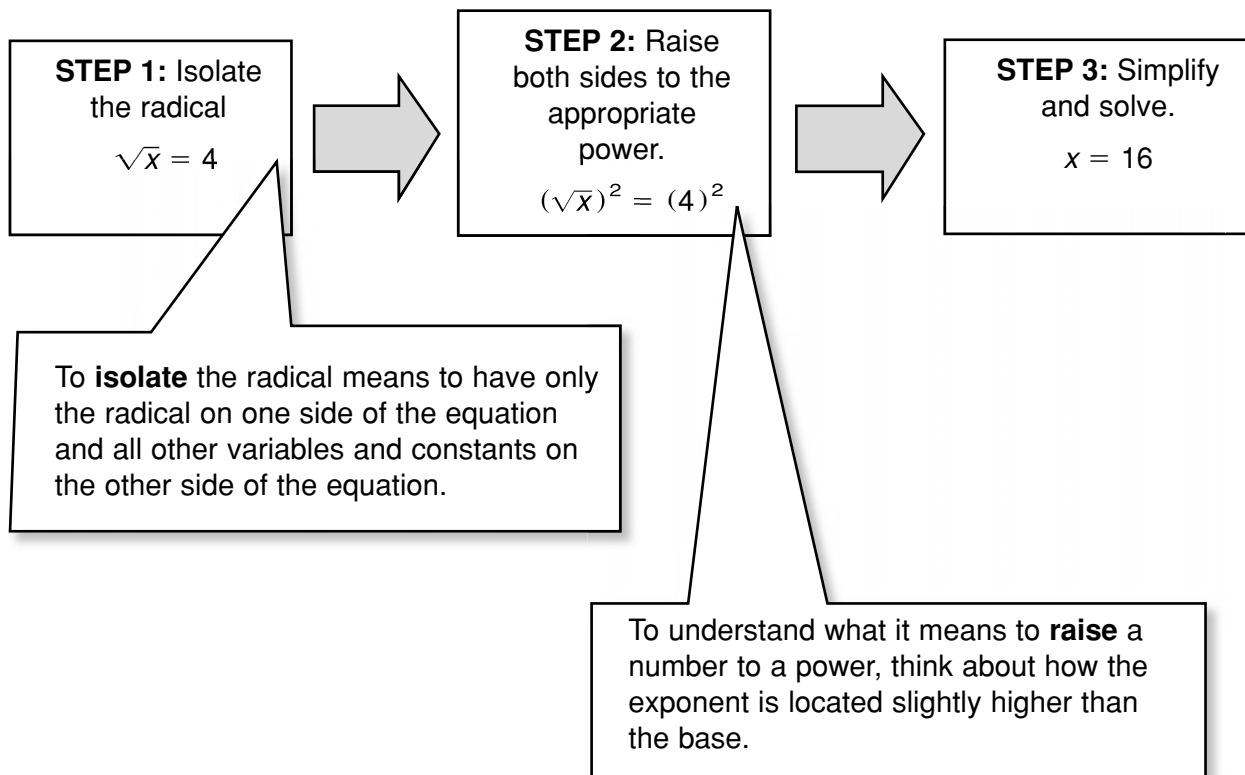


LESSON
8-8 **Reading Strategy**
Use Vocabulary

You can solve radical equations in a three-step process. For example, to solve the equation $\sqrt{x} - 4 = 0$, follow the steps below.



Isolate the radical in each equation.

1. $\sqrt{x} + 3 = 0$ _____
2. $\sqrt{x + 2} - 6 = 0$ _____
3. $4\sqrt{x} + 8 = 0$ _____
4. $\frac{1}{2}\sqrt{x} - 9 = 0$ _____
5. $-2\sqrt{x + 6} = -4$ _____

To what power should both sides of each equation be raised?

6. $\sqrt[3]{x} = 2$ _____
7. $\sqrt{x + 2} = 1$ _____
8. $\sqrt[4]{x - 3} = 3$ _____
9. $\sqrt[3]{x} = -4$ _____

Solve the following equations.

10. $\sqrt{x} - 7 = 1$ _____
11. $\sqrt{x + 2} = 3$ _____

LESSON **Reteach**
8-8 Solving Radical Equations and Inequalities (continued)

Solving equations with rational exponents is similar to solving radical equations.

Solve: $x = (x + 20)^{\frac{1}{2}}$.

- Step 1** Raise both sides to the reciprocal power. Think: $(a^{\frac{1}{n}})^n = a$
 $x^2 = [(x + 20)^{\frac{1}{2}}]^2$
- Step 2** Square both sides. The reciprocal of $\frac{1}{2}$ is 2.
 $x^2 = x + 20$
- Step 3** Write the quadratic equation in standard form.
 $x^2 - x - 20 = 0$
- Step 4** Factor. Set one side of the equation equal to zero.
 $(x + 4)(x - 5) = 0$
- Step 5** Solve.
 $(x + 4) = 0$ or $(x - 5) = 0$
 $x = -4$ $x = 5$
- Step 6** Check for extraneous solutions. This is the only solution.
 $x = (x + 20)^{\frac{1}{2}}$
 $x = -4$ $x = 5$
 $-4 \neq (-4 + 20)^{\frac{1}{2}}$ $5 = (5 + 20)^{\frac{1}{2}}$
 $-4 \neq (16)^{\frac{1}{2}}$ $5 = (25)^{\frac{1}{2}}$ ✓

Solve each equation.

- | | | |
|---|---|--|
| 4. $(5x + 6)^{\frac{1}{4}} = 3$ $[(5x + 6)^{\frac{1}{4}}]^4 = 3^4$ $5x + 6 = 81$ $5x = 75$ $x = 15$ | 5. $(6x - 8)^{\frac{1}{3}} = 4$ $[(6x - 8)^{\frac{1}{3}}]^3 = 4^3$ $6x - 8 = 64$ $6x = 72$ $x = 12$ | 6. $x = (x + 6)^{\frac{1}{2}}$ $x^2 = [(x + 6)^{\frac{1}{2}}]^2$ $x^2 = x + 6$ $x^2 - x - 6 = 0$ $(x - 3)(x + 2) = 0$ $x = 3$ |
|---|---|--|

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LESSON **Challenge**
8-8 Multiple Radicals

Equations may involve more than one radical. In that case, the solution process is repeated to eliminate multiple radicals. For example:

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

To solve, isolate one radical and square both sides as shown below.

$\sqrt{x} = 5 - \sqrt{x - 5}$
 $(\sqrt{x})^2 = (5 - \sqrt{x - 5})^2$
 $x = 25 - 10\sqrt{x - 5} + (x - 5)$

Notice that now there is only one radical in the equation. Repeat the process, isolate the radical, square, and solve.

$x = 25 - 10\sqrt{x - 5} + (x - 5)$
 $-20 = -10\sqrt{x - 5}$
 $2 = \sqrt{x - 5}$
 $2^2 = (\sqrt{x - 5})^2$
 $4 = x - 5$
 $9 = x$

Solve each equation. Check each answer to ensure that it does not include extraneous solutions.

- | | |
|---|---|
| 1. $\sqrt{x - 3} = \sqrt{x + 15} - 2$ <u>15.25</u> | 2. $\sqrt{x + 16} = x - \sqrt{x + 7}$ <u>9</u> |
| 3. $\sqrt{x - 3} - \sqrt{x - 2} = 1$ <u>No solution</u> | 4. $\sqrt[3]{x - 3} = \sqrt{x - 15}$ <u>19</u> |
| 5. $\sqrt{x - 3} = \frac{2}{\sqrt{x - 3}}$ <u>5</u> | 6. $\sqrt{x^2 - 7x + 12} - x = x - 6$ <u>3</u> |
| 7. $\sqrt{3x + 1} = \sqrt[3]{50x + 6}$ <u>5 or $-\frac{1}{9}$</u> | 8. $\sqrt[3]{x - 7} = \sqrt[3]{x - 1}$ <u>8 or -1</u> |
| 9. $\sqrt{x + 2} = 1 + \sqrt{x - 3}$ <u>7</u> | 10. $\sqrt[3]{x + 2} = \sqrt[3]{\frac{x}{2} + 5}$ <u>6</u> |

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LESSON **Problem Solving**
8-8 Solving Radical Equations and Inequalities

The formula $s = \sqrt{30fd}$ can be used to estimate the speed, s , in miles per hour that a car is traveling when it goes into a skid, where f is the coefficient of friction and d is the length of the skid marks in feet.

1. How does the speed vary as the length of the skid marks? Directly
2. Kody skids to a stop on a street with a speed limit of 35 mi/h. His skid marks measure 52 ft, and the coefficient of friction is 0.7. Kody says that he was driving only about 30 mi/h. Kody wants to prove that he was not speeding.
 $d = \frac{s^2}{30f}$
 a. Solve the equation for d in terms of s .
 b. How long would the skid marks be if he had been driving at a speed of 35 mi/h? About 58 ft
 c. Was Kody speeding or not? Explain how you know.
No; possible answer: his skid marks were only 52 ft, not 58 ft.
 d. Find his actual speed. About 33 mi/h
3. Ashley skids to a stop on a street with a speed limit of 15 mi/h to avoid a dog who runs into the street about 20 ft ahead of her. Ashley claims to have been going less than 15 mi/h. The coefficient of friction is 0.7.
 a. If Ashley were driving the speed limit, by what distance would she have missed the dog?
About 9 ft
 b. If Ashley were driving less than 10 mi/h, by what distance would she have missed the dog?
By at least 15 ft

Choose the letter for the best answer.

4. Barney was driving at 25 mi/h. A car pulls out 30 ft ahead of him. Which statement is true?
 A Barney hits the car.
 B Barney stops less than a foot from the car.
 C Barney misses the car by 3 ft.
 D Barney's skid marks measure 23 ft.
5. On a busy highway with a speed limit of 70 mi/h, a truck ahead of Verna jackknifes across the road. Verna skids to a stop 10 ft short of the truck. Her skid marks measure 260 ft. Was Verna speeding?
 A Yes; her speed was 73.9 mi/h.
 B Yes; her speed was 75.3 mi/h.
 C No; her speed was 70 mi/h.
 D No; her speed was only 63 mi/h.

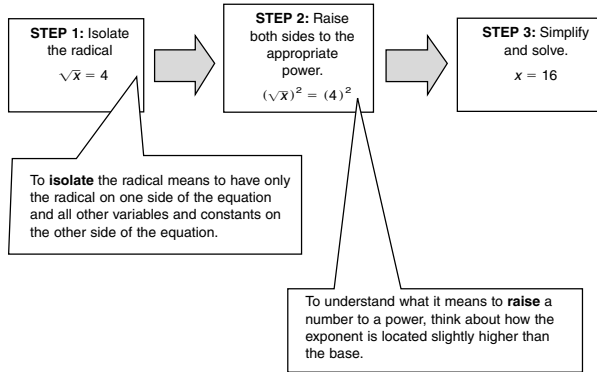
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LESSON **Reading Strategy**
8-8 Use Vocabulary

You can solve radical equations in a three-step process. For example, to solve the equation $\sqrt{x - 4} = 0$, follow the steps below.



Isolate the radical in each equation.

1. $\sqrt{x} + 3 = 0$ $\sqrt{x} = -3$
 2. $\sqrt{x + 2} - 6 = 0$ $\sqrt{x + 2} = 6$
 3. $4\sqrt{x} + 8 = 0$ $\sqrt{x} = -2$
 4. $\frac{1}{2}\sqrt{x} - 9 = 0$ $\sqrt{x} = 18$
 5. $-2\sqrt{x + 6} = -4$ $\sqrt{x + 6} = 2$

To what power should both sides of each equation be raised?

6. $\sqrt[3]{x} = 2$ Third power 7. $\sqrt{x + 2} = 1$ Second Power
 8. $\sqrt{x - 3} = 3$ Fourth power 9. $\sqrt[3]{x} = -4$ Third power

Solve the following equations.

10. $\sqrt{x} - 7 = 1$ $x = 64$ 11. $\sqrt{x + 2} = 3$ $x = 7$

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