LESSON MAKER PRO

Check the Denominator

Solve rational equations and test your answers.

HIGH SCHOOL · PC.A.E.21

PC.A.E.21 "Solve simple rational equations in one variable, and give examples showing how extraneous solutions may arise."

NAME _____ DATE _____

THE BIG IDEA

A denominator cannot equal zero, so find any excluded values before you solve. Multiply both sides by a common denominator, solve the new equation, then check each possible answer in the original equation. Clearing denominators can produce a value that is not a solution.

WORKED EXAMPLE

Solve $4/(x-11) = 8/(x+15)$.

1. Exclude $x = 11$ and $x = -15$.
2. Multiply by $(x-11)(x+15)$: $4(x+15) = 8(x-11)$.
3. Expand and solve: $4x+60 = 8x-88$, so $x = 37$.
4. Check: $4/(37-11) = 8/(37+15) = 2/13$.

Answer: x = 37

PRACTICE 6 problems

1 Solve $12/x = 3$.

ANSWER _____

2 Solve $5/(x-1) = 10/(x+1)$.

ANSWER _____

3 Solve $9/(x+2) = 3/(x-2)$.

ANSWER _____

4 Solve $(x+1)/(x-2) = 3$.

ANSWER _____

5 Solve $(x+1)/(x-1) = 2/(x-1)$. Explain why any rejected value is not a solution.

ANSWER _____

6 Solve $(x+2)/(x-3) = (x-3)/(x+2)$.

ANSWER _____

APPLY IT Show your work

1 Friends split a $72 video game subscription equally. When 2 more friends join, each person's share drops by $3. Let x be the original number of friends. Write and solve a rational equation to find x.

WORK SPACE

ANSWER _____

2 A 60 MB video clip downloads at x MB per second. On a faster connection, the speed is x+2 MB per second, and the download takes 5 fewer seconds. Write and solve a rational equation to find the original speed.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $(x^2-25)/(x-5) = 0$. Show how clearing the denominator creates an extraneous solution, and explain why you must reject it.

WORK SPACE AND ANSWER

ANSWER KEY

Check the Denominator

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve 12/x = 3.	**x = 4**
2	Solve 5/(x-1) = 10/(x+1).	**x = 3**
3	Solve 9/(x+2) = 3/(x-2).	**x = 4**
4	Solve (x+1)/(x-2) = 3.	**x = 7/2**
5	Solve (x+1)/(x-1) = 2/(x-1). Explain why any rejected value is not a solution.	**No solution. Clearing the denominator gives x = 1, but x = 1 makes the original denominators zero.**
6	Solve (x+2)/(x-3) = (x-3)/(x+2).	**x = 1/2**

PART 2 · APPLY IT

1. **72/x - 72/(x+2) = 3; x = 6 friends** The difference in each person's share is $3, so 72/x - 72/(x+2) = 3. Solving gives x = 6 or x = -8; only 6 is a possible number of friends.
2. **60/x - 60/(x+2) = 5; x = 4 MB per second** Download time is file size divided by speed, so 60/x - 60/(x+2) = 5. Solving gives x = 4 or x = -6; speed must be positive.

CHALLENGE

Clearing the denominator gives x^2-25 = 0, so x = 5 or x = -5. Reject x = 5 because it makes the original denominator zero. The solution is x = -5.

Accept equivalent rational equations in the word problems. For each answer, check that no original denominator equals zero; in the word problems, also reject negative quantities.