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Quiz - Factoring Lesson #6
Solving Quadratic Equations by Factoring (v13a)

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1. Solve the following quadratic equations.

a. $x^3 + 13x^2 + 30x = 0$

$$x(x^2 + 13x + 30) = 0$$

$$x(x+10)(x+3) = 0$$

↓ ↓ ↓

$$x = 0, -10, -3$$

b. $9x^2 + 6x + 1 = 0$

$$(3x+1)(3x+1) = 0$$

$$x = -\frac{1}{3}$$

c. $3x^2 = 23x + 8$

$$3x^2 - 23x - 8 = 0$$

$$(3x+1)(x-8) = 0$$

$$x = -\frac{1}{3}, 8$$

d. $2y^2 - 18 = 0$

$$2(y^2 - 9) = 0$$

$$2(y+3)(y-3) = 0$$

$$y = \pm 3$$

e. $(x+2)^2 = 6x + 28$

$$x^2 + 4x + 4 = 6x + 28$$

$$x^2 - 2x - 24 = 0$$

$$(x-6)(x+4) = 0$$

$$x = 6, -4$$

f. $(2x+3)(2x-3) = 1 - 6x$

$$4x^2 - 9 = 1 - 6x$$

$$4x^2 + 6x - 10 = 0$$

$$2(2x^2 + 3x - 5) = 0$$

$$2(2x+5)(x-1) = 0$$

$$x = -\frac{5}{2}, 1$$

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Quiz - Factoring Lesson #6
Solving Quadratic Equations by Factoring (v14a)

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2. Solve the following quadratic equations.

a. $x^3 - 2x^2 - 24x = 0$

$$x(x^2 - 2x - 24) = 0$$

$$x(x-6)(x+4) = 0$$

↓ ↓ ↓

$$x = 0, 6, -4$$

b. $3x^2 - 19x - 14 = 0$

$$(3x+2)(x-7) = 0$$

↓ ↓

$$x = -\frac{2}{3}, 7$$

c. $8x^2 = 15 - 14x$

$$8x^2 + 14x - 15 = 0$$

$$8x^2 + 20x - 6x - 15 = 0$$

$$4x(2x+5) - 3(2x+5) = 0$$

$$(4x-3)(2x+5) = 0$$

↓ ↓

$$x = \frac{3}{4}, -\frac{5}{2}$$

d. $3y^2 - 27 = 0$

$$3(y^2 - 9) = 0$$

$$3(y+3)(y-3) = 0$$

↓ ↓

$$y = \pm 3$$

e. $(x+3)^2 = 4x+24$

$$x^2 + 6x + 9 = 4x + 24$$

$$x^2 + 2x - 15 = 0$$

$$(x+5)(x-3) = 0$$

↓ ↓

$$x = -5, 3$$

f. $(2x+1)^2 = (x+5)^2$

$$4x^2 + 4x + 1 = x^2 + 10x + 25$$

$$3x^2 - 6x - 24 = 0$$

$$3(x^2 - 2x - 8) = 0$$

$$3(x-4)(x+2) = 0$$

↓ ↓

$$x = 4, -2$$

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2. Algebraically, determine any restrictions on values of the variable in these radical equations.

<p>a. $\sqrt{4x-16}=13$</p> $4x-16 \geq 0$ $4x \geq 16$ $x \geq 4, x \in \mathbb{R}$	<p>b. $\sqrt{3x-1}+8=0$</p> $3x-1 \geq 0$ $3x \geq 1$ $x \geq \frac{1}{3}, x \in \mathbb{R}$	<p>c. $\sqrt{4x-2}+\sqrt{2-x}=10$</p> $4x-2 \geq 0$ $4x \geq 2$ $x \geq \frac{1}{2}$ $2-x \geq 0$ $2 \geq x$ $x \leq 2$ $\frac{1}{2} \leq x \leq 2, x \in \mathbb{R}$
<p>d. $\sqrt{3x-1}-\sqrt{4-2x}=3$</p> $3x-1 \geq 0$ $3x \geq 1$ $x \geq \frac{1}{3}$ $4-2x \geq 0$ $4 \geq 2x$ $2 \geq x$ $\frac{1}{3} \leq x \leq 2, x \in \mathbb{R}$	<p>e. $\sqrt{8x+6}=\sqrt{2x-3}$</p> $8x+6 \geq 0$ $8x \geq -6$ $x \geq -\frac{3}{4}$ $2x-3 \geq 0$ $2x \geq 3$ $x \geq \frac{3}{2}$ $x \geq \frac{3}{2}, x \in \mathbb{R}$	<p>f. $\sqrt{x-1}=\sqrt{x-4}$</p> $x-1 \geq 0$ $x \geq 1$ $x-4 \geq 0$ $x \geq 4$ $x \geq 4, x \in \mathbb{R}$

3. Solve the following radical equations algebraically. Verify the solution.

<p>a. $\sqrt{x-2}=5$</p> $x-2=25$ $x=27$ $\frac{LS}{= \sqrt{27-2}} = \sqrt{25} = 5$ $\frac{RS}{= 5} \checkmark$	<p>b. $\sqrt{3x+1}=5$</p> $3x+1=25$ $3x=24$ $x=8$ $\frac{LS}{= \sqrt{3(8)+1}} = \sqrt{25} = 5$ $\frac{RS}{= 5} \checkmark$
<p>c. $\sqrt{5x-9}-2=7$</p> $5x-9=81$ $5x=90$ $x=18$ $\frac{LS}{= \sqrt{5(18)-9}-2} = \sqrt{81}-2 = 7$ $\frac{RS}{= 7} \checkmark$	<p>d. $2\sqrt{1-3x}+1=9$</p> $1-3x=16$ $-3x=15$ $x=-5$ $\frac{LS}{= 2\sqrt{1-3(-5)}+1} = 2\sqrt{16}+1 = 9$ $\frac{RS}{= 9} \checkmark$

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4. Solve the following radical equations algebraically. Verify the solution.

<p>a. $\sqrt{x+2} = \sqrt{3-x}$ square both sides</p> $x+2 = 3-x$ $2x = 1$ $x = \frac{1}{2}$ <p>LS $= \sqrt{\frac{1}{2}+2} = \sqrt{\frac{5}{2}}$</p> <p>RS $= \sqrt{3-\frac{1}{2}} = \sqrt{\frac{5}{2}}$ ✓</p>	<p>b. $\sqrt{2x-1} - \sqrt{3x-8} = 0$</p> $(\sqrt{2x-1})^2 = (\sqrt{3x-8})^2$ $2x-1 = 3x-8$ $7 = x$ <p>LS $= \sqrt{2(7)-1} - \sqrt{3(7)-8} = \sqrt{13} - \sqrt{13} = 0$</p> <p>RS $= 0$ ✓</p>
<p>c. $\sqrt{4-x} - \sqrt{4-2x} = 0$</p> $(\sqrt{4-x})^2 = (\sqrt{4-2x})^2$ $4-x = -4-2x$ $x = -8$ <p>LS $= \sqrt{4-(-8)} - \sqrt{4-2(-8)} = \sqrt{12} - \sqrt{12} = 0$</p> <p>RS $= 0$ ✓</p>	<p>d. $\sqrt{2+x} = \sqrt{4-\frac{x}{4}}$ square both sides</p> $2+x = 4-\frac{x}{4}$ $\frac{5}{4}x = 2$ $x = \frac{8}{5}$ <p>LS $= \sqrt{2+\frac{8}{5}} = 3\sqrt{\frac{2}{5}}$</p> <p>RS $= \sqrt{4-\frac{(8/5)}{4}} = 3\sqrt{\frac{2}{5}}$ ✓</p>

5. Solve the following radical equations algebraically. Verify the solution.

<p>a. $\sqrt{x-2} + x = 8$</p> $(\sqrt{x-2})^2 = (8-x)^2$ $x-2 = x^2 - 16x + 64$ $x^2 - 17x + 66 = 0$ $(x-11)(x-6) = 0$ <p>$x = 6$ ✗</p> <p>LS $x=6$ $= \sqrt{6-2} + 6 = 2+6 = 8$ ✓</p> <p>LS $x=11$ $= \sqrt{11-2} + 11 = 3+11 = 14 \neq 8$</p> <p>RS $= 8$</p>	<p>b. $\sqrt{4x+8} - 2\sqrt{x} = 2$</p> $(\sqrt{4x+8})^2 = (2\sqrt{x}+2)^2$ $4x+8 = 4x + 8\sqrt{x} + 4$ $(4)^2 = (8\sqrt{x})^2$ $16 = 64x$ <p>$x = \frac{1}{4}$ ✗</p> <p>LS $= \sqrt{4(\frac{1}{4})+8} - 2\sqrt{\frac{1}{4}} = 3-1 = 2$</p> <p>RS $= 2$ ✓</p>
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c. $\sqrt{6x+19}-x=2$

$$(\sqrt{6x+19})^2 = (x+2)^2$$

$$6x+19 = x^2+4x+4$$

$$x^2-2x-15=0$$

$$(x-5)(x+3)=0$$

$$\boxed{x=5}, \cancel{x=-3}$$

LS $x=5$

$$= \sqrt{6(5)+19} - 5$$

$$= 7 - 5$$

$$= 2 \quad \checkmark$$

LS $x=-3$

$$= \sqrt{6(-3)+19} - (-3)$$

$$= 1 + 3$$

$$= 4 \quad \times$$

RS = 2

d. $\sqrt{7x-54}+6=x$

$$(\sqrt{7x-54})^2 = (x-6)^2$$

$$7x-54 = x^2-12x+36$$

$$x^2-19x+90=0$$

$$(x-10)(x-9)=0$$

$$\boxed{x=10, 9}$$

LS $x=10$

$$= \sqrt{7(10)-54} + 6$$

$$= 4 + 6$$

$$= 10$$

RS = 10 \checkmark

LS $x=9$

$$= \sqrt{7(9)-54} + 6$$

$$= 3 + 6$$

$$= 9$$

RS = 9 \checkmark

e. $\sqrt{2x-7}=\sqrt{x}-1$ Square both sides

$$2x-7 = x - 2\sqrt{x} + 1$$

$$2\sqrt{x} = -x + 8$$
 Square again

$$4x = x^2 - 16x + 64$$

$$x^2 - 20x + 64 = 0$$

$$(x-16)(x-4) = 0$$

$$\boxed{x=4}, 16$$

LS $x=4$

$$= \sqrt{2(4)-7}$$

$$= \sqrt{1}$$

$$= 1$$

RS $x=4$

$$= \sqrt{4} - 1 = 1 \quad \checkmark$$

LS $x=16$

$$= \sqrt{2(16)-7}$$

$$= \sqrt{25}$$

$$= 5$$

RS $x=16$

$$= \sqrt{16} - 1 = 3 \quad \times$$

f. $\sqrt{2-x}=x$

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

$$2-x = x^2$$

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

$$(x+2)(x-1)=0$$

$$\boxed{x=1}, -2$$

LS $x=1$

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

$$= \sqrt{1}$$

$$= 1$$

RS $x=1$

$$= 1 \quad \checkmark$$

LS $x=-2$

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

$$= \sqrt{4}$$

$$= 2$$

RS

$$= -2 \quad \times$$