LESSON MAKER PRO

Denominator Detectives

Solve rational equations, then test every answer.

HIGH SCHOOL · A2.A.1.3

A2.A.1.3 "Solve one-variable rational equations and check for extraneous solutions."

NAME _____ DATE _____

CHECK THE ORIGINAL

A rational equation has a variable in a denominator. First, note which values would make any denominator zero. Clear the denominators to solve, then check each result in the original equation because a result that makes a denominator zero is not a solution.

WORKED EXAMPLE

Solve $(x+11)/(x-13) = 24/(x-13)$.

1. The denominator is zero when x = 13, so x cannot equal 13.
2. Multiply both sides by x-13: x+11 = 24.
3. Subtract 11: x = 13.
4. Reject x = 13 because the original equation is undefined there.

Answer: No solution.

PRACTICE 6 problems

1 Solve 3/(x-2) = 1.

ANSWER _____

2 Solve (x+4)/(x-1) = 7/(x-1).

ANSWER _____

3 Solve 8/(x+2) = x/(x+2).

ANSWER _____

4 Solve (x+5)/(x-4) = 9/(x-4). State whether the value you get by clearing denominators works in the original equation.

ANSWER _____

5 Solve 2/x + 1/3 = 1.

ANSWER _____

6 Find both solutions to 1/(x-1) + 1/(x+1) = 3/4. Check that both are allowed.

ANSWER _____

APPLY IT Show your work

1 A $30 game-night kit is split equally among x friends. When one more friend joins, each person pays $1 less. How many friends split the cost at first?

WORK SPACE

ANSWER _____

2 A 40 GB game downloads at x GB per hour. With a faster connection, it downloads at x+2 GB per hour and finishes 1 hour sooner. Find the original download rate.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $(x^2-4)/(x-2) = 5$. Explain why one value found by clearing the denominator must be rejected.

WORK SPACE AND ANSWER

ANSWER KEY

Denominator Detectives

HIGH SCHOOL · A2.A.1.3

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve 3/(x-2) = 1.	**x = 5**
2	Solve (x+4)/(x-1) = 7/(x-1).	**x = 3**
3	Solve 8/(x+2) = x/(x+2).	**x = 8**
4	Solve (x+5)/(x-4) = 9/(x-4). State whether the value you get by clearing denominators works in the original equation.	**No solution. Clearing denominators gives x = 4, but that makes the original denominators zero.**
5	Solve 2/x + 1/3 = 1.	**x = 3**
6	Find both solutions to 1/(x-1) + 1/(x+1) = 3/4. Check that both are allowed.	**x = 3 and x = -1/3. Neither makes a denominator zero.**

PART 2 · APPLY IT

1. **5 friends** Solve 30/x - 30/(x+1) = 1 to get x = 5 or x = -6. Only 5 is a possible number of friends.
2. **8 GB per hour** Solve 40/x - 40/(x+2) = 1 to get x = 8 or x = -10. A download rate must be positive, so the original rate is 8 GB per hour.

CHALLENGE

x = 3. Clearing the denominator gives (x-2)(x-3) = 0, but x = 2 must be rejected because it makes the original denominator zero.

For the practice equations, accept equivalent forms of the exact answers. In the word problems, negative roots satisfy the cleared equations but are not meaningful rates or counts in context.