

# Radical Reality Check

*Solve, check, and interpret radical equations.*

**HIGH SCHOOL • MA.912.AR.7.1**

**MA.912.AR.7.1** "Solve one-variable radical equations. Interpret solutions as viable in terms of context and identify any extraneous solutions."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

**You will need:** Pencil; Ruler

## SQUARE, THEN CHECK

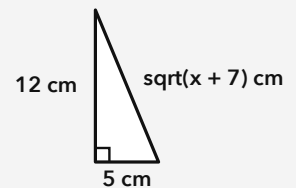
Isolate a radical before squaring both sides of an equation. Solve the resulting equation, then substitute every candidate into the original equation because squaring can create an extraneous solution.

### WORKED EXAMPLE

Use the labeled right triangle to find  $x$ .

1. The hypotenuse is  $\sqrt{5^2 + 12^2} = 13$  cm, so its label gives  $\sqrt{x + 7} = 13$ .
2. Use the side lengths in the figure:  $\sqrt{x + 7} = 13$ .
3. Square both sides:  $x + 7 = 169$ .
4. Subtract 7:  $x = 162$ .
5. Check in the original expression:  $\sqrt{162 + 7} = \sqrt{169} = 13$ .

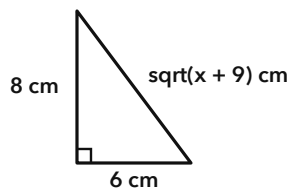
**Answer:  $x = 162$**



## PRACTICE 6 problems

Show your calculation or reasoning. Include units when needed.

- 1** Use the labeled right triangle to find  $x$ .



**ANSWER** \_\_\_\_\_  
 \_\_\_\_\_

- 2** Solve:  $\sqrt{3x - 4} = 2$

**ANSWER** \_\_\_\_\_  
 \_\_\_\_\_

- 3** Solve:  $\sqrt{x - 2} = x - 4$ . Name any extraneous solution.

**ANSWER** \_\_\_\_\_

\_\_\_\_\_

- 4** Solve:  $\sqrt{2x + 6} = x$ . Name any extraneous solution.

\_\_\_\_\_

\_\_\_\_\_

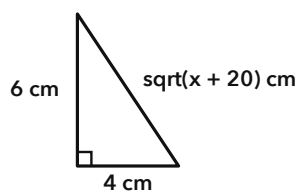
\_\_\_\_\_

\_\_\_\_\_

**ANSWER** \_\_\_\_\_

\_\_\_\_\_

- 5** Use the labeled right triangle to find  $x$ .



**ANSWER** \_\_\_\_\_

\_\_\_\_\_

- 6** Solve:  $\sqrt{x - 9} = \sqrt{3x - 29}$

**ANSWER** \_\_\_\_\_

\_\_\_\_\_

## APPLY IT Show your work

- 1** A game design project uses the level-balancing rule  $\sqrt{s} = s - 6$ , where  $s$  is the number of score tiers in a game mode. Find the viable value of  $s$  and identify any extraneous solution.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2**

A student video club models the number  $h$  of editing hours for a short video with  $\sqrt{h - 2} = h - 4$ . Find the viable number of hours and identify any extraneous solution.

---

---

---

---

**CHALLENGE** One step up

Solve  $\sqrt{x + 3} + \sqrt{x - 1} = 6$ . Then show a substitution that checks your solution.

---

---

---

---

---

**PRACTICE 2**

$x = 8/3$

**PRACTICE 3**

$x = 6$ ;  $x = 3$  is extraneous.

**PRACTICE 4**

$x = 1 + \sqrt{7}$ ;  $x = 1 - \sqrt{7}$  is extraneous. Square to obtain  $x^2 - 2x - 6 = 0$ , giving  $x = 1 \pm \sqrt{7}$ . The original equation requires  $x \geq 0$ , so reject  $1 - \sqrt{7}$ . For  $1 + \sqrt{7}$ ,  $2x + 6 = 8 + 2\sqrt{7} = (1 + \sqrt{7})^2$ ; its principal square root equals  $x$ .

**PRACTICE 6**

$x = 10$

**APPLY IT 1**

$s = 9$  is viable;  $s = 4$  is extraneous. Square both sides to get  $s = (s - 6)^2$ , which gives candidates 4 and 9. Only 9 makes the right side of the original equation nonnegative and satisfies the equation.

**APPLY IT 2**

$h = 6$  hours is viable;  $h = 3$  hours is extraneous. Square both sides to get  $h - 2 = (h - 4)^2$ , which gives candidates 3 and 6. Substitute both values into the original equation, and only 6 works.

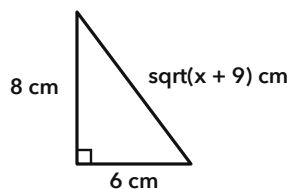
**CHALLENGE**

$x = 73/9$ ;  $\sqrt{100/9} + \sqrt{64/9} = 10/3 + 8/3 = 6$ . Let  $u = \sqrt{x + 3}$  and  $v = \sqrt{x - 1}$ . Then  $u + v = 6$  and  $u^2 - v^2 = 4$ , so  $u - v = 2/3$ . Hence  $u = 10/3$ ,  $v = 8/3$  and  $x = v^2 + 1 = 73/9$ .

Accept equivalent exact forms, including  $8/3$  and  $73/9$ . For items that ask for extraneous solutions, students must identify the rejected candidate as well as the valid solution.

**PRACTICE 1**

$x = 91$

**PRACTICE 5**

$x = 32$

