Solving Radicals Equations

When we solve an equation, we "work backwards" to isolate the variable.

Which operation would be "backwards" to finding a square root?

Squaring is the inverse ("backwards") of square rooting!

Squaring will undo square rooting!

Examples: Solving Radicals Involving Square Roots

1. Solve:

a) $\sqrt{3x} = 6$

To solve the radical equation,

we square both sides of the equation and solve for x:

$$\sqrt{3x} = 6$$

Verify:

Turn over

b. $\sqrt{x+2} = -3$ *Restrictions:*

Square both sides of the equation!

Need to verify the solution!

Verify: $LS \; ? \; RS$

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

Since, the LS is NOT equal to the RS, then x = 7 is NOT a solution. In this case, 7 is called an EXTRANEOUS ROOT.

An Extraneous Root is a solution that does not satisfy the original equation.

Therefore, when solving radical equations, we must verify the solutions by substituting it into the original equation to determine whether it is a solution or whether it is an extraneous root.

Look back at the original question.

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

Why does it make sense that there is no solution?

We are asking for what value of x when we take the square root of it will give us a negative value

- there is no such value!

c. $\sqrt{x-1}+3=4$ Restrictions:

Isolate the radical

Square both sides of the equation!

Solve for x

Need to verify the solution!

Verify: $LS \,?\, RS$

$\sqrt{x-1}+3=4$

Since, the LS is equal to the RS, then x = 2 is a solution.

d. $n-\sqrt{5-n}=-7$ Restrictions:

Isolate the radical

Square both sides of the equation!

Solve for n

Need to verify the solution!

Verify:

$LS\,?\,RS$

$n-\sqrt{5-n}=-7$

$LS\,?\,RS$

$n-\sqrt{5-n}=-7$

Therefore, x = -11 is an extraneous root and the solution is x = - 4.

e. $7+\sqrt{3x}=\sqrt{5x+4}+5$

Note: This equation has a radical on both sides of the equation.

You will need to square both sides of the equation twice!

Restrictions: $5x+4\geq 0,\quad x\geq 0$

Verify:

$LS\,?\,RS$

$7+\sqrt{3x}=\sqrt{5x+4}+5$

$LS\,?\,RS$

$7+\sqrt{3x}=\sqrt{5x+4}+5$

Since, the LS is equal to the RS, then x = 0 and x = 12 are both solution.

Modelling Real-World Applications

Ex. 1 Collision investigators can approximate the initial velocity, v, in kilometres per hour, of a car based on the length, l, in metres, of the skid mark. The formula $v = 12.6\sqrt{l} + 8, l \geq 0$ models the relationship. What length of skid is expected if a car is travelling 50 km/hr when the brakes are applied? How is knowledge of radical equations used to solve this real world problem?

Ex. 2 The surface area (S) of a sphere with radius r can be found using the equation $S = 4\pi r^2$.

(a) Using the given equation, how could you find the radius of a sphere given its surface area? Write the equation.

(b) The surface area of a ball is 426.2 cm^2. What is its radius?

Key Ideas p. 300

Assign p. 300 - 303 questions 3(bc),4(ad),6(bc), 7(bcd), 8(acd), 9(bd), 10, 12, 14, 16