

Strategy for Solving Rational Equations Notes

- Identify any non-permissible values
- Find the Lowest Common Multiple (LCM) of the denominators
- Multiply every term on both sides by the LCM
- Reject any non-permissible values that appear as solutions

1. Solve each equation below and identify any non-permissible values.

a) $\left[\frac{x}{4} - \frac{x+3}{6} = \frac{x-3}{2} \right] \quad | \quad 12$

$$3x - 2(x+3) = 6(x-3)$$

$$3x - 2x - 6 = 6x - 18$$

$$-5x = -12$$

$$5x = 12$$

$$x = \frac{12}{5} //$$

b) $\left[\frac{5}{2x} - \frac{7}{5x} = \frac{3}{x-2} \right]$

LCM = $10x(x-2)$

$$5(5)(x-2) - 7(2)(x-2) = 30x$$

$$25(x-2) - 14(x-2) = 30x$$

$$25x - 50 - 14x + 28 = 30x$$

$$-22 = 19x$$

$$x = -\frac{22}{19} //$$

$$\begin{aligned} x &\neq 0 \\ x &\neq 2 \end{aligned}$$

c) $\left[\frac{1}{x-2} = \frac{5}{x+4} \right] \quad \left(\begin{array}{l} x \neq 2 \\ x \neq -4 \end{array} \right) \quad | \quad (x-2)(x+4)$

$$x+4 = 5(x-2)$$

$$x+4 = 5x-10$$

$$14 = 4x$$

$$x = \frac{7}{2} //$$

d) $\frac{x}{x-2} + \frac{1}{x+2} = \frac{8}{x^2-4}$

$\left[\frac{x}{x-2} + \frac{1}{x+2} = \frac{8}{(x+2)(x-2)} \right] \quad | \quad (x+2)(x-2)$

$$x(x+2) + x-2 = 8$$

$$x^2 + 2x + x - 2 = 8$$

$$x^2 + 3x - 10 = 0$$

$$(x-2)(x+5) = 0$$

$$x = 2 \text{ or } x = -5$$

↑
reject $\therefore x = -5 //$

$$x \neq \pm 2$$

3. The speed of a plane is seven times as great as the speed of a car. The car takes 3 hours longer than the plane to travel 315 km. Find the speed of the car and the speed of the plane in km/hr. (use the back of the sheet)

Let x be the speed of the car.

Let $7x$ be the speed of the plane

$$\frac{315}{7x} + 3 = \frac{315}{x}$$

$$315 + 21x = 2205$$

$$21x = 1890$$

$$x = 90 \text{ km/h}$$

1. Solve the following radical equations **algebraically**. State restrictions at each stage of the solution process and identify any **extraneous roots**.

a) $\sqrt{3x+4} = 10$ $x \geq -\frac{4}{3}$
 $3x+4 = 100$
 $3x = 96$
 $x = 32$

b) $\sqrt{4-x} + 5 = 2$
 $\sqrt{4-x} = -3$
 \therefore no solution

c) $x + 2\sqrt{x-3} = 6$ $x \geq 3$
 $(2\sqrt{x-3})^2 = (6-x)^2$ $(-x^2 + 6)^2$ $6-x \geq 0$
 $6 \leq x$

d) $\sqrt{2x+5} - \sqrt{x-1} = 2$ $x \geq 1$
 $x \geq -\frac{5}{2}$
 $(\sqrt{2x+5})^2 = (2 + \sqrt{x-1})^2$
 $2x+5 = (4 + 4\sqrt{x-1} + x-1)$
 $2x+5 = (4 + 4\sqrt{x-1} + x-1)$
 $(x+2)^2 = (4\sqrt{x-1})^2$
 $x^2 + 4x + 4 = 16x - 16$
 $x^2 - 12x + 20 = 0$
 $(x-2)(x-10) = 0$
 $x = 2$ or
 $x = 10$

Solutions: a) 32 b) no solution c) 4 d) 10, 2