Key

UNIT 9 - SOLVING RADICAL EQUATIONS

What is the opposite of taking the square root of a number? Square the #

$\sqrt{4}=2 \qquad (2)^2=4$

Solve: $\sqrt{x+8}+3=10$

Step 1: Isolate the radical expression:

$\sqrt{x+8}+3=10$
$-3 \quad -3$

$(\sqrt{x+8})^2=(7)^2$

Step 2: Square both sides of the equation:

$x+8=49$
$-8 \quad -8$

$\boxed{x=41}$

Check:
$\sqrt{x+8}+3=10$
$\sqrt{41+8}+3=10$
$\sqrt{49}+3=10$
$7+3=10$
$\boxed{10=10}$

Step 3: Solve the resulting equation:

Step 4: Check answers:

(on own)
(Go over)

(with partner)

Solve & Check each radical equation:

a) $\sqrt{x}-10=0$

$+10 \quad +10$

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

$x=100$

Check:
$\sqrt{x}-10=0$
$\sqrt{100}-10=0$
$10-10=0$
$0=0$
yes

b) $8\sqrt{x-3}=16$

$\frac{8\sqrt{x-3}}{8}=\frac{16}{8}$

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

$x-3=4$
$+3 \quad +3$

$\boxed{x=7}$

Check:
$8\sqrt{x-3}=16$
$8\sqrt{7-3}=16$
$8\sqrt{4}=16$
$8\cdot 2=16$
$16=16$
yes

(celebrity)

c) $\sqrt{3x+1}-2=6$

$+2 \quad +2$

$\left(\sqrt{3x+1}\right)^2=(8)^2$

$3x+1=64$

$3x=63$

$\boxed{x=21}$

$\sqrt{3x+1}-2=6$

$\sqrt{3\cdot21+1}-2=6$

$\sqrt{63+1}-2=6$

$\sqrt{64}-2=6$

$8-2=6$

$6=6$

yes ☺

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

$x-6=16$

$+6 \quad +6$

$x=22$

$\sqrt{x-6}=4$

$\sqrt{22-6}=4$

$\sqrt{16}=4$

$4=4$

yes ☺

(celebrity)

e) $\left(\sqrt{y+1}\right)^2=(1)^2$

$y+1=1$

$\boxed{y=0}$

$\sqrt{y+1}=1$

$\sqrt{0+1}=1$

$\sqrt{1}=1$

$1=1$

yes ☺

f) $\sqrt{x-4}+5=11$

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

$x-4=36$

$\boxed{x=40}$

$\sqrt{x-4}+5=11$

$\sqrt{40-4}+5=11$

$\sqrt{36}+5=11$

$6+5=11$

$11=11$

yes ☺

(on own)

g) $2\sqrt{3y+1}-3=1$

$\dfrac{2\sqrt{3y+1}}{2}=\dfrac{4}{2}$

$\left(\sqrt{3y+1}\right)^2=(2)^2$

$3y+1=4$

$3y=3$

$\boxed{y=1}$

$2\sqrt{3y+1}-3=1$

$2\sqrt{3\cdot1+1}-3=1$

$2\sqrt{3+1}-3=1$

$2\sqrt{4}-3=1$

$2\cdot2-3=1$

$4-3=1$

$1=1$

yes ☺

Extraneous Solutions

When you solve an equation by squaring each side, you create a new equation. This new equation may have solutions that do not solve the original equation.

Original equation	Square each side	New equation	Solutions of new equation
$(x)^2 = (2)^2$	$x^2=4$	$x^2=4$	$x=\pm 2$

Extraneous Solution:

Use those steps to solve and see what happens:

$(\sqrt{2x+15})^2 = (x)^2$

$2x+15=x^2$

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

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

$x=5 \quad x=-3$

$\sqrt{2(5)+15} = 5$

$\sqrt{25} = 5$

$5=5$

yes ☺

$\sqrt{2x+15} = x$

$\sqrt{2(-3)+15} = -3$

$\sqrt{-6+15} = -3$

$\sqrt{9} = -3$

$3=-3$

No ☹

Try on your own!

1. $x=\sqrt{12-x}$

$x^2=12-x$

$x^2+x-12=0$

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

$\cancel{x=-4} \quad x=3$

$-4=\sqrt{12-4}$

$-4=\sqrt{16}$

$-4=4$

☹

$3=\sqrt{9}$

$3=3$

☺

2. $x=\sqrt{3+2x}$

$x^2=3+2x$

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

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

$x=3 \quad \cancel{x=-1}$

$3=\sqrt{3+6}$

$3=\sqrt{9}$

$3=3$

$-1=\sqrt{1}$

$-1=1$

NO