/CAHSEE:	Review:
<p>Which of the following conclusions is true about the statement below?</p> $x^2 = \sqrt{x}$ <p>A The statement is always true.</p> <p>B The statement is true when x is negative.</p> <p>C The statement is true when $x = 0$.</p> <p>D The statement is never true.</p> <p>What are some issues that arise when teaching students about a variable as a radicand?</p>	<p>Let $x = 3$ and $x = 5$. Determine if both numbers are solutions to the equation</p> $x - 1 = \sqrt{5x - 9}$ <p>Only $x = 5$ is a solution.</p>
<p>Current:</p>	

Solve $2(3x + 5) + 6 = 10$ using two different methods. Describe the method.

Samples:

$$\begin{aligned} \frac{2(3x+5)}{2} + \frac{6}{2} &= \frac{10}{2} \\ (3x+5) + 3 &= 5 \\ (3x+5) &= 2 \\ 3x &= -3 \\ x &= -1 \end{aligned}$$

$$\begin{aligned} 2(3x+5) + 6 &= 10 \\ 2(3x+5) + 6 &= 4 + 6 \\ 2(3x+5) &= 4 \\ 2(3x+5) &= 2 \cdot 2 \\ (3x+5) &= 2 \\ 3x &= -3 \\ x &= -1 \end{aligned}$$

Today's Objective/Standards: Common Core Standard: A-REI-2: Solve simple rational and radical equations in one variable and give examples how extraneous solutions may arise.