LESSON MAKER PRO

Check the Roots

Solve radical equations, then test every candidate.

HIGH SCHOOL · A2S.AF.B.8

A2S.AF.B.8 "Explain why extraneous solutions to an equation may arise and how to check to be sure that a candidate solution satisfies an equation. Extend to radical equations."

NAME _____ DATE _____

WHY CHECK?

Squaring both sides can produce a candidate that does not satisfy the original equation. After you solve, substitute each candidate into the original equation and compare the two sides.

WORKED EXAMPLE

Solve sqrt(x+16) = x-4. Check each candidate.

1. Square both sides: $x+16 = (x-4)^2$.
2. Simplify: $0 = x^2-9x = x(x-9)$. The candidates are 0 and 9.
3. Check 0: sqrt(0+16) = 4, but 0-4 = -4. It does not work.
4. Check 9: sqrt(9+16) = 5 and 9-4 = 5. It works.

Answer: x = 9

PRACTICE 6 problems

1 Solve sqrt(x+11) = x-1. Check both candidates.

ANSWER _____

2 Solve sqrt(x+3) = x-3. Check both candidates.

ANSWER _____

3 Solve sqrt(2x+20) = x-2. Check both candidates.

ANSWER _____

4 Solve sqrt(x+8) = x+2. Check both candidates.

ANSWER _____

5 Solve sqrt(3x+10) = x+2. Check both candidates.

ANSWER _____

6 Solve sqrt(x+14) = -x-2. Check both candidates.

ANSWER _____

APPLY IT Show your work

1 Two bike-route apps estimate travel time in minutes for a route that is x blocks long. One predicts sqrt(x+17) minutes, and the other predicts x-3 minutes. For how many blocks do the estimates match? Check your answer.

WORK SPACE

ANSWER _____

2 Two gaming clubs estimate setup time in minutes for an event with x players. One uses sqrt(2x+14), and the other uses x-5. How many players make the estimates equal? Check your answer.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve sqrt(x+24) = 2-sqrt(x+8). Check any candidate you find, then explain why it is or is not a solution.

WORK SPACE AND ANSWER

ANSWER KEY

Check the Roots

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve sqrt(x+11) = x-1. Check both candidates.	**x = 5. The candidate -2 is extraneous: the two sides are 3 and -3.**
2	Solve sqrt(x+3) = x-3. Check both candidates.	**x = 6. The candidate 1 is extraneous: the two sides are 2 and -2.**
3	Solve sqrt(2x+20) = x-2. Check both candidates.	**x = 8. The candidate -2 is extraneous: the two sides are 4 and -4.**
4	Solve sqrt(x+8) = x+2. Check both candidates.	**x = 1. The candidate -4 is extraneous: the two sides are 2 and -2.**
5	Solve sqrt(3x+10) = x+2. Check both candidates.	**x = 2. The candidate -3 is extraneous: the two sides are 1 and -1.**
6	Solve sqrt(x+14) = -x-2. Check both candidates.	**x = -5. The candidate 2 is extraneous: the two sides are 4 and -4.**

PART 2 · APPLY IT

1. **8 blocks** Squaring gives $x^2-7x-8 = 0$, so the candidates are 8 and -1. At x = 8, both estimates are 5 minutes; -1 does not satisfy the equation.
2. **11 players** Squaring gives $x^2-12x+11 = 0$, so the candidates are 11 and 1. At x = 11, both estimates are 6 minutes; 1 does not satisfy the equation.

CHALLENGE

No solution. Squaring gives sqrt(x+8) = -3, which is impossible because a square root cannot be negative. Squaring again would produce x = 1, but the original equation gives 5 = -1, so 1 is extraneous.

Accept equivalent substitution checks that show both sides of the original equation. In the challenge, students may also note that for x at least -8, the left side is at least 4 while the right side is at most 2.