

Notes: 30.1 Rational Equations and Word Problems

0.5 Factor denominators

1. Identify restrictions
2. Multiply all terms so that denominators eliminate
3. Solve the Algebra 1 equation
4. Check that your solutions aren't restricted values (if they are, they are extraneous solutions)

Solve the following:

<p>1) $\frac{x^2-4}{x+1} = x+5$ $x \neq -1$</p> <p>$\frac{x^2-4}{x+1} \cdot (x+1) = (x+5)(x+1)$</p> <p>$\cancel{x^2} - 4 = \cancel{x^2} + 6x + 5$</p> <p>$-4 = 6x + 5$</p> <p>$-9 = 6x$</p> <p>$\frac{-9}{6} = x$</p> <p>$x = -\frac{3}{2}$</p>	<p>2) $\frac{2}{x} - \frac{1}{x+2} = \frac{3}{x}$ $x \neq 0, -2$</p> <p>$\frac{2}{x} \cdot (x+2) - \frac{1}{x+2} \cdot (x+2) = \frac{3}{x} \cdot (x+2)$</p> <p>$2(x+2) - 1(x) = 3(x+2)$</p> <p>$2x+4 - x = 3x+6$</p> <p>$x+4 = 3x+6$</p> <p>$-2 = 2x$</p> <p>$x = -1$</p>
<p>3) $\frac{1}{x} - \frac{2x}{x+2} = \frac{x-6}{x(x+2)}$ $x \neq 0, -2$</p> <p>$\frac{1}{x} \cdot (x+2) - \frac{2x}{x+2} \cdot (x+2) = \frac{x-6}{x(x+2)} \cdot (x+2)$</p> <p>$1(x+2) - 2x(x) = (x-6)$</p> <p>$x+2 - 2x^2 = x-6$</p> <p>$0 = 2x^2 - 8$</p> <p>$0 = 2(x^2-4)$</p> <p>$0 = 2(x+2)(x-2)$</p> <p>$x = -2$ (ext.) $x = 2$</p>	<p>4) $\frac{1}{x} - \frac{x-1}{x^2+x} = \frac{x-1}{x+1}$ $x \neq 0, -1$</p> <p>$\frac{1}{x} \cdot (x+1) - \frac{x-1}{x(x+1)} \cdot (x+1) = \frac{x-1}{x+1} \cdot (x+1)$</p> <p>$1(x+1) - (x-1) = (x-1)x$</p> <p>$x+1 - x+1 = x^2 - x$</p> <p>$2 = x^2 - x$</p> <p>$0 = x^2 - x - 2$</p> <p>$0 = (x-2)(x+1)$</p> <p>$x = 2$ or $x = -1$ (ext.)</p>
<p>5) $\frac{3}{x+1} + \frac{2}{x-4} = \frac{4x-11}{x^2-3x-4}$ $x \neq -1, 4$</p> <p>$\frac{3}{x+1} \cdot (x+1)(x-4) + \frac{2}{x-4} \cdot (x-4)(x+1) = \frac{4x-11}{(x+1)(x-4)} \cdot (x+1)(x-4)$</p> <p>$3(x-4) + 2(x+1) = (4x-11)$</p> <p>$3x-12 + 2x+2 = 4x-11$</p> <p>$5x-10 = 4x-11$</p> <p>$x = -1$ (ext.)</p> <p>No solution</p>	<p>6) $\frac{2}{x} - \frac{4}{x+1} = 3$ $x \neq 0, -1$</p> <p>$\frac{2}{x} \cdot (x+1) - \frac{4}{x+1} \cdot (x+1) = 3x(x+1)$</p> <p>$2(x+1) - 4(x) = 3x(x+1)$</p> <p>$2x+2 - 4x = 3x^2+3x$</p> <p>$0 = 3x^2+5x-2$ $(\frac{-5 \pm \sqrt{25-4(3)(-2)}}{2(3)})$</p> <p>$0 = (x+2)(3x-1)$</p> <p>$x = -2$ or $x = \frac{1}{3}$</p>

Word Problems (about working fractions of a job)

Jesse's coach requires the team to help prepare the baseball diamond at school. Jesse and Cody, working together, can clean up the infield in 2 hours. If Jesse worked alone, it would take him 5 hours. To figure out how long it would take Cody to prepare the infield by himself, you must consider the portion of the job that can be completed in 1 hour.

<p>7) If it takes Jesse 5 hours to complete the job, what fraction could he complete in 1 hour, assuming he works at an even pace?</p> <p style="text-align: center;">$\frac{1}{5}$</p> <p style="text-align: center;">Jesse</p>	<p>8) If it takes Cody t hours to complete the job, what fraction could he complete in 1 hour, assuming he works at an even pace?</p> <p style="text-align: center;">$\frac{1}{t}$</p> <p style="text-align: center;">Cody</p>
<p>9) Jesse and Cody, working together, can clean up the infield in 2 hours. What fraction of the job can they complete in 1 hour if they work together?</p> <p style="text-align: center;">$\frac{1}{2}$</p> <p style="text-align: center;">together</p>	<p>10) Now write an equation using the verbal model below:</p> <p>Jesse's work in 1 hour + Cody's work in 1 hour = Together work in 1 hour</p> <p style="text-align: center;">$\frac{1}{5} + \frac{1}{t} = \frac{1}{2}$</p>
<p>11) Solve the equation from #8 to determine how long it would take Cody to complete the job if he worked alone. $t \neq 0$</p> $\frac{1}{5}t(2) + \frac{1}{t}5(2) = \frac{1}{2}5t(2)$ $2t + 10 = 5t$ $10 = 3t$ $\frac{10}{3} = t$ <p>It takes Cody $\frac{10}{3}$ hours = $3\frac{1}{3}$ hours = 3 hrs & 20 min to clean up the infield.</p>	<p>12) Garrett has cleaned up the infield on his own before, and it took him 4 hours. How long will it take all three, working together, to prepare the infield for a game? $x \neq 0$</p> $\frac{1}{5}(\frac{10}{3})4x + \frac{1}{t}5(\frac{10}{3})4x + \frac{1}{4}5(\frac{10}{3})4x = \frac{1}{x}5(\frac{10}{3})4x$ $\frac{10}{3}4x(3) + 20x(3) + 5x\frac{10}{3}(3) = 20(\frac{10}{3})(3)$ $40x + 60x + 50x = 200$ $150x = 200$ $x = \frac{200}{150}$ $x = \frac{20}{15}$ $x = \frac{4}{3} = 1\frac{1}{3}$ <p>Together it will take them 1 hour & 20 min.</p>