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Mr. Rogove Date:_____

Learning Objective: We will find positive solutions for equations involving square roots and cube roots. (Lesson 71)

Activating Prior Knowledge:

We can solve linear equations (solve for x)

$-2(5x-3) = x + 28$ $-10x+6 = x+28$ $-x \quad -x$ $-11x+6 = 28$ $-6 \quad -6$ $\frac{-11x}{-11} = \frac{22}{-11}$ $x = -2$	$9x - 5 = \frac{1}{3}(6x - 78)$ $x = -3$

Concept Development:

Solving non-linear equations has some of the same elements…our goal remains the same in solving equations: Isolate the variable
Solve for x

We can simplify the expressions until we have the form of $x^2 = p$ *or* $x^3 = p$ and then take the square root or cube root of both sides of the equation to solve for x.

Need to be positive!!

$x^2 = -4$
$\sqrt{-4}$ Alg 2!
$2i$

Example:

$x^3 + 9x = \frac{1}{2}(18x + 54)$
$x^3 + 9x = 9x + 27$
$-9x \quad -9x$
$x^3 = 27$
$\sqrt[3]{x^3} = \sqrt[3]{27}$
$x = 3$

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Guided Practice:

Steps to Solving Equations Involving Square Roots and Cube Roots

1. Use the properties of equality to transform the equation to the form of $x^2 = p$ *or* $x^3 = p$.
2. Solve for x by taking the square root (or cube root) of both sides of the equation.
3. Check your work by substituting the positive solution for your unknown value into the exercise.

$x^2 + 4x = 4(x + 16)$ $x^2+4x = 4x+64$ $-4x \quad -4x$ $x^2 = 64$ $\sqrt{x^2} = \sqrt{64}$ $x = 8$ CHECK: $(8)^2+4(8)=4(8+16)$ $64+32=4(24)$ $96 \stackrel{\checkmark}{=} 96$ $8^2 = 64$ No! $64 \stackrel{\checkmark}{=} 64$	$x^2 - 14 = \underline{5x} + 67 - \underline{5x}$ ✗ $x^2-14=67$ $+14 \quad +14$ $x^2=81$ $\sqrt{x^2}=\sqrt{81}$ $x=9$ $67 \stackrel{\checkmark}{=} 67$
$x(x + 4) - 3 = 4(x + 19.5)$ $x^2+4x-3=4x+78$ $-4x+3 \quad -4x+3$ $x^2=81$ $x=9$ CHECK: $9(9+4)-3=4(9+19.5)$ $9(13)-3=4(28.5)$ $117-3=114$ $114 \stackrel{\checkmark}{=} 114.$	$x(x - 1) = 121 - x$

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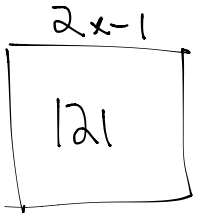
A square yard has a side length $2x - 1$ and an area of 121 square yards. What is the value of x?

$(2x-1)^2 = 121$

$\sqrt{(2x-1)^2} = \sqrt{121}$

$2x-1 = 11$

$x = 6$



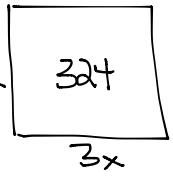
A square has a side length of $3x$ and an area of 324 square inches. What is the value of x?

$3x^2 \neq (3x)^2$

$\sqrt{324}$

$\frac{3x}{3} = \frac{18}{3}$

$x = 6$



$\sqrt{(3x)^2} = \sqrt{324}$

$3x = 18 \quad x = 6$

$(3x)^2 = 324$

$\frac{9x^2}{9} = \frac{324}{9}$

$x^2 = 36 \quad x = 6$

$(4x)^3 = 1{,}728$

$\frac{64x^3}{64} = \frac{1728}{64}$

$x^3 = 27$

$\sqrt[3]{x^3} = \sqrt[3]{27}$

$x = 3$

$(4x)^3 = 1728$

$\sqrt[3]{(4x)^3} = \sqrt[3]{1728}$

$\frac{4x}{4} = \frac{12}{4}$

$x = 3$

$-3x^3 + 14 = -67$

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$x(2x^2-5)+3x=-2x+1024$

$2x^3-5x+3x=-2x+1024$

$2x^3-2x=-2x+1024$

$+2x \quad +2x$

$\frac{2x^3}{2}=\frac{1024}{2}$

$x^3=512$

$\sqrt[3]{x^3}=\sqrt[3]{512}$

$\boxed{x=8}$

$216+x=x(x^2-5)+6x$ ✳

$216+x=x^3-5x+6x$

$216+x=x^3+x$

$-x \quad -x$

$216=x^3$

$\sqrt[3]{216}=\sqrt[3]{x^3}$

$\boxed{6=x}$

$\left(6\sqrt{2x}\right)^2-2x=\frac{1}{2}(144-4x)$

$6^2\sqrt{4x^2}-2x=72-2x$

$36\cdot 2x-2x=72-2x$

$+2x \quad +2x$

$\frac{72x}{72}=\frac{72}{72}$

$\boxed{x=1}$

$(\sqrt{x})^2=\sqrt{x}\cdot\sqrt{x}=\sqrt{x^2}=x$

CHECK:

$(6\sqrt{2\cdot 1})^2-2(1)=\frac{1}{2}(144-4(1))$

$(6^2\cdot 2)-2=72-2$

$72-2=70$

$70=70$

$\left(2\sqrt{x}\right)^2-(6x+2)=3(3-2x)+29$ ✳

$2^2\cdot\sqrt{x^2}-6x-2=9-6x+29$

$4x-6x-2=38-6x$

$+6x \quad +6x$

$4x-2=38$

$+2 \quad +2$

$\frac{4x}{4}=\frac{40}{4}$

$\boxed{x=10}$

CHECK:

$(2\sqrt{10})^2-(6(10)+2)=3(3-2(10))+29$

$40-62=9-60+29$

$-22=-22$

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Independent Practice:

No ind Prac. Can give out homework

Closure:

Solve for x:

$$\frac{1}{2}(2x^2 + 10) = 30$$

$x(2x^2)$ $x(x^2+2)$

$x \cdot 2 \cdot x \cdot x$ $2x^3$ x^3+2x

Notes:

Aligns to lesson 5 grade 8 module 7. Homework should be problem set from lesson 5.