

Rational Equations

A rational equation is an equation that contains at least one rational expression.

To solve a rational equation,

- Factor each denominator and determine the least common denominator (LCD)
- Identify the non-permissible values
- Multiply all terms on both sides of the equation by the LCD, and then simplify
- Solve for the variable
- Check that the solution(s) are permissible, and that they make sense in the given context

Example 1: Solving Rational Equations

Solve the following equations. What values are non-permissible? Verify your solutions.

a. $\frac{2a-3}{a-3} - 2 = \frac{12}{a+3}$

b. $x - \frac{2}{x-3} = \frac{x-1}{3-x}$

Example 2: Solving More Rational Equations

Solve the equations. What are the non-permissible values?

a. $\frac{6}{x-5} + \frac{6}{x^2-11x+30} = \frac{2}{x-6}$

b. $\frac{4x-1}{x+2} - \frac{x+1}{x-2} = \frac{x^2-4x+24}{x^2-4}$

Example 3: Use a Rational Equation to Solve a Word Problem

A ski club chartered a bus for a ski trip at a cost of \$480. In an attempt to lower the bus fare per skier, the club invited non-members to go along. After five non-members joined the trip, the fare per skier decreased by \$4.80. How many club members are going on the trip?

Solution:

Example 4: Use a Rational Equation to Solve a Word Problem

Jason and Alexa are required to paint over the graffiti on a wall. If Jason worked alone, it would take him 20 h to repaint. Working alone, Alexa could do the job in 15 h. How long, to the nearest minute, will it take them to do the painting if they work together?

Solution:

	Time to Paint Wall	Fraction painted in 1 hour	Fraction painted in t hours
Jason			
Alexa			
Together			

Example 5: Use a Rational Equation to Solve a Problem

In Northern Manitoba, there is a championship dog sled race from The Pas to Flin Flon and back. In one particular race, the *total* distance was 140 miles. Conditions were excellent on the way to Flin Flon. However, bad weather caused the winner’s average speed to decrease by 6 mph on the return trip. The total time for the trip was 8.5 hours. What was the winning dog team’s average speed on the way to Flin Flon?

Solution:

Remember: Distance = Speed × Time

	Distance (miles)	Speed (mph)	Time (h)
Trip to Flin Flon			
Return from Flin Flon			
Total Trip			