www.MathWorksheetsGo.com
On Twitter: twitter.com/mathprintables

I. Model Problems.
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Web Resources

YouTube Video Tutorial of How To Solve Radical Equations
www.mathwarehouse.com/radical-equations/how-to-solve-radical-equations.php

Graph Paper Maker (free): www.mathworksheetsgo.com/paper/

Online Graphing Calculator(free): www.mathworksheetsgo.com/calculator/

Solving Radical Equations

There are four steps to solving radical equations:

1. Isolate the radical.
2. Square both sides.
3. Solve for *x*.
4. Check for extraneous solution(s).

I. Model Problems

In the following examples you will solve radical equations.

Example 1: **Solve for *x*.** $2\sqrt{3x+1}+4=12$

Isolate the radical.

$$\begin{aligned} 2\sqrt{3x+1}+4 &= 12 \\ -4 \quad & \quad -4 \\ \hline \frac{2\sqrt{3x+1}}{2} &= \frac{8}{2} \\ \sqrt{3x+1} &= 4 \end{aligned}$$

Square both sides.

$$\left(\sqrt{3x+1}\right)^2 = (4)^2$$

Solve for *x*.

$$\begin{aligned} 3x+1 &= 16 \\ -1 \quad & \quad -1 \\ \hline \frac{3x}{3} &= \frac{15}{3} \\ x &= 5 \end{aligned}$$

Check for extraneous solution.

$$\begin{aligned} 2\sqrt{3(5)+1}+4 &= 12? \\ 2\sqrt{15+1}+4 &= 12? \\ 2\sqrt{16}+4 &= 12? \\ 2(4)+4 &= 12? \\ 8+4 &= 12? \\ 12 &= 12 \end{aligned}$$

Solution checks.

Answer: $x = 5$

Example 2: **Solve for *x*.** $\sqrt{2x}+14=10$

Isolate the radical.

$$\begin{aligned} \sqrt{2x}+16 &= 10 \\ -16 \quad & \quad -16 \\ \hline \sqrt{2x} &= -6 \end{aligned}$$

Square both sides.

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

Solve for *x*.

$$\begin{aligned} \frac{2x}{2} &= \frac{36}{2} \\ x &= 18 \end{aligned}$$

Check for extraneous solution.

$$\begin{aligned} \sqrt{2(18)}+16 &= 10? \\ \sqrt{36}+16 &= 10? \\ 6+16 &= 10? \\ 22 &\neq 10 \end{aligned}$$

Solution is extraneous.

Answer: no solution

II. Practice Problems

Solve.

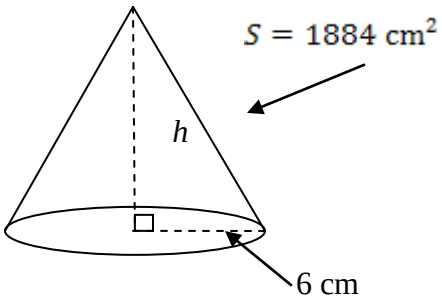
1. $\sqrt{x} = 8$
2. $\sqrt{2x} = 3$
3. $\sqrt{-4x} = -6$
4. $\sqrt{x+7} = 8$
5. $\sqrt{8-x} = 10$
6. $\sqrt{4x-7} = 15$
7. $3\sqrt{x} = 27$
8. $-5\sqrt{x+4} = 45$
9. $2\sqrt{x+6} = 14$
10. $\sqrt{2x-4} - 6 = -3$
11. $-4\sqrt{x+5} = -48$
12. $8\sqrt{7-3x} = 24$
13. $2\sqrt{x} - 8 = 12$
14. $-4\sqrt{x} + 11 = 3$
15. $3\sqrt{5x-26} + 6 = 15$
16. $-4\sqrt{9x-5} + 12 = 24$
17. $-5\sqrt{2x-8} - 6 = -36$
18. $-\frac{2}{3}\sqrt{4x-1} + 6 = -4$
19. $\frac{1}{4}\sqrt{6-5x} + 2 = 6$
20. $x - 1 = \sqrt{15-7x}$
21. $7\sqrt{3x+14} + 12 = -19$
22. $\sqrt{x+5} - 1 = \sqrt{x}$

III. Challenge Problems

Solve.

23. $\sqrt{2x^2 - 64} = x$
24. $\sqrt{10x^2 - 7} = 3x$
25. $\sqrt{x+2} + \sqrt{x} = 4$

26. The surface area of a cone is found with the formula $S = \pi r\sqrt{r^2 + h^2}$. Find *h* for the cone below. Use $\pi = 3.14$.



27. Shown is a student's work. Find the error.

$$\begin{aligned} \sqrt{2x} + 2 &= 8 \\ 2x + 4 &= 64 \\ 2x &= 60 \end{aligned}$$

$x = 30$

IV. Answer Key

1. $x = 64$
2. $x = \frac{9}{2}$
3. $\emptyset$
4. $x = 57$
5. $x = -92$
6. $x = 58$
7. $x = 81$
8. $\emptyset$
9. $x = 43$
10. $x = \frac{13}{2}$
11. $x = 139$
12. $x = -\frac{2}{3}$
13. $x = 100$
14. $x = 4$
15. $x = 7$
16. $\emptyset$
17. $x = 22$
18. $x = \frac{113}{2}$
19. $x = -50$
20. 2
21. $\emptyset$
22. 4
23. $x = 8$
24. $x = \sqrt{7}$
25. $x = \frac{49}{16}$
26. $h = 8$ cm
27. In the first step the student needs to isolate the radical by subtracting two from both sides before squaring. Also, the student squared the right side of the equation incorrectly; they would need to apply FOIL.