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Reteaching

Solving Square Root and Other Radical Equations

Equations containing radicals can be solved by isolating the radical on one side of the equation, and then raising both sides to the same power that would undo the radical.

Problem

What is the solution of the radical equation? $2\sqrt{2x + 2} - 2 = 10$

$$2\sqrt{2x + 2} - 2 = 10$$

$$2\sqrt{2x + 2} = 12 \quad \text{Add 2 to each side.}$$

$$\sqrt{2x + 2} = 6 \quad \text{Divide each side by 2.}$$

$$(\sqrt{2x + 2})^2 = 6^2 \quad \text{Square each side to undo the radical.}$$

$$2x + 2 = 36 \quad \text{Simplify.}$$

$$2x = 34 \quad \text{Subtract 2 from each side.}$$

$$x = 17 \quad \text{Divide each side by 2.}$$

Check the solution in the original equation.

Check

$$2\sqrt{2x + 2} - 2 = 10 \quad \text{Write the original equation.}$$

$$2\sqrt{2(17) + 2} - 2 \stackrel{?}{=} 10 \quad \text{Replace } x \text{ by } 17.$$

$$2\sqrt{36} - 2 \stackrel{?}{=} 10 \quad \text{Simplify.}$$

$$12 - 2 \stackrel{?}{=} 10$$

$$10 = 10 \checkmark$$

The solution is 17.

Exercises

Solve. Check your solutions.

1. $x^{\frac{1}{2}} = 13$

2. $3\sqrt{2x} = 12$

3. $\sqrt{3x} + 5 = 11$

4. $(3x + 4)^{\frac{1}{2}} - 1 = 4$

5. $(6 - x)^{\frac{1}{2}} + 2 = 5$

6. $\sqrt{3x + 13} = 4$

7. $(x + 2)^{\frac{1}{2}} - 5 = 0$

8. $\sqrt{3 - 2x} - 2 = 3$

9. $\sqrt[3]{5x + 2} - 3 = 0$

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Reteaching (continued)

Solving Square Root and Other Radical Equations

An extraneous solution may satisfy equations in your work, but it does not make the original equation true. Always check possible solutions in the original equation.

Problem

What is the solution? Check your results. $\sqrt{17 - x} - 3 = x$

$$\sqrt{17 - x} - 3 = x$$

$$\sqrt{17 - x} = x + 3$$

Add 3 to each side to get the radical alone on one side of the equal sign.

$$(\sqrt{17 - x})^2 = (x + 3)^2$$

Square each side.

$$17 - x = x^2 + 6x + 9$$

$$0 = x^2 + 7x - 8$$

Rewrite in standard form.

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

Factor.

$$x - 1 = 0 \quad \text{or} \quad x + 8 = 0$$

Set each factor equal to 0 using the Zero Product Property.

$$x = 1 \quad \text{or} \quad x = -8$$

Check

$$\sqrt{17 - x} - 3 = x$$

$$\sqrt{17 - 1} - 3 \stackrel{?}{=} 1$$

$$\sqrt{16} - 3 \stackrel{?}{=} 1$$

$$1 = 1 \checkmark$$

$$\sqrt{17 - x} - 3 = x$$

$$\sqrt{17 - (-8)} - 3 \stackrel{?}{=} -8$$

$$\sqrt{25} - 3 \stackrel{?}{=} -8$$

$$2 \neq -8$$

The only solution is 1.

Exercises

Solve. Check for extraneous solutions.

10. $\sqrt{5x + 1} = \sqrt{4x + 3}$

11. $\sqrt{x^2} + 3 = x + 1$

12. $\sqrt{3x} = \sqrt{x + 6}$

13. $x = \sqrt{x + 7} + 5$

14. $x - 3\sqrt{x} - 4 = 0$

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

16. $\sqrt{2x - 10} = x - 5$

17. $\sqrt{3x - 6} = 2 - x$

18. $\sqrt{x - 1} + 7 = x$

19. $\sqrt{5x + 1} = \sqrt{3x + 15}$

20. $\sqrt{x + 9} = x + 7$

21. $x - \sqrt{x + 2} = 40$